

RADCON[®] FORMULA #7



At the forefront of concrete waterproofing and protection[®]

WHY RADCON #7 ?

With **Radcon Formula #7**'s progressive growth dating back to 1975, the product has built an undisputable track record over some 70+ countries. The acceptance of **Radcon Formula #7** has been driven by the product's unique performance on-site, leading now to its use on projects of global prominence.

Radcon Formula #7 is not a surface coating, admixture, crystal growth, or water repellent. It is a biochemically modified solution that is spray applied to cured concrete. Through a 3 day watering process, the product penetrates and reacts with the concrete forming a sub-surface barrier, waterproofing pores, capillaries and large cracks against the ingress of water and contaminants.

The philosophy behind **Radcon Formula #7** is that the product works with the concrete, as concrete does have some inherent waterproofing capability. By doing this **Radcon Formula #7** makes the concrete waterproof, both through the matrix and most importantly sealing cracks. Tradition has been to introduce another variable into the waterproofing equation, that being a membrane to cover up the concrete. Then, to protect the membrane from environmental and mechanical damage a protective screed is often required, thus introducing another variable.

During construction, any surface coating becomes vulnerable to damage from other trades. The problem which arises from this traditional approach, may not

necessarily be realised immediately. If and when leakage does occur then fault finding and remedial action can be a monumental task, with water tracking beneath the screed and/or membrane.

Alternatively, **Radcon Formula #7** is applied to concrete with pre-formed fall lines thus eliminating the need for protective screeds. As there is only one waterproofing variable, the concrete, in the advent of a leakage during the life of the structure, repair is performed directly to the concrete. Even with this being the case, waterproofing will never substitute good engineering practice of quality concreting, adequate jointing and detailing.

WHAT MAKES RADCON #7 DIFFERENT?

The unique features of **Radcon Formula #7** relate to its silicate composition which has been biochemically modified. Firstly, the product will permanently waterproof existing leaking cracks in concrete up to 2.00mm, even when exposed to typical high thermal stresses on rooftops. Secondly, the product that has absorbed into the concrete matrix remains active to seal new hairline cracks on contact with water. This phenomenon has been confirmed on applications in areas of earthquake activity.

WHAT RADCON #7 DOES.



BENEFITS

FAST

The application rate with one motorised spray unit ranges up to 800 sqm per hour. This enables relatively quick product application to fast-track projects.

EASE OF APPLICATION

Although the product requires a level of technical competence, it is easy to apply. At the end of the application this can easily be tested by ponding the treated area.

TRAFFICABLE (AFTER 1ST WATERING)

After the first watering is completed, at approximately 6 hours after product application, the site becomes completely trafficable. This increases site time efficiency and reduces risk of damage from other trades during construction.

OUT-GASSING

In humid environments trapped moisture in concrete often leads to premature delamination of membranes. Alternatively, **Radcon Formula #7** still enables the concrete to out-gas moisture eliminating this problem.

In freeze/thaw environments, **Radcon Formula #7** significantly reduces moisture absorption into the matrix and seals cracks increasing the concrete's durability in this harsh environment. The out-gassing also allows moisture to evaporate out of the concrete reducing freeze-thaw damage.

NON-TOXIC

Radcon Formula #7 is water-based. Equipment can easily be cleaned and the product can be safely handled on-site.

COMPLETE WATERPROOFING (MATRIX, CRACKS AND FUTURE HAIRLINE CRACKING)

Radcon Formula #7 is a complete replacement for a membrane as it waterproofs both the concrete matrix, and cracks even when exposed to high thermal stresses. The penetrated product remains reactive in the presence of water to provide autogenous healing capabilities to future hairline cracking.

RISK MANAGEMENT

Radcon Formula #7 is applied directly to structural concrete with no requirement for a protective screed - one waterproofing variable. Thus, if at any stage of the building's life, a leakage occurs it can be repaired quickly and easily with no tracking beneath a membrane or screed. This approach drastically reduces the cost of ongoing maintenance with no removal of membranes or toppings.

