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	PAVEMENT INFORMATION NOTE	
Edited by Arvo Tinni. Email arvo@tinni.com.au		22 02 2011

CONCRETE PAVEMENTS – INTERNAL DRAINAGE

Question: *"How do you deal with water seeping through cracks in concrete pavements – including the possibility of water pumping up through the subgrade?"*

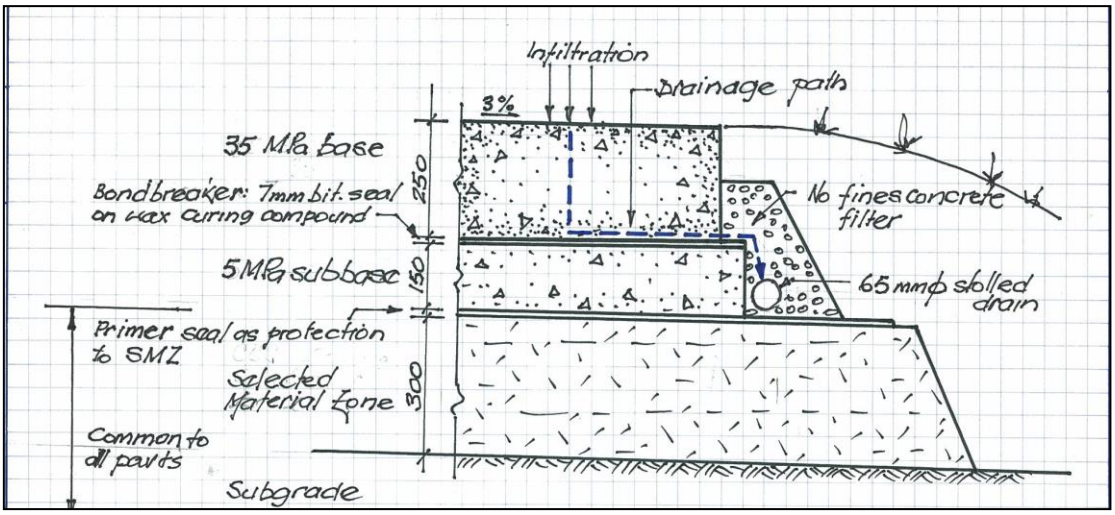
Discussion

In any pavement structure water either infiltrates from above or below (including sides through "edge infiltration".

Notes on infiltration from above:

- In PCP design, the induced joints are capable for 2 mm thermal movement without losing the aggregate interlock requirement. These joints are silicone sealed and the seals have a nominal design life of 10 years. If these seals are broken, water can enter the base.
- CRCP is actually designed to have closely spaced (1 – 3 m) fine cracks.
- For all concrete pavements, cracks less than 1 mm width are regarded as OK. It is also accepted that cracks <0.5 mm (overseas <1 mm) are waterproof and cracks <0.3 mm will actually self heal.
- In the event if cracks >1 mm appear, these will be silicone sealed as part of routine maintenance.
- In fine cracks it is the surface tension of water that stops gravity driven infiltration, however vehicle tyres at, say, 90 km/h will create extremely high instantaneous hydrostatic pressures that easily force water into the pavement structure. This could be of the order of the equivalent of >>1 MPa (10 kg/cm^2 = 1 MPa).
- This problem occurs with all pavement types, although the amount of likely infiltration in concrete pavements is less than in flexible pavements (either new or deteriorated).
- The method of handling this in concrete pavements is to provide special "pavement edge drains" to collect the water from the interface of the base and subbase. This is the deliberately debonded layer and allows water to gravitate or be forced to the edge drain. The arrangement means that the surface infiltration will never reach the subgrade and is an important aspect where soft or expansive subgrades are encountered.

- The following sketch illustrates the arrangement:



Detail of Pavement Edge Drain

- It may be noted that this drainage design is peculiar to concrete pavements and does not exist in any flexible pavement design, including the composite pavements where the asphalt base layer is "bonded" to the concrete subbase. Any water that enters a flexible pavement has to make its way, through pavement layers to the subsoil drains. In fill situations the subsoil drains, of course, do not exist.

- Minor pumping can occur with temperature warping of base slabs. However, any water that may be present will be forced to the no fines concrete pavement edge drains.

Notes on Infiltration from below:

- Generally, this is a problem in cuttings. The cause can be either through capillary action from the subgrade or the floor of the cutting being below the original water table.
- Control of the ingress of water is basically identical for all pavement types, except that with concrete pavements, also no fines concrete drainage blankets can be used and in tunnels a no fines concrete subbase is often provided instead of the conventional Lean Mix Concrete subbase.
- Pumping of water from the subgrade is unlikely to occur as the concrete pavements have zero deflection under load.
- In places where a drainage blanket is required, this will cut off any vertically upward movement of water.

Arvo Tinni
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