

### Introduction

Where relatively large volumes or areas of repair mortar are required, Renderoc mortars may be applied by the wet spray process. The technique offers the following advantages over hand or trowel applied mortars when the various application parameters are met.

- a. Excellent bond to the substrate concrete.
- b. Excellent compaction of the mortar.
- c. Higher build than stated on the data sheets without sagging or slumping.
- d. Rapid placement of material.
- e. Prevention of some of the operator-induced defects.

### Principles of operation

For the wet spray process, the Renderoc repair mortar is mixed in a forced-action mixer to produce a material with the correct consistency for pumping. When thoroughly mixed, the material is placed into a hopper containing a feed screw which moves the material to the pump.

The pump which is commonly a helical screw in a static jacket, but may in some cases be a positive displacement piston pump, forces the material along suitable pressure rated delivery hoses to the application nozzle. A jet of compressed air is introduced to the mortar just prior to the end of the nozzle, causing the mortar to be broken into small particles and projected at relatively high speed to the repair area. Some of the equipment currently available combines the mixer, hopper, feed screw, pump and air compressor in one electrically or diesel powered unit.

Wet spraying of mortars is a skilled process and requires experienced operatives to achieve good results. The operatives controlling the nozzle and the mixing of the mortar have a significant influence on the quality of the completed job. It is, therefore, strongly recommended that experienced applicators should be employed who are familiar with the process. Where such experience is not available, the applicators should demonstrate their capability through monitored trials.

### Materials

It is possible to use the wet spray process for all grades of Renderoc mortar which are normally hand or trowel applied. Experience has shown that to achieve the correct consistency for pumping it may be necessary to marginally exceed up to 200ml, the maximum water content stated on the appropriate data sheets.

The factor controlling the water content is the stiffness of the mortar. It needs to be both 'soft' enough to drop into the feed screw of the pump and pass along the hoses, yet 'stiff' enough to enable a reasonable build to be achieved on vertical and overhead surfaces.

### Priming

Any exposed steel reinforcement should be primed in accordance with the recommendations in the relevant data sheet. This will generally involve application of Nitoprime Zincrich, a zinc rich one component epoxy.

If the concrete can be maintained in a saturated surface dry (SSD) condition immediately prior to the application of the sprayed mortar, no bonding aids are required. The impact of the mortar from the spray nozzle causes good wetting of the mortar on to the concrete surface and results in excellent bond strengths.

### Thickness of application

Renderoc mortars should not be applied at a thickness below the minimum specified on the relevant data sheet. The mortar should be built up to the required thickness by applying wet on wet material, without allowing the previous layer to dry out. Experience has shown that the maximum hand applied thickness stated on the data sheets can be exceeded without slumping or sagging.

This is due to the excellent compaction and bond.

Typical thicknesses achievable by spraying on to vertical surfaces are detailed on the relevant Renderoc data sheet.

The practical thicknesses achievable on site will depend on the orientation of the substrate, the consistency of the material and the geometry of the repair area. In no circumstances should a thickness be reached where the material sags or slumps as this can affect the bond at the mortar / substrate interface. Should this occur, the material must be removed and replaced.

### Area of application

The area which may be sprayed during one application will be dependent on a number of factors.

- a) The temperature and prevailing environmental conditions control -
  - i) the drying time of the mortar and limit the time which may elapse between successive passes of the nozzle.
  - ii) the setting time, which will determine whether application and finishing can proceed simultaneously.
- b) The number of operatives will determine whether application and finishing can occur simultaneously.

### Finishing

Renderoc mortars are finished by cutting to the required profile and closing with a steel float. Wooden or plastic floats, or damp sponges, may be used to achieve the desired surface texture. The complete surface should not be overworked. The surface will normally be finished immediately after spray application.

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## Curing

Renderoc mortars are cement based. In common with all cementitious materials, Renderoc products must be cured immediately after finishing in accordance with good concrete practice. Recommended curing procedures are described on the relevant Renderoc data sheet.

## Equipment

### Pumps

Renderoc mortars have been sprayed successfully through a number of screw pump plaster spray machines. Any similar type of equipment should also be suitable. However, it is recommended that a trial with the material and the proposed pump should be performed prior to commencing a job. The type of equipment selected for a job will depend on its availability, the amount of material to be applied and the location. Although many of the pumps have a compressor built in, this is frequently not adequate to ensure sufficient dispersion of the material and compaction on to the substrate. In general, a separate compressor is recommended.

