Press release from Jan de Beer, cell 082 456 3677:

Concrete Low-Volume Roads Economic And Safe Option For Rural Areas

With poor rural gravel roads causing horrific accidents, The Concrete Institute (TCI) feels there is substantial scope for more low-volume concrete roads to increase road safety in South Africa.

Bryan Perrie, managing director of TCI, says jointed in situ (poured in place) concrete can be used to construct economical and durable rural low-volume roads – basically used as access roads or farm-to market pavements designed to handle speeds of up to 90 kilometres per hour in unpopulated areas and up to 65kms per hour speeds as low-volume city roads. "But the mixes for use in concrete roads should be designed by an approved concrete testing laboratory or TCI should be approached for advice on materials and mix proportions," Perrie cautions.

Perrie says economy, ease of construction and maintenance considerations make unreinforced jointed pavements (JCP) ideal for low-volume roads and streets. "In jointed low-volume roads, pavements, load transfer by aggregate interlock is generally adequate. When close joint spacings are used, reinforcing steel is not needed but reinforcing mesh should be used in odd-shaped panels and for those with manholes and other openings."

Joints are provided in concrete pavements to:

- Limit stresses and control cracking resulting from restrained contraction and the effects of restrained warping and traffic loads.
- To facilitate construction and level control.
- To accommodate movements.

Joints must provide adequate load transfer to ensure adequate performance of the pavement. This can be achieved by the use of sawn construction joints at relatively close spacings and keyways at construction joints.

Perrie says the correct choice of materials is vital for the construction of durable low-volume concrete roads. Cement should be CEM I or CEM II A 42.5 or higher complying with the requirements of SANS 50197. Where extenders (ground granulated blast furnace slag or fly ash) are used, these should comply with the requirements of SANS 50450 and SANS 55167. When extenders are used, allowances should be made in the concrete mix design, particularly with regard to early strength under field conditions to ensure timeous cutting of joints. Curing methods and regimes may also have to be improved, especially in inclement weather.

"Satisfactory aggregates for use in low-volume concrete roads and streets are those that comply generally with 'SANS 1083 Aggregates for Concrete'. In addition, the fine aggregate should possess an acid insolubility of at least 40% for skid resistance. This requirement is satisfied when quartzose sand is used. Calcareous sands, such as dolomite, are acceptable if blended with at least 40% of a suitable quartzose sand."

Perrie says the mixing water should be clean potable water or other water free of substances that may impair the strength, the setting time, or the durability of the concrete, or the strength and durability of any reinforcement.

"Under certain circumstances, the properties of the concrete may be improved by the proper use of chemical admixtures, such as water-reducing admixtures. Their use should be based on an evaluation of their effects on specific materials and combinations of materials, including strength development, particularly within the first 24 hours after concrete placing. This is because certain admixtures may retard the setting and strength development of the concrete, thus delaying joint sawing and increasing the risk of random cracking.

“The concrete should be strong enough to ensure a hard, durable, skid-resistant surface and to accommodate the tensile stresses resulting from shrinkage, warping and loading. This requirement is satisfied by specifying a target flexural strength or modulus of rupture (third-point loading, determined in accordance with SANS 864) of not less than 4.5 MPa at 28 days.

“Proper drainage is also essential to prolong the lifespan of low-volume concrete pavements. Experience has shown that inadequate drainage is probably responsible for more pavement distress in Southern Africa than inadequate structural or material design. The design philosophy is to provide effective drainage so that the pavement structure is prevented from becoming saturated. Both the discharge of surface run-off and the control of subsurface water need to be considered. Consequently, effective drainage is essential for good pavement performance, and is assumed in structural design.

“Surface run-off can be controlled in the rural environment by constructing sufficiently wide side drains which discharge at sufficiently frequent intervals into the adjacent land, or into culverts that carry the water to suitable discharge points. In the urban environment, it can be controlled with the use of kerb and channel systems discharging into inlets into a storm water pipe system. In order to reduce costs for low-volume roads, consideration should be given to dishing the road surface and carrying the storm water on the road surface to suitable discharge points,” Perrie concludes.

A detailed publication “Low-volume Concrete Roads” is available for free downloading from The Concrete Institute website, www.theconcreteinstitute.org.za or phone 011 315 0300 for more information.

Ends

Caption: (for all concrete pics supplied)

Low-volume concrete roads under construction and in use in South Africa.

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