

CornerStone Wall Solutions Inc., Vancouver, Canada

Back to the Future – retaining wall construction in the Barangaroo Reserve, Australia

Located on the east coast of Australia, the metropolis of Sydney is known worldwide for its majestic skyline, fronted by the iconic Sydney Opera House and the Harbour Bridge. Less well known, past the southern edge of the bridge, the Barangaroo Reserve has captured the fancy of Sydneysiders in recent years as a gloriously beautiful, accessible green space. Nearly 6,500 feet (2 kilometers) of MagnumStone retaining wall were placed in the Barangaroo Reserve following the shoreline and forming the terrace at the headlands.

It wasn't always that way. An area steeped in Aboriginal history and culture, the Barangaroo headlands had fallen on rough times. As Sydney evolved into a major worldwide shipping port, the shoreline was stripped and paved into an industrial container terminal. Development chipped away at the magnificent sandstone banks and, more recently, the site had become derelict, falling into irrelevance as the shipping industry moved to deeper waters.

It took the tireless efforts of former Prime Minister Paul Keating, years of public wrangling, and an international landscape

architectural design competition to bring the Barangaroo Reserve to fruition as the first phase of a \$6 billion 54-acre urban renewal project that started in 2006. Construction continued into 2015, and now the headlands of the site – the 14-acre Barangaroo Reserve – serves the community as a thriving public green space with dramatic overlooks, extensive walking and cycling trails, picnic areas, and 75,000 native trees and shrubs.

Dramatic Reformation

Playing a major supporting role in this dramatic reformation of the reserve are nearly 6,500 feet (2 kilometers) of MagnumStone retaining wall. Developed and licensed by CornerStone Wall Solutions Inc. based in Vancouver, BC, and Calgary, AB, Canada. MagnumStone is one of a suite of retaining wall systems offered worldwide by the company.

Manufactured in Australia by Austral Masonry, the hollow core blocks create the gently curving terrace that contains the extensive vegetation and transitions the headlands to the multi-use Barangaroo development and into Sydney's city center.



Photos: Austral Masonry

The MagnumStone™ blocks were placed on a leveling pad and tied back into the soil with geo-grid. The hollow core design enables the plants' root systems to spread throughout the soil.



Three rows of gently curving MagnumStone walls follow the shoreline and form the terrace at the headlands. Each row is about 984 feet (300 meters) in length.

While MagnumStone retaining wall blocks often serve as focal points for architectural design, for this application the design architects wanted the hardscape to blend into the terrace, according to Angela LaLoggia, a sales engineer at Austral Masonry, who worked on the project.

"We used special liners with a smooth-face picture frame beveled finish to provide a minimalist look to the wall so it would blend in with the plantings," LaLoggia said.

Among the most dramatic effects at the Barangaroo Reserve are the 10,000 sandstone blocks that form the foreshore. The massive blocks, approximately 4 feet wide and 16 feet long (1.4 x 4.9 meters), were quarried and cut on the site using 10-foot diameter blades. It took two years to install the blocks. The stone replaces a seawall and creates an open, inviting shore rather than a barrier.

Blending In

The MagnumStone wall needed to blend with the sandstone, so Austral Masonry incorporated color into its mix design. "We undertook color sample trials with our concrete supplier following discussions with the landscape architects and builder," LaLoggia said.

The result is a natural look that emphasizes the plantings on the terrace. MagnumStone's hollow core design, a critical component, made it possible to rebuild the original hill that had been carved away by the industrial development of the previous century.

The MagnumStone block, "recreated the original hill to return it to the natural state," LaLoggia said. "The landscaping involved the introduction of established trees and plants, so the



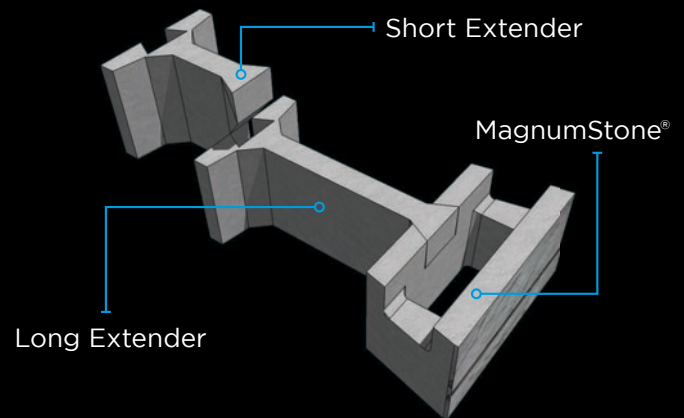
Austral Masonry colored the MagnumStone blocks to blend in with the sandstone blocks that rise from the shoreline and flank the stone staircase.

