1956–57

VICTORIA

COUNTRY ROADS BOARD

FORTY-THIRD ANNUAL REPORT

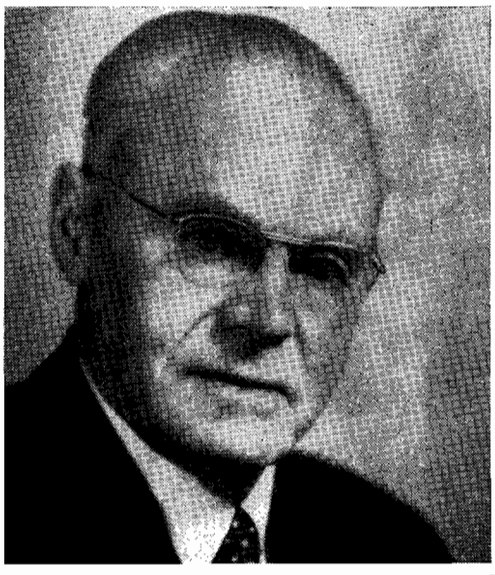
FOR YEAR ENDED 30TH JUNE, 1956

PRESENTED TO BOTH HOUSES OF PARLIAMENT PURSUANT TO ACT No. 3662.

[*Approximate Cost of Report.*—Preparation, not given. Printing (1058 copies), £700.]

By Authority:
W. M. HOUSTON, GOVERNMENT PRINTER, MELBOURNE.
No. 14.—[3s. 6d.]—12934/56.

Mr. D. V. Darwin.
Chairman, Country Roads Board.



RETIRING MEMBERS.

Mr. F. M. Corrigan (Deputy Chairman).

Mr. R. F. Jansen (Board Member).

NEW MEMBERS.

Mr. C. G. Roberts (Deputy Chairman).

Mr. W. H. Neville (Board Member).

Cover.—Widening of the Alpine Road near Blowhard, Mt. Hotham.

COUNTRY ROADS BOARD

FORTY-THIRD ANNUAL REPORT, 1956

CONTENTS

CONTENTS—*continued.*

COUNTRY ROADS BOARD

FORTY-THIRD ANNUAL REPORT

Exhibition Building,
Carlton, N.3,
23rd November, 1956.

The Honorable Sir Thomas Maltby, M.L.A.,
Minister of Public Works,
Department of Public Works,
Melbourne, C.2.

SIR,

In accordance with the requirements of Section 96 of the *Country Roads Act* 1928 (No. 3662), the Board has the honour to submit to you, for presentation to Parliament, a report of its proceedings for the year ended 30th June, 1956.

FINANCE.

The main changes in the Board's sources of revenue which occurred during the financial year were as follows :—

(*a*) Section 2 of the *Transport Regulation* (*Amendment*) *Act* 1954 (No. 5843) which had provided for the surplus from Transport Regulation Fund to be paid into the Country Roads Board Fund, was repealed by the *Transport Regulation Act* 1955 (No. 5930).

(*b*) The *Commercial Goods Vehicles Act* 1955 (No. 5931), which came into operation on the 1st April, 1956, provided that the owner of every commercial goods vehicle should pay as a contribution for wear and tear caused thereby to public highways a charge at the rate of one-third of a penny per ton-mile, based on the tare weight of the vehicle plus 40 per cent. of the load capacity of the vehicle, for every mile of public highway along which the vehicle travels in Victoria. This tax does not apply to vehicles with a load capacity of not more than 4 tons or to vehicles employed solely on the cartage of certain commodities specified in the Act.

(*c*) The Commonwealth Government announced an increase of 3d. per gallon in the tax on petrol, of which the proceeds of 1d. per gallon were to be paid to the States, on the existing area-population basis, as from the 1st April, 1956.

The surplus from the Transport Regulation Fund which was paid into the Board's fund at the 30th June, 1955, amounted to £337,992, whereas the amount actually received from the ton-mile tax between the 1st April and 30th June, 1956, was £216,000. As payment of this tax in respect of each month's operations is not due until the 14th of the following month, this latter sum represents only two months' collections. The effect of the decision regarding the extra petrol tax is to increase the amount received by the Board by approximately £600,000 per annum.

Although these items represent an overall increase in the funds available to the Board, the total funds at the Board's disposal were still insufficient to cover the cost of urgent and necessary works, and the bulk of these funds is still being expended on the maintenance of existing assets. With costs still rising, it is apparent that, despite the increases, less effective work is actually being carried out than previously. The rapid

growth of road traffic, and heavy road transport in particular, has further aggravated the position, and, until there is a very substantial increase in the funds available to the Board, little progress can be expected with the necessary programme of improvements.

The net amount received by the Board during the financial year from motor registration fees and fines, and half the drivers' licence fees, less cost of collection, refunds, &c., was £5,184,710, an increase of £355,610 over the amount received from the same sources during the financial year 1954–55. The receipts from petrol tax (including the extra 1d. per gallon which operated from the 1st April, 1956) were £4,430,575, an increase of £628,205 over the previous year's receipts.

The increase in the volume and weight of traffic over the State's road system is reflected by the fact that the total number of motor vehicles (i.e., cars, motor cycles, and trucks) rose from 637,662 at the 30th June, 1955, to 686,483 at the 30th June, 1956, an increase of 7·6 per cent.

During the financial year 1955–56, a total sum of £26,411,000 was applied for by municipal councils and the Board's engineers for expenditure on both classified and unclassified roads, but, although the Board realizes that the works applied for were urgent and necessary, it was in a position to allocate only £17,690,000, equivalent to 66·6 per cent. of the total applications. The actual road expenditure for the year, viz., £10,428,539 was considerably higher than has obtained in previous years. This increased expenditure was largely due to a very favourable construction season in the early months of 1956 over the greater portion of the State, resulting in an accelerated rate of expenditure and a total expenditure for the financial year much above the Board's estimate. It is regrettable that this meant the hold up to some extent of claims for reimbursement from municipal councils, and it was necessary before the end of the financial year to seek legislative authority to incur an overdraft of £500,000 to help meet claims on hand. This overdraft was obtained by means of an advance from consolidated revenue, and the Board is obliged to repay it before the 30th September in the ensuing financial year.

As in previous years, it was necessary for the Board to allot a very high proportion of its funds to provide for the maintenance of existing assets, and only a limited programme of improvements could be financed. Where it was not possible to allocate funds for items of reconstruction, &c., it was deemed expedient to make some provision for resheeting on the sections of road concerned in order to hold them until such time as a more permanent type of work could be provided for. Although grants were made available for a number of new bridges, many others needing urgent replacement could not be undertaken through lack of funds.

Commonwealth Aid Road Funds.

Under the *Commonwealth Aid Roads Act* 1954, operative from the 1st July, 1954, providing for the payment into the Commonwealth Aid Roads Trust Account of the proceeds of 7d. per gallon customs duty on motor spirit imported into Australia and a similar amount per gallon excise duty on motor spirit refined in Australia, the proceeds of an additional 1d. per gallon were paid into the account as from the 1st April, 1956.

After the retention by the Commonwealth of £900,000, representing £800,000 for the construction, maintenance, and repair of strategic roads, roads of access to Commonwealth property and other roads serving or likely to serve Commonwealth properties and £100,000 to be expended on the promotion of road safety practices throughout the Commonwealth, the balance is distributed to the States on the basis of three-fifths as to population and two-fifths as to area. Provision is made for the moneys paid to the States to be expended on the construction, reconstruction, maintenance, and repair of roads or on the purchase of roadmaking plant, with the proviso that not less than two-fifths of the amount shall be expended for similar purposes in connexion with rural roads, which do not include highways, trunk roads, and main roads. It is also provided that an amount equivalent to £1,000,000 apportioned each year among the States on the population-area basis may be expended on other works connected with transport by road or water. The total amount payable to the State of Victoria represents approximately £175,700 out of each £1,000,000 distributed to the States.

The total sum received by the Board from the proceeds of petrol tax during the financial year 1955–56 was £4,430,575. Added to the sum available to the Board from motor registration fees and fines, drivers' licence fees, additional transfer fees, municipal repayments, &c., the total of £10,356,990 was £948,658 greater than the receipts from the same sources in the preceding financial year.

The amounts expended on roads and bridges during the year from moneys derived under the provisions of the Commonwealth Aid Roads Acts were as under :—

	£
Construction and maintenance of classified roads	2,499,312
Construction of unclassified roads, including the restoration and rebuilding of bridges	1,429,685
Assistance on construction of Soldier Settlement roads ..	62,980
Repair of flood damage on unclassified roads	17,787
Provision towards maintenance of unclassified roads	420,811
	4,430,575

Loan Moneys.

