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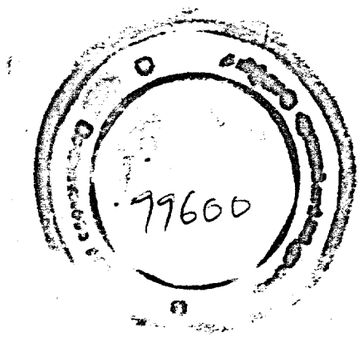
TRANSPORT-COMMUNICATIONS

MONTHLY REVIEW

MARCH 1956—No. 107

INDIAN ROADS CONGRESS, NEW DELHI.



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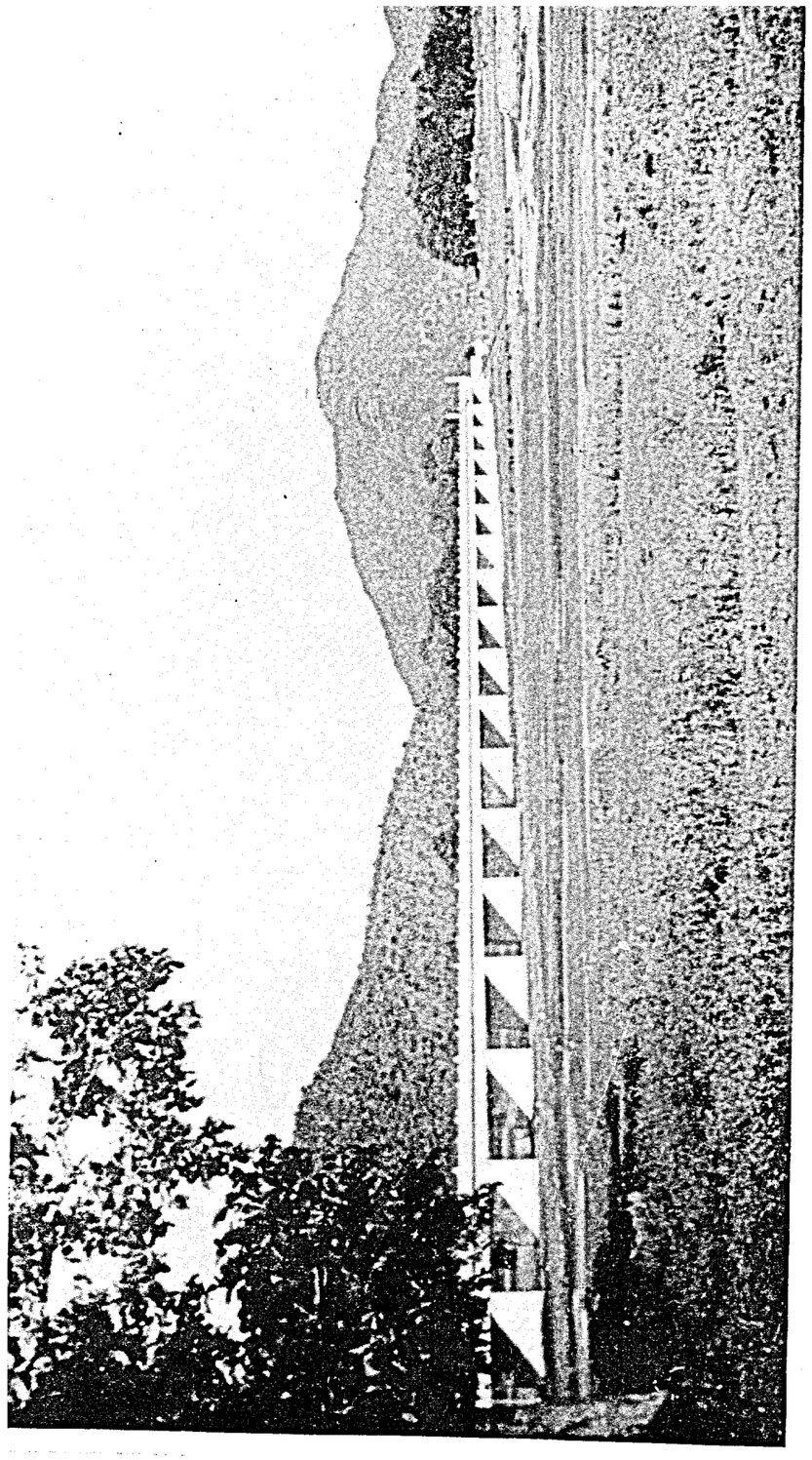

PRESTRESSED CONCRETE BRIDGE ACROSS THE PALAR RIVER

TRANSPORT-COMMUNICATIONS MONTHLY REVIEW

A REVIEW OF
ROAD ENGINEERING, DEVELOPMENT & TRANSPORT

MARCH 1956

BRIDGING INDIA'S RIVERS

PRESTRESSED CONCRETE BRIDGE ACROSS RIVER PALAR

PALAR Bridge, the first prestressed concrete road bridge in India, was recently opened to traffic by the Deputy Minister for Transport & Railways. Prior to the construction of this bridge, a bed-level causeway was in use and traffic was very much inconvenienced during the flood season. With the construction of this bridge, important towns in the southern part of the State have been connected with Madras by an all-weather road.

The Madras-Dindigul road, National Highway No. 45, connects Madras with southern districts and crosses the river Palar at mile 38/3-5. River Palar rising in the Kolar district of Mysore State joins the Bay of Bengal at about 10 miles from the site of the bridge.

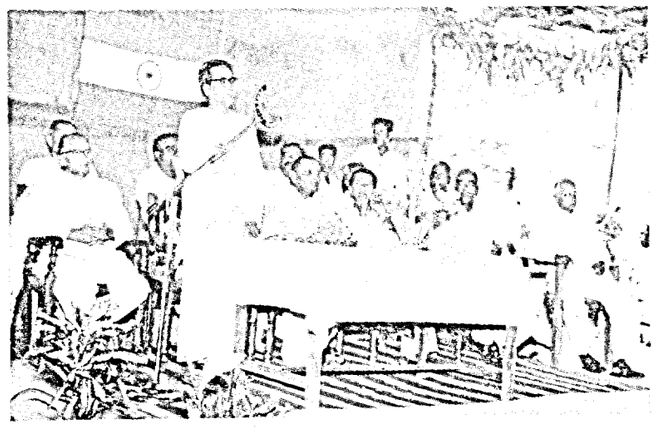

Photo 2. **Shri O. V. Alagesan, Deputy Minister for Transport and Railways, Govt. of India speaking at the Opening function of the bridge.**

Photo 3.
Existing causeway.

Photo 4. **Concreting the well curb.**

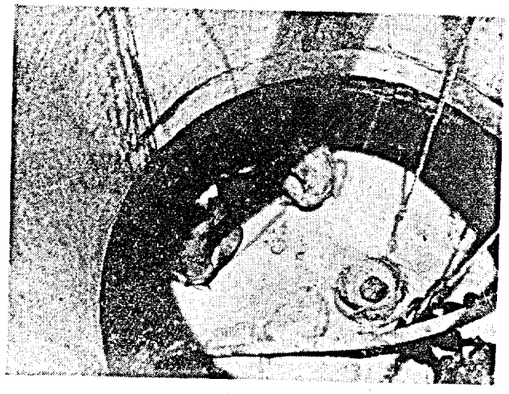

Photo 5. **Interior of a well with the earth under the curb cleared.**

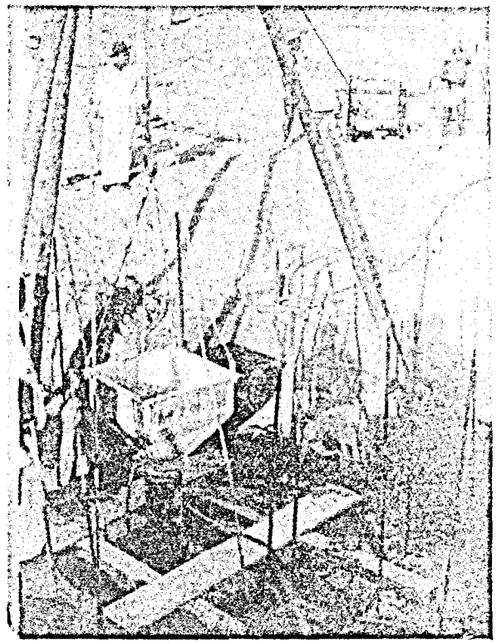

Photo 6. **Tremmie in use.**

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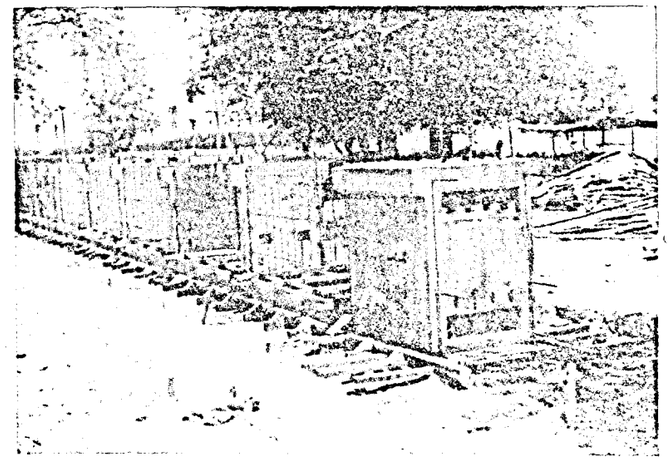


Photo 7. **End block and diaphragms. Note the arrangement of ducts in the end block.**

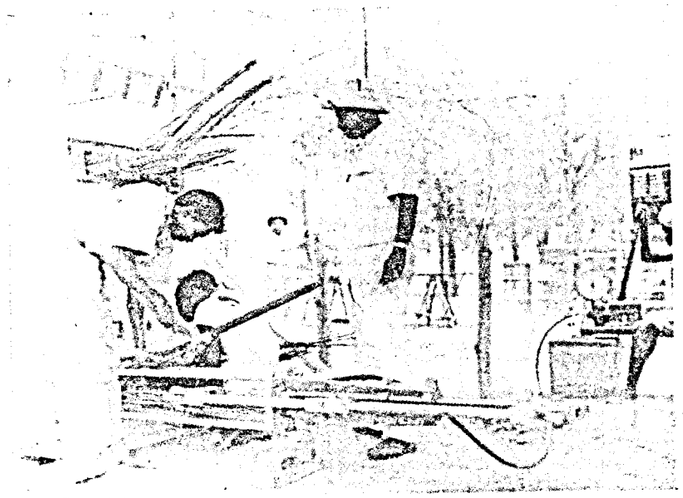


Photo 8. **Fixing of the wires after tensioning by driving in the wedge.**

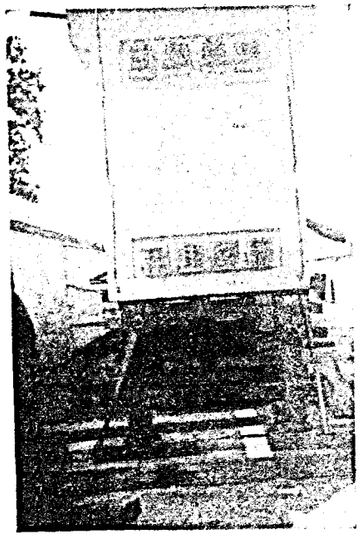


Photo 9. **Beam on sleeper crib.**

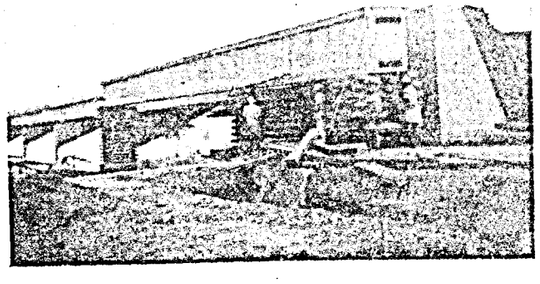


Photo 10. **Transfer of the beam to trollies in the bed.**

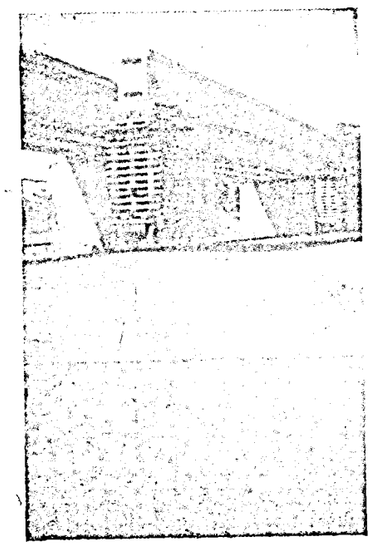


Photo 11. **A beam on the move on the river bed.**

Hydraulic Particulars

Discharges were worked out by taking cross-sections of the river both upstream and downstream of the site and at the railway bridge situated about 4 miles downstream of the site. It was also obtained by adding to the flood discharge over the anicut situated 60 miles above the site, the discharge of the tributaries that join the river between the anicut and the bridge site. The bridge is designed for the maximum of these discharges, namely, 3,28,000 cusecs.

