



NSW PUBLIC WORKS BATHURST SEWERAGE TREATMENT WORKS

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**CASE
STUDY
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Introduction

Prior to the introduction of performance based specification for Portland cements, Type C cement was popular with the authorities concerned with specification of concrete to resist the attack of sewage where the low pH and high sulphates occur. More recently, factory blended cements containing one or more supplementary cementitious material (SCM) have been in favour. However, there was a reluctance to use SCM blended directly into the concrete at the batchplant.



The supplementary cementitious materials available in Australia are Fly Ash, Ground Granulated Blast Furnace Slag and Silica Fume. These materials, when used wisely can be used to enhance the properties of concrete and generally lead to a reduction in the cement quantity cost.

In concrete where compressive strength is the main design requirement, there is an optimum addition rate for fly ash, influenced by the properties and proportions of the other components. This addition rate is essentially constant across the strength range for a given set of materials, tending to reduce as the target strength increases. Hence, pre-blending of cement, in fixed proportion, is not always conducive to the optimum performance of fly ash in concrete.

Bathurst Sewerage Treatment Works

The Contract for extensions to Bathurst Sewerage Treatment Work, let to Belmadar Constructions Pty Ltd in 1995, made no provision for fly ash in the S25 and S32 concretes where Types SL and SR cement were specified. CSR Readymix submitted an alternative tender involving the separate addition of Mount Piper fly ash at the concrete batchplant and called on the Ash Development Association of Australia (ADAA) for assistance in putting the case to NSW Public Works (PWD). Despite a reluctance to increase the variables at the batchplant, the PWD was appreciative of the sound technical reasons for the use of fly ash to enhance the durability of the concrete. The PWD was aware of the results of laboratory trials for sulfate resistance being conducted for ADAA. Permission for the use of fly ash by addition at the batchplant was granted.

The proposed concrete mix was assessed for drying shrinkage against a control mix designed to the original specification requirements.

The shrinkage results which confirmed the suitability of the proposed fly ash mix are given in the following table.

DRYING SHRINKAGE OF ASH CONCRETE

Drying Period (weeks)	Drying Shrinkage (microstrain)	
	Control Mix (no fly ash)	Fly ash mix
1	270	240
2	380	350
3	450	400
4	500	460

On Site Comments

CSR Bathurst Concrete Plant Manager, Cec Stamp was enthusiastic about the properties of the concrete containing Mount Piper fly ash. "There were no problems with the concrete. The tests were high (around 45MPa for the S32 concrete) and there was no problem in controlling the slump to 85±15mm by eye".

The Outcome

Fly ash was included in N20, S31 and S32 concretes, combined with Bathurst and Eugowra aggregates and Type SL cement from Kandos. Water reducing admixture was included in all mixes. Following the success of the Bathurst venture, it is expected that similar concrete will be used regularly on PWD contracts in the future.

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