

PAVEMENT PATCHING BY INSITU STABILISATION

1. INTRODUCTION

In some areas of Victoria, particularly in the South West, pavements are constructed of marginal materials which are moisture sensitive and deteriorate very quickly if the seal cracks or breaks and water penetrates into the pavement. Rapid deterioration of pavements in these circumstances has resulted in the need for an economical “quick response” pavement patching system to cope with the volume of patching work, particularly after prolonged wet weather. With the introduction of the roto mill attachment for skid steer “Bob Cat” type vehicles and Flocon patrol trucks equipped with an emulsion spray bar and aggregate spreader, road patching operations have become very mobile and self sufficient compared to traditional patching methods used in the past.



2. CEMENTITIOUS BINDERS

General Purpose (GP) Cement is commonly used for stabilisation because of its quick setting characteristics. However in some areas, there has been a move away from GP cement for stabilisation because the quick set time (2 to 3 hrs) often does not allow enough time to trim and compact the stabilised material properly, particularly in summer. The slower setting blended cements generally result in narrower shrinkage cracks which are more easily treated. Use of GP cement seems to work best in cold wet areas where a rapid set is required and where early trafficking causes deformation of “green” unstable materials as is often the case in South Western Region. Alternatively, if a slow setting cement is preferred, mechanical stabilisation of these

materials with crushed rock prior to addition of slow setting cement could be considered.

Where increased working time is required, an 85%/15% cementitious blend of Ground Granulated Blast Furnace Slag (GGBFS) and lime binder is now available in 20 kg bags suitable for use on small scale stabilisation works such as patrol patching work. This binder has a set time of at least 6 hours and can be reworked up to 24 hours after placement. Some materials stabilised with slag/lime blend can reach a similar strength to GP cement after about 7 days or a higher strength after 28 days. Use of slow setting cementitious additives allow patches to be placed on one day then trimmed and sealed the next day. This has the benefit of allowing for traffic compaction overnight provided that suitable warning signs are provided and traffic volumes are not too high to severely damage the repair work, causing a hazardous situation for motorists.

The quantity of cementitious material added to the existing pavement need not exceed 3% by mass, and desirably, it should be around 2% if shrinkage cracking is to be minimised. The aim of the treatment is to modify the insitu material to improve its strength and performance rather than to produce a fully bound layer that is likely to suffer fatigue cracking due to poor support from the underlying sub-base or subgrade.

3. EQUIPMENT REQUIRED

The following plant is used for the skid steer stabilisation system:

- Skid steer machine with rotomilling head, bucket or “screed smudger frame”.
- 3 to 6 tonne vibrating steel drum tandem roller.
- Purpose built tender truck and trailer to transport the skid steer and roller but fitted with a 1200 litre (or greater) water tank and sign racks etc.
- Flocon patrol truck fitted with emulsion tank, calibrated spray bar and aggregate box spreader. Alternatively, emulsion sealing could be carried out as a separate sprayed seal operation by a sealing gang.

A conventional profiler or larger, purpose built stabilising machine can be used to mill and mix the material.

4. PROCEDURE

The procedure used by the VicRoads South Western Region is as follows :

- (a) Mix the area to be patched with the rotomill attachment to depth of about 150 mm. The area of the patch should generally not exceed 150 m² to achieve full compaction before the cement sets. The minimum practical width is about 1.2 m.
- (b) Reshape the loose material with skid steer 4 in 1 bucket attachment (grader should be used for larger patches)
- (c) Add water to achieve optimum moisture content plus an additional 3 l/m² to hydrate the cement.
- (d) Lightly roll the surface, place bags of cement to achieve a rate of 6 to 9 kg/m² for 150 mm solid depth or 2 to 3 kg/50 m of depth.
- (e) Spread cement evenly over the surface by hand raking, skid steer or grader
- (f) Mix cement into the pavement with the profiler removing over size material in excess of 75 mm.
- (g) Check moisture content using the "hand squeeze" method and add water and re-mix if necessary.
- (h) Compact the patch working from the edges to the centre. This requires about 12 passes to achieve a Density Ratio of 95% of Maximum Dry Density using modified compactive effort.
- (i) Trim off surplus material with the skid steer bucket or grader to achieve a smooth even surface.
- (j) Finish off rolling with truck to achieve a tight surface suitable for primer sealing.
- (k) Apply CRS emulsion at the rate of 1.5 to 1.8 l/m² and cover with size 7 aggregate immediately behind the sprayer to prevent runoff. The special Flocon arrangement is ideal to achieve this as spreader is mounted immediately behind the spray bar.
- (l) Roll the primerseal with the patrol truck and open to traffic under controlled conditions. (Road Works speed limit should be considered).

(m) Inspect the surface next morning for any damage to the primerseal particularly after rain. Repair defective areas by hand using CRS emulsion and grit.

(n) Apply a SAM (BSRS) final seal within 12 months or earlier if required. Unlike a cutback bitumen primerseal, an emulsion primerseal has no restriction on how early the final seal can be applied.

5. DISCUSSION

This economical form of patching is suitable for repairing most types of granular pavements in rural areas. In some cases better quality base materials may be required to be added to the insitu material. The emulsion primer sealing method forms a compatible surface with the existing seal and, if done well, can achieve a similar surface texture which should not affect the application of a future reseal, since no kerosene cutter is used.

Use of asphalt or cold mix for repairs (or as a surfacing) is more costly, contains cutter (if cold mix) and is not as convenient to use, particularly if it has to be picked up from a plant some distance away from the site. Cold mix patches are often the cause of "bleeding" reseals when resealed too soon after patching.

6. COSTS

The unit cost of the treatment depends on the size of individual repairs. For stabilisation to 150 mm deep with a Size 7 single application emulsion primerseal the cost is around \$19.00/m² for a 150 m² patch to \$52/m² for a 50 m² patch.

7. REFERENCES

WHITE G. (1996) Report and Video on the use of Skid Steer stabilised Patrol Patching System in South Western Region.

GeoPave Technical Note No 15, Stabilisation - Cementitious Blends Incorporating GGBFS

8. CONTACT OFFICERS

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