General features of the Bridge

The bridge, which is 2,202 ft long between the faces of abutments, is from bank to bank and provides a lineal waterway of 2,070 feet. There are 23 spans of 90 ft clear each. The piers are of plum concrete 6 ft wide at top with a batter of 1 in 32 Plate I.

Foundations

The foundations for each pier consist of two circular wells reinforced concrete (1:3:6) with 8 ft internal diameter and steining 2 ft thick. The wells are provided with R. C. kerbs having an angle-iron edge and are sunk to an average depth of about 32 ft.

The sinking was done by open dredging to about 20 ft depth. At depths greater than 20 ft, isolated boulders and disintegrated rock were met with. Wherever boulders were met with, they were blasted by means of gelignite, holes having been drilled under water by means of pneumatic equipment.

The bottom 5 ft of the well was plugged with cement concrete 1:2:4. The top plug consisted of 2 ft thick cement con-

crete 1:4:8. The wells were provided with R. C. capping slabs 27 in. thick. For plugging the bottom of the wells a "Tremmie" was used. The "Tremmie" consisted of a hopper connected to a pipe 8 in. diameter. The pipe was taken down to the bottom of the wells and the hopper was well above the level of water in the well. First the pipe was completely filled with sand. Concrete 1:2:4 mix with a consistency giving a slump of 6 in. was poured into the hopper. The hopper and the pipe, which were connected to a winch by means of wire rope and pulley were slowly raised by about 6 inches. Sand flowed out a little and its place was taken by concrete of plastic consistency. In this way the whole pipe was filled with concrete. At this stage, when the pipe was lifted by 6 in. and then lowered, some of the concrete in the pipe flowed out and the bottom of the pipe remained in concrete. Fresh concrete was then poured into the hopper and the pipe was lifted by 6 in. and lowered. This process was repeated. Care was taken to see that bottom of the pipe was always within the concrete that flowed out. A diver was sent under helmet now and then to level up the concrete that had flown out of the pipe. Soundings were taken to ascertain the depth of concrete. Usually it took about 5 hours to plug one well.

Superstructure

The deck consists of 6-in. thick reinforced concrete slab cast-in-situ on the top of 4 precast prestressed girders, each 95 ft 10 in. long. The girders are U-shaped in section and are of cellular construction 61 in. deep and 41 in. wide, plate II. The vertical legs of the 'U' are 5 in. thick and the soffit is 6 in. in thickness. Diaphragms 6 in. thick are spaced at 9 ft 6 in. centres. There are two end blocks 4 ft 10 in. in length. Thus, there are nine bays for each girder.

The girders were prestressed according to Magnel-Blaton system with 256 wires of 5 mm. diameter each. Details are given in Plate II.

Casting of the Girders

The girders were precast in a casting yard on the bank and hauled into position on the piers. The casting and prestressing were done in the following stages:—

1. Casting of the end blocks;
2. Casting of precast diaphragms;
3. Casting of soffit slab;
4. Casting of webs; and
5. Prestressing.

The shutterings for the end block, diaphragms, etc., were made of mild steel plates stiffened with structural steel sections.

Vibrators were used for compacting the concrete.

There were 8 cables of rectangular section with 32 wires in each of the beams. The cables were first built into grills by using the standard Magnel-Blaton grills and inserted into the girder through cable holes provided in the end blocks and the diaphragms. For providing these cable holes, standard Magnel-Blaton rubber cores were used. The wires were anchored using Magnel-Blaton anchorages which consisted of distribution plates of cast steel, sandwich plates and wedges. The cable force is distributed to the end block over such an area that the pressure in the concrete does not exceed 3,500 lb per sq. inch.

The tensioning equipment used consisted of Magnel-Blaton hydraulic jack. The prestressing was done by locking a pair of wires by inserting a wedge in the sandwich plates at one end. The wires were stressed at the other end till the calculated elongation after allowing for pair loss, jack and spring losses and relaxation of the wire during anchoring was reached and then securely anchored by driving hard the wedges into the sandwich plates.

Launching of the Girders

The launching of the girders weighing nearly 60 tons each from the casting bed to the piers was accomplished by the use of two trolley systems, one running on the bank and another on the bed of the river. The girders were first lifted from their bed and placed on the trolleys on the bank. The trolleys were moved to the edge of the bank and the beams were slowly

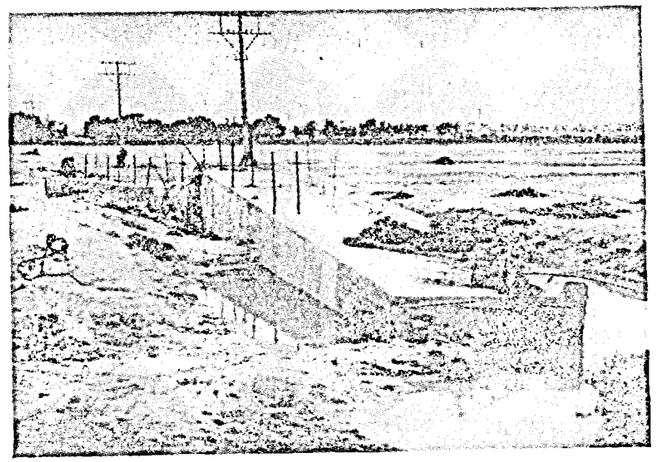


Photo 12. **The fallen beam after the flood has subsided.**

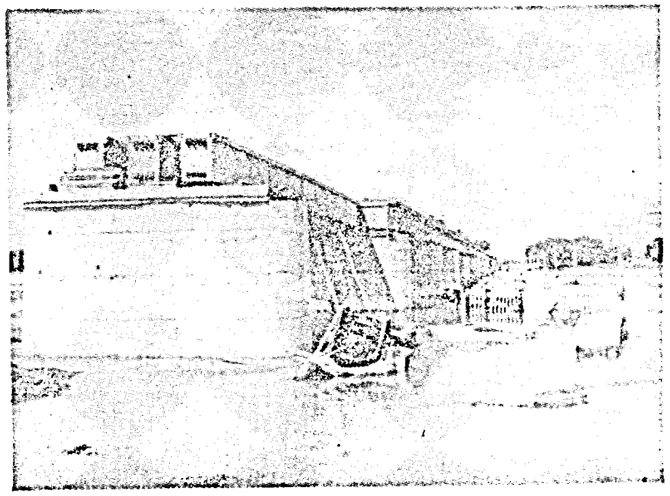


Photo 13. **During launching, one beam fell in the river because of sudden flood.**

transferred to the trolleys with tall cribs built on them to facilitate transfer of the beam on the bed of the river. The bed trolleys were moved along the track by means of relay winches.

When the girder came against the required span, a rail nest was placed between the cribs of the trolleys and cut-waters of piers. A ball racks was introduced beneath the girders and girder was moved over the rail nest on to the piers by means of screw jack.

When the beam for the fifth span from the Chingleput side was being launched, on one evening there was a sudden depression in the Bay of Bengal and 6 in. of rain fell in one night. Flood was rising in the river and rain was pouring from above. In spite of working under these conditions, by the time the rail nest and ball tracks were inserted under both ends of the beam for transferring it to the piers from the trolleys in the bed of the river, the trolleys began to tilt towards the upstream side owing to the scour occurring under the rail track in the bed. The beam fell into the river and appears to have fallen on a mound of sand, causing it to break into two due to the weight of the end block. Photos 12 & 13 show the beam in the river bed.

Roadway

The roadway of the bridge is 22 ft wide with 9 in. by 15 in. kerbs on either side. The wearing coat is of 1 : 1½ : 3 cement concrete. The girders are provided with a rocker bearing for the free end and rest on a mortar pad 6 in. by 1 in. section at the fixed end Plate I.

Cost

The total estimated cost of the work is Rs 25 lakh. The cost of foundations is Rs 5.9 lakh ; the cost of superstructure, Rs 10.5 lakh, the cost of substructure, Rs 3.2 lakh ; the cost per running foot of the bridge works out to Rs 1,051/–. The cost of moving the girders from the casting yard to their position on the piers worked out to nearly Rs 3/- per ton, or Rs 180/– for each of the girders.

DEFINITIONS OF HIGHWAY ENGINEERING TERMS

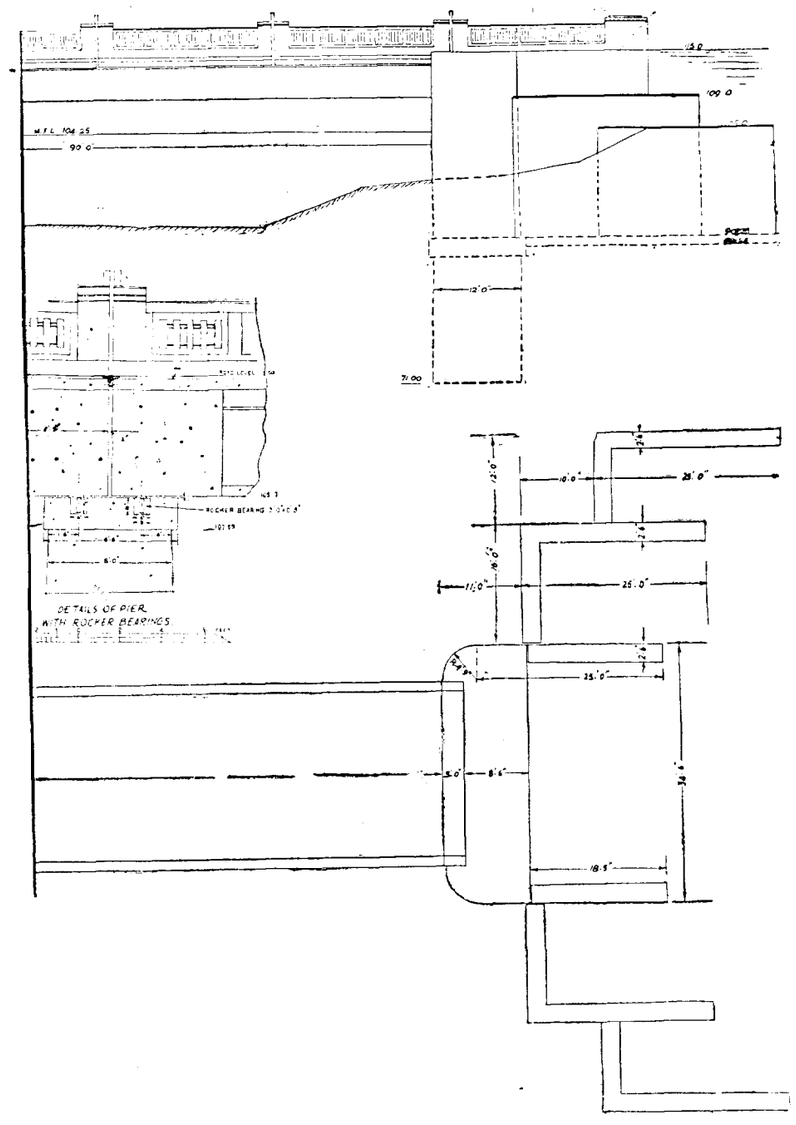
BITUMEN A non-crystalline solid or a viscous material having adhesive properties, derived from petroleum, either by natural or refinery processes, and which is substantially soluble in carbon disulphide.

[Bitumens are black or brown in colour. Though they may occur naturally, they are usually obtained as the last residual products from the distillation of, or as extracts from, selected petroleum oil.]

BLOWN BITUMEN A bitumen the properties of which have been modified by the passage through it of air under pressure at a high temperature.

