TRANSPORT-COMMUNICATIONS

MONTHLY REVIEW

JANUARY 1957—No. 117

INDIAN ROADS CONGRESS, NEW DELHI.

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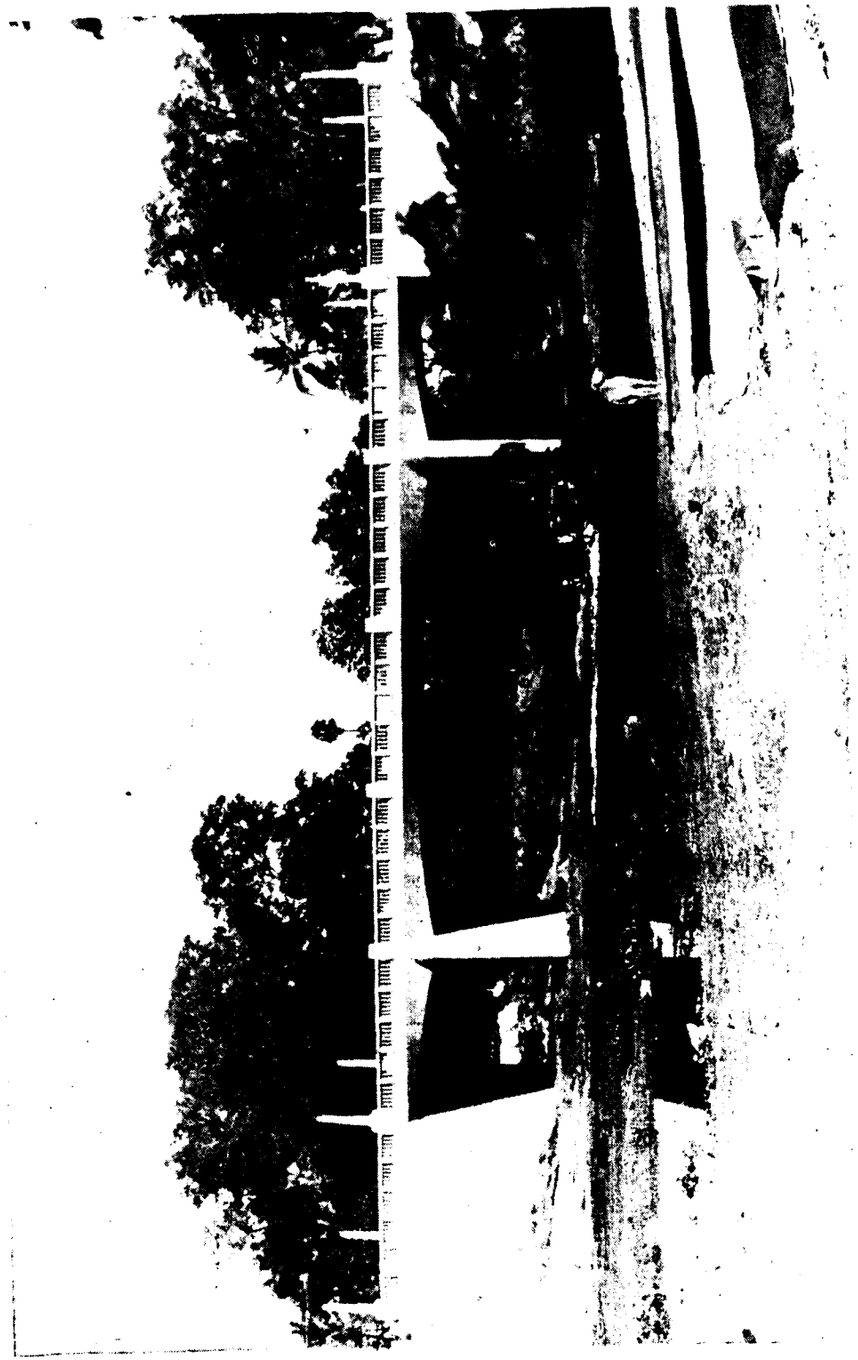


THE NOYYAL BRIDGE

TRANSPORT-COMMUNICATIONS MONTHLY REVIEW

A REVIEW OF
ROAD ENGINEERING, DEVELOPMENT & TRANSPORT

JANUARY 1957

BRIDGING INDIA'S RIVERS

186

THE NOYYAL BRIDGE

THE Noyyal river, a tributary to the river Cauvery, is crossed by National Highway No. 47, the Highway connecting Salem - Coimbatore - Trivandrum - Cape Comorin, just outside the Coimbatore town. Very important trade centres, viz., Pollachi, Coimbatore and Palghat are served by this road. Originally, there was a masonry arched bridge at the crossing. When the arches had to be replaced, the brick piers and abutments were utilized, coursed rubble stone masonry was constructed over the brick piers, and plate girders 5 ft deep were put in. This plate girder bridge had three spans of 36 ft clear each. Inspection revealed that the foundations of the piers were in a dilapidated condition. It was also noticed that the masonry of the piers consisted of blocks of brick the joints between the blocks in some cases were not staggered. Some of the blocks were displaced, with the result that some courses of the brick, masonry were hanging without support. Consequently, the masonry got crushed. Considering the weakness of the piers, the bridge was closed to vehicular traffic. Photo 1 shows the plate girder bridge and Photos 2 and 3 show the condition of the masonry. When the bridge was declared closed to vehicular traffic, because of the importance of the route not only for through traffic but also for local needs, a low level causeway about 200 ft upstream of the bridge was constructed as a temporary expedient. Early in 1951, one span of the plate girder bridge collapsed.

Site

The alignment of the highway on approaches of the plate girder bridge was curved on both sides. The curve on the south was particularly sharp. There was evidence of erosion on the right bank of the river at a short distance upstream of the bridge and at a similar distance on the left bank downstream. A large portion of the end span on the right was silted up. There was also considerable silting immediately downstream of the bridge on the right bank. The river was in bad regime at the site mainly due to the low level causeway upstream of the bridge. Possibly the presence of this causeway prevented the river from increasing its waterway during the floods by scour. The small vents on the left bank of the causeway were, to some extent, responsible for the tortuous course of the channel and the resulting erosion and silting. Because there was no hydraulic advantage in shifting the site and because new alignment involved the acquisition of costly garden lands on both sides of the river, the new bridge was constructed at the site of

Photo 1.

Plate Girder Bridge.

Photo 2.

Condition of masonry of the Plate Girder Bridge.

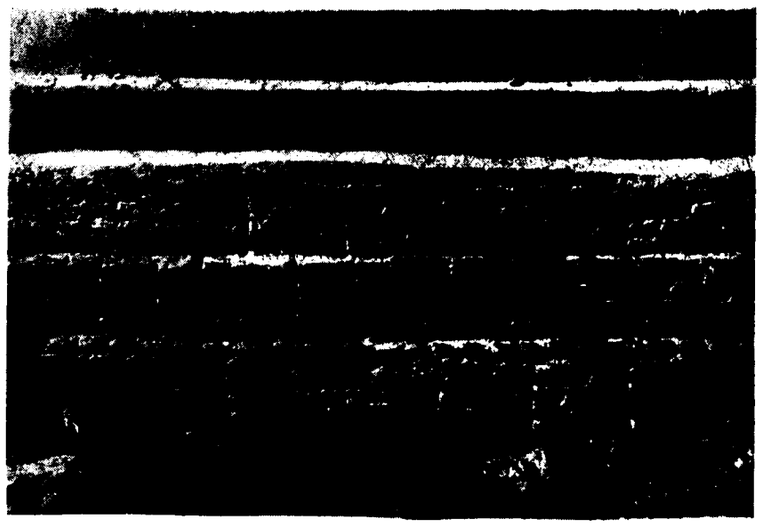


Photo 3.

Condition of masonry of the Plate Girder Bridge.

