

# Renderoc HB40

## High performance medium-weight concrete reinstatement mortar

### Uses

Renderoc HB40 exhibits a series of performance characteristics designed to achieve maximum compatibility with concrete with a compressive strength greater than 30 MPa.

For the reinstatement of large areas of reinforced concrete where low permeability characteristics are required and where higher compressive strength is an important consideration. Renderoc HB40 has been engineered for the repair of columns and beams but, because of its relatively low fresh wet density, is also suitable for soffits and other overhead repair work. The mortar can also be used for small, localised patch repairs.

Where compatibility with lower strength concrete is required, but low permeability and high-build characteristics are important, Renderoc HB25 should be used.



**Important note:** this mortar is approved for use with Norcure realkalisation. When using it in conjunction with this method, the concrete bonding primer should be an OPC:water slurry. Polymer bonding agents should not be used. No steel primer should be applied. Refer to your local Parchem sales office for further advice.

### Advantages

- Maximum compatibility with concrete of compressive strength greater than 30 MPa
- High-build applications possible while maintaining higher compressive strengths - fewer cold joints
- Frequently obviates the need for formwork
- Polymer-modification provides extremely low permeability to water, carbon dioxide and chlorides
- Exceptional system of shrinkage compensation provides long-term dimensional stability
- Can be applied quickly and efficiently by wet spraying
- One component, pre-bagged to overcome site-batched variations
- Contains no chloride admixtures
- Suitable for internal and external applications

### Standards compliance

Renderoc HB40 has been tested and approved in accordance with the Hong Kong Housing Authority Specification TM1 to TM8 (1990) and ASTM C596-89 (modified 23°C, RH50%).

### Description

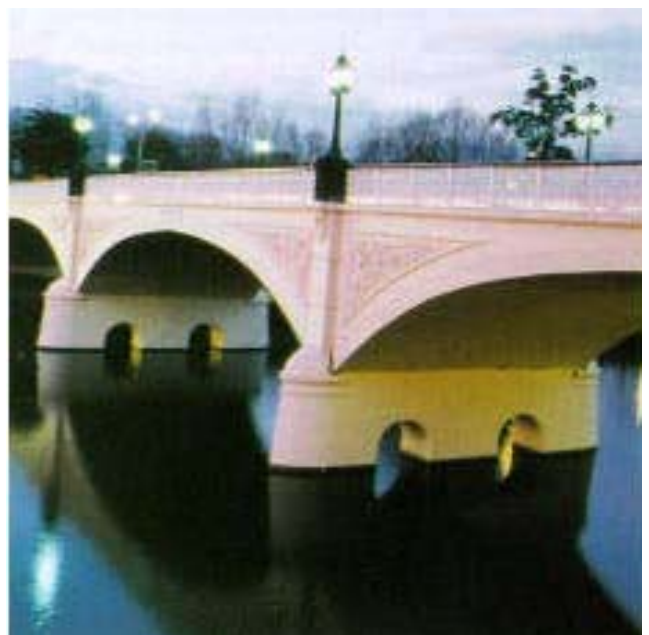
Renderoc HB40 concrete reinstatement mortar is supplied as a ready to use blend of dry powders which requires only the site addition of clean water to produce a highly consistent, medium-weight repair mortar. It is based on Portland cements, graded aggregates, lightweight fillers and chemical additives which provide a mortar with good handling characteristics while minimising water demand. The low water requirement ensures good strength gain and long-term durability.

### Technical support

Parchem offers a comprehensive range of high performance, high quality construction products. In addition, Parchem offers a technical support package to specifiers, end-users and contractors, as well as on-site technical assistance.

### Design criteria

Renderoc HB40 exhibits a series of performance characteristics designed to achieve maximum compatibility with concrete with a compressive strength greater than 30 MPa.