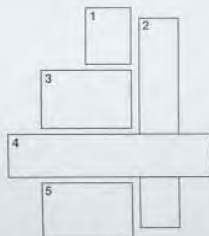
PROVEN PERFORMANCE

With product applications dating back to 1975, **Radcon Formula #7** has developed an enviable track record, based on successful long term performance. **Radcon Formula #7** is available across some 70+ countries and now waterproofing sites of global recognition.

PRODUCT DESCRIPTION

Radcon Formula #7 is a biochemically modified silicate solution that provides long-term waterproofing and durability benefits to concrete. It penetrates into concrete and reacts with free calcium and water to form a non-water soluble calcium silicate hydrate gel complex in cracks, pores and capillaries. This gel creates a sub-surface barrier against the ingress of water and contaminants such as chloride ions.

Radcon Formula #7 will seal existing leaking cracks up to 2.00mm. In the matrix the product remains reactive when in contact with water to provide autogenous healing properties to future hairline cracks.



FRONT PAGE

1. Mekong River (Friendship) Bridge, Thailand/Laos
2. Kuala Lumpur Telecommunications Tower
3. Australian Taxation Office, Hurstville, Sydney
4. Seacon Square Shopping Centre, Bangkok
5. Microsoft Head Office, Epping, Sydney

PERFORMANCE CHARACTERISTICS

- Permanently seals existing cracks up to 2.00mm.
- Reseals future hairline cracking.
- Reduction of chloride diffusion coefficient by 89% to $3.5 (10^{-12} \text{ m}^2/\text{s})$.
- Water permeability reduced by 70% to $5.0 (10^{-12} \text{ m/s})$ at 10kg/cm^2 .
- Increases surface hardness from 6 to 8 on Moh's scale.
- Reduces scaling in freeze-thaw environments by 89% at 50 cycles.
- Allows 84.1% moisture vapour permeability.
- Suitable for tanking applications (positive hydrostatic pressure) - tested to 400 metres.
- Non Toxic - Certified suitability for potable water.

Fourth Edition Copyright © 1999 by Radcrete Pacific Pty. Ltd.
A.C.N. 003 228 975
SYDNEY AUSTRALIA

Radcon Formula #7 and **Radcrete** are registered Trade Marks of Radcrete Pacific Pty. Ltd.

SPECIFICATION DETAILS

MATERIAL SPECIFICATION

"The waterproofing solution shall create a vapour permeable sub-surface barrier to prevent water leakage and ingress of contaminants into the cracks and concrete matrix."

"The solution will be a non-toxic, clear, odourless silicate based material with proprietary biochemical modification such as **Radcon Formula #7**® manufactured by Radcrete Pacific Pty. Ltd."

"The solution will penetrate into concrete and react with free calcium and water at ambient temperatures. The solution will form a non-water soluble calcium silicate hydrate gel complex which is a chemically resistant compound in cracks, pores and capillaries."

"The product will seal existing leaking cracks up to 2.00mm. In the matrix, it remains reactive with water to provide autogenous healing properties to future hairline cracks."

CONCRETE MIX DESIGN

Radcon #7 will meet or exceed its stated performance when applied to slag blend concrete or ordinary Portland cement type GP concrete; Type "C" fly-ash replacement up to 30% of cement replacement. Type "F" fly-ash is NOT suitable for use with **Radcon Formula #7** due to causing pozzolanic reactions in the concrete.

LARGE OR STUBBORN CRACKS

Grind out and flood crack with product. A Calcium solution may be required to bulk up the product in large cracks. Fill with a non-shrink or polymer modified mortar; or revert to an elastomeric sealant if there is a possibility that the crack is "working" or "volatile". In large cracks where the product runs through quickly, temporarily use waterproof tape on the underside to pond product in the crack.