An amount of £1,094,000 was made available to the Board during 1955–56 from the loan moneys, as compared with £956,000 in the previous financial year. The provision of this loan money enabled the Board to finance a number of urgent and necessary works. On the other hand, the use of these moneys involved an increase of £70,861 in the Board's interest bill, which now stands at £746,873, a very heavy drain on the Board's resources.

Allocations for Works.

The total allocation for road and bridge works from all funds in the financial year 1955–56, not including revotes and amounts already committed in respect of works authorized, was £12,555,521, as compared with £10,165,740 in 1954–55. The allocation of £12,555,521 comprised £6,731,521 from the Country Roads Board Fund, £5,824,000 from the Commonwealth Aid Roads Fund, and £1,094,000 from loan moneys.

When revotes and commitments are taken into account, the comparable figures for the financial years 1954–55 and 1955–56 respectively were £12,483,702 and £17,690,000.

MAIN ROADS.

The total amounts applied for, both by municipal councils for works under municipal supervision and by the Board's engineers for works under the direct supervision of the Board, for the maintenance and improvement of the 9778 miles of main roads in the State was £8,783,355. The total sum allotted was £6,139,818, made up of £4,088,686 from the Country Roads Board Fund and £2,051,132 from Commonwealth Aid Road funds. This sum represented 70 per cent. of the total allocations, as compared with an allocation of 64 per cent. in the preceding financial year.

One hundred and ninety-municipalities shared in the allocation, and the amount allotted for main roads directly supervised by the Board was £376,000, which is included in the total allocation figures mentioned above. As in previous years, the Board in making its allocation provided firstly the amount essential for patrol and general maintenance, bridge maintenance, resheeting, and resealing, this provision leaving a balance for works in the nature of improvements far short of actual requirements. Funds were also made available for an extension of bituminous surfacing work, together with some reconstruction of worn-out sections of pavement and weak bridges. Here again the amount at the Board's disposal was woefully short of that needed, so that maintenance rather than improvement absorbed the greater portion of its funds.

The expenditure for the year on main roads was £3,543,351, equivalent to 57·7 per cent. of the allocations, compared with 66 per cent. in 1954–55, 67 per cent. in 1953–54, and 73 per cent. in 1952–53. Commitments outstanding at the 30th June, 1956, amounted to £1,628,778.

Apportionment of Costs.

It is provided in the Country Roads Act that not more than one-third of the amount expended from the Country Roads Board Fund on the maintenance of main roads during the preceding year shall be apportioned to the municipalities, whose contributions are due and payable on the 1st January in the financial year next following that in which the expenditure was incurred. The Act also provides that the municipal contribution may be reduced below one-third where the cost of maintenance of a road is deemed to be excessive and where such cost is due to motor traffic not of local origin or to timber traffic. In dealing with the apportionment of the cost of works, the Board must take into account the revenue, valuation, and rating of the municipality concerned.

With the great development in motor traffic generally and with increased timber traffic in certain parts of the State, municipal contributions have in many cases been reduced below one-third. This has operated for a number of years, and has been of considerable assistance to the Councils concerned. The Board has further assisted in reducing the contributions by providing portion of the grants from Commonwealth Aid Roads Funds, free from additional contribution by the Councils, these supplementary grants being made mainly in relation to larger items such as reconstruction and bridge projects.

The percentage of contributions by councils to the total expenditure for 1954–55 was 15·61 per cent. as compared with 15·65 per cent. in 1953–54. Details are as follow:—

	£
Expenditure from the Country Roads Board Fund	2,396,132
Expenditure from the Commonwealth Aid Road Funds ..	749,344
	3,145,476
Amount apportioned to Councils (based on expenditure from Country Roads Board Fund only)	£ 490,986
Percentage of amount apportioned to the total expenditure from the Country Roads Board Fund	20·49%
Percentage of apportionment to total expenditure (including Commonwealth Aid Road grants)	15·61%

A commencement was made with the duplication of the Burwood Road in the City of Box Hill, which carries a great volume of traffic to the Dandenong Ranges, by the construction of the earth works on the section from McComas Grove (just east of Elgar Road) to Greenwood Street. This project involved the moving back of one brick and one weather-board residence and the replacement of a narrow bridge between Elgar Road and McComas Road.

The reconstruction of 4·66 miles of Wells Road, between Springvale Road and Frankston, was completed as a first stage of an ultimate four-lane divided roadway which, it is anticipated, will be widely used as an alternative route to the Mornington Peninsula. The pavement consisted of 8-inch consolidated fine crushed rock over a sand subgrade, and was constructed 26-feet wide and sealed 24-feet wide. Two reinforced concrete bridges were constructed on this section to provide suitably for traffic over McColl's Drain and Eel Race Drain. The total expenditure on the work was £104,350, comprising £87,500 for road works and £16,850 for bridges.

STATE HIGHWAYS.

The Board's limited funds, referred to under the section relating to main roads, again permitted only a much restricted allocation for the 3850 miles of State highways throughout the State, and provision for works within the "maintenance" category rather than within the "improvements" category absorbed the greater portion of the available funds, and the experience of the previous year was repeated, viz., the year's work represented for the most part the reconstruction of some of the old assets and the maintenance of others which had already reached the end of their economical life.

Work on the Princes Highway West between Melbourne and Geelong, consisting of road and bridge works at Brooklyn and Kororoit Creek, which had been commenced in the previous financial year was continued, and a contract was let for the duplication of the

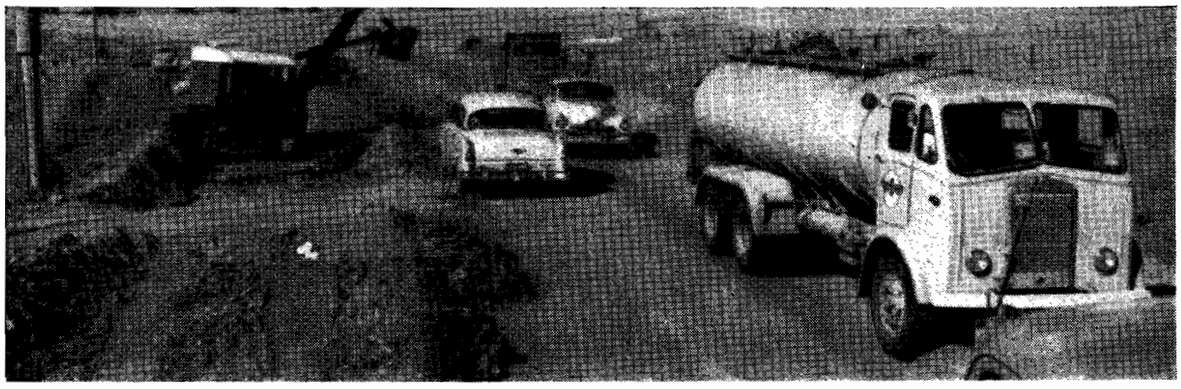


Plate No. 1.—Realignment in progress on curve at 16·1 miles where fatal accidents have occurred.

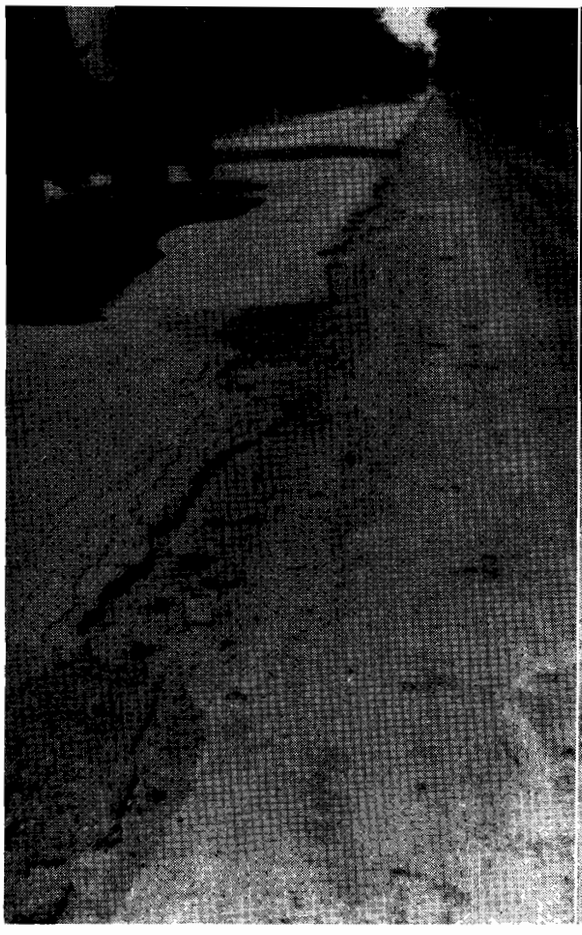


Plate No. 2.—Narrow old worn section near Barnawartha.