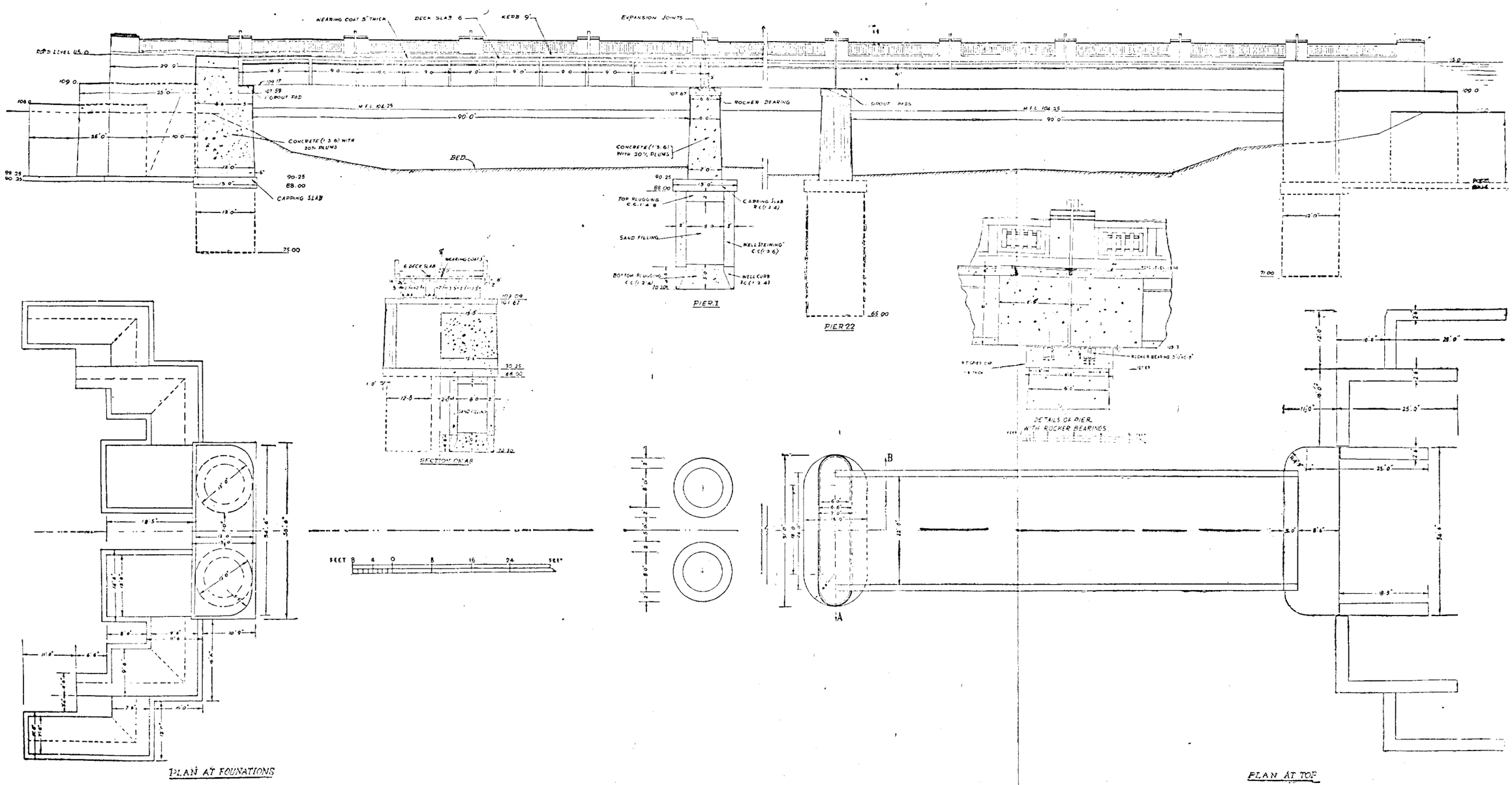
CUT-BACK BITUMEN A bitumen whose viscosity has been reduced by a volatile dilutant.

PLATE I



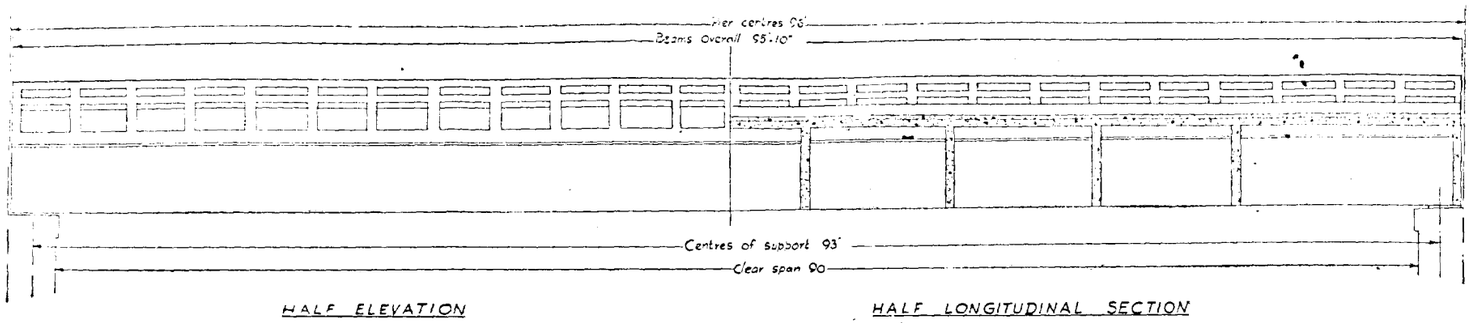
PALAR BRIDGE

PLATE I

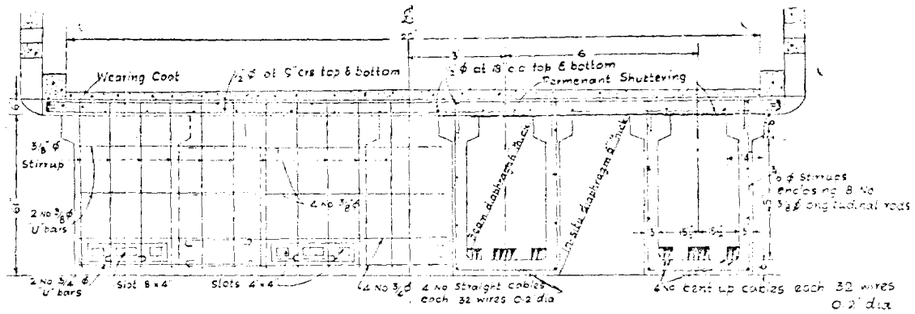


PALAR BRIDGE

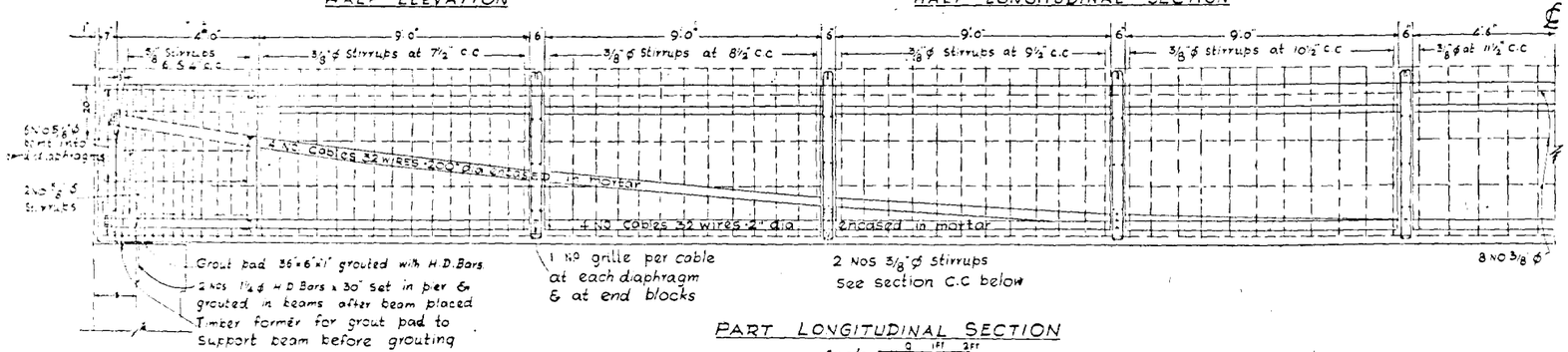
PLATE II



HALF ELEVATION



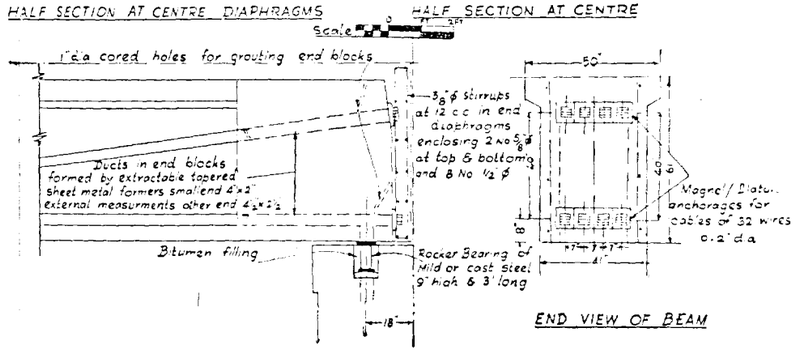
HALF LONGITUDINAL SECTION



HALF SECTION AT CENTRE DIAPHRAGMS

HALF SECTION AT CENTRE

Scale 0 1Ft 2Ft

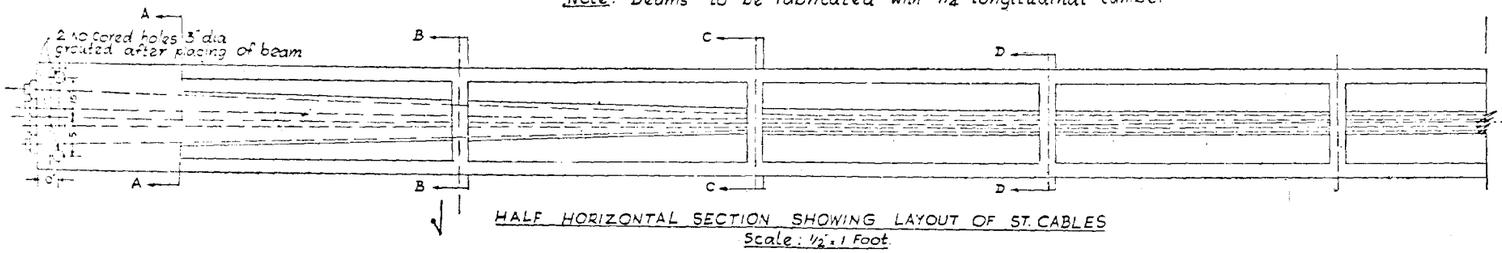


PART LONGITUDINAL SECTION

Scale 0 1Ft 2Ft

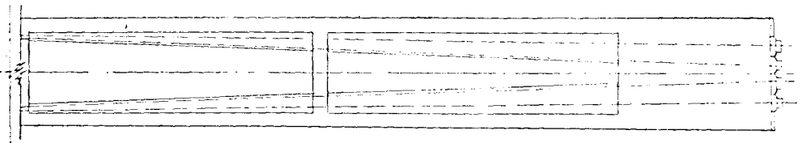
Note: Beams to be fabricated with 1¼" longitudinal camber

END VIEW OF BEAM

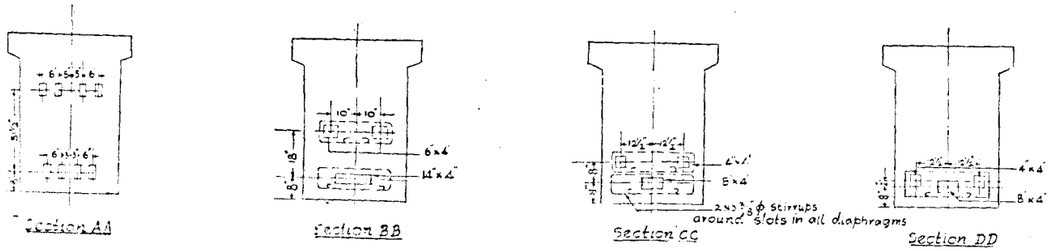


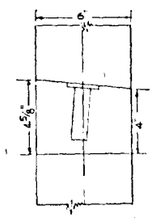
HALF HORIZONTAL SECTION SHOWING LAYOUT OF ST. CABLES