CURING COMPOUNDS

Water curing is preferred - minimum 7 days. PVA (Polyvinyl acetate) which biodegrades within 28 days is also suitable. Other materials such as chloro-rubber, resins, wax emulsions and acrylics are suitable but will have to be removed by grit blasting or chemical wash to allow proper penetration of the product.

LIMITATIONS

Radcon Formula #7 is not suitable for sealing working/volatile cracks as a result of structural defects or caused by mechanical damage. (See LARGE OR STUBBORN CRACKS)

The product is not suitable for sealing where segregation and voids are likely such as construction/pour joints. Nor suitable around penetrations where there is a non-masonry/cementitious interface. (See ANCILLARY DETAILING RECOMMENDATIONS)

Radcon Formula #7 is not suitable for negative hydrostatic pressure applications such as the inside face of a basement/retaining wall which is constantly wet.

APPLICATION SPECIFICATION

BASIC APPLICATION REQUIREMENTS

- **Radcon Formula #7** must be applied to a clean, dry, dust-free concrete surface, at least 28 days old. Renders may be treated after 7 days.
- Any materials that retard penetration such as curing compounds must be removed prior to application.
- Where segregation or voids are apparent, chip out, spray with **Radcon Formula #7**, then make good with cementitious materials.
- Good concrete practice should be followed such as adequate curing, compaction and vibration.
- Old or carbonated concrete requires Calcium treatment to reinstate free Calcium. Contact Radcrete Pacific Pty. Ltd.
- Do not apply where ambient temperatures are below +5°C or above +35°C.

APPLICATION RATES

Normal: 1 litre to 5 square metres.
Smooth, dense surfaces: up to 1 litre to 6 square metres.
Rough, porous surfaces: down to 1 litre to 4 square metres.
For cracked areas: an additional 1 litre per 5 lineal metres is recommended.

APPLICATION METHOD

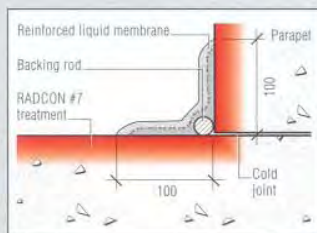
1. Locate all cracks and spray with solution ensuring they are flooded with product.
2. Apply the solution to the remaining area at a rate of between 4-6 sq.mtr. per litre.
3. When surface becomes touch dry - (usually 2-6 hours depending on wind conditions and ambient temperature) flood spray the treated areas with water.
4. On Day 2 - 24 hours later water again.
5. On Day 3 - 24 hours later water again.
6. It is advisable that after the third watering, pond the area for a minimum of 12 hours to verify a waterproof seal has been achieved.

ANCILLARY DETAILING RECOMMENDATIONS

For faster and more effective waterproofing with **Radcon Formula #7** it is important to take into consideration specific design detailing. These detailing features allow the designer/builders to optimise the inherent benefits of **Radcon Formula #7** giving the concrete structure greater durability against the ingress of water and contaminants.

COLD JOINTS

Where parapet walls sit directly onto a concrete slab a cold joint is formed. Possible voids or shrinkage cracks can occur. To waterproof this joint effectively whilst allowing for lateral movement, we recommend the use of a two coat reinforced liquid membrane strip extending 100mm either side of the joint as detailed here.

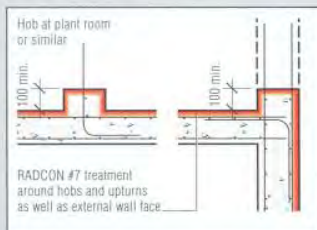


If upturns are incorporated into the concrete pour then these strip seals are not required saving time and money.

UPTURNS/HOBBS

An upturn is a raised section of concrete approximately 100mm which is formed as part of the base slab. These in-situ upturns are encouraged where parapet walls or expansion joints are planned to raise the cold joint above the floor level.

Fall lines should be incorporated into the slab pour for drainage and elimination of toppings or screeds.



