

PLANIGROUT 300 PLANIGROUT 310 PLANIGROUT 350

Anchoring and grouting systems
using epoxy mortar





**MAPEI EPOXY MORTARS
MAXIMUM PLASTICITY AND
WORKABILITY FOR SAFE, TOUGH,
LONG-LASTING ANCHOR POINTS.**

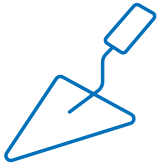
PLANIGROUT 300

PLANIGROUT 310

PLANIGROUT 350

Safe anchor points made easy

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Epoxy mortars for anchoring and grouting

For **anchoring and grouting work**, special products characterised by high mechanical properties that maintain a high level of durability over time are required. This is why it is indispensable to only use products for this type of application that have CE marking in compliance with the latest applicable standards.

CE marking is also an essential requirement in order to market, sell and use them in member states of the European Union, as well as to identify the minimum requirements for this type of product, for example:

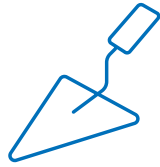
- high dimensional stability
- mechanical properties appropriate for the type of work to be carried out
- slip-resistance of steel reinforcement
- perfect bond with both the element to be anchored or grouted and with the substrate

The latter of these characteristics is particularly important because these types of mortar are often used to form **rigid connections and to fill gaps** between concrete elements or between elements made from different materials, such as steel and concrete. The first type of connection is typically found in prefabricated buildings where pillars need to be anchored to the foundations, while the second example refers to grouting and anchoring crane rails in place, for example.

The importance of the substrate

Apart from the characteristics of the products used, in order to guarantee that anchoring or grouting work lasts a long time, the **substrate** plays a vital role and it must be **mechanically sound, have no grease or oil stains and be free of dust**. To ensure it is up to the job, correct preparation of the substrate is also extremely important because it can help the anchoring and grouting product perform even better. Whether working on a new build or carrying out renovation work, it is important to evaluate the level and types of loads and stresses the products will be exposed to so that all the actions and loads, whatever their nature (vibrations, impact loads, static and dynamic loads, etc.), are transmitted to the foundations evenly.





Characteristics of epoxy mortar

The **main characteristics** that define the performance properties of an **epoxy anchoring and grouting mortar** depend on its composition. This is what determines its durability following exposure to stresses caused by external loads and forces, aggressive agents and the effects of time.

Main characteristics to evaluate epoxy mortar

Characteristics of fresh mortar

Plasticity, maintenance of workability, segregation.

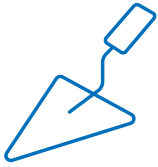
Characteristics of hardened mortar

Volumetric stability, resistivity, compressive and flexural strength, modulus of elasticity, pull-out strength of steel reinforcement, impermeability to water and oil, resistance to freeze/thaw cycles, aggressive chemicals and vibrations, adhesion to concrete and steel.

The importance of plasticity in material

An **anchoring and grouting product** must be able to **flow into tight spaces** and into areas of differing geometry. This is why the **material must maintain its plasticity**, including when steel reinforcement is present, so that it can fill every point of the structure to be anchored or grouted evenly. Being able to maintain its workability, therefore, is an essential factor.

Find out through Mapei the main performance characteristics of epoxy anchoring and grouting mortars and how to use and apply them correctly



Specific products

Planigrout 300, Planigrout 310 and Planigrout 350

Epoxy mortars specifically developed for anchoring, grouting, repairing and filling structures, including those exposed to dynamic loads and vibrations.

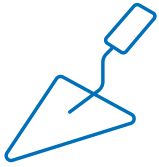
These types of mortar comply with the principles defined in EN 1504-9 (*Products and systems for the protection and repair of concrete structures: definitions, requirements, quality control and evaluation of conformity. General principles for the use of products and systems*) and the minimum requirements for EN 1504-6 (*Anchoring of reinforcing steel bar*).

For **Planigrout 310** and **Planigrout 350**, certification issued by the **American Nelson laboratory** is also available with the results of tests carried out according to ASTM (American Society for Testing and Materials), the **standards applied in the Oil&Gas sector**, which also measure and evaluate aspects of their performance properties not taken into consideration by European standards.

Results of tests carried out according to ASTM standards

- Compressive strength - **ASTM C 579**
- Tensile strength - **ASTM C 307**
- Flexural strength - **ASTM C 580**
- Modulus of elasticity - **ASTM C 580**
- Bond strength - **ASTM C 882**
- Creep - **ASTM C 1181**
- Coefficient of thermal expansion - **ASTM C 531**
- Linear shrinkage - **ASTM C 531**
- Peak exothermic temperature - **ASTM D 2471**





Planigrout 300

DESCRIPTION

Three-component epoxy mortar with plastic consistency for anchoring and grouting structures; applied in layers up to 5 cm thick

AREAS OF USE

After mixing component A with its catalyser (component B) and fillers (component C), it forms a free-flowing, non-segregating, even mortar that is easy to apply. After mixing, **Planigrout 300** hardens without shrinking in around 8 hours at +23°C through a process of chemical curing and forms a compound with excellent mechanical properties, adhesion and resistance to chemicals which maintains these properties over time.



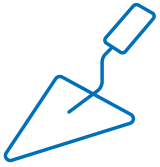
COMPONENTS

- epoxy resins
- selected aggregates in a granulometric curve
- special additives

APPLICATION

- Workable for around 1 h at +23°C
- Temperature +10°C to +35°C

CHARACTERISTIC	TEST METHOD	MINIMUM REQUIREMENTS ACCORDING TO EN 1504-6	PERFORMANCE OF PRODUCT
Density of mix (kg/dm ³)	/	/	2,0
Maximum size of aggregate (mm)	/	/	2
Brookfield viscosity (mPa·s)	/	/	35,000
Slump after mixing (cm)	EN 13395-2	/	> 20
Pot life of mix	/	/	1 h
Minimum applicable thickness (cm)	/	/	1
Maximum applicable thickness (cm)	/	/	5
Compressive modulus of elasticity (MPa)	ASTM D 695	/	2,400
Compressive strength (MPa)	EN 12190	> 80% of value declared by manufacturer after 7 days	40 (after 1 day) 80 (after 3 days) 90 (after 7 days)
Flexural strength (MPa)	EN 196-1	/	15 (after 1 day) 25 (after 3 days) 30 (after 7 days)
Pull-out strength of steel reinforcing bars - movement under a load of 75 kN (mm)	EN 1881	≤ 0.6	< 0.45
Glass transition temperature	EN 12614	≥ +45°C	+50°C
Creep - movement under a load of 50 kN for 3 months (mm)	EN 1544	≤ 0.6	0.3
Adhesion to concrete (substrate in MC 0.40 - water/cement ratio = 0.40) according to EN 1766 (MPa)	EN 1542	/	> 3 (failure of concrete)
Adhesion strength of steel bar anchored with Planigrout 300 in concrete substrate (MPa)	EN 1881	/	12
Reaction to fire	EN 13501-1	Euroclass	D-s2, d2



Planigrout 310

DESCRIPTION

Three-component free-flowing, high-strength, rapid-hardening epoxy mortar for anchoring and grouting structures; applied in layers up to 10 cm thick

AREAS OF USE

The use of innovative **Low Dust** technology considerably reduces the amount of dust given off during mixing for better, healthier working conditions. After mixing component A with its relative catalyser (component B) and mineral fillers (component C), it forms a **free-flowing, solvent-free mortar** that flows into intricate areas and tight spaces. It hardens through a process of chemical curing and forms a compound with excellent mechanical properties, adhesion and resistance to chemicals within a few hours of application.



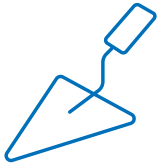
COMPONENTS

- solvent-free epoxy resins
- selected aggregates in a granulometric curve
- special additives

APPLICATION

- Workable for around 30 min at +23°C
- Temperature +10°C to +35°C

CHARACTERISTIC	TEST METHOD	MINIMUM REQUIREMENTS ACCORDING TO EN 1504-6	PERFORMANCE OF PRODUCT
Density of mix (kg/dm ³)	/	/	2,20
Maximum size of aggregate (mm)	/	/	6
Brookfield viscosity (mPa·S)	/	/	80,000
Slump after mixing (cm)	EN 13395-2	/	> 10
Pot life of mix	/	/	approx. 30 min
Minimum applicable thickness (cm)	/	/	2.5
Maximum applicable thickness (cm)	/	/	10
Tangent modulus of elasticity (GPa)	ASTM C 580	/	18
Peak exothermic temperature (415 ml of product) (°C)	ASTM D 2471	/	43
Compressive strength (MPa)	EN 12190	> 80% of value declared by manufacturer after 7 days	100 (after 1 day) 110 (after 3 days) 120 (after 7 days)
Flexural strength (MPa)	ASTM C 580	/	27 (after 7 days)
Tensile strength (MPa)	ASTM C 307	/	13 (after 7 days)
Pull-out strength of steel reinforcing bars - movement under a load of 75 kN (mm)	EN 1881	≤ 0.6	≤ 0.36
Coefficient of thermal expansion (1/°C)	ASTM C 531	/	2.5 x 10 ⁻⁵
Creep - movement under a load of 50 kN for 3 months (mm)	EN 1544	≤ 0.6	≤ 0.10
Adhesion to concrete (MPa)	EN 1542	/	> 3
Adhesion strength of steel bar anchored with Planigrout 310 in concrete substrate (MPa)	EN 1881	/	15
Reaction to fire	EN 13501-1	Euroclass	E



Planigrout 350

DESCRIPTION

Three-component free-flowing, high-strength, rapid-hardening epoxy mortar for anchoring and grouting structures; applied in layers up to 10 cm thick

AREAS OF USE

The use of selected raw materials **limits the reaction temperature** generated in the mortar, including when applied in thick layers. Compared with traditional cementitious-based products, the use of innovative **Low Dust technology** considerably reduces the amount of dust given off during mixing for better, healthier working conditions. When the three components are mixed together, it forms a free-flowing mortar characterised by excellent mechanical properties, resistance to chemicals and adhesion to substrates once hardened.



COMPONENTS

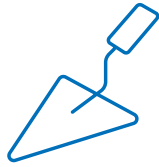
- solvent-free epoxy resins
- selected aggregates in a granulometric curve
- special additives