Scale: ½" = 1 Foot

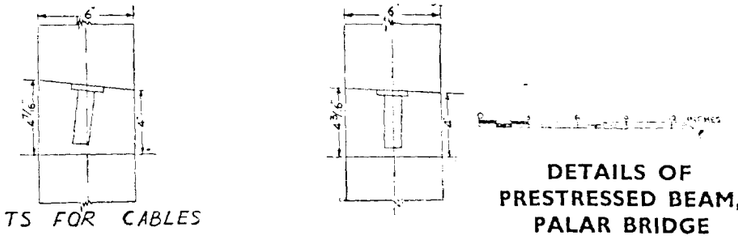


PART HORIZONTAL SECTION SHOWING BENT-UP CABLES



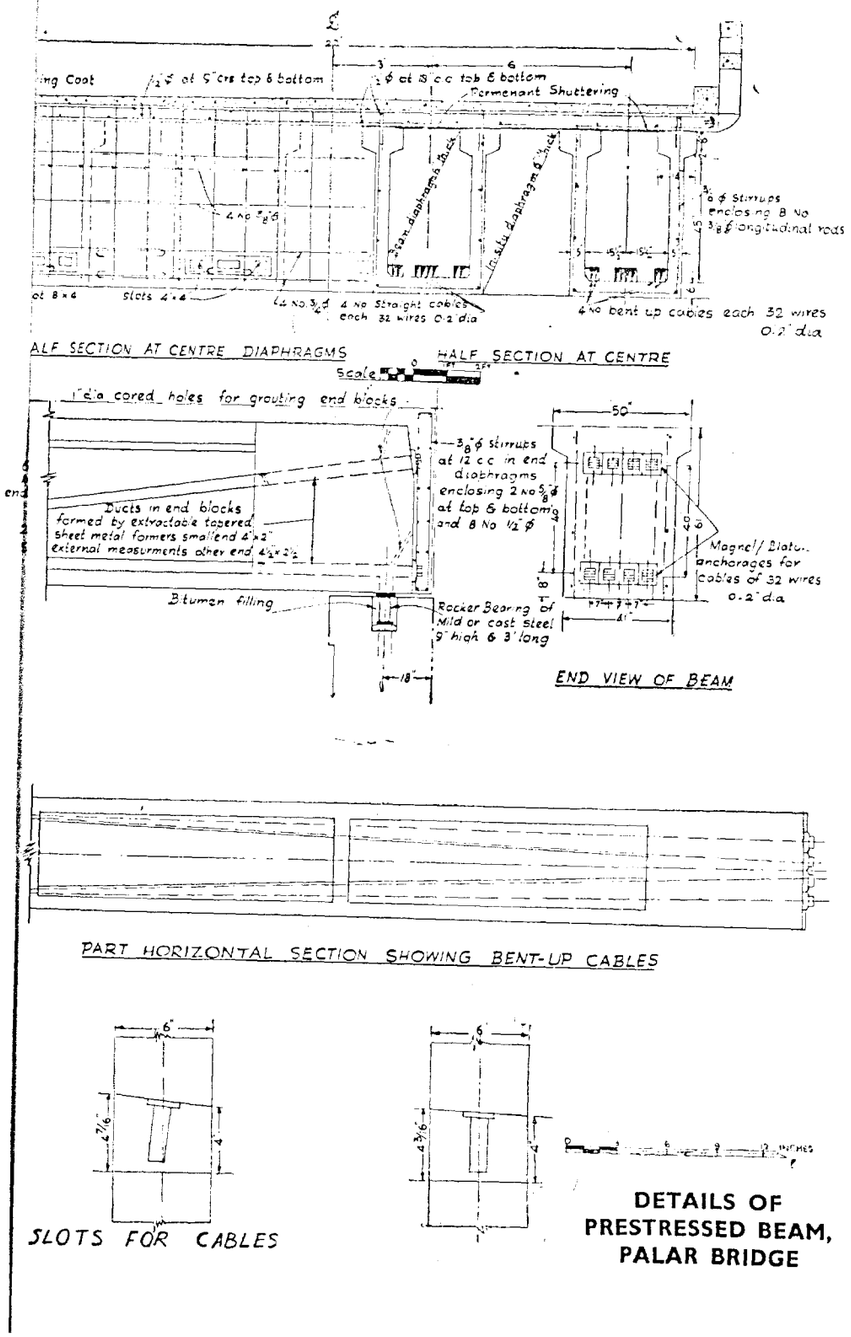


CORED SLOTS FOR CABLES



DETAILS OF PRESTRESSED BEAM, PALAR BRIDGE

PLATE II



DETAILS OF PRESTRESSED BEAM, PALAR BRIDGE

EDITORIAL COMMENTS ON THE PRESIDENTIAL ADDRESS OF SHRI K. K. NAMBIAR

Delivered At Nagpur

The Hindustan Times, New Delhi, 9-1-1956

Rural Roads

ADDRESSING the Indian Roads Congress Mr K. K. Nambiar has made a special plea for more rapid development of rural communications and urged that "without adequate and ear-marked funds, rural roads can never receive the attention they deserve and without adequate rural roads the benefit of all round advancement can never reach the rural population." He is justified in his complaint that the present pace of road development in this country has no relation to actual needs. As even at the end of the Second Five-Year Plan period, the country will have only about 117,000 miles of surfaced and 213,000 miles of unsurfaced roads, the inadequacy of road facilities for India's expanding economy is obvious. The neglect has been particularly noticeable in the case of the construction of rural roads, though, as Mr. Nambiar has pointed out speedy expansion of rural communication is essential not only for increasing the standard of living in rural areas but also for bringing urban and rural populations into closer contact. The standard of road maintenance also has suffered for lack of planned attention. A country-wide road development programme which will provide, within a measurable distance of time, sufficient road communication facilities for the country's economic needs, particularly the needs of rural areas, will serve a double purpose. It will help in speeding up economic development and at the same time provide considerable scope for relieving unemployment. No national programme for economic reconstruction can afford to neglect road development.

Lack of funds is the reason generally given for the slow progress of road development. As Mr. Nambiar has mentioned in his address, this lack is only the result of a certain attitude towards roads in general. "This attitude betrayed itself" Mr Nambiar observes, "in the readiness with which funds intended for roads had been diverted to other purposes and the promptness and severity with which the axe was applied to the road budgets at the slightest excuse." There is no doubt of the fact that the importance and urgency of road development are still not properly appreciated-due to the unfortunate impression that programmes for road construction and road improvement can wait. In any case, the suggestions made by Mr. Nambiar for raising the necessary funds—many of them have often been made in the past—should be taken up for immediate consideration and implementation. The first step is the creation of a statutory non-lapsing fund for financing all road development and maintenance programmes. There is already the suggestion of the Taxation Commission for setting up an All-India Rural Communications Fund with contributions from the proceeds of customs and excise duties on petrol and such other sources. There are a number of other ways by which these funds can be augmented from year to year for financing road development and maintenance.

Mr. Nambiar has also mentioned the desirability of issuing Highway Bonds for raising additional funds, as has been done in certain other advanced countries. If there is a definite road policy based on the country's actual needs, it should not be difficult to lay down necessary plans for financing it on a regular basis.

The Hitavada, Nagpur, 10-1-56

The delay in the implementation of the Nagpur Plan, especially between the year

1943 and the commencement of the First Five-Year Plan, was no doubt due to lack of finances. But finances could have been found if the Government had not adopted a step-motherly attitude towards road development. In his presidential address to the 20th session of the Indian Roads Congress Mr. K. K. Nambiar, Chief Engineer, Madras, passed some pertinent comments on the Cinderella-like treatment meted out to road development in this country. "Lack of finance for roads", observed Mr. Nambiar "is only the result of a certain attitude towards roads in general. This attitude betrays itself in the readiness with which funds intended for roads have beeen diverted to other purposes and the promptness and severity with which the axe is applied to the road budgets at the slightest excuse". Mr. Nambiar went on to reiterate the need for the creation of a statutory non-lapsing fund for financing road development and maintenance programmes. This is a prime plank in the platform of the Roads Congress and has been stressed in almost every presidential address, including that of Mr. R. K. Batra's at the Bhubaneswar Session held in February, 1954. In the chapter on "Roads" in the First Five Year Plan the Planning Commission has recognised "the importance of continuity in the supply of funds with a view to avoiding wasteful expenditure and pursuing even modest programmes without interruption".

The funds must therefore be adequate and non-lapsing if we are to make up the leeway in road development.

Mr. Nambiar's suggestion that road-user taxes should be earmarked for the development and maintenance of roads and that they should be credited to statutory road funds of the Centre and States is one that deserves close attention.

The Bombay Chronicle, Bombay, 10-1-1956

Road Programme

There is not the slightest doubt that as Dr. Pattabhi Sitaramayya, Madhya Pradesh Governor said in his inaugural Address, the objective of doubling India's per capita income calls for a more adequate road system, and it is the inadequacy of the roads that has put a heavy strain on the railways. He said that without roads the scope and utility of every other item of development would be retarded. It is no exaggeration to say that not only economic development but all civilised amenities in the remote rural areas are dependent on a proper development of the road system. That this is fully realised by the Planning Commission is clear from the bigger targets envisaged in the Second Plan, which provides for an expansion of national highways from about 12.5 to 17.5 thousand miles and of State roads from about 20 to 35 thousand miles.

Alluring as it is, Mr. K. K. Nambiar's other suggestion to raise loans against "highway bonds" may be open to objection. Loans to the utmost extent possible have to be raised and will be raised both by the Centre and State governments for development purposes, but it may be impracticable to issue the type of bonds suggested, which, in any case have no additional emotional appeal that might make the raising of loans easier. The suggestion to create an Indian Service of Highway Engineers is also a proposal which overshoots the target. Suggestions for creating of an Engineering Service have been made and may have some chance of acceptance, but of a special cadre only for Highways has little chance of coming through. This, by itself, however, need not stand in the way of the engineers using their talents and initiative to develop indigenous pavement designs as he suggested and cheaper techniques. There could also be no difficulty in the States setting up separate departments devoted to the development of highways. As the plan-frame said the expansion of road building "is desirable from the point of view of providing both employment and the basic amenities of life in rural areas," and if this work can be done more effectively by a separate department there is no reason why there should not be such a department in each State.

The Nagpur Times, 10-1-1956

Need For More Roads

Probably Financial Experts will find it difficult to agree with Nambiar's proposi-

tion that the entire revenue from above (road user) taxes and levies should be placed in the Roads Fund and that its diversion to any other purpose should be statutorily prohibited. Many of these taxes were levied, to start with, for making up the deficits in the Budgets of the various Governments, which viewed them as sources of taxation that could be profitably tapped. It was not with an eye to the development of the roads that these taxes were imposed. Evidently therefore, if Nambiar's suggestion is accepted, the people may have to bear more taxes on certain other commodities or services. Similarly demarcation of certain revenues for certain purposes only is wrong in principle from the point of wholeness of the State finances. What the State is supposed to do is to impose taxes where the burden can be borne without feeling its weight, and make allotments for those purposes which are of great national urgency. Nothing should be done to alter that basic fundamental of public finance, although it is necessary that expenditure on roads should bear certain proportion to vehicle and other taxes collected by the Central and the States Governments. What that proportion should be should depend upon how urgent the proposed expenditure is.

We are, however, in entire agreement with Nambiar when he suggests that allotments for roads should be non-lapsable. Much of the progress in the construction of roads and buildings is held up because of Red Tapism. After an amount is allotted in the Budget, it takes half the year to set the wheels in motion. During the remaining half of the year, when things have started going a considerable portion of the allotment lapses, and there is again the slow motion of the wheel of allotments and sanctions. This process must be stopped if construction works are to be done economically, efficiently and quickly. After the State has decided to complete the construction or repairs of a certain road, the amount allotted for that purpose should be placed in the Roads Fund, and Engineers left to carry on their work without further worry about the finances. This practice would also stop the great pressure of payments at the end of every financial year, felt by State Governments, because everyone is keen on spending as much as possible before the year ends. There is no wonder if this hurried execution of works gives us indifferent roads and defective buildings.

It hardly needs an array of arguments to prove that we can not make much advancement unless there is a network of good roads all over the country, connecting every village with its neighbouring market, and the smaller markets with the larger. It would be no exaggeration to say that rural development and the solution of the problem of rural unemployment depend largely upon quick construction of more roads. To this end our manpower should be used to the maximum along with what mechanical aid can be availed of. It also needs expansion of training facilities for technicians. We can have more roads quickly only if we make an all-out effort for it.

