Renderoc HF

FOSROC constructive solutions

High performance non-shrink cementitious micro-concrete

Uses

For large volume repairs to damaged reinforced concrete elements, particularly where access is restricted and where vibration of the placed material is difficult or impossible.

Advantages

- Dual-expansion .system compensates for shrinkage in plastic and hardened states
- Can be pumped or poured into restricted locations
- Highly fluid to allow for placement without vibration
- Rapid strength gain to facilitate early reinstatement
- High ultimate strengths and low permeability of cured repair
- Non-metallic expansion system does not generated hydrogen
- Contains no chloride admixtures

Standards compliance

U.S. Corps of Engineers COR-C621-82A (which supersedes CDR-C-588-78.

The appropriate sections of-the following specifications:

ASTMC-827-78 BS 1881

ASTMC-109-77 BS 4550

ASTMC-191-79 BS 4551

ASTMC-230-67 BS 5075. Part 2

Description

Fosroc Renderoc HF is supplied as a ready to use Wend of dry powders which requires only the site addition of clean water to produce a free-flowing non-shrink repair micro-concrete. The material is based on Portland cements graded aggregates and fillers, and additives which impart controlled expansion characteristics in both the plastic and hardend states, while minimising water demand. The low water requirement ensures high early strength and long term durabilty.

For exceptionally large repairs, the mixed Renderoc HF may be modified by the site addition at 8 mm to 12 mm clean, graded, saturated, surface dry aggregates. The local Fosroc once should be consulted prior to modifying Renderoc HF in this way. Where the repair mortar is required to exhibit low-alkaline characteristics the use of Fosroc's Renderoc LA should be considered.

Technical support

Fosroc offers a comprehensive range of high performance, high quality construction products. In addition, Fosroc offers a technical support package to specifiers, end-users and contractors as wen as technical on-srte assistance in locations all over the world.

Design criteria

Renderoc HF can be applied in sections up to 125 mm deep. For larger sections, the addition of approved aggreate may be required. This will depend on the specific configuration of the repair location. Consult the local Fosroc office for further information.

Properties

Compressive strengths

Age (days)	N/mm²
1	20
7	44
14	55
28	64
180	82

Result obtained when tested in accordance with BS 1881, Part 4,1970. Cubes cured under restraint Temperature: 20°C.

Variation with temperature

	Compressive strength N/mm²		
Age (days)	50°C	20°C	35°C
1	4	20	30
7	30	44	46
14	50	55	55
28	64	64	60
180	84	82	70

Flexural strength

Age (days)	N/mm²
1	2.5
7	8.0
14	9.5
28	10.0
180	11.0

Results obtained when tested in accordance with BS 4551, 1980, for flowable consistency at 20°C.

Coefficient of thermal expansion: 11x10-6 per °C.

Thermal conductivity; 1 1/2 w/m per °C.

Young's modulus: 29 kN/mm².

Freeze-thaw stability: Meets the requirements of BS 5075. Part 2.1982.

Ultimate anchorage bond stress: exceeds CP110.-

Part 1. 1972. Table 22 - requirements for 40 N/mm² concrete at 24 hours.

Setting time - variation with temperature

Temperature °C	Initials set (hours)	Final set (hours)
5	5	5
20	5	7
35	3	4

Results obtained when tested in accordance with BS 4550. Part 3.1978. for flowable consistency.

Fresh wet density: approximately 2100 kg/m3 depending on actual consistency used.

Time for expansion

	Start	Finish
Plastic state:	15 minutes	Initials set
Hardened state:	Initials set	3 days

Note: temperatures above 20°C may slightly reduce these times.
Pressure to restrain plastic expansions: approximately 0.004 N/mm².

Specification clauses

The fluid concrete repair material shall be Renderoc HF a single component cement-based micro concrete the which only the site-addition of clean water (and approved, grade aggregates where specified) shall be permitted. The micro-concrete shall be non-metalic, contain no chlorides and shall be shrinkage compensated in both the plastic and hardened states.

The product shall be capable of achieving a compressive strength of not less than 20 N/mm² after 24 hours at 20 °C. Most importantly the cured product shall have a coefficient of thermal expansion within the range 10 to 12 x 10-6 per °C

Application instructions

Preparation

The unrestrained surface area of the repair must be kept to a minimum. The formwork should be rigid and tight to prevent loss of material and have an impermeable face to prevent drying out. The formwork should include drainage outlets for pre-soaking and if beneath a provision for air-venting. Provision must also be made for suitable access points to pour or pump the mixed micro-concrete into place.

Defective concrete surfaces must be cut back to a sound base. Smooth surfaces should be mechanical roughened. Corroded reinforcing steel should be exposed around its full circumference and cleaned to remove all loose scale and corrosion deposits. It is important to clean the steel to a bright condition. Grit blasting is recommended.

Several hours prior to placing, the prepared concrete substrates should be saturated with clean water. Immediately prior to placing, any free water should be removed. Alternatively, all prepared concrete substrate should be primed curing Nitobond EP, a slow-setting epoxy bonding aid.

Mixing

Care should be taken to ensure that Renderoc HF is thoroughly mixed in a forced-action mixer of adequate capacity. Alternatively, mix in a suitably sized drum with a high torque (400/500 rpm) rotary drill fitted with an approved mixing paddle.