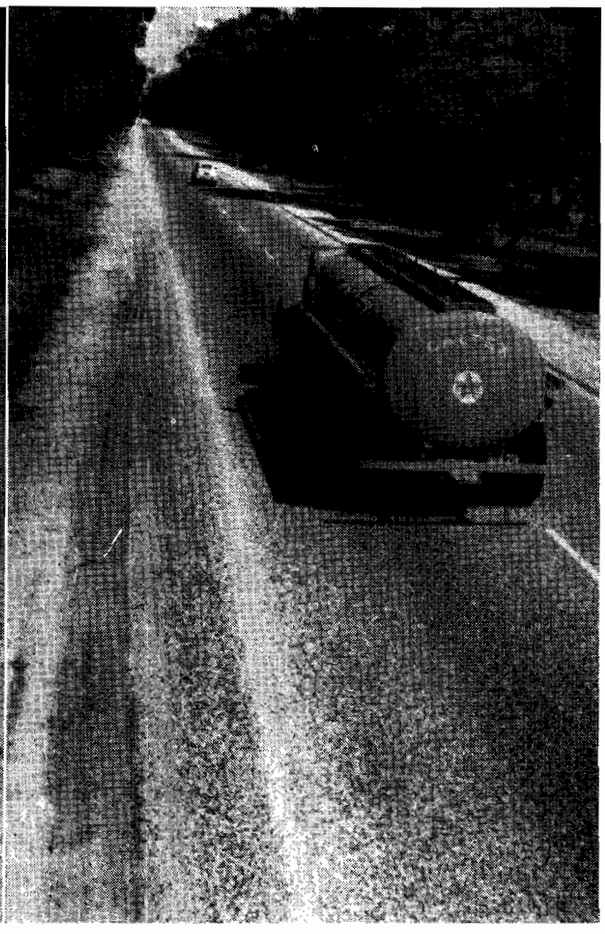


Plate No. 3.—Reconstructed section between Averel and Longwood.

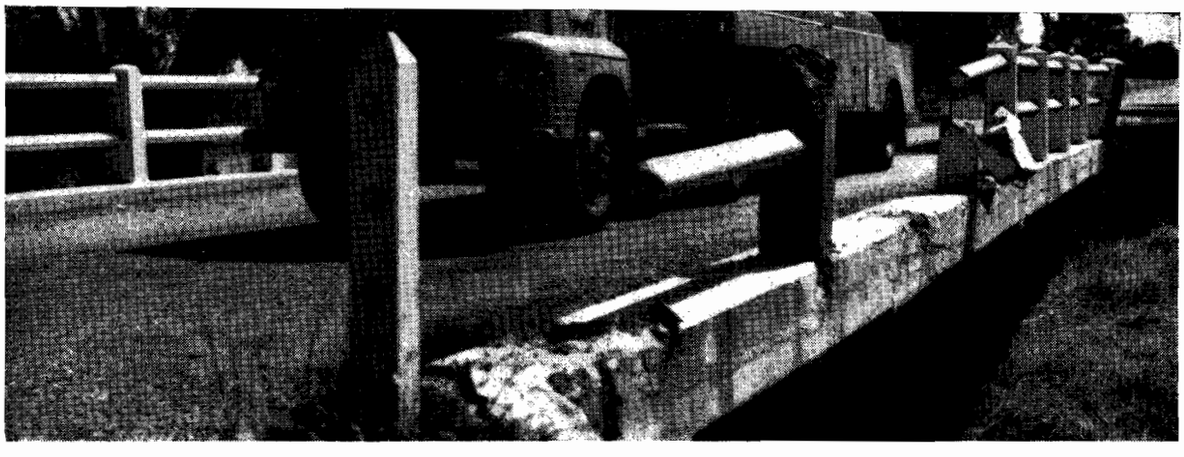


Plate No. 4.—Few handrails have escaped damage from heavy transports.

Plate No. 5.—Reconstruction in progress on Glenelg Highway east of Nintingbool.

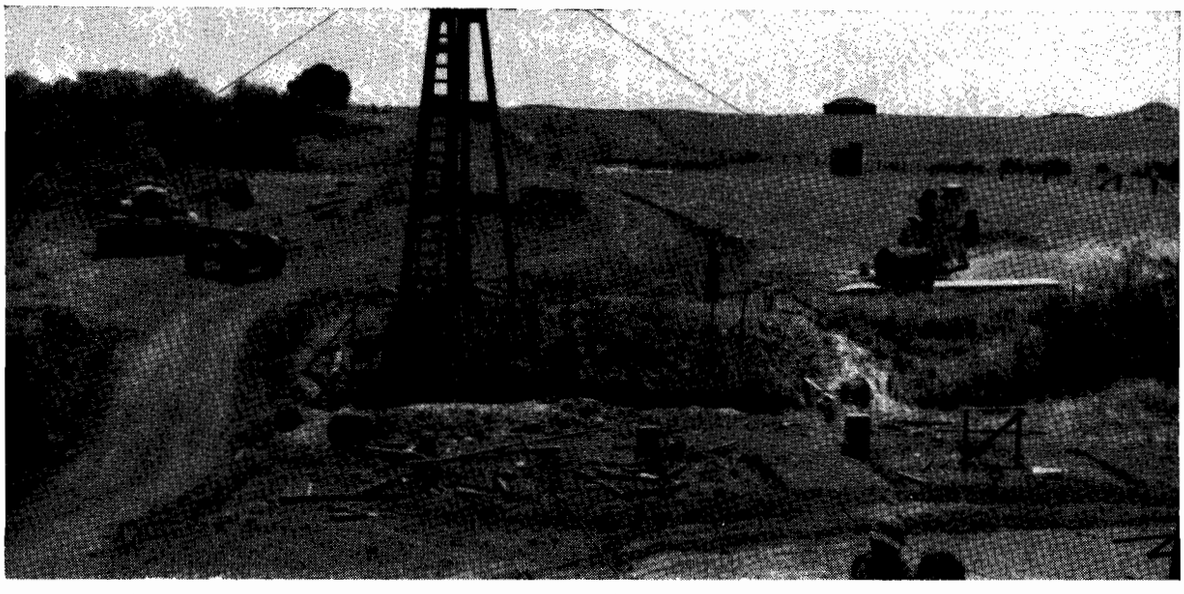


Plate No. 6.—Realignment and reconstruction of North-Western Highway approx. 7 miles north of Ballarat.

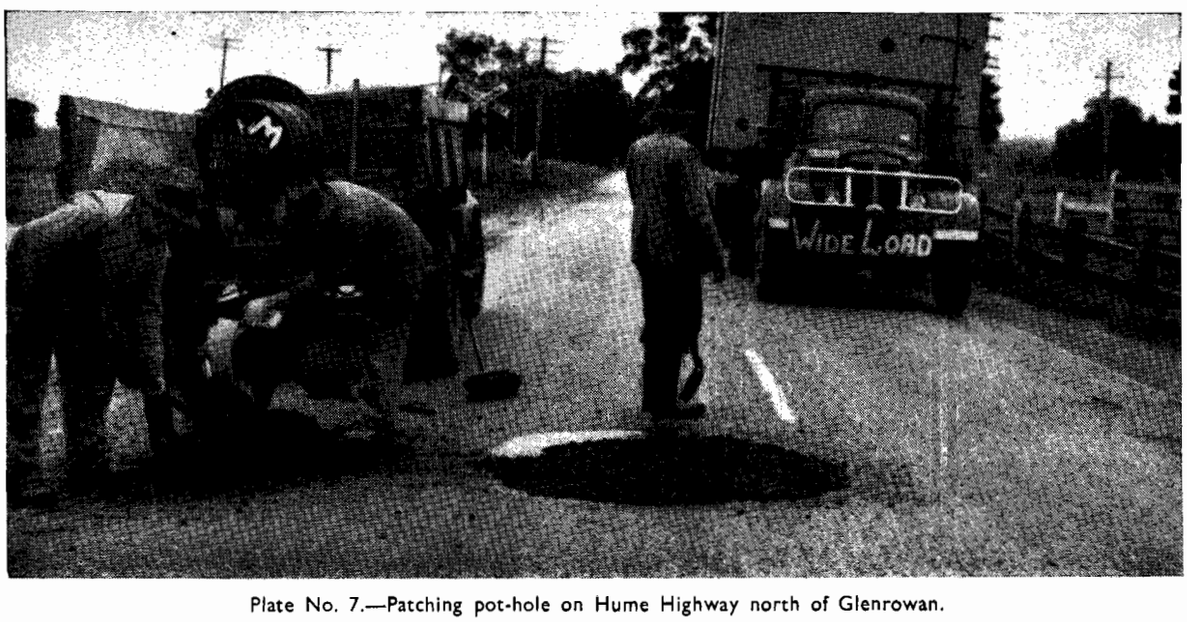


Plate No. 7.—Patching pot-hole on Hume Highway north of Glenrowan.

