Ash Development Association

SEACLIFF BRIDGE

CASE STUDY No.8

August 2006

INTRODUCTION

'After more than a century of temporary road closures owing to an unstable cliff line along Lawrence Hargrave Drive (LHD), the townships of Clifton and Coalcliff now have a reliable transport corridor link that may rival the Great Ocean Road for the title of Australia's most spectacular seafront drive. After a 19-month construction programme, the 665m long bridge, comprising a balanced cantilever bridge and an incrementally launched bridge, bears testament to how seemingly insurmountable project obstacles can be overcome through engineering innovation, and community and stakeholder involvement.'[i]

ALLIANCE

'Just three months after authorising the road closure, the RTA announced that it had joined with three private sector companies in an alliance to develop a solution that would reconnect Lawrence Hargrave Drive between Clifton and Coalcliff. It is the state of New South Wales' first ever alliance agreement for a road construction project.

The LHD alliance partners comprised the RTA, Barclay Mowlem, Coffey Geosciences and Maunsell Australia. The team members selected from each organisation brought an incredible pool of expertise in construction, geotechnical, civil, structural and environmental engineering, as well as community liaison. In total, 34 individuals were represented on the team, and were cross-representative of gender, age and qualification.'[ii]

DURABILITY

'With a project cost of about $50 million, durability and long term performance were not optional. This is the most aggressive environment that an RTA structure will endure. The design life is 100 years, but equally the ongoing maintenance needs to be considered and minimised by careful detailing and quality construction. Chloride induced corrosion is the most serious cause of deterioration in reinforced concrete structures.'[iii]

Image 1: Aerial View

CONCRETE

Good quality concrete was essential and several options were considered to deliver the optimum balance of durability and timely construction. Boral Concrete were chosen to supply the concrete for the project and worked with the alliance to develop appropriate mix designs and all aspects to deliver the sites concrete requirements. Initial considerations included marine cement (60% ground granulated blast furnace slag and 40% Portland cement), combined with silica fume. The problem with this mix is it is sticky to place and has very low strength gain characteristics and needs additional curing. The extended curing time would have added more than two days per segment. This would have added several months to the overall construction programme.

An effective solution was developed by the incorporation of a minimum 25% by weight of fly ash in the concrete. The RTA was confident that choosing a concrete with an inclusion of fly ash would give the durability they required. The previous work by the ADAA in conjunction with the CSIRO in researching and highlighting the excellent durability of fly ash concrete in aggressive environments was fundamental in allowing the RTA to come to this decision.

FLY ASH

Eraring fine grade (classified) fly ash from Flyash Australia was chosen for the project for its consistency and its fineness inhibiting effective performance in concrete.

CONSISTENCY OF FLY ASH CONCRETE

The expertise of Boral's concrete staff together with the commitment of the LHD alliance resulted in excellent concrete being produced for the project, as shown in Table 1.

REFERENCES

[i] **Sea Cliff Bridge; A 21st century solution to a century-old problem**, Lawrence Hargrave Drive (LHD) Link Alliance, 2005.

[ii] Ibid.

[iii] Mark R Sinclair, **Lawrence Hargrave Drive balanced cantilever and incremental launch bridges construction**, Concrete In Australia, v32 no.1, 2006, 21.

ACKNOWLEDGMENTS

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	% fa	Shrinkage microstrain	Slump mm	28 day strength mPa	S.Dev.	C of V	w/c
Piles	25	700	200	54	-	-	0.37
Piles	28	610	120	57	2.53	5.90	0.36
Bridge deck	26	480	120	56	2.30	5.20	0.36

Table 1: Summary Performance Results

Image 2: LHD Pedestrian Walkway