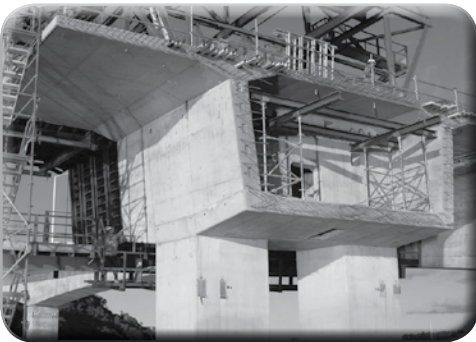




Waterproof Concrete



A Natural Pozzolan for High Performance Concrete



Microsilica 600

# MICROSILICA 600 – for Waterproof Concrete

Any waterproofing system must meet all serviceability criteria. A holistic approach to integral waterproofing is necessary and should consider:-

- Permeability – the concrete, joints and cracks must all have an acceptable water penetration rate.
- Durability – the concrete must be durable in respect to chemical attack and corrosion resistance.
- Structural requirements – the concrete's physical properties (strength, creep, modulus and shrinkage) must be acceptable.

Microsilica 600 satisfies all these requirements as far as the concrete matrix is concerned. However, appropriate design of joints and the control of concrete cracking are of equal importance if the structure is to perform to expectations.

Microsilica 600 concrete is ideally suited for the construction of such structures as underground car parks, tunnels, basements, sewerage treatment plants, tanks, ponds and thin wall buildings.

## Benefits of Microsilica 600 Waterproof Concrete

### Serviceability Criteria

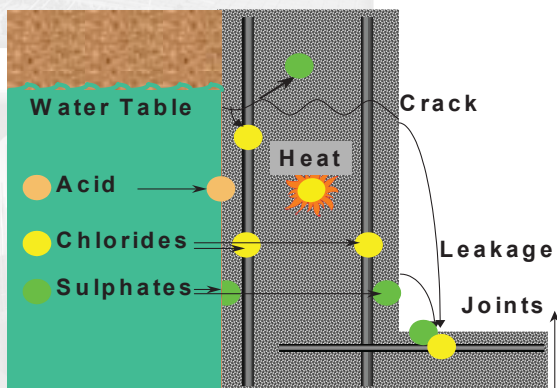


Figure 1. Diagrammatic view of a basement showing serviceability criteria. The addition of Microsilica 600 to the concrete ensures improvement in all areas.

### No Membranes or Drainage Required

- Major cost saving in materials
- Reduction in program time
- Less subcontract labour

### Enhanced Placing Characteristics

- Better pumpability
- Lower heat of hydration
- No segregation
- Shorter curing period

### Improved Durability

- Very high sulphate resistance
- Corrosion resistant
- Resistant to mild acids

### Structural Improvements

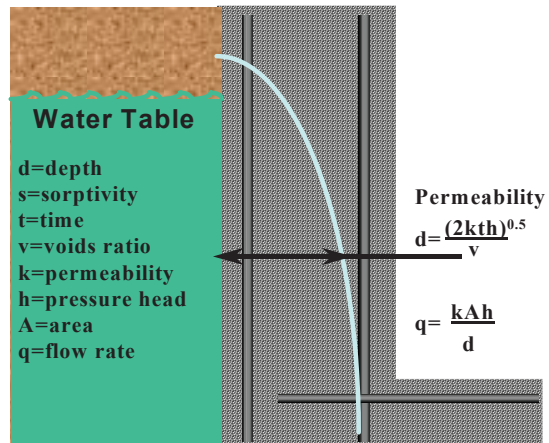
- High strength
- Low creep
- Low shrinkage
- High modulus



Figure 2. The use of Microsilica 600 for the Wilsons Dam, Upper North Island, NZ reduced permeability and increased resistance to water erosion.

## Water Penetrability

Water moves through concrete under two mechanisms - permeability and sorptivity. Permeability is the flow due to a pressure head. Sorptivity is the flow due to capillary suction. Formulae for the flow of water through concrete have been established for both mechanisms and are detailed in figure 3. The water proofing designs are based on Valenta and Darcy equations for permeability



**Figure 3.** Diagram of basement showing the permeability equations. Factors of safety are added to these and then they are used as the design base.

## Sorptivity & Permeability

The sorptivity test measures the depth of water in concrete after specimens have been soaked in water for 24 hours. Sorptivity is dependent on binder content and composition (Figure 5).

Mix type	Binder kgs/m <sup>3</sup>	W/CB ratio	Sorptivity mm/min <sup>0.5</sup>
Plain	280	0.57	0.13
Plain	326	0.49	0.12
Plain	400	0.40	0.11
5% MS600	283	0.57	0.11
8% MS600	332	0.51	0.10
8% MS600	405	0.39	0.06

**Figure 5.** At high cement contents the addition of 8% Microsilica 600 reduces sorptivity by 50%

Mix type	Binder kgs/m <sup>3</sup>	W/CB ratio	Permeability m/sec
Plain	400	0.43	4.55 x 10 <sup>-13</sup>
7% MS600	430	0.39	2.22 x 10 <sup>-13</sup>
10% MS600	444	0.38	3.50 x 10 <sup>-14</sup>

**Figure 6.** Microsilica 600 effectively reduces water permeability when included in the concrete

## MICROSILICA 600 APPLICATIONS & INFORMATION

Other Microsilica 600 applications for specialist concretes and high performance concrete are detailed in the following brochures:

- Industrial & Commercial Floors
- Chemical Resistant Concrete
- High Strength Concrete
- Marine Concrete
- Shotcrete

Reference should also be made to the operational and safety requirements in the following documents:

- Health & Safety Data Sheet
- Concrete Mixing Instructions
- Concrete Placement & Finishing Procedures
- Plastic Properties of Microsilica 600 Concrete

### Product Note

The information contained in this brochure is offered in good faith and every effort has been made to ensure its accuracy. However, due to differences in conditions, environments and materials no liability is accepted by Microsilica NZ, Golden Bay Cement or their agents for loss or damage, direct or otherwise, resulting from the application of the information contained herein. Microsilica NZ reserves the right to change product specification without prior notice



MICROSILICA NZ

P O Box 1359, Shortland St, Auckland 1140,  
New Zealand. Ph 64 7 345 4710.  
Email [microsilica@goldenbay.co.nz](mailto:microsilica@goldenbay.co.nz)

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