# CONCRETE PAVING — 50 YEARS AGO

By way of comparison with the techniques and machinery described in the proceeding article on the new continuously reinforced concrete pavement being provided on The Foreshore Road at Botany, we'd like to include some details of how cement concrete roads were built in the late 1920's by the Main Roads Board.

Imperial measurements have been retained in these references but, for those who wish to *metricate* them, we have included necessary conversion rates at the end of this article.

Firstly, a few facts about the concrete paving machine, five of which were used by the Board. This was a self-propelled machine, driven by a 4-cylinder petrol engine and moving on caterpillar tracks. It had a mechanically-operated elevating hopper and a broom-and-bucket distributor. The water supply was regulated by an automatic cut-off cistern which could be set to hold the desired amount of water.

Each paver was usually fed by 25 cwt end-tipping trucks, working in pairs — one carrying 1½ inch and ¾ inch metal and the other carrying sand and cement — the contents of a pair of trucks making up a complete 28.25 cubic feet batch.

The number of lorries required to feed each paver depended, of course, on the length of the *lead*, from the stock piles to the operating site. Four pairs of trucks were required for a *lead* of one mile. (See Board's 1926-27 Annual Report, pp. 6-8).

As an example of the efficiency reached in the laying of cement concrete pavements, the Board's 1928-29 Annual Report announced (on page 14) that their metropolitan day labour organisation laid, *on an average, over 1,000 square yards of 7 inches to 9 inches reinforced concrete pavement per ordinary working day throughout the period of any work.*

In the reconstruction of Lyons Road, Drummoyne (Secondary Road No. 2006), which was completed in July 1929, the average output of the paver for the whole work was 1,142 square yards per ordinary working day, with peak outputs of 1,890 and 1,638 square yards.

Quick-hardening cement was used at intersections and the cost of laying the concrete slab (including dowel bars, edge bars and bar mat reinforcement), was 15 shillings per square yard, plus excavation at 4s. 2d. per cubic yard and disposal of the spoil at 2s. 4d. per cubic yard.

As an example of an early major road pavement project undertaken using cement concrete, we need look no further than the much publicised construction of the Hornsby to Hawkesbury River section of the new Sydney — Newcastle Road. This has been amply chronicled in the March 1930 issue of "Main Roads" (Vol. 1, No. 6, pp. 130-7, 142), expanded in the 30-page article by Mr. T. H. Upton on "The Establishment of Direct Road Communication between Sydney and Newcastle" in the May, June and July 1932 issues of the Journal of The Institution of Engineers, Australia (available free in reprint form from the Department's Public Relations Section) and summarised in the Department's book "The Roadmakers" (pp. 118-121).

The Board's decision to lay a cement concrete pavement south of the Hawkesbury River had a sound economic basis. Of the tenders submitted for the work, it was the cheapest type of pavement.

Excluding the cost of formation and subsidiary works, the cost per square yard of each type (based on the lowest tender in each case) was:

- tar macadam with broken stone base 18s. 7d.
- bituminous concrete with broken stone base £1 7s. 0d.
- portland cement concrete 16s. 4½d.

Cement concrete had other advantages, such as requiring only one operation and needing the minimum quantity of materials. These were important factors in view of the limited operating space available for paving equipment especially between Berowra and the Hawkesbury River, where suitable side tracks were not available. For this reason, the adoption of a class of pavement which could be completed for its full depth in one operation had outstanding advantages for those requiring construction in two or more layers.

However, better water supplies became imperative. To supply mixing water for the paver and water for keeping the covering on the concrete slab wet during curing (as well as drinking and washing water for the camps), it was estimated that a maximum rate of 39 gallons of water per minute would be required. Local water supplies were inadequate and it was necessary to install special 3-inch pipes with pumps along the road from the Water Board mains near Hookham's Corner, first to Mt. Colah and eventually right down to the Hawkesbury River (a total distance of over 14½ miles). A number of large tanks, providing a storage capacity of 6,000 gallons were also necessary.

The concrete pavement was 20 feet wide, (of 1-2-3 mix), 7 inches thick at the centre, 9 inches at the edges, with a deformed longitudinal joint down the centre, transverse joints at approximately 50 feet intervals, and reinforced on fills with bar mesh to the extent of 60 lb. per 100 square feet. The pavement was flanked on either side with earth shoulders 4 feet wide and had between it and the subgrade a layer of bush sand 3 inches thick.

