RADCRETE

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EDITORIAL

Another solid Newsletter to keep you updated with our activities. The Radcrete Newsletter is designed to give you a quick update on projects completed around the world utilising Radcon Formula #7.

Each site will normally have a introductory summary covering basic site information for those who only have time for a quick skim.

Combined with this site history information any new testing that has been undertaken on the product will be covered in brief. Copies of test reports are supplied upon request.

These Newsletters should be filed in your Radcrete Sealing Systems Manual as they bring the technical information to 'life' and provide you with a useful site reference overview. Hopefully one of your sites will be covered in one of our Newsletters some time in the near future.

As Radcrete has continued to expand into new markets we have received constant requests for new products. In coming Newsletters we look forward to reporting to you on our exciting new product developments covering water repellents, paints and other coatings.

In all situations we attempt to utilise the endless potential of soluble silica - being a base for Radcon #7 and an abundant environmentally friendly material.

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FIGURE 1 - DOVER PARKVIEW CONDOMINIUMS, SINGAPORE

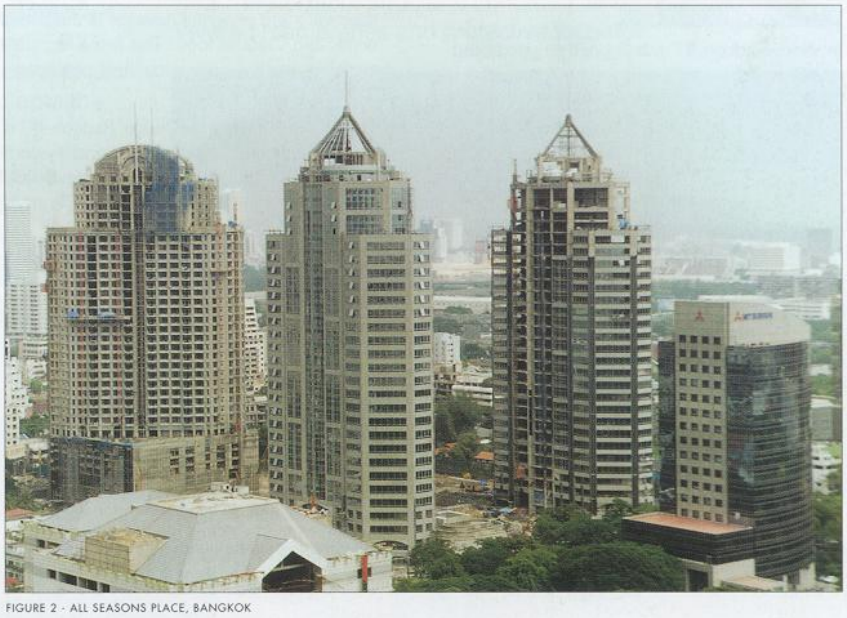

FIGURE 2 - ALL SEASONS PLACE, BANGKOK

RADCON #7 PUSHES ON IN S.E. ASIA

With representative offices across Asia and some 9 years experience in the region, Radcon Formula #7 waterproofs two of the larger commercial projects in SE Asia - Dover Parkview Condominiums in Singapore, and All Seasons Place in Bangkok. Full site details are covered inside.

CONCRETE: CRACKS AND CORROSION IN MARINE ENVIRONMENTS

The following article will look briefly at the nuts and bolts of how Radcon Formula #7 works and some independent testing which supports two of the products important performance claims.

To briefly explain how Radcon #7 functions, the chemical base is a biochemical modified soluble silicate. It is spray applied to concrete and watered over 3 days which assists the products penetration and reaction with the concrete matrix and crack walls. During this watering procedure the silicates react with the Calcium Ions which are liberated during the hydration of Portland Cement. This slow reaction of Radcon #7 and Calcium Ions creates a gel material within the concrete matrix and cracks which possess unique waterproofing characteristics.

What separates Radcon #7 from all other silicate materials is its' biochemical modification. The proprietary formulation alters the characteristics of this gel so that it can achieve two important performances. (i) The ability to seal existing cracks. (ii) The ability to regenerate or create new gel when Radcon #7 is in the presence of water and free Calcium Ions.

The upshot of these performance features is the product can be used for 'waterproofing' to replace membranes. It can also be used to protect concrete from ingress of aggressive materials such as chloride ions, especially where cracks create potential durability problems.

REACTIVE ABILITY OF RADCON #7

A crack sealing test was recently undertaken by the Department of Applied Chemicals and Material Science in the Faculty of Engineering at the University of Bologna, Italy.

In short, Radcon #7 was applied to uncracked concrete slabs which were put in a specially

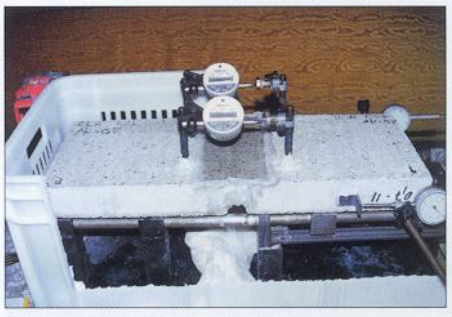

FIGURE 3 - TEST RIG

developed test rig shown in Figure 3. The slab was ponded with water and slowly pulled apart at 50 microns per day in 3 steps to simulate shrinkage cracking. The crack width was accurately controlled and measured by electronic comparators.

At each movement the slab showed a small degree of dampness as the crack was initially created and subsequently widened. Note that the test slab was only 30mm in thickness. If the slab was a full structural member of 120mm+ we would not expect any moisture to pass to the soffit. As soon as the gel in the matrix is activitated by the water and Calcium Ions, the bio-chemical materials stabilise the natural autogenous healing capabilities of the concrete. See Figure 4.

FIGURE 4 - NEW CRACK SEALED

This process continued until the crack was 300 microns (0.3mm) which is classified as a hairline crack..

