

No. PL-18 (26)/58

Dated the 25th April, 1962

To

The State Governments of Uttar Pradesh, Rajasthan,
Madhya Pradesh, Bombay, Bihar, and Andhra Pradesh
(Department dealing with roads)

Subject : Construction of stabilised soil roads

I am directed to say that the Stabilised Soil Roads Committee of the Indian Roads Congress, at its meeting held at Amritsar from the 25th to 27th April 1958, recommended the adoption of stabilized soil in road works in the interest of economy. A copy of the conclusions arrived at by the Committee in regard to the stabilised soil specifications and a copy of the method of stabilised soil road construction referred to therein have already been sent to the State Chief Engineers with the Consulting Engineer (Road Development)'s letter No. PL-18 (26)/58 dated the 27th August 1958. Copies of the conclusions and the method of construction are, however, enclosed for information. I am to add that the Committee stipulated that the stabilised soil specifications referred to above should be considered for adoption only in those localities where the conditions of adoption were specified in the conclusions, where the cost of the crust including surface dressing, was at least 25% less than that of the normal surface treated water-bound macadam specification in force in the area, and where the annual rainfall was less than 60 inches.

2. The Government of India think that stabilised soil specifications referred to above, may be tried in the construction of a few new stretches of road up to a total of 30 miles in length in your State on experimental basis. Preference should be given to those roads where the inhabitants of the area are prepared to donate land free of cost. I am accordingly to request that proposals for the construction of such stretches of road according to those specifications, together with detailed plans and estimates, may be forwarded to this Department for consideration. Complete information about traffic, intensity of rainfall, and the depth of sub soil water level should be given in the report covering the estimate. I am to add that the Government of India will be prepared to consider the sanction of a grant-in-aid from the Central Road Fund (Ordinary) Reserve, to meet 50% of the initial cost on earth embankments and the crust of stabilised soil roads including surface treatment up to a maximum length of 30 miles.
3. The State Government will be required to keep complete and separate records of the specifications and the costs of construction and maintenance of those roads and furnish periodical reports to the Government of India for purposes of research.

Annexure I

CONCLUSIONS ARRIVED AT BY THE STABILISED SOIL ROADS COMMITTEE AT ITS MEETING HELD AT AMRITSAR FROM THE 25TH TO 27TH APRIL 1958 REGARDING THE STABILIZED SOIL ROAD SPECIFICATIONS

- (i) With a two-coat surface treatment over a priming coat, but without stone graft, a stabilized soil road built according to Mehra's method is considered capable of carrying upto 200 tons of mixed* traffic per day;
 - (ii) With a two-coat surface treatment over a stone graft (no priming coat being necessary in this case) a stabilized soil road built according to Mehra's method is considered capable of carrying upto 500 tons of mixed* traffic per day;
 - (iii) Where good hard stone is economically available, a graft should invariably be given even though the prevalent traffic may be less than 200 tons per day. This would allow for development of traffic up to 500 tons per day. The stone ballast used for this purpose should be one inch gauge and the quantity used should be 8 to 10 cft per 100 sq ft, the criterion being complete coverage of the surface with stone ballast.
 - (iv) Where stone is too costly and the traffic is in no case expected to be more than 200 tons per day, grafting may be omitted and a priming coat used instead before surface dressing.
 - (v) Wherever a road is built with stone graft, the other specifications (i.e. with primer only) should also be laid in a short length (about a mile) for observing the comparative performance of the two specifications.
 - (vi) As regards the total thickness of the crust, the Committee was of the view that it should be properly designed taking into consideration the various factors involved like water logging etc. In ordinary cases, the Committee was of the opinion that the crust thickness of a stabilized soil road should correspond in strength to the normal water bound macadam specification prevalent in the locality.
 - (vii) In water logged areas, some form of effective capillary cut-off should be provided, whether by adopting a high embankment, or a sand blanket course, or a bituminous water-proof coating etc.
- Wherever the sub-soil water level was between zero to six feet below the formation level of the road, the area should be considered as water logged.

(viii) The Committee was of the view that the prerequisites for the successful large scale application of the technique of soil stabilization to road construction were :

- (a) availability of personnel trained in the technique for constant supervision
- (b) field laboratory for controlling the execution; and
- (c) a State Testing and Control Laboratory for initial design and reference during execution.