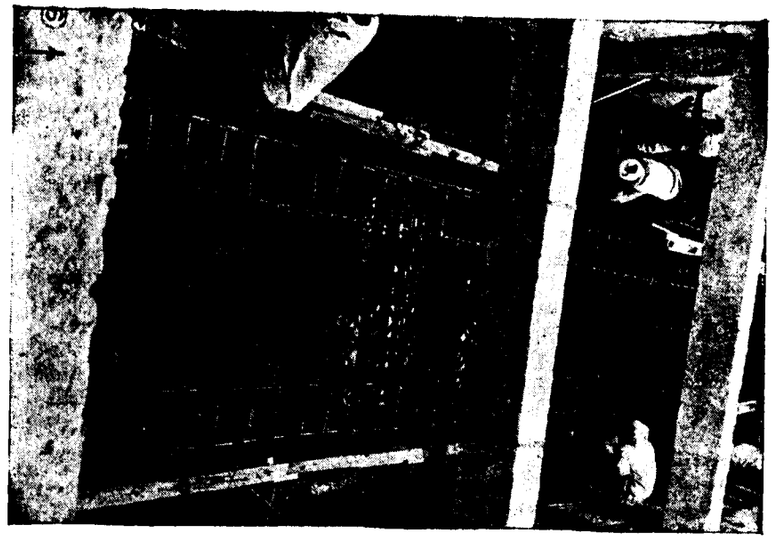


Photo 4.

Reinforcement for the footing.

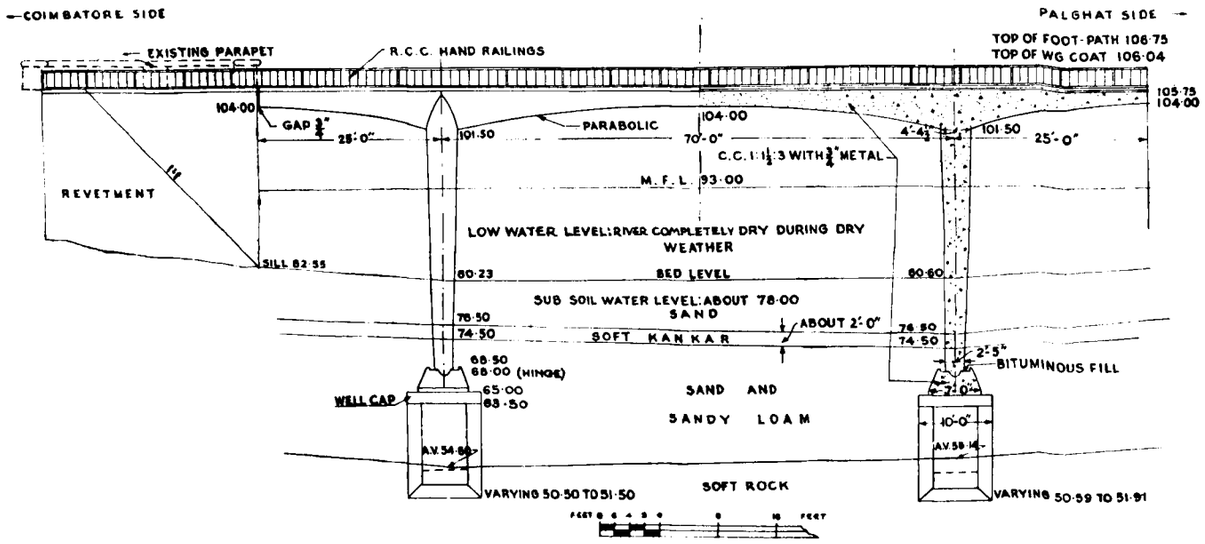
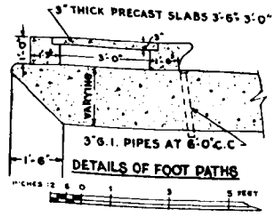


Fig. 1. Longitudinal Section.



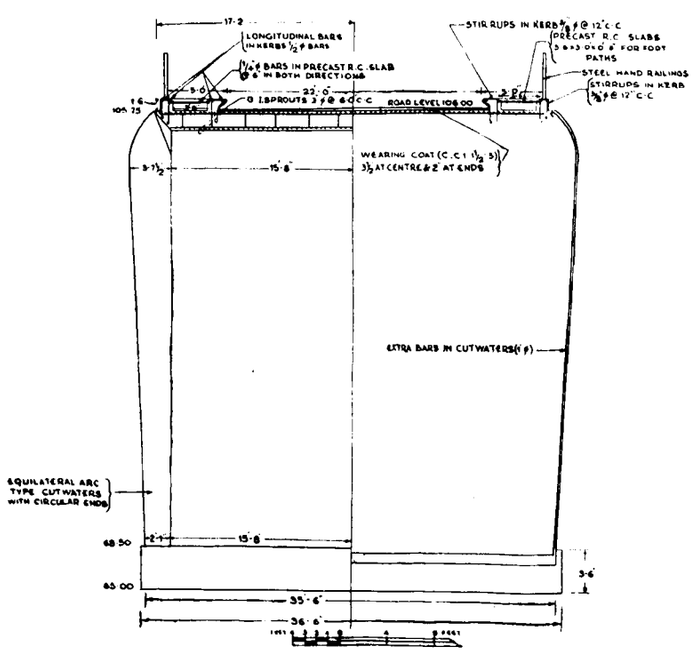


Fig. 2. Cross Section.

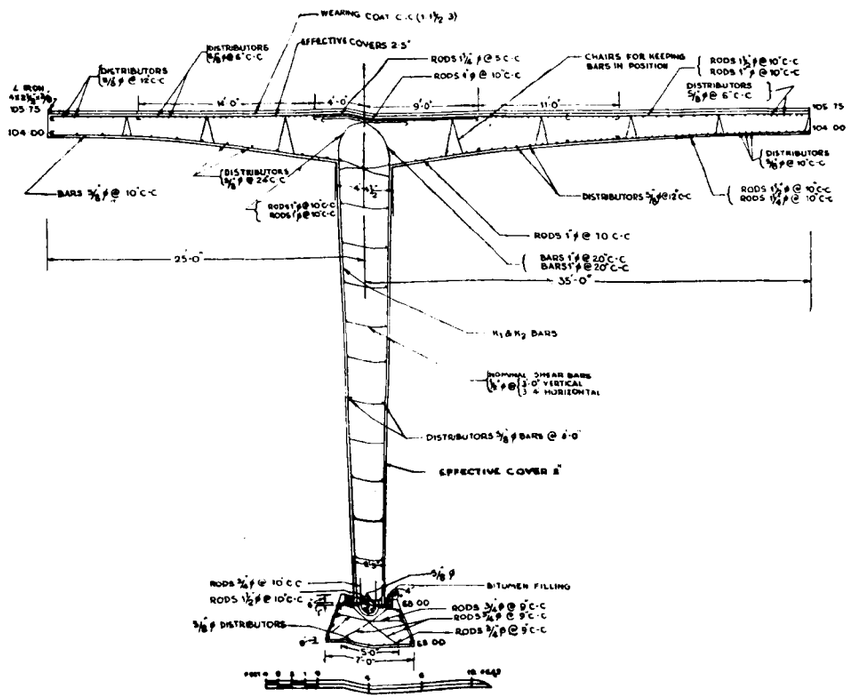


Fig. 3. Details of Reinforcement.

ROAD DEVELOPMENT IN BIHAR

By

B. PRASAD

BEFORE Independence, Bihar had no well integrated system of roads to meet the requirements of traffic. There were practically no black-topped roads in North Bihar and only 949 miles of roads were in the charge of Public Works Department. After Independence a Post-War Road Development Plan for a balanced system of roads was drawn up. This Plan was revised in 1949. The revised aimed at linking the State capital with district head-quarters, joining market places with areas of production, and opening up backward tribal areas and places rich in mineral resources etc. This scheme aimed at improving 477 miles in Tirhut Division, 808 miles in Bhagalpur Division, 455 miles in Patna Division and 422 miles in Chotanagpur Division. Thus, 2,162 miles estimated to cost Rs 16.88 crores were programmed for improvement. Under this scheme, 1,727 miles of roads were taken over till March 1951 on which a sum of Rs 1.88 crores was spent till that date.

FIRST FIVE YEAR PLAN

National Highways

There are 1,124 miles of National Highways in Bihar, which are being improved and maintained at the cost of the Central Government. Under the first Five Year Plan, 29 schemes costing Rs 1.81 crores were sanctioned. Among the works completed, mention may be made of the bye-pass at Patna on N. H. 30, Barakar, Poonpoon, Bakhra and Kitchania bridges on N. H. 31, widening of Bakhtiarpur-Mokameh road, and the construction of Ranchi-Tatanagar-Jamshedpur road etc.