Renderoc HB40 has been engineered for the repair of columns and beams, but, because of its relatively low fresh wet density, can readily be used for vertical and overhead repair work. It can be applied in sections up to 40 mm thickness in vertical locations and up to 30 mm thickness in overhead locations in a single application and without the use of formwork. Thicker sections can be achieved by the use of formwork or can be built up in layers. Deep pockets can sometimes be filled in a single application dependent on the configuration of the pocket and the volume of exposed reinforcing steel.

Build can be dramatically increased by wet spraying. Typical achievable thicknesses are 70 to 110 mm vertically and 60 to 85 mm overhead, although this will depend on substrate profiles and the distribution of steel reinforcement. Consult your local Parchem sales office for further information.

The material should not be applied at less than 10 mm thickness.

Where strengths below 30 MPa and/or higher builds are required, Renderoc HB25 should be used.

### Properties

The following results were obtained at a water:powder ratio of 0.15 and a temperature of 20°C unless otherwise stated.

Test method	Typical result
<b>Compressive strength</b>	
<b>(BS 6319 Pt 2: 1983-dry cure):</b>	10 MPa @ 1 day
	25 MPa @ 7 days
	35 MPa @ 28 days
<b>Flexural strength</b>	
<b>(BS 6319 Pt 3: 1990):</b>	6.5 MPa @ 28 days
<b>Tensile strength</b>	
<b>(BS 6319 Pt 7: 1985):</b>	2.9 MPa @ 28 days
<b>Modulus of elasticity in compression</b>	
<b>(BS 6319 Pt 6: 1984):</b>	18 kN/mm <sup>2</sup> @ 28 days
<b>Water absorption</b>	
<b>ISAT (BS 1881 Pt 5: 1970)</b>	
<b>10 minutes:</b>	0.006 ml/m <sup>2</sup> /sec
<b>2 hours:</b>	0.002 ml/m <sup>2</sup> /sec
<b>Drying shrinkage</b>	
<b>23°C/RH50% (ASTM) :</b>	< 400 microstrain @ 7 days
	< 600 microstrain @ 28 days
<b>Carbon dioxide barrier - equivalent thickness of concrete to Renderoc HB40 @ 10 mm (Taywood method):</b>	
	600 mm

### Chloride diffusion by Taywood bulk diffusion test (accelerated):

< 5 x 10<sup>-13</sup> m<sup>2</sup> s<sup>-1</sup>  
(low permeability concrete defined as < 1 x 10<sup>-12</sup> m<sup>2</sup> s<sup>-1</sup> by non accelerated testing)

### Coefficient of thermal expansion:

11 x 10<sup>-6</sup>/°C

### Setting time (BS 4551 Pt 14: 1980)

**initial set:** 3 hours

**final set:** 5 hours

### Fire rating

**(BS 476 Pt 4: 1970):** Non combustible (Class 0 surface)

**Fresh wet density:** Approximately 1780 kg/m<sup>3</sup> dependent on actual consistency used.

**Chemical resistance:** The low permeability of Renderoc HB40 severely retards chemical attack in aggressive environments. The cured mortar is highly impermeable to acid gases, water borne chloride ions, and oxygen.

### Specification clauses

#### Steel reinforcement primer

The steel reinforcement primer shall be Nitoprime Zincrich\*, a single component zinc-rich epoxy resin. The primer shall be an 'active' type, capable of avoiding the generation of incipient anodes in the immediately adjacent locations. It shall be fully compatible with the Renderoc system of concrete repair.

#### High-build concrete reinstatement mortar

The reinstatement mortar shall be a single component polymer-modified, cement-based blend of powders to which only the site-addition of clean water shall be permitted. It shall be manufactured to achieve maximum compatibility with reinforced concrete with a compressive strength greater than 30 MPa and as a consequence, shall exhibit the following characteristics when tested to the standards shown.