The Mail, Madras, 9-1-56.

Actually, as Mr. Nambiar indicated, roads add to the general revenues instead of drawing from them. Let Governments show in their budgets their share of the road user taxes against their allotments for roads, to enable the public to see how far the money they pay is applied to roads.

Mr. K. K. Nambiar wisely goes farther and suggests that all road user taxes should be ear-marked for the development and maintenance of roads and credited to statutory road funds of the Centre and States and that their diversion to other purposes should be prohibited by statute.

He asserts that "Even after meeting charges for collection and administration, the balance will be sufficient to meet all normal expenditure on the development and maintenance of roads, provided the road funds of the Central Government are equitably allocated to the States". One great advantage in establishing such funds is that unspent grants for roads in the budget, instead of being allowed to lapse, can be added to them and utilised for such purposes in the succeeding year or years.

The Taxation Inquiry Commission, which reported in March 1955, suggested the creation of a Rural Communication Fund, the Central Government making an annual contribution from the proceeds of

customs and Central excise duty on petrol, and State Governments contributing sums amounting to not less than 25 per cent of the Central Government. That recommendation should be implemented without delay, as Mr. K. K. Nambiar urged, so that more grants may be given for village roads. Such roads are under the control of local bodies, but these have insufficient resources to maintain them. In Madras and Andhra States the revenues of District Boards have fallen considerably in recent years, and some have reduced their expenditure on communications. The result is—Mr. Nambiar puts it very mildly—"the construction of rural roads lags behind."

Numerous villages are still unconnected with main roads leading to towns in which markets, hospitals, centres of higher education, and courts and public offices are situated. Often they are isolated when there is heavy rain and large areas are flooded. Existing rural roads are, mostly, in a deplorable condition: so are many of the major roads. In Madras State, in 1953 the latest year for which official statistics are available, out of a total of 25,885 miles of road, 10,820 miles were unmetalled. Most of them are corrugated or broken, causing serious discomfort to travellers and damage to vehicles, while dust from roads envelopes houses and spreads diseases. Mr. Nambiar said: "Without adequate, earmarked funds, rural roads can never receive the attention they deserve, and without adequate rural roads the benefit of all-round advancement can never reach the rural population." This is often overlooked by authority, despite so much talk about rural development.

The Assam Tribune, Gauhati, 8-1-56.

It has hardly been realised that the production targets, under the Second Plan, especially those of steel, cement and coal would necessitate a tremendous increase in the demand for rail, road and shipping traffic. The overall targets of production in the coming Plan will add up to an additional load of 61 million tons per annum on the railways or about 50 per cent more than what the railways would be carrying at the close of the First Plan. It is patently not possible for the railways to cope with this burden of traffic unless their plan of Rs 1480 crores is totally approved. With the reduced allocation of only Rs 1,125 crores it would not be possible for the railways to make provision for anything more than about 42 million tons of additional capacity. Similarly a bare provision of Rs 250 crores for roads would be very inadequate to meet the increasing traffic requirements. Also, the shipping targets can hardly be realized within the small total provision for transport. The "Plan-frame" had envisaged an expansion in our shipping tonnage from 525,000 tons in 1953-54 to about 1,500,000 tons in 1961-62. But with an overall sanction for transport of Rs 1,384 crores it is well nigh impossible to realize this target of shipping tonnage.

As a result of all this it looks as though the transport bottlenecks would continue even during the Second Five Year Plan and might even get worse than they now are at the end of the First Plan. Industry and commerce would be severely affected by the lop-sided development that would naturally result. In Assam particularly the commercial interests have been anxiously looking forward to an improvement in the transport position. But the provisions for transport under the Second Plan leave little for them to enthuse about but probably only something to fear. This unrealism in making inadequate allotment for transport will also be reflected in the danger of inflation that is likely to be consequence of transport bottlenecks. Again, since transport was expected to provide about 40 per cent of the new employment opportunities under the Second Plan the slash in transport expenditure will reduce such opportunities.

FILLING AND SEALING MATERIALS FOR JOINTS IN CONCRETE ROADS

R. S. Millard,

Road Research Note No. 7, Deptt. of Scientific & Industrial Research, Road Research Laboratory, Harmondsworth.

(Concluded from February 1956 T.C.M.R.)

Methods of supply

Commercial compounds are usually sold by weight. As the density of different compounds varies between 60 and 110 lb per cu. ft., this custom may be misleading in calculating quantities and comparing prices. It is occasionally found that a compound at a higher price per ton than another is cheaper per yard run of joint because it has a lower density. A conversion table (Table 2) enables the length of joint sealed per hundredweight of compound to be calculated from the weight per unit volume of the compound and the dimensions of the joint.

Compounds are usually supplied in metal drums. If they are hot-poured types, this occasions some difficulty in transferring them to the heater. A more convenient method of supplying compounds is in stout reinforced paper bags or cartons, the insides of which have been dusted with a fine powder to enable the paper to be easily stripped from the compounds. After the paper has been removed the compounds are cut with a hot shovel into pieces of convenient size for placing in the heater.

Table 2

QUANTITIES OF SEALING COMPOUND

	Yards run per cwt of sealing compound											
Specific gravity of sealing compound	1.0			1.25			1.5			1.75		
Weight per cu. ft of sealing compound (lb) *	62.5			78.2			93.8			109.5		
Joint width (in.)	½	¾	1	½	¾	1	½	¾	1	½	¾	1
Depth of seal (in.)												
¾	180	130	100	143	104	80	120	86	67	102	73	57
1	141	100	78	113	80	62	95	67	52	81	57	44
1½	100	70	54	80	56	43	67	47	36	57	40	31

* These figures are calculated for joints with arrisses rounded to ½-in. radius, but include no allowance for wastage, which may be as high as 20 per cent.

Application of the sealing compound

It is essential to the riding quality of the road that the arrisses of the joint be properly shaped and that the slot to receive the sealing compound be neatly formed. Neat joints also give a good appearance to the road.

Suitable dimensions for the slot to receive the compound have been found to be ¾ in. for the width and 1 in. for the depth. The edges of the joint are usually rounded to minimize danger of spalling. In practice it is found difficult to form arrisses of less than ⅜-in. radius and this dimension has been found satisfactory.

Forming the slot.—Recommendations on the method of construction are outside the scope of this Note but as the method of forming the slot may affect the performance of joint-sealing compounds, some general indications are given of methods which have been used successfully. The slot is most conveniently formed at the time of construction. In hand construction a suitable method is to clip a wooden lath of the required section to the top of the joint filler. After compacting the concrete past the joint, the lath is removed and the joint is raked clean and arrissed. It is then an advantage to replace the lath to prevent grit from entering the joint before the sealing compound is applied.

Methods based on this principle have been successfully employed with concrete compacted by machine. In one method the wooden lath is replaced by a metal assembly locking into the side forms and a small clearance is allowed to accommodate surge of the concrete. For dummy joints a rubber-covered metal bar has been used.

Care should always be taken that no continuous concrete remains across the joint either below the joint filler or between the filler and the sealing compound.

Preparation for sealing.—The edges of the joint should be dry and free from dust and grit. If they are damp or dusty no sealing compound will adhere to the concrete. If a bituminous sealing compound is to be used, the edges of the joint should be primed with a thin bituminous paint.

During the past ten years machines have been developed for cleaning, priming and applying the sealing compound. The machines enable these jobs to be done quicker, more neatly and more thoroughly than by hand.

A cleaning machine, comprises a rotating wirebrush driven at high speed by a small petrol engine and mounted on a three-wheeled carriage which can easily be manoeuvred by one man. This machine finds its main uses in removing dust and laitance from the edges of joints in newly laid concrete and in preparing roughly cleaned old joints for sealing. It is not intended for use in cleaning out old joints containing appreciable quantities of sealing compound. It cleans out grooves up to 1 in. deep and if the groove is wide two brushes can be fitted side by side.

An alternative method of removing dust is by an air jet. A machine was originally designed to spray white-line road paint and has been adapted for this use. It incorporates two jets; from the forward jet, air is blown into the joint to remove dust, and from the rear jet, primer is sprayed into the joint. The machine incorporates an air compressor driven by a petrol engine, and a tank containing 5 gallon of primer, which is sufficient to treat approximately 800 yard of joint.

Priming: This is an extra operation and is often neglected. The improved adhesion and resulting increased durability make the operation well worth the small extra cost. Some manufacturers supply primers for use with their sealing compounds. A suitable primer for most compounds may be prepared by fluxing a soft straight-run bitumen to the consistency of paint with light creosote oil and solvent naphtha.

The following is a description of the constituents and the manufacture of such a primer that has been found satisfactory.

A soft residual bitumen is melted and fluxed with just sufficient light creosote oil to render it fluid (of the consistency of

thick syrup) when cold. When in this condition, solvent naphtha is added to bring the mixture to the consistency of paint. The approximate composition of a suitable mixture is as follows:

Percentage by weight	
200-pen. bitumen 66	Blended hot
Light creosote oil 14	Blended hot or cold
Solvent naphtha 20	Blended cold

As the solvent constituents are volatile the primer should be in airtight tins. This primer is highly inflammable and should not be exposed to heat or naked flame.

The primer may easily be applied with a brush, using as thin a coating as possible. It should be allowed to dry before the sealing compound is applied.

Bituminous emulsions have been found rather unsatisfactory as primers, as they generally break before the bitumen is able to penetrate into the surface of the concrete.

Sealing. The best method of heating hot-poured compounds is in an oil-jacketed heater, to prevent overheating. Such special heaters are most desirable with rubber/bitumen compounds because the difficulty sometimes encountered in pouring provides a great temptation to overheat. With some jet-resistant compounds a thermostatically controlled heater is essential.

For normal compounds, if a special heater is not available, a small tar-boiler may be used, when special attention will be required to prevent overheating.

For placing in the heater the sealing compound should be broken or cut with a hot shovel into pieces about the size of a 6-in. cube. A small quantity of compound should first be melted in the bottom of the heater by gentle heat, more pieces being added as the compound in the boiler becomes liquid. Sealing compounds should never be heated above 200°C (392°F); the temperature should never exceed 180°C (356°F) for long periods. The heating of sealing compounds in drums over a fire-basket is not recommended because control of the heating temperature is almost impossible. All compounds should be well stirred during heating to disperse any filler which might otherwise settle to the bottom.

The sealing compounds can be poured using a heavy watering can with an extended nozzle which may be placed right in the joint. When the more viscous rubber/bitumens are used it may be necessary to use an open asphalt bucket with a narrow spout.

With practice, operators are able to pour quite neat joints. As an aid to neatness two boards may be laid, one on each side of the joint, and the sealing compound poured up to them. Hand pouring is slow, however, and is particularly difficult on windy days.

Pouring machines are now available; one such machine consists of a small tank (11-gallons capacity) heated by calor gas mounted on three wheels and with a gravity-fed heated nozzle. Flow of sealing compound can be controlled from the nozzle of the machine. The machine can be used to heat sealing compounds from cold. This, however, means that sealing must be delayed while the compound is heated. A more efficient use for the machine is in conjunction with a heater of approximately 200-gallon capacity to which the unit is taken from time to time to be replenished.

In winter the joints should be poured slightly low to accommodate future compression. In spring, summer and autumn the compound should be poured until it is level with the concrete. Excess material may easily be cut away with a sharp shovel or levelled with a hot iron provided the material is not burned.

Maintenance

All concrete road joints and cracks should be inspected once a year, preferably in the autumn, and all defective joints and cracks resealed. The following method is recommended.

Cleaning. All joints and cracks should be cleaned so that they are completely

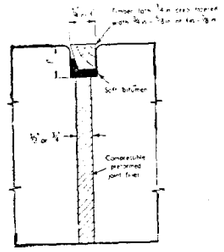


Fig. 3. Method of Using Wooden Inserts to Fill the Sealing Slot Temporarily

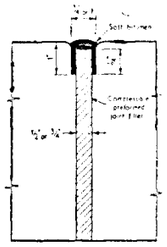


Fig. 4. Method of Using Preformed Joint Filler to Fill the Sealing Slot Temporarily

free of grit. If the joints have previously been filled with bitumen or other non-compressible material, as much of this material as possible should be cleaned out.