APPLICATION

- Workable for around 45 min at +23°C
- Temperature +10°C to +35°C

CHARACTERISTIC	TEST METHOD	MINIMUM REQUIREMENTS ACCORDING TO EN 1504-6	PERFORMANCE OF PRODUCT
Density of mix (kg/dm ³)	/	/	2.38
Maximum size of aggregate (mm)	/	/	6
Brookfield viscosity (mPa·s)	/	/	120,000
Slump after mixing (cm)	EN 13395-2	/	> 10
Pot life of mix	/	/	approx. 45 min
Minimum applicable thickness (cm)	/	/	10
Maximum applicable thickness (cm)	/	/	50
Tangent modulus of elasticity (GPa)	ASTM C 580	/	17
Peak exothermic temperature (415 ml of product) (°C)	ASTM D 2471	/	29
Compressive strength (MPa)	EN 12190	> 80% of value declared by manufacturer after 7 days	60 (after 1 day) 90 (after 3 days) 100 (after 7 days)
Flexural strength (MPa)	ASTM C 580	/	25 (after 7 days)
Tensile strength (MPa)	ASTM C 307	/	10 (after 7 days)
Pull-out strength of steel reinforcing bars - movement under a load of 75 kN (mm)	EN 1881	≤ 0.6	≤ 0.36
Coefficient of thermal expansion (1/°C)	ASTM C 531	/	4.1 x 10 ⁻⁵
Creep - movement under a load of 50 kN for 3 months (mm)	EN 1544	≤ 0.6	≤ 0.20
Adhesion to concrete (MPa)	EN 1542	/	> 3
Adhesion strength of steel bar anchored with Planigrout 350 in concrete substrate (MPa)	EN 1881	/	15
Reaction to fire	EN 13501-1	Euroclass	E

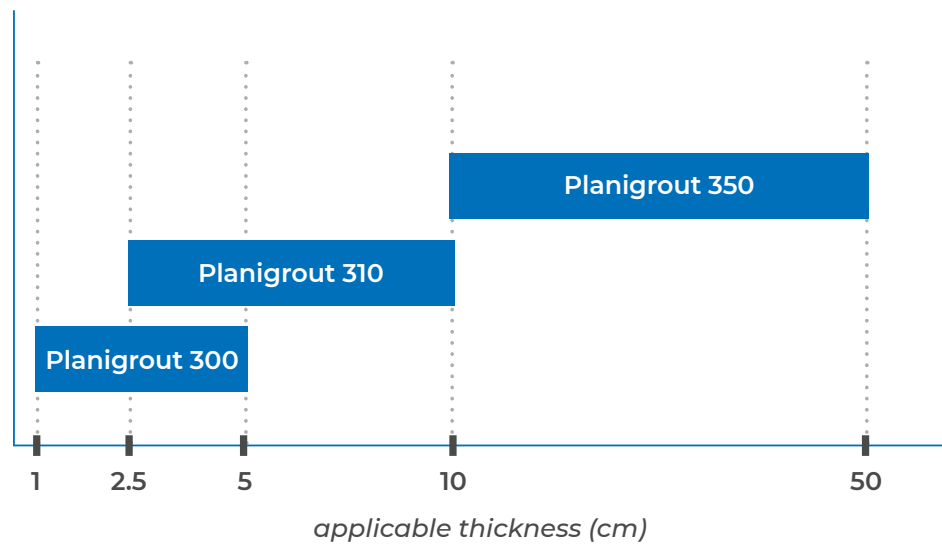




Product characteristics

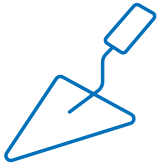
Apart from their performance properties, **Planigrout 300**, **Planigrout 310** and **Planigrout 350** also differ in the thickness that may be applied.

Applicable thickness



Summary of the main performance properties of each product

	POT LIFE OF MIX	MAXIMUM SIZE OF AGGREGATE (MM)	COMPRESSIVE STRENGTH AFTER 1 DAY (MPA) EN 12190	COMPRESSIVE STRENGTH AFTER 3 DAYS (MPA) EN 12190	COMPRESSIVE STRENGTH AFTER 7 DAYS (MPA) EN 12190
PLANIGROUT 300	1 h	2	40	80	90
PLANIGROUT 310	30 min	6	100	110	120
PLANIGROUT 350	45 min	6	60	90	100



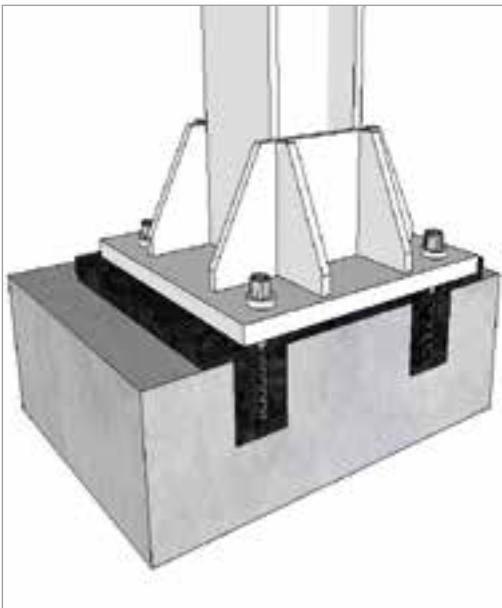
Main areas of use

Planigrout 300, Planigrout 310 and Planigrout 350

are used mainly for the following:

- Anchoring and grouting support bases for presses, compressors and heavy industrial machinery in general, including those exposed to high levels of mechanical stress.
- Structural anchors for tie-bars, anchor bolts for existing structures in concrete, stone, rock and steel, including in areas exposed to vibrations and aggressive chemicals.
- Repairs to support bases for presses and heavy industrial machinery in general.
- Levelling off the surface of bearing elements used to support floor beams.
- Repairing support beds for rails of overhead cranes.
- Repairing joints in deteriorated concrete industrial paving (movement joints).