CONSTRUCTION/POUR JOINTS

At these joints, we recommend the use of: (i) a waterstop material such as a reputable swelling hydrophilic rubber or bentonite clay to alleviate the risk of leakage through potential honeycombing.

If the slab has already been poured, (ii) a reinforced liquid membrane extending 100mm either side of the joint is recommended.

Construction joints should be formed vertically with a 'stop board' to ensure good compaction and either side of the joint.

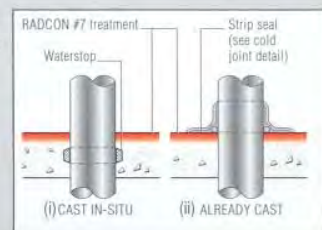
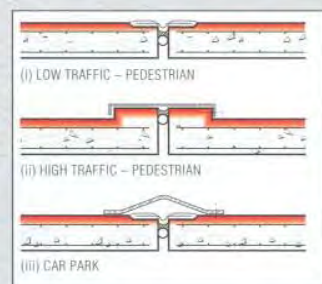
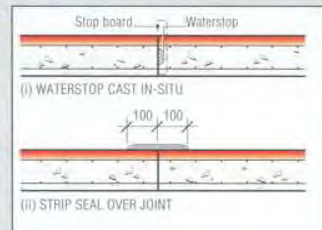
EXPANSIONS JOINTS

Three expansion joint systems are detailed here: (i) for low pedestrian trafficable rooftops involving an adhered membrane strip and elastomeric sealant, (ii) for high pedestrian traffic rooftops involving the use of upturns, metal plating and elastomeric sealant, and (iii) car park environment using system (i) plus a metal speed hump. All systems involve a dual approach so that if one material fails then the secondary seal will remain in place.

PENETRATIONS

Where pipes form penetrations through the structural concrete these should be detailed in one of two ways: either, (i) use a waterstop material cast in-situ or (ii) use a reinforced liquid membrane strip 100mm around the penetration.

For more detailed drawings of these design considerations please refer to the Datasheet or our technical web page www.radcrete.com.au.



INDEPENDENT TECHNICAL APPRAISALS & REPORTS

The following list of technical appraisals and reports address the unique performance capabilities of **Radcon Formula #7**. This list is by no means exhaustive, Radcrete Pacific Pty. Ltd. hold many tests from a variety of institutes around the globe for just as many specific applications.

When comparing **Radcon Formula #7** with other materials one must appreciate the mechanism by which the product achieves a seal. That is, the treated concrete will still absorb water into the top surface to reactivate the product and create a waterproof barrier. Naturally this mechanism does not lend itself to tests such as absorption.

The correct way to evaluate the product is by the reduction of the water permeability coefficient of the treated concrete. **Radcon Formula #7** creates a watertight structure by sealing cracks up to 2.00mm and significantly reducing the permeability of the matrix.

As commitment to the ongoing research and development of the product, new testing methodologies are constantly being explored in many different regions of the world. For a comprehensive overview of these test reports detailed here, please contact your nearest representative.

ABSAC Technical Opinion No.193
Building Research Centre (UNSW)
Condition Survey
Building Research Centre (UNSW)
Laboratory Evaluation
ISAT to B.S. 1881
Water Permeability
Chloride Ion Diffusion (Taywoods)
Building Research Centre (UNSW)
Corrosion Behaviour in
Cracks - Marine Environment
University of Bologna, Italy
Crack Widening & Sealing
Concrete Institute of Australia
Watertight Concrete - Current
Practice Note 28
US Highway Dept (USA)
Bridge Deck Surface Treatments
Adhesion of Asphalt to treated surface
Resistance to Water Absorption
Freeze-Thaw Scaling Resistance
Effect of Hot (160°C) Asphalt on
treatment
Effect of Out-gassing on material
Outdoor test