This work can be done by hand but is greatly expedited by the use of cutting and grooving machines. In one machine developed for the purpose the cutter consists of a number of toothed, forged-steel wheels mounted freely on axles set on the perimeter of a revolving drum. The drum is driven at a speed of up to 2500 revolutions per minute by a petrol engine. The groove cutting action of the machine arises from the flail-like motion of the cutter wheels as the drum rotates. The width of the cut can be varied between ½ in. and 2 in. and the maximum depth of cut is 1¼ in.

Filling the Joints. The principle adopted in filling old joints and wide cracks is to pack them with a compressible material to within 1½ to 2 in. of the top before sealing. If the joints are well formed it may be possible to tamp in pieces of fibreboard. Usually, however, this is not practicable, and it is necessary to use such material as chopped fibreboard, hemp, copra or sawdust. The material should be packed firmly but not tightly.

Sealing. The tops of all joints and cracks should be sealed following the recommendations in the section on joint-sealing compounds. If a bituminous sealing compound is used, joints should be primed before sealing.

On some old concrete roads vertical movement at the joints occurs under traffic, especially when load transfer devices are not used. This imposes an added strain on the sealing compound, which is required to be sufficiently deformable to accommodate the rapid movements and yet be sufficiently hard to resist the ingress of grit. Both these requirements cannot be met with any existing compound and it is necessary to tolerate the ingress of some grit in using a compound which will accommodate the vertical movements satisfactorily. For this purpose the most suitable compound is a rubber/bitumen mixture of rather soft consistency.

In order to derive the full benefit from oint-cleaning and sealing machines they should be used in combination. Using a team in which the grooving machine was followed by the rotary brush, then by the priming unit and finally by the pouring unit it has been found practicable to treat up to two miles of joint per day on a concrete road. Higher rates of working can probably be achieved on airfields.

The cost of re-sealing joints by hand is generally between 9d. and 1s. 3d. (Rs -/8/- to Rs 1-1-0) per yard, two-thirds of this cost being the price of materials. Mechanization will not reduce this cost substantially. Its main advantages are in the greater output and in the higher standard of workmanship which should increase the period before which further maintenance is required.

ABSORPTION OF WATER BY BRICKS TREATED WITH BITUMINOUS MATERIALS

by

S. R. Mehra, H. L. Uppal & L. R. Chadda

IT is sometimes necessary to waterproof burnt bricks when used in foundation or roofing.

Attempts to paint brick with bitumen with a brush and by dipping it in a hot bitumen for some time were not successful. Impregnating bricks with bitumen under vacuum was costly.

Experiments were, therefore, carried out to waterproof bricks by painting with cold penetration bituminous materials. Bricks of uniform average quality were selected, and their absorption when immersed in water for 24 hours was determined. The bricks were then dried in the oven to constant weight and used for various tests.

Three grades of cold penetration bituminous material, Primer No. 1, 2 & 3, were heated and applied to bricks of known absorption at the rate of 10, 15 and 20 lb per 100 sq. ft area. The composition of the primers used is given below.

Primer No. 1

Bitumen 80/100	50 per cent
Diesel Oil	50 per cent

Primer No. 2

Bitumen 70/100	30 per cent
Diesel Oil	70 per cent

Primer No. 3

Bitumen 80/100	30 per cent
Furnace Oil	70 per cent

The absorption at the end of 24 hours is given in Table 1.

Experiments were also undertaken by painting bricks with bitumen 80/100 and bitumen mixed with 5, 10 and 15 per cent of kerosine oil. The results are given in Table 1.

Table 1

Absorption of Bricks after Immersion in Water for 24 hours

Waterproofing material		Rate of painting lb per 100 sq. ft	Temperature of heating Degrees Centigrade	Percentage absorption in 24 hours	
				Blank	Treated
Bitumen diluted with kerosine					
Per cent	5	20	180–200	12.9	11.6
	5	20	180–200	13.6	11.8
	10	20	180–200	14.51	11.6
	10	20	180–200	13.51	6.3
	15	20	180–200	11.77	6.7
	15	20	180–200	11.24	8.4
Primer No. 1		10	70–80	11.6	
		15	70–80	10.2	
		20	70–80	12.3	
Primer No. 2		10	70–80	8.7	The oily layer got separated from the brick under water
		15	70–80	12.6	
		20	70–80	13.5	
Primer No. 3		10	50–60	10.5	
		15	50–60	11.6	
		20	50–60	10.9	

It will appear from Table 1 that none of the treatments could completely waterproof the brick.

Further experiments were carried out by applying a tack coat of varying quantities of Primer No. 1, 2 & 3 and then treating the brick with hot bitumen at 20 lb per 100 sq. ft. These bricks were immersed in water for 24 hours. The percentages of absorption by different treatments are given in Table 2.

Table 2

Absorption of Bricks treated with Bitumen and a Primy Coat

Material used	Rate of application lb per 100 sq. ft	Temperature of application of bitumen Degrees Centigrade	Percentage absorption	
			Blank	Treated
Primer No. 1	10	180–200	12.5	2.1
	15	,,	11.8	0.6
	15	,,	10.7	0.5
Primer No. 2	10	,,	13.2	1.4
	15	,,	12.2	0.6
	15	,,	14.1	0.6
Primer No. 3	10	,,	15.1	10.2
	15	,,	13.2	6.5
	20	,,	12.6	5.1

It will appear that a tack coat of Primer No. 1 or No. 2 and bitumen could waterproof bricks.

The above described experiments show that a tack coat of Primer No. 2 followed by a coat of bitumen could replace two layers of bitumen in sealing roofs against leaking. Also, bricks treated with Primer No. 2 and bitumen could be used in damp-proof courses and possibly in the lining of canals.

DRIVING NEAR PARKED CARS IS DANGEROUS

City driving has many dangers and not the least of these dangers is the danger of driving near parked cars. Driving near them you'll find that the unexpected can happen so suddenly and so close at hand that you rarely have time to avoid the consequences. Irresponsible drivers whip out from the curb right into your line of travel.

When driving near parked cars, be alert and avoid an accident.

HERE AND THERE

1. REFUSAL TO GRANT A CERTIFICATE OF APPROVAL OF LOCATION FOR PETROL STATION IN A BUSY LOCALITY HELD VALID

IN a town (Milford in Connecticut, U. S. A.) a certificate of approval for location of a petrol station was obtained in 1946. The certificate was not used. In 1952, a new owner unaware of the certificate given in 1946 applied for a fresh approval. This application was rejected. Using the certificate given in 1946, licence for the operation of a service station was obtained from the Commissioner of Motor Vehicles. The town of Milford then instituted court action against the Commissioner of Motor Vehicles. The Supreme Court held that the denial of the certificate in 1952 operated to revoke the certificate granted in 1946 and that the Commissioner of Motor Vehicles had no powers to issue the licence.

In 1953, the owner again applied to the Zoning Board for a certificate. This was refused. The owner appealed to the court. The court dismissed the appeal. On appeal the Supreme Court held that the Board had not acted unreasonably in denying the application because it felt that traffic conditions at the proposed location were hazardous. **The property had frontages on three streets and entrances and exits were proposed for all three.** Evidence tended to show that traffic on the three streets was frequently congested and that many **cars in entering and leaving the petrol station would have to cross traffic lanes.** Furthermore, the presence of the petrol station in proximity to a public park might well provide a definite hazard for those seeking to enjoy the facilities of the park.

(From 'Memorandum No 83-3, Circular 301, Highway Research Board,' U. S. A., November, 1955.)

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2. BELGIAN ROAD FUND

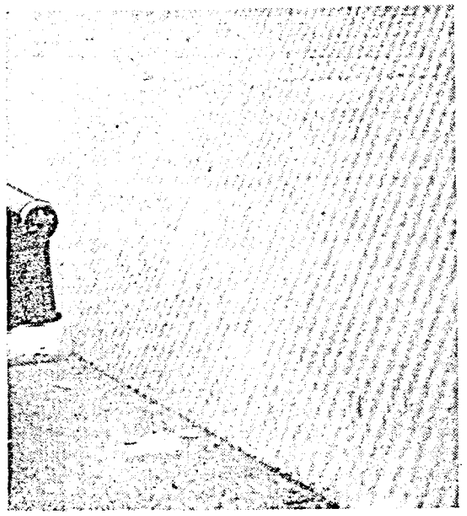
UNDER a law passed on August 9, 1955, a new Road Fund has been set up by the Belgian government with the object of speeding up the urgent work of extending and improving the national road network. It takes the place of the original Fund set up in 1952 which, although charged with a very extensive programme of construction and modernisation, had achieved only limited results, largely through lack of money.

The Fund will be financially autonomous and will have authority to issue over the fifteen-year period government-guaranteed loans to the value of the required B. Frs. 30,000 million. The first loan, to the value of B. Frs. 2,500 million, was issued on October 17, 1955, and will be followed by equivalent loans in each of the two following years. The Fund will also receive an annual allotment from the government Extraordinary Budget, destined principally for the servicing of its loans.

The Fund will be under the supervision of the Minister of Public Works and Reconstruction and will be administered by civil servants drawn from the Ministries of Public Works, Finance, Economic Affairs, and Communications.

One B. Franc equals Rs 0-1-6.

(From 'Highways and Bridges and Engineering Works,' October 26, 1955.)



3. SLOPING BEVELED RETAINING WALL MINIMIZES GLARE

A noteworthy design feature of the urban expressways at Austin, Texas, is an unusual retaining wall effect, aimed at cutting down noise and glare. The walls are corrugated by forming them against corrugated metal form lining. The walls have a batter ranging from .5 to 1 to .7 to 1, the bevel being adjusted for various local conditions such as height. Pleasing effect as well as eliminating glare and minimizing traffic noise are achieved by this sloping beveled retaining wall design.

(From "Roads and Streets", December 1955.)

4. SINGLE-SIZED ROADMAKING AGGREGATES

THE work carried out by the Road Research Laboratory (England) on single-sized gravel aggregates has been extended to single-sized roadmaking aggregates, 244 samples of which, from $\frac{1}{4}$ to 2 in. in size, were obtained from county surveyors of England and Wales. The aggregates were subjected to tests for grading, shape, specific gravity, and resistance to crushing impact and abrasion to determine their compliance with British Standard although not all of the samples had been ordered to that specification.

The following conclusions are drawn: (1) Only 28 per cent of the samples would have complied with all the requirements of B. S. 63. (2) The most difficult requirement was the minimum permitted percentage of the specified size; only 52 per cent of the samples would have complied with it, though a high proportion of those which would have failed to comply were good single-size aggregates of a slightly smaller or larger nominal size than that specified. It is thought that commercial production to the correct nominal standard should be possible when the appropriate screens are used on the plant. (3) Two modifications of B.S. 63 are suggested: an increase of the permitted flakiness index of the $\frac{3}{8}$-in. nominal size from 35 to 40 and a reduction of the aperture size of the sieve used to define the small undersize in the $\frac{1}{4}$-in. nominal size from No. 7 to No 10.

(From "Highway Research Abstracts"—November, 1955.)

5. FAR-SIDE BUS STOPS CUT ACCIDENTS

ABOUT three years ago, the city of Tucson, Arizona (population 175,000) relocated all bus stops on the far side of street intersections. A comparison of accident records for the six-month periods before and after this change showed that:

(1) Accidents involving passengers boarding or leaving buses had dropped from 24 to 8—a reduction of 66 per cent.

(2) Collisions between buses and other vehicles dropped from 44 to 37 (a 15 per cent reduction.)

Bus drivers find it easier to move in and out of the traffic flow from the new bus stops because they are beyond the intersecting streams of cross traffic; and motorists are enjoying the benefits of reduced traffic congestion, even though traffic volume has increased 20 per cent in greater Tucson since the bus stops were moved.

(From the "Road Safety and Traffic Review," Spring, 1955.)

CURRENT LITERATURE

ABSTRACTS

BITUMINOUS PAVING MIXTURES-FUNDAMENTALS FOR DESIGN-BULLETIN 105-Highway Research Board, Washington, D.C.

THIS bulletin discusses fundamentals governing the design of bituminous paving mixtures. The essential properties required are defined and procedures are discussed for designing to meet these requirements.

The uses and types of bituminous mixtures are related to some of their properties.

The effects of variations in characteristics and gradations of aggregates and the effects of variation in bitumen content and characteristics of bitumen on the physical properties of mixtures are discussed at length.

Practice in designing these mixtures and references are listed.

Eight appendices are included which describe applicable methods of tests of mixtures, mixture components, and of surfaces.

BLOWN TYPE BITUMEN—Indian Standard 702-1955. Indian Standards Institution, University Buildings, Delhi.