Typical application examples for Planigrout 300, Planigrout 310 and Planigrout 350

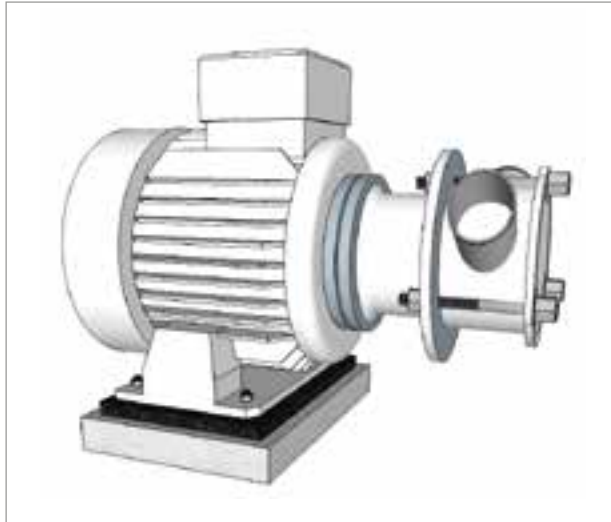


Anchoring steel bars

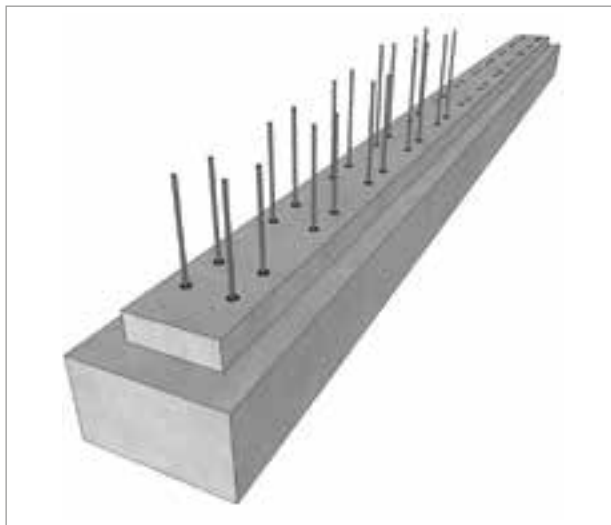


Anchoring and grouting rails for tramlines and/or overhead cranes

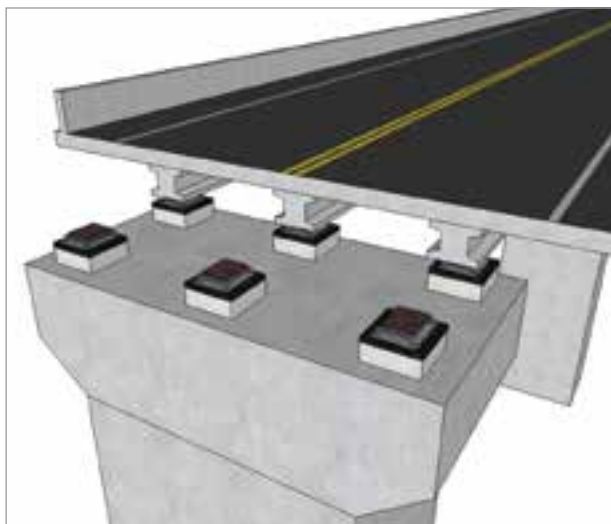




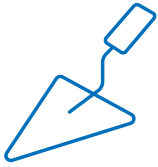
Grouting under and around support bases for industrial machinery



Anchoring steel reinforcement



Repairs to concrete supports



Typical examples

Anchoring steel reinforcement



1 Drill a series of holes for the steel reinforcement.

2 Clean the holes with compressed air.

3 Pour mortar into the holes.

Repairs to concrete beam supports



1 Raise the floor joists with hydraulic jacks to gain access to the area to be repaired.

2 Remove the deteriorated concrete with power tools, clean the substrate with compressed air and apply formwork around the beam support to be repaired.

3 Pour mortar into the formwork.

Anchoring and grouting rails for tramlines



1 Remove all deteriorated concrete.

2 Clean the substrate.

3 Pour the mortar under the rails.

Repairs to movement joints

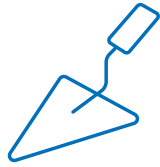


1 Cut the floor to be repaired and clean out the joint.

2 Pour mortar into the cut area.

3 Repair the expansion joint.





Application procedure

Substrate preparation

Concrete substrates must be **sound, clean** and **dry**.

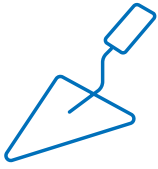
- Repair any defects in the surface, such as cracks or cavities, before applying the product.
- Use hand tools or power tools to remove any loose or detached areas, efflorescence, cement laitance and form-release oil and compound.
- Remove any dust from the sublayer with an industrial vacuum cleaner.

If it is not possible to remove all oil stains from the sublayer (due to oil leaking from machinery previously installed, for example), use special **Primer CC 200** two-component, epoxy resin-based anchoring primer for cementitious surfaces before applying the mortar.

Primer CC 200 is made from a special formulation that is able to penetrate deep down into sublayers and **creates a barrier that prevents oil**, lubricants and fuel **from rising back to the surface through capillary action**. It is also resistant to water and saline solution. Apply the product in two coats, one after the other, with a brush, broom or a smooth flat trowel. It is recommended to broadcast each coat of primer while still wet with dry **Quartz 0.5** to create a rough surface and to help ensure the pour of epoxy mortar adheres more firmly. When applying the product on concrete, make sure the sublayer is fully cured.

Adhesion of mortar to metal

In order to form a **perfect bond between the mortar and the surface of metal**, it is recommended to remove all traces of rust, paint and any loose material with power tools. All metal **surfaces must also be cleaned** with solvent to remove any greasy or oily substances.



Mixing the components

Mixing Planigrout 300

The three components which make up **Planigrout 300** must be mixed together according to the quantities indicated on the product Data Sheet.