To see how far this cracking phenomena could extend it was decided to utilise a 3% calcium solution to simulate the quantity of Calcium ions in a full structural member. The sample was progressively pulled apart to 1,300 microns (1.3mm) with Radcon #7 showing some signs of dampness, but overall maintaining a watertight seal as more gel was formed. The gel created in the crack was photographed using a microscope in Figure 5

FIGURE 5 - RADCON GEL (0.4MM)

From there it was decided to examine the sample when subjected to dynamic movement simulating thermal stress. The slab was slowly closed to 900 microns (0.9mm) and then slowly opened to 1,300 microns (1.3mm) again. This cycle was repeated several times. In each incremental movement the crack did initially showed moisture for a short time then dried up. Again note that this test slab was only 30mm in thickness.

The conclusion was that Radcon does meet its' performance claim of being able to re-seal new hairline cracks that develop after product application. It also showed that the biochemical components gives Radcon #7 the ability to reactivate and generate new gel in the presence of water and Calcium Ions. This is the first time this performance has been accurately simulated in a laboratory.

To the best of our knowledge, Radcon #7 is the only product that can be independently verified to be able to seal hairline cracks that develop after product application.

CORROSION IN CRACKED CONCRETE

Radcrete commissioned the Building Research Centre, UNSW, Sydney to look at the 'Corrosion Behaviour of Reinforcement in cracked sections'. It was decided to use 3 mix designs commonly specified for marine environments, plus look at the performance of Radcon #7 and silanes (iso-butyltriethoxysilane). While silanes make no claims to seal cracks it was decided to limit crack widths to within their repellent performance of 0.3mm.

The testing looked at (i) HALF CELL POTENTIAL and (ii) MASS LOSS of the reinforcement bar in cracked concrete.

Samples were cast with a reinforcing bar 20mm below the surface with a crack running longitudinally along the line of the reinforcing. The crack widths were controlled to measure 0.2mm. The samples were sealed with wax on all sides except the upper cracked section. See illustration in Figure 6.

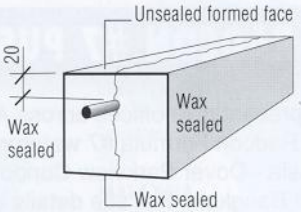

FIGURE 6 - ILLUSTRATION OF SAMPLES

The samples were cyclically immersed in a 3% saline solution to a depth of 500mm then dried to a surface temperature of 40°C. Each cycle was 24 hours in duration and the results were graphed in Figures 7 & 8.

The Half Cell Potentials should not be considered in isolation as a measure of corrosion, but used as a guide only. The Mass Loss test measured the

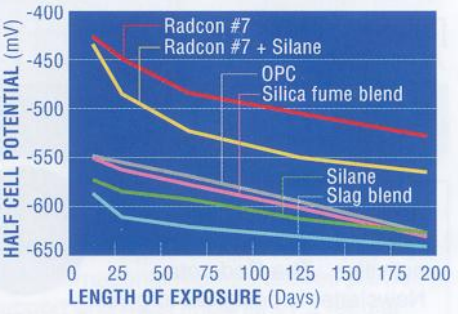

FIGURE 7 - HALF CELL POTENTIAL

percentage of mass that corroded from the reinforcement bar. It is a real indicator of corrosion activity and complements the Half Cell Potential measurements.

It is worth noting that there was no significant differences between the performance of the untreated mix designs. More time may have been required. In general, the treated samples had approximately a 55-60% improvement in Mass Loss performance when compared to the untreated concretes. The mix designs included an Ordinary Portland Cement only, a Silica Fume blend and a Blast Furnace Slag blend concrete.

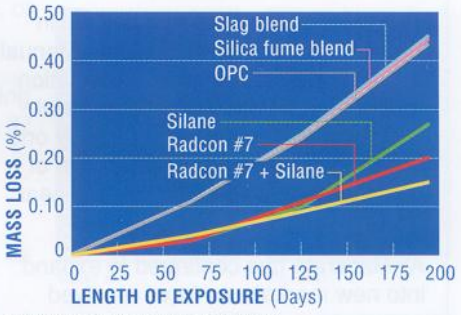

FIGURE 8 - MASS LOSS OF REINFORCEMENT BAR

You should also note that the Radcon #7, and the combined Radcon #7 plus Silane performance were roughly similar, however the Silane only performance deteriorated at a similar rate to the untreated samples between 126-195 days indicating that the silane had lost effectiveness.

Alternatively Radcon #7 maintains its protection. If the tests could be carried out for longer we would see a stronger indication of the different levels of performance.

The simple conclusion to be drawn is that even if you have a blended mix design for marine environments - if the concrete is cracked it has the potential to cause durability problems. If you choose to use Radcon #7 only, or Radcon #7 combined with Silane, the potential for reinforcement corrosion is dramatically reduced so that a better than expected operating life of the structure can be achieved. Silanes alone showed good performance in this test initially but lost effectiveness over time.

For copies of any of these test reports please fax your request on company letterhead to (+61-2) 9362 3244.

GRANDE ESPLANADE, MANLY COVE

Architect:	**Michael Dysart & Partners**
Engineer:	**Ashby Doble**
Main Contractor:	**Concrete Constructions**
Area treated:	**Level 9 & Level 4 rooftops, swimming pool & plant rooms**
Size:	**2,100 square metres**
Applicator:	**Multitech Sealants & Waterproofing**

After extensive research and visits to past Radcon Formula #7 treated projects in Sydney, the consultants for Grande Esplanade chose our system approach to waterproof the key areas of this project.

As the decision was made before the concrete slab was poured, Concrete Constructions were able to take full advantage of the benefits of the Radcon #7 sealing system.

FIGURE 9 - APPLICATION

These revolve around casting hobbs/ upturns into the pour at all parapet walls, major penetrations and plant rooms as seen in Figure 10. By planning these upturns the Radcon #7 system is greatly simplified as a liquid membrane strip seal is no longer required.

The rooftop on this site was broken into 2 major post-tensioned areas with a final interconnecting normally reinforced pour strip. Being a large area with no expansion joints additional steps were made to ensure a water tight result was achieved.

Firstly, the face of the construction joints in the pour strip were scabbled to allow the new concrete to get an adequate 'key'. Full detailing is photographed in Figure 11. Secondly, **RX Waterstop**® was installed below the first row of steel and just prior to the concrete pour Radcon #7 was sprayed onto the construction joint faces.

