AustStab Construction Tip

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Pavement crossblending prior to stabilisation

Introduction

The performance of insitu and plant-mix stabilisation methods relies on many factors, with one of them being the uniformity of the host material or at least identifying the changes in uniformity to allow other design factors to be taken into consideration. Often distressed pavements include asphalt patches of varying thicknesses and frequency that if not removed or treated appropriately will reduce the success of stabilisation reaching its full potential (see Figure 1).

Figure 1 Candidates for crossblending of road materials prior to stabilisation.

Crossblending is an insitu treatment prior to stabilisation to improve the uniformity of the granular materials to be stabilised with an appropriate binder. This process also allows greater recycling within a pavement maintenance program.

If crossblending is not carried out and the subject pavement comprises variable pavement types, then sampling will need to take place at all variable locations to ensure an appropriate mix design is adopted in each area. Otherwise where asphalt patches or shoulders with little gravel exist (< 100 mm), these areas may not react as expected with addition of the selected binder and result in premature failures.

This construction tip provides information for engineers, superintendents and contractors for best practice techniques for crossblending prior to insitu stabilisation.

Terminology

Common terminology used to describe crossblending is 'lateral', 'sidecasting', 'left to right' or 'side to side' shift of materials as shown in Figure 2.

The 'target depth' during initial milling is based on the stabilisation design depth, with an allowance for bulking and consideration of the final wearing course and whether existing drainage levels must be maintained.

Goals

Crossblending involves the movement of material that contains a variety of non homogeneous materials in concentrated areas across the road until some uniformity criteria is met. The process involves sidecasting material adjacent to the excavated run using a profiler and then mixing the material with a stabiliser/grader or skidsteer loader, compaction and trimming the material to specified levels. This is achieved by physically moving existing materials from one side of the pavement to another, while 'blending' this material at the same time (see Figure 3).

Figure 2 Sidecasting of pavement material using a 2 m wide profiler.

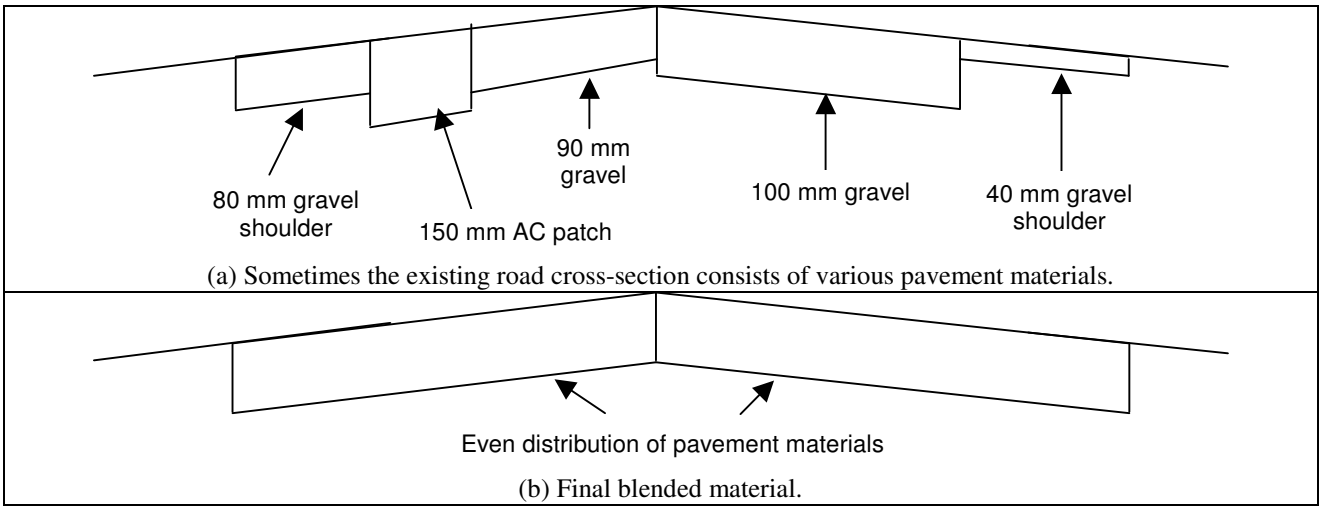

Figure 3 Sometimes a pavement cross section prior to stabilisation may consist of different materials and layer depths, and the aim is to achieve a uniform material and thickness.

Safety

Care must be taken to ensure traffic control is managed at all times. It is also preferable to undertake crossblending on roads that enable traffic to be detoured around the worksite.

Site investigation

The success of a rehabilitation treatment relies on a thorough site investigation before the project starts to assess a host of job specific constraints (ie. traffic loadings, pavement composition, drainage features, subgrade condition, etc). An important part of this phase is to visually inspect and understand the degree of pavement material variability. Variability may be along and across the road.

Crossblending would be considered when more than 10% of the design area is not considered homogeneous, or more than 50% of the pavement depth in concentrated locations is either asphalt or previously cemented materials. An alternative to crossblending is to remove and replace the existing materials and this increases the cost of the treatment.

Where possible, material sampled from the road to carry out a mix design should include a relevant proportion of non homogeneous material/s to ensure field conditions are best reflected in the laboratory. When additional material is required to replace existing material removed from patches as it may be unsuitable, this imported material may be a quarried product or clean recycled materials[1].

[1] The most common local government specification for the supply of road making material is the IPWEA specification for *Supply of Recycled Material for Roads, Drainage and Fill*.

Another aspect of the initial site investigation is to collect data of the existing granular pavement profiles. For example, if a pavement is to be widened to incorporate an existing shoulder, it is not uncommon to find varying depths of granular material between the shoulder and central carriageway. Crossblending of these materials can improve the success of the final treatment across the entire width of the rehabilitated pavement.