Pour component B into component A, making sure that the entire contents of the catalyser (component B) are used. Mix them together with a drill with a mixing attachment at low-speed to avoid entraining air into the mix until thoroughly blended. Add the aggregates (component C) to the compound while mixing and keep mixing for a further 4 or 5 minutes until it forms a smooth, even-coloured paste.

Planigrout 300	12.2 kg kit	A:B:C = 1.6:0.6:10
	36.6 kg kit	A:B:C = 4.8:1.8:30

Mixing Planigrout 310 and Planigrout 350

Unlike **Planigrout 300**, component C of these two products is divided into four 21 kg bags and they have different mixing ratios.

To prepare **Planigrout 310** and **Planigrout 350** pour component B into component A, making sure that the entire contents of the catalyser (component B) are used.

Mix the two components together with a drill with a mixing attachment at low-speed until completely blended. Pour the mix into a cement mixer (it is recommended to use a vertical or horizontal mixer at low-speed) and slowly add component C in an even flow until it forms an even, lump-free mix. If only partial quantities of the products are used, use high-precision electronic scales to weigh out each component according to the ratios in their relative Data Sheets.

Planigrout 310	96.1 kg kit	A:B:C = 10.5:1.6:84 *
Planigrout 350	94.4 kg kit	A:B:C = 7.0:3.4:84 *

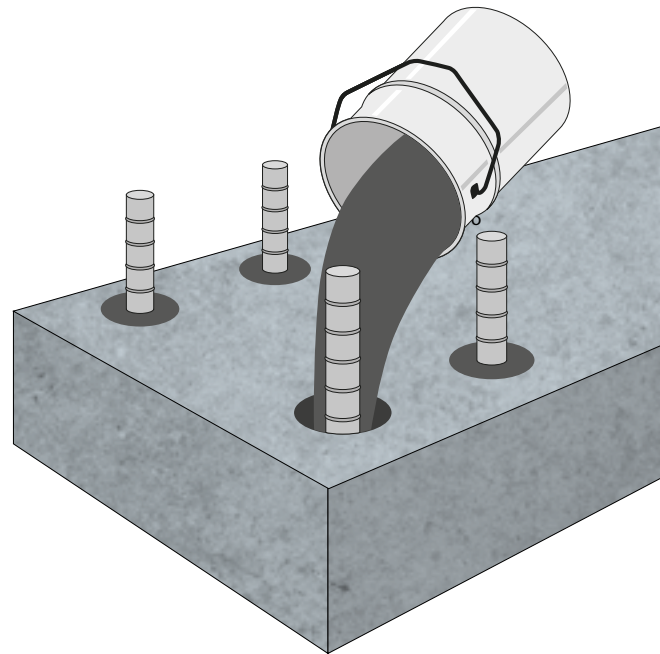
* Component C made up of 4 x 21 kg bags.



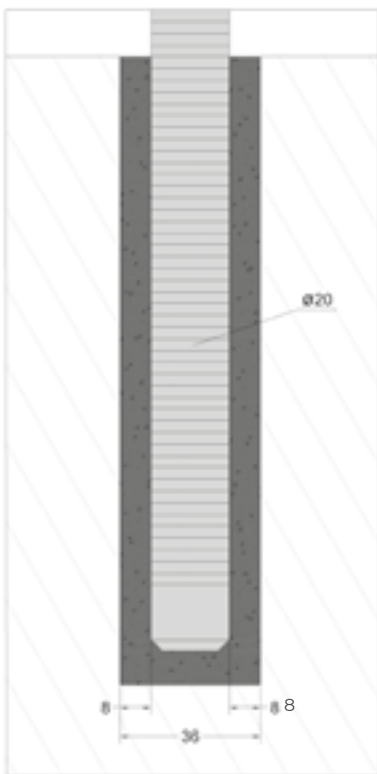
Placing by pouring into drilled holes

Size of holes and application procedure

When anchoring steel bars in concrete, special care must be taken when calculating the diameter of the holes in which the bars are to be anchored. The diameter of the holes must be calculated according to the maximum particle size of the aggregate in the anchoring product. The gap between the bars and the sides of the holes must be at least 3 to 4 times the maximum particle size in order to ensure the gap around the bars is filled correctly and completely.

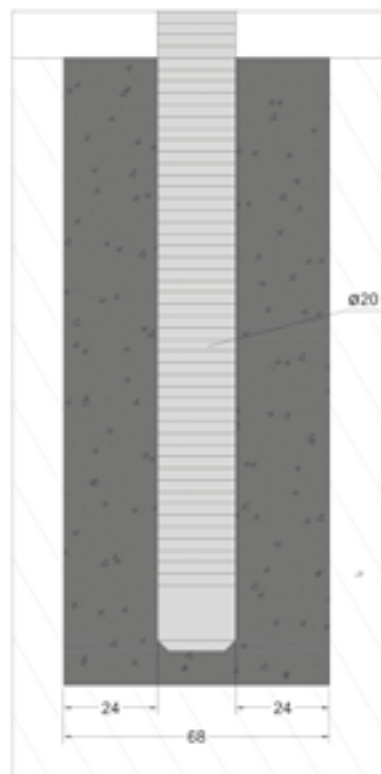


Example of how to calculate the diameter of the hole to anchor a $\varnothing 20$ mm bar



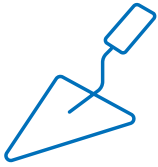
PLANIGROUT 300

Max. aggregate size = 2 mm (6-8 mm ring)
diameter of hole ~ 32/36 mm



PLANIGROUT 310 and PLANIGROUT 350

Max. aggregate size = 6 mm (18-24 mm ring)
diameter of hole ~ 56/58 mm



Placing by pouring into formwork

Positioning and sealing formwork

When the products are applied by pouring them into formwork, such as underneath machine beds or to repair beam supports, because of the plastic consistency of **Planigrout 300**, **Planigrout 310** and **Planigrout 350**, well-sealed temporary or permanent formwork needs to be used in order to guarantee they flow only into the areas required and are held in position until they have completely hardened.