Plate No. 8.—Reconstructed section of Midland Highway near Swanpool.

Plate No. 9.—Sealing a reconstructed and widened section of Maroondah Highway near Coldstream.

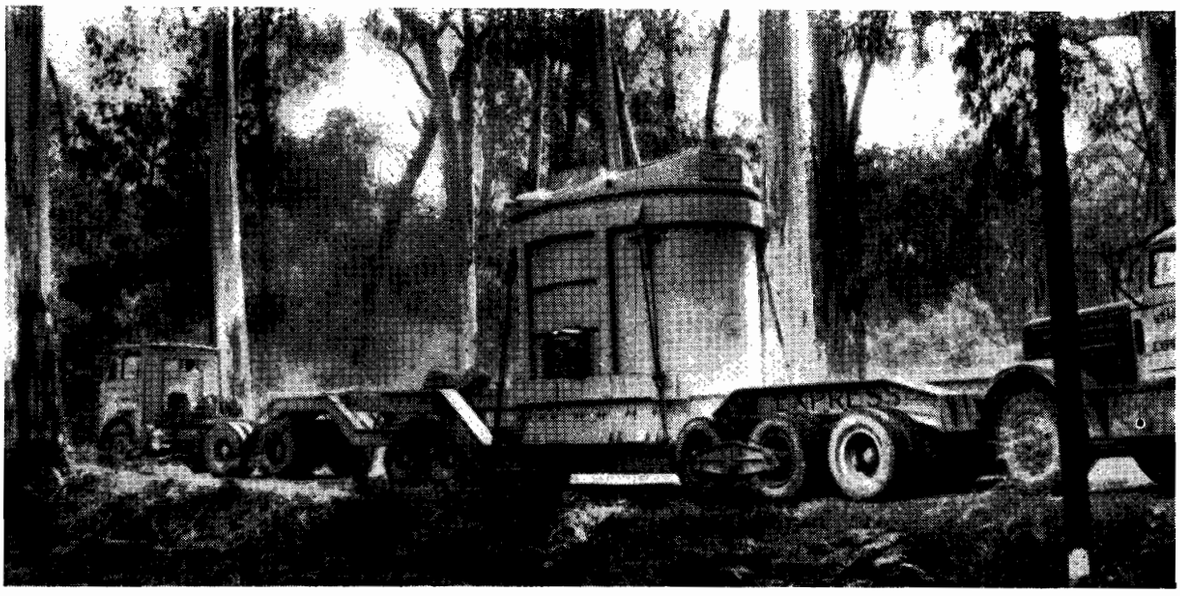


Plate No. 10.—A 40-ton S.E.C. transformer on Maroondah Highway *en route* to Eildon Project.

Plate No. 11.—Resealing in progress on Princes Highway East at Pakenham.

Plate No. 12.—Widening of Princes Highway East between Oakleigh and Dandenong.

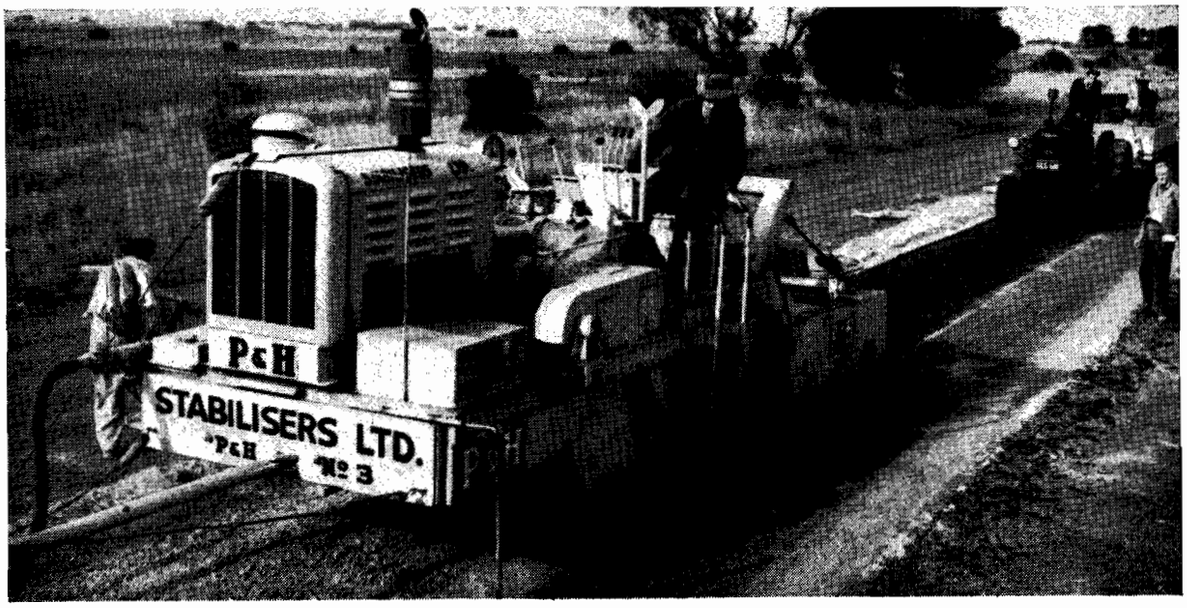


Plate No. 13.—P. and H. stabiliser working on Western Highway at approx. 18 miles.

pavement on the Princes Highway East between Oakleigh and Springvale, and a number of reconstruction projects, many less than a mile long, were completed on sections, including some which had virtually collapsed, whilst some urgent bridge projects were put in hand. However, many sections are rapidly deteriorating under the intense traffic they are called upon to carry. This particularly applies to the Murray Valley, Calder, and Hume Highways, which through extremely heavy traffic and adverse weather conditions, steadily deteriorated during the year.

Practically the whole of the work on State highways is carried out under the direct supervision of the Board, whose Divisional Engineers were asked to submit programmes of work which would be practicable with the funds available. They applied for a total sum of £6,677,403 and were allotted a total sum of £4,180,973, including £762,093 from loan moneys, equivalent to 62·6 per cent. of the total applications. Even these amounts had to be curtailed before the end of the financial year in view of the heavy demands on the Board's funds.

Works on State highways are financed without contribution from municipal councils.

A contract was let for the duplication of the pavement on the Princes Highway, from Ferntree Gully Road to Springvale Road, by the provision of an additional pavement 24-ft. wide, the length involved being 3·82 miles. The pavement depth is specified as 12 inches consolidated over sandy loam and 20 inches over clay subgrade, and comprises quarry waste and sandy loam base and fine crushed rock surface courses with provision for an ultimate 2-inch bituminous macadam final course. The contract, which was for an amount of £100,320, was approximately 50 per cent. completed during the financial year.

On the South Gippsland Highway, a section of 1·22 miles from Bena to Whitelaw was realigned and reconstructed, at a cost of £32,500, a 22-feet wide pavement being provided, with 11–15 inches of consolidated burnt shale and fine crushed rock. A length of 1·92 miles of the Bass Highway east and west of Dalyston was also realigned and reconstructed at a cost of £39,200, a 20-ft. seal being provided over an 11-inch consolidated burnt shale and fine crushed rock pavement. A length of 2·25 miles of the Maroondah Highway east from Coldstream was realigned and reconstructed, providing a 24-ft. seal for a 12-inch–15-inch consolidated gravel pavement, at a cost of £28,300.

One of the major works in hand during the year was the duplication of the Princes Highway West between Melbourne and Geelong. The greater part of the work at Brooklyn and the construction of duplicate bridges at Kororoit Creek, on a section of the Highway extending to the 9-mile post, was well advanced, and surveys were made of further sections totalling approximately 28 miles. Plans for the greater part of this length have also been completed, but tenders have not been invited in view of the large expenditure involved.