Silicate of soda, at the rate of 1 gallon per 250 square feet of pavement was applied 24 hours after the concrete was laid. This treatment was later abandoned on the Board's work as abrasion tests, using a sand blast apparatus, were found not to support the generally accepted view of improving the wearing qualities of the concrete.

The paver used was a 27E Smith machine. Each batch consisted of 12.2 cubic feet of ¾ inch metal, 12.2 cubic feet of 1½ inch metal, 16.5 cubic feet of sand and 8 cubic feet of cement. Materials were conveyed from the stock piles to the paver by 2-ton lorries with power-operated tipping bodies. Each lorry obtained the materials for one complete batch by visiting each stock pile

**One of the Smith 27B concrete paving machines used by the Main Roads Board — *in operation on the new* Sydney-Newcastle Road near Berowra in 1928. Note the raised position of the feeding hopper.**

**A truck loads the premixed material into the hopper of the paving machine. The travelling bucket at the right pours the concrete onto the roadway.**

in turn and there receiving from the batching hopper of a Barber Greene loader, the correct quantity of the particular aggregate. The final visit was to the cement shed, where six jute or eight paper bags of cement were emptied into the truck.

Each loader could fill its hopper from the stockpile and empty it into a lorry in ten seconds. The complete loading cycle for each lorry for 1½ inch metal, ¾ inch metal, sand and cement, was 1 minute 45 seconds, of which 50 seconds were occupied in obtaining the aggregates and 55 seconds in obtaining the cement. Two loading platforms were used at the cement shed to avoid undue congestion at that point. The volume of the batch bulked wet, using crushed basalt, was 28.2 cubic feet or sufficient to pave approximately 5.2 square yards of road.

The first section from Hookhams Corner to Mt. Colah (3 miles in length) was completed in February 1929. The cost per square yard of concrete laid, including dowel and edge bars, was 16s. 7d. As side tracks were available throughout this section, the pavement was laid full width in one operation.

In October 1928, a commencement was made on the earthworks of the second section from Mt. Colah to Berowra. Though not as heavy as those of the third section (from Berowra to Kangaroo Point on the Hawkesbury River) these were nevertheless sufficiently heavy to require ample time for consolidation. It was anticipated that, by commencing them at that time, they would be ready to take the concrete surface as soon as the paving of the third section had been completed. This would enable the concrete work to proceed continuously for 11⅔ miles from the Hawkesbury River to Mt. Colah.

The laying of the concrete pavement was commenced at the Kangaroo Point end in September 1929 and completed to Mt. Colah in May 1930. A job schedule was drawn up, requiring a rate of progress of 1 mile of pavement each fortnight, or equivalent to an output of 1,225 square yards of pavement per available day.

At first, owing to the very long lead of 3¾ miles from stock piles to paver, the lorry contractors' inability to secure sufficient vehicles to keep the paver continuously supplied, and the restricted space for turning the lorries supplying the paver, only comparatively moderate daily outputs (of approximately 1,000 to 1,200 square yards) were obtained. As the work advanced, and the distance from the depot decreased, the lorries available sufficed for the work, batches arrived with greater frequency at the paver, and outputs increased accordingly.

With many deep cuts and fills restricting access, the only approach to the paver for the lorries supplying the raw materials was along the formation and it was foreseen that the turning of these to back in and tip their loads into the boot of the paver would cause inconvenience and delay. To permit them to turn under their own power, it would have been necessary to widen out the formation but this was not a practical solution.

Although turntables were known to have been used in similar circumstances abroad, they had not previously been tried out for this purpose in Australia. It was considered, however, that the circumstances demanded the introduction of this equipment and a locally manufactured turntable was purchased for £317 and put into use during October 1929. Its success was at once apparent.

On the first day the turntable was introduced, the day's output rose from 1,250 to 1,545 square yards and for the following month the average output per day was 1,574 square yards, with peaks of 1,850, 1,849 and 1,663 square yards. The maximum of these was reached on 12 November 1929 and represented 360 batches of concrete, at the rate of 38.9 batches per hour, or one batch every 92 seconds! The total weight of dry material which passed through the paver during this day was 760 tons, equivalent to the weight of material carried on a goods train of forty-eight trucks of 16 tons capacity each.

Whereas formerly it had taken approximately 4 minutes for each lorry to turn under its own power, the turning was now accomplished in from ½ to 1 minute. Fewer lorries were required (on this account alone, the saving more than paid the cost of the equipment) and congestion on the road where the lorries turned was eliminated. Part of the credit for the improved rate was, no doubt, also due to the gradual welding of the various operations into a smooth flowing cycle.

