

FASTPLUG

Rapid setting structural repair mortar - Class R4

DESCRIPTION

Prepacked specialised Portland cement based on the latest polymer, fibre and cement technology. It provides a simple, cost effective rapid repair system for in-situ and precast concrete, levelling applications, patching water retaining structures or pipes, plugging voids and repair of damaged waterproof screeds.

FASTPLUG is a 'structural grade' repair product, being waterproof and slump free, with exceptional compressive adhesion strengths and shrinkage compensation. This product has many and varied applications with or without the addition of extra aggregate from sharp sand to aggregate.

It can be used in vertical, overhead or other difficult areas of repair without the use of primer, special lightweight aggregates or support. To create a matched surface finish to any **FASTPLUG** repair, **FASTPATCH** or **MATCHPATCH** cements can be used, being totally compatible.

ADVANTAGES

- Ready to use, simply add clean water.
- A versatile cement which, when mixed with water and various aggregate combinations, can produce end product from pourable through to a structural mortar mix.
- Produces a shrinkage compensated, high strength (60N/mm^2), rapid setting slump free, hardwearing mortar mix.
- Complete compatibility with existing cured concrete properties, ensuring excellent monolithic performance
- Bond strength higher than tensile strength of standard concretes, no special primers necessary.
- Waterproof (ISAT).
- Free of chloride and alkali silica reactions.
- Polymer modified to provide superior adhesion (50Nmm^2) and give protection from acid gases, moisture ingress and chloride attack.
- Ideal for use in cold and damp conditions.
- Exceptional freeze/thaw resistance.
- Excellent finishing and handling characteristics.
- WRAS listed and approved product.
- Complies with clause 6 of the DTP Standard (BD 27/86)

CERTIFICATION

WRAS listed and approved product. Further details available upon request



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0086-CPR-602636

EN1504-3: Concrete repair product for structural repair
PCC (based on hydraulic cement polymer modified)

Compressive Strength:	Class R4 $\geq 45\text{Mpa}$
Adhesive Bond:	Class R4 $\geq 2.05\text{Mpa}$
Chloride Ion Content:	$\leq 0.05\%$
Carbonation resistance:	Passes
Elastic Modulus:	26.1Gpa
Thermal Capability Part 1	Class R4 $\geq 2.0\text{Mpa}$
Capillary Absorption:	$0.108\text{kg.m}^{-2}.\text{h}^{-0.5}$
Dangerous substances:	Complies with 5.4
Reaction to Fire:	Euroclass A2-s1,d0

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PREPARATION

Ensure surface for repair is sound, clean and free from deleterious substances. Laitence should be removed by mechanical means and any oils or greases etc. can be cleaned off using **ALFANOL HD** or similar product.

Exposed reinforcement steel should be fully exposed, checked and cleaned before repair commences.

With **FASTPLUG** there is no requirement for excessive mechanical keying or rebating of edges, 5mm. minimum is sufficient, due to superior bond and feathering qualities.

NB. Do not attempt repairs at ambient temperatures below 5°C without protective measures, or to a substrate with a strength less than 20N/mm².

PRIMING

FASTPLUG cement does not use a separate primer system. It is only necessary to ensure the prepared surface is thoroughly damped with clean water. Remove any excess surface water prior to application of the repair mix.

NB: If concrete to be repaired is new (hours old), use warm water to prevent thermal shock.

MIXING

Mix **FASTPLUG** cements with clean water 14% by weight or 5.5 parts to 1 part water by volume. 3.5ltrs per 25kg tub.

Mix only sufficient material for use within 10-15 minutes, if aggregate is introduced this placing time is increased. (assess by trial mix).

ADD CEMENTS TO WATER, this ensures easy hand mixing of a smooth mortar within a minute. If larger quantities than 4 kilos are to be mixed, i.e. for a screed or aggregate filled mix, use mechanical mixer or hand drill paddle mixer to ensure economy of mixing time and speed of placement.

A normal concrete mixer is not suitable as it will entrain air into the mix, use a forced action pan mixer for large mixes.

When bulking out with coarse aggregate, add no more than 4.5 litres of water which must include any water in the aggregate. Typically, the extra water addition is as follows:-

Extra Water	Flow (mm)	Set Time (minutes)
10% (3.9 litres total)	160	30
20% (4.3 litres total)	175 - 180	35 - 40
30% (4.5 litres total)	210 - 220	40 - 45

PLACING

1. Crack filling

For 'dead cracks' chase out to a minimum 5 mm depth, dampen down thoroughly with clean water, and remove any excess surface water prior to repairing. For horizontal crack repair use **FASTPLUG** at a grout consistency achieved with increased W/C ratio. For vertical cracks chase out to depth of crack and fill with **FASTPLUG** standard mix (putty consistency).

NB: **FASTPLUG** can be used as putty filler in conjunction with proprietary crack injection systems.

2. Small repairs

Apply **FASTPLUG** standard mix onto prepared substrate using a compaction technique. This helps to remove entrapped air. Apply in layers not exceeding 50 mm in vertical and soffit situations or 100 mm in pockets. If necessary support with shuttering to allow for compaction if working to reveals.

For deeper repairs, subsequent layers can be applied, providing previous layers are well keyed and stable but not fully cured - usually 25 to 30 minutes dependent on temperature. This will ensure a complete monolithic bond. Interlayer pre-wetting is unnecessary.

For final profiling or finish to a high quality use a damped, clean steel trowel. If surface colour match is required refer to application No. 8.

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PLACING

3. Plugging and tie hole filling

Using the standard mix ratio, a putty-like consistency is achieved (without additional aggregate) this is ideally suited to hand placement for most plugging applications. All seepage or infiltration of water through the substrate must be temporarily stopped prior to the application of **FASTPLUG**.

For tie hole filling or other cast-in component applications, **FASTPLUG** or **TIEPLUG** can be plugged easily into a tie-hole after withdrawal of 'she' bolt and 'corking' procedures are completed. For 'through ties' ensure any plastic tube left in the wall is removed or drilled out back to 50 mm from the concrete face. Dampen down the hole surface concrete and plug with standard mix, compacting thoroughly to ensure a watertight fill. If a cosmetic finish is required leave last 20 mm of fill for **FASTPATCH** (refer to Section 8). See **TIEPLUG** literature for full details on tie hole filling.

4. Repairs greater than 100 mm deep

Use preparation techniques as previously specified, except in the area of rebating edges which will now be dependent on the size of aggregates introduced.

Clean, coarse, hard aggregate (5-10 mm size) can be introduced in equal proportions by weight without adversely affecting the physical performance of **FASTPLUG**. For a deeper repair than 300 mm use a layer-build technique (as per specification in section 2) in 300 mm maximum layers. With addition of up to 50% by weight (2:1 approx) of aggregate there will be an extension of initial setting time (20-25 minutes) and a similar delay period (35-45 minutes) will be necessary between interlayer applications to ensure complete monolithic bond.

These figures are dependent on ambient temperature and the temperature of the substrate. If setting time is critical test by trial mix.

5. Patching

FASTPLUG standard and aggregate mixes are ideal for use on roadways, bridges, reservoirs, water treatment tanks, deteriorated concrete or masonry structures, concrete pipes and sewage culverts. Deep repairs can be filled (as per section 4) with or without additional aggregate. In the case of porous substrates an initial slurry coat mix of **FASTPLUG** should be applied prior to the use of the repair mix. The use of **FASTPLUG** cement with its fibre reinforcement, fast setting time and high bond/compressive strength properties will allow traffic bearing patches to be in service within an hour (9-10 N/mm²). Other properties of freeze-thaw resistance, durability, shrinkage and slump characteristics are essential in this type of application.

6. Levelling

Manholes, runways, fixings, crane rails, floors, kerbs, stairs, copings and other areas where trafficking and speed of repair is important.

A slight increase in water content will give a more mobile mix without loss of waterproofing qualities and facilitate ease of placement. Aggregates can be added to give increased yield and economy, ensure clean, hard and graded; dependent on application, use medium sand graded up to 5mm aggregate.

For setting manhole rings and covers, **FASTPLUG** mixes have a consistency which permits the ring to be levelled even on a slope or curve allowing application of hot or cold applied asphalt coats and trafficking within 1-2 hours

7. Repair of damaged waterproof screeds

FASTPLUG standard mix is ideally suited to spot and small repairs (i.e. less than 0.5 m² by 50 mm depth). Modification of the water:cement ratio can be implemented within the following criteria:- 5.4 to 5.6 parts **FASTPLUG** to 1 part water by volume. Addition of up to 30% by weight (3:1 approx) of clean, hard, medium grade sand can also be considered for special finishes.

To achieve a strong monolithic repair, ensure the substrate has a clean, well 'keyed' surface and a stepback lap joint of approximately 100mm onto the existing screed material. Additionally, lap joints as well as day joints must be well 'keyed' to enhance adhesion and provide a waterproof repair.

The minimum recommended thickness of **FASTPLUG** standard mix should be 12 mm with a maximum 50 mm in single layer applications. Refer to layer build data (Section 2) for thicker repairs to screeds.