The application of Radcon #7 in this situation acts as a bonding and wetting agent, also ensures that Radcon #7 has a good presence down the construction joint. After supervising the placing of the concrete we were confident that

FIGURE 10 - CAST IN-SITU PARAPETS

FIGURE 11 - EXPOSED CONSTRUCTION JOINT

FIGURE 12 - GRANDE ESPLANDE, MANLY COVE, SYDNEY

the joint would act monolithically. But due to the size of the rooftop the potential for movement at one of the construction joints was a reality and thus a liquid membrane bandage with bond breaking tape was also emplaced.

On this project the client engaged Ove Arup Engineers to inspect all products applied to horizontal surfaces.

Finally, the original Development Application called for the finished rooftop to be green in colour. After the Radcon #7 application and waterings were complete an alkyd-free green chloro-rubber paint was applied which can be seen here in Figure 13.

What could be more simple: stressed concrete, good design and detailing, working together closely to achieve a common goal. Waterproof structural concrete, no complicated multi-layered membranes and protective toppings.

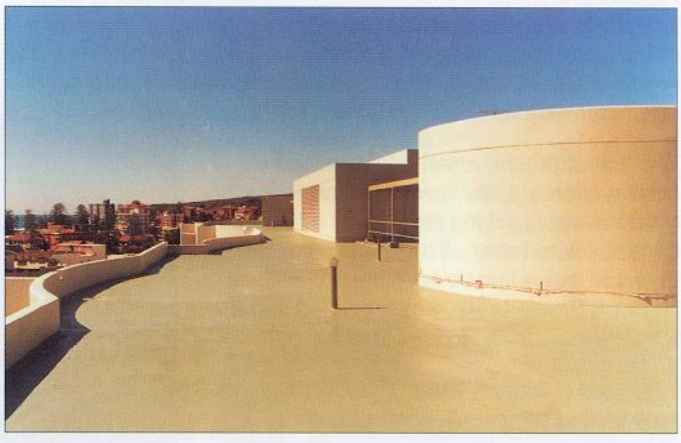

FIGURE 13 - RADCON #7 TREATED FIRST, THEN PAINTED

ROADS & TRAFFIC AUTHORITY BRIDGE DECK, SYDNEY

The Roads and Traffic Authority of New South Wales recently specified Radcon Formula #7 for application to the F4 Highway Entrance ramp on James Ruse Drive after there was an accident which resulted in an acid spill.

The damaged asphalt was removed exposing the old structural concrete. Due to the time constraints and heavy traffic on this major artery the application was undertaken at night. Kratrim, our approved applicators completed the work.

After the application was complete, a new asphalt topping was installed over the Radcon #7 treatment. There are two critical performance features of Radcon #7 in this type of application.

Firstly, the asphalt topping will still be able to gain full bond to the treated structural concrete. And secondly the temperature of up to 160°C during installation of the asphalt does not affect in the performance of Radcon #7.

FIGURE 14 - SCABBLED BRIDGE DECK

ALL SEASONS PLACE, BANGKOK

Owner:	**All Seasons Property Co., Ltd.**
Architect:	**Palmer & Turner (Thailand)**
	Sathian & Associates Co., Ltd.
Structural Engineer:	**Palmer & Turner (Thailand)**
Quantity Surveyor:	**Rider Hunt Levett & Bailey**
Main contractor:	**Christiani & Nielsen (Thailand) PCL**
	Phases I, II, & III
Areas treated:	**Rooftops**
Size:	**5,000 square metres**

All Seasons Place in the heart of Bangkok's business district on Wireless Road, is one of the most expensive and exclusive developments to be undertaken in Thailand. The project is being developed by All Seasons Property Co., Ltd., a joint venture between M. Thai Group Ltd. & China Resources (Holdings) Co., Ltd.

M.Thai Group Ltd. is one of Thailand's largest companies. The company derives its reputation and strength from its solid track record in property development.

FIGURE 15 - RADCON #7 TREATED

China Resources (Holdings) Co., Ltd. established in Hong Kong in 1948, is an international conglomerate with a wide range of interests including worldwide property development.

All Seasons Place will be the first development in Bangkok to fully integrate office, residential and hotel uses. The completed project will feature 5 towers made up of a residential condominium tower, three office towers, and a five star hotel with serviced apartments above.

The first structural phase included the construction of three towers: office tower 1, office tower 2 and the residential condominium tower. The upper level roof decks of these first three towers all utilised **Radcon Formula #7**, which totalled some 5,000 square metres of waterproofing.

Designed by internationally renowned architects, Palmer & Turner, the office towers feature column free layout ensuring maximum flexibility. Towers 1 & 2 each comprise of 30,000 square metres of usable office space on 28 floors. The overall floor plan is unique with a ceiling height of 2.7 metres contributing to the open air feel of the office space.

When the 3 office towers are complete there will be over 45 high speed lifts servicing the offices as well as a large car park area which can cater for over 2,000 cars.

The condomium tower incorporates its own entrance separate entrance off Soi Ruam Rudee. For parking, there are two floors of basement-level parking in addition to three

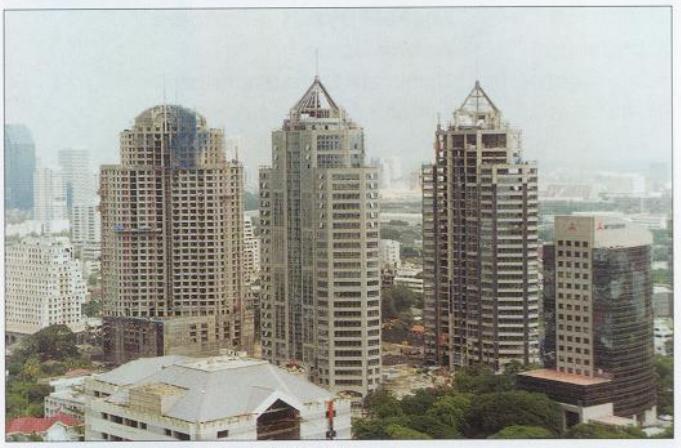

FIGURE 16 - THREE OF THE 5 TOWERS UNDER CONSTRUCTION

levels of above ground parking. Four high speed passenger lifts and two service lifts operate in the tower.