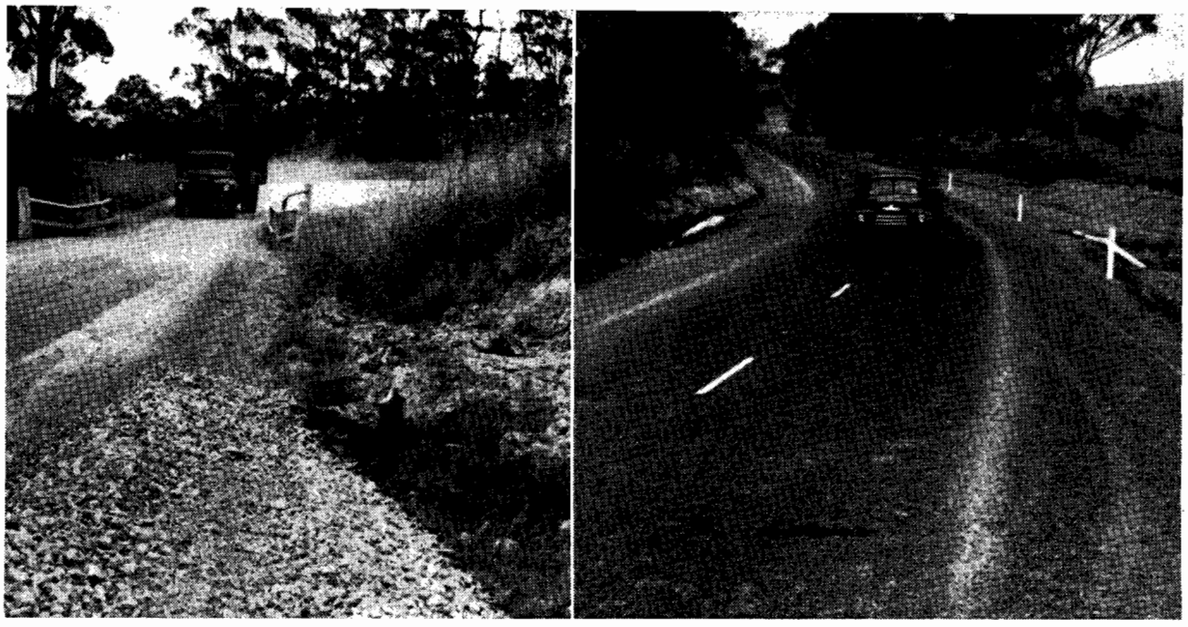
A start was also made with the widening of the concrete road at Norlane in preparation for duplication and provision of a service road.

On the same highway at Waurn Ponds, a new reinforced-concrete bridge was built by contract and new approaches on an improved alignment together with a new intersection with the Anglesea Road were completed by direct labour. This much-needed improvement removed the hazard of two-way highway traffic over the old stone-arch bridge with its badly-aligned approaches. Traffic over the old bridge is now permitted one way only towards Anglesea and Lorne.

On the Western Highway, some further progress was made with the reconstruction and widening of the Pentland Hills section between Bacchus Marsh and Myrniong, including the provision of a third lane for slow traffic on a steep hill.

On the Bellarine Highway, the short badly-aligned section between the Portarlington–Queenscliff Road and Point Lonsdale Road was reconstructed on a improved alignment and widened, and a new intersection with the Point Lonsdale Road was provided to permit a safer turning movement.

SOUTH GIPPSLAND HIGHWAY



Plates No. 14 and 15.—"Before and after" photos. of a realigned and reconstructed section of the South Gippsland Highway at 61 miles.

Plate No. 16.—Rough narrow twisting section of South Gippsland Highway between 67·9 and 69 miles which has been reconstructed.

Plate No. 17.—The same section after reconstruction.

STATE HIGHWAY RECONSTRUCTION

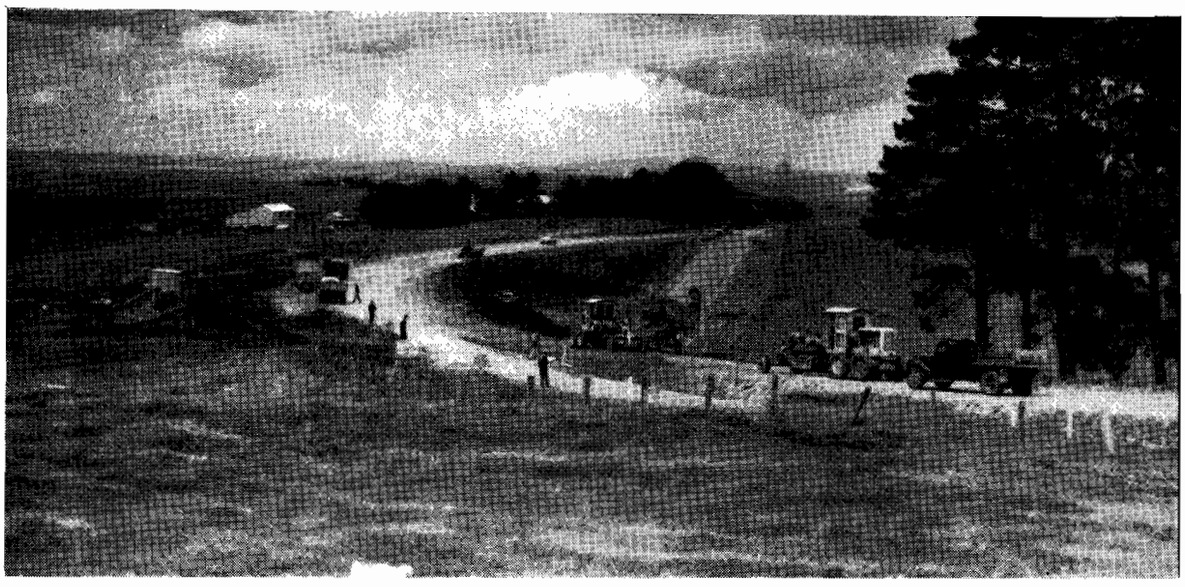


Plate No. 18.—Elimination of bad curve on Western Highway 1 mile east of Myrniong. New curve is seen on left.

Plate No. 19.—Section of Princes Highway West 3 miles west of Colac before widening and resheeting.

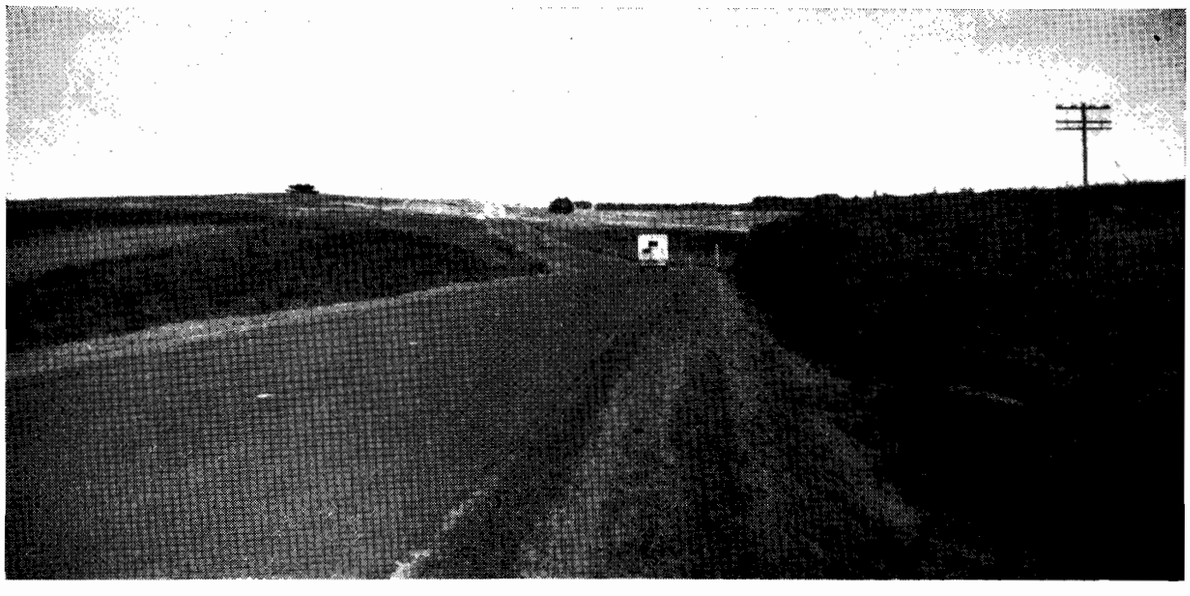


Plate No. 20.—Same section after widening, resheeting, and sealing.

12934/56.—2

TOURISTS' ROADS.

