TRANSPORT-COMMUNICATIONS

MONTHLY REVIEW

SEPTEMBER 1956—No. 113

INDIAN ROADS CONGRESS, NEW DELHI.

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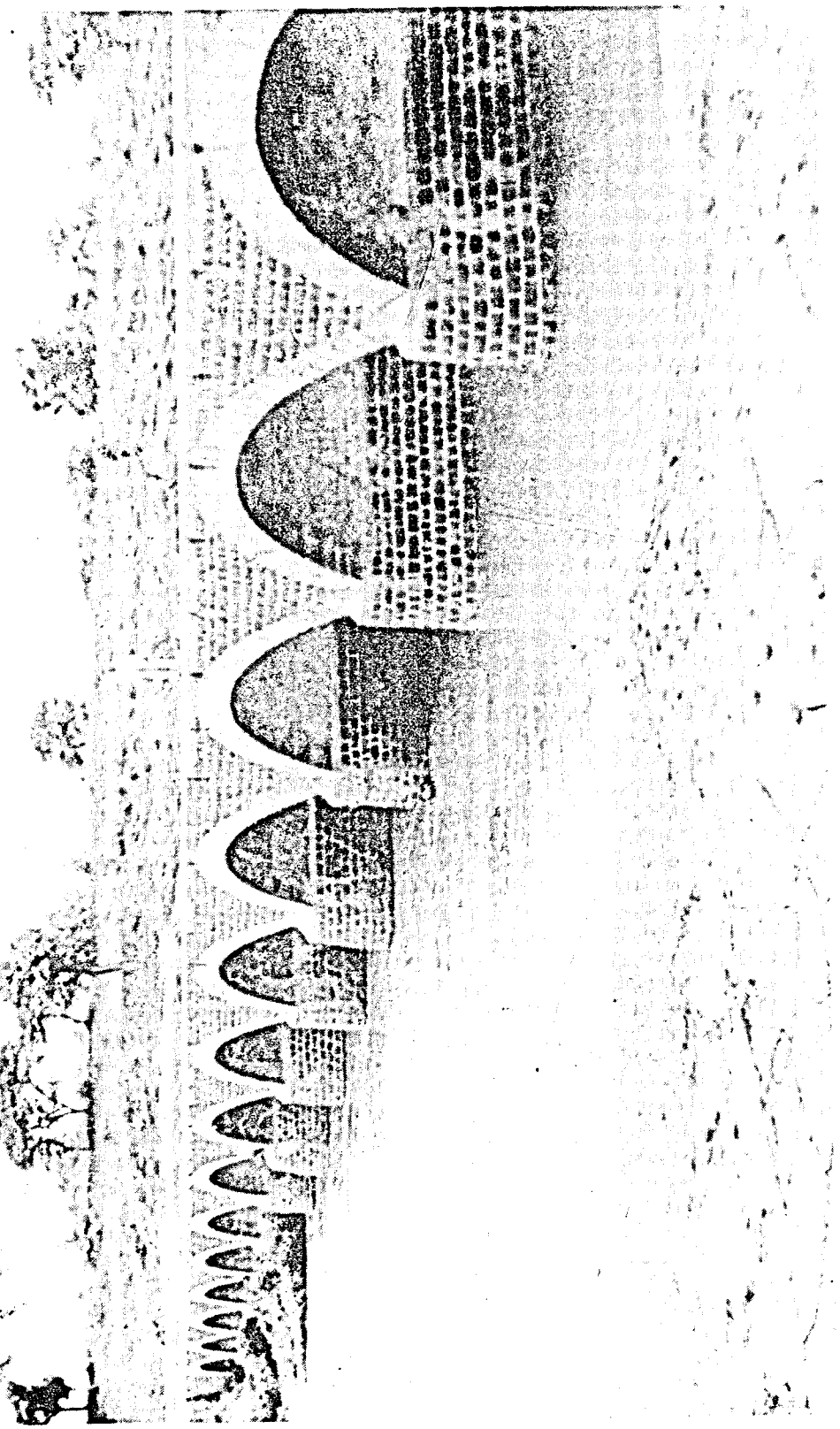

BRIDGE ACROSS PURNA RIVER

At 8/5 of Nandura-Jalgaon Road, Madhya Pradesh. 14 spans of 30 ft each. Brick arches with cut stone facing.

TRANSPORT-COMMUNICATIONS
MONTHLY REVIEW

A REVIEW OF
ROAD ENGINEERING, DEVELOPMENT & TR

SEPTEMBER 1956

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NATIONAL HIGHWAYS BILL IN THE LOK SABHA

SHRI O. V. Alagesan, Union Deputy Minister for Transport and Railways, moving the Bill* for consideration in the Lok Sabha traced the history of the Center's interest in the road system of the country. Explaining the provisions of the Bill, he said that the Central Government would have power under the Bill to employ the agency of the State Government or any other agency for the execution of work, recover suitable fees for services or benefits rendered to traffic by way of provision of ferries, temporary bridges on unbridged crossings and tunnels, and to issue directions to any State Government for carrying out the provisions of the Act.

Sometime a national highway had to be aligned to cater to local needs. In such cases, the State Government was required to meet a portion of the cost of development. Therefore, the Bill sought to empower the Central Government to enter into agreement with State Governments for sharing the expenditure on any national highway. Similarly, the Central Government would have power to enter into agreements with municipalities of towns with a population of more than 20,000 regarding the development or maintenance of the part of the situated within the town concern

The Deputy Minister emphasi the utmost co-ordination betw and rail was necessary if the Pla were not bedevilled by lack of t Road transport had the advan rail transport in that it could re to door step and make effective For better transport, the import properly developed and well-ma system of national highways was

During the general discussio Bill, as many as 21 members par in the debate. Every one of the who spoke supported the Bil heartedly and said that a s properly developed and well-m national highways was very ess the development of the countr members emphasized the need f more milage to the system to se portion of the country. The follo brief summary of the points members during the debate.

Shri Ramachandra Reddy supporting the Bill said that i places, specially within mun and near large towns, the roadland was

* See August 1956 issue of T.C.M.R., pp. 5 to 8.

encroached upon to a very great extent. That resulted in the narrowing down of the highway with consequent risk of accidents. As long as the removal or retention of these encroachments remained in the hands of the State Governments or District Boards, because of the personalities and personal influence, these could not be evicted effectively. He therefore urged the Central Government to take power to deal with the encroachments in a very effective manner.

There were several places on roads where bridges were wanted and where bridges were not strong enough to carry heavy vehicles. It was, therefore, necessary that a survey should be made to find out the weak culverts and bridges and to bring them up to standards. The roads within municipal areas not only catered for the through traffic but also the local traffic used them. It was, therefore, necessary that more funds should be provided for improving and maintaining the highway within municipal and highly congested 'panchayat' areas.

Shri Ramachandra Reddy urged that a highway connecting Nellore with Bombay be included in the proposed system. The length of this road would be about 900 and odd miles and some portions of it were already cement concreted and black topped.

Shri U. M. Trivedi (Chittor Rajasthan) was of opinion that the milage of national highways should have been at least commensurate with the length of the railways in the country. There were 40,000 miles of railways and it would not be out of proportion to declare 40,000 miles of roads as national highways. This should be done progressively under the provisions of the Bill.

Referring to the portion of Clause 4 of the Bill, "All lands appurtenant thereto whether demarcated or not", Shri Trivedi said that such a provision resulted in a lot of trouble to the villagers. Where the boundaries have not been clearly demarcated, the earth for use on the road was borrowed by the contractors from cultivable lands, resulting in loss and inconvenience to the villagers. He, therefore, urged that the boundaries should be clearly demarcated.

Shri Trivedi cited the example of Jhalawad Road Railway Station, where the loopline was in Madhya Bharat territory and the main line in the Rajasthan territory. Buses carrying passengers coming to Jhalawad road station from long distances were not allowed to go near Jhalawad road station in Madhya Bharat territory even though its distance from the Rajasthan border was only of the order of 2 furlongs. Consequently, passengers had to make their own arrangements for carrying their luggage. If the oad connecting Neemuch to Bewar were declared a National Highway, the inconvenience to public could perhaps be eliminated.