The tower also features exclusive facilities including a swimming pool, children's pool, squash court, sauna and private garden with a children's playground. Combined with this the residents will have access to the Hotel's facilities.

Phase 2 which is underway includes Office Tower 3 and the Hotel & Serviced Apartments.

The Conrad Group will be operating the 5 star hotel comprising of some 400 rooms. The Tower will provide spectacular and panoramic views across the Central Business District on a clear day. The Tower will also share approximately 200 serviced apartments which makes up the total 33 floors.

The roof decks of the first 3 towers feature a number of section changes such as walls, plynths, hobbs, stair wells,

FIGURE 17 - ARTISTS IMPRESSION OF THE COMPLETED TOWERS

ALL SEASONS PLACE, BANGKOK

walls and gutters. Figure 15 gives some idea of the situation, combined with a large amount of M&E services makes for a difficult waterproof task. Radcon #7 was sprayed directly onto the structural rooftop and Figure 15 shows the concrete drying out after the Radcon #7 treatment.

Bolt holes were drilled through the concrete to make way for the M & E services. Each of these bolt holes were treated with Radcon #7 to ensure there was no compromise of the waterproofing integrity.

On this site it was Radcon #7's ability to be applied into tight and inaccessible areas that makes it a very reliable system.

Unlike any other penetrating products, Radcon #7 also seals cracks which inevitably develop in all concrete structures. The product will maintain a watertight seal as the concrete continues to hydrate and the structure is exposed to thermal stresses.

In addition to a long service life, Radcon #7 offers the benefit of still enabling good bond of mortar and tile beds, directly to the structural concrete. In fact when cementitious materials are placed over a Radcon #7 treated surface such as a tile bed the bond strength of the mortar to the structural concrete is increased by up to 28%.

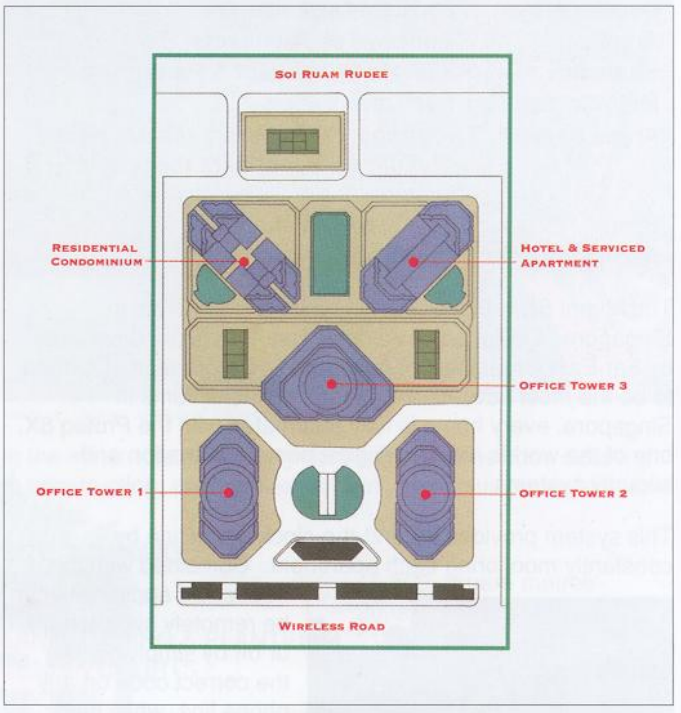

FIGURE 18 - SITE PLAN OF ALL SEASONS PLACE

C.H.I.J.M.E.S., SINGAPORE

Architect:	**Ong & Ong**
Engineer:	**Ove Arup & Partners**
Main Contractor:	**Gammon Contractors**
Area treated:	**2 levels of internal courtyard, walkway rooftops & water features**
Size:	**3,000 square metres**
Representative:	**Reverton Engineering**

Built in 1854, Singapore's beautiful old mission school, formerly known as C.H.I.J., has recently been transformed into a haven for fine dining and shopping in the heart of Singapore's heritage trail.

The site is now called C.H.I.J.M.E.S.. includes commercial additions to the 140 year old Church section that can be seen restored to all its former glory in Figure 20.

On this project Radcon Formula #7 was applied to some 3,000 square metres for waterproofing of the suspended concrete decks. The areas included the two levels that can be seen in Figure 19. Firstly, the sunken courtyard section which is suspended over the basement carpark. This section has been completely tiled and features a water fountain.

FIGURE 19 - THE SUNKEN COURT YARD, C.H.I.J.M.E.S.

And secondly, the upper level of the internal courtyard which has been both landscaped and tiled. This podium level forms the rooftop to the restaurants and commercial offices located underneath. Radcon #7 will still perform to specification when completely covered with landscaping.

FIGURE 20 - 140 YEAR OLD CHURCH RESTORED

The completed site is one of the top tourist visits in Singapore hosting a gallery of international boutiques, fine dining restaurants, wine bars and commercial leasing.

The project was constructed by Gammon contractors with our exclusive representative for Singapore, Reverton Engineering undertaking the waterproofing works.

DOVER PARKVIEW, SINGAPORE

Developer:	**Far East Organisation**
Architect:	**Andrew Tan Architects**
Engineer:	**KTP Ho Consultant & Partners**
Main Contractor:	**Neo Corporation**
Areas treated:	**rooftops, roof-garden, planter boxes, podium deck, car park roof-deck, swimming pools, wet areas**
Size:	**50,000 square metres**
Representative:	**Reverton Engineering**

The Miami Style **Dover Parkview** is now complete in Singapore. Designed by Andrew Tan Architects, developed by Far East Organisation, built by Neo Corporation. Claimed to be the most advanced high tech condominiums in Singapore, every home is fully automated with the Proteq 8X, one of the worlds most intelligent home automation and security systems.