BLOWN Type Bitumen is a material commonly used in the building industry for expansion and construction joints in buildings and roads, for damp proof courses and for sticking roofing felts on to the roof and coating of pipes to prevent corrosion. Blown Type Bitumen also forms the basic coating material in the manufacture of roofing felts.

The specification issued by the Indian Standars Institution covers six grades of blown type bitumen and mentions the uses for which each of these grades is suited. The specification lays down the physical requirements and tests for the different grades of the material.

CALCULATION OF PRESSURE OF CONCRETE ON FORMS, R. Schjodt, Separate No. 680 of the American Society of Civil Engineers-May-1955.

A formula for the calculation of pressure of concrete on forms is developed mathematically.

The setting time, consistency and weight of the concrete, the smoothness, permeability and cross-section of the forms, the rate of filling and the depth to which the working penetrates are the factors considered.

The material constants needed for the calculation are discussed, and safe values indicated.

The pressures obtained by using the formulas are compared with building practice and with tests. (Author's Summary.)

VEHICLE OPERATION AS AFFECTED BY TRAFFIC CONTROL AND HIGHWAY TYPE. Bulletin 107 of the Highway Research Board, Washington, D.C.

THIS bulletin contains three Papers presented at the Thirty-Fourth Annual Meeting of the Highway Research Board in January 1955.

"Operating Characteristics of a Passenger Car on Selected Routes," by Carl. C Saal, discusses certain operating

characteristics of a typical 1951-model passenger car, including amount of time operated in various class intervals of speed, rate of deceleration, percentage of maximum intake, manifold vacuum, percentage of throttle opening, fuel consumption, and other related characteristics. The test car was operated on 28,000 miles of highway during 1951 and 1952. Included were studies on high-speed freeways and parallel major highways and studies related to traffic signals, sight distances, grade separations, and various traffic conditions.

"Analysis of Flow on an Urban Thoroughfare," by Roy H. Fielding and Thomas E. Young, describes changes made in traffic control and a study of the effects of these changes in terms of traffic volumes, capacity, accident records, delays and operating speeds, and on certain operating characteristics of motor vehicles.

"Economics of Operation on Limited-Access Highways," by A. D. May, reports the findings of twelve case studies in which a comparison of operations was made on two abutting or nearby sections, one having limited access and one non-limited access. Travel time, gasoline consumption, utilization of brakes, and safety were investigated.

QUALIFIED

The civil service applicant applied for a position in the diplomatic corps.

"What makes you think you are qualified?" he was asked.

"I've been married 20 years," he answered modestly, "and my wife still thinks I have a sick friend."

HOW TO SLEEP AT COMMITTEE MEETING

The head should rest on a tripod formed of the trunk and of the arms firmly placed on the table. The head should be placed on the hands in a slightly flexed position to allow the tongue to fall forward and prevent stertorous breathing. The fingers should be outstretched over the face and eyes, pressing the skin of the forehead upwards to wrinkle it. This gives an appearance of deep concentration.

SELECTED RECENT LITERATURE IN ENGINEERING JOURNALS

I. GENERAL

1. **Conditioning and Transport of Cement**; M. R. LAUSET, *Annales de L'Institut Technique du Batiment et des Travaux Publics*, July-August 1954, pp. 649-663 (in French).
2. **Principles of Engineering Organization**; GERALD J. SAWYER, *American Highways*, July 54, pp. 3, 17-20.
3. **Expressways and the Central Business District**; DAVID R. LEVIN, *American Highways*, July 1954 pp. 4, 20-23.
4. **Glimpses of Transport Problems**; W. E. KREBS, *Journal of the Institution of Engineers (India)*, July 1954, pp. 623-663.
5. **Tree Planting in Desert Area, Successful Tests in South Australia, Unique Watering System**; *Australian News*, August 1954, p. 7.
6. **Planning and Engineering of U. S. Air Force Bases**; LEE B. WASHBOURNE, *Separate No. 457, Proceedings of American Society of Civil Engineers*, July 1954.
7. **Fundamental Problems of Avalanche Obstructions**; R. HAEFELI, *Strasse und Verkehr*, August 1954, pp. 305-315 (in German).
8. **Construction of Roads, View of Science and Industry**; G. WAHRMANN, *Strasse und Verkehr*, August 1954, pp. 315-318 (in French).
9. **Road Construction and Landscape Design**; J. SCHNEIDER, *Strasse und Verkehr*, August 1954, pp. 326-327 (in German).
10. **Quality Control for Road and Airfield Construction**; J. M. FISHER, *Roads and Road Construction*, September, 1954, pp. 285-288.
11. **Contour Scale Model in Modern Planning**; *Roads and Road Construction*, September, 54, pp. 289-290.
12. **Remarks on Certain Aspects and Problems of the Road Situation**; ANGUS MACLEOD, *The Journal of the Institution of Municipal Engineers*, September, 1954, pp. 172-178.
13. **Britain's Highways—What Needs To Be Done**; CHRISTOPHER T. BRUNNER, *Modern Transport*, September 18, 1954, pp. 5 & 30.
14. **Transport Progress in East Africa—New Railway and Harbour Works**; *Modern Transport*, September 18, 1954, p. 25.
15. **Investigation into the Dynamic Testing of Roads**; Dr. L. W. NIJBOER, and Dr. R. JONES, *Roads and Road Construction*, July 54, pp. 202-209.
16. **Walgett Shire, its Road Development and Organisation**; G. J. CLIFF, *Main Roads*, September, 1954, pp. 22-29.
17. **Suspended-Span Deck for Wharf Prestressed**; *Engineering News Record*, August 26, 1954, pp. 36-38.
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19. **Comparative Investigations on the Measurement of Coefficient of Friction of Road Surfacings**; Dr. E. NEUMANN, *Strasse und Tiefbau*, August 1954, pp. 385-391 (in German).
20. **The Road Engineer as the Traffic Engineer**; ALFRED BOKMIGER, *Strasse und Tiefbau*, August 1954, pp. 397-398 (in German).
21. **The Traffic Problem and the Traffic Engineer**; *Strasse und Tiefbau*, August 1954, p. 399 (in German).

22. **Computation of Non-uniform Discharges in Combined Cross Sections**; WALTER BLEINES, *Der Bauingenieur*, September 1954, pp. 339-342 (in German).

23. **Discussion of River bed Scour During Floods**; *Proceedings of the American Society of Civil Engineers*, August 1954, Separate No. 479, pp. 13-22.

24. **Flow in Open Channels**; EDWARD F. WILSEY, *Proceedings of the American Society of Civil Engineers*, August 1954, Separate No. 466.

25. **Tranquil Flow through Open-Channel Constructions**; CARL E. KINDSVATER and ROLLAND W. CARTER, *Proceedings of the American Society of Civil Engineers*, August 1954, Separate No. 467.

26. **Belgian Motorways—C.C.A. Report on Design and Construction Method**; *Highways and Bridges and Engineering Works, Part I*, September 29, 1954, p. 4.

27. **Growing Toll of Road Accidents in Europe—Role of the Traffic Engineer in Reducing Hazards on the Highway**; *The Surveyor*, October 2, 1954, pp. 845-846.

28. **Road Improvements Essential to cut Accident Rate**; *The Surveyor*, October 2, 1954, pp. 846-847.

29. **Development of Road Tunnels in Britain**; *The Surveyor*, October 2, 1954, pp. 847-850.

30. **Run away Pavements for Jet Aircraft I**; TOTH, *Le Technique Moderne Construction*, September 1954, pp. 329-331 (in French).

31. **Road Development: Policy and Practice**;

    The Surveyor, October 9, 1954, pp. 869-171; October 16, 1954, pp. 893-895; November 13, 1954, pp. 983-984; December 11, 1954, pp. 1093-1094.

32. **Is Parking a Public Responsibility**; WILLIAM R. B. FROCHLICH, *Proceedings American Society of Civil Engineers*, Separate No. 510, September, 1954.

33. **Cathodic Protection of Steel-Piled Wharves**; L. T. RYAN, *The Journal of the Institution of Engineers, Australia*, July-August 1954, pp. 160-168.

34. **Geoelectrical Foundation Investigation**; Dr. VOLKER, FRET FRITSCH, *Die Bautechnik*, October 1954, pp. 318-322 (in German).

35. **Use of Rubber in Railway Track Construction**; NILS LUNDEN, *Schweizerische Bauzeitung*, October 23, 1954, pp. 623-625 (in German).

36. **Highway Engineering Research 1953/1954**; *Forsechungsgesellschaft fur des Strassenwesen (Research Association for Highway Engineering) Koln*, (in German).

37. **Specifications for the Filling of Lead off Drains**; *Forschungsgesellschaft fur des Strassenwesen (Research Association for Highway Engineering), Koln*, 1954 (in German).

38. **Specifications for the Petrol Filling Stations — Petrol Station Working Committee**; *Forschungsgesellschaft fur des Strassenwesen (Research Association for Highway Engineering), Koln*, 1954, (in German).

39. **Experience with Autobahn in Germany**; Dr. E. W. GOERNER, *Strasse und Verkehr*, October 1954, pp. 401-409 (in German).

40. **A Retrospect and Prospect on the Highway Construction in Federal Area**; Dr. HANS CHRISTOPH SEEBOHM, *Strasse und Autobahn*, October 1954, pp. 325-336 (in German).

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43. **The New Mosel Bridge, its Traffic Problems, Past and Present**; ERNST BITZEGEIO, *Der Bauingenieur*, August 1954, pp. 273-277 (in German).

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47. **The New Underwater Tunnel, New York**; *Roads and Road Construction*, October 1954, pp. 330-331.

48. **The Engineer and Management**; *The Surveyor*, October 16, 1954, pp. 895-896.

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57. **Hydraulic Investigation of Stream Flow—Laws of Formation of Flows in Relation to Time**; JEAN GOUDARD, *Travaux*, November 1954, pp. 809-811 (in French).

58. **Right-of-way for State Highways**; *Better Roads*, October 1954, pp. 42, 46 & 48.

59. **Mechanization Problems on India's Projects**; *World Construction*, September-October, 1954, pp. 22-26.

60. **Hampshire Roads**; *Roads and Road Construction*, November 1954, pp. 346-348.

61. **Probable Trends in the Design of Airfield Pavement—Concrete has Much to Recommend it**; *Highways and Bridges and Engineering Works*, November 10, 1954, pp. 1 & 3.

62. **A Solution of "Simple" Non-Linear Pipe-Line Networks**; R. CULVER, *Civil Engineering and Public Works Review, Part I*, November 54, pp. 1185-1188.

63. **Stable Turf Shoulders**; *Civil Engineering and Public Works Review*, November 1954, p. 1202.

64. **Method for the Design of Suitable Dimensions for Road Pavements**; Dr. TH. TEMME, *Strasse und Tiefbau*, October 54, pp. 538-545 (in German).

65. **Approximate Determination of Clay Content from Volume of Sediment of Soil in N/100/Sodium Chloride Solution**; *Indian Railways Technical Bulletin, Volume XIX, No. 115*, November 1954, pp. 241-243.

66. **Engineering Ideals and Problems Past and Present, Mr. D. M. Watson's Presidential Address to the Institution of Civil Engineers;** *Highways and Bridges and Engineering Works*, November 3, 1954, pp. 1 & 3.

67. **Formulation and Experimental Verification of Elastic Limits of Stress Conditions;** Dr. R. V. Band, *Schweizerische Bauzeitung*, November 13, 1954, pp. 663-669 (in German).

68. **The Box Inlet Drop Spillway and its Outlet;** Fred W. Blairdell and Charles A. Donnelly, *Proceedings American Society of Civil Engineers*, November 1954, Separate No. 534.

69. **River Defence Works in South Wales;** C. C. Evans, *Civil Engineering and Public Works Review*, October 1954, pp. 1071-1074.

70. **Design of Carriageways and Bridges, Nottinghamshire Engineer's Suggestion for Simplification;** *Highways and Bridges and Engineering Works*, November 17, 1954, pp. 1 & 3.

71. **Road Surface Texture and Skid-Resistance;** *Highways and Bridges and Engineering Works*, November 17, 1954, p. 4.

72. **The Log—Probability Law and its Engineering Applications;** Ven Te Chow, *Proceedings American Society of Civil Engineers*, November 1954, Separate 536.

73. **Glasgow—Stirling Trunk Road Reconstruction—Design and Construction Proposals for Lanarkshire;** *Highways and Bridges and Engineering Works*, October 27, 1954, pp. 6 & 8.

