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EXPLANATORY NOTES ON THE PURPOSE AND USE OF SUBBASES

Issue

Mass concrete subbases do not have contraction joints and hence it is normal for the concrete to crack. The mechanics of cracking is explained in my Discussion Paper: "The Effect of Cracking in Subbases" dated 4 April 2006. To many engineers the role of the subbase is not clear and often the extent of cracking may cause unwarranted "concerns".

Purpose

The purpose of this paper is to augment the above Discussion Paper and to summarise the purpose and requirements from subbases.

Austroads Pavement Design Guide (1992)

"A bound or lean mix concrete subbase is provided under a concrete pavement for one or more of the following reasons:

1. To provide a suitable "working platform" on which to operate construction plant. (This has been omitted from the 2004 Guide).
2. To provide uniform support under the pavement.
3. To reduce deflection at joints, thus maintaining effective load transfer across contraction joints by aggregate interlock (especially if no other load transfer devices are provided).
4. To assist in the control of shrinkage and swelling of high volume change subgrade soils and
5. To resist erosion of the subbase and limit "pumping" at joints and slab edges".

There is **no suggestion that the subbase is a structural layer** in the pavement. The reason that there is a variation in the Effective subgrade strength is because the thickness of the subbase also governs the actual spread of the load distribution on the subgrade. This would occur regardless of the subbase material that was used.

Austroads Pavement Design Guide (2004)

This point is further emphasised in the new Guide by stating that: "Lean mix concrete subbases are constructed as mass concrete without transverse joints and will therefore develop cracks. It is **intended to achieve a pattern of relatively close spaced and narrow cracks that provide a degree of load transfer** and which in conjunction with the debonding layer will not reflect into the base. Limiting both the upper strength and the shrinkage of the subbase concrete controls cracking."

Comments

1 The closer the crack spacing the narrower the cracks and the better aggregate interlock for load transfer.

2 The stronger the concrete, the higher the shrinkage and hence more prone to cracking.

3 Minimising the characteristic strength of the concrete will reduce shrinkage and hence the amount and spacing of the cracks.

4 To achieve a characteristic strength of 5 or 7 MPa, a target strength of ~10 MPa will be required. The actual 28 day strengths should be limited to a maximum of about 15 MPa.

5 Achievement of the proper strength characteristics in the LMC is often difficult because of the need to observe the RTA's mandatory 90/160 binder content. When this occurs, the responsibility for the crack patterns becomes RTAs and should be drawn to their notice.

6 As an example, say, a 2 m crack spacing results from the high strength concrete, then at least 4-5 longitudinal cracks would also be expected, these in turn would create some very odd shaped patterns in mid slabs. (The mechanics of this is explained in my Discussion Paper). However, because the crack width would be very fine, there is no detriment to the total pavement structure.

7 The 7 mm primer seal would further enhance the water proofness of the LMC.

8 It would be a fallacy to try to hang some structural parameters on the subbase.