This system provides around-the-clock protection by constantly monitoring each apartment. Combined with this household appliances can be remotely switched on or off by simply dialling the correct code on any phone line, while heat detectors forewarn and help prevent any potential fires.

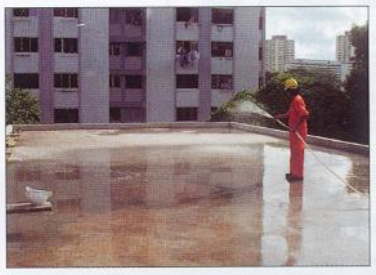

FIGURE 21 - 1ST WATERING AFTER THE RADCON #7 TREATMENT

High-tech wizardry aside, Dover Parkview also boasts one of Singapore's best private landscaped gardens designed by **Belt Collins**, the landscape architect behind the famous Shangri-La Hotel, Singapore.

As part of the resort living atmosphere, Dover Parkview has a full range of recreational facilities. These include an underwater-music swimming pool (see Figure 23), children's play pool, jacuzzi, eurobath, sauna, outdoor fitness station, gymanisium, four tennis courts, BBQ pits and more.

FIGURE 23 - SWIMMING POOL WITH UNDERWATER MUSIC

The project is located off Dover Road, close to established schools, tertiary institutions and major conduits like the Ayer Rajah Expressway. In addition, residents can look forward to an air-conditioned shuttle service between Dover Parkview, Buona Vista MRT Station and the popular Holland Village.

Radcon Formula #7 was used as the exclusive waterproofing system for this project. The product was used in applications covering everything from high thermal stress slabs to water holding vessels to rooftop gardens - totalling some 50,000 square metres of waterproofing.

ROOFTOPS

Radcon #7 was used to waterproof all of the flat concrete rooftops on the 4 towers. Topside insulation was still required so the surface finish needed a topping that can be seen in Figure 24.

LANDSCAPED AREAS

This site combined planter boxes and extensive landscaping over the podium level which can be viewed in Figures 22 & 25. Importantly plant roots will not attack the integrity of the

FIGURE 22 - DOVER PARKVIEW, SINGAPORE

DOVER PARKVIEW, SINGAPORE

Radcon #7 waterproofing treatment. The depth of the soil on the landscaped areas was up to 1.2 metre.

WATER HOLDING VESSELS

A total of three suspended swimming pools were waterproofed with Radcon #7. Each of these pools are located in the podium deck which is suspended over the lower ground car park.

WET AREAS

All bathrooms in the 600+ condominiums were all waterproofed with Radcon #7. As the product penetrates into the concrete there is minimal risk of damage from other trades such as tilers. Even when traditional membranes are installed correctly they can be easily damaged after installation . Radcon #7 eliminates this problem.

FIGURE 24 - ROOFTOP WITH INSULATION AND TOPPING

Overall there could not be a better demonstration of the versatility of Radcon Formula #7 when waterproofing. It is important to note that Radcon #7 is a 'system approach' which includes the use of other products

FIGURE 25 - LOOKING DOWN ONTO SUSPENDED PODIUM DECK

in the minor role of ancillary detailing. This includes detailing to construction, cold and expansion joints, plus penetrations.

SITE SUMMARY

ROOFTOPS	5,500 square metres
WET AREAS	20,000 square metres
LANDSCAPING & PLANTERS	21,000 square metres
TENNIS COURTS	1,000 square metres
POOLS	1,500 square metres

AUSTRALIAN HIGH COMMISSION RESIDENCE, SINGAPORE

Owner:	**Australian Government**
Project Manager:	**Overseas Property Group, ACT**
Architect:	**Kerry Hill Architects**
Engineer:	**Fraiser Worley Group**
Main Contractor:	**V3 Contractors**
Representative:	**Reverton Engineering**

The Overseas Property Group primarily manage the construction of Government related buildings in overseas markets such as this Australian High Commission residence locate in Singapore. The requirements on these projects is to include as much Australian involvement as possible - from engineering to architectural services, to contracting and product supply.

Radcon #7 has been used on a number of major government projects in Australia such as the Australian Taxation Offices at Wollongong and Hurstville. Importantly the product has received its Australian Building Systems Appraisal Council (ABSAC) Appraisal which is considered mandatory for products on government projects.

Added to this the product has had full representation in Asia for up to 9 years.

It was these reasons for the products acceptance and approval by the Overseas Property Group for this project. Radcon #7 was utilised on all exposed flat concrete roof decks and in the swimming pool. The application was undertaken by our Singapore representatives, Reverton Engineering.

We are proud to have been given the opportunity to be involved on this site representing Australia. Other Australian involvement included the engineers, Fraiser Worley (formerly Wholohan Grill & Partners) and Kerry Hill Architects, both well regarded for their work in the region.

FIGURE 26 - AUSTRALIAN HIGH COMMISSION RESIDENCE, SINGAPORE

FIGURE 27 - INTERNAL COURTYARD AND SWIMMING POOL

KVERNDALEN BRIDGE DECK, NORWAY

Name of section:	**Arteid Bridge - Kverndalen**
Bridge:	**Kverndalen**
Owner:	**NSB Gardermobanen (Norweign State Railways)**
Main contractor:	**AP Spesialprosjekt/Skanska**
Applicator:	**Minihaller AS**
Area:	**Bridge deck**
Size:	**1,500 square metres**

The Arteid Bridge located forms part of the New Fast Train to Norway's new airport just outside Oslo. The railway project includes several major bridges, of which Radcon Formula #7 has been applied to three - to the deck and culvert. One of the bridges, Kverndalen, can be seen in Figure 29.

FIGURE 28 - BRIDGE DECK

A strong reason for choosing Radcon #7 on these bridges is due to the crack sealing performance of the product. Any concrete protection product will provide some protection to the structure by protecting the general matrix of the concrete, but Radcon #7 can address cracks which may be present or develop in the structure. Local testing has been undertaken through SINTEF for chloride ingress and permeability.

