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GALVANIZED STEEL: PRACTICAL, DURABLE, RELIABLE AND PROVEN

SYDNEY DESALINATION PLANT
SHORING UP THE FUTURE

In this issue

Editorial
Emmanuel Pimentel

Prepared by
Galvanizers Association of Australia

The population in most urban centres of Australia is increasing. Sydney is no different and its population is expected to increase by 30-40% over the next 30 years. The prolonged drought and the predicted changes to the global climate have resulted in diminished rainfall and a subsequent reduction in the level of water in our dams. This has meant that authorities need to look at alternative methods of securing the supply of water to the public, industry and agriculture.

The Sydney Desalination Plant was designed to protect the future of the region by ensuring the supply of water without impinging on other natural water sources. The location of the plant in a coastal area, and the nature of the process it is required to handle, means that corrosion protection is a significant feature of the design. Sydney Water needed to build a structure that was durable, but kept the future maintenance costs to a minimum.

The Sydney Desalination Plant will initially supply 15% of Sydney's water requirements by producing 250 million litres of water a day. Sydney Water has also looked to the future by ensuring that the plant can be easily scaled up to produce 500 million litres a day when and if this is required.

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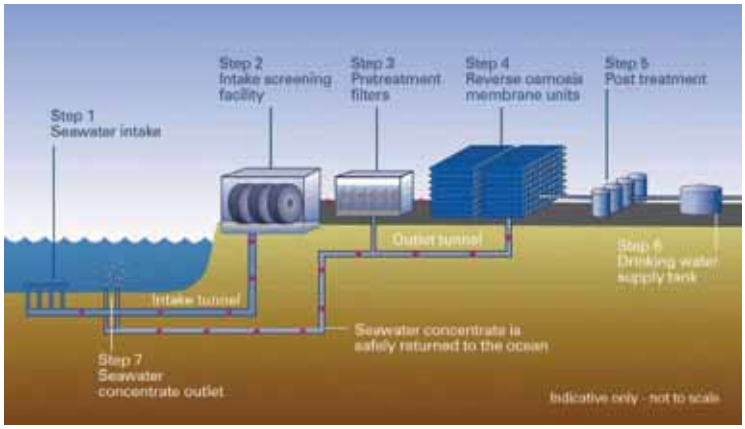
SYDNEY DESALINATION PLANT

The Sydney Desalination Plant

The new Sydney Desalination Plant is located on the Kurnell Peninsula, bounded by Botany Bay and the ocean in NSW.

The desalination plant has been commissioned by Sydney Water and is being delivered by Blue Water, a joint venture between John Holland and Veolia. The 18 km pipeline that will distribute the water produced at the plant is being built by the Water Delivery Alliance. This group includes Sydney Water, Bovis Lend Lease, McConnell Dowell, Kellogg Brown & Root, Worley Parsons and Environment Resources Management.

The Sydney Desalination Plant will be capable of supplying up to 15% of Sydney's water requirements. The plant will take seawater and produce fresh water via a process called the reverse osmosis system. This involves an initial screening and filtering process and then the seawater is pushed at a very high pressure through reverse osmosis membranes. There are 36,000 membranes in the Sydney Desalination Plant! The membranes remove salt and other particles, leaving only fresh water to pass through to the other side. The resulting fresh water is stored in tanks prior to distribution and treated in the same manner as water from natural catchment areas. The by-product of the process is a seawater concentrate (also known as brine) that is twice as salty as natural seawater and slightly higher in temperature. This brine is then released back into the ocean and the process has been designed to have minimal impact on the surrounding environment.



Sydney Desalination Plant (courtesy of Sydney Water)

Powering Up The Green Way

In keeping with the overall objective of the project to minimise its environmental footprint, the power required to run the plant is being offset by the construction of a 67 turbine wind farm at Bungedare, NSW. The wind farm is being built by Renewable Power Ventures and will have a capacity of 140 MW. This will increase the production of wind power in NSW by 700%. The aim is to ensure that the plant offsets 100% of its power with the development of renewable power resources.

Nuts and Bolts of the Structural Side

The reverse osmosis building is the heart of the Sydney desalination project. The building is 235m long and 75m wide. For those from the "rectangular pitch states", that equates to approximately two football fields. There are also other associated assets, such as a prescreening facility, piping and supports, water storage tanks and others.

The project requires over 60,000 cubic metres of concrete, 13,500 tonnes of reinforcement steel and 3000 tonnes of structural steel.

Beating Corrosion – How Did They Do It?

As discussed, the reverse osmosis building is a very large structure and its coastal location and application make durability a critical part of its design. A steel portal frame building was assessed as the most practical economic design due to its large area and the wide spans required to house the necessary plant and equipment. However, the coastal nature of its location required that a superior corrosion protection system was specified and used to ensure durability, economical operation and minimal maintenance, all while keeping the initial cost as low as possible.

Galvanized steel was used for practically all of the structural and associated steelwork. The use of galvanized steel meant that the fabrication could be done offsite. This increases the speed of fabrication and considerably reduces the number of people required onsite. The flexibility of galvanized steel was also important because the project was fast-tracked and speed of fabrication and erection are inherent advantages of such a structural system that requires corrosion protection.

Coincidentally, the GAA had only recently finished a survey of galvanized steel on some of the port terminals in Botany Bay. The data showed that galvanized steel light towers on the water's edge had performed well without maintenance for over 27 years and there was still a significant level of protection remaining.

Where extra protection was required due to the aggressiveness of specific microclimates within the plant, then the galvanized steel was over-coated with an epoxy mastic paint.