Shri Trivedi urged that the highway connecting Ajmer and Mhow be also declared a National Highway. This road will connect N. H. 3, Agra-Bombay road, with N.H. 8, Delhi-Bombay road. A road existed on this route but due to the fact that it passed through various small princely States like Shahpura, Udaipur, Nimbakhera, Ratlam, etc., it was neglected and was in a bad state at the present moment. Incidentally, this highway would connect Nasirabad and Neemuch, which were also important places.

Shri Trivedi said that municipalities having a population of one lakh and less did not have sufficient resources; therefore, the development and maintenance of highways passing through such towns should be taken over by the Government.

Shri S. L. Saxena (Gorakhpur District, North) pleaded for the inclusion of the following three roads in the proposed National Highway system :—

(1) Grand Trunk Road from Kanpur to Delhi via Farukhabad and Aligarh.

(2) A road along the Nepal border.

(3) The road connecting Faridabad and Allahabad via Azampur and Jaunpur.

He mentioned that the old Moghul road from Kanpur to Delhi via Farukhabad was a very important one and was at present well maintained. The maintenance of no portion of this old trunk road should be left to the State Government.

There was a frontier of nearly 700 miles between Nepal and India. It so happened that the Indian people committed dacoities in Nepal territory and came over to Indian side. Also some decoities were commited by the Nepalese on the India side. If a highway along the border connected Gorakhpur to Nautanwa, it would serve as a border road and would to a great extent help restore law and order in the area. Also, this road would be of strategic importance. Moreover, the border between India and Nepal had dense forests and was very fertile. Due to lack of communications the whole area was backward and this road would very much help in opening up the country for development.

The road from Faridabad to Allahabad was a very important one and it was necessary that due consideration to include this in the National Highway system should be given.

Shri Anand Chand (Bilaspur) urged that all crossings of national higaways with railways should be bridged. He cited the example of railway level crossing at Ambala Saddar, where the gates of the existing level crossing remained closed for 3 to 4 times a day, the duration of each closure extending to three-quarters of an hour.

He was not in favour of any kind of cess or toll being levied for the use of highways or structures on highways.

Urging that there should be an adequate system of national highways in the eastern and western frontiers of the country, Shri Anand Chand desired that a road connecting Simla with Fazilka be declared a national highway.

All important towns lying on the National Highways system should be bypassed. Municipalities in India today were not very rich. They had very many other functions to perform, and were not able to perform them with the limited funds at their disposal. It was but meet that the Central Government should meet the expenditure of maintaining the highways within the municipal towns.

Shri T. N. Singh (Banaras U. P.) emphasized that a detailed study of the method of financing capital projects should be made. He was of the opinion that cess or tolls should not be levied.

In future the diesel oil would find greater use for road transport purposes. Therefore, the cess levied on diesel oil should be earmarked for road development purposes instead of being credited to general revenues as at present.

Shri Achutan (Cranganoor) said that the west coast road connecting Bombay and Cape Comorin through Malabar had not been included in the schedule. This highway was an important one and amendment to include this road as a national highway should be brought up.

Shri Achutan pointed out that route Nos. 7 and 47, which run on the eastern and western side of the Western Ghats, should be connected by a highway. At present a road connecting Chalakudi on the west and Pollachi on the east of the ghats existed. The road was a kutcha one and it was beyond the means of the State Governments to finance its construction to higher standards. He said that this should therefore be declared as a national highway.

Also, Shri Achutan pleaded for the speedy execution of the Arur and Alwaye bridges.

In the Kerala region, municipalities having a population of even 40,000 were not having sufficient financial resources to properly maintain the streets within their area. Therefore they could not be burdened with the responsibility of maintaining the National Highways. This point deserved careful consideration.

Shri M. D. Joshi (Ratnagiri, South) said that a highway connecting Bombay with Mangalore along the west coast via Ratnagiri and Karwas was very important and that it should be included in the system of National Highways. He endorsed the suggestion that the National Highways should by-pass municipal areas.

Shri L. Jogeshwar Singh (Inner Manipur) emphasized that, because in the Manipur State roads were the only means of communication, tolls for ferries should not be levied. He desired that for

continuity the Burmese Government should be moved to construct and maintain the road in Burma in continuation of N. H. No. 39. He pleaded for the inclusion of the road from Silchar to Manipur as a national highway and suggested the inclusion of a road linking Agartala with Shillong in Assam in the National Highway system.

Shri N. M. Lingam (Coimbatore) said that national highways could develop only when the network of State highways and feeder roads connecting villages were properly planned. Unless the network of the secondary roads were maintained to proper standards, so that they could feed the national highways which were the arteries of communications between States, there was no point in laying emphasis on the development of national highways. A poor and under-developed country like India could not afford to take an expanded system of national highways while village and other roads were starved. In other words, the allocation for national highways and schemes for their extension should bear a proportion to the allocation that was made for the development of roads other than national highways. It was also necessary that there should be adequate traffic offering on national highways. Transport policy was closely allied with the development of national highways. To encourage traffic, a sound transport policy was necessary. The first adjunct to the success was the development of industries, in particular the automobile industry and commerce. To develop national highways and make allocation on a huge scale as was now contemplated, existence of a good system of State and secondary roads and well developed automobile industry was necessary. The Motor Vehicle Taxation Enquiry Committe had said the burden on the industry was very heavy. The incidence of taxation on automobile industry in India was the highest in the world and the taxation of the automobile was not uniform in every part of the country, and the Committee had recommended a uniform system of taxation for motor vehicles. The Committee had also pointed out that unless this was done, the automobile industry and highway transportation would not develop. The Committe had also pointed out that the condition of the existing roads constituted an additional taxation on the transport industry because the wear and tear owing to the nature of unsatisfactory surfaces of the roads was an indirect taxation on motor vehicles.

Shri Lingam pointed out that all the national highways in the country were not to the same standard in respect of alignment, standard of maintenance and other improvements like landscaping etc. He suggested that each national highway should be taken up and made fit for traffic throughout its length only after a survey of traffic on that highway had been made. If it was found that there was no justification for the development of a particular national highway, it should then be postponed to a later date. The construction of missing links and bridges should be given first preference. If a traffic survey of the various highways was made and taken up by stages according to the requirements of traffic, then the national highways would bring forth maximum results.

In other countries like America, national highways were beautified, their roadsides improved and provision made for picnic grounds etc. India was far behind in this respect. The first need was for an integrated and well-planned system of national highways, State highways, district and village roads. For effecting such an integration and for maintaining a balance and for seeing that the moneys spent on the roads were effectively utilized, a body like the Road Board was necessary. In fact, the Nagpur plan had recommended the constitution of such a body by the Centre. The functions of the Transport Ministry were expanding. They were in charge of shipping, inland transport, motor transport, etc. So, there was the necessity for a separate Ministry for Road Transport. At least there should be high-powered body like the Road Board suggested in the Nagpur Plan. This body should be in charge of planning, development, maintenance research, etc. It must have a representative of the Ministry of Defence working on it.

Roads had to be designed not only with reference to strategic needs but also to

take care of industrial and rural development. Also, in a big country like India with varying climates they had to be designed to suit the different types of climatic and topographical conditions. Such a complex problem could be effectively handled only by a high-powered body like the Road Board.

Shri Lingam pointed out that on several highways the portions near railway level crossings were in a neglected condition. He cited the example of the excellent concrete road between Mettupalayam and Coimbatore where the portion near the railway level crossing was full of ruts. He stressed on the need for proper coordination between the Railway Ministry and the Ministry for Transport.

Shri Biran Dutt (Tripura, West) drew attention to the statement made by the Railway Minister at the time of the Railway Budget, when it was said that as it was not possible to link Tripura with Assam by rail, a national highway linking Assam with Tripura would be constructed. He desired that the road connecting Shillong, Silchar, Karimgunj and Agartala should be included as a National Highway. The Tripura P. W. D. had not got sufficient resources to maintain this road in a proper condition. There was also dearth of technical personnel.

Shri Matthen said that the national highways when properly maintained and gradually extended would fill in the gap in the capacity of railways to move goods and passengers and would thus solve the bottleneck in transport.