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It is essential that machine mixing capacity and labour availability is adequate to enable the placing operation to be carried out continuously. The rate of water addition will generally be between 4.5 litres and 4.5 litres per 25 kg bag of Renderoc HF. The optimum water content should be determined and accurately measured into the mixer. With the mixer running, add the total contents of the Renderoc |HF bag. Mix continuously for 3 to 5 minutes, making sure that a smooth even consistency is obtained.

Where the addition of graded aggregate has been specified, this should be added after the water and Renderoc HF are properly mixed. Mixing should then continue for a further 1 minute to ensure correct dispersion.

It is recommended that the mixed product be passed through a suitable coarse metal screen prior to placing or pumping to highlight any unmixed material.

Placing

The mixed material should be placed immediately. If placing by pump, standard .concrete pumping practice should be followed. The pump and pipeline must be 'grouted' with a cement slurry or mortar, discharging the 'grout' as waste. Pumping should be commenced immediately after 'grouting' in this way.

Low temperature working

In cold conditions down to 2°C, the use of warm water (up to 30°C) is advisable to accelerate strength development. Normal precautions for winter working with cementitious materials should then be adopted.

High temperature working

At ambient temperature above 35°C, the material should be stored in the shade and cool water used for mixing.

Curing

Renderoc HF is a cement-based repair compound. In common with all cementitious materials. Renderoc HF must be cured immediately after striking the formwork in accordance with good concrete practice. The use of Nitobond AR or one of Fosroc's Concure range of curing compounds, sprayed on to the surface of the hardened Renderoc RG in a continuous film, is recommended. In harsh drying conditions, supplementary curing such as wet hessian and/or polythene sheeting must be used.

Estimating

Supply

Renderoc HF : 25 kg bags

Yield

Renderoc HF : approximately 13.5 litres per 25 kg bag.

Actual yield per bag will depend on the consistency used.

Storage

Shelf life

Renderoc HF has a shelf life of 12 months if kept in a dry store in the original, unopened bags.

Storage conditions

Store in dry conditions in the original, unopened bags. If stored at high temperatures and/or high humidity conditions the shelf life may be reduced.

Precautions-health and safety

Renderoc HF contains cement powders which, during normal use, have no harmful effect in dry skin. However, when Renderoc HF is mixed, or becomes damp, alkali is released which can be harmful to the skin. During use, avoid inhalation of dust and contact with skin and eyes. Wear suitable gloves, eye protection and dust masks. The use of barrier creams is recommended. In case of contact with skin, wash with clean water. In case of contact with eyes, rinse immediately with plenty of clean water and seek medical advice. If swallowed, seek medical attention immediately - do not induce vomiting. Renderoc HF is nonflammable.

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Storage

Shelf life

All products have a shelf life of 6 months if kept in a dry store in the original, unopened bags or packs.

Storage conditions

Store in dry conditions in the original, unopened bags or packs. If stored at high temperatures and/or high humidity conditions the shelf life may be reduced to 3 to 6 months.

Precautions

Health and safety

Renderoc NSLA contains cement powders which, when mixed or become damp, release alkalis which can be harmful to the skin. During use, avoid inhalation of dust and contact with skin and eyes. Wear suitable protective clothing, gloves, eye protection and respiratory protective equipment. The use of barrier creams provide additional skin protection. In case of contact with skin, rinse with plenty of clean water, then cleanse with soap and water. In case of contact with eyes, rinse immediately with plenty of clean water and seek medical advice. If swallowed, seek medical attention immediately - do not induce vomiting.

Nitoprime Zincrich and Concure products should not come into contact with skin or eyes, or be swallowed. Ensure adequate ventilation and avoid inhalation of vapours. Some people are sensitive to resins, hardeners and solvents. Wear suitable protective clothing, gloves and eye protection. If working in confined areas, suitable respiratory protective equipment must be used. The use of barrier creams provide additional skin protection. In case of contact with skin, rinse with plenty of clean water, then cleanse with soap and water, In case of skin contact with Nitoprime Zincrich, and Concure 90 Clear, remove immediately with resin removing cream followed by washing with soap and water. Do not use solvent. In case of contact with eyes, rinse immediately with plenty of clean water and seek medical advice. If swallowed, seek medical attention immediately - do not induce vomiting.

Additional information

Fosroc manufactures a wide range of products specifically designed for the repair and refurbishment of damaged reinforced concrete. This includes hand-placed and spray grade repair mortars, fluid micro-concretes, chemical-resistant epoxy mortars and a comprehensive package of protective coatings. In addition, a wide range of complementary products is available. This includes joint sealants, waterproofing membranes, grouting, anchoring and specialised flooring materials.

Fosroc have also produced several educational training videos which provide more detail about the mechanisms which cause corrosion within reinforced concrete structures and the solutions which are available to arrest or retard these destructive mechanisms. Further information is available from the publication: 'Concrete Repair And Protection - The Systematic Approach', available in seven language formats.

For further information about products, training videos or publications, contact the local Fosroc office.

Fire

Renderoc NSLA, Nitobond EP and Concure P are non flammable.

Nitoprime Zincrich and Concure 90 Clear are flammable. Keep away from sources of ignition. No smoking. In the event of fire, extinguish with CO2 or foam. Do not use a water jet.

Flash points

Nitoprime Zincrich:	16°C
Concure 90 Clear:	40°C

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