State Roads

The first Five Year Plan for improvement of State Roads provided for metalling and black-topping of 1,888 miles and maintaining 552 miles of Katcha roads, at a cost of Rs 9.4 crores. The expenditure during the Plan period was, however, restricted to 7.25 crores and the balance was to be carried over to the Second Plan. In 1954, satisfactory progress having been achieved, with the financial assistance in the shape of a loan of Rs 2.75 crores and a grant of Rs 1.08 crores from the Government of India, the scope o this scheme was enlarged to Rs 10 crores bringing the total milage of road programme for improvement to 2,940 miles. During the First Five Year Plan Period it was programmed that 2,236 miles will be improved. Out of this 2,236 miles, 1,960 were to be metalled and blacktopped to all weather standards.

Despite the difficulties such as scarcity of road-building materials, lack of proper transport and extremely inadequate wagon quotas, the physical progress achieved was satisfactory as shown below.

	Physical progress in miles (length of metalled roads.)	
March, 1951	769	
March, 1952	950	
March, 1953	1,165	
March, 1954	1,440	
March, 1955	1,600	
March, 1956	2,083	(Besides this 173 miles were improved as kutcha roads)

Roads Near Sugar Factories

Besides the above mentioned works, the first Five Year Plan provided for improvement of 76·0 miles of roads near sugar factories. These were to be improved to all-weather standards with a 24 ft formation, 9-ft wide cement concrete

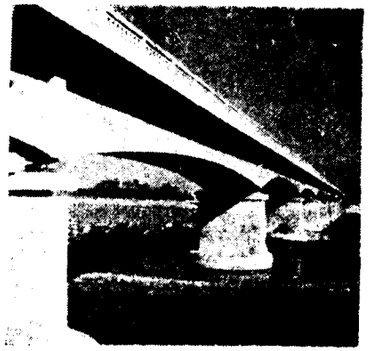


Photo 1.
A view of the Akharaghat bridge.

Photo 2.
The Derium bridge with one central span of 40 ft and end spans of 30 ft each on the Oumka-Sahibganj road.

Photo 3.
The Dangri causeway on Kharagpur-Tarapur road.

Photo 4.
The Bakhra Bridge on Patna-Ranchi road.

Photo 5.
The Gumani bridge.

Photo 6.
Chirayatanr overbridge, 304 ft long east of Patna Junction.

Photo 7.
Overbridge at Patna over Eastern Railway Main lines.

Photo 8.
Nagpheni causeway.

Photo 9.
The Kitchinia bridge on Patna-Ranchi road.

Photo 10.
The Sanjoy submersible bridge.

pavement, and all bridges and culverts for 2 lanes of I.R.C. Class A loading. Of these, 12 miles have been completed by March, 1956.

Inter-State Roads

With the help of a grant of Rs 1.08 crores, 212 miles of inter-State roads, roads opening up backward areas and connecting places rich in mineral resources, have been programmed for execution. The estimated cost of these is Rs 1.50 crores. The balance of Rs 0·42 crores will be met from the State funds. The entire work is expected to be completed by March, 1958.

Central Road Fund

Eleven roads aggregating 331 miles were proposed to be improved at a cost of Rs 120 lakhs under the scheme up to the end of the plan period. Most of the works have been completed. It is proposed to take over further roads under this scheme against the balance available to the State from this fund.

Village Roads

Village roads are being improved with the co-operation of the villagers. When a work is taken up, one-third of the estimated cost is paid by the State Government, one-third by the Central Government, and the villagers are required to contribute one-third either in cash, free labour, land or materials. Towards this scheme, the Central Government have contributed Rs 3 lakhs by March, 1956, and 61 roads selected in consultation with the Divisional Commissioners have been programmed for improvement. Much progress has not been achieved due to difficulty in getting agreement for paying one-third of the provision from the Gram Panchayats.

Bridges

Several major bridges, and causeways have been completed. Photographs of some of them are given on pages 10 and 11. In addition, major bridges are under construction over the rivers Durgawati on Ramgarh-Mohania and Mohania-Bhabhua roads ; Ulai and Nagi on Jamui-Jhajha-Chakai road ; Garu Bridge on river North Koel : a Bridge on River Mayurakshi ; a Bridge 1600 ft long on North Koel. Bridges over Rivers Kailash, Chiraijore, Mani and Bela are also under construction. A number of causeways, submersible bridges and minor bridges are also being constructed. Three prestressed R. C. C. bridges are being built.

By March, 1956, the Public Works Department had 4785 miles of roads against 949 miles in 1947. Of these, 3860 miles are metalled and black-topped and the rest are expected to be improved by March, 1958. The total expenditure incurred on road development in the first Five Year Plan is about Rs 14 crores.

A map showing the roads in the charge of the Public Works Department is given on page 13.

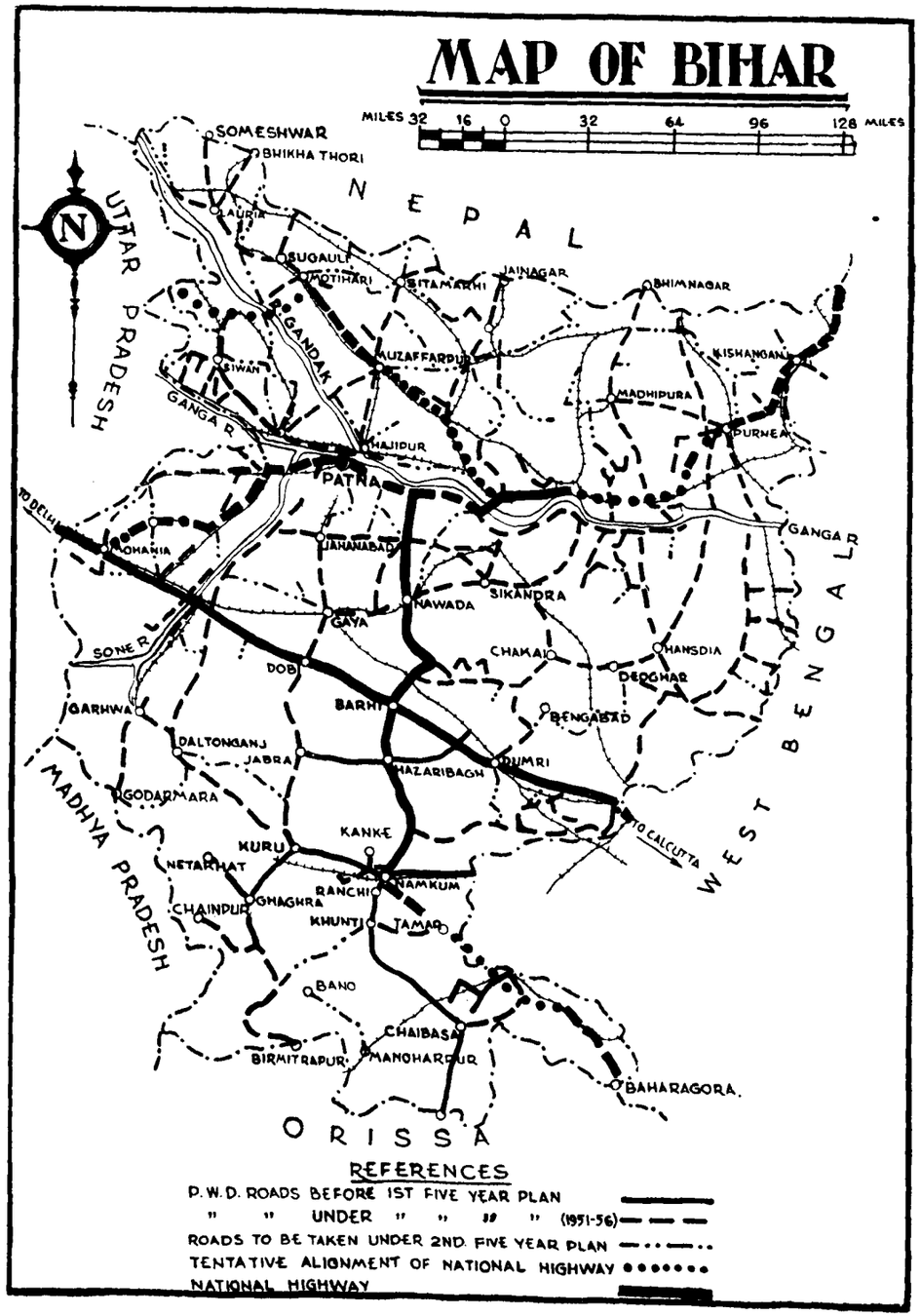
SECOND FIVE YEAR PLAN

The States 2nd Five Year Plan provides for the following schemes for the development of road :—

	Ceiling of expenditure as fixed by the Planning Commission.	Physical Targets
	Rs. crores	miles
i. State Highways Improvement.	13·80	1560
ii. Roads around Sugar Factories area.	1.60	140
iii. Local bodies roads.	2.20	2252
Total	17.60	

Besides the above milage of roads, a number of major bridges are also proposed to be constructed on these roads. Special mention may be made of the Pontoon bridge across river Gandak at Sonepur, Harohar bridge in Monghyr District, and Damodar bridge near Phusro railway station.

