

# Chem Concrete Pty Ltd

Manufacturer & Supplier of Concrete Waterproofing Admixtures

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## Independent Testing of ChemConcrete<sup>WP</sup>

### • Introduction

Chem Concrete is an Australian-owned company comprising a team of globally-recognised professors, PhD holders, and engineers who specialise in developing, manufacturing, and supplying a new generation of concrete waterproofing admixtures (called 'hybrid' admixture) – highly reliable, cost-effective, and environmentally-friendly.

ChemConcrete<sup>WP</sup> Admixture (Patent No. 2023902368) is the new generation of concrete waterproofing admixtures. Concrete treated with ChemConcrete<sup>WP</sup> has significantly improved durability and waterproofing performance compared to traditional waterproofing admixtures. This admixture has been independently tested by many ready-mix concrete suppliers (both in Australia and overseas), private laboratories/companies, and universities and academics (e.g., Laval University in Canada, University College London in the UK, New Mexico Institute of Mining and Technology in the USA, Concordia University in Canada, etc.). Some test results have been published or are under review in international journals and conferences, such as the 9<sup>th</sup> International Congress on Civil Engineering, Architecture and Urban Development. The major findings of the independent testing are summarised below. The testing results show that ChemConcrete<sup>WP</sup> Admix provides permanently waterproof concrete with significantly improved mechanical and durability properties compared to untreated concrete and concrete treated with a few other commercial waterproofing admixtures.

### • Testing Protocol

Concrete specimens were prepared following the mix design in Table 1. Specimens were demoulded after 24 h, placed in plastic bags, and then cured for 28 days in an ambient chamber at 23 °C. Compressive and flexural strengths, bulk water absorption, initial surface absorption, permeability, and acid, sulphate, and chloride resistance of both untreated concrete and concrete treated with ChemConcrete<sup>WP</sup> were measured. The water-to-cement ratio was determined through trial tests in a way to achieve a slump of 100 mm for both untreated and treated concrete with ChemConcrete<sup>WP</sup> Admix. ChemConcrete<sup>WP</sup> was used at 2% of total cementitious materials by weight. Tests were performed based on ASTM C143, ASTM C 642, DIN1048, ASTM C78, ASTM C39, and BS 1881-2008, respectively. To measure the acid, sulphate and chloride resistance, cubic concrete specimens (100 × 100 × 100 mm) were immersed in sulphuric acid (H<sub>2</sub>SO<sub>4</sub>), sodium sulphate (Na<sub>2</sub>SO<sub>4</sub>), and sodium chloride (NaCl) solutions with concentrations of 2%, 5%, and 5%, respectively, for 90 days. Results were compared with the strength test results of unexposed specimens cured for the same age (118 days). Testing results are reported in Tables 2 and 3.

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Results show that ChemConcrete<sup>-WP</sup> Admix improves compressive and flexural strengths and increases the resistance of concrete in exposure to acid, sulphate, and chloride environments due to significantly reducing the water absorption rate and permeability of concrete.

This product is classified as non-toxic, environmentally-friendly, and non-hazardous material. Based on Australian Industrial Chemicals Introduction Scheme (AICIS), all the chemicals/ingredients used in the manufacture of ChemConcrete<sup>-WP</sup> Waterproofing Admixture are classified as 'Very Low Concern to Human and Environment'.

Table 1. Mix design of concrete specimens\*.

Mix No.	Designation	Basalt (kg/m <sup>3</sup> )	Sand (kg/m <sup>3</sup> )	Cement (kg/m <sup>3</sup> )	ChemConcrete <sup>-WP</sup> (kg/m <sup>3</sup> )
1	Untreated concrete	1080	670	375	0
2	Concrete treated with ChemConcrete <sup>-WP</sup> Admix	1080	670	375	8

Table 2. Tests results\*.

Property	Control concrete	ChemConcrete <sup>-WP</sup>	Reference
Water absorption 30 min 12 h 24 h	2.01 % 5.89 % 8.63 %	0.16 % 0.67 % 0.98 %	ASTM C 642
Water penetration	13 mm	3 mm	DIN 1048
Initial surface absorption test (ISAT) (ml·m <sup>-2</sup> ·s <sup>-1</sup> ) 10 min 30 min	0.51 0.27	0.01 0.005	BS 1881: 2008
Compressive strength	42.50 MPa	47.50 MPa	ASTM C39
Flexural strength	5.65 MPa	6.25 MPa	ASTM C78
Slump	150 mm	160 mm	ASTM C143

\* For particular concrete mixes and site conditions, it is suggested to evaluate the specific effect of ChemConcrete<sup>-WP</sup> on the properties of concrete through site trials prior to the application.

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Table 3. Acid, sulphate, and chloride tests results\*.

Designation		Mass loss (%)	Compressive strength reduction (%)
H <sub>2</sub> SO <sub>4</sub>	Control concrete	6.89	58
	ChemConcrete <sup>-WP</sup>	2.34	22
Na <sub>2</sub> SO <sub>4</sub>	Control concrete	0.51	11
	ChemConcrete <sup>-WP</sup>	0.08	3
NaCl	Control concrete	0.48	13
	ChemConcrete <sup>-WP</sup>	0.08	3

\* For particular concrete mixes and site conditions, it is suggested to evaluate the specific effect of ChemConcrete<sup>-WP</sup> on the properties of concrete through site trials prior to the application.

\*Under some specific conditions, Chem Concrete may provide performance-based warranties sometimes up to the design life of the projects when ChemConcrete<sup>-WP</sup> Admix is used. Please consult this with a technical team member of Chem Concrete in Sydney office, Australia.