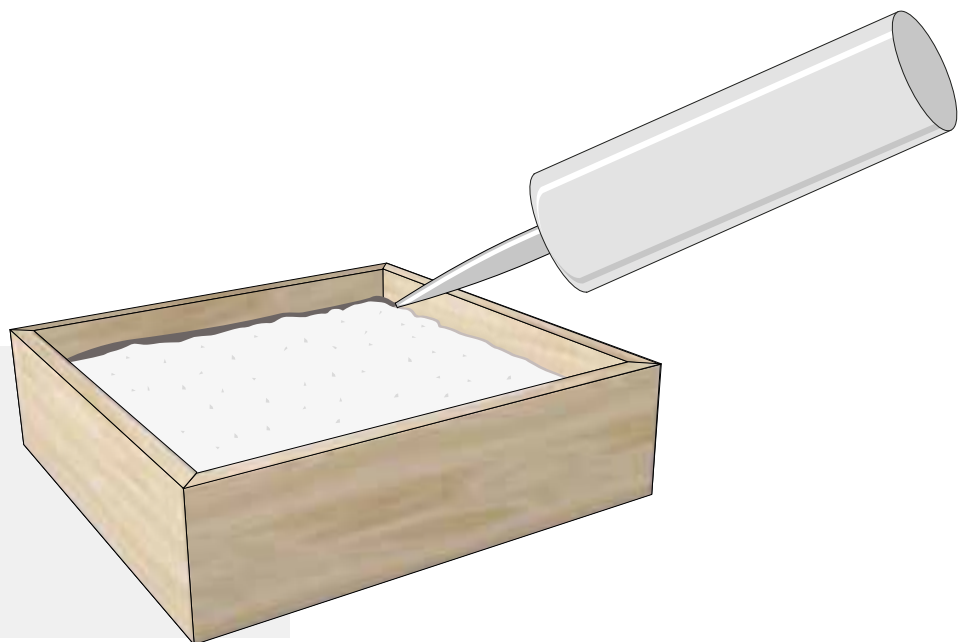
Sealing formwork

Any formwork used to carry out grouting, repair or anchoring work must be well sealed to prevent leaks or infiltrations. Various products are recommended to seal formwork:

- **Mapesil LM** one-component silicone sealant, easy to apply on both horizontal and vertical surfaces.
- **Mapeflex PU 45 FT** high-modulus, rapid-hardening polyurethane adhesive and sealant.
- **Mapeflex MS45** one-component, high-modulus, rapid-hardening silylated polymer-based hybrid sealant and adhesive; recommended for damp substrates.

Anti-sticking treatment

It is also recommended to treat formwork with an anti-sticking product, such as a form-release product for epoxy resin or a silicone oil-based form-release product in solvent.