(Continued on page 16)



ROADS IN FINLAND

FINLAND lies between 60 to 70 deg. north latitude and is of 1,47,876 square miles in area. The land is snow-covered for three months in the year in the southern parts and 6 to 7 months in the northern parts. 75 per cent of the area is forest, and timber and wood products constitute a major portion of the country's exports. There are more than 60,000 lakes linked with rivers, streams and rapids, forming several hundred miles of waterways in the country.

Till the early 1920s, there was very little motor traffic in the country. Rail and river were the principal modes of transport for timber. From 1920 the number of motor vehicles in the country gradually increased so that in 1952 their number was 101,435. Of these, 51 per cent were passenger cars, 44.6 per cent lorries and delivery vans, and 4.4 per cent buses. The number of motor cycles in the country in 1952 was 28,081. With the increase in the number of motor vehicles, the traffic using the road increased and automobiles and tractors play an important part in the transport of timber.

The milage of public roads in 1920 was 48,000 km (29,800 miles). A major portion of this milage was constructed before the advent of the motor vehicle and, therefore, the standards adopted were low. Those roads had very many curves of small radii, the sight distances on them were poor, and their pavements had no shoulders. The bridges were generally narrow. Due to the poor bearing capacity of the road structure the Motor Vehicles Act in force permitted axle weights of 7.2 tons for paved roads, 6.4 tons for main gravel roads, and 5.6 tons for other state and village roads. There were no bridges on many of the crossings and as many as 120 ferries were in operation. There were as many as 600 unguarded level crossings in the road system.

Between 1920 and 1931, a milage of 10,000 km (6200 miles) was added to the road system of the country and a network of trunk roads was approved for construction.

During the period 1939-54, no road surfacing work had been carried out. Due to increase in motor traffic, gravel-surfaced roads on heavily trafficked sections had become uneconomical to maintain, and it was decided that in addition to the trunk roads, roads carrying a traffic of 2,000 tons per day should be paved.

In 1952, on the recommendation of the Finnish Road Association, the Government set up a Road System Committee to draw up a development programme and submit proposals for financing road works. This Committee had completed its work in May 1954 and a report had been submitted to the Transport Council presided

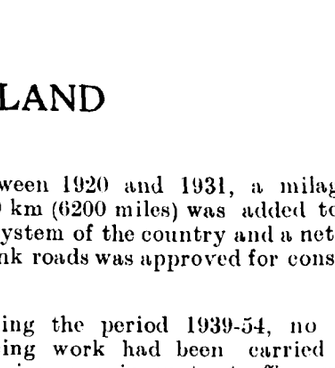


Fig. 1. **Trunk road network recommended by the Finnish Road System Committee.**

over by the Minister of Transport. This Transport Council is composed of experts in all forms of transport and has a

Photo 1.
A Forest road in Summer.

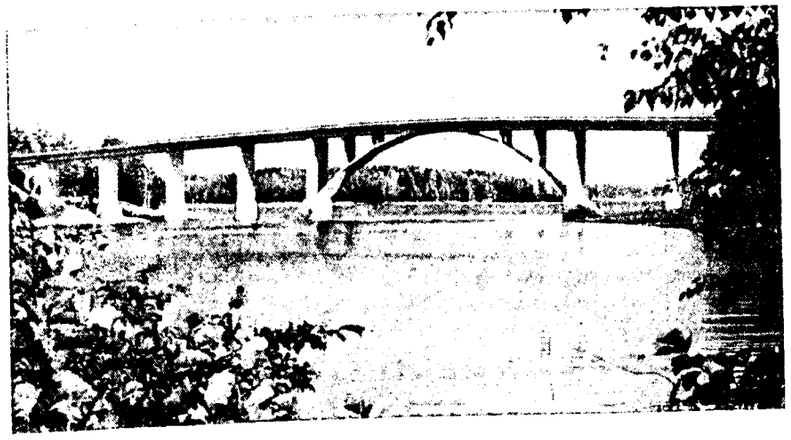


Photo 2.
The Kakisalmi bridge on lake Paijanne.

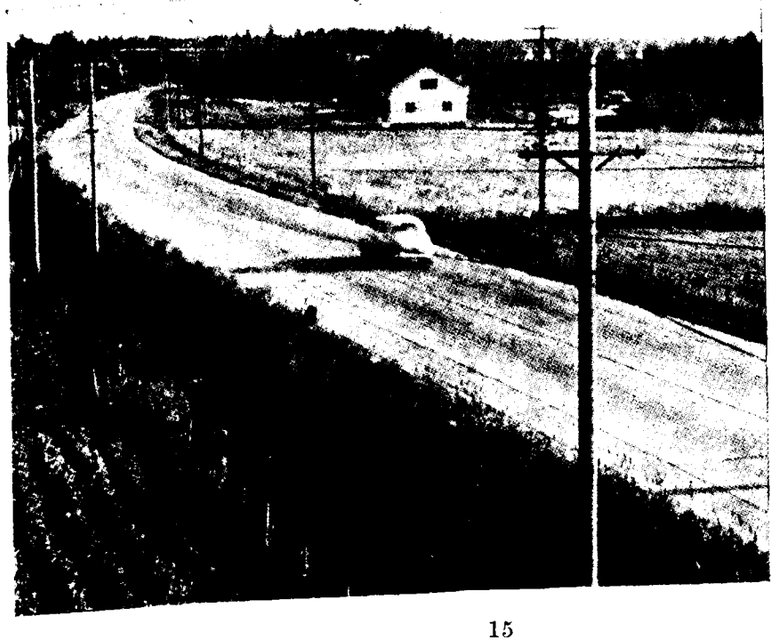


Photo 3.
Road between Helsinki and Turku.

binder should provide waterproof surface as well as hold the chippings firmly.

Another important aspect to be considered is the size of the particles of the blindage. Experience has shown that most of the stone chips fall flat on the surface. In other words, the depth of the blindage is the average least dimension of the chips. If the thickness of loose blindage is more than the average least dimension of chips, the whip-off will be more. It is, therefore, necessary that the chips should be angular in shape and free from thin or elongated pieces. For calculating the quantity of the bitumen it is advisable to take the average least dimension of stone chippings into account.

While determining quantity of the bitumen, the following points should also be taken into account :

(a) the roughness and surface texture of the surface to be treated : the dryness and absorptiveness of the surface,

(b) the porosity or absorptive qualities of blindage and their surface texture.

In the selection of a suitable grade of bitumen, the following points should be considered :

(a) It must develop sufficient viscosity soon after application to hold the blindage. It should set in a reasonable time so that least inconvenience is caused to traffic and no serious damage is done to the surface.

(b) It should be possible to spray it without excessive heating.

(c) After application it should have 'flatening effect' to help even distribution but should not continue to flow across the camber.

(d) After final curing it must not become brittle during winter nor should it soften excessively in summer.

(e) It should penetrate or grasp the old surface in order to secure a good bond and to seal the surface voids or cracks.

It is important that the existing surface should be thoroughly cleaned before application of bitumen. Uniform application of good quality chips and adequate consolidation should be done. The work must be done in suitable weather.

Resurfacing or Seal Coat. Principles outlined for surface dressing apply to resurfacing also. It is important that the seal coat should only be given when necessary, i.e.,

(a) when there are any signs of distress,

(b) if surface has become smooth and is necessary to make it nonskid,

(c) to enliven dry weathered surface to improve wear resistance and

(d) to reinforce and build up pavement structures.