### Mixers

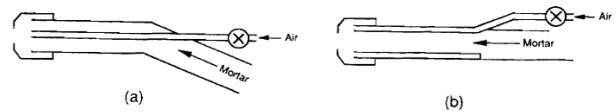
Renderoc mortars must be mixed in forced-action type mixers, and not in free-fall mixers. Some of the pumps have forced-action mixers built into the single powered unit, which perform quite satisfactorily. Continuous mixers where the powder and water are metered into a mixing screw at a controlled rate are generally **not** suitable due to their short mixing time. Please contact the local Fosroc office for guidance on suitability for this mixing process.

### Hoses

The hoses for conveying the mortar should be pressure rated to at least twice the pressure capability of the pump. Typically the hose should be 25 mm internal diameter, with a minimum internal diameter of 19 mm. Mortars have successfully been pumped through 20 metres of hose. Care must be taken to ensure all the hose fittings are properly attached to the hose and are in good condition.

### Nozzles

Various designs of nozzle have been used successfully for spraying Renderoc mortars. The compressed air for dispersing and projecting the mortar on to the substrate is introduced either through a central pipe or down an annulus - figures (a) and (b) respectively. The quality of the application is affected by the diameter of the exit aperture (this controls the size of the cone of sprayed mortar, the rate of flow and the degree of atomisation). Apertures of 10 mm, 12 mm and 14 mm in steel and rubber caps have proved most effective.



## General information

In the wet spray process, the mortar is batched and mixed prior to being pumped along suitable hoses to the discharge nozzle. High velocity air is introduced at the nozzle to disperse the mortar and propel it into position.

The impact of the mortar ensures excellent contact with the substrate and good compaction. The quality of the applied mortar is significantly better than can be consistently achieved by hand or trowel application. As the material is batch mixed prior to pumping, the water content can be accurately controlled, ensuring a consistent product is applied to the substrate.

Wherever possible, it is prudent to keep the pump unit close to the work area to prevent high pressures in the delivery hoses. Under good conditions, the mortar can be applied at a rate up to 20 litres per minute.

The spraying technique employed for each job will depend on the nature of the work and the materials used. Wherever possible, it is recommended that trials are performed with the material and equipment on elements which exhibit the same features as the job to ensure the spraying technique employed is appropriate. The general guidelines presented here offer a starting point for these trials.

## Equipment

The mixer, pump and spray equipment should be specifically designed for spraying mortars or plasters and should be capable of delivering a continuous, even flow of material to the nozzle. The equipment should be inspected and cleaned at least twice a day. The compressor should be capable of supplying a continuous supply of clean, oil-free compressed air to the nozzle, sufficient to disperse the mortar and ensure an even spray distribution of material on to the substrate.

Delivery hoses should be inspected to ensure they are clean and undamaged, with particular attention paid to the couplings. The couplings and seals should be clean and in a good condition. If damaged, they must be replaced prior to proceeding. The delivery hoses should be laid out before work starts and all kinks and constrictions should be eliminated. The air line and couplings should be inspected for damage and laid out alongside the delivery hose without kinks or constrictions. In the work area, the air line should be attached to the delivery hose at regular intervals. The pump delivery pressure should be tested by attaching a suitable pressure gauge to the outlet and operating the pump with clean water as the control material. If the pressure reading is too low, the pressure must be adjusted or, if necessary, the pump stator jacket replaced. When satisfactory, water must

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be pumped through the hoses followed by a slurry of Portland cement and water, introduced into the hoses to act as a lubricant. Do not use slurry of the Renderoc material.

## Workmanship

The contractor should be able to demonstrate his ability to satisfactorily spray cementitious mortars, either by monitored trials or by written proof of expertise from an independent organisation. The contractor should be fully conversant with the relevant codes of practice relating to the spraying of mortars and concretes. As the quality of the sprayed mortar is largely dependent on the skill of the nozzle-man, the contractor should employ an operative who is competent and experienced in spraying mortars.

The surface to accept the sprayed mortar should have been prepared to the required standard. To achieve good bond strength, the surface must be prepared to remove laitance and any organic or inorganic deposits. The aggregate should be exposed to provide a rough surface finish to act as a key for the mortar. Care must be taken to ensure all dust and debris has been removed prior to commencing spraying. Normal precautions for winter working with cementitious materials should be adopted. The materials should not be applied when the substrate and/or air temperature is 5°C and falling. At 5°C static temperatures or at 5°C and rising, the application may proceed. At ambient temperatures above 35°C, the material should be stored in the shade and cool water used for mixing.