For the 416 miles of proclaimed tourists' roads in the State, a total sum of £373,400 was allotted, considerably less than the amounts applied for. The greater portion of this sum was provided for general maintenance, expenditure on improvements being very limited. The total expenditure was £342,839 of which £332,908 was expended under the Board's direct supervision. Municipal councils are not required to contribute towards the cost of work on this class of road.

FOREST ROADS.

A total sum of £178,656 was made available for expenditure on the 377 miles of proclaimed forest roads for the financial year 1955–56, covering mainly patrol maintenance and maintenance resheeting, and the total amount expended was £144,684. No contribution is required from municipal councils towards the cost of works on forest roads.

UNCLASSIFIED ROADS.

On unclassified roads, of which there are approximately 75,000 miles throughout the State, the Board made provision for a limited programme of works on two main types, viz., the construction and reconstruction of roads (including bridges) serving settlements, and the maintenance of unclassified roads generally.

For the construction group, applications amounting to £6,010,000 were received by the Board and a total sum of £4,102,198 allotted, with contributions from Councils varying according to the circumstances of the particular case. For general maintenance, £1,069,000 was applied for and £765,000 allotted, generally on the basis of £2 Board to £1 Council, as previously. In making grants for maintenance of these roads, the Board does not accept responsibility for entire maintenance of the road, but rather makes a contribution towards the cost of maintenance, with the stipulation that the Councils contribute at least £1 towards each £2 provided by the Board. These grants have proved to be of great assistance to the Councils over the years, and although in some cases the amounts allotted are comparatively small, they enable much useful work to be undertaken.

Numerous requests were made during the year by Councils for the declaration of certain unclassified roads as main roads, but the Board was unable to shoulder the additional financial burden which such action would have involved. The Board has endeavoured, however, to assist the Council with the maintenance of the roads as far as funds would permit.

The total expenditure on unclassified roads during the financial year amounted to £1,474,528 for construction and reconstruction works, and £420,811 for maintenance.

BRIDGES.

The work carried out on the construction and maintenance of bridges during the financial year was still far short of requirements, and the position has been aggravated by the difficulty in recruiting and retaining young engineers and officers in the Board's bridge division. In 1954–55, twenty qualified officers of the division resigned and only seventeen new appointments were made, whilst, during 1955–56, the corresponding figures were eleven and five. It is becoming increasingly difficult to compete with private and other enterprises in the recruiting of staff.

In the field where experienced contractors (especially those equipped for smaller works) are few in number, the Board had built up a number of competent bridge gangs, which has permitted the construction of numerous projects by direct labour, including several projects for which funds had been allotted by the Board to municipal councils. In these latter cases, satisfactory tenders were not forthcoming, and the Councils concerned were not sufficiently well equipped to undertake the work themselves. There was, however, fair competition for larger bridge works advertised by tender, although prices were, in general, somewhat high as compared with estimates.

There was considerable damage by floods throughout the year to bridges in various parts of the State, and this has added greatly to construction and maintenance costs. The Board was again compelled to fix gross load limits on a number of structures in order to permit of their use by the general public on a restricted loading basis.

TOURISTS' ROADS

Plate No. 21.—Skiers' cars parked in parking bay on Mt. Buller Road.

Plate No. 22.—Realigned and reconstructed section of Grampians Road approx. 6 miles west of Hall's Gap.

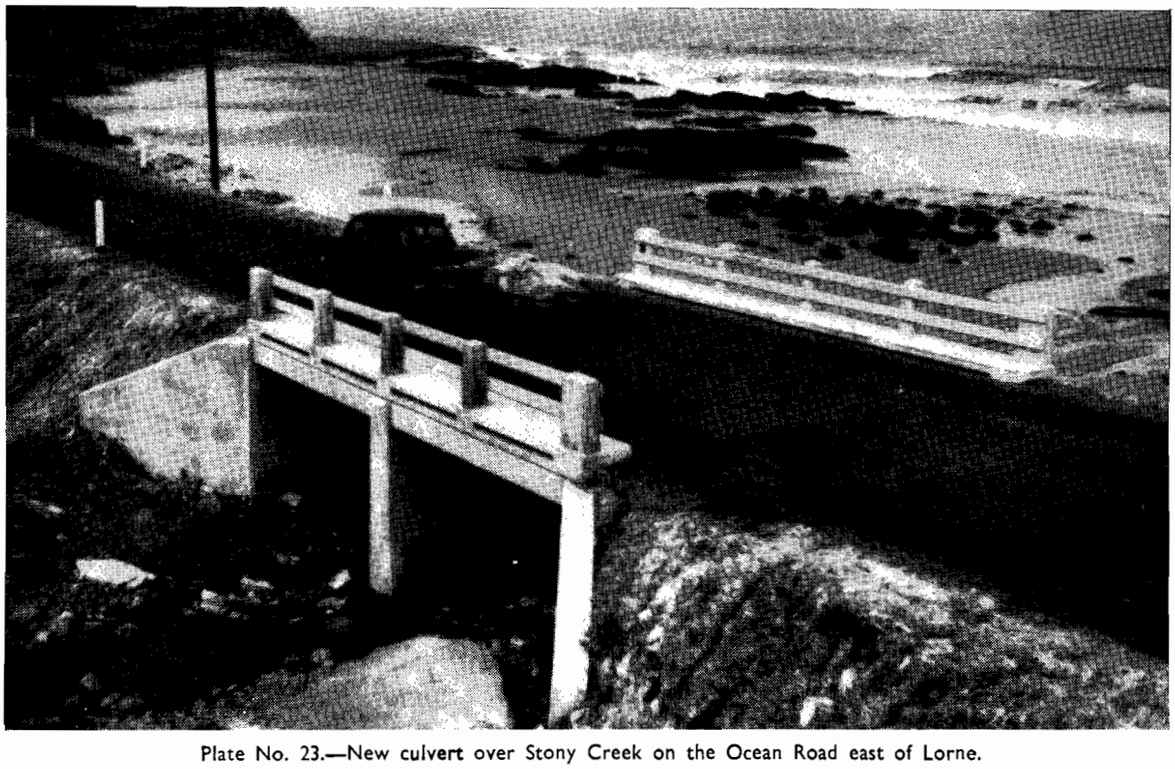
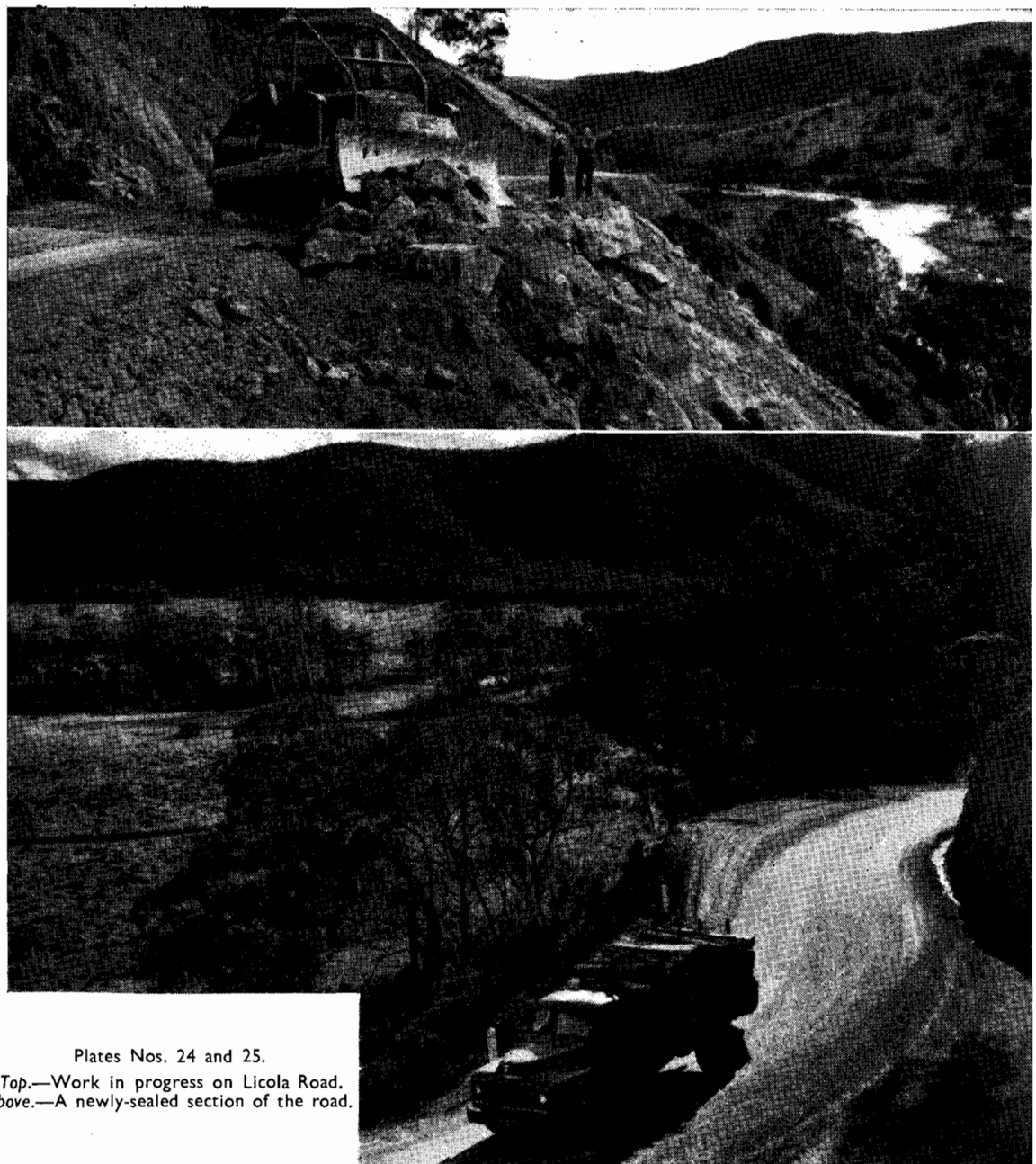