8. Colour and texture matching

For matching existing concrete surface texture and colour use **FASTPATCH/MATCHPATCH** cements. Supplied in grey and white formulations, used individually or mixed; in conjunction with fine aggregate from existing concrete mix (if necessary for colour) a perfect matched finish can be achieved.

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CURING

FASTPLUG cement repairs do not normally require curing assistance for small repairs. However for large repairs, screeds or its use in hot climatic conditions, normal concrete curing techniques are recommended, i.e. damp hessian or white polythene sheet.

CLEANING

Always keep equipment clean, washing off **FASTPLUG** mixes with water before cure. If left to cure mechanical cleaning will be necessary.

COMPATIBILITY

FASTPLUG repairs are compatible with concretes based on different types of hydraulic cement as well as OPC, sulphate resisting (SRPC), PFA modified, chemically resistant etc., its unique properties providing the necessary repair parameters in a majority of cases. It is also compatible with all recommended coatings and finishes as applied to concrete, application of these should be carried out after a cure period of 7 days minimum (concrete being 21 days minimum).

The use of impregnants however will not be as effective as the repair is already waterproof.

Cementitious based coatings can generally be applied within hours of a repair.

PROPERTIES

Compressive strengths: BS4551 *

Age	Compressive strength (N/mm ²)
1 hr	9-15
2 hrs	20-22
4 hrs	28-32
24 hrs	35-50
7 days	50-60
28 days	60-75

*All figures above based on averages of no. of sample cubes tested.
W/C ratio 14%. 20°C at 100% R.H. The typical properties given above are derived from laboratory testing. Results from field applications may vary.

Flexural strengths B.S. 4551 : 1980	
Flexural strength N/mm ²	8.5-9.5 N/mm ²
Bond strength to concrete B.S.6319 Pt.4: 1984 : (28 days, slant/shear method)	
Bond Strength N/mm ²	45-55 N/mm ²

Coefficient of Thermal Expansion:- **FASTPLUG** material coefficients fully compatible with parent concretes $15 \times 10^{-6} / ^\circ\text{C}$

WATER PERMEABILITY

BS: 1881 Pt.5 : 1970 (I.S.A.T.)

Water permeability pressure / time test

Time	Initial absorption (ML/M ² /Sec)		
	Fastplug Standard	Fastplug 50% aggregate	4:1 Mortar sand: Cement
10 mins	ZERO	ZERO	1.140
2 hrs	ZERO	ZERO	0.6

Taywood 'In House' method.

A specimen of **FASTPLUG** bulked out with a medium grade sand (50% by wt) was cast and cured for 24 hours. It was then subjected to a hydrostatic pressure of 50 metres head (164 ft) which was maintained for 3 days before increasing pressure to 100 metres head (328 ft) for a further 3 days. Visual observations were taken and the permeability coefficient by penetration was calculated.

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Hydrostatic pressure	Time Period	Observations
Zero	24 hrs	Initial curing period
5 Bar	6 hrs	10-20% of surface damp
5 Bar	24 hrs	10-20% of surface damp
5 Bar	48 hrs & 72 hrs	Surface dry
10 Bar (142 psi)	72 hrs	Surface remained dry throughout

PERMEABILITY COEFFICIENT

Specimen Thickness: 51.1 mm

Depth of Penetration: 46 mm

Calculated voids content of the penetrated zone: 7.94%

Permeability Coefficient by penetration: 1.62×10^{-12} m/sec

i.e. 7.5 mm of Fastplug Mix = 1000mm of quality concrete.

Independent test carried out by Taywood Engineering research Laboratories Cert. No. 1976

SETTING TIMES

Standard mix: 10-15 minutes.

Aggregate mixes: 20-25 minutes dependent on ambient temperature and water content.

NB During a plastic state just prior to initial set, **FASTPLUG** can be cut, shaped and smoothed - use clean, dampened steel spatula or trowel.

SHRINKAGE COMPENSATION

0.007% at 28 days without curing assistance in a free unrestrained situation.

TEMPERATURE LIMITATIONS

Do not apply **FASTPLUG** below 5°C without protection system. Only use at ambient temperatures below 30°C. Always apply good concrete curing practice and keep powdered material temperature below 25°C and above 5°C in storage and use.

YIELD

13.3litres approx. per 25kg

Up to 23 litres when bulked out with aggregate.

STORAGE & HANDLING

Store in dry conditions, always reseal plastic drum after use.

HEALTH & SAFETY

Refer to separate safety data sheet. Copies available by request

PACKAGING & TRANSPORT

Supplied in 25kg plastic tubs. Not regulated for Road Transport

QUALITY ASSURANCE

Norsekem Limited Products are manufactured under quality assured schemes

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