Warnock Hersey Professional Services (Canada)
Depth of Penetration
Water Absorption
Vapour Permeability
Chloride Ion Penetration
Freeze-Thaw with De-icing Salts
Chemical Resistance
Slip Resistance
Viscosity
Non-Volatile Contents
Relative Density
pH Value
Hardness Test
SINTEF (Norway)
Permeability under 10&40m
head of pressure
Chloride Ion Diffusion -
wetting/drying
SISIR (Singapore)
Non-Toxicity
Potable Water Certification
University of Sydney
Calcium Leaching

MATERIAL SAFETY DATA SHEET INFORMATION

Following is an extract from the **Radcon Formula #7** Material Safety Data Sheet covering the product's general properties.

HEALTH NOTES

Swallowed - No known ill effects.

Eye Exposure - Severe irritation. Flush with large amounts of water.

Skin - No known ill effects have been noted however, with chemicals, one should always avoid contact with skin.

Inhaled - No known damage to internal tissue.

IDENTIFICATION CODES

Australian Adchem Code - Material 15660

USA Manufacturers Code C - 101

PRODUCT PROPERTIES

Colourless, clear to slightly opaque, odourless, soapy feel.

Non-toxic & biodegradable

Percent non-volatile solids: 27.7%

Specific gravity at 25°C: 1.225

0.0% VOG (Volatile Out-Gassing)

Flash point - no true flash - boils at 101°C

Auto ignition temperature - N/A Non-explosive

Viscosity - 14.3 centipoise or 0.1172 Stokes

Hazardous chemicals - Sodium Silicate (modified)

pH 11.7

Elements: Na, Si, Fe, Ni, Cu, Zn, Zr

modified Sodium Silicate (major constituent)

PRECAUTIONS FOR USE

Exposure Limit - No known limit. Avoid skin & eye contact as a general precaution.

Ventilation - Exhausting required in totally enclosed environments. Breathing apparatus advised in these locations.

Personal Protection - Avoid direct contact with eyes at all times. Protective goggles should be worn.

Flammability - Non-flammable.

Storage and Transport - To be stored or decanted into lined steel drums or polypropylene containers.

APPLICATION EQUIPMENT

Radcon Formula #7 has a similar viscosity to water thereby enabling easy application. Depending on the type of application that is being undertaken different equipment can be used.

The application equipment ranges from hand sprayers for small/detailed work, to motorised spray units for car parks, bridge decks or airport runways.

HAND SPRAYER

This hand sprayer is commonly available in hardware stores. It is ideal when addressing spalling cavity treatment or jobs of a few square metres.

BACK PACK SPRAY UNIT

Utilising a Solo® ~ 30psi pressurised knapsack spray, one can expect a coverage of 100 to 150 square metres per hour. This makes the unit ideal for small podium decks and balconies.



MOTORISED SPRAY UNITS

On large sites, a motorised sprayer will usually produce a coverage of 600 to 800 square metres per hour.

Equipment should be used on the lowest pressure setting (30 psi) as atomising the product will increase waste if there is any wind. The units normally comprise of a 1.5hp pump with adequate hosing for easy access on site.

APPLICATION PRECAUTIONS

Ensure all glass, aluminium, wood stains and painted metal railings are protected from **Radcon Formula #7** over-spray or any residual product during watering procedures. For cleaning all equipment should be thoroughly flushed with water.

Work should not be undertaken utilising **Radcon Formula #7** without first consulting Radcrete Pacific Pty. Ltd. or referring to the Datasheet or our technical web page www.radcrete.com.au for specific detailing.



PACKAGING - TECHNICAL SERVICES - GUARANTEES

Radcon Formula #7 is available in 2ltr, 5ltr, 20ltr and 200ltr drums. Product is manufactured in full. No product dilution.

SHELF LIFE & STORAGE

No known limit to shelf life. Keep container sealed and avoid prolonged exposure to direct sunlight. Always agitate drum or container before use.