Plate No. 23.—New culvert over Stony Creek on the Ocean Road east of Lorne.

FOREST ROADS



Plates Nos. 24 and 25.
Top.—Work in progress on Licola Road.
Above.—A newly-sealed section of the road.

Plate No. 26.—Realignment and reconstruction in progress on the Walhalla Road between Gooding and Gould.

BRIDGES

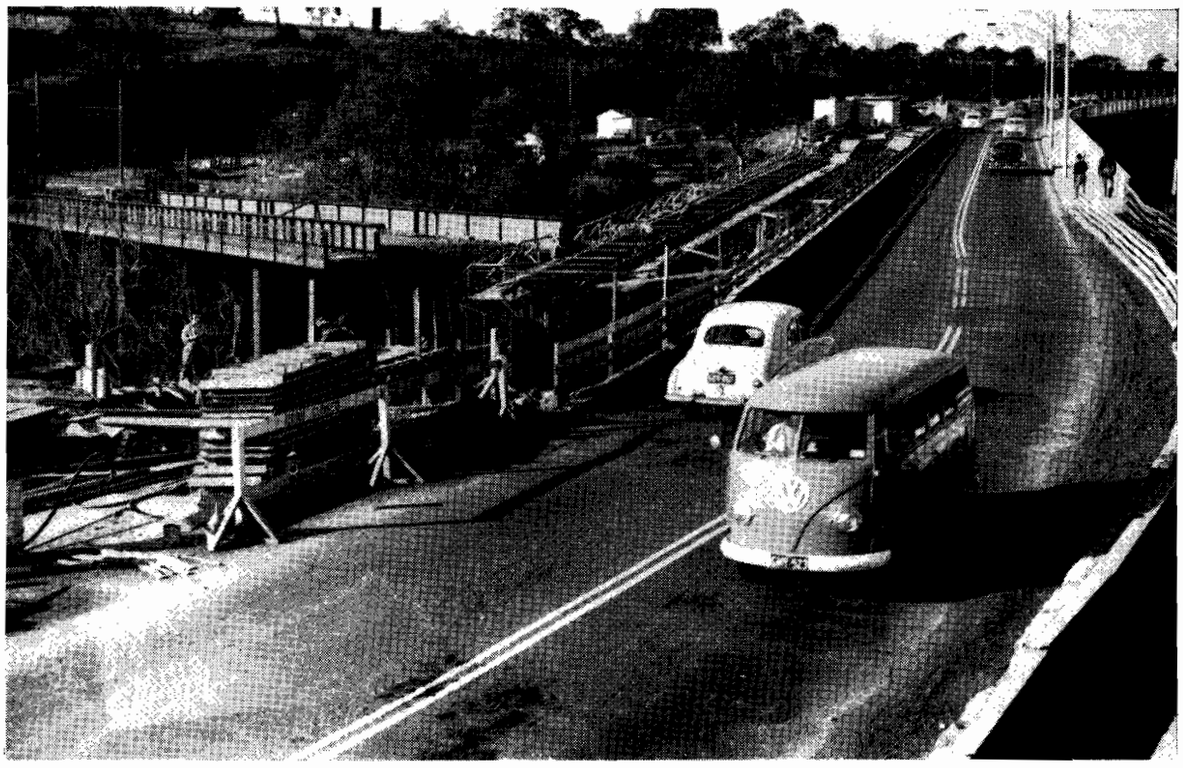


Plate No. 27.—Traffic using half width of new bridge over Yarra River at Johnston Street, Cities of Collingwood and Kew.

Plate No. 28.—One of the new concrete bridges under construction on Midland Highway west of Shepparton, replacing old narrow wooden bridges.

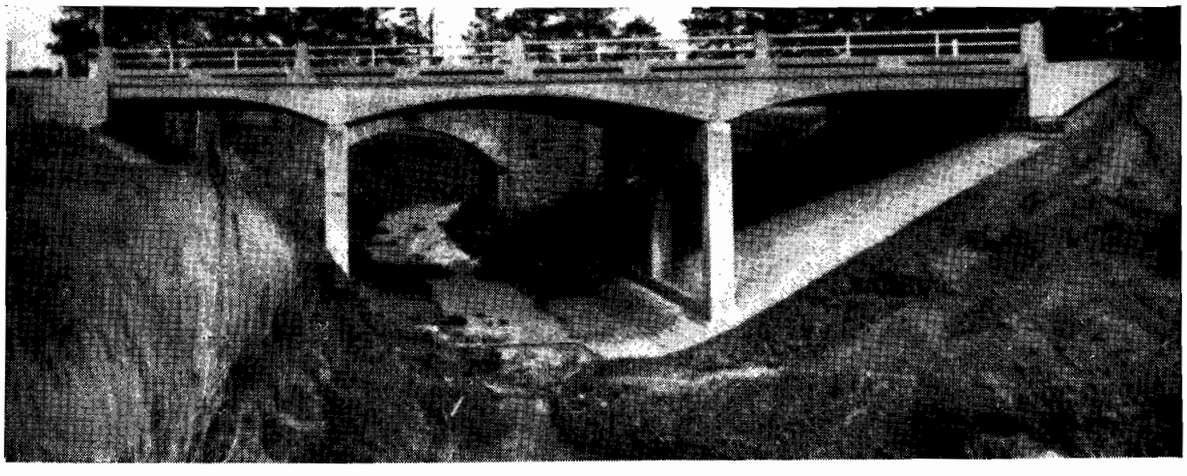


Plate No. 29.—New concrete bridge over Waurn Ponds on Princes Highway West.

During the year, a commencement was made with the construction of 221 bridges of a total value of £1,363,500. This brings the total number of bridges either erected or in course of erection with funds provided by the Board since its inception to 4,517. Of the new bridges, 174 of a total value of £506,500 were under municipal supervision and the remaining 47, of a total value of £857,000, were under the direct supervision of the Board.

Metropolitan Bridges.

Bridge over the Yarra River at King Street, Melbourne.

Under instructions from the Government, the Board has prepared specifications, with a view to the invitation of world-wide tenders, for the design and construction of a bridge 410-ft. long and 149-ft. wide with a continued elevated structure 1,880-ft. long and 63-ft. wide, over the Yarra River at King Street, together with an overpass in Flinders Street 600-ft. long and 58-ft. between kerbs. The whole project is estimated to cost £3,500,000.

Bridge over the Moonee Ponds Creek at Moreland Road, Cities of Brunswick, Coburg, and Essendon.

Progress with the contract for this bridge has been slow, but it is anticipated that the bridge will be fully open to traffic by the end of 1956.

Bridge over the Merri Creek at Arthurton Road, Cities of Brunswick and Northcote.

Progress with the contract for this bridge has been slow, but it is anticipated that all work will be completed by September, 1956.

Bridge over the Yarra River on the Chandler Highway, Cities of Heidelberg and Kew.

The remainder of the work of renewing the deck of this bridge and strengthening the old trusses was completed, and the full width of the roadway opened for traffic. Plate No. 46 shows the reconstructed bridge. Some contract painting of the old ironwork remained to be completed at the end of the period of this Report.

Bridge over the Yarra River at Johnston Street, Cities of Collingwood and Kew.