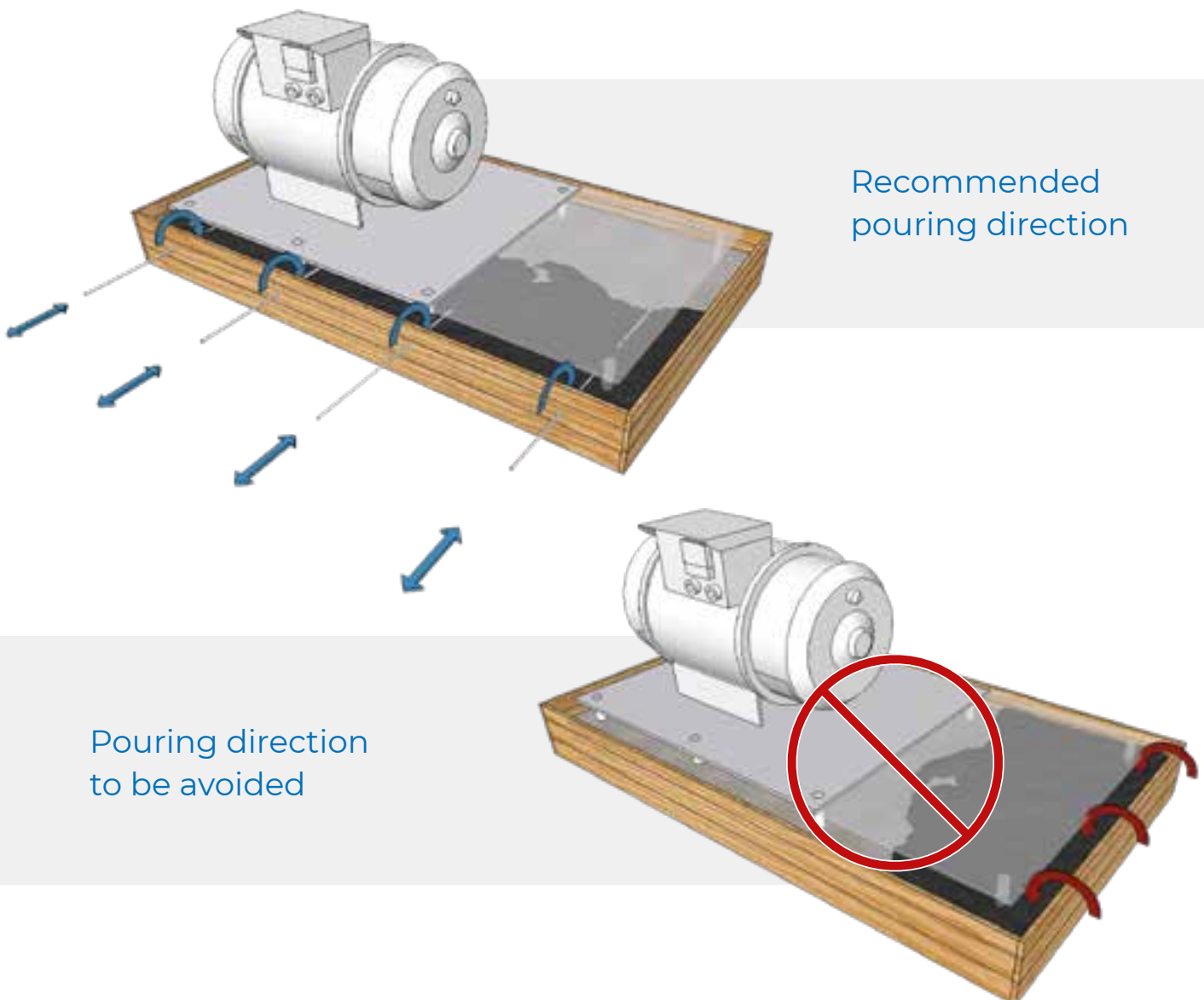
Installing
and sealing
formwork

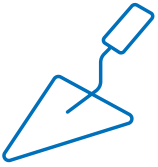
Placing the mortar

When **placing the mortar on small, rectangular surfaces**, pour the product so that it flows parallel to the shorter side of the formwork.

When placing the mortar in particularly large areas, pouring needs to be carried out in several stages and the area needs to be divided into smaller areas. The position of **joints** in the sublayer must be respected and traced into the new mortar.

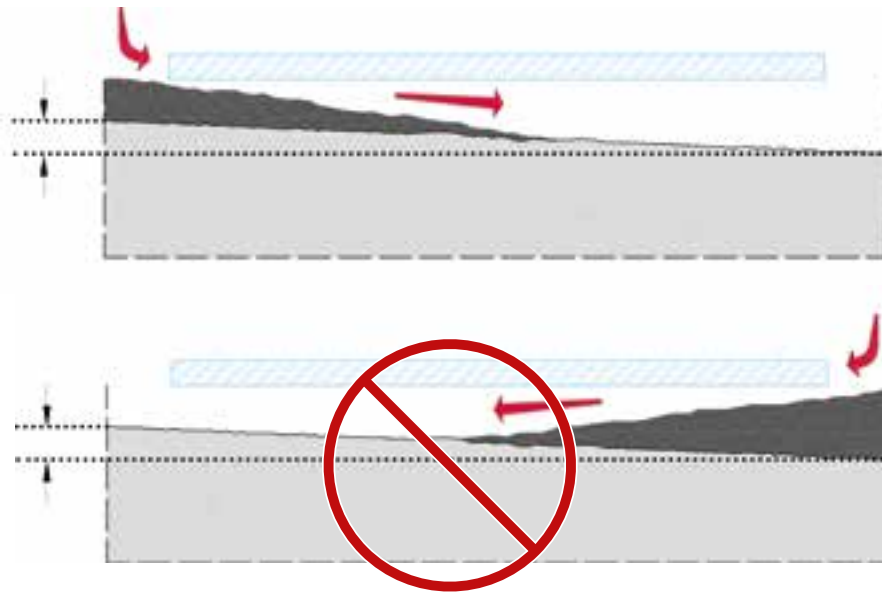
Steel rods or **metal chains** may be used to help the **mortar flow more easily**, taking care to make sure that any air in areas prepared with formwork for the poured mortar is allowed to escape so that no air pockets remain underneath the support bed.



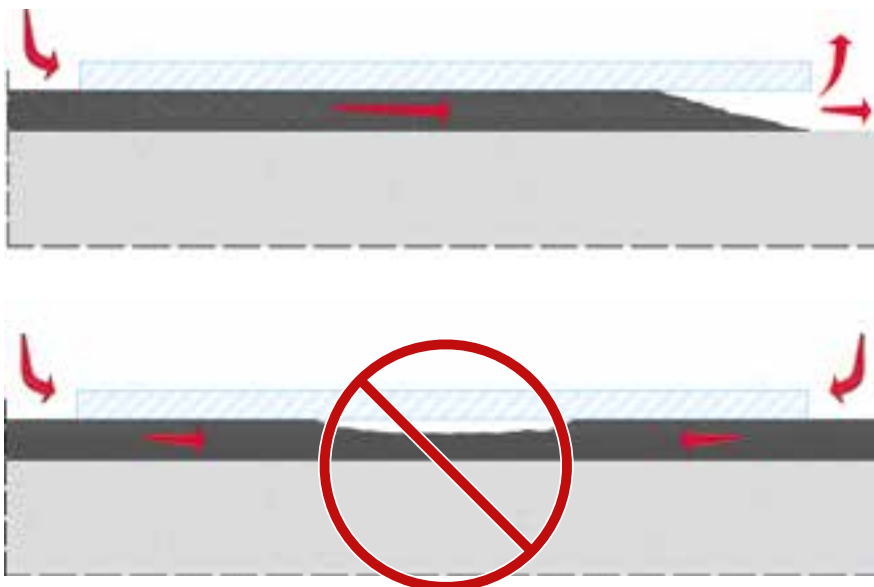


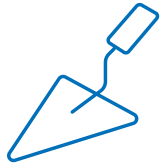
Placing by pouring into formwork

When **pouring mortar under support beds**, it is also important to check if there are any steps or slopes, in that these will influence the direction in which the mortar needs to be poured so that its flow is not impeded by the steps or slopes in the sublayer.