TECHNICAL SERVICES

Complete technical information including testing data and detailing is available from Radcrete Pacific Pty. Ltd. and authorised distributors. Other published information includes the Datasheet and Design Detailing www.radcrete.com.au. For your nearest technical representative, please contact Radcrete Pacific Pty. Ltd.

GUARANTEES

10 or 15 year guarantees for **Radcon Formula #7** treated areas are available where Approved Applicators are used and in suitable applications. Contact the manufacturer for further information and confirmation of suitability.



1. Car Parks

Radcon #7 is ideal for this application as it forms a sub-surface waterproof barrier and seals cracks, even when exposed to high thermal stresses. Combine this with Radcon #7's increase in surface hardness, no loss in slip resistance and easy cleaning due to limited penetration of oil and the choice becomes clear.

The product is applied directly onto the structural concrete without any protection required. Thus if there is any leakage in the future, repairs can be made immediately to the structural concrete, without any tracking problems.



Westfield Market Town, Mt. Druitt, NSW, Australia.
8,700 sqm. Radcon #7 treated to entire car park/rooftop directly over retail area.



Seacon Square Shopping Centre, Bangkok, Thailand.
50,000 sqm. Radcon #7 applied to entire car park/rooftop directly over retail area.

2. Rooftops/Podium Decks

The main benefits of Radcon #7 are long term waterproofing performance in high thermal stress sites, combined with major cost reductions, low maintenance and absolute UV resistance. The finished treatment leaves the structural concrete completely trafficable to generate more useful space for a building.

Alternatively, the roof may be covered with outdoor synthetic grass or tiles with no bond loss to the substrate.



Lippo Karawaci Shopping Centre, Jakarta, Indonesia.
50,000 sqm. Radcon #7 used solely to waterproof this flat concrete roof directly over retail.



Australian Taxation Office, Wollongong, Australia.
3,500 sqm. Radcon #7 used to waterproof the concrete roof and podium level.

3. Bridge Decks/Raised Freeways

The multiple benefits of Radcon #7, specifically, fast application, complete trafficability, concrete protection and reduced maintenance costs, make this treatment a most cost effective protection for civil structures. Another major benefit is the adhesion of asphaltic topping to the substrate is not impaired.



Perth Bridge, Tasmania, Australia.
2,600 sqm. Radcon #7 applied directly onto exposed structural concrete that was eroding from traffic & freeze/thaw damage.



New Taipei Freeway, Taipei, Taiwan.
65,000 sqm. Radcon #7 used to waterproof 4km of raised freeway prior to asphalt topping.

4. Water Holding Vessels

The non-toxic nature of Radcon #7 and ability to withstand severe hydrostatic pressure makes this application ideal for potable water for human consumption, aquariums and water treatment plants.



Tempe Water Tower, Sydney, Australia.
1,000 sqm. Radcon #7 used to waterproof the inside of this leaking water tower.



Ramada Resort, North Ryde, Australia.
2,000 sqm. Radcon #7 used to waterproof this lake completely suspended over a car-park.

5. Concrete Protection

By sealing both the matrix and cracks up to 2.00mm, Radcon #7 provides high resistance to chloride ions from salt water or de-icing salts. In cracks, the product provides a highly alkaline environment to maintain passivity to the reinforcement, and dramatically reduces spalling & mass loss in freeze-thaw environments.



Sandringham Yacht Club, Victoria, Australia.
3,000 sqm. Radcon #7 applied to this pre-cast wave barrier for concrete protection.



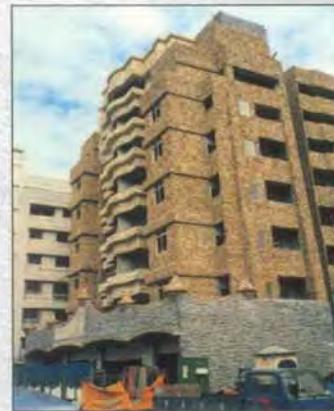
Grain Berth, Port Kembla, Wollongong, Australia.
Radcon #7 alone, was used to seal these leaking cracks up to 2,00mm.

