POLYROAD - YET ANOTHER ALTERNATIVE

INTRODUCTION

In late 2000/early 2001, a project on the Winton - Hughenden road suffered significant distress, very early in the life of the pavement (in fact, one section had severe wheel rutting as a result of construction traffic).

The problem was later identified, through audit, that, although the base material generally met the specification, it was a very sandy material which completely lacked cohesion. As a result, when trafficked, especially after rainfall, the pavement severely rutted and shoved. Several sections were repaired using a combination of lime/flyash/cement through a pug/pave operation. This was successful, however the already placed/sealed sections couldn't be economically treated the same way.

An alternative was sought which allowed treatment insitu, while providing a waterproof, stable unbound pavement material.

PROBLEM IDENTIFICATION

When the materials for the project were tested through audit, the results showed gradings that were within spec and plastic properties that had very low PI and virtually no shrinkage.

These materials are very strong when tested in a CBR mould in a confined condition, but when tested in an unconstrained situation, such as a pavement, especially on the outer wheel path zone, there is little shear strength, hence shoving and rutting is prevalent under load.

The "conventional" treatment for this sort of failure is to recycle the base with an addition, usually cement (type GB). However, the pavement sits on a subgrade that is a residual "black" highly expensive CH clay.

Experience has shown that a rigid layer over an expansive layer displays aggressive fatigue cracking and shrink/swell heave and the pavement disintegrates early in it's life (though not as fast as the original construction).

An alternative solution was sought to modify the properties of the sandy base gravel to provide cohesion, waterproofing and shear strength, while maintaining a flexible layer.

PRODUCT OPTIONS

A range of products was considered, including lime, lime/cement, foamed bitumen and fine grained plastic binder. In addition, a product that has been rarely used in Queensland was considered, called POLYROAD.

The properties of POLYROAD are available through the www.polyroad.com.au and it is not intended to review these properties.
However, the conditions under which it works and the material properties were sought from the supplier to assess the possibility of using the material.

The base gravel lacked fines (ie only around 5% passing the 75um sieve) and had a PI around 4% with LS between 0 and 2.6%.

The base pavement was 200 mm thick, sitting on a subgrade (CH clay) with PI around 27 - 41% and LS 12.2 and 18.4%. At the time, it was thought that the mixing of the base material with a percentage of the black soil would provide a suitable grading and plastic properties, suitable for the addition of POLYROAD. When the materials were added together in the lab, the CBR dropped to 29 and 32 for the two samples prepared. In addition, the swell results were very high, showing that the in service performance would be poor.

The supplier of POLYROAD advised that the target maximum PI for the finished pavement after the addition of POLYROAD is around 8%. As such lab testing was undertaken to determine the dose rate of hydrated lime and PR21L POLYROAD (which includes 33% hydrated lime) to achieve a maximum PI of 8%. The dose rate settled on after extensive mix design and Eades and Grimm lime demand testing was 2% hydrated lime and 1.5% POLYROAD.

The testing showed that a sample of PI 32.8 and LS of 19.2 reduced to PI 10.4 and LS 2.8 with 2% hydrated lime and to PI 7.4 and LS 2.6 after 2% lime and 1.5% polyroad.

Additional testing was also undertaken to assess the CBR of the various materials, with no treatment and with lime/POLYROAD and also parallel testing was undertaken to determine the strength of the material in the presence of water. The results are as follows, for the CBR testing:

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Additive	Test Conditions	CBR
no additive	unsoaked	29
no additive	unsoaked	32
2% lime + 1.5% polyroad	unsoaked	180
2% lime + 1.5% polyroad	unsoaked	160
2% lime + 1.5% polyroad	soaked	220
2% lime + 1.5% polyroad	soaked	180

The samples were also placed in a tank of water to determine the effect of water under accelerated conditions. A photographic record was kept hourly for the first few hours then daily, then weekly, for about two months. The results were quite dramatic, with the untreated gravel/clay disintegrating within two hours and the lime treated gravel/clay dissolving a significant amount after about two weeks but the POLYROAD lost only a few grains of material and none of the strength over the two months and when removed from the tank, the water had only penetrated a few millimetres into the sample.

CONSTRUCTION PROCESS

The section that showed distress early in the pavement life was 1.3km long. The testing undertaken was based on recycling 200mm of granular base with 50mm of CH clay subgrade. The construction process adopted as a result of the laboratory tests was as follows:

> On day 1: place 2% by weight lime, double mix to 250mm depth, incorporating sufficient moisture for compaction/ hydration, lightly compact the mix.
>
> On day 2: add 1.5% POLYROAD and mix the materials together, adding sufficient moisture for compaction, compact, trim, seal/reseal.

The project went well, except for some problems with moisture control on the first day. The POLYROAD has to be placed dryer than normal as the POLYROAD makes the clay particles hydrophobic and it is extremely hard to put water into the material (exactly what it is designed to do). The POLYROAD also has a lubricating action, therefore lower moisture contents can be used without compromising compaction density.

CONCLUSION

The trials using POLYROAD have proven the product viable and it is intended to continue trialling the material in selected locations to determine the most cost effective and best long term situations for the product life. The product has very great potential applications where we require a flexible pavement configuration while maintaining both wet and dry strength over a very long time period. It is intended to utilise the remaining material stored at the shire depot on similar repair work south of this project, once again on residual black CH clays.

However, it is hoped that we will not have to use a product such as this to rectify project construction problems in future.

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