Seal coat should *not* be given to cover defects or to correct corrugations, irregularities and cracking due to base subsidence.

Grouting or Penetration Method. In water-bound macadam, the stones are bound together tightly and prevented from moving by fine aggregate wedged into the voids. The impact and shear forces set up by heavy slow moving traffic overcome the inherent stability and weaken the structure. Consequently the stones move out of position. In grouting process bitumen is used to bind the stone to withstand these forces. In this method of construction stones are laid in position and bitumen is poured from the surface. It is then thoroughly consolidated and finished off with a seal coat.

With the introduction of premix method of binding stones, bitumen grouting is becoming out of date except in areas where excessive rain is experienced and traffic is heavy. In grouting the quantity of bitumen used is much greater than in premix macadam.

(To be continued)

HERE AND THERE

1. A METHOD OF ASSIGNING PRIORITIES FOR ROAD WORKS

● HIGHWAY transport, all things considered, is an important tool for production. It complements all other means of transport and plays an indispensable role in the direct satisfaction of human wants. In the economic sense, the development and maintenance of highways is a business which is closely connected with the productivity and cost of production of any commodity. Since efficiency depends on the employment of good business principles, the general objective should be to construct that group of works which will create the greatest economic benefits for the money and effort spent. In addition, human, political, and local conditions should be taken into consideration.

Financing of highways, unlike that of most other public works, is not a spasmodic or short-term affair but should be established on a long range and continuing basis. Therefore, the programme of construction should be so selected that it leads to rational development of the highway system. All such programmes resolve themselves into the selection and execution of works in any one year. There are very many methods of doing this. When the extent of the system concerned is small and when any individual is intimately acquainted with the needs, it may be possible for him to judge the priority of works. But when the area involved is large, the selection has to be based on information derived from different sources. Therefore, the judgement of many individuals have to be compared in arriving at decisions. Therefore, approach nearest to the ideal is to assign numerical ratings for the various sections of the highway system. The United States Bureau of Public Roads have developed one such system. In this method the relative adequacy of each section of the highway is expressed by a number. When a section of a highway gets a rating of 100 it means that all the elements of the highway are adequate. Sections getting the lowest number are those that are the least adequate. This method, it is claimed, eliminates personal, subjective or relative bias. Basically, it consists of assigning numbers to the various elements of the highway, such as alignment, visibility, passing opportunity, adequacy of the road width, surface, etc., according to a predetermined scale. The sum of these numbers is the rating value. It may be mentioned that much depends on the relative emphasis placed on the various elements. The method is flexible because it is possible to give greater weightage to the required element of the road by assigning a bigger number to it. Thus, the system could be applied to the changing needs as a country develops or to the various regions requiring emphasis on different aspects. American experience shows that the adoption of this method of programme planning leads to efficiency and the development of a highway system suited to individual needs.

It is not to be taken that this method is an unalterable one. As has already been pointed out, the emphasis placed on the individual elements will depend on individual needs. Also, it may be desirable in certain cases to deviate from the order indicated in the sufficiency ratings to maintain a balance between the various classifications of roads, or for economic reasons.

(Adapted 'from Contractors' Record & Municipal Engineering,' November 10, 1954.

2. BENEFITS OF EXPRESSWAYS

● THE following are the minimum savings that may be expected per vehicle mile on expressways and represent conclusions reached by the Board of Public Works of Los Angles in two independent approaches.

Average benefit per vehicle mile

	Rs	a	p
Passenger cars with time value ...	0	2	10
Without time value	0	0	10
Trucks ...	0	7	7
Pick-ups ...	0	3	7

Average savings per passenger vehicle mile

	Rs	a	p
Petrol savings ...	0	0	3
Maintenance cost savings due to elimination of stop and go travel ...	0	0	2
Accident savings ...	0	0	5
Total ...	0	0	10

These estimates are based upon petrol at Rs 1–5–4 per gallon and driver time for commercial vehicles at Rs. 5–15–4 per hour. The time value used in connection with passenger cars, which is of questionable value, is computed at 90 cents per passenger with an average occupancy of one and one-half persons per car.

(*From 'Highways and Bridges and Engineering Works', September 26, 1956.*)

3. HOW THE U.S.S.R. SOLVES ITS TRAFFIC CONGESTION IN BIG CITIES

● IN Moscow the hours of working in institutions, government offices and industrial undertakings are strictly divided. Shops are opened at different hours. This arrangement enables a smoother working of the transport system and avoids rush hours and consequent congestion in public transport. In Moscow even though nine million passengers are carried every day, this arrangement has eliminated major difficulties for passengers. Also, the number of accidents is on the decrease.

(*From 'The Surveyor', 29 September, 1956.*)

4. I. S. I. CERTIFICATION MARKS SCHEME

● UNDER the powers vested in the provisions of the Indian Standards Institution (Certification Marks) Act 1952, and the rules and regulations made thereunder, the Indian Standards Institution has granted a licence to M/s Shree Digvijay Cement Co. Ltd., Sikka (Saurashtra) to use the Standard Mark in respect of ordinary, rapid-hardening and low heat portland cement manufactured by the firm in conformity with IS : 269–1951 Specification for Ordinary, Rapid-Hardening and Low Heat Portland Cement.

The Standard Mark consists of the monogram of the Indian Standards Institution, the number designation of the Indian Standard being inscribed on the top side of the monogram.

5. ROAD SURFACING AT BUS STOPS

● ASPHALTIC concrete with a reinforcement of steel-welded wire fabric has proved a successful form of road surfacing at heavily-used bus stops, reports the Port of New York Authority, and prevents the reppling or furrowing of the surface due to vehicle braking or acceleration. Experiments have been carried out on a section of the George Washington Bridge used as a bus stopping place. The wire fabric is laid in sheets with wires spaced every three inches at right angles to the direction of travel.

(*From 'Modern Transport'-October 20, 1956.*)

6. DESIGN STANDARDS FOR BRIDGES* FOR INTER-STATE HIGHWAYS IN THE UNITED STATES OF AMERICA

● BRIDGES and over-passes should preferably be located to fit well into the alignment and to the profile of the highway and should preferably be of deck construction. The clearance over the entire carriageway and the usable width of shoulders should not be less than 14 feet. In fixing the clearance, allowance should be made for the future change in the levels of carriageway by resurfacings. The width of all bridges of 150 ft or less between abutments shall be the full width of the roadway and the approaches including the usable shoulders. The lateral clearance from the edge of the traffic lanes to the face of walls or abutments and piers at under-passes shall be at least equal to the width of the usable shoulder but not less than 8 ft on the right (in America right hand drive is in use) and 4½ ft on the left. On bridges longer than 150 ft between abutments, barrier kerbs and kerbs on the approaches to highways shall be offset by at least 2 feet. The offset to the face of the parapet shall be at least 3½ ft measured from the edge of the carriageway.

Long bridges on which the full approach roadway width including shoulders is not provided a safety walk shall be provided.

Culverts

All culverts shall be of sufficient width to accommodate the roadway, the median, the shoulders, etc.

(*Adapted from 'Traffic Engineering' September '56.*)

7. A FIXED ARCH OF 330 FT SPAN IN SOUTH AFRICA

● IN South Africa an arched road bridge of 330 ft span with a rise of 66 ft, giving a rise span ratio of 1/5, was completed in 1955. The bridge is across the river Storms on Port Elizabeth-Capetown road. The deck level is nearly 495 ft above the river bed. The arch is cellular in construction and consists of intrados and extrados slabs varying from 9.6 to 11 in. in thickness and connected by four vertical ribs. The thickness of the ribs varies from 11 to 24 inches. Total depth of the arch is 8 ft 6 in. at the springing and 4 ft at the crown. The deck slab, which is 7 in. in thickness, is supported on three longitudinal continuous girders 3 ft 3 in. in depth with intermediate beams. These longitudinal girders are supported both on the approaches to the bridge and on the arch by inclined columns. The obliquity of these columns has the effect of reducing tension in certain portions of the arch. These inclined columns decrease in cross section from top to bottom. The carriageway is 22 ft in width.

* Design Standards for Roads were published in the T. C. M. R. for September 1956.