<b>Compressive strength:</b>	35 MPa @ 28 days (BS 6319 Pt 2: 1983 dry cure)
<b>Flexural strength:</b>	6.5 MPa @ 28 days (BS 6319 Pt 3: 1990)
<b>Tensile strength:</b>	2.9 MPa @ 28 days (BS 6319 Pt 7: 1985)
<b>Elastic modulus:</b> (BS 6319 Pt 6: 1984)	18 kN/mm <sup>2</sup> @ 28 days
<b>Coefficient of thermal expansion:</b>	11 x 10 <sup>-6</sup> /°C
<b>Fire rating:</b>	Non combustible (Class 0 surface) (BS 476 Pt 4: 1970)

The cured reinstatement mortar shall be shrinkage compensated and highly impermeable to acid gases, water and water-borne contaminants. It shall exhibit the following characteristics.

<b>Drying shrinkage:</b>	< 400 microstrain at 7 days ASTM 23° C, RH50%
<b>ISAT:</b>	10 mins – 0.006 ml/m <sup>2</sup> /sec 2 hours – 0.002 ml/m <sup>2</sup> /sec (BS 1881 Pt 5: 1970)
<b>Chloride diffusion:</b> (Taywood bulk diffusion test, accelerated)	< 5 x 10 <sup>-13</sup> m <sup>2</sup> s <sup>-1</sup>
<b>Carbon dioxide barrier:</b>	600 mm (equivalent thickness of concrete to 10 mm of Renderoc HB40, Taywood method)

The mortar shall be capable of achieving the following application thicknesses in a single layer.

	Vertically	Overhead
– by hand/trowel:	40 mm	30 mm
– by wet spraying:	70 to 110 mm	60 to 85 mm

Renderoc HB40 manufactured by Parchem, meets these requirements.

## Application instructions

### Preparation

Saw cut or cut back the extremities of the repair locations to a depth of at least 10 mm to avoid feather-edging and to provide a square edge. Break out the complete repair area to a minimum depth of 10 mm up to the sawn edge.

Clean the surface and remove any dust, unsound or contaminated material, plaster, oil, paint, grease, corrosion deposits or algae. Where breaking out is not required, roughen the surface and remove any laitance by light scabbling or abrasive-blasting.

Oil and grease deposits should be removed by steam cleaning, detergent scrubbing or the use of a proprietary degreaser. The effectiveness of decontamination should then be assessed by a pull-off test.

Expose fully any corroded steel in the repair area and remove all loose scale and corrosion deposits. Steel should be cleaned to a bright condition paying particular attention to the back of exposed steel bars. Abrasive-blasting is recommended for this process.

Where corrosion has occurred due to the presence of chlorides, the steel should be high-pressure washed with clean water immediately after abrasive-blasting to remove corrosion products from pits and imperfections within its surface.

### Reinforcing steel priming

Apply one full coat of Nitoprime Zincrich and allow to dry before continuing. If any doubt exists about having achieved an unbroken coating, a second application should be made and, again, allowed to dry before continuing.

### Substrate priming

The substrate should be thoroughly soaked with clean water and any excess removed prior to applying one coat of Nitobond HAR\* primer and scrubbing it well into the surface. Renderoc HB40 can be applied as soon as the primer becomes tacky. If the Nitobond HAR is too wet, overhead and vertical build up of the Renderoc HB40 mortar may be difficult.

In exceptional circumstances, e.g. where a substrate/repair barrier is required or where the substrate is wet or likely to remain permanently damp, Nitobond EP\* bonding aid should be used. Contact your local Parchem sales office for further information.

**Note:** Nitobond HAR primer should not be used when spraying Renderoc HB40.

### Mixing

Care should be taken to ensure that Renderoc HB40 is thoroughly mixed. A forced-action mixer is essential. Mixing in a suitably sized drum using an approved spiral paddle in a slow speed (400/500 rpm) heavy-duty drill is acceptable for the occasional one-bag mix. Free-fall mixers must not be used. Mixing of part bags should never be attempted.

For normal applications, place 3.0 to 3.2 litres of drinking quality water into the mixer and, with the machine in operation, add one full 20 kg bag of Renderoc HB40 and mix for 3 to 5 minutes until fully homogeneous. Note that the powder must always be added to the water.

