

# North Shore Wastewater Treatment Plant

## *The Construction Perspective*

The previous experience gained in the construction of Stage 1 of this project, together with the flexibility allowed in the design and construct concept, gave principal contractor, Downer Construction, the advantage of being able to build on this knowledge for Stage 3 of the project.

### Smart systems = time savings

Two aspects that have contributed to this job now being ahead of schedule have been the use of an expansive additive in the concrete used for the floor slabs of the main structures, and the extensive use of precast elements for the structures.

By using an expansive additive in the floor concrete in tandem with a polythene slip layer under the slab they were able to pour large areas of floor (up to 1400 m<sup>2</sup>) without any significant risk of shrinkage cracking. The saving in formwork for intermediate stop-ends that would have been otherwise required, more than compensated for the cost of the additive. The resulting time savings were very significant – up to four months. The speed of the project was also assisted by the good weather conditions experienced so far.

The walls, walkways and launder weirs for the clarifiers were all precast units manufactured off-site in the same manner as for the Stage 1 construction. Manufacture of the precast elements ran in parallel with construction of the floor slab so that erection of these proceeded very rapidly immediately on completion of the floor.

The wall units were erected on a polythene slip layer to allow sliding during the subsequent post-tensioning of the walls. A gap of 200 mm between wall panels allowed access for sealing of the post-tensioning ducts, this gap being filled with in situ concrete prior to the installation of the stressing cables. After stressing of the walls, the floor recess, in which the wall panels were located, was grouted.

David Maria, Downer's project manager, said that a very simple system was

used to install the launder weir and walkway units, which are located on each side of the clarifier wall.

"The base of the launder weir is at the same level as the walkway and a galvanised reidbar through these, and the wall, bolted the units together."

"The faces of the precast units were buttered with epoxy mortar prior to being pulled into position and all gaps and annuluses were then grouted."

### Precasting vs in situ

For the aeration tanks in Stage 3, most of the external walls were designed as precast elements.

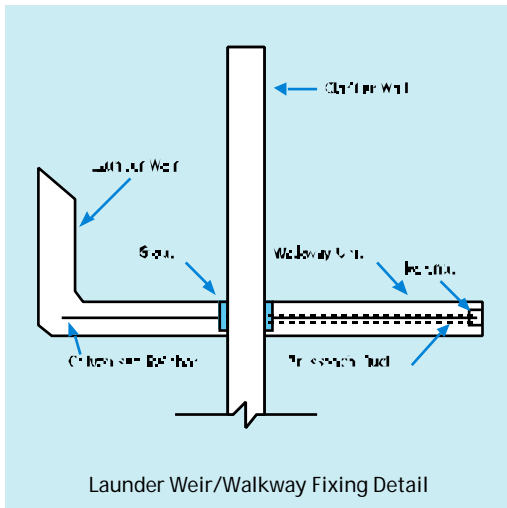
"This has resulted in a considerable saving in time over what was able to be achieved in Stage 1 where the walls were all cast in situ."

A total of 39 wall panels were cast on the tank floor adjacent to where the panel was to be erected, using two sets of steel edge forms. The walls were cast directly on the concrete floor, which was coated with a bond-breaking membrane, and no problems were encountered in lifting the panels off the floor.

David Maria:

"The panels were lifted into position and packed on shims to the correct level and propped until a floor infill pour tying in the wall panel was done. The 600 mm gap between precast panels was then poured in situ. Hydrophilic waterstop was used on all joints for sealing. Two crawler cranes serviced the whole operation, one on each side of the tanks."

Precast units have also been used for the walkways and their supporting columns in a number of locations in the aeration tanks.



The columns were cast on site and the walkways, which are pre-stressed, were cast offsite. These are connected using in situ concrete.

**Made-to-measure pipelines**

In addition to the structures, there are almost 1000 m of underground concrete pipelines for conveyance of the various process fluids. These vary in size from 600 mm diameter to 1800 mm diameter.

David Maria said that because of the fixed routes of these lines it has been necessary to use a considerable number of pipes fabricated to special lengths, and fabricated mitre bends.

“These have been made by cutting standard pipes and rejoining with epoxy mortar.”

In some cases additional external steel reinforcing has been provided across the joints.

“The tight tolerances for the fabrication of these specials has been a challenge for the pipe supplier. However, with over half of the pipes currently installed no major problems have been encountered.”

The ‘design and construct’ concept of this contract has allowed Downer to explore various options with its designers to maximise the benefits of the resources available to the company. An example of this is the extensive use of precast concrete made possible by the availability of suitable cranes and the size of the panels selected to suit the ratings of the cranes.

“Such options minimise costs and speed construction to the benefit of both the contractor and the client without in any way lessening the quality of the works being constructed. A win-win situation for everyone.”

At this mid-way point in the project, David Maria says the concrete works are almost completed with an expected finishing date of the end of March.

At the time of writing, the DAF tank was on site and expected to be commissioned and brought on stream in February.

“Installation of mechanical equipment for the clarifiers is underway and the first of these units is due to be commissioned and brought on stream in March.” **C**



From the top: Wall panels erected for clarifier tank.

Installing a 1800 mm diameter fabricated 100° bend.

**SPECIFICATIONS**

Excavation Quantity:	35,000 m <sup>3</sup>
Concrete Quantity:	4000 m <sup>3</sup>
Rebar Quantity:	350 tonnes

**Major Components**

Aeration tanks:	2 No x 45m x 36m x 5.2m deep
Clarifiers:	2 No x 48m dia. x 5.5m deep
RAS Pump Station (Return Activated Sludge):	1 No
DAF Unit (Dissolved Air Flotation):	1 No
Blowers:	2 No x 250 kW