74. **The Construction of Nomograms for Use in Statistics, Part II, The Graphical Analysis of the Results of a Factorial Experiment;** Philip Lyle, *Applied Statistics, Vol. III, No. 3*, November 1954, pp. 184-195.

75. **Organisation and Methods—its Application to the Work of the Engineer and Surveyor;** Granville Bersy and P. L. Davies, *The Journal of the Institution of Municipal Engineers*, December 1954, pp. 280-301.

See also—Contractors Record and Municipal Engineering, December 8, 1954, p. 10.

76. **Stopping up and Diverting a Highway;** *Contractors Record and Municipal Engineering*, December 8, 1954, p. 10.

77. **The Preparation of Proofs of Evidence;** J. R. Haslegrave, *The Journal of the Institution of Municipal Engineers*, December 1954, pp. 302-308.

78. **Roads into Landscape;** T. F. Thomson, *Journal of the Town Planning Institute*, December 1954, pp. 16-17.

See also Highways and Bridges and Engineering Works, Vol. XXII, No. 1070, January 12, 1955, p. 3.

79. **West Virginia Turnpike Completed;** *Better Roads*, November 1954, pp. 30-32 & 34.

80. **New Regulations Proposed for Night Parking—Use of 'Parking Lamps' on Smaller Vehicles;** *The Surveyor*, December 11, 1954, pp. 1097-1098.

81. **The Road Traffic Bill—Compulsory Testing of Vehicles and Powers;** *The Surveyor, Part I*, December 18, 1954, pp. 1105-1106.

PUBLICATIONS ADDED TO THE ROADS WING LIBRARY DURING DECEMBER, 1955.

1. **Aerodynamic Stabitity of Suspension Bridges with special Reference to the Tacoma Narrows Bridge. Part II.** (The Structural Research Laboratory, University of Washington.)

2. **Aerodynamic Stability Suspension Bridges with Special Reference to the Tacoma Narrows Bridge, Part III.** (The Structural Research Laboratory, University of Washington.)

3. —Do—Part IV.

4. —Do—Part V.

5. **Soil mechanics papers presented at the Building Research Congress 1951. (Technical Memorandum No. 25.)** (National Research, Canada, Associate Committee on Soil and Snow Mechanics.)

6. **Annual report of the Canadian Section of the International Society of Soil mechanics and foundation Engineering, June 1951-June 1952.** (National Research, Canada, Associate Committee on soil and snow mechanics.)

7. **Some effects of Treating Expensive Clays with Calcium Hydronide (Reprint No. 26)** by Irving Goldberg and Alexander Klain, (Institute of Transportation and Traffic Engineering, University of California.)

8. **Some applications of Geology in Soil Mechanics and Foundation Engineering. Reprint No. 22** by Parker D. Trask and H. B. Seed. (Institute of Transportation and Traffic Engineering, University of California.)

9. **The Bombay Town Planning Act, 1955.** Secy. to the Govt. of Bombay, Legal Department. (P. W. D.)

10. **Strength and Residence of Metals** by John M. Lessels. (Chapman and Hall Limited, 37, Essex Street, London, W. C. 2.)

11. **Proceedings of the Society for Experimental Stress Analysis (Vol. X, No. 1)** (Society for Experimental Stress Analysis, Central Square Station P. O. 168, Cambridge 39, Mass.)

12. **Highways in the United States.** (U. S. Department of Commerce Bureau of Public Roads, Washington).

13. **Manual No. 31. Design of Cylindrical Concrete Shell Roofs** (Headquarters of the Society, 33, West 39th St., New York, N. Y.).

14. **Dynamic Highways Policy for the future** (Chamber of Commerce of the United States, Washington, D. C.)

15. **Tech. Memo 3-372 Tar-Rubber Test Section at Waterways Experiment Station (Report No. 1),** (Waterways Experiment Station, Vicksburg, Mississipi.)

16. **Directional Channelization and Determination of Pavement Widths, (Bulletin 72),** National Academy of Sciences, National Research Council, Washington, D. C.)

17. **Roadsides—Their use and Protection (Special Report 17),** National Research Council, Washington, D. C.

18 **Mechanization of Roadsides Operation (Highways Research Board Serial Report 16),** National Research Council, Washington, D. C.

19. **Landscape Designed and its Relation to Modern Highways** (College of Engineering, New Brunswicky, New Jersey.)

20. **Cost Control and Accounting for Civil Engineers (Manual No. 33)** (Headquarters of the Society, 33 West–39th St. (1954) New York.)

21. **Building Code Requirements for Excavations and Foundations (Manual No. 32),** Headquarters of the Society, 33, West 39th St., N. Y.

22. **Differential Equations in Engineering Problems** by Salvadori & Schwarz. (Prentice-Hall, Inc., New York (1954).

23. **Proceeding of the Ohio Highways Engineering Conference 1952.** (College of Engineering, The Ohio State University, Columbos.)

24. **Soil Stabilization Lab Report on Research in Soil Stabilization for Highways.** (Joint Highways Research Project, Massachusetts Institute of Technology and Massachusetts Deptt. of Public Works.)

25. **Public Roads of the Past Historic American Highway** (American Association of State Highway Official, 917, National Press Building, Washington 4, D. C.)

26. **Effect of Size of feet on sheepsfoot Roller (Report No. 6)** (Waterways Experiment Station, Vicksburg Mississippi.)

27. **Performance of Concrete Pavement with 90 ft Contraction joint spacing (Bulletin No. 3)** by N. Gaylord (Joint Highway Research Project, Delaware State Highways Deptt., University of Delaware.)

28. **Report of Committee on Roadside Development 1951 (Presented at the Thirtieth Annual Meeting.)** (Highway Research Board, Division of Engineering and Industrial Research, National Research Council, Washington 25, D. C.)

29. **Vindhya Pradesh Shasan Varshik Parshasan Vivasu 1954.** (Information and Broadcasting, Vindhya Pradesh, Rewa.)

30. **Rules of procedure and Conduct of Business in the House of the People (Fourth Edition),** Lok Sabha Sectt N. Delhi.

31. **Steel Skeleton Volume 1, Elastic Behaviour and Design** by J. F. Baker. (Cambridge University Press, London.)

32. **The Constitution of India (As modified up to the 1st May, 55.)** by J. F. Baker. (The Manager of Govt. of India Press, New Delhi.)

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Back came the reply : "Start summer vacation immediately."

BUDGETS AND ADMINISTRATION REPORTS

GOVERNMENT OF MYSORE BUDGET (CIVIL WORKS) FOR THE YEAR 1955-56

The following extracts relating to Civil Works have been taken from the Government of Mysore Civil Works budgets for the year 1955-56 :

Revenue (Civil Works)

Items	(In lakhs of rupees) Accounts 1953-54	Revised Estimates 1954-55	Budget Estimates 1955-56
Rents	2.21	1.69	1.56
Recoveries of Expenditure	10.26	0.80	0.87
Transfer from Central Road Fund	15.06	20.15	11.55
Miscellaneous	7.32	4.81	4.51
Deduct-Refunds	−0.10	−0.03	−0.06
Total	34.75	27.42	18.43

Expenditure (Civil Works)

Buildings			
Original Works	41.28	64.57	74.41
Repairs	9.88	10.20	10.27
Communications			
Original Works	6.40	6.29	11.00
Repairs	39.92	51.01	51.21
Establishment	20.51	22.02	22.49
Tools and Plant	6.20	5.00	8.90
Grant-in-aid	3.77	6.50	10.50
Suspense	3.92	10.01	10.00
(Development Schemes) Original works	59.16	81.51	86.48
(Communications) Repairs	34.54	40.00	39.25
Tools and Plant	1.44	15.50	8.00
Total	227.02	307.61	332.51

Capital Expenditure on Civil Works outside the Revenue Account

Original works	13.80	17.40	48.00
Establishment charges	0.61	1.30	2.00
Tools and Plant charges	2.45	6.50	5.00
Suspense	0.46	0.50	0.50
Deduct-Receipts on Capital account	−0.29	−0.70	−0.50
Development schemes	—	6.82	17.11
Total	17.03	31.82	72.11

(Continued)

Items	(In lakhs of rupees)		
	Accounts 1953-54	Revised Estimates 1954-55	Budget Estimates 1955-56
Revenue from Roads			
Receipts under the Indian Motor Vehicles Act.	0.89	1.30	1.44
Receipts under the State Motor Vehicles Taxation Act	79.93	88.40	89.37
Other receipts	0.33	0.35	0.34
Deduct-Refunds	−0.19	−0.18	−0.16
Total I	80.96	89.96	90.99
Sales tax on Petrol	21.74	30.37	30.37
Tax on Motor Spirit other than petrol	3.03	2.60	2.60
Total II	24.77	32.97	32.97

(A Brief review of the Budget)

THE revenue and expenditure on revenue account of the Government of Mysore for 1955-56 are estimated at Rs 2296.16 lakhs and Rs 2706.03 lakhs respectively with an anticipated deficit of Rs 409.87 lakhs. The revised estimate for 1954-55 places the revenue at Rs 2117.60 lakhs and expenditure at Rs 2316.29 lakhs indicating a deficit of Rs 198.69 lakhs. The Accounts for 1953-54 recorded a deficit of Rs 157.33 lakhs, the revenue amounting to Rs 2062.25 lakhs against the expenditure of Rs 2219.58 lakhs.

The expenditure on civil works for the year 1955-56 is estimated at Rs 332.51 lakhs which works out to 14.5% of the total revenue of the State. In 1954-55 (Revised estimate) and in 1953-54 (Accounts) the expenditure on civil works amounted to Rs 307.61 lakhs and Rs 227.02 lakhs respectively, representing 14.5% and 11.0% of the total revenue.

The expenditure on communications alone (Original Works and repairs only) works out to Rs 187.94 lakhs for 1955-56 (Budget estimates) which is 8.2% of the total revenue corresponding proportions for 1954-55 (Revised estimates) 1953-54 (Accounts) are 8.4% and 6.8% respectively.

The capital outlay on civil works outside the revenue account is estimated at Rs 72.11 lakhs for 1955-56 (Budget estimate), Rs 31.82 lakhs in 1954-55 (Revised estimate) and Rs 17.03 lakhs in 1953-54 (Accounts). The total budget estimate for 1955-56 sets apart Rs 17.11 lakhs out of the total provision of 72.11 lakhs for development schemes.

LIST OF APPROVED WORKS ON NATIONAL HIGHWAYS

S. No.	Job No.	Name of work	Amount (Rs in lakhs)
		ANDHRA	
1.	1532 AN 7	Construction of sub-way across Kurnool-Sunkesula road on N. H. No. 7	1.74
		BOMBAY	
2.		Four works each costing less than 2 Lakhs	1.47
		HIMACHAL PRADESH	
3.		Three works each costing less than 2 lakhs	0.37
		HYDERABAD	
4.	1526 HD 7	Construction of diversion below Janganpalli tank in miles 65 of Hyderabad-Adilabad N. H. No. 7	1.47
		MADRAS	
5.	1539 MD 7	Improvement to Panagudi Cape Comorin Section of N. H. No. 7 in Tirunelveli Division	2.95
		MADHYA-PRADESH	
6.	1544 CP 43	Additions or alterations to the rest house at Kanker in mile 86/3 of Raipur-Jagdalpur-Vizianagaram route of N. H. No. 43 in Bastar District.	0.03
		RAJASTHAN	
7.	1531 RJ 8	Construction of a bridge over Khari river near Nathdwara on M. 35 of Udaipur-Mankroli road, N.H. 8	4.34
8.		Five works each costing less than 2 lakhs.	2.92
		TRAVANCORE-COCHIN	
9.	1530 TC 47	Improving miles 29/0 to 31/0 of Quilon-Alleppey section of N. H. 47	2.01

(Continued)

S. No.	Job No.	Name of work	Amount (Rs in lakhs)
10.	1541 TC 47	Improving miles 34/0 to 36/0 of Quilon-Alleppey Section of N. H. No. 47	2.17
		WEST BENGAL	
11.	1540 BG 34	Construction of a bridge over the river Bhagirathi on N. H. No. 34 near Berhampore and approaches.	17.76
12.	1546 BG 31	Permanent restoration of protective works to Gheesh bridge on N. H. No. 31.	0.92
13.	1550 BG 31-A	Protective and training works along river line at Likhuvir in the 31st mile of T. V. Road N. H. 34.	3.42

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