Anchoring and grouting mortars do not need to be vibrated but care should always be taken to prevent air bubbles or air pockets forming due to all the air in the area to be filled not being allowed to escape. It is important to pour the mortar in one direction only to limit the formation of air bubbles and air pockets in the mortar.



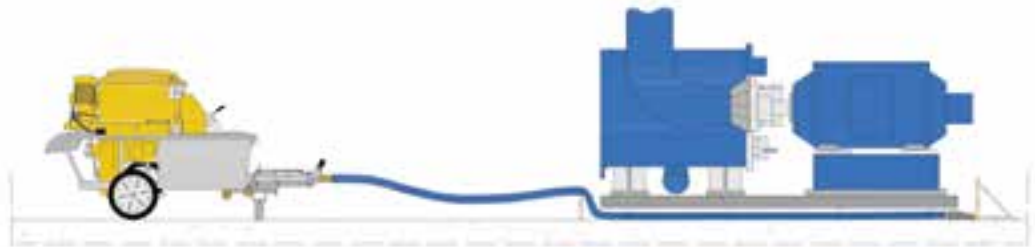


Placing with a mortar pump

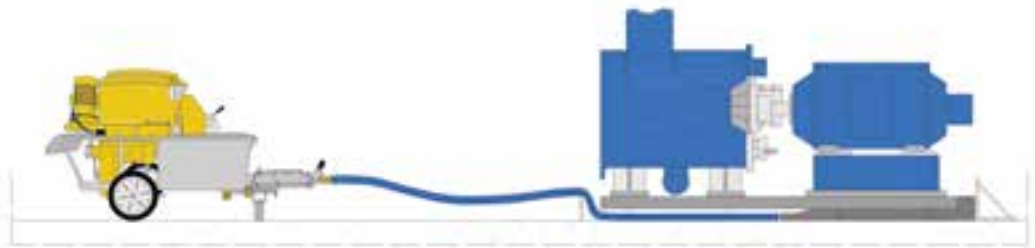
Planigrout 300, **Planigrout 310** and **Planigrout 350** may also be placed with a mortar pump, such as a Putzmeister S5 with a D8-2 hopper and 30-50 mm diameter PVC hoses.

Main phases when filling underneath support beds

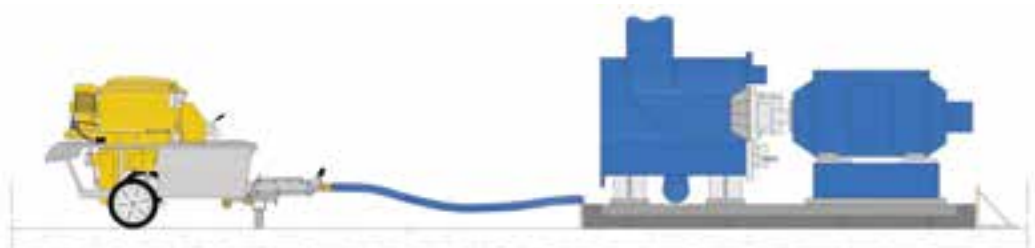
After preparing the mortar in a vertical mixer at low-speed, pour the product into the hopper of the pump. Fill the area under the support bed in several stages, starting with the area furthest from the pump.

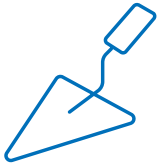


Continue placing the mortar and progressively move the hose backwards around 20-40 cm at a time to help completely fill the area under the support bed. Use small diameter metal rods to help the mortar flow into more complicated areas and into tight spaces.



Finish by filling the last part of the area under the support bed and extract the hose used to pump the mortar.



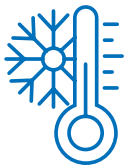


General guidelines for **placing mortar**

Application at high and low temperatures

Temperature is one of the factors that have the highest influence on how the workability and viscosity of the products are maintained. Therefore, before commencing work, it is important to check the conditions in the area where the mortar is to be placed. Reaction times are longer at low temperatures and considerably shorter at high temperatures.

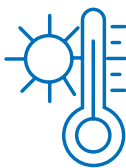
Before using **Planigrout 300**, **Planigrout 310** and **Planigrout 350** certain measures need to be taken, particularly in view of the effect of low and high temperatures.



Low temperatures (< 10°C)

At low temperatures, the workability times and viscosity of the mortars are higher. An increase in viscosity leads to a reduction in the mortar's plasticity. As a result, when the surrounding temperature and the temperature of the substrate are lower than +10°C, the mortar must be placed in an area that has been confined or heated to create the right conditions for the mortar to be placed correctly. The following measures are also recommended:

- store the products before use in an area at +20°C to +25°C
- apply the products during the warmest part of the day
- protect the products from freezing weather



High temperatures (> 35°C)

When applying the products at high temperatures, the workability times of the products are considerably shorter and their viscosity is lower. The following measures are recommended:

- protect the products from direct sunlight
- place the products during the coolest part of the day
- keep the products away from sources of heat
- store the products before use in an area at +20°C to +25°C (inside a temperature-controlled container, for example)

EVERYTHING'S OK WITH MAPEI

HEAD OFFICE

MAPEI SpA

Via Cafiero, 22 - 20158 Milan

Tel. +39-02-37673.1

Fax +39-02-37673.214

www.mapei.com

mapei@mapei.it