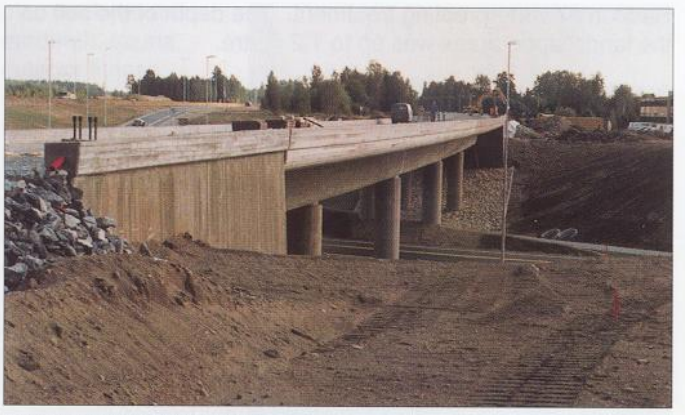

FIGURE 29 - KVERNDALEN BRIDGE, NOOSDLO

By sealing cracks in the concrete as well as the matrix, Radcon #7's performance is greatly enhanced offering superior protection for concrete exposed to freeze-thaw attack, chloride ingress and other air borne pollutants.

Also a major consideration on this civil project was the extensive use of heavy balustrade (stones) along the rail tracks. Although Radcon #7 is a spray applied liquid it penetrates the concrete without leaving a surface film. The product works by reacting with the free Calcium Ions within the concrete to form a sub-surface waterproofing barrier. Therefore the placing of heavy balustrade onto the treated concrete does not damage the Radcon #7 treatment.

ITALIAN SWIMMING POOL

Main Contractor:	**Genio Militare - Ing. Tornabene**
Application:	**Maffei Company - Mirandola, Modena**
Pool Dimensions:	**25m x 12m (up to 4m deep)**

The Military Academy in Modena, Italy is the Training Base and home for the Italian equivalent of the Marines. Their swimming pool was built in 1950 and is suspended on beams and piers. The pool was leaking profusely producing 300mm calcium stalictites as seen in Figure 31. Traditional repair methods were more expensive than completely re-building the pool. Radcon Italia provided an alternative method to try to resolve a difficult problem.

The empty pool was washed and mortar joints in poor condition were re-grouted. Then the whole tiled internal area of the pool was treated with Radcon #7 with the first watering using a 3% calcium solution to help trigger the reaction in the older mortar joints. The pool was filled. During the first week there was no significant improvements. After 10 days large saturated areas started to dry. After 2 weeks, 70-80% of the problem was resolved.

The remaining problem was a construction joint running horizontally around the pool. A unique and untried method was put forward to seal this joint from the outside. Firstly the leaking joint was ground out 40mm deep and 20-30mm wide. A PVC tube of 15mm diametre with regular holes was placed in the cut-out. The tube was covered in a quick setting mortar. After 8 hours the tube was sealed at one end and injected with Radcon #7 at 2 atmospheres pressure. The Radcon #7 displaced the water and reacted with the calcium in the joint creating a watertight seal.

This methodology proved successful and was thought to be miraculous by the Military Engineers. The pool has been given a new lease of life at an exceedingly low repair cost.

FIGURE 30 - SWIMMING POOL RE-FILLED AFTER SUCCESSFUL REPAIRS

FIGURE 31 - SOFFIT WITH 300MM CALCIUM STALICTITES

WAVE PLACE, BANGKOK

Owner:	**Wave Development Ltd.**
Architect:	**Palmer & Turner**
Engineer:	**Meinhardt Thailand Ltd.**
Main contractor:	**Thai Takenaka International Ltd.**
Project Managers:	**Projects Asia Ltd.**
Areas treated:	**Level 2 car park over offices & exposed podium areas**
Size:	**2,500 square metres**
Approved Applicator:	**Radcon Thailand Co. Ltd.**

As Thailand's skyline continues to grow, Wave Place, located in the heart of busy Bangkok, is one of the most recently completed structures. Wave Place is a prestigious project, combining mixed retail and office space.

FIGURE 32 - LEVEL 6 OF WAVE PLACE

The lower half of the building, (Levels 1 - 5) is made up of upmarket retail outlets and international class restaurants. Level 6 forms part of the car park photographed during construction in Figure 32, and Levels 7 - 21 represent prime office space.

Although the car park on Level 6 is mostly covered with other levels it does have some exposed podium area around the glass dome at the front of the building and an open facade. This allows for the entry of wind driven rain and water also being carried in on vehicles into this car park area. With a shopping arcade located directly below, waterproofing of this level becomes critical.

The original design of Level 6 car park was a full membrane system with insulation and reinforced topping up to 150mm.

It was clear to Meinhardt Engineers that applying **Radcon Formula #7** directly to the structural concrete with no requirement for protective toppings, offered some real advantages. Direct cost saving of the topping and insulation only being one of them.

FIGURE 33 - WAVE PLACE, BANGKOK

In addition the use of Radcon #7 greatly helped the construction schedule. The inner city location of this site meant Level 6 became an important storage level for building materials.

By using Radcon #7, areas could be treated, section at a time, as depicted in Figure 33, with the 'down time' for an area only being half to one day. The product is applied to the clean concrete surface and allowed to become touch dry. Once dry (normally 2 - 6 hours), the treatment receives its first of the three waterings. After this 1st watering is concluded and dry, other trades may use the area without any damage to the integrity of the waterproofing treatment.

For Thai Takenaka, this meant they were able to waterproof when it suited their construction timetable. Alternatively, a membrane would be installed at a much slower rate, then require complete protection to prevent any damage from other trades working in the area. Fast application, staggered application and minimal down time generate real cost savings although such major benefits are difficult to put an exact figure on. Taking advantage of this benefit, Thai Takenaka planned the waterproofing over a 2 month period.

Radcon Thailand applied Radcon #7 to 2,000 square metres of concrete, waterproofing the slab which contained a number of joints and hairline cracking. The area was then pond tested prior to handing over.

CRAWLEY AVENUE, PERTH

Radcon Formula #7 was recently utilised to waterproof the rooftop of these prestigious units over looking the Royal Perth Yacht Club.

The product was applied to the cured concrete rooftop leaving the surface completely exposed, not prone to damage from environmental factors such as UV light, temperature fluctuations and rainfall.