Because of the large difference in level between the deck and the bed of the river, an ingenious method of erecting the arch was adopted. Approximately 1/3rd of each half span, i.e. about 55 ft from each springing, was constructed using ordinary shuttering and staging. At the outer end of this short section of the arch rib a temporary hinge was fabricated from sheet metal. Rotation of this hinge was provided by a concentric cylindrical surface which was lubricated with a special grade of Shell oil and powdered graphite. The remaining part of the half span was then constructed in a vertical position and was rigidly tied to the rotating portion of the hinge. Only half of the full width of the bridge was dealt with at a time and only the framework, i.e. ribs without the introdas and extrados, were fabricated. The weight of each portion of the arch so constructed was 80 tons. The centre of gravity of the ribs was about a foot from the hinge before being lowered into position. These were then rotated into position with the help of cranes and the two ends were tied by welding the projecting steel bars. The hinges which were meant for rotation were locked by welding bars which had been incorporated in the design for this purpose. The interior of the hinge was then filled with concrete. After these ribs were in position, the intrados and extrados slabs were cast.

Photo 1. **The Storms River Bridge, South Africa.**

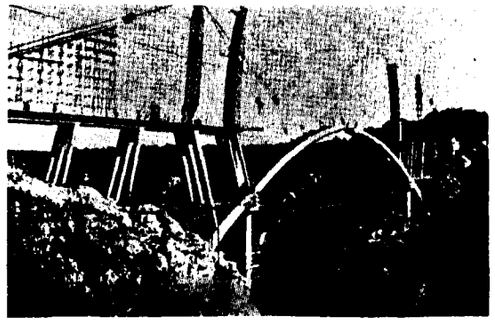


Photo 2. **Method of constructing centre parts of arch.**

Photo 1 is a completed view of the bridge and Photo 2 shows the arch during erection.

(*Adapted from 'Highways and Bridges & Engineering Works' October 3, 1956.*)

CURRENT LITERATURE

ABSTRACTS

NIGHT VISIBILITY: Bulletin 127 Highway Research Board, Washington, D. C.

THIS publication contains seven papers sponsored by the Committee on Night Visibility and presented at the 34th Annual Meeting of the Highway Research Board, U.S.A.

The first Paper presents the results of tests on night sign brightness, the level of illumination to which the eye is adapted, characteristics of letters, and contrast direction.

The second Paper describes the methods and results of tests on candle power of rear lights on trucks, while the third discusses the specifications and performance of a co-operatively developed sealed-beam headlamp for automobiles.

The fourth Paper presents the results of road tests on night visibility through heat-absorbing glass; the fifth presents the effect of tinted optical media, including the heat-absorbing glasses.

Paper number six describes the results of a study on visual efficiency in monocular driving, particularly as regards the necessary safety precautions to be recommended for this type of driver.

The last Paper discusses the causes behind the problem of reduction of visibility caused by oncoming headlights during night driving.

FLEXIBLE CULVERTS UNDER HIGH FILLS: Bulletin 125 Highway Research Board, Washington, D. C.

THIS bulletin contains the following 4 Papers on the subject:

1. "Load Study of Flexible Pipes Under High Fills" covers tests conducted on three 7-foot diameter corrugated metal culvert pipes under 137 feet of fill, each 512 feet in length.

2. "Factors Affecting Vertical Loads on Under-ground Ducts Due to Arching" extends existing earth pressure theories on low or medium height embankments to unusually high embankments over flexible-type culverts.

3. "Performance Study of Multi-Plate Corrugated Metal Pipe Culvert Under Embankment-North Carolina" describes the installation and performance of a 66-inch diameter culvert under approximately 170 feet of earth fill.

4. "Influence of Compression and Shearing Strains in Soil Foundations on Structures Under Earth Embankments" discusses both the design of embankments and culverts and includes the amount of settlement and lengthening of 46 culverts and sluiceways.

AN EXPRESSION FOR CREEP AND ITS APPLICATION TO PRESTRESSED CONCRETE by Cevdet Z. Erzen Journal of the American Concrete Institute, August 1956.

A simple expression for total strain (elastic plus creep) is given. The equation for the total strain is then used in determining the loss of stress in the prestressed beams due to creep of concrete. Resulting analysis indicates that the losses in the prestressed beams may be calculated if the variation of modulus of elasticity of concrete with time and the creep equation of concrete are known.

PROCEEDINGS OF CONFERENCE ON ENGINEERING EDUCATION OF REPRESENTATIVES FROM THE ENGINEERING SOCIETIES OF WESTERN EUROPE AND THE UNITED STATES OF AMERICA. Institution of Civil Engineers, London. January 1953.

THIS contains the memoranda and discussions of the symposium on Engineering Education held in London in 1953 under the joint auspices of the Institutions of Civil, Mechanical and Electrical Engineers. Eleven European countries, Belgium, Denmark, Finland, France, Germany, Holland, Italy, Norway, Sweden, Switzerland, United Kingdom, and the U. S. A. participated in the symposium. Details of the education and training of professional engineers in the above mentioned countries are included in the memoranda.

QUALITY OF CONCRETE IN THE FIELD. Proceedings of the Institution of Civil Engineers, London, May 1955.

THE quality of concrete produced in the field depends on the following factors :—

(1) proportioning cement and aggregate ;
(2) water-cement ratio ;
(3) position and cleanliness of reinforcement ;
(4) cleanliness of forms ;
(5) construction joints ;
(6) placing of concrete ; and
(7) compaction.

Therefore, a Committee appointed by the Institution of Civil Engineers, U. K., have, after consideration of the standards of control which are possible in the manufacture and placing of concrete, recommended tests, etc., and have given guidance in choosing the standards applicable for the strength of concrete that is required. The subject is treated under the headings, control during concrete production, aggregates, control of workmanship, bonding successive layers of concrete, and specification of concrete by strength. The Committee have recommended that concrete be specified by strength. Where strength, mix and slump or workability are all specified, care should be taken to ensure that these requirements are not incompatible and produce a workable mix. Mechanical compacting methods should be used to achieve economy and certainty of workmanship, specially for high strength concrete. In the Appendix, a method of ascertaining the minimum strength from test results by the application of principles of statistics is given.

USES OF AERIAL SURVEYING IN HIGHWAY DESIGN AND LOCATION, by David K. Blythe, Proceedings of the American Society of Civil Engineers, Journal of the Surveying and Mapping Division September 1956.

THE use of aerial photographs in highway design and location is helping to provide better highways in the U. S. A.

This paper explains some of the uses of aerial photographs by citing their use in projects of the Department of Highways Kentucky.

THE SCIENTIFIC PROFESSION IN CANADA

In 1911, in Canada approximately 6.6 per cent of all professionals were scientific and technological men. By 1941, this percentage had doubled itself, and in 1951 it was 18.5.

In the United States, in 1950, more than 20 per cent of the professional group were scientific men and technicians, whereas in 1954 in Russia scientists and engineers made up 35 per cent of the professional group.

SELECTED RECENT LITERATURE IN ENGINEERING JOURNALS

I. GENERAL

1. **Spanish and Portugese Roads** : LOUIS PERSIN *Strasse und Verkehr, Vol. 41, No. 13*, December 1955, pp. 538-542 (in French)

2. **The Motorway and its Environment** ; *The Surveyor, Vol. CXV, No. 3332*, January 1956, pp. 33-34.

3. **The Need for Careful Routing of Motorways** ; *Highways Bridges and Engineering Works, Vol. XXIII, No. 1120*, January 11, 1956, pp. 1 & 3.

4. **Advance Borings for Soils Data—How Michigan's Procedure helps Both Contractors and Design Engineers** ; W. W. MCHANGHLIN, *World Construction*, November-December 1955, pp. 36-38.

5. **Abnormal Road Loads, Proposals Encounter Strong Criticism** ; *Modern Transport, Vol. LXXIV, No. 1922*, January 28, 56, pp. 5 & 9. *The Surveyor Vol. CXV, No. 3334*, January 28, 1956, p. 85.

6. **Cathodic Protection of Steel Structures—Corrosion Losses Cut with Magnesium Anodes** ; *Modern Transport, Vol. LXXIV, No. 1921*, January 31, 1956, p. 7.

7. **Advanced Courses for Engineers in Industry** ; H. D. MORGEN, *The Engineer, Vol. 201 No. 5217*, January 20, 1956, pp. 106-109.