Spray application should commence at the bottom of vertical or near vertical surfaces and the mortar built up to the required thickness by making several passes of the nozzle over the work area.

The nozzle should at all times be held perpendicular to the work surface. In general the distance of the nozzle from the application surface should be between 200mm and one metre, dependent on the structure, air supply, mortar flow rate and application geometry. Care must be taken when spray applying material around reinforcement and into corners. The nozzle should be held at an angle to the surface to ensure complete encapsulation of the reinforcement or complete filling of the corner.

The mortar should emerge from the nozzle in a steady flow, free from pulsation. With wet spray application of mortars, the amount of rebound should be minimal. However, care must be taken to prevent the incorporation of rebound, or other wastage, into the finished work. Where thick layers are required, care must be taken to ensure the material does not slump or sag, as this can result in the breaking of the bond. If slumping does occur, the affected area must be cut out and replaced. Greater thicknesses can be achieved by allowing the initial layer of mortar to stiffen before further layers are applied. The stiffening time will vary with the prevailing environmental conditions. Prior to the application of additional layers, any loose material or overspray must be removed.

The applied material may be trowelled smooth to achieve a specified surface finish. Care must be taken to ensure the bond line is not disturbed during trowelling.

## Curing

Renderoc mortars are cement-based. In common with all cementitious materials, they must be cured immediately after finishing in accordance with good concrete practice.

The use of Nitobond AR or Concure A99, sprayed on to the surface of the finished Renderoc in a continuous film, is recommended.

Large areas should be cured as trowelling progresses (0.5m<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. If used in cold conditions, the finished repair must be protected from freezing.

Overcoating with protective decorative finishes Renderoc mortars are extremely durable and will provide excellent 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. Fosroc recommends the use of the Dekguard range of protective, anti-chloride and 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.

## Safety

All necessary measures should be adopted in accordance with the requirements of all Health & Safety Acts or other nationally recognised legislation. In particular, lighting, ventilation and protective clothing shall be adequate for the safe and proper execution of the work.

Before work commences, refer to the product data sheet and Safety Data Sheet (SDS).

## Equipment used to wet spray Renderoc mortars

### Horizontal pumps

**Putzmeister S5** - Electric powered mixer/pump, towable unit, 5 to 12.5 bar, 10 to 20 litres per minute.

**Bunker S8 (Batchcrete)** - Electric or diesel powered mixer/pump, towable unit; up to 20 litres per minute output; on-board compressor; built in 80 litre mixer.

**Wagner PC25** - Suitable for smaller projects; spray pump only 240 volt 15 amp electric; smaller compressor (12 cfm) required; output up to 10 litres per minute.



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**Putzmeister Strobot 406S** - Suitable for smaller projects; spray pump unit only; 240V 15amp; smaller compressor required; up to 15 litres per minute output.

## Vertical pumps

**Putzmeister Sprayboy P12** - Single phase or 3 phase electric, forced action mixer/pump; 12 litres per minute;

## Mixers

The following stand-alone mixers have been used successfully -

**UniMEC (Batchcrete)** up to 120 litres

**Soroto Pan Mixer** 240V electric; up to 100 litres

**Free fall cement mixers must NOT be used.**

## Compressors

In some instances, the mortars have been placed using the compressors built into the pump units. Experience has shown these to be generally insufficient to achieve good dispersion and compaction of the material.

It is recommended that an independent 100 cfm (3m<sup>3</sup>/min.) compressor is employed for wet spraying Renderoc mortars.

## Important notice

A Safety Data Sheet (SDS) and Technical Data Sheet (TDS) are available from the Fosroc website or upon request from the nearest Fosroc sales office. Read the SDS and TDS carefully prior to use as application or performance data may change from time to time. In emergency, contact any Poisons Information Centre (phone 13 11 26 within Australia) or a doctor for advice.

## Product disclaimer

This Application Guide summarises our best knowledge of the product, including how to use and apply the product based on the information available at the time. You should read this Application Guide carefully and consider the information in the context of how the product will be used, including in conjunction with any other product and the type of surfaces to, and the manner in which, the product will be applied. Our responsibility for products sold is subject to our standard terms and conditions of sale. Fosroc does not accept any liability either directly or indirectly for any losses suffered in connection with the use or application of the product whether or not in accordance with any advice, specification, recommendation or information given by it.



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