The application was completed by our long standing Approved Applicator, Aquaseal Concrete Services. Jerry Bosich Architects were the designers and the builders were Southdown Constructions. The site was completed in May 1996.

For this type of residential construction timing is of completion is essential. When using Radcon #7 on a project the waterproofing can be completed very quickly without compromising the integrity of the system.

On smaller projects a back pack spray unit can be used which will achieve application rates up to 150-200 square metres per hour. For large projects and raised freeway sections, one motorised spray unit can achieve up to 800 square metres per hour. This flexibility enables projects to be fast tracked completing them on time.

FIGURE 34 - COMPLETED PROJECT

MAA ON SHAAN - AREA 90 - PHASE 1, HONG KONG

Client:	**Hong Kong Housing Authority**
Architect:	**Wong Tung & Partners**
Engineer	**Robert Chiang & Associates**
Main Contractor:	**Shui On Building Contractors**
Area:	**Car park over retail**
Size:	**8,000 square metres**

Wong Fu & Co., our exclusive representative for Hong Kong, recently waterproofed 8,000 square metres of car park deck in the Maa On Shaan Shopping Centre.

The area waterproofed by Radcon #7 was the lowest car park level which is located directly over the retail area. Whilst the waterproofed deck is covered by other car park floors, there was a concern that the open sides would allow for wind driven rain. Combined with this vehicles entering the car park would carry rain water onto this critical concrete deck area.

FIGURE 35 - THE TREATED DECK

FIGURE 36 - MAA ON SHAAN SHOPPING CENTRE, HONG KONG

Radcon #7 was ideal in this application as the product can be applied up to 800 square metres per hour and once complete is immediately open to traffic. The project is one of many now completed for the Hong Kong Housing Authority.

CURRAGH MINE, QUEENSLAND

Consulting Engineers:	**CMPS&F Pty. Ltd.**
Contractor:	**John Sheppard Industries Pty. Ltd.**
Approved Applicator:	**Concrete Cutting & Sealing**
Area treated:	**Inside of Tailings Tank**
Size:	**3,000 square metres**

Radcon Formula #7 was recently applied to this tailings tank seen in Figure 37 as part of an upgrade programme. Each year the Curragh Coal Mine is shut down for repairs and after many years of operation the tailings tank was in need of general maintenance.

After mining the coal is washed then loaded onto trucks. Water is very scarce in Central Queensland so what is used in the Tailings Tank is recycled. The tank is designed to allow the coal dust to be separated from the water.

The maintenance contract on the Tank involved: cleaning of the inside surfaces, replacement of failing joint sealant and a full treatment of Radcon #7 to the internals. Radcon #7 was chosen for this site due to its ability to waterproof the concrete and increase the hardness of the concrete against water abrasion.

Replacement of the joint seal involved firstly the installation of a hydrophilic rubber waterstop (pre-formed and gun grade). Once this was firmly installed then a one part polyurethane sealant designed for submerged conditions was applied to all joints.

After the joint was detailed and cleaning was complete, Radcon #7 can be seen in Figure 38 being applied to approximately 3,000 square metres.

Concrete Cutting & Sealing, one of our Approved Applicators, completed the work, with CMPS&F as the Consulting Engineers overseeing the project.

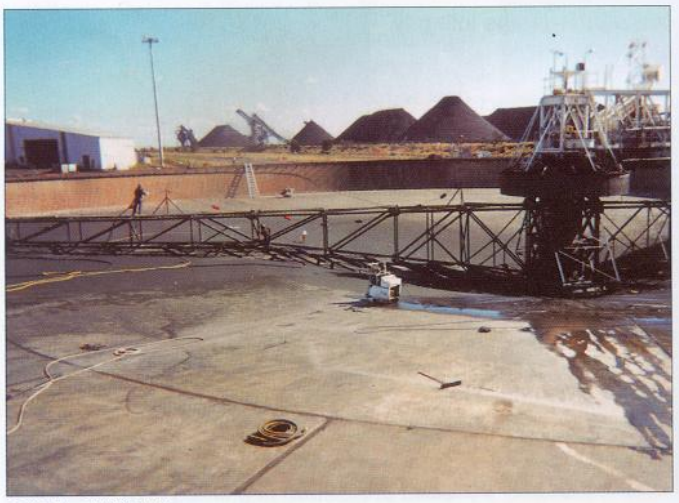

FIGURE 37 - TAILINGS TANK

FIGURE 38 - RADCON #7 APPLICATION

OMEGA APARTMENTS, MOFFET BEACH, QUEENSLAND

Architect:	**Geoff Young Architects**
Builder:	**R J Robertson**
Areas treated:	**Rooftop, balconies & podium**
Size:	**1,200 square metres**
Applicator:	**Laceworth Pty. Ltd.**

Ahh, Queensland... beautiful one day, perfect the next. Laceworth our approved applicators for the Sunshine Coast recently waterproofed this project utilising Radcon Formula #7. The product was specified by Geoff Young Architects and the apartments were constructed by R. J. Robertson Construction.

Moffet Beach is located just north of Brisbane. These upmarket apartments are located on the southern cliff face overlooking the beach seen in the Figure 39 insert. Radcon #7 was used to waterproof the front balconies, rooftop and front entrance podium deck.

FIGURE 39 - OMEGA APARTMENTS, QUEENSLAND

JAYA BANK HEAD OFFICE, JAKARTA

Owner:	**Jaya Bank**
Architect & Engineer:	**Arkonnin**
Main Contractor:	**Jaya Kontruksi**
Area:	**Rooftop & fountain**
Size:	**2,000 square metres**

Another landmark site for Radcon #7 in Indonesia. With the recent completion of Jaya Bank's 20-storey Head Office, Radcon #7 was fortunate to have been given the opportunity to waterproof the flat concrete rooftop of this building. This site is located in the Bintaro Jaya area, south-west of Jakarta.

Four Building Maintenance Units (Gondola's) on this 20 storey building require this rooftop to remain highly trafficable. Originally a traditional membrane system was proposed on this rooftop. Due to the trafficability requirement, any membrane would require to be protected with a structural topping. This system is complicated, and if/when problems occur the maintenance expense can exceed the original waterproofing contract value.