Heavy motor vehicles were using the roads and one of the limitations of the road transport was the strength of bridges and culverts. Therefore, weak bridges and culverts should be strengthened or newly built to cater for heavy loads.

Shri Bansal said that the road connecting Moradabad with Almora and Champavat should be declared as a National Highway. Also, Delhi should be linked with Bikaner either via Rewari or Jhajjar by a national highway.

Shri Bansal pleaded for systematic planting of trees on both sides of roads to offer comfort to travellers. Planting of trees, in his opinion, would increase the life of roads.

Shri B. D. Pande (Almora, North-East) suggested the inclusion of a road from Bareilly on N. H. No. 24 to Taklakote in Nepal via Pilibhit, Tanakkote, Pithorgarh, Dharjuba and Garbiong. That road was a frontier road and gave access to Mansarover and Kailash. Trade and merchandise worth nearly Rs one crore passed through that road. Also, pilgrims from all over India made use of that road. It was also important from the strategic point of view. Being a frontier road, he urged that it would be proper to declare it as a national highway.

Shri Alagesan, Deputy Minister for Transport, replying to the debate mentioned that in the first Five Year Plan the construction of 72 major bridges, of which 30 have been completed, had been taken in hand. During the second Plan another 72 major bridges would be taken up and he hoped that by the end of the Second Plan the targets laid down in the Nagpur Plan would have almost been achieved.

The limited finances available did not permit the development of more milage of National Highways.

Referring to the demand by some members about border roads, the Deputy Minister said that the Central Government were very generous in providing grants to the various State Governments for developing their border roads.

Referring to the demand that the work on links of national highways within municipalities should not be allowed to be financed by municipalities, the various State Governments had been informed that the Centre would be willing to take over the maintenance of these links provided proper widths were available. This matter would be examined further. What was mentioned in the Bill was levy of fees on ferries where the crossings were unbridged. The fee was meant to cover the maintenance of the ferry. Also, when temporary bridges were constructed, fees would be levied for the maintenance of

these bridges. It was not the intention to levy fees or tolls at permanent bridges when they were constructed. The provision in the Bill had been made to cover cases like the Bannihal Tunnel where a large amount of expenditure had to be incurred for lighting the tunnel and for its proper ventilation. Naturally, the traffic that made use of the tunnel had to pay towards the charges of maintenance.

Regarding the provision of over-bridges over railways it had always been the policy to provide over-bridges or underpasses wherever a railway crossed a national highway.

(To be continued)

CORRECTION

In the map of National Highways of India on page 2 of the August issue of the T. C. M. R. the route number of the Highway connecting Delhi and Fazilka should be read as 10 and not 13.

MIXED METAPHOR

"A major milestone which proves that the ship was sound."

HIGHWAY FUNCTIONAL OBSOLESCENCE

Three factors cause functional obsolescence in Highways. These are increased speed, traffic density and bigger and heavier vehicles.

RECOMMENDATIONS OF THE ENGINEERING PERSONNEL COMMITTEE OF THE PLANNING COMMISSION (1956)

IN September 1955 the Planning Commission set up a Committe under the chairmanship of Shri Y. N. Sukthankar to review the programmes of the Central and State Governments under the second Five-Year Plan, to estimate the requirements of engineering personnel of supervisory and higher grades for implementing the Plan, to make an assessment of shortage of supervisory and higher grades of engineering personnel, and to recommend, after review of the existing facilities for training, additional or modified programmes. The Committee was also authorized to make such other recommendations as may be essential for ensuring adequate supply of engineering personnel for the next 15 years.

The officers of the Committee visited some States and held discussions with authorities with a view to assess the requirements of engineering personnel. They had also interviewed representatives of various institutions interested in the subject. After ascertaining the requirements of the various Central Ministries and reviewing the position of supply and demand, the Committee submitted their report in May 1956. The following are some of their important recommendations:

1. Post-graduate training facilities in engineering subjects should be provided on a wider scale within the country.

2. Foreign training for our engineers should be made more purposeful by advance mapping of fields in which such training is urgently required and earmarking trainees for suitable positions in the country on successful completion of training. A larger proportion of foreign scholarships should be made available to teachers in engineering institutions.

3. Since demand for specialists has not developed to any considerable extent, it will be more advantageous to continue the present arrangements under which training is more broad-based.

4. Engineers who have qualified in specialisations for which demand is likely to develop should be afforded facilities for pursuing advanced work in their chosen fields in (a) design and development wings attached to State enterprises and (b) engineering and technological institutions.

5. Standards in engineering institutions should be improved by:

a) bringing service conditions for teaching staff on par with those obtaining in executive positions under Government,

b) sparing competent and experienced men from government cadres for teaching in colleges,

c) arranging field experience in industrial enterprises and engineering projects for teachers to help them keep in touch with the progress taking place in current engineering practices,

d) promoting advanced work and research in universities,

e) making promotions within the teaching line largely on the basis of research work carried out by staff,

f) allowing serving engineers who display a special aptitude and potentiality for research to enter such work on adequate remuneration, and

g) encouraging consulting work by university staff.

6. Standards of examination should be improved by effecting a partial change

in favour of a system which will give evidence of the professional attainments of a student rather than his power to memorise.

7. As an incentive for better performance, employment should be guaranteed to students who top the lists in the examinations.

8. Employing authorities should provide opportunities for experience to persons who have potentialities of being 'built up'.

9. The Practice of advance recruitment of technical personnel and their training prior to posting should be adopted on a wider scale.

10. It is anticipated that in 1960-61, engineering personnel will be in short supply to the extent of about 1,800 graduates and 8,000 diploma holders in different branches.

11. To meet the shortages, capacity, existing established institutions should be expanded fully. It may be possible to secure in this manner an average increase of 20 per cent in the outturn of graduates and 25 per cent in the case of diploma holders.

In addition, 18 colleges and 62 diploma institutions will have to be opened. The total cost of setting up these training facilities (establishment of new institutions and expansion of capacity in existing institutions) will be in the neighbourhood of Rs 16 crores.

12. It will take three to four years for these additional facilities to yield results. In the interim period, shortages will have to be met by :—

(a) promotion from lower ranks,

(b) more balanced utilisation of available talent,

(c) retention of persons for suitable periods beyond the age of superannuation,

(d) temporary overloading, to some extent where this is not already being practised, and

(e) the organisation of functional training at the supervisory level.

13. Functional training for supervisory personnel will have to be continued as a permanent measure, even beyond the interim period, since the additional facilities planned will meet only 60 per cent of prospective demand.

14. Institutional training for skilled workers, present and future, should be geared to the requirements of employing authorities.

15. There is evidence to show that in the engineeering field there is considerable 'flight' of personnel from job to job resulting in dislocation of work, unsatisfactory performance and increased expenditure on staff.

16. 'Flight' of personnel is an organizational problem and is tied up with differences in salary scales, security of tenure and regional preferences.

17. States should agree to a common line of action for the evolution of uniform conditions of service for personnel engaged on development schemes.

18. The long term interests of temporary engineers engaged on development projects should be protected.

19. A suitable authority should be set up by agreement between the States and the Centre for (a) regulation of salary scales and security of tenure and (b) allocation, inter-state movement and welfare of personnel engaged on development projects outside the regular cadres.

20. Flexibility and speed have to be secured in recruitment through the Public Service Commissions in the context of the personnel needs of the development programmes.

21. Recruitment should be speeded up through (a) suitably strengthening the Public Service Commissions, (b) bifurcating their work relating to senior and junior posts and (c) devising simpler and quicker methods of consultation.

22. Recruitment to services at the college campus should be tried because of (a) the advantage of speeding up recruitment and (b) the beneficial effect which a Service Commission going round the universities will have on students.

23. There should be one or two bulk selections every year for technical men of a particular category.

24. Priority should be given to the creation and maintenance of a Register of Technical Manpower.

25. Indian nationals receiving technical training abroad should be kept informed of employment opportunities advertised in India.

26. Future recruitment policy should be guided by the need to keep in balance the age composition of serving engineers.

27. The successful implementation of a manpower policy implies (a) an effective and continuous collection of the necessary information, (b) the framing of policy on the basis of information so collected and (c) the execution of such policy. Each of these functions requires a suitable organization.

28. A Technical Manpower Committee of the Cabinet should be set up, with a corresponding Committee of Secretaries, to evolve policies regarding technical personnel. A Technical Manpower Division should be created in the Planning Commission to serve the Cabinet Committee. Similar Committees will have to be set up at the State level.

29. The Central Government should explore the possibilities of instituting a suitable All India Service of Engineers by common consent of the participating States.

30. Technical and scientific personnel should be introduced at suitable levels in the general administrative machinery, especially to hold posts where their experience is of value.

QUICK IN THE UPTAKE!

Patient: "*How much do I owe you for curing my deafness?*"

Specialist: "*My fee is three guineas.*"

"*Four guineas?*"

"*No, five guineas.*"

Liberal minded person is one who thinks the same as you do.

DESIGN STANDARDS FOR THE INTER-STATE HIGHWAY SYSTEM OF THE U. S. A.

RECENTLY the American Association of State Highway Officials approved design standards for the 41,000 mile inter-state highway system.

Minimum Land Widths

The minimum land widths have not been fixed by the standards because it is recognised that varying conditions make variable lands widths necessary. However, guides for the land widths for rural roads suggested in the standards are given below :

Type of Highway	Minimum Width in Feet: Roads without Frontage	Roads with Frontage
2-lane	150	250
4-lane divided	150	250
6-lane divided	175	275
8-lane divided	200	300

In urban areas where land was likely to be costly, the standards specified that the roadland should include all the necessary elements of the highway including service roads.

Design Traffic

The roads should be designed for the 30th highest hourly volume of traffic expected in 1975, taking into consideration the future development.

Where sight distances and passing opportunities are adequate and the hourly volume of traffic, expected in 1975, is equal to or less than 700 vehicles per hour, a single 2-lane road can be constructed. In all other cases, divided highways are specified. At all intersections with railways or other highways, there shall be over-bridges or under-passes. But in sparsely populated rural areas, cross roads having traffic of 50 vehicles or less per day may have intersections at grade.

Design Speed

The design speeds specified are 70 m.p.h. for flat country, 60 m.p.h. for rolling country, and 50 m.p.h. for mountainous country.

Gradients

The maximum grades are 1 in 33.3 for flat country, 1 in 25 for rolling country, and 1 in 20 for mountainous country.

The central separating verge between the carriageways of a divided highway shall be at least 36 ft wide. For urban and mountainous areas, this should be reduced to 16 ft. No median strip shall be less than 4½ ft.

Width of Traffic Lanes and Shoulders

Traffic lanes will be at least 12 ft wide and shoulders should be 10 ft in width. However, shoulders could be reduced to 6 ft in mountainous terrain.

Full roadway width including shoulders should be provided on all bridges up to 150 ft long. On longer bridges, if barrier kerbs are used along the median, they must be offset by at least 2 ft while the parapets or railings should be offset by not less than 3½ ft. The clearance for structures crossing the highway shall have a clear height of 14 ft over the full roadway width including the shoulders. Lateral clearances must be equal to the width of the shoulders, and in no case should be less than 8 ft on the right and 4½ ft on the left of through traffic lanes.

(*Adapted from 'Engineering News Record'—July 26, 1956.*)

DEFINITIONS OF HIGHWAY ENGINEERING TERMS

TREMIE : A cylindrical tube, funnel shaped at the top, used for depositing concrete in water.

VIBRATOR : A machine which compacts a layer of freshly mixed concrete by vibration.

INEXPENSIVE BUILDING BRICKS FROM WASTE OF RICE HULLS

ASH from burned rice hulls is the basic ingredient of "Soilash" blocks, developed after many experiments by Assistant professor John H. Hough, of the university of Louisiana.

The key to the process is the chemical change which takes place in the rice hulls when they are burned, turning them into a mineral state which is 94.5 per cent silica. It was found that the rice-hull ash (which has some of the characteristics of fine sand, but with a much lower density) when mixed with clay soil, made a building block well suited for use in the moist climate of Louisiana.

The bricks are made of equal amounts by volume of clay soil and rice-hull ash, combined with a small quantity of emulsified asphalt. Sufficient water is added to the mixture to form a plastic mass, similar to mortar in consistency. This mixture is poured into forms of the desired shape and the bricks allowed to dry in the shade for about a week. They are then taken out of the forms and exposed to the sun for "curing." Within about 28 days they are ready for use in the construction of small homes or farm buildings.

Rice-hull ash flakes are porous and contain a number of non-connecting cells which make the ash a good insulator. Due to this quality, buildings constructed of the "Soilash" brick are said to be resistant to heat, cold, and hot dry winds.

Experiments at the University have shown that heavy soaking with water did not affect the bricks. Also the bricks were resistant to alternate freezing and thawing tests. Professor Hough believes that the new brick will solidify and become stronger over the years.

It is important that the soil used in making the bricks be carefully selected. In the tests "all soils used which contained not less than 40 per cent clay or more than 85 per cent responded satisfactorily. Soils in which clay existed in quantities greater than 85 per cent cracked badly during the curing period. Soils containing 40 per cent did not have sufficient strength in compression after being cured and the bricks were too friable. Soils containing an excess of salts, such as would be usually true of soils near the coast or adjacent to a salt lake, are not satisfactory. *Generally speaking, any soil that will adhere when moist and form a ball when rolled in the hands and then dry hard without cracking is satisfactory.*"

It is desirable that before a large quantity is manufactured a few trial bricks should be made from available soils and then tested for hardness and strength at the end of the 28-day curing period.

The emulsified asphalt used in the mixture is a solution of approximately 60 per cent asphalt and 40 per cent water, with a chemical, or emulsifying agent added, that keeps the particles in a uniform state of suspension. As the bricks dry out the water evaporates and the asphalt particles blend into a continuous film. Professor Hough used a patented asphalt stabilizer known as "Bitudobe," manufactured by the American Bitumuls and Asphalt Company.

Professor Hough's recommendation for the proportions to be used in the mixture is as follows : "one part soil, one part rice hull ash, and 10 per cent emulsified asphalt by volume of the soil content. In actual practice this would be one cubic foot of soil, 1 cubic foot of rice hull ash and ¾ gallon of emulsified asphalt, with

enough water added to obtain a plastic, easily worked substance. It was found that 2½ gallons of water per batch of 1 cu.ft. of soil and 1 cu. ft. of ash to be most satisfactory. Naturally, the moisture content of the soil at the time it was used would have some bearing on the total amount of water to be added. However, the water measure is not critical. Enough should be added in each case to make a mix that can be easily placed in the mould and worked against the sides and into the corners before filling in the centre."

As for the mixing procedure, Professor Hough says:

"The following order for adding the ingredients was found to produce the best results: Place one-half of the total water required and the total amount of emulsified asphalt into the mixer and allow to mix for three minutes. Add the soil and continue mixing until the soil is saturated with the water-emulsified asphalt liquid, which takes approximately five minutes. Then add the rice-hull ash. Continue mixing until the rice-hull ashes have been so thoroughly absorbed by the saturated soil that they seem to have completely disappeared. This will take from three to five minutes and usually by this time the mix is very stiff. Add the remaining half of the water and continue mixing until a pliable plastic mass is produced. If it is necessary to add water in addition to the estimated required amount, add very slowly and in small quantities. Never add more water than is necessary to produce a workable mix."

It should be noted that mixing by hand would require longer than the times indicated above. At the University a mechanical mortar mixer was used, after a concrete mixer was tried and discarded because it did not mix the ingredients satisfactorily. Professor Hough suggests that it might be feasible in some areas to set up a community mechanical mortar mixer.

"The moulds (for the 8 in. by 12 in. by 4 in. bricks) can be made from wooden forms. It is necessary to keep the interior surfaces clean and well oiled to prevent sticking. Used motor oil is good for this purpose. We found it more satisfactory to make removable sheet metal linings and place these metal linings inside the wooden forms. The rigid forms would support the sheet metal during the pouring period, and at the end of ten minutes the wood form could be removed leaving the sheet metal around the soft brick until it was set. Three wooden frames with three sections each were ample to take care of all the sheet metal linings used in one day's pourings.

"The mix was scooped into each mould and well-trowelled into the corners and against the sides. Surplus mix was scraped off the top with a wooden float, which left a fairly rough surface suitable for receiving mortar.

"As soon as the bricks were firm enough to handle, they were turned on edge so that the greatest possible area was exposed to the air. (The sheet metal lining could be removed at the end of the day's pouring, but the brick, though stiff enough to prevent slump, was not firm enough to move).

"It was definitely established that the initial drying had to be slow. Otherwise external strains were set up that caused severe cracks. For this reason it was impossible to dry the bricks in the open under direct sunlight. Covering with wet burlap did not retard the drying time sufficiently. We found it necessary to dry the bricks under shade for at least seven days. They could then be moved out into the open under direct sun and allowed to cure. Any rain that fell on the bricks during the curing period after the initial drying in the shade had no adverse effect on them."

A properly made soil block will provide sufficient strength for small buildings and will resist normal weather conditions, actually gaining in strength over a period of years. The insulation value of this building material is unusually high because of the thickness of the soil brick wall. *This high insulation value could prove to be very important in warm climates.*

[*From 'Engineering News of India'—August 1956*]

HERE AND THERE

1. DAMAGES FOR DESTRUCTION OF LATERAL SUPPORT AND IMPAIRMENT OF ACCESS AND VIEW

THE property of one Mrs. Weir in Florida was situated at the intersection of two highways, the Atlantic Avenue on the north and the Canal Avenue on the east. There was a building on this property where she carried on her business. This building had its frontage on the Atlantic Avenue and a parking lot to the rear with access from the Canal Avenue. The county responsible for the development of highways in the area had the Atlantic Avenue widened and resurfaced.

Mrs. Weir brought a suit for the following loss and damages that she had suffered during the course of construction:

(1) The lateral support of her land was destroyed, causing her building to settle and crack.

(2) The rents had therefore to be reduced, resulting in loss of business. The building of a retaining wall along the southern boundry of the Atlantic Avenue in front of her building and across the Canal Avenue had ruined the view of her building. Also, the access to Canal Avenue from the Atlantic Avenue was eliminated, requiring a circuitous route to the parking place in the rear of her property. This resulted in forcing the prospective customer to take a circuitous route and consequent loss.

(3) The above was tantamount to taking her property without compensation.

For her support, she quoted a case wherein the owner of a water-operated sawmill was allowed compensation for raising the water level of the millrace, resulting from the filling of a marshy place by a State Road Department. The court was of opinion that the case above mentioned did not apply to the present case because there was no physical invasion of the property as in the case in question. The court was also of opinion that the right to lateral support from adjoining land applied only to land in its natural state and did not extend to land burdened by buildings. In this contention the court was supported by a previous case in which it was recorded: "It is a settled principle of law that the right to lateral support applies to the land in its natural condition, and an adjoining landowner cannot by erecting buildings on the margin of his own land deprive the owner of the adjoining land of the right to excavate his own land upto the line of his neighbour's property, though on account of the additional burden placed upon the land, by the erection of the house thereon, said house may fall, by reason of the withdrawal of the lateral support."

The Florida court followed this principle of law because, in its opinion, any contrary view would enable an abutting property owner to construct a building on his land in such fashion that in many cases it would completely prohibit the improvement of the public way abutting thereto.

The court also held that the right of ingress to and egress from property as well as the right to enjoy its view are subordinate to the public right-of-way.

(*Adapted from 'Highway Research Board Bulletin', Circular 318, June 1956.*)

2. AIR-CONDITIONED BUS

AIR conditioning plant to control heating, ventilation and air humidity is reported to be a feature of a new 45-seater Ikarus bus now being developed in Hungary.

The bus is powered by an eight-cylinder engine of 108 b.h.p. and is said to have a road speed of 60 m.p.h. Earlier examples of Ikarus passenger vehicles, one of chassisless construction having its engine at the rear, have been exhibited at the Geneva show during recent years.

(*From 'Motor Transport, 27, July, 1956'*).

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3. TECHNICAL SOUNDNESS

TECHNICAL soundness of a project may be judged from such questions as:

(a) Is the project technically feasible?

(b) Are there alternatives to the proposed project? e.g., can the objectives of the project be attained by improving existing facilities?

(c) Is the project well conceived and in accord with up to date practice in regard to design and construction methods and procedure?

(d) Will it harmonise with – (I) Other local projects? (ii) Regional plans and projects? and (iii) National plans and projects?

(e) Will it provide at least a minimum standard of service for the present and future?

(f) What are the legal difficulties that may be encountered? e.g., is special legislation necessary before the project can be realised?

The preliminary investigation should provide designs for the structure or works of the project that are technically sound, and a reasonable anticipation of what more detailed investigations and designs would show to be necessary. It would include factors which affect the economy and safety of construction and the satisfactory operation of the completed project.

In the formulation of conclusions and the making of recommendations based on the investigations, attention must be paid to the following:

(a) The interpretation of the data must be impartial and objective, i.e., it must not be forced to conform to a preconceived notion.

(b) A factor must be considered as favourable only when it is supported by all available data. The exception does *not* prove the rule but is cause for further investigation.

(c) All the studies should be reviewed and summarised, and the favourable and unfavourable features succinctly stated in writing and preferably tabulated.

(d) The summing up should be honest

(*From 'The Surveyor' — February 11, 1956.*)

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4. MOTOR VEHICLES IN PRINCIPAL COUNTRIES OF THE WORLD (*in thousands*)

	All Motor vehicles		Per cent Increase 1953–54			Vehicles per 1,000 of population in 1955	Passenger cars as per cent of cars, lorries and buses
	1954	1955	Passenger cars	Lorries and buses	All vehicles		
U.S.A.	55,235	57,595	4.9	1.0	4.3	351	83
U.K.	3,865	4,263	12.4	4.6	10.3	84	74
Canada	3,350	3,396	1.7	0.2	1.4	220	75
France	2,970	3,310	14.0	7.2	11.4	77	63
U.S.S.R. (a)	2,600	2,600	—	—	—	12	9
W. Germany	1,848	2,107	20.4	0.2	14.0	42	68
Australia	1,727	1,885	11.4	4.8	9.1	209	68
Italy	920	1,078	21.4	8.8	17.2	22	63
Japan	614	748	29.7	20.2	21.8	8	18
South Africa	700	726	5.3	1.9*	3.7	53	79
Brazil	650	720	8.9	12.8	10.7	12	51
Sweden	542	664	27.4	4.4	22.5	92	82
Belgium	548	599	12.9	0.6	9.3	68	73
Argentina	416	477	22.1	2.5	13.2	25	66
Mexico	438 (b)	472	8.2	14.1	7.8	16	55
New Zealand	444	462	5.9	0.8*	4.1	216	73
Netherlands	296	352	21.6	13.7	18.9	33	67
Denmark	246	294	22.1	14.8	16.3	67	66
India	281 (b)	290 (b)	1.3	6.8	3.2	0.8	63
Switzerland	265	290	10.4	4.5	9.4	59	84
Venezuela	173	206	10.2	34.2	19.0	36	58
Spain	179	203	12.7	14.4	13.4	7	49
All other countries (c)	3,596 (b)	4,298 (b)	—	—	—	—	—
World	81,903 (b)	87,035 (b)	6.9	3.8	6.3	37	76

	Passenger cars		Lorries & Buses	
	1954	1955	1954	1955
U.S.A.	45,757	48,017	9,478	9,578
U.K.	2,817	3,167	1,048	1,096
Canada	2,513	2,557	837	839
France	1,832	2,090	1,138	1,220
U.S.S.R. (a)	225	225	2,375	2,375
W. Germany	1,254	1,512	594	595
Australia	1,414	1,271	586	614
Italy	614	745	306	333
Japan	104	135	510	613
South Africa	543	572	157	154
Brazil	338	368	312	352
Sweden	428	545	114	119
Belgium	388	438	160	161
Argentina	257	314	159	163
Mexico	244	262	184	210
New Zealand	321	340	123	122
Netherlands	194	236	102	116
Denmark	158	193	88	102
India	158	160	88	94
Switzerland	221	244	44	46
Venezuela	109	120	64	86
Spain	89	100	90	103
All other countries (c)	557	824	471	661
World	60,262	64,435	19,028	19,751

(a) *Estimates.* (b) Totals include unspecified vehicles and are therefore larger than the sum of cars, lorries and buses.
(c) Countries having less than 200,000 vehicles.
Sources: The American Automobile, except for W. Germany, for which official figures are shown.
(*From 'I. R. T. D. A. NEWS LETTER', September 7, 1955.*)
* Decrease

5. ORGANISATION OF THE BUREAU OF PUBLIC ROADS

THE BUREAU of public roads, U. S. A., is headed by the Commissioner for Public Roads. It is composed of four divisions: Engineering, Finance, and Business Management, Research and Legal. Each of the first three departments is headed by a Deputy Commissioner, and the latter by the Solicitor.

The Engineering Division determines design policies and supervises activities of the field organization in dealing with the States on preparation of construction programs and other steps prior to the beginning of construction. It also assumes supervision of a project when it reaches the construction stage and is responsible for proper performance and progress on all projects.

The Finance and Business Management Division is responsible for all financial activity in connection with the obligation and payment of funds for work undertaken.

The Research Division conducts research into all phases of highways and their use, including design, construction, transport, administration and finance.

The Legal Division is in charge of legal matters pertaining to acquisition of right-of-way, patents, lease agreements and investigations.

Direct contact with state highway departments is maintained through division and district engineers who are in charge of the field organizations. Each of the divisions includes several states. In each state, there is a district engineer who represents the Commissioner directly in all co-operative work with the state.

(From 'Federal-aid for Highways,' National Highway Users Conference, January, 1956).

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6. LEACHING OF LIME FROM CONCRETE

HYDRATION of portland cement is accompanied by the liberation of free lime which renders the concrete porous, decreases its strength and durability, and causes disfiguration by giving rise to efflorescence. Investigations were carried out to find means of preventing the leaching of lime. Surkhi and ammonium oxalate have been tried for fixing the free lime as soon as it is formed. Besides, the effect of leaching on the tensile strength of concrete using surkhi and ammonium oxalate as curing agents has also been studied. The following are the main conclusions: (1) the quantity of free lime liberated in the first three months is slightly more than 20 per cent by weight of cement; about 85–90 per cent of this quantity is liberated in the first month; (2) surkhi combines with free lime, but the rate of reaction is slow; (3) though ammonium oxalate combines with free lime rapidly, the amount of salt required to fix all the free lime liberated is large and therefore may be uneconomical in practice; (4) there is very little difference between the tensile strength of concrete and that of surkhi and ammonium oxalate-cured concrete after subjecting to treatment with carbon dioxide water for 3 months, thereby showing that there is no substantial indication of the efficacy of adding surkhi or ammonium oxalate for curing.

(From 'CSIR News' A fortnightly News Bulletin, Vol. 6, New Delhi, Aug. 11, 1956).

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7. REINFORCED TIMBER

TIMBERS reinforced with flat, square or preferably trapezoidal or triangular steel bars, tightly fitted into milled recessed grooves and firmly glued to the wood, proved to be economical for use in two executed timber structures. In the construction of a 47-foot span footbridge and a frame for a 50-by-130-foot warehouse, the results of a carefully executed laboratory study were successfully field-tested. The relative lightness of the reinforced beams resulted in expeditious and swift erection of the structures.

Reinforced beams with solid or laminated lumber, plywood, or fiber-board webs were subjected to laboratory tests. Under ideal service conditions, the steel-reinforced construction systems can be successful, as proved by the study. However, especially repetitive dimensional changes of (1) the steel reinforcement with change in temperature and (2) the wood with change in moisture content can, result in (a) excessive glue-line stresses and (b) undesirable redistribution of internal stresses, which can make the steel reinforcement ineffective and, thus, result in structural failure.

(From 'Highway Research Abstracts,' June, 1956).

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8. MOISTURE CONTENT BEST SUITED FOR COMPACTION OF EMBANKMENTS

EXTREME conditions of moisture content should be avoided when compacting soils for embankments. If the soil is very wet excessive pore-water pressures are likely to develop during the compaction work, with consequent decrease in the stability of the fill. On the other hand, soils in a very dry condition are usually difficult to compact satisfactorily. As a general rule, therefore, the main bulk of the fill should, be compacted at a moisture content close to the average natural moisture content measured below the top 3–4 ft of soil.

(Further studies in the Compaction of Soil and the Performance of Compaction Plant. W. A. Lewis. Road Research Technical Paper no 33. Road Resarch Laboratory, Harmondsworth Middlesex. Dept. of C. S. & I. R.

LOCAL BUSINESS TO FINANCE BRIDGE SURVEY

Nine Dundee firms have promised among them to contribute £ 3,200 towards the preliminary expenses of a Tay road bridge at Dundee. It is anticipated that expenses of between £ 10,000 and £ 15,000 will be incurred in the preparation of plans, surveying and boring costs.

CURRENT LITERATURE

ABSTRACTS

ABSTRACTS ON BITUMINOUS MEMBRANES AND ENVELOPES issued by the Department of Soils, Geology, and Foundations. Highway Research Board, U.S.A., Circular 317, May, 1956.

THIS first circular issued by the Department of Soils, Geology and Foundations of the Highway Research Board lists 30 items relating to bituminous surfaces. These include current researches, new developments in testing methods and apparatus. Under each of the items a brief summary of the article is also given.

REPORT ON PAVEMENT RESEARCH PROJECT IN INDIANA by Walter T. Spencer, Harold Allen and C. Smith. Bulletin No. 116-Experimental Concrete Pavements. Highway Research Board U.S.A. 2101, Constitution, Washington U.S.A.

THIS report describes the location, design, materials, construction, traffic, and early performance of an experimental concrete pavement built in Indiana (U.S.A.) to study the effectiveness of sub-bases in the control of pumping.

Experimental sections, which have a total net length of 4 miles, serve as one of the carriageways of a divided highway.

Each mile of the carefully controlled test road has eight sections of different kinds of basis as noted below :—(1) two of soil-cement mixtures with thicknesses of 3 and 5 inches; (2) three of open-graded crushed stone, with thicknesses of 3, 5, and 8 inches; and (3) three of dense-graded crushed stone, with thicknesses of 3, 5, and 8 inches. The ninth section in each mile was designated as a control section with the concrete pavement placed directly on the fine-grained soil.

The concrete pavement has a 9-8-9-inch thickened-edge section and is 24 feet wide. The first and third miles have plain concrete with contraction joints spaced 15 feet. The second and fourth miles have contraction joints spaced 40 feet.

The soils in the upper 3 feet of the subgrade are in the A-6 and A-7-6 groups of Highway Research Board classification. The soils in the upper 6 inches are predominately in the A-6 group, with group indices greater than 6.

Detailed tests were made to carefully control all phases of construction. Undisturbed triaxial specimens were taken from the subgrade just prior to paving. In-place CBR's were run in each section on both the subgrade and subbase.

The project has 72 Bouyoucos moisture electrodes installed in the subgrade and subbase and 2,000 precise level plugs in the concrete pavement.

The completed project was opened to traffic on November 11, 1949.

Pavement roughness indices for each lane of each section have been determined at various times.

Detailed traffic studies classify vehicles by types and weights and determine variations in traffic volumes. A speed and placement study of trucks was made in 1950.

The pavement sections having plain concrete, 15-ft joint spacing, and no subbase have shown distress due to pumping. There has been no pumping or extrusion of material in the sections having open-graded subbase.

Further observations will be necessary to determine the relative effectiveness of the various types and thicknesses of subbases in the control of pumping. In addition to the continuation of the performance study, a program to measure the deflections of the concrete pavements under both static and moving loads was initiated late in 1953. (*Author's Summary.*)

STRESS MEASUREMENTS, SAN LEANDRO CREEK BRIDGE, By R. W. Clough and C. F. Scheffey, Transactions of the American Society of Civil Engineers, Volume 120, 1955.

MANY difficulties are encountered in investigating live-load effects on a bridge in the field. There is presented a description of a full-scale investigation on the San Leandro Creek Bridge near Oakland, Calif. Among the difficulties are the effects of temperature and localized strain patterns. The use of dummy gauges to compensate for temperature changes is described, and the limitations of such compensation are examined.

BUILDING CODE REQUIREMENTS FOR REINFORCED CONCRETE, Journal of the American Concrete Institute May 1956, No. 9 Vol 7. Standard 318—56.

THIS code covers the design and construction of buildings of reinforced concrete. Among the subjects covered are: quality of concrete; allowable stresses; mixing, placing, curing, and cold weather protection of concrete; forms; cleaning, bending, placing, splicing, and protection of reinforcement; embedment of pipe and conduits in concrete; construction joints; general design considerations; flexural computations, shear and diagonal tension; bond and anchorage; flat slabs; columns and walls; footings; and precast concrete.

SOIL-TESTING METHODS: MOISTURE, DENSITY, CLASSIFICATION, SOIL-CEMENT, BULLETIN 122: Highway Research Board, U.S.A, 2101, Constitution, Washington, D. C.

THIS bulletin contains four Papers.

1. "Preparing Base-Course Materials for Disturbed-Soil Indicator Tests," by H.S. Gillette, covers research study to ascertain the differences in results of the disturbed soil indicator tests when one laboratory used the dry method and the other laboratory the wet method of preparing the same sample.

2. "Rubber-Balloon Apparatus for Measuring Densities of Soils in place," by R.L. Handy and D.T. Davidson, describes the development and use of a rubber-balloon apparatus for measuring densities in place on level, sloping or vertical faces.

3. "Neutron and Gamma-Ray Methods for Measuring Moisture Content and Density to Control Field Compaction," by R. Horonjeff and F. Javete, describes the procedure and discusses the practicability of using the method as compared to the usual field tests for moisture and density. The results of field tests upon a sandy loam are given.

4. "Simplified Methods of Testing Soil-Cement Mixtures," by J. A. Leadabrand and L. T. Norling, discusses modifications and methods for shortening standard laboratory testing of both ASTM and AASHO methods.

For emergency construction and for small projects where detailed testing is not feasible, or where facilities are not available, a simple procedure involving moulding and inspection of specimens to establish safe construction control factors is given. Use of the shortened test procedure has resulted in considerable savings of time, manpower and materials.

FLOOD ESTIMATION AND CONTROL by B. D. Richards, Third Edition Revised, Chapman & Hall Ltd., London, 1955.

THE main purpose of the book is to analyse in detail the various factors affecting the flood discharge as accurately as possible.

The subject matter is dealt with exhaustively in all its various aspects, such as flood formulae—for example, Dicken's, Inglis, etc., 12 in number, rainfall, flood hydrographs, and floods in relation to soil erosion, etc.

Eleven worked out examples illustrating the procedures outlined are also included.

THE ANALYSIS OF INTERCONNECTED BRIDGE GIRDERS BY THE DISTRIBUTION OF HARMONICS by L. G. Jaeger and A. W. Hendry. The Structural Engineer, July 1956.

THE Paper describes a new method for the analysis of simply supported interconnected bridge girders. The transverse system is considered to be a uniform medium of total moment of inertia equal to that of the actual transverse system and a differential eqation including terms due to rotation and twist is written down for each longitudinal. These equations are solved by harmonic analysis and distribution coefficients are derived giving the amplitudes of the harmonics of the bending moment or deflection curve for each girder. The theory presented allows for any degree of torsional stiffness of the longitudinals and in the most general case the distribution coefficients are functions of three dimensionless parameters; the first is a measure of the transverse stiffness of the bridge, the second of the torsional stiffness and the third expresses the ratio of the inertias of the outer to the inner longitudinals. For design purposes the cases of zero and infinite torsional stiffness are of greatest interest, but intermediate cases can be obtained and very simple method is developed for zero torsional stiffness and the calculation of transverse moments is also dealt with. A number of comparisons with experimental results are quoted and the application to the design of steel and concrete bridges is demonstrated. (*Author's Summary.*)

A BRIEF NOTE ON COMPRESSION INDEX OF SOIL, Yoshichika Nishida Journal of the Soil Mechanics and Foundations Division, Proceedings of the American Society of Civil Engineers.

THIS paper reports a new relationship between the compression Index and the void ratio of soils after a theoretical consideration from some simple assumptions.

The relationship given by the Author agrees well with results of experiments conducted for verification and gives a new approximate method to estimate the compression index of soils as a linear function of the void ratio.

DEVELOPMENT AND DESIGN OF THE WALT WHITMAN BRIDGE, Milton Brumer and C. W. Hanson. Journal of the Structural Division Proceedings of the American Society of Civil Engineers, July, 1956.

THIS paper presents the historical development and design features of a major bridge project, a suspension bridge of 2000 ft span, starting when it became apparent that a new cross river traffic facility must be provided. The numerous phases of study and influences leading to final selection of location and type of the crossing are described.

The problems of design of the main foundations are thoroughly discussed and the criteria for design of the superstructure are presented in detail.

CONCRETE ROADS IN BELGIUM AND WESTERN GERMANY—THEIR STRUCTURAL DESIGN AND PERFORMANCE: Road Research Technical Paper No. 35. H. M. Stationery Office, London 1955.

THIS technical Paper gives an account of the inspection of concrete roads in Belgium and Germany undertaken by a Committee for Co-operative Research between the Cement Concrete Association and the Road Research Laboratory. It describes the various aspects of design of the roads such as layout, subsoil and foundation conditions, types and spacing of joints, and the present condition of the road inspected. Some of the chief observations made by the Committee are given below :—

(1) The heavy traffic on concrete roads in Germany has not affected the surface even after 20 years' of service.

(2) There is a tendency in both Belgium and Germany to reduce the frequency of joints. In Belgium, unreinforced concrete slabs upto 50 ft long with no intermediate dummy joints are successfully

(*Continued on page 27*)

SELECTED RECENT LITERATURE IN ENGINEERING JOURNALS

X BRIDGES AND OTHER STRUCTURES

1. **Viaduct Doenkade Rotterdam**: J. AARNOUDRE, and W. J. P. PELLE, *Cement, Vol.7, No. 7-8*, August 1955, pp. 154-156 (in Dutch).

2. **Continuous Prefabricated Prestressed Bridge 'Klaprozenburg' in Amsterdam**; G. F. JANSSONIUS and G. SCHERPBIER, *Cement, Vol. 7, No. 7-8*, August 1955, pp. 159-161 (in Dutch).

3. **Measurement of the Moment Distribution in a Prestressed Two Span Beam**; CVANDER VEEN, *Cement, Vol. 7, No. 7-8*, August 1955, pp. 187-191 (in Dutch).

4. **Pretensioned Beams for House Building in the Netherlands**; C. VERUYT, *Cement, Vol. 7, No. 7-8*, August 1955, pp. 192-195 (in Dutch).

5. **Bridge Across the Overijssel Canal at Lemelerveld**; A. A. B. VAN DIEMEN **de jel**, *Cement, Vol. 7, No. 7-8*, August 1955, pp. 199-201 (in Dutch).

6. **Prestressed Concrete Bridge Forming Part of the Flood-Protection Works at Krimpen on Ijssel**; J. A. H. HARTMANN, *Cement, Vol. 7, No. 7-8*, August 1955, pp. 212-213 (in Dutch).

7. **Simplification of Calculation of Rigid Frames**; F. C. VAN ERP, *Cement, Vol. 7, No. 9-10*, October 1955, pp. 251-256 & 248 (in Dutch).

8. **Residual Stresses and Their Influence on Structural Design**; C. O'CONNOR, *The Journal of the Institution of Engineers, Australia, Vol. 27, No. 12*, December 1955, pp. 313-321.

9. **Effect of Modern Constructional Methods on Tunnel Design**, DR. L. V. RABCEWICZ, *Water Power*, December 1955, pp. 452-457 (Part I); January 1956, pp. 25-29 (Part II).

10. **New Method of Design of Interconnected Girders**; WOLFHARD KLEMP, *Beton und Stahlbeton bau, Vol. 51, No. 1*, January 1956, pp. 14-19 (in German).

11. **Test on Reinforced Concrete Ribbed Decking with Constant Continuous Loading**; DR. STEFAN SORETZ, *Die Bautechnik, Vol. 33, No. 1*, January 1956, pp. 6-9 (in German).

12. **Contribution to the Design of Steel I-Beam Structures**; DR. KONRAD SATTLER, *Die Bautechnik, Vol 33, No. 1*, January 1956, pp. 16-19 (in German).

13. **On proportioned Frames**; DR. P. CRONKA, *Die Bautechnik, Vol. 33, No. 1*, January 1956, pp. 19-26 (in German).

14. **Standards for Anchorage of Steel Columns in Concrete Foundations**; *Die Bautechnik, Vol. 33, No. 1*, January 1956, pp. 28-31 (in German).

15. **Design of Framed Girders Subject to Sway—by Csonka—Observation on the Article**; ERICH KREY, *Die Bautechnik, Vol. 33, No. 1*, January 1956, pp. 33-34 (in German).

16. **Rational Design of Concrete—Encased Stanchions—Full Scale Tests Suggest Savings in Steel**; OSCAR FABER, *Engineering, Vol. 180, No. 4691*, December 23, 1955, pp. 855-857.

17. **Steenbras Dam Strengthened by Post-Tensioning Cables**; S. S. MORIS, *Civil Engineering, Vol. 26, No. 2*, February 1956, pp. 33-37.

18. **Rigid-Frame Failure Raises Questions as to Standard Design Assumptions**; EDWARD COHEN, *Civil Engineering, Vol. 26, No. 2,* February 1956, pp. 45-49.

19. **Anchorages and Superstructure of Walt Whitman Bridge**—HOMER R. SEELY, *Civil Engineering, Vol. 26, No. 2,* February 1956, pp. 52-60.

20. **Philadelphia Airport to have Unique Hanger**; *Civil Engineering, Vol. 26, No. 2,* February 1956, p. 78.

21. **San Francisco's Southern Crossing**; *Western Construction*, February 1956, pp. 27-32.

22. **Earthquake Forces in a Tall Building**; RAY W. CLOUGH, *Civil Engineering, Vol. 26, No. 1,* January 1956, pp. 54-55.

23. **Rock Anchors Hold TV Tower on MT Wilson**; A. E. SCHMIDT, *Civil Engineering, Vol. 26, No. 1,* January 1956, pp. 56-58.

24. **Direct Design of Two-Hinged Arches of Constant Section**; JAMES MICHALOS, *Civil Engineering, Vol. 26, No 1,* January 1956, pp. 65-68.

25. **Rock Pressure and Tunnel Construction**; Prof. DR. C. ANDREA, *Schweizerische Bauzeitung, Vol. 74, No. 8,* February 25, 1956, pp. 107-111 (in German).

26. **Rock Pressure and Tunnel Construction**; Prof. DR. C. ANDREA, *Schweizerische Bauzeitung, Vol. 74, No. 9,* March 3, 1956, pp. 129-131 & 134 (in German).

27. **A New Method of Design of Interconnected Girders**; WOLFHARD KLEMP, *Beton und Stahlbetonbau, Vol. 51, No. 1,* January 1956, pp. 14-19 (in German).

28. **Various Types of Prestressed Structures**; FREDRICH CARL AUGASTEIN, *Beton und Stahlbetonbau, Vol. 51, No. 2,* February 1956, pp. 25-29 (in German).

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BUDGETS AND ADMINISTRATION REPORTS

GOVERNMENT OF WEST BENGAL BUDGET FOR 1956-57

The following extracts have been taken from the Govt. of West Bengal (Civil Works) Budget for the year 1956-57.

Revenue (Civil Works)

Heads	(In lakhs of rupees) Actuals 1954–55	Revised Estimate 1955–56	Budget Estimate 1956–57
Rents	6.75	6.00	6.50
Ferry receipts	2.83	3.00	3.00
Tolls on roads	3.64	3.50	3.50
Recoveries of Expenditure	5.38	18.00	2.00
Transfer from Central Road Development Account	78.08	47.70	53.60
Transfer from Capital Account of grain purchase schemes of surcharge levied for improvement of village roads in heavy procurement areas	4.81	0.10	—
Miscellaneous	12.12	67.93	43.00
Deduct—Refunds	-9.80	-0.13	-0.01
Total	103.81	146.10	111.59
Expenditure (Civil Works)			
Buildings			
Original Works		82.55	13.07
Repairs		96.80	99.80
Communications			
Original Works		100.90	87.24
Repairs		87.00	94.00
Miscellaneous			
Original Works		1.40	—
Repairs		0.20	0.20
Establishment		37.25	42.27
Tools and plant		7.55	7.55
Grants-in-aid		20.87	18.33
Suspense		-2.99	7.02
Development Schemes		146.21	35.27
Total		577.74	404.95

— Not available

Continued :

Heads	(In lakhs of rupees) Actuals 1954–55	Revised Estimate 1955–56	Budget Estimate 1956–57
Capital Expenditure on Civil Works outside the revenue account			
Original Works			
Buildings	—	—	111.39
Communications	—	—	10.58
Miscellaneous	—	—	3.09
Suspense	—	—	0.02
Development Schemes	—	—	193.15
Total	—	—	318.23

A brief review of the Budget

THE revenue and expenditure of West Bengal for the year 1956-57 are estimated at Rs 4936 lakhs and Rs 6355 lakhs respectively indicating a deficit of Rs 1419 lakhs. According to the revised estimate for 1955-56 revenue and expenditure figures were 5069 lakhs and Rs 6578 lakhs respectively leading to deficit of Rs 1509 lakhs.

The expenditure on Civil Works met from revenue for 1956-57 forms 8.2 per cent of the revenue as against 11.4 per cent in the revised Budget for the previous year. Expenditure on communications (Original works and Repairs) form 3.7 per cent of the revenue in the current year's budget and 3.7% in the revised Budget for 1955-56. The provision for capital expenditure on Civil Works outside the revenue account in the current year is Rs 318.23 lakhs, out of which Rs 193.15 lakhs have been allotted for Development Schemes.

(*Continued from page 22*)

used. In Germany, the normal practice is to use slabs 40 ft (12 m.) in length, but recently proposals have been put forward for using slabs with expansion joints spaced 117 ft (35 m.) apart and having two intermediate dummy joints. The Germans are experimenting with wider spacing of joints.

(3) German engineers favour the use of full-width construction using rails mounted on concrete bankettes. This avoids the use of forms for the central joint, and leads to better riding quality because the deflection of the forms is minimized and because inequalities at the longitudinal joint, due to transverse flow of the concrete on superelevations, are avoided.

(4) In Germany, joints cut with a carborundum saw in hardened concrete had an excellent appearance: they are less perceptible than those formed in the concrete at the time and, in addition, consume less sealing compound. In Belgium, a special machine was used for forming joints immediately after the concrete was laid.

LIST OF APPROVED WORKS ON NATIONAL HIGHWAYS

S. No.	Job No.	Name of work	Amount (Rs in lakhs)
		ANDAMAN	
1.	1627 AH 4	Widening culverts in M 81/6 to 134/7 of the Madras-Chittoor-Bangalore Road, N.H. No. 4	0.16
2.	1631 AH 5	Forming metalled road from Madiki to Vimagiri along Alamuru canal bund, N. H. No. 5.	4.10
		ASSAM	
3.	1629 AS 9	Reconstruction of culvert No. 14/1 and protective works in miles 20 and 21 of Numaligarh Dimapur Road N. H. No. 39.	0.24
		JAMMU AND KASHMIR	
4.	1630 JK 1A	Reconstruction of the two spans of the Sangam bridge over the Jhelum river in mile 25 of Jammu-Srinagar road, N. H. No. 1A.	0.30
		MADRAS	
5.	1628 MD 45	Land Acquisition for widening the Bye-pass road at Manaparai from M 221/3+150 to mile 223/0 + 601 on N. H. No. 45.	0.30
		ORISSA	
6.	1632 RS 6	Construction of a bridge over Kanthakhari Nallah on N. H. No. 6.	5.99
		RAJASTHAN	
7.	1633 RJ 8	Construction of a bridge over Bhokhla Nalla on Kherwara-Bichiwara Section of N. H. No. 8.	0.87
		UTTAR PRADESH	
8.	1626 UP 2	Construction of approaches to the over-bridge over N. E. Railway on Mathura Bye-pass N. H. No. 2.	1.08

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