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The smooth face of the wall enables it to retreat into the background as the vegetation takes over.



After five years of growth, the MagnumStone wall has receded into the background, just as the landscape architects envisioned.

retaining wall terraces had to be able to handle the large and evasive root systems without causing the wall to move after a period of time.”

The developers also wanted a narrow design, which MagnumStone accomplishes by its hollow core. Producers like the design because it uses about 40% less concrete and 40% less cement, which is both a cost savings and a lighter carbon footprint. The lighter weight also reduces shipping costs and speeds installation. Blocks are filled with compaction material and topsoil, creating a stable, natural retaining wall system.

“Structurally, the walls had to be able to carry substantial dead loads from the batters, creating the hill at Barangaroo,” LaLoggia said. “Original designs varied from cantilevered block walls to mass gravity walls. In the end, soil reinforced walls proved to be the most economical and quickest to build. And from a more practical perspective, the MagnumStone walls would enable the plants’ root systems to spread uninhibited through the geogrid soil mass.”

Standing Firm

The MagnumStone walls at Barangaroo are two courses high – about 4 feet (1.2 meters), and weave around the rising banks in six runs, each about 984 feet (300 meters) long. Each block weighs about 1,370 pounds (621 kilos) – stout enough to stand firm but easy to handle for an excavator. The blocks were placed on a leveling pad of unreinforced concrete and then tied back into the soil using a geo-grid soil-reinforcement material. The installer also inserted drainage tubes in the core of the blocks.

Installation went quickly, using MagnumStone’s interlocking double lug system it calls “SecureLug” to connect the top course to the base course. SecureLug makes it possible to in-

terlock the system without using mortar. An excavator and two installers were able to lay about 130 blocks per day. That adds up to 1,040 sq. ft. (97 sq. m.) per day of installation.

Austral Masonry used a special concrete mix to stand up to the marine environment. “Due to the proximity to the coast, the wall was in a severe marine environment classification,” LaLoggia said. “In order to meet the durability requirements, we used S50 concrete in the precast blocks, ensuring a design life of 120 years.

Because the large MagnumStone concrete hollow blocks require no steel reinforcement, there were no cover issues or long-term durability concerns.” Not needing steel reinforcement also added to the speed and usability of the MagnumStone molds. The molds allowed for efficient casting in order to keep up the large demand for block needed on the site.

Designed by leading Australian landscape architects Johnson Pilton Walker in association with U.S.-based Peter Walker & Partners, the Barangaroo Reserve was immediately embraced by Sydney residents and visitors alike. Designed to emulate what the harbor may have looked like pre-development in the 18th Century – but with a modern landscape design vibe – it draws a steady stream of cyclists, runners, walkers, yoga groups, and families anxious to take advantage of the warm sea breezes and pastoral greenery.

Given Back to Nature

“I recently visited Barangaroo and honestly, I was amazed at the end result of the project,” said Alain Michaud, vice president of CornerStone Wall Solutions, the licensor of MagnumStone. “There are just trees everywhere. The retaining walls were essentially hidden in the background, and it was exactly what the landscape designers had envisioned.



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As seen from above, the Barangaroo Reserve transformed this portion of the Sydney Harbor from a derelict shipping yard to a public green space popular with locals and tourists.

The hollow cores and the terracing worked perfectly for what they were trying to do. They've really given it back to nature, instead of it being just a big industrial wasteland," he added.

The Barangaroo Reserve is a gleaming example of what a sustainable future can look like, using modern materials and design techniques to return spaces to a natural state while building in amenities like multi-use paths and commons areas.

"We are so proud that our products not only made the construction process simpler, but they aided in creating a landmark environmental 'green' reserve that will be enjoyed for generations to come," Michaud said. "Helping to build communities in an environmentally conscious way is something that drives us every day at CornerStone. We're continually striving to improve and develop sustainable solutions." ■

FURTHER INFORMATION

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by CORNERSTONE®

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