8. **Use and Effect of Chlorides in Road Ice-Control, Findings by State Highway Departments** : *Highways and Bridges and Engineering Works Vol. XXIII. No. 1122*, January 18, 1956, pp. 1 & 3.

9. **Trees Falling on Highway, the Legal Aspect** ; LORD MESTON, *Highways and Bridges and Engineering Works, Vol. XXIII, No. 1122*, January 18, 1956, p. 10.

10. **Motorways and Road Research in 1831** ; B. G. MANTON, *Highways and Bridges and Engineering Works, Vol. XXIII, No. 1123*, January 25, 1956, p. 6.

11. **Aerial Surveying Techniques and their Application to Highway Engineering**, B. F. J. BRADBEER and H. G. DAWE, *The Journal of the Institution of Highway Engineers, Vol. III, No. 9*, January 1956, pp. 7-14.

12. **Ice-Free Road Experiments** RICHARD PALMER, *Roads and Engineering Construction*, November 1955, pp. 82-84 & 104.

13. **Highway Development Vital to Technical Advance** ; *The Surveyor, Vol. CXIV. No. 3318*, October 8, 1955, pp. 985-986.

14. **Estimating Traffic Growth on New Roads and Bridges** ; *The Surveyor, Vol. CXIV, No. 3318*, October 8, 1955, p. 989.

15. **Grade Separation—The Radical Solution for Urban Intersections;** *The Surveyor Vol. CXIV. No. 3318,* October 8, 1955, p. 991.

16. **Why Roundabouts Are Not A Success—Spanish Engineers Criticise British Recommendations;** *The Surveyor, Vol. CXIV, No. 3318,* October 8, 1955, pp. 991-992.

17. **The Engineer in Planned Economy;** *The Surveyor, Vol. CXIV, No. 3324,* November 19, 1955, pp. 1123-1128.

18. **A Guide to Sideways Force Coefficients;** *The Surveyor, Vol. CXV. No. 3335,* February 4, 1956, pp. 95-96.

19. **Aesthetics in Highway Engineering;** *The Surveyor, Vol. CHV. No. 3335,* February 4, 1956, p. 99.

20. **The Measurement and Isolation of Vibration;** J. A. MACINANTE, *The Journal of the Institution of Engineers, Australia Vol 27, No. 12,* December, 1955, pp. 323-336.

21. **Selected Aspects of the Geometric Design of Airports;** JOHN HUGHJONES, *Proceedings of the Institution of Civil Engineers, Part II, Vol. 5,* February 1956, No. 1, Airport Paper No. 29, pp. 1-25.

22. **Measuring and Assessing Figures for Road Surface Slipperiness;** *Highways and Bridges and Engineering Works, Vol. XXIII, No. 1125,* February 8, 1956, pp. 1, 3 & 4.

23. **Rainfall and Run-Off—An Investigation at Harlow New Town;** L. H. WATKINS, *The Journal of the Institution of Municipal Engineers, Vol. 82, No. 8,* February 56, pp. 305-316.

24. **The Ohio Turnpike:** THEORDORE J. KAUER, *Roads and Road Construction, Vol. 34, No. 398,* February 1956, pp. 34-38 (Part I).

25. **The Motorways and its Environment;** SIR E. OWEN WILLIAMS, *Roads and Road Construction, Vol. 34, No. 398,* February 1956, pp. 39-40.

26. **Roads in Victoria;** *Roads and Road Construction, Vol. 34, No. 398,* February 1956, pp. 48-53.

27. **Criteria for Public Works:** *The Surveyor, Vol. CXV, No. 3336,* February 11, 1956, pp. 111-113.

28. **The Zurich-Winterthur Autobahn;** H. M. THOMMEN, *Schweizerische Bauzeitung, Vol. 74, No. 7,* February 18, 1956, pp. 100-104 (in German).

29. **The Role of Geology in Civil Engineering Works;** A. BONTE, *Annales des Ponts et Chaussees, Vol. 126, No. 1,* January-February 1956, pp. 77-103 (in French).

30. **A Central Motorway for Kent–An Examination of an Interesting and Economic Project;** *Highways and Bridges and Engineering Works, Vol. XXIII, No. 1128,* February 29, 1956, pp. 1-3 & 4.

31. **A Good Case for Toll Highways—Prominent Engineers Give Their Views to London Institution;** *Highways and Bridges and Engineering Works, Vol. XXIII, No. 1129,* March 7, 1956, pp. 1, 3, 4 & 6.

ADDITIONS TO THE LIBRARY OF THE INDIAN ROADS CONGRESS

1. **"Glossary of Terms Relating to Iron & Steel B. S. 2094: Part 5: Bright Steel Bar & Steel Wire".** (British Standards Institution, 2, Park Street, London W. 1.)

2. **"Glossary of Terms Relating to Iron & Steel B. S. 2094 Part 6: Forgings and Drop Forgings".** (British Standards Institution, 2, Park Street, London W. 1.)

3. **"Timber Ladders, Steps and Trestles". B. S. 1129: 1954.** (British Standards Institution, 2, Park Street, London W. 1.)

4. **"Tests to Assess the Properties of Hot Applied Joint Sealing Compounds for Concrete Pavements". B. S. 2499: 1954.** (British Standards Institution, 2, Park Street, London W. 1.)

5. **"Everyday English Idioms 20th Edition"**—R. Benham, (D. B. Taraporevala Sons & Co. Ltd., 210, Hornby Road, Bombay.)

6. **Richtlinien fur die Anlage Von Stadtstraben (Rast) Teil I Ausgabe 1953 (Specifications for the Layout of Town Roads Part I).** (Kirschbaum Verlag, Bielefeld [Germany]).

7. **Earth Roads** Dr. Ing. H. Leussink & Dr. Ing. E. W. Goerner (Erich Schmidt Verlag., Beilefeld, Germany) (in German).

8. **Road side Planting** (Erich Schmidt. Verlag, Bielefeld, Germany) (in German).

9. **"Standard for the Maintenance of Concrete Pavements"** (Koln—Deutz—Alarichstrasse 35, Germany) (in German).

10. **"Standards Concrete Pavements" 1953.** (Koln-Deutz—Ala—richstrasse 35.)

11. **"Proceedings of the Third International Conference on Soil Mechanics and Foundation Engineering Volume III. 16-27 August 53 Switzerland".** (Organizing Committee, ICOSOMEF, Gloriastrasse 39, Zurich-6)

12. **"IXth International Road Congress Lisbon 1951—Report of the Proceedings of the Congress"** (Permanent International Association of Road Congresses), 2, Rue Paul Cezaund, Paris.

13. **'Culvert Hydraulics' H. R. B. Research Report No. 15-B, 1953, Pubs. No. 287.** (Highway Research Board, 2101, Constitution Avenue, Washington 25-D. C.)

14. **"Writing the Technical Report 3rd Edition (1952)".** J. Raleigh Nelson, (McGraw-Hill Book Co. Inc., New York.)

15. **B. S. 882, 1201; 1954: "Concrete Aggregates from Natural Sources".** (British Standards Institution, 2, Park Street. London W. 1.)

16. **Sand-Clay Roads, Bulletin No. 19 (Nov. 1917).** B. K. Coghlan, (Texas Engg. Experiment Station, College Station, Texas, U. S. A.)

17. **The Value of Applied Geology Bulletin No. 20, (March, 1918).** D. R. Semmes. (Texas Engg. Experiment Station, College Station, Texas, U. S. A.)

18. **The Administration of Highway Improvements, Bulletin No. 21 (April 1919).** R. L. Morrison, (Texas Engg. Experiment Station, College Station, Texas, U. S. A.)

19. **Bituminous Pavement Investigations in Certain Texas Cities Part I. Bitulithic Bulletin No. 22 (May 1919).** Roy M. Green, (Texas Engg. Experiment Station, College Station, Texas, U. S. A.)

20. **Principles of Pavement Selection with Statistics of Pavements in Texas Cities & Towns Prior to January 1, 1920, Bulletin No. 23, (May 1920).** Roy M. Green & L. W. Kemp, (Texas Engg. Experiment Station, College Station, Texas, U. S. A.)

21. **Bituminous Pavement Investigations in Certain Texas Cities, Part II, Bulletin No. 24 (September 1921),** Roy M. Green, (Texas Engineering Experiment Station, College Station, Texas. U. S. A.)

