

Tugun Bypass

Project Report - Queensland

The Tugun Bypass project involves the construction of a new 7km motorway that will stretch from Currumbin in Queensland and pass west of the Gold Coast airport's main runway to join the Tweed Heads Bypass in NSW. Initially this will have two lanes in each direction, complete with breakdown shoulders, a wide median and grade-separated interchanges. The project allows for two extra lanes to be added in future if demand dictates greater capacity. Due to environmental considerations in the area, approximately 2km of the bypass crosses airport land parallel with the main runway, requiring the construction of a tunnel to avoid interfering with airport operations and runway extensions that were due to commence at the end of 2006. The 350m tunnel will be 27m wide, 8m high and will be accessed via 300m approach ramps at either end. Like the roadway, the tunnel will also have four lanes with provisions made for its adaptation to six lanes in the future if required.

The tunnel is clearly the most critical phase component of the bypass and the most technically challenging handover was required by November 2006. Due to the nature of the material to be excavated from the tunnel and height restrictions due to its being so close to the Coolangatta Airport a tremmie process involving Bentonite and a long life high slump concrete mix was employed by Piling Contractors and Bauer. The tunnel walls, also known as diaphragm walls, were basically constructed in situ and were typically 17m deep, 6m long and 1m wide requiring from 120 to 160m³ per pour depending on the exact dimensions.



Holcim was awarded the supply of concrete to the critical tunnel section of the project even though a major competitor was awarded the overall project. This was due to a combination of factors, such as our very good reputation with tremmie concrete on the Gold Coast and the disciplined and serious approach in which we go about servicing this particular application. However, the prevailing reason was that we were the only company which had developed a mix that met all of the required application specifications. After many trial mixes the Technical Team was confident enough to run trials in the field. The customer was involved each time and this built confidence in Holcim and in the product that we had developed.

Key Concrete Requirements

The required concrete mix for the project required key and innovative components. It had to be super-workable (220-230mm slump) yet still low shrinkage and importantly it had to be able to maintain its super-

Location	Gold Coast, QLD
Client	Queensland Department of Main Roads and Road and Traffic Authority NSW
Contractor	Pacific Link Alliance, consisting of the Abigroup SMEC Joint Venture and Queensland Main Roads
Sub Contractor	Piling Contractors
Engineer	-
Products supplied	22,300m ³ of concrete including: <ul style="list-style-type: none"> • 40MPa long life high flow 30,000m³ of concrete including: <ul style="list-style-type: none"> • 5MPa sub base
Supplying Plants	Holcim Burleigh and Tweed
Commencement	-
Completion	-

workable characteristics for a minimum of 6 hours due to the tremmie process being employed and yet still have final set at less than 24 hours.

Table of Specification Requirements and Achievements

Property	Spec Requirement	Actual Achievement
Strength MPa 28 day min mean	43.8	60.0
Drying Shrinkage 56 days	650 us	600 us
Slump at 6 hours after arrival on site	6 hours life	7 hours life
Maximum Heat C	< 80	< 50.0
Max W:C Ratio	0.46	0.43
Exposure Classification	B2	B2

The Table of Specifications demonstrates that all of the client's specification requirements were achieved.

The following quote from Danny Treen, Project Manager for Piling Contractors, sums it up even better than the table: "The decision to award the supply of concrete for the Tugun Bypass Diaphragm Walls was based primarily on Holcim's technical and quality record. In both these two areas they have excelled.

To date we have placed approximately 20,000m³ within the Diaphragm Wall alone. The Bypass is a particularly demanding Project in terms of the technicalities; Holcim hit the ground running!

They understood our demands on site with regards to workability, strength gain, supply and frequency of supply. This can be attributed to their full time onsite management team and technical expertise that they supplied throughout the Project come rain or shine!"

Did the project pose challenges?

This biggest challenge was the running of the night shift in response to the demand to coordinate plant and technical staff and the trucking fleet, as the start times were sporadic and often changed with little notice due to the nature of excavations on site.

The job had a very simple rule in that once a pour was started it had to be finished, as the nature of the panels in this process required a continuous pour. This meant that at times a pour was started in good conditions but



finished in poor conditions such as heavy downpours. This required mix adjustment on the spot in order to maintain water-to-cement ratio specification with wet sands and water entering the agitator in transit.

As slump and set control were highly critical, the production team was focused on getting everything 100% correct. Because consistency was critical a dedicated person was on the slump stand for each and every pour, without exception.

During the project there was a change in cement performance, leading to a variation in consistency. Alarmingly, the 6 hour life was decreased, which was of great concern, as the 6 hour life was absolutely necessary for the panels in one continuous pour. The Technical field team was quick to notice a change in consistency and put the pour immediately on hold before any concrete was placed into a panel. The pour was put on hold for 8 hours until a plan could be put in place and a remedy around the problem was determined. Piling Contractors and Pacific Link Alliance, although anxious to keep the project going, were appreciative of our no risk approach.

How Holcim achieved customer and project satisfaction

Holcim was proactive in its approach to the client's requirements and commenced discussions as early as possible in order to commence trials and get a head start on our competitors.

The company maintained a flexible approach during the trial process as the project requirements were influenced by several parties and specifications.

Holcim met and communicated with the client several times during the trial process to ensure we were still on track in terms of the project requirements. In discussion with the Alliance we appointed a Project Coordinator who became the central point of communication for the project.

There was total dedication and a never-give-in attitude from the technical team in achieving the mix requirements, which involved special admixtures which had never before been used in combination with each other in South East Queensland.

As Danny Treen of Piling Contractors has stated, 20,000m³ has been placed to date. There remains 2300m³ for the diaphragm walls and Holcim has another 20,000m³ of yet to be determined concrete to deliver to Pacific Link Alliance.

One of the great positives from this project is that our relationship with Piling Contractors has gone from strength to strength. Should the proposed Tugun Desalination plant be approved we have been given the commitment to supply concrete to the diaphragm wall sections of the project, employing a similar mix to the application.