## Application

Exposed steel reinforcing bars should be firmly secured to avoid movement during the application process as this will affect mortar compaction, build and bond.

Apply the mixed Renderoc HB40 to the prepared substrate by gloved hand or trowel. Thoroughly compact the mortar on to the primed substrate and around the exposed reinforcement. Renderoc HB40 can be applied in sections up to 40 mm thickness in vertical locations and up to 30 mm thickness in overhead locations in a single application and without the use of formwork. Thicker sections should be built-up in layers but are sometimes possible in a single application dependent on the actual configuration of the repair area and the volume of exposed reinforcing steel. Thicker applications can always be achieved by spray application - see below.

If sagging occurs during application, the Renderoc HB40 should be completely removed and reapplied at a reduced thickness on to the correctly reprimed substrate.

Note: the minimum applied thickness of Renderoc HB40 is 10 mm.

## Build-up

Additional build-up can be achieved by application of multiple layers. The final thickness is dependent on the material consistency and substrate profile.

The surface of the intermediate layers should be scratch-keyed and cured with Nitobond AR\*. Repriming with Nitobond HAR and a further application of Renderoc HB40 may proceed as soon as this layer has set.

## Spray application

Renderoc HB40 can be quickly and efficiently applied by the wet spray technique. In circumstances where large areas of repair are required, the rapid placement and higher build attainable by this method offer economic advantages over hand-trowelling. The resultant repair also offers a generally more dense compound with enhanced mortar/substrate bond characteristics. For further details on the wet spray technique, including selection of spraying machines and nozzles, consult Fosroc's guide 'Application of Renderoc mortars by the dry and wet spray process' or contact your local Parchem sales office.

## Finishing

Renderoc HB40 is finished by striking off with a straight edge and closing with a steel float. Wooden or plastic floats, or damp sponges may be used to achieve the desired surface texture. The completed surface should not

be overworked. After spray application, the mortar may need to be 'cut back' to the required profile using a steel float and then finished with damp sponges as described above.

## Low temperature working

In cold conditions down to 5°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. The material should not be applied when the substrate and/or air temperature is 5°C and falling. At 5°C static temperature or at 5°C and rising, the application may proceed.

## High temperature working

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

## Curing

Renderoc HB40 is a cement-based repair mortar. In common with all cementitious materials, it must be cured immediately after finishing in accordance with good concrete practice. The use of Nitobond AR, sprayed on to the surface of the finished mortar in a continuous film, is recommended. Large areas should be cured as trowelling progresses (0.5 m<sup>2</sup> at a time) without waiting for completion of the entire area. In fast drying conditions, supplementary curing with polythene sheeting taped down at the edges must be used. In cold conditions, the finished repair must be protected from freezing.

## Overcoating with protective decorative finishes

Renderoc HB40 is extremely durable and will provide long-term protection to the embedded steel reinforcement within the repaired locations. The surrounding parts of the structure will generally benefit from the application of a barrier/decorative coating to limit the advance of chlorides and carbon dioxide, thus bringing them up to the same protective standard as the repair itself. Parchem recommend the use of the Dekguard\* range of protective, anti-carbonation coatings. These products provide a decorative and uniform appearance as well as protecting areas of the structure which might otherwise be at risk from the environment. Dekguard products may be applied over the repair area without prior removal of the Nitobond AR curing membrane. Other curing membranes must be removed prior to the application of Dekguard products.



## Cleaning

Nitobond HAR, Nitobond AR and Renderoc HB40 should be removed from tools, equipment and mixers with clean water immediately after use. Cured material can only be removed mechanically.

Equipment used with Nitoprime Zincrich and Nitobond EP should be cleaned with Solvent 10.

## Limitations

Renderoc HB40 should not be used when the temperature is below 5°C and falling. Do not mix part bags. Due to the relatively lightweight nature of Renderoc HB40, the product should not be used in areas subjected to traffic (in these circumstances, Renderoc S should be considered). Neither should it be exposed to moving water during application. Exposure to heavy rainfall prior to the final set may result in surface scour. If any doubts arise concerning temperature or substrate conditions, consult your local Parchem sales office.

