

Asphalt VS Concrete Road Pavements and Some Significant Outstanding Drainage Problems

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I have been involved with the design and construction of roads and drainage projects working at PWD, UDC and Wallace Evans Jamaica Ltd., for over 50 years, so I believe I am in a good position to give the public a broad perspective of the considerations in a way that is easily understandable.

Before the 1950's practically all road surfaces were semi penetration macadam with two layers of spray and chip on a layer of 2" of crushed stone. The base varied from using on-site materials like marl, bauxite, hard shale, stone packing, to just grading and rolling the existing dirt road surface. Much of this still exists and in areas with low rainfall/good drainage/light traffic have served us well.

With the increasing size/weight and volume of vehicles, the PWD started to completely rebuild and realign roads with "engineered" foundations and asphalt concrete surfaces (PWD acquired "Barber Greene" equipment in the 50's, and thereafter, Jamaicans referred to these surfaces as "Barber Green"). In many areas PWD were able to resurface the existing road without reconstructing the base e.g. Gutters to Santa Cruz which has performed beyond expectations from 1958 to now with some resurfacing in between. Examples of new alignments with marl base built since then, Queens Highway (1953) Mandeville to Spur Tree 1955, Linstead to Ewarton 1958, Moneague to Crescent Park 1968/69, Mandeville, Linstead/May Pen By-Passes, Three Miles to Spanish Town Highway 1972 all of which gave 20-30 years' service before being repaved. Some in Kingston, e.g. Washington Boulevard, Tom Redcam, Oxford Road, Hope Road, Old Hope Road and have been similarly reconstructed, with appropriate drainage, have given similar service. We at UDC rebuilt all the roads along the Kingston Waterfront in 1972 but used a marl base stabilised with 3% cement to prevent moisture intrusion from the high water table - only recently repaved. We are blessed with marl over about 2/3 of Jamaica which provides inexpensive and excellent road base material but it must be protected against moisture intrusion or stabilised with cement.

Since that time, all of the north coast highway from Negril to Port Antonio has been reconstructed, with realignment as necessary, and designed to provide an excellent road with an asphalt surface.

In other words where we have been able to properly engineer roads we have gotten far more than the design life expected before having to repave/repair them. That is for the main roads/highways asphaltic concrete surfaced roads have served us very well.

There are a few sections of roads where because of the geography, terrain, geology, storm water volumes and where the roadway has to be part of the drainage solution, asphalt surfaces will not stand up and a concrete surface is the appropriate solution e.g. Fern Gully.

Concrete road surfaces are substantially more expensive than an asphalt solution, so we use concrete roads only where necessary. Concrete surfaces will normally last longer than asphalt surfaces but even after resurfacing of an asphalt road from time to time, it still makes far more economic sense to use an A/C surface rather than a concrete one. The analysis requires taking into account the initial and long term costs reduced to net present value. Generally one would not use concrete surfaces in built up



areas or on roads with a multiplicity of underground services, nor for example from Six Miles to Ferry where there is a special problem of deep and varying thickness of peat or on the sensitive holositic clays in St. Mary which will cause differential settlement and probably break-up of a concrete surface.

A concrete road is also a very good solution where there are tight curves/ hairpin bends, and particularly if the road is steep for better traction and to minimise damage from heavy multi-axle trucks or where water frequently/constantly flows on/across the road

In other words, the NWA engineers know when and where it is appropriate to design/construct concrete or asphalt surfaced roads. By the way, when I was at the PWD in the late 60's we analysed this matter in detail and came to the same conclusion at that time.

But we do have some significant drainage and road problems still to be dealt with including the main road from Harbour View to Port Antonio. Here over-loaded trucks carrying sand and gravel mostly, have caused significant base failure. The last and present Government have been endeavouring to arrange for this reconstruction to be done as a priority.

When I was at PWD in the 1960's the drainage issues were being pursued aggressively. During this time the Sandy Gully system, its branches and the other drainage systems were constructed in Kingston as well as others like North Gully in Montego Bay and the system in Sav-La-Mar. These now provide a network into which all local road and other drainage

can be tied. UDC constructed South Gully in Mobay and the main drains in Ocho Rios in the 70s. Others like Port Maria, Santa Cruz and Cave Valley were designed from the 1960's but have not yet been constructed.

There is a concrete drain from the Chapleton main road to Denbigh which is woefully undersized as demonstrated by the recent flooding there. This problem is, in my opinion, best solved by providing another drain on a different route with the required additional capacity while leaving the existing drain to function as well.

There are 5,500 miles of PWD Roads and about the same amount of Parish Council roads, most of which are not main roads, where we have our major road issues. Much of the problems are in the non-limestone areas where rainfall is often high, soil conditions are poor, drains block easily, landslides happen frequently etc.

Where these roads are paved it is usually semi-penetration with two coats of spray and clip. It is my contention that these surfaces are failing a lot easier and quicker under wet conditions since the oil crisis in 1974 which resulted in reduced bitumen quality since then.

With such a great mileage of secondary and tertiary roads we need a cheaper solution than asphaltic concrete surfacing. A double surface dressing costs about ½ of an asphaltic concrete surface and 1/10th of a concrete surface. The least cost surfacing solution for the secondary, roads can best be achieved by finding a solution to the bitumen problem. Clearly concrete surfacing is out of the question for thousands of miles of these roads.

There is a system available (Micro-Surfacing) using premixed materials which produces a much better quality and more durable "spray and chip" solution but more costly than traditional spray and chip. This needs to be pursued more vigorously in my opinion.

Obviously as the traffic increases and drainage etc. conditions demand, it is logical to resurface sections with asphaltic concrete – e.g. as has been done on Widcombe Road, and recently on the Gordon Town Road. I just saw a claim that the difference between concrete and asphalt roads is only 3%. To have a sensible comparison one would need to do cost comparisons for different classes of roads, traffic volumes, soil conditions, drainage requirements. Compare, for example, repaving Widcombe Road or Gordon Town Road with 40 mm of A/C or a 200-mm thick unreinforced concrete surface on the existing base. The former is about \$1,400/sq. yd. as against concrete at \$6,500/sq. yd. – i.e. 4 ½ times not 3% more!

By the way we do not have concrete paving and finishing machines in Jamaica. For us to construct significant lengths of concrete paving, it would require a substantial investment in equipment which would require a guarantee of work to justify the investment. Hand-placing/finishing is OK for the short length in Fern Gully, not a highway.

For asphaltic concrete (A/C) PWD purchased the original Barber/Greene equipment in the 1950's and as the demand grew, private enterprise got involved and even bought the Barber/Greene equipment, from Government. So, with concrete paving we might have to follow the same procedure for the Government to initially purchase such equipment – not likely now.

Please note that I have not discussed the issues relating to the repair of asphalt and concrete roads. Suffice it to say that asphalt roads are very much easier and cheaper to repair than concrete roads.



It is noteworthy that in the 1960's the economy was growing at an average of 6%/year which allowed the Government to do all that was done then as against the 1% growth we have had for a few decades since. Then we were producing 500,000 tons of sugar, last year 83,000 tons! 150,000 tons of bananas now very little (plenty bush however) 14 million tons of bauxite/alumina, now less than ½ of that. Thank goodness for tourists and remittances from Jamaican's overseas! In short, the Government currently has very limited resources to deal with these problems in the short term.