

Marina Bay Sands Integrated Resort and Casino

Marina Bay, Singapore (2010)

BACKGROUND

Marina Bay Sands is a premier entertainment destination with a vibrant diversity of attractions and facilities. It is Asia Pacific's largest integrated resort that possess a distinct identity which has distinguished Singapore from other cities. Las Vegas Sands has invested \$5.7 billion USD in the project, including the fixed S\$1.2 billion cost of the 560,000 square meters (6,000,000 square feet) site itself.

Marina Bay Sands features three 55-story hotel towers containing a total of 2,561 rooms, crowned by a two acre Sands Skypark bridging across the towers, offering 360-degree views of the city and the sea; an iconic Art Science Museum; one-million square feet of integrated waterside promenade and shopping mall; a state-of-the art 1.3-million square feet convention center; two 2,000-seat theaters; and a casino.

SOLUTION

The challenge was to find a sole waterproofing product that could address numerous issues associated with such a mega-project including all below-grade areas, multiple floors, tunnels, roof tops, lift and sump pits and water tanks. The site was being built on reclaimed land and surrounded by seawater.

The following is a summary of key challenges and requirements for the mega-project:

By simply adding KIM to the concrete mix at the time of batching, waterproofing concrete becomes a quick and easy process that won't hold up the construction timeline. The Krystol system uses advanced integral crystalline waterproofing technology to transform porous concrete into a permanent, water-resistant barrier and provide a guaranteed defense against water damage and steel reinforcement corrosion. If cracks later form, the incoming water will react with KIM and trigger further crystal growth, filling cracks and keeping the structure watertight.



Asia Pacific's largest integrated resort was built on reclaimed land; up to 25 meters below grade.



Kryton's KIM-HS was used to waterproof the base slabs, suspended slabs, tunnels, and water tanks.

OWNER:

Las Vegas Sands Corp.

DESIGN TEAM:

Moshe Safdie and Associates

DESIGN ARCHITECTS:

Aedas

Peter Walker and Associates

LANDSCAPE

ARCHITECTS:

RG Vanderweil

MECHANIC AND ELECTRICAL ENGINEER:

ARUP

READY-MIX PROVIDER:

Island Concrete Pte Ltd

CONTRACTORS:

Penta Ocean, Sembawang,
Ssangyong, KTC, Sato Kogyo,
Lian Beng, Sambo and
McConnell Dowell

DISTRIBUTOR:

Lee Construction Pte Ltd.

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Challenges included:

- Tight construction timeline
- Multiple contractors working on the site
- An easy, efficient application, and permanent system
- Close proximity to salt water
- System must be able to withstand significant hydrostatic pressure - deepest point is 25 meters (82 feet) below grade

Options considered included traditional membranes, bentonite sheets and various waterproofing admixtures. After an extensive final evaluation process, the customer was confident with Kryton's crystalline concrete waterproofing admixture, Krystol Internal Membrane (KIM), and awarded the project to Lee Construction Pte Ltd., the exclusive Kryton distributor in Singapore, in August 2007.

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Over 60,000 cubic meters of concrete was waterproofed using KIM-HS admixture, which equates to approximately half a million kilograms of the product. Areas that were waterproofed using the Krystol system included the massive base slabs, suspended slabs, walls, tunnels and water tanks within the entire footprint of the project. Marina Bay Sands is Asia Pacific's largest integrated resort and casino; it includes a shopping centre, museum, crystal pavillions, underground parking, convention centre, theatre and casino.

KIM allowed the seamless pouring of concrete from one area to the next. There is no wait time needed for backfilling, preparation of the substrate, or additional manpower to apply a traditional membrane system.

Due to the size of the project, one single contractor could not complete the job on its own. Rather, the project was divided into "packages" and awarded nearly a dozen different main contractors. This would normally pose a major logistical challenge to the waterproofing supplier in having to coordinate application between contractors but the use of the KIM admixture greatly diminished the risk of delays and on-site application errors as KIM is dosed at the batching plant and added directly into the mixer truck. Marina Bay Sands opened on April 27th, 2010 and has seen 19.6 million visitors walk through its doors in its first year of operations .

Kryton International Inc.



Hall 1, Stand F11

Kryton International Inc. provides the most effective concrete waterproofing systems in the world. With over 40 years of experience, 50 distributors worldwide, and more than 10,000 successful waterproofing projects, Kryton is recognised and acknowledged as the leader in taking the risk out of concrete waterproofing globally.

Whether you are an engineer, architect, property developer or general contractor, Kryton helps indus-

try professionals solve the most difficult concrete waterproofing challenges by providing innovative, time-tested solutions, backed by service and support that are second to none. Kryton products provide cost- and labour-savings that help you stay on budget and on schedule for the most innovative designs.

Using proven Krystol technology, Kryton protects concrete permanently. Its revolutionary self-sealing technology and comprehensive support system transforms concrete into an ever-vigilant, waterproof barrier. In the short

term, you will shave weeks off construction schedules, cut waterproofing costs by up to 40% and maximise your building footprint. In the long term, you will avoid leaks, discoloration and costly callbacks. All of which explains how Kryton can offer an industry-leading 25-year warranty, as well as how 40-year-old Kryton projects are as dry today as when they were first built.

Kryton products are proven in the harshest of environments from the Palm Islands and Atlantis Hotel in Dubai to the Marina Bay Sands and Marina

Coastal Expressway in Singapore. Kryton provides a permanent waterproofing solution.

Kryton offers admixture solutions, surface-applied treatments, repair and maintenance products, joint waterproofing protection and water repellent sealer.

With a reputation for excellence, and systems in some of the most iconic global projects, Kryton is the world's leading concrete waterproofing solutions provider. To learn about Kryton products, visit kryton.com.