Radcon Formula #7 was proposed as an alternative and carefully reviewed by Arkonin to be a simpler, more effective waterproofing system. With correct design, Radcon #7 is simply treated to the structural concrete whereby it creates a sub-surface gel barrier within the concrete. The treated surface remains trafficable.

FIGURE 40 - INSULATION ON THE SOFFIT

The end result is waterproof structural concrete, leaving one waterproofing variable - the concrete. No complicated sandwich membrane systems and toppings that are difficult to maintain if there are any problems.

With the structural concrete exposed, the rooftop insulation was moved to the underside of the concrete. The insulation was expanded fibreglass in a foil sandwich which was tacked to the soffit with chicken wire and nails. This detailing can be viewed in Figure 40.

FIGURE 41 - JAYA BANK TOWER

The fact is that a waterproofing guarantee lasts around 10-15 years which may represents only represent 20% of the life of a building. If a problem ever occurs with a Radcon #7 treated rooftop the problem can by easily identified and repaired with minimum of expense.

PT Argacipta Cemerlang our exclusive representatives for Indonesia applied Radcon #7 to some 2,000 square metres on the rooftop and also the adjoining fountain.

STOP PRESS: We understand that this building has recently been sold to Bank Bali along with a large portion of land in the area.

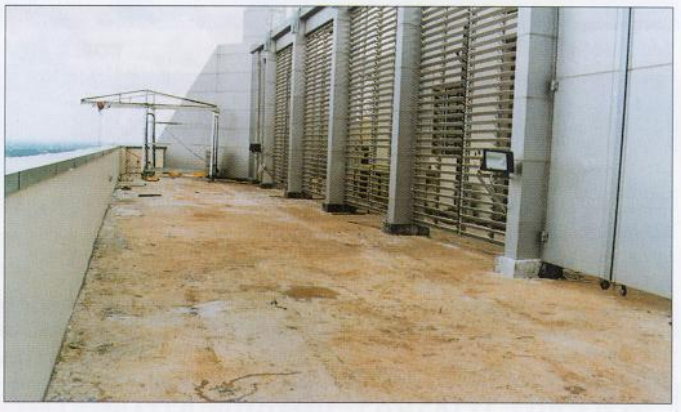

FIGURE 42 - EXPOSED CONCRETE ROOFTOP AFTER RADCON #7 TREATMENT

REPRESENTATIVES VISIT AUSTRALIA

After exporting Radcon Formula #7 to Japan through Radcon Japan since 1992 we were fortunate enough to have the principles visit our head office in Sydney. After catching up on technical matters and future opportunities there was time to see some of the sites of Sydney. Mr Hideotoshi Itoh and Mr Syuichi Imai of Radcon Japan can be seen in Figure 43 at Manly with Ms Riina Klaas, Director of Radcrete Pacific.

Fortunately there was also some time to spend on Sydney Harbour on a beautiful Autumn day seen here in Figure 44.

As Radcon #7 continues its drive into Europe the product has undergone extensive testing, most recently in Italy through the University of Bologna. Interestingly they embarked on an innovative testing programme to explore the crack sealing and re-healing performance of the product in concrete. A summary of this testing is covered on Page 2 of this Newsletter.

FIGURE 43 - JAPANESE AT MANLY

With exciting performance results achieved Radcon Italia, our Italian representatives, and representation from the University of Bologna flew to Australia on a fact finding/technology sharing tour. The tour involved presentations to local construction personnel in Sydney and meetings with the Building Research Centre, UNSW. The Building Research Centre has undertaken a large percentage of testing for Radcon #7 in Australia and the two testing authorities can be seen here in Figure 45 discussing different theories.

FIGURE 44 - JAPANESE ON SYDNEY HARBOUR

Pictured left to right: Dr. Marton Marrosszeki, Building Research Centre; Jason Klaas, Radcrete Pacific; Dr Giovanni Rabachin, Consultant to University of Bologna; Mr Ennio Boldrini, Radcon Italia; Mr Frank Cavalieri, Translator (retired Architect); Mr Bill Psaltis, Radcon Italia; Mr Roger Scerri, Building Research Centre.

FIGURE 45 - TWO TESTING AUTHORITIES DISCUSS DIFFERENT THEORIES

Everyone has heard the phrase - 'you can have the best product in the world, but if it is not applied correctly then you have wasted your money. At an international level we have a policy of one exclusive representative per country.

In nearly all countries this representative acts as both our Exclusive Representative and Approved Applicator. We work very closely with all our international representatives providing complete technical support and most importantly a regular visit pattern.

We do not encourage on-selling of the product, but rather control the product application so that our clients can be assured that, (1) a competent trained applicator is used and (2), Radcon #7 is being applied to specification.

Alternatively we do use registered Approved Applicators who work closely with our company and have been trained in the use of the Radcon #7 Sealing System approach. This is particularly the case in Australia.

Therefore for any of your future concerns, insist the contractor provides a registered copy of our EXCLUSIVE REPRESENTATIVE, or APPROVED APPLICATOR certificate when issuing the Radcon Formula #7 contract.

Copies of these two certificates are illustrated in Figures 46 & 47 respectively.

FIGURE 46

FIGURE 47

RADCON #7 - INTERNATIONAL REPRESENTATION

For contact details of your nearest representative, please phone or fax:

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Parana

CHILE
Ms Marcela Olivares
Parker International Ltda.
Santiago

ESTONIA/LATVIA/LITHUANIA
Mr Toomas Volens
As Eke Tehnokeskus
Tallinn

GUAM
Mr Terry Thompson
J.T. Developments
Cairns, Australia

HONG KONG
Mr Terrence Wong
Wong Fu & Co. Ltd.
Kowloon

INDONESIA
Mrs Sylvia Hardjosudiro
PT. Argacipta Cemerlang
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Radcon Italia S.R.L.
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LEBANNON
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SRI LANKA
Mr Yunus Rajkotwala
H.E. Engineering Ltd.
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Mr Simon Chou
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Mr Curt Nelson
Tech-crete Ltd.
Bottineau

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