

Book review

PPR482 – A Pilot-scale Trial of Reservoir Pavements for Drainage Attenuation

B. Chaddock and M. Nunn. Transport Research Laboratory, Wokingham, UK, 2011, ISBN 978-1-84608-952-7, £35.00 (printed) or £25.00 (PDF), 96 pp.

If the predicted 20 to 30% increase in rainfall occurs as a result of climate change, and who would argue that it is unlikely to do so, this together with infrastructure developments will cause both the rate and volume of water runoff from built up areas to increase unless mitigating measures are implemented. One means of reducing the effect of increased runoff is the use of sustainable drainage systems which deal, either at source or at points where discharge occurs, with runoff by mimicking the natural processes of rainwater distribution to the air and the ground. A review of reservoir pavement usage summarised in this report concluded that this technology has historically been constructed for lightly trafficked applications only.

Sustainable drainage systems can form part of the highways infrastructure in a number of ways including the construction of an innovative reservoir road pavement. These pavements contain porous materials or cellular blocks that delay and reduce the peak flow of water to the drains. The report, which was prepared for the Highways Agency (HA), provides details of the design methodology for the various combinations of permeable bound and unbound surfacing materials and permeable and impermeable foundations. The HA sponsored some research to develop guidelines to allow their use on more heavily trafficked roads and to outline their potential application to the strategic road network in England.

To these ends, one of the contributors to this project, an aggregate producer and contractor, Aggregate Industries, built a trial incorporating their products at a factory site. They constructed a range of reservoir pavements comprising two bays with permeable and impermeable concrete block and permeable asphalt surfacing overlying a plastic cellular product that forms a sub-surface reservoir with a small outlet to control the flow. In the other two bays, one had an impermeable surface on a porous concrete base into which the water was fed to attenuate the flow, and the other had permeable asphalt over an open graded porous subbase. In all cases, the foundation was rendered impermeable with a geo-membrane. The bays

were extensively instrumented. This report describes the construction and assessment of the structural and hydraulic behaviour of these trial pavements.

The pavements were trafficked by heavy commercial vehicles and no evidence of deterioration in the form of cracking or deformation was found from structural testing and visual condition surveys in any of them. Hydraulic performance was investigated and the expected behaviour of full-scale reservoir pavements was demonstrated. The effects of water infiltrating through a permeable pavement and draining into a sandy gravel sub-grade were observed to enable the natural attenuations of peak rainfall intensities for the various alternatives to be determined together with delays to the peak water flows from the reservoirs.

The body of the report contains sections on the design (both structural and hydraulic) of reservoir pavements, the design and construction of pilot-scale trials, pavement construction tests, tests on completed pavements, structural performance of trial pavements, hydraulic performance of trial pavements, other attributes of reservoir pavements and finally, implementation of reservoir pavements on the HA road network.

The following items are among the conclusions reached.

- (a) Reservoir pavements have many advantages but care needs to be exercised in choosing their locations.
- (b) The technology needs to be developed for heavier traffic applications but the trials undertaken indicate that there is potential for reservoir pavements to carry heavy traffic.
- (c) The checks applied demonstrated that the test pavements fulfilled many of the structural requirements assumed in their design.
- (d) The pervious surfaces of block paving and porous asphalt become significantly clogged and, accordingly, the use of pervious surfaces has to be assessed for particular locations. The use of pervious surfaces has an effect on the whole life cost of the pavement.

This is a very useful report for those involved in the design of pavements. Indeed, such is the devastating effect on anyone whose property is flooded, the report should be essential reading for all civil engineers involved in any aspect of infrastructure development.

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