6. Facades

Facades either cast in-situ or rendered will benefit from a Radcon #7 treatment by: sealing shrinkage cracks, stopping efflorescence and reducing permeability. Paints and other coatings may be applied over the treatment with no bond loss. De-laminating render may be re-bonded by Radcon #7 injection.



Heritage Building, Melbourne, Australia.
This single skinned rendered building had leaked through the facade for many years. After several coats of paint were removed Radcon #7 was applied to stop all leakage.



Vanco Building, Taipei, Taiwan.
3,000 sqm. Radcon #7 was applied to the complete facade to prevent efflorescence & water penetration.

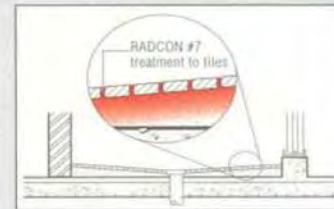
7. Tiled Areas/ Shower Recesses

In remedial applications, Radcon #7 is applied to the tiled surface to prevent the penetration of water through porous mortar joints. Mortar joints should be in good condition and any cracks in the tile bed should be treated with caution as they may be volatile. Therefore, they may require grind and filling with an elastomeric sealant material to allow for movement.

In new construction, Radcon #7 is also suitable for application beneath a tile bed and will in fact increase the bond strength between the mortar bed and the structural concrete by 27%.



Monument Yogya, Indonesia.
Radcon #7 was applied to 5,000 sqm beneath the tiled finish.



Detail of shower recess.
Radcon #7 can be applied to mortar joints around tiles to stop water leakage.

The site applications, briefly outlined herein, show just some of the major Radcon #7 uses for waterproofing and durability improvement of concrete. Comprehensive information is detailed in the Datasheet or our web page www.radrete.com.au.



INVENTOR STORY

With now 30+ years since the invention of **Radcon Formula #7**, Radcrete Pacific is honoured to share part of the genius that was Dr. A.W. Smith.

Dr. A.W. Smith was the initiator of the biochemical technology behind the **Radcon Formula #7** waterproofing product in 1975. Since then the product has undergone further refinement to become the product it is today.

Dr. Smith, a rather shy and retiring individual was a self-educated bio-chemist. His natural abilities in this field led to his first major achievement. This being the development of state of the art blood analysis diagnostic equipment for the early detection of human disease. This breakthrough led to Dr. Smith being nominated for a Nobel Prize in Chemistry.

Dr. Smith chose not to be commercially minded; thus his early career recognition led him to the lecture circuit, where he could impart his knowledge through various university invitations.

He gave his time to Universities across America and in Tokyo, Osaka and Kyoto. Dr Smith was further recognised by being awarded an Honorary Doctor of Science degree from Osaka University.

It was his acquired knowledge in this field and practical nature that led to the development of **Radcon Formula #7**.

After many years of successful site applications across 50+ countries, **Radcon Formula #7** is now becoming the accepted superior alternative and continues to build an undisputable track record in concrete waterproofing and protection.

INTERNATIONAL REPRESENTATION



Radcrete Pacific Pty. Ltd.

A.C.N. 003 228 975

NEAREST REPRESENTATIVE

DISCLAIMER

Radcrete Pacific Pty. Ltd. warrants that the products manufactured by it shall be free from material defects and will conform to formulation standards and contain all components in the proper proportions. Should any of the products be proven to be defective, the liability to Radcrete Pacific Pty. Ltd. shall be limited to replacement of the material proven to be defective and shall in no case be liable otherwise or for incidental or consequential damages.

Radcrete Pacific Pty. Ltd. makes no guarantee as to merchantability or fitness for a particular purpose and this guarantee is in lieu of all other guarantees expressed or implied. The user shall determine the suitability of the product for the intended use and assume all risks and liability in connection therewith.