## Estimating

### Supply

<b>Renderoc HB40:</b>	20 kg bags
<b>Nitoprime Zincrich:</b>	1 litre cans
<b>Nitobond HAR:</b>	1, 5 and 20 litre containers
<b>Nitobond AR:</b>	1, 5 and 20 litre containers
<b>Nitobond EP:</b>	1.5 and 6 litre packs
<b>Solvent 10:</b>	4 and 20 litre cans

### Coverage and yield

<b>Renderoc HB40:</b>	Approximately 12.8 litres/20 kg bag (approximately 1.3 m <sup>2</sup> at 10 mm thickness)
<b>Nitoprime Zincrich:</b>	7.4 m <sup>2</sup> /litre
<b>Nitobond HAR:</b>	3 to 4 m <sup>2</sup> /litre
<b>Nitobond AR:</b>	6 to 8 m <sup>2</sup> /litre
<b>Nitobond EP:</b>	4 - 5 m <sup>2</sup> /litre

Notes: the actual yield per bag of Renderoc HB40 will depend on the consistency used. The yield will be reduced if the material is applied by a spray technique. The coverage figures for liquid products are theoretical - due to wastage factors and the variety and nature of possible substrates, practical coverage figures will be reduced.

## Storage

### Shelf life

All products have a shelf life of 12 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 4 to 6 months. Nitobond HAR and Nitobond AR should be protected from frost.

## Precautions

### Health and safety

Renderoc HB 40 is classed as hazardous under WorkSafe Australia guidelines. Renderoc HB40 contains cement powders that, when mixed or become damp, release alkalis that 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 dust mask. The use of barrier creams provides additional skin protection. In case of contact with eyes, rinse immediately with plenty of clean water and seek medical advice. In case of contact with skin, rinse with plenty of clean water, then cleanse with soap and water.

Nitoprime Zincrich, Nitobond EP & Solvent 10 are classed as hazardous under WorkSafe Australia guidelines. Nitoprime Zincrich, Nitobond products and Solvent 10 should not come in contact with the skin and 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 Nitobond EP, 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.

If poisoning occurs, contact a doctor or Poisons Information Centre - phone 13 11 26.



Material Safety Data Sheets (MSDS) are available from your local Parchem sales office. Read the MSDS and product data sheet carefully before first using any product.

#### Fire

Renderoc HB40, Nitobond HAR, Nitobond AR, and Nitobond EP are non-flammable.

Nitoprime Zincrich and Solvent 10 are flammable. Keep away from sources of ignition. No smoking. In the event of fire, extinguish with CO<sub>2</sub> or foam. Do not use a water jet.

#### Flash points

Nitoprime Zincrich:	16°C
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Solvent 10:	27°C
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For further information, refer to the Product Material Safety Data Sheet available from your local Parchem sales office.

#### Additional information

Renderoc HB40 is part of a range of high performance cement-based mortars, engineered to provide long-term solutions for reinforced concrete decay. Several papers have been published and these provide engineers, consultants and other specifiers with important background information.

Parchem also manufactures many other products designed for the repair and refurbishment of damaged reinforced concrete. These include fluid micro-concretes, chemical-resistant epoxy mortars and a comprehensive package of protective coatings. In addition, a wide range of complementary products is available and this includes joint sealants, waterproofing membranes, grouting, anchoring and specialised flooring materials.

Fosroc has produced an educational video trilogy called 'Attack under arrest' which provides more detail about the mechanisms which cause corrosion within reinforced concrete structures and the solutions which are available. Further information is available from the publications: 'Concrete repair and protection - the systematic approach', available in seven language formats, and 'Application of Renderoc mortars by the dry and wet spray process'.

For further information about products, training videos or publications, contact your local Parchem sales office.

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