*Not more than one-third should be iron tyred

Annexure II

USE OF SOFT AGGREGATES IN STABILIZED SOIL ROAD CONSTRUCTION METHODS OF EXECUTION AND FIELD CONTROL

1. In the alluvial plains of India, the characteristics of the soil change at short intervals, and therefore, soil samples are taken from points at close intervals to select locations from where the soil is to be borrowed.
2. Soil samples are taken at points a quarter of a furlong apart and 70 ft from the centre line of the road. After removing the top loose soil, soil at one foot depth is sampled; one foot being the specified depth of borrow pits. These samples are subjected to the following laboratory tests :
 - (i) Sieve analysis through No. 10, 40 and 200 American standard sieves
 - (ii) Liquid limit
 - (iii) Plastic limit and plasticity index
 - (iv) Salt content.
3. *Collection of soils* : Soils from approved locations are dug out and collected in stacks in required quantities every half a furlong.
4. *Optimum moisture* : Water calculated to produce the optimum moisture content is measured and is added to the stacks. Allowance is made for evaporation losses and absorption by brick aggregate.
5. *Rolling* : The base and wearing courses are rolled by 8-ton flat power roller. Ten per cent of the aggregate is reserved for sprinkling on the wearing surface before rolling. After the first rolling, water is sprinkled on the road and left overnight. In the morning, the surface is again rolled to finish.
6. *Curing* : The road is kept closed to traffic for four or five days and is heavily sprinkled with water during this period. After this, water is lightly sprinkled for the next ten to fourteen days and controlled traffic is allowed to use the road. In the beginning, rubber-tyred traffic only is allowed and gradually the road is opened to all kinds of traffic.
7. *Specifications for the base and wearing courses* : The thickness of stabilized soil crust shall be the same as that of other types of road in the area. In most of the places where the sub-grade remains fairly dry, a crust of 6 in. thickness of conventional type road has been found satisfactory. Therefore, the following specifications, are recommended for that thickness.

Base course : Thickness-4.5 inches of soil mixture (uncompacted).

Sand content : Not less than 50 per cent (Fraction Passing 40 and retained on 200 U.S. Sieve).

Plasticity Index : 5.0 to 7 (the lower P.I. is to be used where natural soil of the P.I. with the given sand content is available. The higher P.I. is to be used when highly plastic clay is to be added in the Mixture).

Wearing course : Thickness (uncompacted) 4.5 inches of soil and brick aggregate mixture consisting of 8 parts, soil and 4 parts aggregate.

Sand content of soil (-40+200 fraction) : Not less than 33 per cent.

P.I. of soil : 9.5 to 12.3 When the road is to be surface treated, the P.I. shall be 8 to 10. (The upper P.I. to be used when a high plasticity clay is to be blended)

8. Cost per mile : The present day cost of 10 ft wide road per mile is Rs 9,700

Base course 3 in.

Rs 2,700

Wearing course 3 in.

Rs 7,000

Total

Rs 9,700

The cost of unsurfaced water-bound macadam of the same thickness in the same locality would be about Rs 19,600/-.

9. It was observed that except for small stretches totalling a little under 5 per cent of a 17 miles experimental length constructed to the above mentioned specification the entire road behaved very well/and took up a mixed traffic of 200 tons per day though initially it was designed as a village road to take up a traffic of only 50 tons per day. It was observed that the slight rutting that took place during the dry weather got more or less smoothened out automatically under the traffic during the wet weather. So the wear on the road was uniform. Levels both in the centre and along edges were taken for a period of three years and it was observed that the wear on an average was about 0.5-0.6 in. per year.
10. Stabilized soil road with bituminous surfacing : With surface treatment over a priming coat. Roads built to the above mentioned specifications have given satisfactory service for a traffic intensity of about 200 tons per day of mixed traffic in the Punjab. In areas with a heavier rainfall, roads built to the above mentioned specifications should invariably be given a *bituminous surfacing coat*.
11. Stone grafting of base coat : If the wearing course (before rolling) is grafted with stone metal of 1 in. gauge at the rate of 7 cu. ft. per 100 sq. ft. and rolled and surface treated, it has been found to be strong enough for a traffic intensity of 500 tons per day.