Structural steel showing extra corrosion protection at base of columns

The flexibility and ease of use of galvanized steel is demonstrated by the fact that although a substantial amount of steel was galvanized in NSW, a significant amount of the fabrication and galvanizing was undertaken outside of Sydney. In fact, the major structural items in the reverse osmosis plant, about 1600 tonnes of steel, were fabricated by Alfasi Steel Constructions and galvanized in Melbourne. The excellent cooperation and logistical coordination between Alfasi and the galvanizer resulted in the fabrication, galvanizing, transport and erection all being conducted in a timely and economical manner.

Bill Matanas was the Project Engineer for Alfasi Steel Constructions. "The cooperation between the two organisations meant that from a coatings viewpoint, this was one of the easiest projects for me to manage despite its large size and being interstate. We worked really well with the galvanizer."

Australian Made for Australian Conditions

An important aspect of the structural steel in the reverse osmosis plant is that it was sourced, fabricated and galvanized in Australia. The capability of the local steel industry coupled with the ingenuity and coordination skills of Alfasi Steel Constructions and the galvanizer meant that the project was able to proceed smoothly. The access of all the stakeholders to each other played a significant part in the success of the project.

Using a local supplier also made sense to Alfasi. "The galvanizer would come and pick up the steel once a day from the workshop during normal times. However, if things got really busy or deadlines were tight, then they would come twice a day. Occasionally, one day turnaround was required and we always found that their people were happy to help out. We could send our transport there ready to pick up the steel for Sydney and they would make sure it was ready for us."

The GAA found that everything went smoothly with these Australian companies dealing with each other and supplying a major local infrastructure project. Of particular interest was the fact that employees found that it gave them something tangible to be proud of and say, 'we did that'. The hot dip galvanizing industry prides itself on its service and the project showed what Australian industry can do when it's given the opportunity.

Logistics played a large part in the project. Galvanized steel can cope with transportation due to its robustness

Both Alfasi and the galvanizer showed that local product and local industry are able to meet the demanding and exacting requirement of challenging and iconic infrastructure projects.

As the galvanizer was a member of the GAA, they had access to all the technical support and other services that are provided as part of their membership. Customers of GAA members also have access to this valuable resource and this provides them with the security of knowing that their suppliers have access to all of the latest up to date technical information. It can be disappointing when projects have problems with imported product only to find that there is a lack of support and then experts such as the GAA are expected to assist in remediation and/or design modifications. Members contributing to the GAA provide funding for research, technical services, education and work in other areas. This shouldn't be dismissed lightly by those involved in large infrastructure projects.

Now in Sydney, they can all drink to that for well into the future!

Project team:

Client:	Sydney Water
Project Management:	Blue Water JV
Structural Engineering:	SKM/Maunsell (AECOM) JV
Steel Fabrication:	Alfasi Steel Constructions KERMAC Welding and Engineering New World Engineering Silo Constructions S & L Steel
Coating:	Australian Hot Dip Galvanized Steel

Acknowledgements
Alfasi Steel Constructions
Australian Steel Institute
Blue Water JV

For more information on case studies and the successful use of local galvanized steel in major projects or any general queries on corrosion, then please feel free to contact the GAA or your local GAA member company.

Structural steel at the Sydney Desalination Plant

EDUCATION REVOLUTION

Australian Hot Dip Galvanized Steel not left in the shade

Hot dip galvanized steel has long been a staple building material for schools and educational facilities. Its use has recently been increased due to the government's Education Revolution upgrade program and galvanize will feature case studies in the future to show designers the versatility of this proven material.

Australian Shadola are an Australian company specializing in the provision of shade structures and weather canopies and a significant part of their work involves educational facilities. All of their structures are engineered and structurally certified, including wind ratings above 130 km/h.

Australian Shadola's structures need to meet both the aesthetic and durability requirements of educational facilities. Their flexibility in construction and use is also important. Shadola specializes in modular design so that work may be done in stages as both needs and finances dictate.

The fact that steelwork is in schools means it has to be robust enough to undergo the sort of punishment that schoolchildren can mete out, but also have minimal maintenance costs as education funding is always at a premium and subject to many competing needs.

David Scrivens, Manager of Australian Shadola, insists that all of his steel is after fabrication hot dip galvanized and he relies on its durability, reliability and quality to provide him with an Australian-made premium product. Also, importantly for structures designed to protect children from the sun, hot dip galvanizing is itself immune to the effects of the sun and UV. Zinc doesn't only work in sunscreen to protect the human body from the sun – it also protects steel!

St. Michaels, Baulkham Hills

"It gives you confidence to be able to give a warranty," says David. "We galvanize every job we do after fabrication."

Hot dip galvanized steel also has the advantage of a long history of use in schools, is easy to handle, is robust enough to handle transportation and is able to be erected under most climatic and site conditions. "Some of our jobs involve larger steel components and quantities compared to most in our industry as we use RHS members, not C and Z purlins." Hot dip galvanizing allows David to meet his specific requirements of quality and durability. "By using RHS our product is very robust."

Manly Selective College

As the Education Revolution and the development of schools gets into full swing, the need to provide Australian children with facilities that protect them from the sun and the elements is of utmost importance. Thanks to the likes of Australian Shadola, local hot dip galvanized steel will be increasingly used to provide a safe, low maintenance and robust structural material.

Hot dip galvanized steel may provide much-needed shade, but as the toughest and most economical material of choice in educational facilities, it need not stay there!

Acknowledgements

David Scrivens – Manager, Australian Shadola

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ABN 60 004 579 828

We provide information, publications and assistance on all aspects of design, performance and applications of hot dip galvanizing.
124 Exhibition Street Melbourne Victoria 3000 Telephone **03 9654 1266** Facsimile **03 9654 1136**
Email **gaa@gaa.com.au** Web page **www.gaa.com.au**