

# AN OUT-OF-THE-BOX SOLUTION A NEW BLUEPRINT FOR MEGA TRANSPORT PROJECTS

CLIENTS	NORTHWEST RAPID TRANSIT (NRT) CONSORTIUM
PROJECT	SYDNEY METRO NORTHWEST
LOCATION	SYDNEY AUSTRALIA
SECTOR	TRANSPORT INFRASTRUCTURE
DATE	2016-2018

CRANES	1 X M2480D, 1 X M1680D
ENGINEERS	2
INSTALLATION CREW	6
OPERATIONAL CREW	6
MAINTENANCE CREW	6

When the Men from Marrs were asked to design a craneage solution for one of the eight new railway stations on Australia's biggest public infrastructure project, the Sydney Metro, we knew the stakes were high.

Always up for a challenge, we worked with the Northwest Rapid Transit (NRT) consortium to develop what would become a new blueprint for future transport infrastructure mega projects.

The Sydney Metro is the biggest public transport project undertaken in Australia. A priority infrastructure investment for the New South Wales (NSW) Government, the AU\$20 billion+ project will deliver Sydney's next generation of metro trains.

The Northwest Rapid Transit (NRT) consortium – including MTR Corporation, John Holland, CPB Contractors, UGL Rail and Plenary Group – was awarded the operations, trains and systems contract for Stage 1 of the project, the Sydney Metro Northwest line.

Part of the 15-year contract involves the installation of 23 kilometers of new track and rail systems, converting an existing 13 kilometers of railway to metro status, the building of eight new railway stations and 4,000 commuter car parking spaces, and the upgrade and conversion of five existing Sydney railway stations.

With 16 construction sites on the opening Northwest stage alone, the Sydney Metro is notable for its scale and complexity – and when it came to the craneage solutions, there was a need for thinking outside the box, literally.

## THE CHALLENGE

In 2016, NRT awarded Marr Contracting a scope of work including extensive methodologies and lift plans to cover the installation, operation, and removal of cranes at the Castle Hill Station.

At the time we started working on the project, the consortium was considering a solution using crawler cranes travelling along the edge of a 200m x 30m cut-and-cover station box in order to complete the required lifts. However, as the site was congested and landlocked between two existing roads, the proposed crawlers would have placed a large surge load against the station box walls with the consequence of having to excavate around the box and fill in with groundworks to specific bearing pressures.

Looking at the prospect of excessive costs and a limited solution that would have had a major impact on the programme, NRT challenged us to come up with a better solution.

## OUR SOLUTION

Understanding the benefits of combining fewer cranes with greater efficiency on similar scale sites in the oil and gas industry, we designed a solution using two heavy-lift, luffing jib cranes sitting alongside the station box which provided lifting capacity across the entire site.

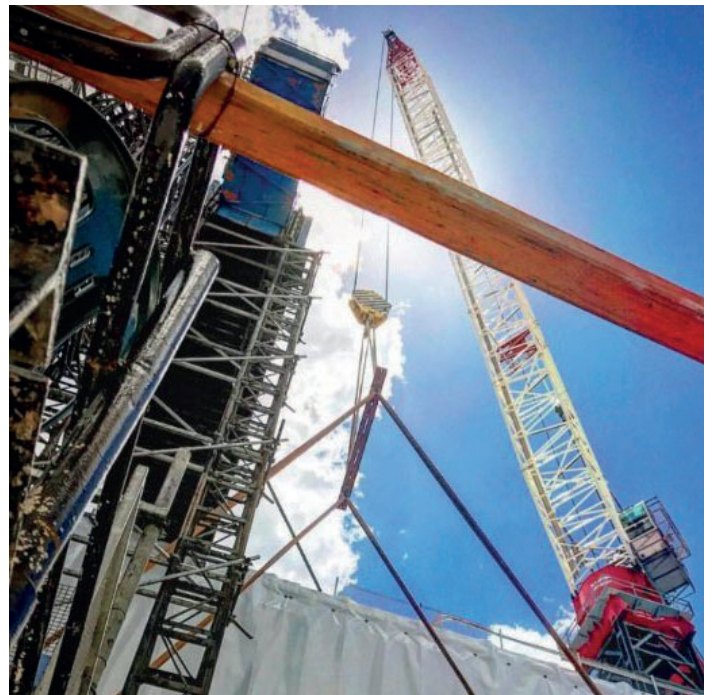
The cranes provided were the result of design collaboration with manufacturer, Favelle Favco: a 330-tonne capacity M2480D with a 90-meter boom and a 200-tonne capacity M1680D with 62-meter boom. They lifted a variety of loads, including pre-cast beams, columns and panels weighing up to 60 tonnes; in addition to site machinery, such as earth-moving equipment, mobile cranes, concrete, reinforcing steel, and general construction materials required for a tunnel project of such magnitude.

## THE RESULT

Adopting our solution changed the way the entire project was constructed, principally because of the ability to lift bigger pieces, reduce land, and remove the requirement for costly, challenging, and time-consuming groundworks. In addition to decongesting the site, increasing productivity and saving costs; using fewer, higher capacity cranes also reduces the chance of collision.

The approach has since become a new blueprint for other station builds on the project (and around the world). Following the success of the Castle Hill Station project, we have been engaged to use the same new technology on multiple stations in the Sydney Metro project including the new Martin Place and Barangaroo stations.









**April 2017:** The first crane is erected after working with NRT since initial discussions in April 2016 to develop the craneage methodology for the project. Our solution covered all aspects of the craneage requirements from design to installation, lifting and removal of the cranes on completion. Designed with efficiency in mind, the solution negated the need to move cranes around the job. This allowed the first crane (M2480D) to be installed, which was then used to install the second smaller crane (M1680D) and remove the cranes in the same fashion at the completion of the project. This meant we only had to take our large mobile crane onsite twice – for install and removal – helping to decongest the site and reduce costs to the client.



Using just two cranes in fixed locations, our methodology catered to the challenge of lifting elements weighing up to 60 tonnes, including some 50-tonne weights at the extreme ends and anywhere within and across the 200-metre station box.



A critical consideration for the project was how to decongest the site. With cranes able to reach across the station box, we were able to facilitate a more efficient delivery unload and install process to lift pre-cast beams weighing up to 60 tonnes.



A birds-eye view of the congested site showing the position of the M1680D (foreground) and M2480D (background) in relation to the station box. Designed to meet the geotechnical considerations of the site, the position of the crane foundations adjacent to the station box allowed the cranes to carry out lifts on both sides of the construction area.



**October 2018:** On completion we had successfully completed various lifts in addition to the heavy pre-cast beams, such as site machinery including mobile cranes, earth-moving equipment, concrete, reinforcing steel, and general construction materials required on a tunnel project of this magnitude.