A major benefit of crossblending is the opportunity to physically view subbase or subgrade layers after the first and subsequent 'horizontal shift' of material. This allows thorough inspection of the underlying layer and may permit additional testing (eg. CBR analysis from insitu DCP testing) and hence further treatment where required. A pay item can be included in the contract documents that provides a transparent pricing for the repair of the subgrade.

Equipment used

A number of equipment items are required for crossblending to be carried out successfully. The following list is the preferred equipment to make the job efficient and meet better depth control:

- 2m or wider profiler (alternatively a reclaimer)
- Grader
- Skidsteer or front end loader
- Tipper trucks

A profiler is initially used to excavate a section of pavement material to the target depth and side cast it. In some situations where the job location, size and/or timing make it impractical to use a profiler, a reclaimer may be used to loosen the existing material and conventional road plant, such as a grader and skidsteer, is used to move and 'blend' the pulverised material.

When a grader is used to break up the material, the settings on the grader should be to tyne to a depth as close as possible to the design depth, but not exceeding it. The grader (and skidsteer) is then used to push the material onto the existing pavement area.

Excavation and sidecasting tips

The first activity in the process of crossblending is to excavate the existing pavement material to the target depth and side cast it to the opposite side of the pavement (see Figure 4). This process typically begins at the crown or centreline where material is removed to the target depth from the first run or pass and placed onto the adjacent pavement as close as possible to the gutter or shoulder. With the next run the profiler removes material and places it directly into the excavated area created from the first run (see Figure 4).

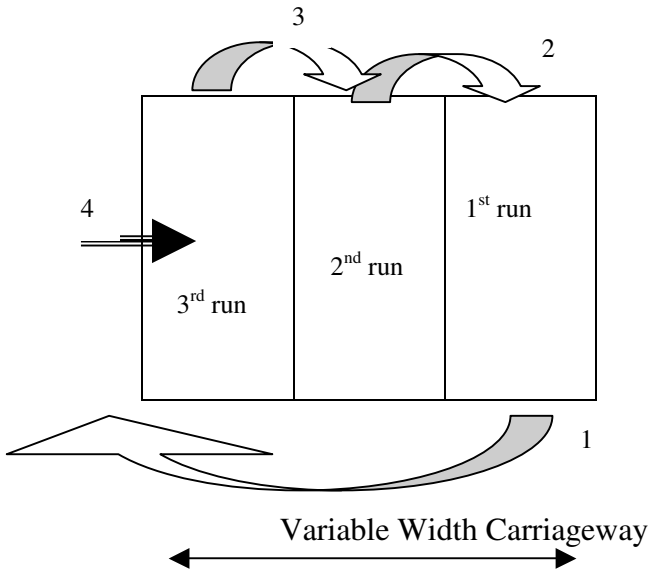

Figure 4 Typical crossblending procedure.

Should any extensive areas of asphalt patching be encountered within the project, the pulverised materials from this source should be distributed throughout the project length to enhance uniformity of the stabilised pavement material. However, the engineer may require complete removal in some instances.

Surface levels

Particular attention should be given to final pavement levels required by the engineer. It is a common feature to leave a stabilised pavement below the original level, or gutter level to accommodate a new wearing course. When estimating the target depth for cross blending the effect of bulking due to the volumetric change from the addition of binder and final wearing course thickness should be taken into account so that an estimated quantity of material that must be removed from the site can be determined (see example in box). Some pavement profiles before treatment are 'flat' and the engineer may design a crossfall for drainage. Increasing the height of the crown provides an opportunity to utilise the material from the shoulder into the crown of the road. This approach saves money and is an environmental benefit by minimising the amount of material sent to tips.

Example of surface level calculations
During the crossblending phase, estimate the depth of material to be removed from site.
Data
Design depth of stabilisation is 200 mm
Binder application rate is 3% by mass ($12kg/m^2$)
Wearing course: 40 mm AC14
Calculations
Estimated bulking due to addition of binder: 20 mm (approximately 10%)
Finished surface level of crossblended material prior to stabilisation:
0 – 20 mm(bulking) – 40 mm(AC) = -60 mm

Once the amount of material that needs to be removed from a site has been estimated, a quantity of material can be calculated for each run. During the crossblending process, the profiler will then dispose of this quantity into trucks. It is also preferable if the surplus material going to trucks is loaded towards the end of a run so that the side cast material is not placed beyond the scope of works. This process avoids double handling of materials so that crossblended materials are removed in a simultaneous operation with a profiler, not via a secondary operation with a skidsteer or loader.

Blending phase

A grader and/or skidsteer is often used to push the side cast material back into differing excavated area/s as shown in Figure 5.

Figure 5 Pushing the blended material back into the boxed pavement area.

Pavement stabilisation

After crossblending has been completed the binder can be spread or applied and stabilised using standard specifications and utilising stabilisers or reclaimers.

Subgrade repairs

Subgrade repairs are sometimes considered too difficult and time consuming. This is far from the truth and there is a body of evidence that demonstrates that well planned contracts will allow engineers to make informed decisions onsite and get quick insitu stabilisation treatments underway the next day with an agreed rate at the time of tender. If the underlying pavement distress is a weak subgrade and levels are fixed, it makes good sense to improve the subgrade properties during the road rehabilitation process.

Figure 6 After the removal of the pavement material the subgrade will be exposed allowing the opportunity to repair the subgrade rather than risk pavement distress at a later date.

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Web Sites

AustStab home page http://www.auststab.com.au/

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