Another interesting detail of organisation, small in itself, but nonetheless important in the overall procedure, was the arrangement for bringing forward each day the side forms stripped from the work done two days previously. As no vehicle could travel beyond the end of the newly laid concrete, these forms had to be carried forward by hand and there loaded on a lorry to be transported perhaps half a mile or more ahead for re-use. As the loading of this lorry anywhere near the paver while concreting was proceeding would have caused congestion, this operation was carried out each day by a special gang, starting at 4 a.m. and finishing before 7.30 a.m. when the day's paving commenced.

Following the curing of the concrete slabs, a gang of about fifty men was engaged in clearing off the earth covering, trimming and consolidating the shoulders, finishing the joints with bitumen, and erecting the protection fencing.

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Construction of The Foreshore Road has progressed well. This aerial photograph was taken in March this year.

Construction at the north-western end of The Foreshore Road near its junction with General Holmes Drive. The elevated decking in the foreground will eventually carry General Holmes Drive's southbound carriageway over The Foreshore Road.

The Stothert and Pitt CPP 60 slip-form paver at work o
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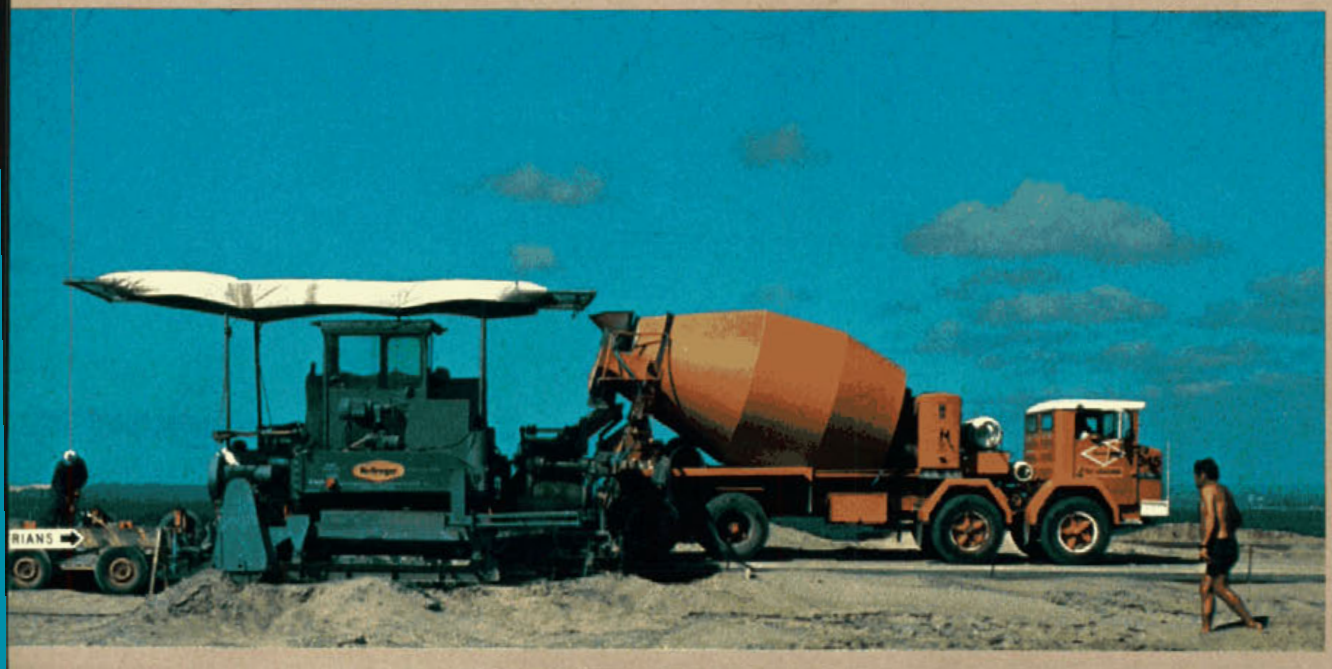

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Road. The daily output from this machine averaged
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Looking east along the route of The Foreshore Road, showing the railway overpass under construction, the link with Beauchamp Road (on the left centre) and the Caltex depot (on the right centre). The slip-form paver can also be seen.

# ONCRETE ROAD

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