22. **Design of the Reinforced Concrete Road Slab, Bulletin 39. (March 1931).** L. E. Grinter (Texas Engg. Experiment Station, College Station, Texas. U. S. A.)

23. **A History of Suspension Bridges in Bibliographical Form. Bulletin 57, (July 1941).** A. A. Jakkula (Texas Engg. Experiment Station, College Station, Texas. U. S. A.)

24. **Proceedings of the Conference on Highway Economics. Bulletin No. 61 (September 1941.)** (Texas Engineering Experiment Station, College Station, Texas. U. S. A.)

25. **Roadway and Runway Soil Mechanics Data, Part I : Permanency of Clay Soil Densification Bulletin No. 67 (June 1942).** Henry C. Porter, (Texas Engg. Experiment Station, Texas. U. S. A.)

26. **Roadway and Runway Soil Mechanics Data, Part II - Density and Total Moisture Content of Clay-Soil-Bulletin No. 68, (July 1942).** Henry C. Porter, (Texas Engg., Experiment Station, College Station, Texas. U. S. A.)

27. **Roadway and Runway Soil Mechanics Data, Part III - Density and Total Density Change of Clay Soil, Part IV-Density and Total Volumetric Change of Clay Soils, Bulletin No. 69 (July 1942),** Henry C. Porter, (Texas Engg. Experiment Station, College Station, Texas. U. S. A.)

28. **Roadway and Runway Soil Mechanics Data, Parts V-VII, Bulletin Series No. 70 (August 1942).** Henry C. Porter, (Texas Engg., Experiment Station, College Station, Texas. U. S. A.)

29. **Roadway and Runway Soil Mechanics Data, Parts VIII-IX Series No. 71 (August 1942),** Henry C. Porter, (Texas Engg. Experiment Station, College Station, Texas, U. S. A.)

BUDGETS AND ADMINISTRATION REPORTS

MADRAS STATE BUDGET FOR 1956-57.

The following extracts relating to Civil Works have been taken from the Madras State Budget for the year 1956-57 :—

Revenue

Heads	(In lakhs of rupees) Actuals 1954–55	Revised estimates 1955–56	Budget estimate 1956–57
Rents	7.35	6.60	6.60
Receipts from workshops	0.22	0.62	0.65
Recoveries of expenditure	50.15	92.45	203.19
Transfer from Central Road Fund	36.65	—	—
Ferry Receipts-Highways Department	2.24	2.14	2.18
Tolls on roads	0.05	0.50	0.50
Miscellaneous	16.02	13.86	13.18
Deduct-refunds	1.30	-0.80	-0.80
Total ...	111.38	115.37	225.50

Expenditure (Civil Works)

Buildings			
Original works	19.45	31.70	16.81
Repairs	34.08	37.12	34.62
Communications			
Original works	13.50*	6.70	4.89
Repairs	203.62	207.00	211.59
Miscellaneous			
Original works	0.07	0.62	0.01
Repairs	1.07	1.03	1.02
Development schemes			
Buildings	2.18	4.25	6.95
Communications	23.57*	64.51	166.23
Establishment	53.61	52.29	56.21
Tools and Plant	21.94	44.12	35.26
Grant-in-aid	54.95	83.35	23.77
Suspense	-14.73	15.92	6.48
Lump sum deduction for probable savings	—	—	-9.97
Lump Addition for regrant of lapses and rebates and exgratia payments	—	—	0.12
Add-Recoveries	80.83	170.97	192.61
Total ...	494.15	719.58	746.60

* Amount met from central Road Fund has not been deducted. It has been shown as receipt under the Revenue head (Civil works).

Capital Expenditure on Civil Works outside the revenue account

Heads	(In lakhs of rupees) Actuals 1954–55	Revised estimates 1955–56	Budget estimates 1956–57
Original Works			
Buildings	15.84	47.00	130.21
Communications	@	@	4.05
Miscellaneous	@	@	2.61
Development Schemes			
I. Schemes included in the Five Year Plan			
(i) Buildings	16.02	28.96	78.60
(ii) Communications	@	@	75.41
(iii) Tools and Plant	@	@	20.00
(iv) Grants-in-aid	@	@	44.10
(v) Establishment	0.84	0.56	0.53
II. Other Development Schemes			
(i) Buildings	3.25	0.33	24.73
(ii) Grants-in-aid	—	—	29.32
(iii) Establishment	1.27	1.57	4.69
(iv) Tools and Plant	0.07	0.23	0.28
(v) Supervision charges	1.13	1.28	1.17
Establishment	2.40	4.86	6.45
Tools and Plant	0.12	0.72	0.38
Lump-sum deduction for probable savings	—	—	–7.96
Lump-sum addition for regrant of lapses	—	—	0.20
Add-Recoveries	—	0.53	8.13
Total ...	40.94	86.04	422.90
Receipts from Roads			
Receipts under the Indian Motor Vehicles Act	347.39	13.92	14.02
Receipts Under the Madras Motor Vehicle Taxation Act	—	366.00	366.00
Motor Spirit Tax	112.91	110.04	140.04
Other Receipts	14.85	0.03	0.04
Deduct—Refunds	–2.34	–1.53	–0.38
Total ...	472.81	488.46	519.72

@ Shown under "Expenditure-Civil Works"

MADRAS STATE BUDGET FOR 1956-57

(A brief review with reference to Civil Works)

THE estimated revenue receipts of the State for the year 1956-57 is Rs 6077.95 lakhs. The expenditure on revenue account is estimated at Rs 6243.83 lakhs, resulting in a deficit of Rs 165.88 lakhs. The revised estimate for 1955-56 showed a revenue of Rs 5268.04 lakhs and expenditure on revenue account of Rs 5488.71 lakhs, with a consequent deficit of Rs 220.67 lakhs.

Expenditure on Civil Works during 1956-57 is estimated at Rs 746.60 lakhs which forms 12.3% of total State revenue. The corresponding ratio of the previous year was 13.7%. Out of the total revenue expenditure on Civil Works, Communications (original works and repairs only) account for 6.3% of the estimated revenue for 1956-57, while it was 5.3% for 1955-56 (Revised estimate.)

The provision for capital expenditure on Civil Works outside the revenue account is estimated at Rs 422.90 lakhs for 1956-57, while the revised estimate for 1955-56 is Rs 86.04 lakhs. The increase in this expenditure in the current season is due to an increase in provision for Buildings (original works Development Schemes).

THE LESSONS OF WAR AND PEACE ARE THE SAME

"I have come to the conclusion that one thing to which we must give topmost priority is roads — roads of all kinds, not only very up-to-date bitumenized or cement roads, but roads of any kind, to open out vast areas of this country which are closed up today and which you cannot reach unless you walk or ride.....I give roads first priority."

— Jawaharlal Nehru

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"No unpretty prices. Anyone Who buys bulbs from us will find his garden clothed next spring in beautiful bloomers."

Then again:

"Our hyacinths not only are pretty to watch, but grown in your homes they stink."

(From bulb catalogues from Holland)

LIST OF APPROVED WORKS ON NATIONAL HIGHWAYS

S. No.	Job No.	Name of work	Amount (Rs in Lakhs)
		ANDHRA	
1.	1665 AH 5	Formation of metalled road from Vemagiri to Bommuru along diversion of National Highway No. 5 in East Godavari District.	3.13
		BOMBAY	
2.	1666 BM 8	Construction of a bridge with its approaches across the Kolak River in mile No. 136 of the Bombay-Ahmedabad Road N. H. No. 8.	7.92
3.	1667 BM 8	Construction of a diversion of Bombay-Ahmedabad Road, National Highway No. 8 at Bulsar.	5.19
4.	1668 BM 8	Construction of a bridge with its part approaches across the Damanganga River in miles 130 of the Bombay-Ahmedabad Road, National Highway No. 8.	11.44
		JAMMU & KASHMIR	
5.	1676 JK 1-A	Payment of cost of recoupment of the Bailey Bridge equipment used on the construction of a bridge at Ramban on Jammu-Srinagar Road, National Highway No. 1-A.	5.07
		ORISSA	
6.	TA 34 RS 5	Construction of a high level bridge across the river Birupa on National Highway No. 5 Cuttack.	23.17
		UTTAR PRADESH	
7.	1669 UP 26	Construction of approaches to Jhararghat Bridge over Betwa on Jhansi-Saugor Road, National Highway No. 26.	4.26

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