ASH DEVELOPMENT ASSOCIATION

ULTRA HIGH FLY ASH PAVEMENT CONSTRUCTION

by P.D.MARSH, Pacific Power.

FLY ASH TECHNICAL NOTES

No. 5. 1996

Road construction at Eraring Power Station

Accelerated Loading Facility (ALF)

INTRODUCTION

The construction of ultra high fly ash pavements, containing more than 90% fly ash, has appeal on both cost and environmental grounds. Several ultra-high fly ash road pavements have recently been constructed near Pacific Power's Eraring Power Station. The major result of these projects has been to demonstrate that the pavements:

- performed well
- are technically viable alternatives to conventional road building materials,
- may have cost advantages compared to natural road building materials for sites close to power stations.

Demonstration has included:

- testing of trial pavements using Austroad's Accelerated Loading Facility,
- field trials of two fly ash pavement sections constructed in a private coal haul road servicing Eraring Power Station,
- reconstruction of the Main road interchange ramps serving Eraring Power Station.

WHY USE FLY ASH ?

The use of large volumes of fly ash in road construction helps to conserve natural resources eg. sands and gravels. This reduces the environmental impact which would otherwise be caused by mining these resources.

In addition, the need to construct additional ash storage facilities at the power stations can be deferred or even eliminated.

OBJECTIVES

Whilst stabilised fly ash pavements have been shown to be feasible overseas, ultra high fly ash mixes used in road pavement construction are relatively new in Australia.

Design of pavements constructed with conventional road building material uses fatigue life performance models developed specifically for Australian use. With a new material like ultra-high fly ash, these performance models need to be confirmed and appropriate parameters incorporated. Much greater use of this material in road construction in Australia can become feasible if quality design tools for its use are available.

To confirm the models, a series of local field trials was carried out with the following objectives:

- Develop local expertise in the construction of ultra-high fly ash road pavements,
- Determine and compare the service life and failure mode of ultra-high fly ash pavements using the Austroads' Accelerated Loading Facility (ALF),
- Evaluate the suitability, or otherwise, of established relationships recommended in the literature, when applied to fly ash,
- Investigate the suitability for fly ash of the performance models used in Australia for predicting performance of cement-stabilised crushed rock pavements,
- Recommend alternative fatigue performance models that may be appropriate for these ultra-high fly ash pavements,
- Compare these performance models with performance models established from laboratory testing,
- Carry out long-term field trials of in-service ultra-high fly ash pavements under heavy traffic loading,
- Compare performance, under accelerated loading, with that observed in these long-term field trials.

TESTING OF TRIAL PAVEMENTS USING THE ACCELERATED LOADING FACILITY

The focus of the project was testing of six trial pavements by Austroads' Accelerated Loading Facility (ALF).

The site was selected within the Eraring Power Station area on an existing road that allowed traffic

diversion around the test pavements for the duration of the project.

Initially, four 300 mm thick test pavements were constructed as follows:

- fly ash with 8% cement;
- fly ash with 4% cement;
- lightly bound fine crushed rock (FCR) control section;
- 4% cement stabilised fly ash subbase with lightly bound FCR base.

These pavements were constructed in May 1994 and testing by ARRB Transport Research Ltd. commenced in early June 1995.

It was subsequently decided to test two additional pavements which were constructed in the last quarter of 1995 comprising:

- fly ash with 2% cement
- 4% cement stabilised fly ash subbase with a better grade of lightly bound fine crushed rock base than that used earlier.

All sections were surfaced with a spray seal and a 25 mm asphalt surface was placed a few weeks before ALF testing.

A 50 mm layer of bottom ash, which is very permeable, was placed between the subgrade and pavement to facilitate wetting of the subgrade, if required, during the ALF test.

Results obtained from the ALF trials are encouraging for the use of ultra high fly ash blends as road base and subbase material.

A data sheet complementing this paper will include an in-depth analysis of the ALF test results and recommendations for design of ultra high fly ash road pavements.

HOW DID THE FLY ASH PAVEMENTS PERFORM UNDER NORMAL TRAFFIC LOADING?

Coal Haul Road Eraring

A field trial was carried out at a site located just outside the weighbridge at Eraring Power Station on Pacific Power's private coal haul road from Newstan and Awaba Coal Mines.

Two fly ash pavement sections, designed for a forty year life. were constructed as follows:

- 150 mm fine crushed rock stabilised with 1.5% cement over 300 mm fly ash with 8% cement subbase;
- 450 mm full depth fly ash stabilised with 8% cement.

These sections were surfaced with a spray bituminous seal and 50 mm of asphalt to resist the braking forces from the coal trucks approaching the weighbridge. It is an excellent trial area because of the knowledge of precise traffic loadings from the weighbridge.

Construction of the pavement commenced in September 1994 and was completed in three days. Asphalt surfacing was completed one week later and the road was re-opened to traffic.

These pavements have carried more than 45,000 coal trucks with a gross load exceeding two million tonnes and have performed very well, with no cracking or other damage evident to date.

Interchange Ramps

The northbound on-ramp and the southbound on-ramp from the main road were reconstructed using fly ash stabilised with 8% cement as detailed below:

- The traffic lane of the southbound on-ramp was boxed out to an appropriate depth for a 450 mm pavement of 8% cement stabilised fly ash to be placed using conventional road construction plant. This ramp has been in service since July 1995 and its performance to date has been excellent.
- The northbound on-ramp was reconstructed using cement stabilised fly ash as an overlay. The depth of the overlay was controlled by the levels of the table drains. This ramp has been in service since September 1995 and its performance has been excellent to date.

CONSTRUCTABILITY ISSUES

One matter that must be considered is the curing time of the pavement. Immediate trafficking of freshly constructed pavement is not recommended. As such, re-opening of roadworks overnight is not a sound practice with this type of pavement. It is preferable not to traffic the pavement until after the spray seal has been applied.

As such, the advantages of fly ash pavements are best seen when new roads are being constructed and traffic can be diverted for the duration of the construction period.

CONCLUSION

The ALF trials and the field trials have produced positive and encouraging results for the use of ultra high fly ash blends in road pavement construction.

Initial estimates indicate that this material may result in savings compared to conventional road construction material for sites close to power stations.

Ash Development Association of Australia
GPO Box 5257, Sydney NSW 2001.
Australia.

Supported by: