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NEXT SESSION OF THE INDIAN ROADS CONGRESS AT MADRAS

On the invitation of the Government of Madras, the Seventeenth Annual Session of the Indian Roads Congress will be held at Madras from the **7th to the 14th February, 1953**. The tentative programme of the Session is given below. Besides discussions on Papers, there will be inspections of works and roads in and around Madras. A technical exhibition will be organized on the occasion.

February 1953

7th	9.00–13.00	Subcommittee meetings.
	14.30–17.00	40th Council meeting.
8th	11.00–13.00	Formal Opening. Photo.
	14.30–17.00	Papers.
9th	9.00–10.30	Subcommittee meetings.
	10.30–13.00	Papers.
	14.30–17.00	Papers.
10th	9.00–10.30	Subcommittee meetings.
	10.30–13.00	Papers.
	14.30–17.00	Panel Discussion.
11th	10.30–13.00	Business meeting.
	14.30–17.00	Panel Discussion.
12th	10.00–13.00	41st Council meeting.
	14.30–17.00	Chief Engineers' meeting.
13th 14th	...	Inspections.

Engineers who would like to attend the Session but are not Members of the Indian Roads Congress should apply for membership to the Secretary, Indian Roads Congress, Jamnagar House, Shahjahan Road, New Delhi-2.

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ARE P. W. D. RATES HIGH?

U. P. GOVERNMENT ORDERS ENQUIRY

A report appearing in the 'Hindustan Times' on the 16th September 1952 stated that the U. P. Government had appointed a Committee to suggest ways to reduce the rates at which works are being given out by the Public Works Department and to examine the standard of the quality of such works.

We welcome such enquiries as they will, we are sure, tend to dispel uninformed criticism of the P. W. D. rates being high. Engineers should be able to convince the Committee that they are efficient custodians of public funds which they spend wisely and without waste.

The terms of reference of the Rates Committee are stated to be:

(i) To examine the rates structure;

(ii) To compare existing P. W. D. rates with the rates of sister departments, such as the Local Self Government Engineering Department, the Irrigation Branch, and some of the larger public bodies; and

(iii) To suggest ways whereby the rates can be reduced.

The Committee consists of Mr. Sampurnanand, Minister for Home (Chairman); Secretary, Public Works Department; Chief Engineer, Irrigation Branch; Chief Engineer, Buildings and Roads Branch; Mr. H. C. Ray, Under-Secretary, Finance Department; six members of the U. P. Legislative Assembly; and Mr. L. D. Bhargava, Deputy Secretary, P. W. D. (Secretary).

Questionnaire

The report continues: "A comprehensive questionnaire has been drawn up to cover such questions as the trend of rates of non-controlled materials, such as timber, bricks, sand, and lime; increase in labour costs since the war; decrease, if any, in the efficiency of labour since the war; availability of skilled and unskilled labour as compared to pre-war days; whether there is keen competition among contractors; whether several Government agencies working at one place lead to unhealthy competition and increase in rates; and **the quality of work executed through agencies other than P. W. D.,** such as other departments of the Government and local bodies.

"The P. W. D. allows for fluctuations in costs by percentage decrease or increase over the printed schedule, the questionnaire says. The present schedule for building works is 175 per cent and for road construction 200 per cent above the printed 1938-39 schedule.

"At present petty works up to Rs 2,000 are executed without inviting tenders. The questionnaire asks if a revision of this figure is called for."

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U. N. DRAFT INTERNATIONAL CONVENTION

FOR

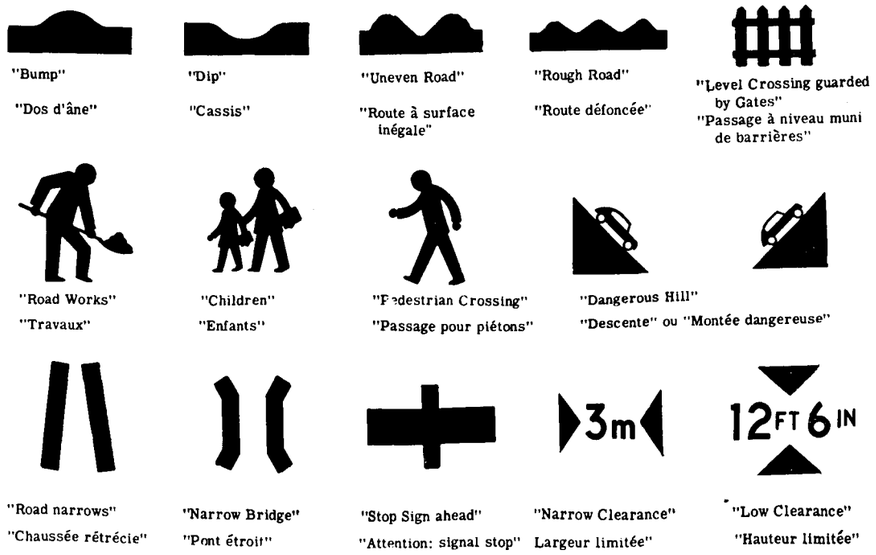
UNIFORM ROAD SIGNS AND SIGNALS

(BY COURTESY OF THE UNITED NATIONS)

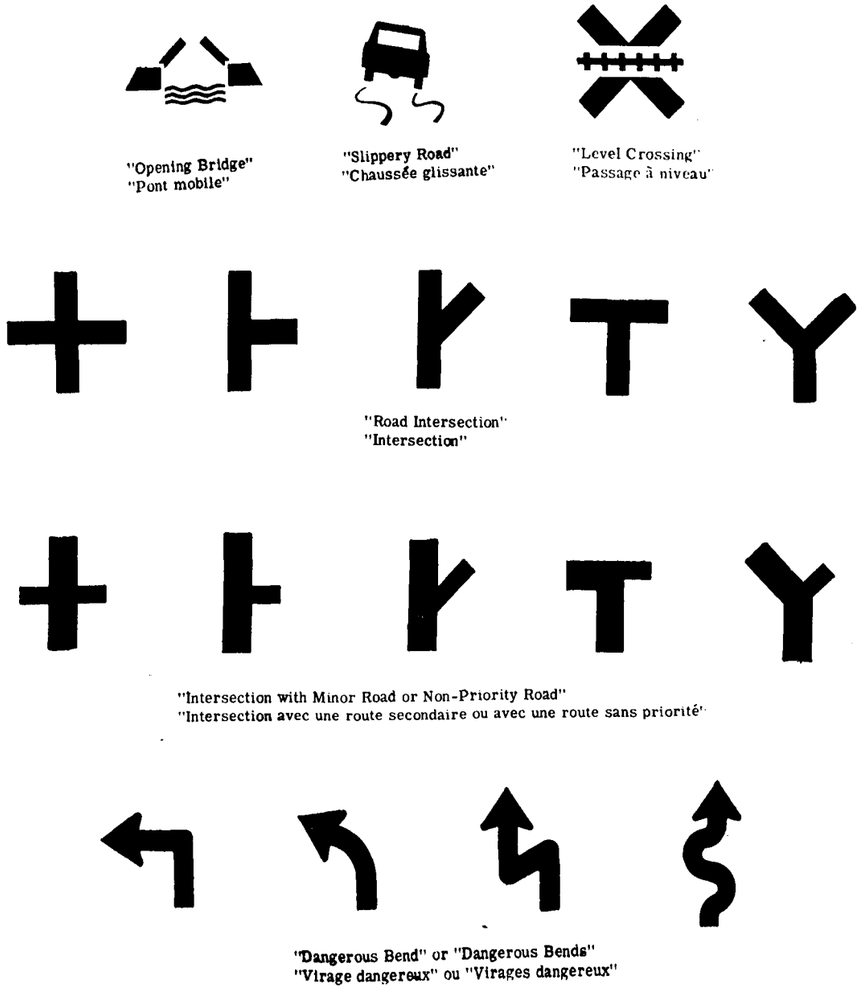
AFTER twenty months of work, the group of six experts appointed by the U. N. Secretary-General in 1950 to draft an international convention establishing a uniform system of road signs, signals and pavement markings concluded its third and final session on 18th July, 1952.

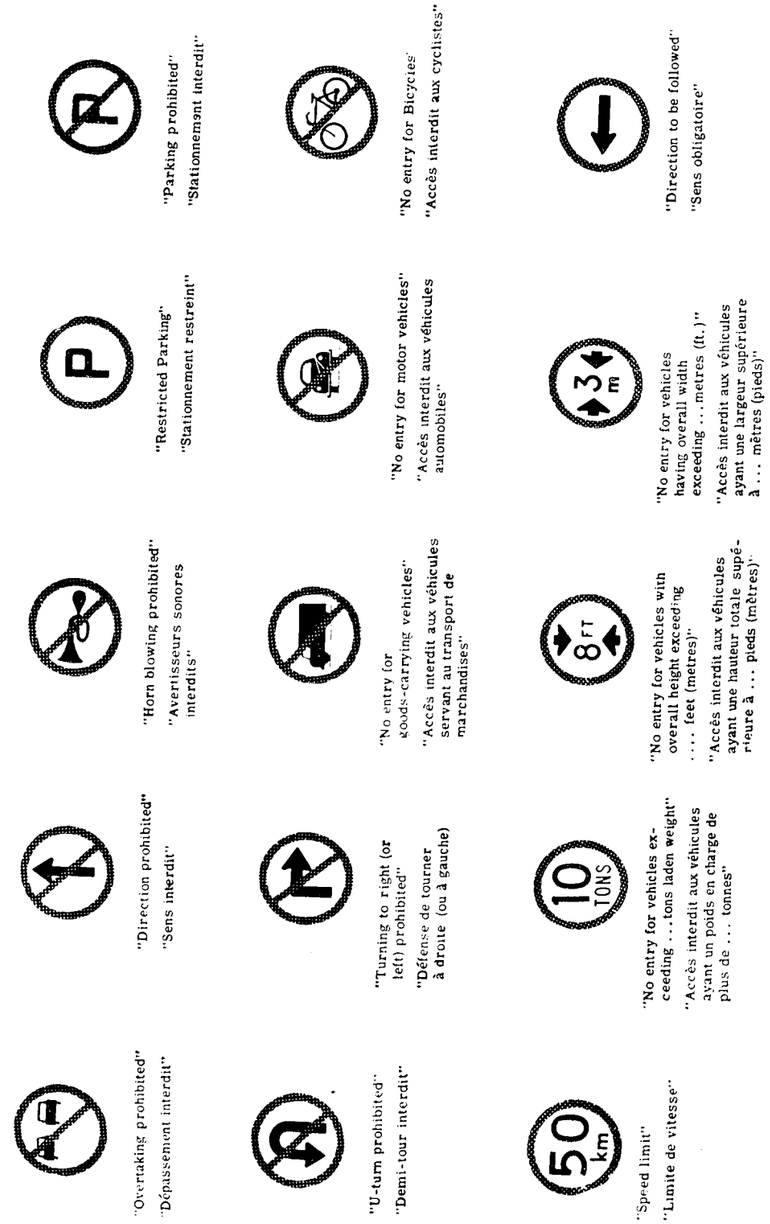
The recommendations of the grou now go to the U. N. Transport an Communications Commission and th Economic & Social Council for furthe action.

The draft convention is based o scientific and practical studies by the experts*. The system proposed, in which the symbols, colours, and shapes of signs (reproduced here) are uniform, would, they believe, enable international highway users to understand road signs even though they did not understand the country's language.



* The details of these studies were published by us in our issue for December 1951.

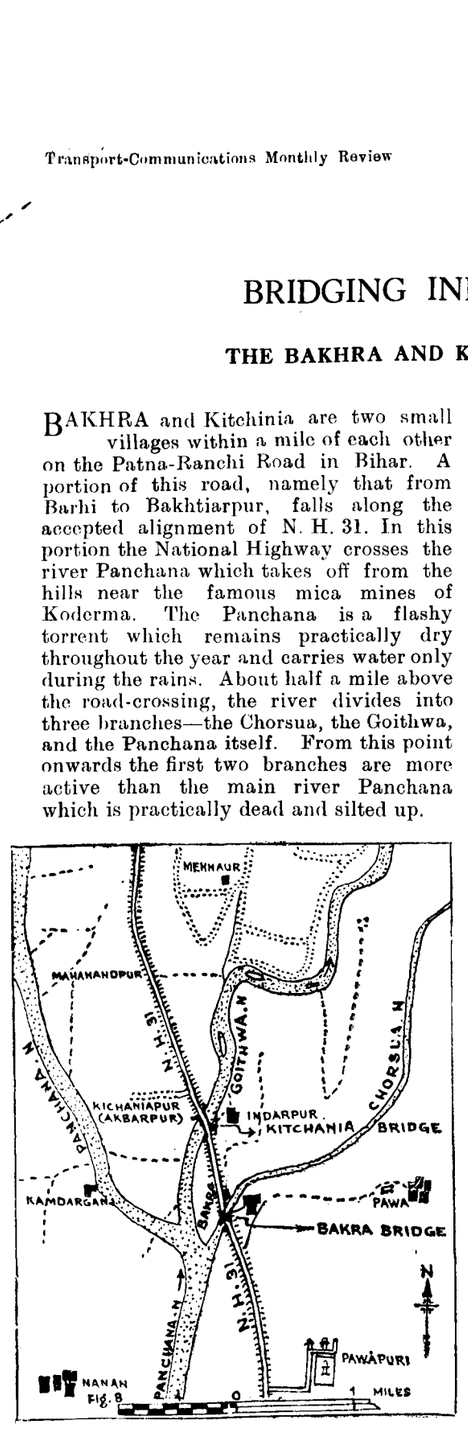




BRIDGING INDIA'S RIVERS

THE BAKHRA AND KITCHINIA BRIDGES

BAKHRA and Kitchinia are two small villages within a mile of each other on the Patna-Ranchi Road in Bihar. A portion of this road, namely that from Barhi to Bakhtiarpur, falls along the accepted alignment of N. H. 31. In this portion the National Highway crosses the river Panchana which takes off from the hills near the famous mica mines of Koderma. The Panchana is a flashy torrent which remains practically dry throughout the year and carries water only during the rains. About half a mile above the road-crossing, the river divides into three branches—the Chorsua, the Goithwa, and the Panchana itself. From this point onwards the first two branches are more active than the main river Panchana which is practically dead and silted up.



Map of locality

The Patna-Ranchi Road used to cross the two main branches by means of masonry bridges with light steel girders, designed for a live load of about 4 tons only. The roadway on these bridges was less than 10 ft wide.

The bridge over the Chorsua (Bakhra) branch was washed away in August 1948 on account of growth of discharge in this branch. It was decided that while replacing the Bakhra bridge that over the Kitchinia should also be replaced, for the reasons to be explained below, by one designed to National Highway standards.

Since the main river divides itself into three branches and the discharge through each branch has been varying from year to year, it is not possible to assess with certainty the discharge that will pass down each branch in the years to come.

The selected waterways for the bridges were fixed from a study of the cross-sections of the rivers and their behaviours during the last few years. They take into account the present trends in the discharges down each branch and the design is such that it is hoped that present conditions will be stabilized for a long time to come. Should conditions change very significantly, the design will permit of adjustments at some future date to meet conditions prevailing at that time.

Both the new bridges are high level R. C. C. bridges consisting of beam and slab deckings carried on piers founded on masonry wells sunk by open dredging.

The decking has a clear roadway of 24 ft with a 9-in. wide kerb on each side. (See Cross Section)

Railings of angle iron posts and tubular horizontals are fixed to the outer faces of the kerbs.

[By Courtesy of M/s J. C. Gammon Ltd. Bombay.]

A view of the Kitchinia Bridge.

KITCHINIA BRIDGE

The Kitchinia bridge has five spans of 68.5 ft, 93 5 ft, 92 ft, 93.5 ft, and 68.5 ft. The length of the bridge is 416 ft between faces of abutments.

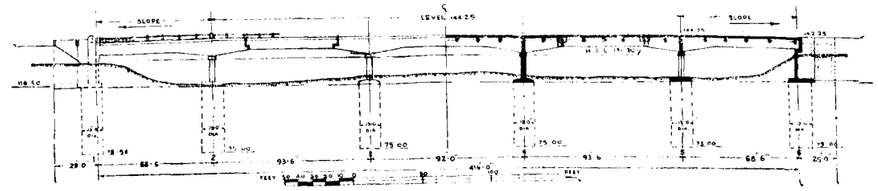
The end spans and the central span are cantilevered out to support the two suspended beams in the second and the fourth spans.

The beams of the suspended spans and the end spans over the abutments rest on sliding plates; a roller rocker bearing is provided for the central span over one of the piers: the beams rest on lead sheets over the remaining piers.

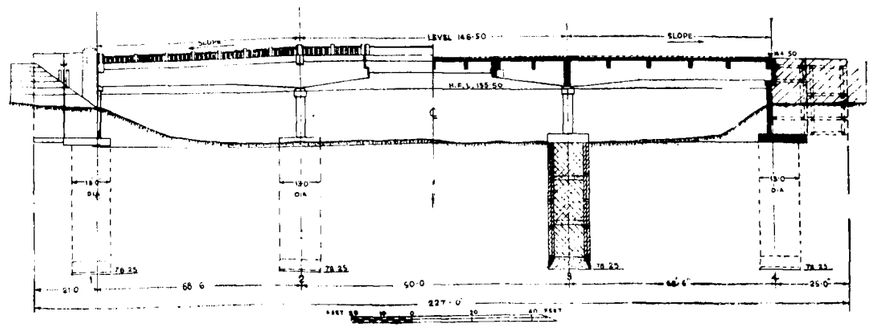
Each pier and abutment is founded on two circular wells, 13 ft outer diameter, and built of 2.5 ft thick steining of brick masonry in 1 : 4 cement mortar. An R. C. C. well kerb, with steel cutting edge, was provided at the bottom of the steining. Vertical steel bars anchored in the kerb reinforce the steining vertically.

The wells were sunk under their own weight by dredging out soil from inside. After sinking to the desired level, they were plugged and filled with sand.

The abutments are of the R. C. C. counterfort type. The wings (like the abutment buttresses) are of the beam and slab type and are tied together by R. C. C. ties. They are independent of the abutments and rest on open concrete foundations.



L-section of Kitchinia bridge



L-section of Bakhra bridge

The complete bridge, except the steining of the wells, is built of 1 : 2 : 4 cement concrete. The design is based on I. R. C. heavy loading, a stream velocity of 10 ft. per sec., a wind pressure of 20 lb per sq. ft, a temperature variation of ± 30 deg. F, and a safe bearing capacity of 8 tons per sq. ft (7½ tons on the Bakhra bridge) in good yellow earth strata.

Each pier consists of two circular columns, well braced at the top and bottom, by pier and and well caps. In the two intermediate piers on the Kitchinia bridge diaphragm walls are provided between the columns (no such diaphragm walls are provided on the Bakhra bridge).

BAKHRA BRIDGE

The Bakhra bridge is similar to the Kitchinia bridge in general detail. It is 227 ft between abutment faces, and has a lineal waterway of 216 ft 8 inches. The spans are 68.5 ft, 90 ft, and 68.5 ft. The suspended beams and the end beams over the abutments rest on sliding plates. On the piers the beams rest on lead sheets.

COSTS

The break-up of the cost is tabulated below :-

	Kitchinia bridge (Rupees)	Bakhra bridge (Rupees)
Foundations	2,68,500	1,79,000
Piers	34,000	20,000
Abutments and wing walls	54,000	65,000
Superstructure	2,08,500	1,16,000
Total	5,65,000	3,80,000
Cost per running foot	1,210	1,390
Cost per sq. ft of Carriageway	50	58
Cost per sq. ft of entire elevation	17.5	20.3
Cost per cu. ft of Bridge	0.73	0.85

The bridges were opened to traffic in 1951, having taken about a year to build. The contractors were Messrs J. C. Gammon Ltd., who have kindly supplied the photos, drawings, and cost data.

OFFICE HOURS

Mr. A. Lennox-Boyd, Minister of Transport, created a surprise last week. / Ignoring the fact that many office staffs in London do not commence work until 9-30 a.m. and that it is not unknown for some seniors to start later, he arranged to meet the Road Haulage Association's ***ad hoc*** *committee very shortly after 9 a.m. This and other actions are causing the Minister's stock to continue to rise.*

—From 'Motor Transport' - July 5, 1952.

A Picture is worth a Thousand Words.

"That's pretty good-looking for a used car. What's the most you ever got out of it?"

"Nine times in one mile."

REVIVAL OF THE TOLL ROAD*

A SYMPTOM

A few years ago the United States had presumably seen the last of the toll road. In place of the toll gate, a highway tax added to the price of gasoline had become the modern way to raise revenues for roads. America's gasoline filling stations have in effect provided some 200,000 totally-un-obnoxious toll gates and the station attendants are the gate keepers who collect the toll. The average amount exacted from the road user is now 5 cents per gallon of gasoline, which is equivalent to about one-third of a cent- per mile of driving. In the past twenty-five years these gasoline tax collections have totalled some 20 billions of dollars, and approximately 85 per cent of the total has been spent on road work, as intended.

In view of the general acceptance and relative success of this modern substitute for the ancient turnpike, widespread revival of the toll road during the past few years has been an unexpected turn of events. That the revival should never have taken place is the more puzzling when one considers how unpopular the movement has been among highway officials and organizations representing the automotive industries.

Opposition to the toll road movement in America has been expressed in no uncertain terms. A conspiracy of Wall Street is what one official has termed the movement and another has decried it as a return to eighteenth-century thinking. Still another brands toll roads as undemocratic, for they provide a special service for the favoured few who can pay, and leave the less fortunate to make their way as best they can over the public highways. The federal government has declined to grant federal aid for roads on which a toll is charged, and associations of every description indulge in the annual satisfaction of resolving that the toll method of financing highways is unsound.

This lack of appreciation, however, does not appear to have dampened the enthusiasm either of those who are financing and constructing toll roads or of those who find it pleasant to drive on them. During 1951 the toll road continued to make new appearances along the heavily travelled main routes of America. Today, out of a total road milage of three millions there are some 600 miles of toll roads along the principal interstate motor routes of the United States, most of them in the eastern part of the country. But, if the new toll roads authorised in New York, Pennsylvania, Ohio, Indiana and other eastern states are built as scheduled, a toll road system three to four times the length of existing turnpikes may be a reality in the near future.

A Lesson to the Learned

The importance of the toll-road movement in the United States, however, is not to be measured simply in miles or dollars but rather in the reasons that explain its return. For those reasons tell us what is wrong with the conventional ways we have been financing highways and what needs to be done if the roads we need are ever going to be built. The story of the modern toll road is the story of the inadequacies with which United States authorities have been forced to cope in attempting to keep pace with the extraordinary growth of motor vehicle traffic. If this lesson can be taken to heart, the toll road has served a sound purpose.

* * *

* Abstracted from the "Road International" (Spring 1952) a publication of the International Road Federation.

In the United States the basic reason for the revival of the toll road is the absence of sufficient funds to build the highways required. This sounds strange indeed in a country which last year spent more than the equivalent of 1600 crores of rupees on its roads. But it must be remembered that Rs 1,600 crores hardly goes far in a nation with over 3 million miles of highways and 52 million motor vehicles. Moreover, about half the money available for roads is used to maintain the facilities we have, so that new construction to meet expanding needs is limited to the other half. Furthermore, the roadbuilder often finds his hands tied by ill-advised laws which govern how and where available money should be spent. These legal formulas have often been worked out in such a way as to please those who exert the most political influence rather than those who do most of the driving. In many cases rural roads have been favoured over city streets and secondary roads have received greater support in relation to traffic needs than have primary highways.

Inflation and the Highway Dollar

There are further explanations of why the United States is short of money to finance a modern and safe system of roads. Inflation has cut the value of the highway dollar in half, but resistance to gasoline tax increases has made it impossible to raise the "price" of roads the way prices have risen for beefsteak or automobiles. At the same time traffic in many parts of the country has become so heavy that on main routes an ordinary two-lane road no longer suffices. Multiple-lane superhighways must be built instead, at costs which commonly run to several million dollars a mile.

The reason for this is two fold: first, there is a natural resistance to tax increases even though this particular charge is not really a tax at all, but a price for road service. Resistance to higher charges is strengthened by the realisation that once a tax goes up it rarely comes down. Second, even when the gas tax is properly considered as the price paid for roads, the proceeds may be distributed according to law on projects of little consequence rather than on the roads really needed.

The shortage of funds on America's roads has had unfortunate results. To stretch available funds the roadbuilder must often straighten a road here and widen there, despite the need for relocating the entire highway and starting over again. In many cases the cost of acquiring a right of way to permit major improvements has been made prohibitive by the fact that homes and business establishments have grown up along the route and widening the roads requires buying valuable property and paying for the buildings too. So there is resort instead to superficial but costly changes on the old inadequate right of way which do very little to remove the causes of congestions or the need for further remedies.

How this frustrating situation came about in a nation whose engineers have generally given a good account of themselves is clear enough in retrospect. **The governments of the states should have purchased enough land on either side of the travelled way to provide for any further widening and to prevent people from building close to the road and creating traffic hazards**. But it was not considered wise to let the government go any farther than absolutely necessary to perform basic public services and the laws of the states accordingly forbade purchase of more land than was needed for the specific purpose of building a road.

Many of these provisions of law still stand, and they have cost state governments dearly. The best that can be done now is to prevent the same error from being made when a new road is built, by legislation enabling the state to purchase wide rights of way and refuse access to the road except at designated places. Nearly half the states, however, are still without adequate legal authority to build new roads to so-called "limited access" standards.

In many states there are constitutional prohibitions against public borrowing. Today, when the need for issuing bonds for costly highways is clear, it is necessary to amend these state constitutions before the funde can be borrowed. This is often made difficult by the fact that the American public has been sold on the idea that a "pay-as-you-go" policy of financing new roads out of current tax earnings constitutes economic virtue. This viewpoint is well established despite the

absence of any reason why a well-designed road good for many decades of service should not be **built when it is needed and paid for while it is used**.

Advantages and Limitations

It is against this background of legal and financial frustration that the toll road has begun to look modern. For the toll service permits a modern road to be built where and when it is needed, regardless of obstacles to access control, borrowing, tax increases, or sane spending. A toll road is built on a new right of way, with access limited to points where feeder roads are built to join it. It is financed by revenue bonds secured by the prospective earnings of the facility, and these bonds are not subject to state debt limits. The problem of raising the gasoline tax rate is avoided, for the toll authority sets the rates in the light of cost and demand considerations. And there is assurance that when the motorist pays is being used to provide the specific road he wants.

These and other attributes of the toll road do not lead to the conclusion that a solution of the world's highway financing problems lies simply in issuing revenue bonds and building the facilities needed. Toll roads, like toll-supported bridges, merely provide one additional tool to help fashion a satisfactory motor transportation system which in its entirety will be made up of many types of roads serving many different needs. The toll road, for example, is no solution for crowded streets in the centre of the city or for little-travelled roads in the country. The toll road to be financially solvent is limited to a small mileage of main rural roads carrying a heavy volume of traffic.

On routes not carrying sufficient traffic it is possible, of course, to provide financial assistance to supplement toll receipts. Thus, in a country where consideration is being given to building a railroad with government assistance, it might be found more economical and more advantageous to subsidise the construction of a toll highway for trucks and buses.

The Wisest Solution

In countries which are considering the overall problem of road finance it will be apparent that an overall solution requires more than a few miles of toll roads. **The wisest approach would be to obtain the necessary funds through gasoline tax and apply the proceeds wisely in accordance with traffic needs**. In most cases the magnitude of the needs would require borrowing, with the proceeds of the bond issue dedicated to the specific highways to be constructed. Tax rates might have to be raised to service the debt and the revenues so earned would have to be set aside for road purposes exclusively.

There is no question that in principle the sound approach to solving the highway problem today lies precisely in that direction. Failure to act along these lines is the basic reason for the emergence of the toll road. Actually, the steps outlined above are not a remedy for the toll-road movement in the United States but rather a description of the ailment. For the toll-road movement has developed out of the failure of public highway management to apply the tools available to it in a manner productive of effective highway development. Only in a country which can avoid these pitfalls will the gasoline filling stations prove in all cases to be better than the toll gate.

Perhaps, though, the fundamental reason for failure to arrive at a sound solution to the highway problem in the United States is the failure to recognise the real relation between good roads and economical motor transport. The highway is one among many elements which together provide highway transportation service. Others are the vehicle, tyres, gasoline, oil and so on. All these factors contribute to the final service. We have been quite willing to invest in modern automobiles and to pay large sums for the gasoline we burn but we have neglected the parallel need for putting more money into the roads.

Yet it is no mystery that the total cost and quality of the final service depends a great deal on the excellence of the road system. Since an unsurfaced highway causes excessive vehicle operating costs, the improvement of such a road will reduce costs, including vehicle depreciation, tyre wear and gasoline consumption; a net reduction in the cost of

transportation may thus be achieved despite the outlay required to improve the road.

Similarly, reduction of operating costs, time losses and accidents can be realised when facilities inadequate to accommodate the traffic using them are replaced by roads and streets which permit safe and expeditious vehicle movement. This balancing of costs and benefits provides a valuable guide to highway investment policies. **The vehicle operator who pays to use a toll road knows that paying more for the road means paying less in gasoline costs, brake wear, accidents and time. Toll road users have been quicker to master elementary economics than state legislatures!**

It is too bad that the lesson of the toll road has not been taken to heart in America. If the energies expended in decrying it were loosed on the law makers to provide more modern financial tools the results would no doubt be gratifying. The gasoline tax and the registration fee, which provided a remarkable financing combination in the past, could very easily continue to serve the accelerated demands of 52 million vehicles.

In any event, toll roads are breaking the log jam of accumulating main road construction projects. They are offering a demonstration of what needs to be done to renovate outmoded financing policies and to allow this nation on wheels to get rolling.

VILLAGE INDUSTRIES

A man bought a sawmill and after he had paid for it, said to the former owner : " Friend, since you tell me you're going to leave here, I wish you'd give me a few pointers on how to make the mill pay."

The former owner of the mill laughed and explained: " Stranger, this here mill was left to me by grandma, and the patch where I got my timber from belonged to my fust wife, so I didn't have to invest nothing. My two boys cut the logs gratis, and Pearl—she's my niece—carried 'em down here free of charge. Me and my third wife run the mill, so that part didn't cost no overhead. I worked this mill that way for two years and lost a thousand pounds. Good luck to ye ! "

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SPECIAL ARTICLE NO. 9

VERTICAL CURVES FOR HIGHWAYS

[Adapted from I. R. C. Paper No. 156 - Journal of the Indian Roads Congress Vol. XVI-I Nov., '51.]

THE alignment of a road generally follows the lie of the land from considerations of economy and aesthetic principles of road location. Since the natural ground is rarely level the longitudinal profile of the road is usually taken initially as a series of straight grades. Where two such grade lines meet a vehicle travelling at speed would experience shock. So it is necessary to effect gradual changes in the grade by introducing suitable curves in the vertical plane and these are called vertical curves.

To attain the primary objectives of safety and comfort in travelling the design of vertical curves has to take into account the following :—

a. The design speed of the road ;

b. The gradients connected by the vertical curve :

c. Requirements of visibility ; and

d. Requirements for comfort.

Speed Standards

The Specifications and Standards Committee of the Indian Roads Congress have recommended speed standards for the different road classifications* and these are reproduced below.

Table 1—Standard Design Speeds

Class of Road	DESIGN SPEED			
	Plains		Hills	
	m.p.h. V	Ft/Sec V	m.p.h. V	ft/Sec V
National Highways.	50	73	30 **	44
Provincial Highways.	50	73	30	44
Major District Roads.	40	59	25	37
Other District Roads.	30	44	20	29
Village Roads.	20	29	15	22

Gradients

The grade line is the most important element of design in its influence on safe and economical vehicle operation and on the quantities of cut and fill. Hence, it is necessary for the designer to know what gradients are to be aimed at so that he can achieve a balance between economy of design and the convenience of the road user.

In hilly country the gradients should be such that they can be negotiated with the

* Special Article No. 4. Transport-Communications Monthly Review, April, 1952, page-16.

** Where practicable.

least changing of gears by heavy motor vehicles since there may not be much animal drawn traffic on such roads. In the plains the roads are used by both the slow moving bullock cart and the fast moving motor vehicle. There are many varieties of bullock carts differing in design and capacity, and in the strength and the number of draft bullocks. Therefore, the nature of the problem does not permit of laying down precise standards for adoption throughout the country. Experimental data on which the standards could be based are not available and until such data are collected, the following standards are recommended by the Specifications & Standards Committee.

Table 2 - Gradients

	Ruling.	Limiting.	Exceptional*
Plains.	1 in 30	1 in 20	1 in 15
Hills.	1 in 20	1 in 15	1 in 12

Gradients up to the **ruling gradient** can be used as a matter of course in road designs and quantities of cut and fill balanced as far as possible.

The **limiting gradients** may be used where the topography of a place compels this course or where the adoption of gentler gradients would add enormously to the cost. In such cases, the length of the continuous grade line at a grade steeper than the ruling gradient should be limited as far as possible. In hills where limiting gradients have to be used rather frequently it is important to separate such stretches by providing stretches of level road or easier grades.

In some very extraordinary situation **exceptional gradients** (see Table 2) may be unavoidable. For example, in a built-up area adherence to the grade of 1 in 20 may involve damage to expensive abutting property. Also in a hilly tract short stretches of grades, steeper than the maximum, may become essential to gain elevation to reach an obligatory point on a fixed route. In such exceptional cases gradients in excess of the maximum, and up to the exceptional, may be permitted. But each such case should be very critically examined and justified.

* for short distances not exceeding 300 ft in a mile.

Visibility

For the purpose of determining the length ahead along the road that should be visible to the driver of a motor vehicle it is first necessary to define the position of the driver with reference to the road surface. Virtually it is the height of the eyes of the driver seated in the vehicle that defines this position. This height varies with the height of the seat above the road surface and with the height of the driver. Measurements taken with drivers seated on some of the popular modern makes of passenger cars in India showed a variation between 4 ft and 4 ft 6 in. The eyes of the drivers of some low-hung sports cars may be lower but these being relatively few in number may be neglected. The drivers of passenger buses and trucks are seated at a much higher level and therefore can see more of the road.

For purposes of road design the height of the driver's eye above the road surface is assumed in various countries as under.—

United Kingdom ...	3.75 ft.
Australia ...	4.00 ,,
America ...	4.50 ,,
France ...	4.10 ,,
International Road system of Europe ...	4.48 ,,

The Specifications and Standards Committee recommended that the height of the driver's eye for Indian conditions may be assumed as 4.00 ft.

As explained in Special Article No. 8 on Sight Distances, two types of sight distance have to be considered. One is the absolute minimum and is equal to the safe stopping distance. The other is the minimum overtaking distance, that is, the clear length of roadway a driver overtaking a slower vehicle has to look for between himself and another approaching vehicle ahead travelling in the lane he proposes to use for the purposes of overtaking. The height of such vehicle ahead

is also assumed as 4 ft which, while erring on the side of safety, simplifies design of the vertical curve. For non-overtaking sight distance the height of the object which require to be sighted before the vehicle can stop is taken as 4 inches.

Comfort. Radial acceleration is a measure of riding comfort and, as will be shown later, is provided for when the curve is designed to secure adequate visibility.

Vertical curves are of two kinds.

a. Summit curves.

b. Valley curves.

A curve with convexity upwards is called a **summit curve. This is illustrated in Fig. I below. Fig. I (a)** is the case of an ascending gradient intersecting a descending gradient and Fig. I (b) is the case of an ascending gradient meeting another ascending gradient. An intermediate case would be that of an ascending gradient meeting a horizontal.

A curve with convexity downwards is called a valley curve. This is illustrated in Fig. 2 below. Fig. 2(a) is the case of a descending gradient meeting an ascending gradient whereas Fig. 2 (b) is the case of one descending gradient meeting another descending gradient. In between these two cases would be the case of a descending gradient meeting a horizontal.

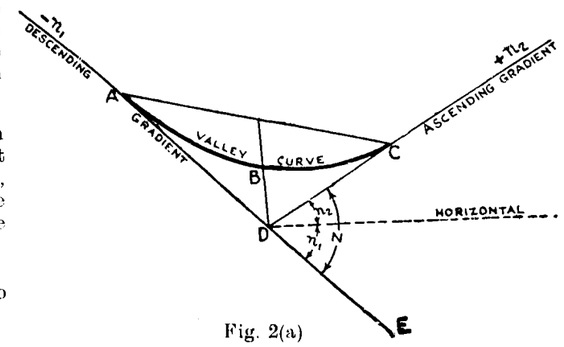


Fig. 2(a)

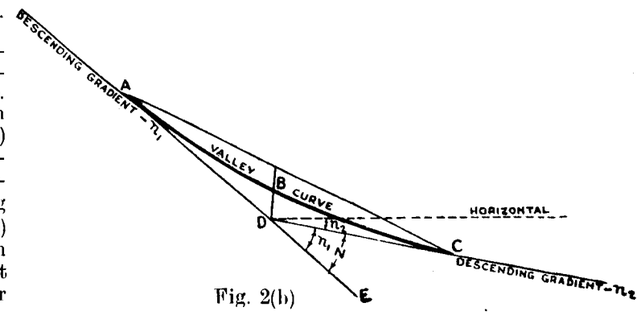
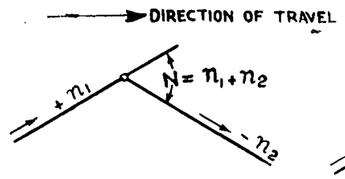
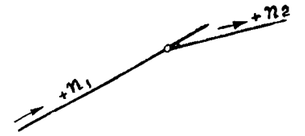


Fig. 2(b)



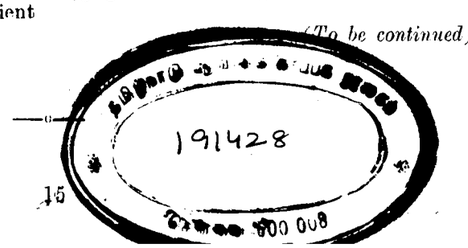
(a) ASCENDING GRADE MEETING A DESCENDING GRADE

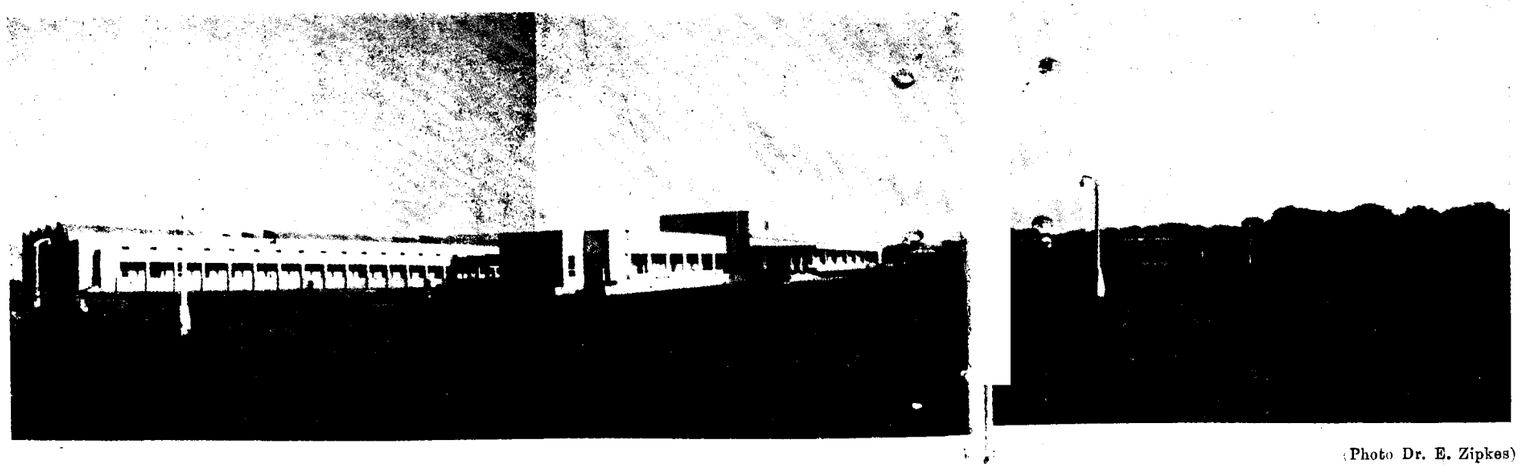


(b) ASCENDING GRADE MEETING ANOTHER ASCENDING GRADE

Fig. 1 – SUMMIT CURVES

(To be continued)





A Panoramic View of the Institute at Okhla

INDIA'S HARMONDSWORTH

THE OKHLA ROAD RESEARCH INSTITUTE

"ONE thing to which we must give topmost priority is roads—roads of all kinds, not only very up-to-date bituminized or cement roads, but roads of any kind, to open out vast areas in this country which are closed up today," said the Prime Minister when he inaugurated, on the 16th July last, the Central Road Research Institute at Okhla, a suburb and pleasure resort of Delhi.

Requesting the Prime Minister to declare the Institute open, Maulana Abul Kalam Azad, the Union Minister for Natural Resources & Scientific Research and Education, recounted the main functions of the Institute as follows :—

(1) Fostering and promoting road research in general;

(2) Fundamental and Applied research on road materials, construction, and maintenance;

(3) Testing;

(4) Standardizing specifications;

(5) Devising suitable instruments for various tests on roads;

(6) Study of soil mechanics and carrying out tests on soils for the development of all-weather village roads;

(7) Studying the characteristics and behaviour of different types of roads under different traffic conditions;

(8) Studying incidence of accidents, compiling road statistics and evolving road safety devices;

(9) Organizing co-operative research schemes with the assistance of engineering colleges, other research institutions, and industrial concerns doing similar work;

(10) Tendering technical advice and assistance where sought;

(11) Disseminating results of research; and

(12) Training technologists.

With the Prime Minister giving the topmost priority to roads—roads of any kind—and with the Minister in charge of the Department posing the problems to be tackled in the new Institute, the Director of the Road Research Institute, **Dr. E. Zipkes**, did well to go straight to the root of the matter. He counted his blessings—

(Photo Dr. E. Zipkes)

the spacious experiment halls, the comfortable offices, the fine equipment, and other facilities. But he emphasized that "to do good research work we need good research workers." He went on to give an excellent outline of the gifts and qualities which make a research worker, more particularly a research engineer.

The Research Man

"Everybody will agree," said Dr. Zipkes, "that a research man must have imagination: a mind continually prepared to reach out into the unknown. At the same time, however, he must have a great deal of patience. Patience and imagination . . . a queer mixture of qualities which nature does not—as a rule—bestow on the same personality. In many people patience and imagination seem mutually to exclude one another. The imaginative type is generally in too great a hurry keeping up with the jumps of his far-reaching mind to have any patience for mere details. The patient, conscientious worker, on the other hand, likes to stick to his job, not feeling too curious about new horizons.

"But whenever—may be with the help of education or self-discipline—both these qualities come together in the same person, research has found its man—a man who will patiently conduct experiment after experiment, will undisturbedly collect the most contradictory facts, will, if necessary, go back and start the same series of investigations all over again; a man who is capable of interrupting the course of his work for weeks,—not to say months—to improve his apparatus or even design a new one; yet, at every stage of this long journey, his imagination tries to get behind mere facts, to get at the meaning of what the experiments show him. Such a research worker is continually on the alert for the one little thing that will provide him with a spring-board; the spring-board for the big leap into the new land, where he ultimately may find the solution of his problem.

"The trouble is that in most cases the research man does not know when he will encounter his spring-board. He does not even know what it will look like. It is therefore so very difficult and often unwise to split research work up into hand-work for one person and brain-work for another. And this brings me to a third essential characteristic of the research worker: he must be willing to do any kind of work.

"To every university graduate who joins this Institute I should like to point out: Don't hesitate to use your hands! Don't be afraid to get them dirty with tar or oil or loam . . . The essential thing is not that you should actually do everything always yourself, but that you should be prepared to do so whenever your work demands it. There is no plea for self indulgence in our job. If a research man makes concessions to public opinion, it will very likely be at the expense of the quality of his work.

"We may secure patents; we may publish papers and books; but these are only by-products of our work. They are not the ultimate purpose of research. The real success is obtained when the problem is conquered. And sometimes even a negative result, that is, the thorough proof that one was on the wrong way, is a result and may be called success—Of course, not a very glamorous one, but that can't be helped. In research, as in any other serious work, the cause must be put before the man.

"Now, in road research, we are mostly concerned with one particular kind of

(Continued on page 25)

HERE AND THERE

1. FORGING A TECHNICAL VOCABULARY

THE unified structure forged by lexicography in any well-planned polyglot technical dictionary is an authentic bar to the participation in it of persons not fully familiar through actual research with the whole range of the subject-matter embodied. Since such research requires years of undivided attention in at least two languages, little room is left by it for the practice of other professions, and this, in turn, renders impossible—and even ridiculous—the engagement of lexicographically unqualified people who may happen to have even considerable knowledge of the languages involved, to "write in" alongside of an originally prepared English word list what they think is the proper equivalent in the foreign language.

Personal opinion is of little consequence in a scientific work, and in a technical dictionary the only proper solution of every problem is the actual knowledge of the undoubtedly preferred usage and its variants, if any. Mere knowledge of the particular language, no matter how fluent —even if reinforced by long experience in fields other than technical lexicography itself—will no more qualify one to assist in the preparation of a polyglot technical dictionary than it would in writing authoritative legal opinions without the proper legal training.

Unfortunately, however, this is precisely what has been happening in the case of the polyglot technical nomenclatures, with a level of performance already at least partially exposed.

(Extracted from "Report on Inter lingual Scientific and Technical Dictionaries" —UNESCO, Paris, 1951).

2. PROCTOR URGES ASCE TO LEAD FIGHT AGAINST SUPERSTATE

* * *

THE super state is being created here—just as surely as it existed in the totalitarian countries of Europe. The Engineer, says Proctor* must draw on his Professional prestige for clear thinking and unbiassed analysis and lead in the fight against the trend.

He points out that "national progress has resulted from co-operation and integrated efforts of the engineer, management, risk capital, and skilled workmen, in an atmosphere of free competition—where opportunities for profit, coupled with a chance of loss, permit fair opportunity."

But engineers have done only half the job they should be doing, he says. In perfecting labour-saving devices, mechanization for rapidly increasing living standards, the facilities for mass entertainment and travel, we have largely ignored our responsibilities for the social impacts, the economic repercussions, and the cultural implementations of our work.....while the politicians have been quick to exploit our ineptitudes.

Vacuous and Soul-Destroying

"To every engineer trained in the mental habit of direct analysis, it must be crystal clear that **we are challenged by a world-wide politico-economic philosophy that is based on the vacuous soul-destroying promise of maximum return for minimum effort:** the equivalent of pulling ourselves by our boot straps.

* * *

"Such a philosophy, preaching indolence, the socialized usurpation of private enterprise by the super-state, and the abolition of individual freedoms, leads to, and encourages, the loss of respect for creative effort and inventive intelligence; the concept that "ideas" are public-owned natural resources, acceptance by the public of the unethical and the expedient; and of a moral lassitude in high public office and in political life.

* * *

"The inevitable concomitant is, of course, the sacrifice of religion with the banishment of God from our daily life and work. Thus is bred the super-state with its managed economy, and its staggeringly top-heavy bureaucracy. This is the dead-end road that leads only to totalitarianism and communism."

Engineers can no longer hide behind their slide rules, he says. Theirs may well be the only leadership in which there is today sufficiently complete public confidence to guide men's minds back to the basic precepts of the dignity of hard work, the decency of public trust, and the religious principles on which the country was founded by our great forefathers.

"Herein lies the other half of our job, so long and so tragically neglected.....To accomplish this job we need to employ to the full the teamwork that is inherent to our organization and the full force of our influence."

(Extracted from 'Engineering News-Record'—June 12, 1952.)

* C. S. Proctor, President, American Society of Civil Engineers.

3. LESSONS FROM FAILURES

ENGINEERING progress is advanced whenever destructive loads are applied to a designed structure and the results are studied. Such destructive testing is essential if the time honoured idea of economy in engineering construction is to be furthered. Over-design is never questioned as to adequacy, but sound engineering recognizes excess materials and labour as an economic waste.

Some engineers go so far as to say that ten per cent of all engineering structures should fail in the interest of adding to fundamental knowledge, as well as to prove that design is running close to minimum costs. Obviously, this drastic means of destructive testing is infeasible when dealing with human lives and public property, but the principle is worthy of use in modified form.

Work is about to start on the test road sponsored by the Western Association of State Highway Officials to study basic design for bituminous roads, particularly under the impact of legal-limit and greater loads. This test road is designed to produce progressive failure so that the relationship between factors of design, loads, and length of service can be evaluated. However, this very failure presents a serious problem in public relations.

Engineers are prone to become so engrossed in their work that they neglect the fact that occasionally the public takes a peep over their shoulders to see what they are doing. Because the public is always interested in highway work, and with the added concern of the trucking groups, there will undoubtedly be much newspaper and general public observation of the road test.

It is logical for the observations of these laymen to be based on the idea that engineers are building a road to see if it will stand up under truck traffic. Evidence of destruction will be accepted as indicating failure of the test, and he so reported, unless these non-technical observers are informed otherwise. All casual visitors, and particularly newspaper representatives, should be properly informed on the test program and the value engineers secure from failures.

Further, the situation presents an excellent opportunity for another step in good public relations for highway engineers. It is a chance to emphasize that an occasional indication of inadequacy in highways should not be looked upon as failure but rather as a mark of proper economy. The public wants more and more miles of roads for its gas tax. **By over-design the highway engineer could eliminate failures, but his objective is to produce the most usable miles for the gas-tax-payers' dollar.** Thus, the WASHO test road presents a fine opportunity to educate the public into the principle of engineering design which spends public funds wisely and without waste.

(From "Western Construction", April, 1952).

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4. A QUICK METHOD OF MAKING A ROAD PLAN

AN article by Mr. W. E. I. Armstrong, M.Eng., A.M.I.C.E., of the Road Research Laboratory, was recently published in **Roads and Road Construction, (Dec. 1951)** describing an apparatus to facilitate the production of records of surface defects in roads. It consists of a small three-wheeled apparatus which is pushed along the road by hand. A box is fitted on top which takes recording paper in rolls 9 in. wide, and when the recorder is pushed forward the paper is pulled backwards across the top of the box at 1/120th of the forward speed of the apparatus, so that a plan can be produced to a scale of 10 ft to the inch.

An opening in the cover permits defects to be recorded on the paper against a crosswire. Seven spring-loaded ball-pointed pens are mounted over the space, under which the paper passes on the top of the box. Blue ink is used to indicate kerb lines, red ink the longitudinal joint in the case of concrete roads. By lowering the appropriate pens a blank plan of the road is produced as the paper moves. A counter is fixed to the front wheel to enable distance to be calculated. Any defects are then marked on the paper as they occur and any of the features, such as manholes, recorded. In this way a plan of the road is developed.

(Extracted from 'Journal of the Institution of Municipal Engineers'—April 1st, 1952).

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5. DO YOU KNOW?

1. In 1899 the U. S. War Department purchased three automobiles for the use of officers. But the department was not at all sure that the automobile was as dependable as it might be. What provision was made in case the vehicles wouldn't run?

2. How much does the U. S. A. spend every year on road maintenance alone? And how much is provided in India's Five Year plan for road development?

ANSWERS

1. According to the American Automobile Association, the department equipped each vehicle so that a mule could be hitched to it if it refused to run.

2. *Yearly* road maintenance cost in the U. S. A., Rs 560 crores.

Five Year road development programme in India, Rs 100 crores.

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6. TRANSPORT COSTS

THE roads are the conveyor belts of industry and agriculture and of the community, and a more efficient road system would reduce the cost of transport and so reduce the cost of everyday essentials. More important still, at the present time it would reduce the cost of goods sold abroad and so help our prospects in overseas markets. It is illogical to build factories equipped with labour-saving machines, or to improve the mines and generating stations to supply the power and so produce goods cheaply, if the whole of the savings thereby effected are wasted in transporting the goods from factory to station, from factory to port, from farm to market, from producer to consumer.

(Extracted from 'The Surveyor' — July 19, 1952)

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7. GETTING PUBLIC SUPPORT

A LESSON CAN BE DRAWN from the successful efforts of the Northern Kentucky Sanitation District No. 1 to get separate communities to co-operate on a sewage treatment program. In Kentucky, it was proved again that no amount of figures, charts, tables, and highly technical discussions of bacteria count will 'sell' a sewage treatment program to the general public as quickly as will a simple statement couched in personalized terms. Tell a taxpayer that he has to pay more taxes because the bacteria count in a stream is so many parts per million—and your answer will probably be a shrug or a thoughtful "is that so?", which means he doesn't understand, but won't admit it. But put the pollution on the basis of injury to his children's health; on the basis of visible mess floating on the stream; on the basis of economic loss to his community—and then you'll get a "sale".

(Extracted from "Engineering News-Record" May 29, 1952).

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8. EXTRA TAX SUGGESTED

50 Mile Radius Proposal

* * *

A memorandum entitled "Proposals that the railways should be subsidized from the profits of free enterprise road transport"—a copy of which has been submitted to a well-known member of the Parliamentary Road Group—rejects further direct taxation to meet the railway deficit and suggests instead that a special tax, based on unladen weight, should be paid by all operators taking advantage of the assumed future freedom from mileage restrictions when they operate beyond a 50 miles radius from base.

The proposals assume that the potential number of A, B and C licensed vehicles and passenger vehicles for which the owners would pay the additional tax for the privilege of operating outside a 50 miles radius would reach 200,000 vehicles with an average of 4 tons unladen weight. This would provide a total of 800,000 tons, and if the additional tax were £ 25 per ton, the proceeds would be approximately £ 20 millions. If the proposals were adopted, the memorandum forecasts, a large number of vehicles now on C and C hiring licences would contract out and would cease to travel long distances, as traders would receive a more economical service from professional hauliers.

Another result would be that, if the tax were payable quarterly, a large number of operators would contract out in slack periods and contract in when their particular trades were active.

* * *

(Extracted from "MOTOR TRANSPORT" London, of February 2, 1952)

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9. THE POSITIVE APPROACH

"IS there anything wrong with it?"

This almost has to be an engineer's number one question to any proposal or conclusion. And the rest of us will face daily questions in much the same way if we are prudent and analytical.

But this "what's-wrong?" approach can become too strong a habit. Its negative necessities can come to dominate all our thinking. When they do, we are left with only old ideas and facts on which to move forward. Soon outworn ideas lead to ingrown lives

The best flaw-picker in the world can but lay the ground work for constructive action. Until he visualizes some possible good, the best of his flawpicking just prevents recurrence of bad.

Seeing clearly what is wrong, often is the necessary antecedent to seeing clearly what is right. But pride in ability to spot the wrong can easily breed smugness. We can too easily be self-satisfied with flaw-picking as an accomplishment in itself. Yet flaw-picking alone never helped anybody enough to bring much gratification to the picker—or the picked. The beginnings of satisfaction start when some good outcome is conceived.

For progress, time spent looking for something good must exceed time spent flaw-picking. We are on the right track if, each day, we find ourselves saying "That's good" at least twice as often as we're saying "That's bad."

(Extract from SAE Journal— May 1952)

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10. SENSE OF PROPORTION

HERE I think it will be appropriate to plead for some sense of proportion in our public expenditure. We are prone to imitate grand things we find in other contries, forgetting the vast difference there is in our and their national resources. This has led us to build servants' quarters where each unit costs Rs 8,000, hostels of which the cost per student is Rs 5,000 to Rs 6,000, and hospitals costing Rs 7,000 to Rs 8,000 per bed. No doubt these are very fine structures, comparable to similar foreign institutions. But can we afford them? Against this some private institutions had to put up hostels which are cheap hutments costing Rs 500 to Rs 600 per student.

Anyhow I feel we are losing our sense of proportion, and this must be happening in every branch of development. I do not know to what extent our foreign educated or foreign travelled experts are responsible for this. But I have a feeling that they do lose sight of the difference between our and the other countries' resources.

I found the same thing in other countries similarly situated. I found in Lisbon in Portugal a fine Engineering Laboratory put up, stocked with the latest type of American apparatus, some of it not even set up.

Against this, the road research and building research laboratories near London, are housed in cheap brick sheds, though these institutions have been working for more than 20 years and are doing valuable work. The contract between the National laboratories set up by us, all ready made, and these institutions which have grown up from modest beginnings, is very noticeable.

[*Extracted from 'The Institution of Engineers (India), Bombay Centre,' 30th Annual Session Address by Shri M. L. Champhekar, Chairman.*]

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11. TRANSPORT IN RAJASTHAN

(Based on a Half-Yearly report by the Government of Rajasthan for the second half year of 1951.)

RAJASTHAN, the State with the largest area (128,408 square miles) in the country, has a meagre road mileage of 12,485 miles, out of which only 4,424 miles are metalled. This works out to a mile of road for every 10.3 sq. miles, and a mile of metalled road for every 29 sq. miles.

Even with this small mileage of metalled roads, stream crossings on some of the very important routes are unbridged. During the rainy season road traffic is held up for long periods, thus causing great hardship to the public.

The Railway mileage in Rajasthan is also comparatively low in relation both to the area and the population of the State. Air transport is still in its infancy.

The need for an efficient transport system in Rajasthan is felt all the more because production in most of the areas is far from sufficient for the local needs. The limitations of local production have to be overcome by import from without or by efficient distribution within the State. The possibility of frequent famines in Rajasthan has to be eliminated. To provide employment to the people, new industries have to be developed. For all this there is a great need of a rapid development of road and railway mileages in Rajasthan.

With many factors limiting an increase in the railway mileage, attention should be diverted to developing roads in Rajasthan. The crying need of the State is building roads and more roads, providing suitable stream crossings, and maintaining the roads and bridges in an all-weather condition.

Along with the development of roads should be taken up the nationalization of the road transport services to provide rapid, efficient, adequate and economical means of transport. It is only with the nationalization of road transport that rail and road co-ordination can be properly effected, and fair wages and working conditions for workers assured.

Rajasthan is sparsely populated. It is cheap transport alone that will facilitate travel in the State. A network of good roads, properly maintained, and the nationalization of passenger services may perhaps solve the transport problem. There is much truth in the statement that improvement in the means and modes of transport in Rajasthan will mark the successive stages in the development of the State.

(Elsewhere in this issue we publish the Rajasthan Civil Works Budget Estimates for 1952-53. We also publish in this issue an article on "Facts and figures on nationalized transport"——Ed.)

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MATHEMATICS FOR THE MILLION

It was examination day at the police college and one candidate was making heavy weather. He passed the physical tests, but the written examination gave him a little trouble. One question:

"A man buys an article for 12s. 6d. and sells it for 9s. 9d.; does he gain or lose on the transaction?"

After pondering over the question, the candidate finally answered: "He gains on the pence, but loses on the shillings."

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TECHNICAL INFORMATION

FILL STABILIZATION FOR ROADS ON MUCK VERTICAL SAND DRAINS

IN the mucky meadowlands in the northern and southern parts of the State, the New Jersey Turnpike presents a special job in construction.

As the mud on these meadows reaches depths in excess of 100 feet, it was apparent that any ordinary fill would soon sink out of sight, and that permanent stability would be obtained only through replacement of enormous quantities of material.

Fills for ordinary depths are quite common; also the removal of muck and replacement with suitable material is often successful. Such methods, however, are limited to shallow swamp areas; for deep swamps, the cost becomes prohibitive, and in many cases results in the formation of enormous mud-waves.

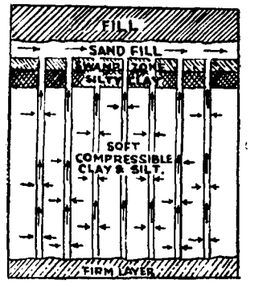
Not all of the marsh areas required special treatment. Where the soft, unstable material lay in comparatively thin layers, it was stripped and replaced with granular fill. In general, the sand-drain method appears desirable wherever muck reaches considerable depth, or where easy removal by dredging or stripping is not practicable.

To stabilize the soft soil and to give the Turnpike a firm foundation so that the heavy vehicular loads will be carried rapidly and safely, this technique of "sand draining" is being used.

Pile drivers push a pipe into the spongy meadowlands to depths ranging from six to more than 100 feet.

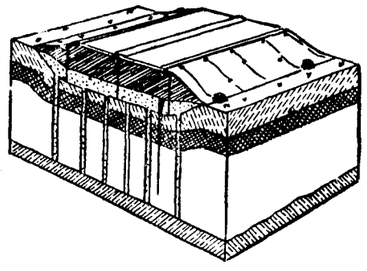
When the pipe hits a solid foundation, sand is poured in and the pipe is then pulled, leaving a vertical column of sand extending down through the muck.

FILL STABILIZATION - VERTICAL SAND DRAIN METHOD.



OPERATION OF SAND DRAINS

Diagram of water flow from the soft underlying clay and silt through the porous vertical drains and sand blanket.



FINAL STABILIZED ROADWAY

Showing compression of soft materials under embankments. Pore pressure devices and settlement platforms left for permanent record.

Sand drains were placed at intervals, depending on muck conditions, from a few feet to as much as 20 ft apart. Several million feet of such drains have been placed in the meadowlands of the six counties at costs ranging from 40 cents to 1 dollar a linear foot. The cost is influenced by the depth as well as the contract footage to be placed, and by availability of, and transportation cost for, the sand.

These sand drains act like an old-fashioned lamp wick, permitting the water to drain out of the muck as the weight of the top is pressed down. The water flows upward through the sand drains and then horizontally along the "sand blanket," running off at the side of the roadway. This process of draining continues until "stabilization", or settlement, is reached, and forms a firm base for the Turnpike.

(Extracted from "Roads & Road Construction"—Jan., 1952.)

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(Continued from page 17)—**THE OKHLA ROAD RESEARCH INSTITUTE**

research work, namely engineering research. We need,—apart from different training—men with a somewhat different outlook than purely scientific research.

The Research Engineer

"On one side we have the scientist—on the other the engineer. Somewhere in the middle, reaching out a little to both professions, stands the research engineer.

"A scientist may sometimes have his head in the clouds of theories; he may lose thereby his contact with the earth. The engineer must never have his head in the clouds. Firmly he should stand with both feet on the ground to meet the practical and mostly very material day-to-day demands of his work. We, research engineers, are allowed to have our heads in clouds, sometimes, but we must not lose our contact with the earth either. It would make all our endeavours useless. We employ the same methods as a scientist, but our results must hold good in the hands of the executing engineer."

Keep more than Your Promise

The Director then pledged himself and his colleagues in the Institute to do his best "with imagination and patience, prepared to do the job ourselves, without self-indulgence" and to adopt, as the guiding spirit of their work, the words "keep (more than) your promise," or to express it otherwise, "do (more than) your duty."

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SHOWING OFF

The next time you feel the urge to show off when behind the wheel of a car, warns the National Automobile Club, remember that it takes but a split second, but a panic-stricken moment of confusion, to switch from spectacular driving to spectacular death.

—From 'California Highways & Public Works,' March-April, 1952.

ADMINISTRATION REPORTS AND BUDGETS

(1) RAJASTHAN CIVIL WORKS BUDGET 1952-53

THE following extracts pertaining to Civil Works have been taken from the Rajasthan Budget for the year 1952-53 :—

	(In Lakhs of Rs)		
	Actuals 1950-51	Revised Estimate 1951-52	Budget Estimate 1952-53
I. Revenue (Civil Works)			
(1) Rents	2.94	4.24	6.21
(2) Ferry Receipts	.11	.05	.03
(3) Tolls on Roads	.32	.12	.12
(4) Recoveries of Expenditures	.01	.01	.01
(5) Transfer from Central Road Fund	.02	4.73	69.07
(6) Miscellaneous	3.42	1.66	1.57
(7) Deduct—Refunds	–.01	–.01	–.01
Total	6.81	10.80	77.00
II. Expenditure (Civil Works)			
(a) **From Revenue Account**			
(1) Original Works	44.27	13.69	15.73
(2) Repairs	50.79	78.23	77.59
(3) Establishment	19.04	18.24	16.87
(4) Tools and Plant	.97	1.35	2.70
(5) Suspense	14.36	1.42	1.20
(6) Regrant for lapses	...	...	.43
(7) Deduct—Lump Sum cut	...	...	–1.00
(8) Establishments and Tools & Plant charges transferred to other heads of Account.	...	–6.53	–10.17
Total	129.43	106.40	103.35
(b) **From Capital Account** (outside the Revenue Account)	55.86	45.63	33.34
III. Expenditure—Communications			
(i) **Original Works**			
(a) Met From Central Road Fund	19.18	3.73	10.76
(b) Met from Ordinary Revenues		4.33	3.00
(ii) **Repairs**	n. a.	56.00	56.00
Total	...	64.06	69.76
IV. Revenue from Roads			
(i) Ferry receipts	.11	.05	.03
(ii) Tolls on Roads	.32	.12	.12
(iii) Receipts under Motor Vehicles Act	18.92	25.10	26.00
Total	19.35	25.27	26.15

A BRIEF REVIEW OF THE RAJASTHAN BUDGET

(With special Reference to Civil Works)

THE Rajasthan Budget for 1952-53 provides for a revenue of Rs 1632.18 lakhs and an expenditure of Rs 1725.66 lakhs, leaving a deficit of Rs 93.48 lakhs. The revised estimates for 1951-52 show a deficit of Rs 6.79 lakhs with the revenue receipts amounting to Rs 1596.52 lakhs and revenue expenditure to Rs 1603.31 lakhs.

Revenue expenditure on Civil Works for 1952-53 estimated at Rs 103.35 lakhs forms 6.0 per cent of total State revenue in the year, the corresponding percentage for the two preceding years 1951-52 and 1950-51 being 6.6 and 9.3 respectively. Revenue expenditure on communications (Original Works and Repairs) in 1952-53 is estimated at Rs 69.76 lakhs which is 4.3 per cent of State Revenues. The corresponding percentage for the previous year 1951-52 is 4.4.

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2. ADMINISTRATION REPORT OF THE PUBLIC WORKS DEPARTMENT, TRAVANCORE & COCHIN FOR THE YEAR 1124 M. E.*

TRAVANCORE BRANCH.

THE total revenue realised by the Public Works Department from Travancore Area during the year under review amounted to Rs 7.59 lakhs against 3.06 lakhs in the previous year. The biggest single item contributing to the revenue of the department was "navigation receipts" being responsible for 77% of the revenue. During the year nothing was received pending accounts adjustments, as a subvention from the Central Road Fund which represents the State share of allocation of extra duty on petrol from the Government of India.

The total expenditure of the Department on all heads was Rs 168.75 lakhs against Rs 203.47 lakhs in the previous year. The expenditure was divided under various major heads as follows—Buildings Rs 24.61 lakhs ; Communications Rs 76.53 lakhs ; Miscellaneous Public Improvements Rs 1.04 lakhs · Irrigation Rs 17.09 lakhs ; Tools and Plant Rs 1.05 lakhs.

The following statement gives the expenditure on Communications under the heads original works and repairs during the year under review and the two preceding years.

Rupees Lakhs

Year	Original Works	Repairs	Total
1124 M. E.	42.30	34.23	76.53
1123 M. E.	51.93	32.77	84.70
1122 M. E.	30.31	31.47	61.78

Length of Communications maintained during 1124 M. E. and the previous year were as below :

	1124 M. E.	1123 M. E.
(i) Metalled Roads	1,451	1,402
(ii) Unmetalled roads	2,355	2,340
(iii) Village roads incld. Cart Tracts	1,010	1,001
(iv) Planters roads	63	62
(v) Traces	420	425
(vi) Navigation Canals & Backwaters	400	400
	5,698	5,630

Continued on Page 30

* Covering the period approximately from August 1948 to August 1949.

BOOK REVIEW

HANDBOOK OF EARTH MOVING MACHINERY—Issued by the Central Water and Power Commission, Govt. of India ; 1951 ; pp. 274 iv ; Rs. 8/-

THE publication is a compilation of a series of lectures organized by the Central Water and Power Commission, Government of India, and delivered by some of the foremost experts in the field. The lectures were attended by a large number of engineers from all parts of India.

The main object of these lectures was to bring to the notice of Indian engineers the latest information on earth-moving machinery so as to enable them to make a proper selection of such machinery and utilize it in the most efficient and economic manner.

The lectures were divided under the following main heads : (1) Machinery for Dam Construction in India, dealing with the comparative economy of manual labour and machinery and the essentials for an economic use of mechanical equipment ; (2) Project Layout and Selection of Machinery ; (3) Earth-handling and moving Machinery : this section devotes a lecture to each of the usual types of equipment : (4) Prime Movers : (5) Compaction : (6) Maintenance and Upkeep : (7) Repair Shops : and (8) Training of Operators.

Also some useful tables and a glossary of terms commonly used in earth moving operations are included at the end.

In mechanized work the choice of the proper type and size of equipment, its 100 per cent utilization, and its constant maintenance in an efficient working condition, are the most important pre-requisites of economic execution of the job in hand. These lectures, based on expert practical experience, cover the whole field and should prove very helpful to all those engaged on works where earth moving machinery is employed.

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PIECE OF JUSTICE

In the early days of the Old West, an old timer was elected justice of the peace. As was usual in those days, he knew no law. When cases were brought before him, he would take out, with a flourish, a fine looking book, inside which he had fastened a Sears-Roebuck catalogue. One day he thumbed the pages, put his finger on a point and said : "You are fined 4.98 dollars."

The defendant got up to protest. "Sit down !" the lawyer cautioned, pulling at his client's coat-tail. "You're just plain lucky, he turned to Pants instead of Pianos."

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List of Approved Works on National Highways

S. No.	Job No.	Name of work	Estimated cost Rs	Remarks.
		BOMBAY		
1.	631 BM 8	Construction of a bridge over the Mahi river at Vasad on the Bombay-Ahmedabad National Highway.	34,59,000/-	
2.	632 BM 8	Raising the road and providing three hume pipe culverts in mile 159 of the Bulsar-Navsari Section of the Bombay-Ahmedabad National Highway.	26,500/-	
		PUNJAB		
3.	621 PB 1	Realigning and improving curve in mile 197/2-3 of the Grand Trunk Road in Ludhiana Distt.	9,960/-	
4.	622 PB 1	Realigning and improving curve in mile 196/2-3 of the G. T. Road in Ludhiana District.	7,660/-	
5.	623 PB 1	Realigning and improving curve in mile 196/6 of the G. T. Road in Ludhiana District.	8,980/-	
6.	624 PB 1	Realigning and improving curve in mile 196/6-7 of the G. T. Road in Ludhiana District.	6,400/-	
7.	625 PB 1	Realigning and improving curve in mile 197/6-7 of the G. T. Road in Ludhiana District.	9,869/-	
8.	626 PB 1	Improving curve in mile 204 of the G. T. Road.	8,340/-	
9	627 PB 1	Improving the curves by providing proper super-elevation in miles 201 and 203 of the G. T. Road.	7,350/-	
10.	628 PB 1	Improving the existing alignment in mile 204 of the G. T. Road.	9,560/-	
		SIKKIM		
11.	630 SK-31A	Providing sanitary and water supply installation in the inspection bungalow at Rangpo on N. H. No. 31-A.	4,400/-	
12.	633 SK-31-A	Improving the reconstructed portion of N. H. No. 31-A at Rangpo (mile 24 to 24½).	3,01,500/-	
		HIMACHAL PRADESH		
13.	629 HP 22	Widening the Hindustan-Tibet Road from mile 26 to 30 (excluding culverts).	2,02,800/-	

List of Books added to the Roads Organisation Library during September, 1952

1. **The Bihar Finance Act, 1950/Bihar Act XVII of 1950/Part III-Levy of Tax on Passengers and Goods carried or Transported By Public Service Vehicles and Public Carriers.** (Extracted from Bihar Government Gazette, dated 30th March, 1950).

2. **The Bombay Civil List corrected up to 1st January, 1952.** (The Director, Govt. Printing and Stationery, Bombay).

   The Macmillan Company, New York, 1949.

3. **Theory of Modern Steel Structures —Statically determinate Structures, Vol. I (Revised edition)** by Linton E. Grinter.

4. **Theory of Modern Steel Structures-Statically in determinate Structures, Vol. II** by Linton E. Grinter.

5. **Supplement to Valuation for Compensation and Development Charges** by Ronald Collier (Butterworth and Co. (Publishers) Ltd.—Bell Yard. Temple Bar, London, W. C. 2.)

6. **Aqueous Cementitious Systems Containing Lime and Alumina—Bulletin No. 34,** by Harold H. Steniour. (Portland Cement Association, 33 West Grand Avenue, Chicago 10, Illinois).

7. **Petrography and Engineering Properties of Igneous Rocks—Engineering Monographs No I** by **Richard C. Milenz** (U. S. Dept. of the Interior, Bureau of Reclamation).

8. **Masonry-Rubble Walls-CP 121.202 (1951)** (The Council for Codes of Practice for Buildings, Construction and Engineering Services, Lambeth, Bridge House, London, S. E. I.).

9. **ROAD Accidents In Delhi.** Govt. of India, Ministry of Transport (Roads Organization) 3 copies

10. **Soil Survey Manual—U. S. Department Agriculture Handbook No. 18** by Soil Survey Staff (Superintendent of Documents, Govt. Printing Office, Washington D. C.).

11. **Prestressed Concrete—A Theoretical and experimental study (BETON PRECONTRAINT ETUDE THEORIQUE ET EXPERIMENTALE).** by Y. Guyon (EDITIONS EYROLLES, 61, Boulevard Saint-Germain, Paris Ve , 1951.)

12. **Bulletin of the Association of Permanent International Road Congress—Bulletin No. 129.** (Science and Industrie, 2, Rue Paul-Cezanne, Paris (VIII.) 3 copies.

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(Continued from page 27)—**ADMINISTRATION REPORTS**

COCHIN BRANCH

The total receipts of the Public Works Department from the Cochin Area during the year under review amounted to Rs 9.20 lakhs and the expenditure to Rs 41.94 lakhs. The expenditure on Communications [illegible] amounted to Rs 15.91 lakhs of which Rs 6.39 lakhs was incurred on original works and Rs 9.52 lakhs on repairs. The total length of roads under annual maintenance was about 650 miles. According to the Report, all the roads were satisfactorily maintained during the year and all bridges and culverts were kept in proper repair.