Good progress was made on the superstructure during the year, and half the roadway width on the new bridge was made available for traffic in February, 1956. Plate No. 27 shows the plan of the half road width of the new bridge.

Bridge over the Moonee Ponds Creek in Dean Street, Cities of Brunswick and Essendon.

A contract was let in August, 1955, for the construction of a new bridge to link Dean Street, Essendon, with Dawson Street, Brunswick, and reasonable progress has been made.

Bridge over the Maribyrnong River at Napier Street, Cities of Footscray and Melbourne.

Plans were completed during the year for a new bridge to replace the old swing bridge at this site, which, due to deterioration of a number of members, has been half-closed to traffic. Traffic proceeding towards Melbourne now uses a temporary timber bridge which was recently constructed by the Board as a first step in the reconstruction scheme. The new bridge is planned to provide overpasses over a railway goods line along the west bank of the river as well as roads on either bank. Tenders have been invited for the new structure, the construction of which has been authorized by a special Act of Parliament, (Act No. 5822 of 1954), in which provision is made for contributions by the Government and various authorities (excluding the Board) with the Board named as the constructing authority.

Country Bridges.

The following important bridges in country areas were either commenced or in hand during the financial year :—

Bridge over the Mitchell River on the Princes Highway East at Bairnsdale, 585 feet in length, was continued by direct labour under the Board's own supervision.

Plate No. 30.—New bridge over Goulburn River on the Upper Goulburn Road east of Alexandra.

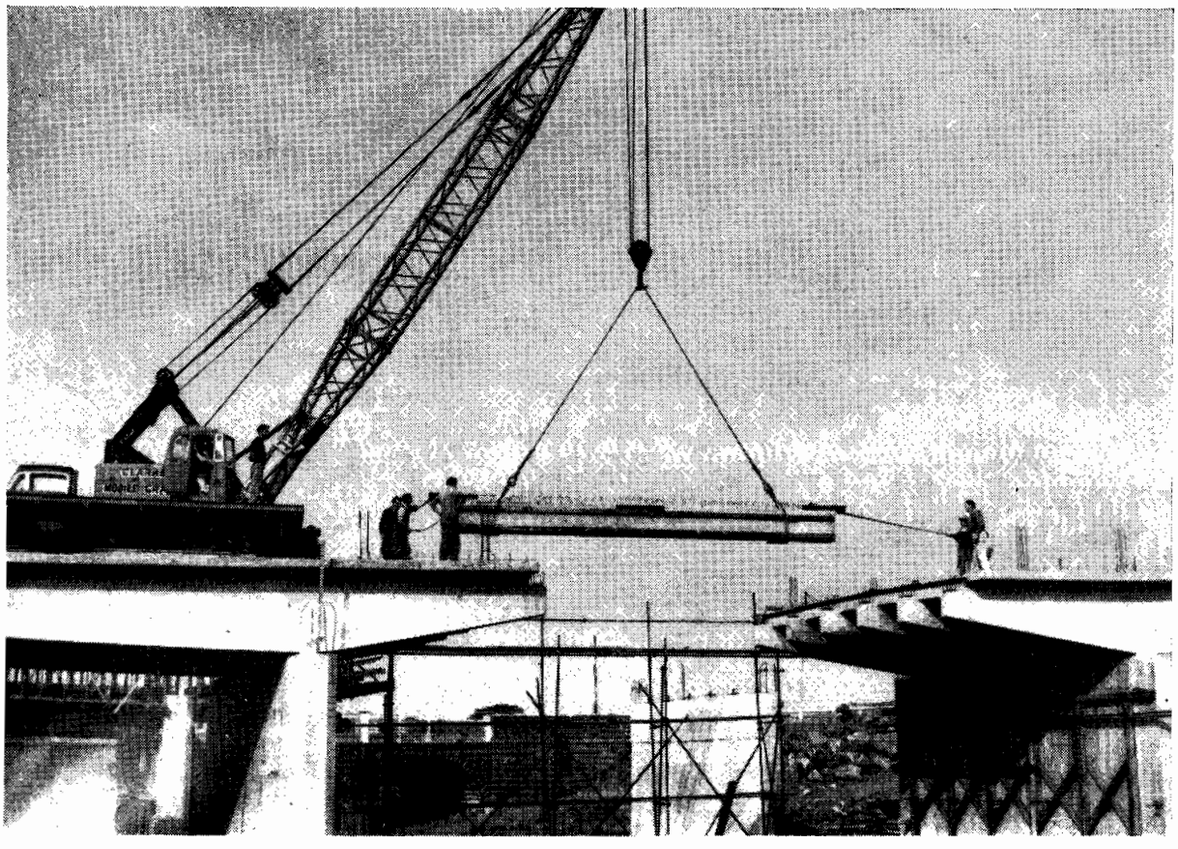


Plate No. 31.—Two new bridges over Kororoit Creek on the Princes Highway West, being portion of dual lane highway under construction. Illustration shows the western lane bridge, the first precast beam to complete the final span.

Contracts were let for the construction of two reinforced-concrete bridges totalling 877 feet in length on the Midland Highway over flood channels of the Goulburn River between Shepparton and Mooroopna. The bridge over the River Yarra on the Warrandyte–Kangaroo Ground Road at Warrandyte was completed and opened to traffic in December, 1955. A contract was let for the construction of the superstructure of the two bridges over the Kororoit Creek on the Princes Highway East at Brooklyn, made necessary by the duplication of this section of the highway. (Plate No. 31.)

On the morning of the 27th January, 1956, the piers of the Wy Yung bridge on the Bairnsdale–Bullumwaal Road in the Shire of Bairnsdale collapsed, and 110 feet of the deck fell into the Mitchell River. The collapse was due to the presence of teredo in the piles below water level.

Immediate steps were taken by the Board to deal with the matter by the erection of a Bailey bridge with a span of 130 feet, and this was completed by the 5th March. Two new piers had first of all to be constructed, and piles more than 70-ft. long at one end and 50-ft. long at the other were driven. The total cost of the work was £3,500.

Arrangements have been made for a full feature survey of the existing site with a view to preparation of plans for a new permanent structure.

FLOOD DAMAGE.

The particularly wet conditions which prevailed in many parts of the State during the year caused considerable damage to roads and bridges. The damage was particularly severe in the Benalla Division, where the Murray Valley Highway at Tallangatta was flooded on numerous occasions over a length of three-quarters of a mile, causing continual replacement of pavement gravel. On the Hume Highway, floods immediately north of Wangaratta caused considerable damage to the pavement and blocked traffic, while an adjacent section of the Ovens Highway was covered with flood waters for months. The damage consisted of scouring of the pavement and shoulders, and deep-seated foundation failure. Long sections of the Goulburn Valley Highway between Tallygaroopna and Numurkah also failed and required reconstruction.

In addition to the State Highways mentioned, extensive damage was caused to roads and bridges in the Shires of Benalla, Bright, Mansfield, Oxley, Shepparton, Towong, Upper Murray, and Yackandandah.

Late in August, 1955, works which were being carried out by the Board on behalf of the State Rivers and Water Supply Commission, in connexion with the Big Eildon project were seriously affected by floods. Due to heavy rain in the catchment areas of the new Eildon Weir and the restricted outlet of water from the Weir at that time, the water level rose rapidly, threatening to cut the Maroondah Highway and the Dry Creek Road at Bonnie Doon, and the Mansfield–Woods Point Road at Howqua. In addition, flood debris collected against the old Howqua River bridge and smashed temporary props under the old timber trusses.

Bailey bridging was sent to the Dry Creek Bridge, as the work being carried out by contract on a new bridge at this site was in its very early stages, only the centre pier being constructed. An 80-ft. " double single " Bailey bridge with two 10-feet approach ramps was erected on a side track upstream of the new bridge centre line, 33 men being employed on the job, which was completed, except for the approaches, in one day.

At the Howqua River on the Mansfield–Woods Point Road, the Shire Engineer closed the old timber truss bridge, and a 48-ft. C.B.G. bridge was erected to bridge the gap from the road filling to the Mansfield abutment, whilst a 50-ft. broad-flange beam and timber bridge was erected over span No. 3 which had been cast a few days earlier.

Rainfall during the year throughout the Bendigo Division was much above the average, and resulted in widespread flooding, particularly in the months of August, 1955, and May and June, 1956.

On the Calder Highway, traffic was held up on many occasions by water in the floodways between Bendigo and Wycheproof, and, on the 17th May, the flood water from the Avoca River covered the pavement in Charlton township. At mileage 173·2,

COLLAPSE OF WY YUNG BRIDGE

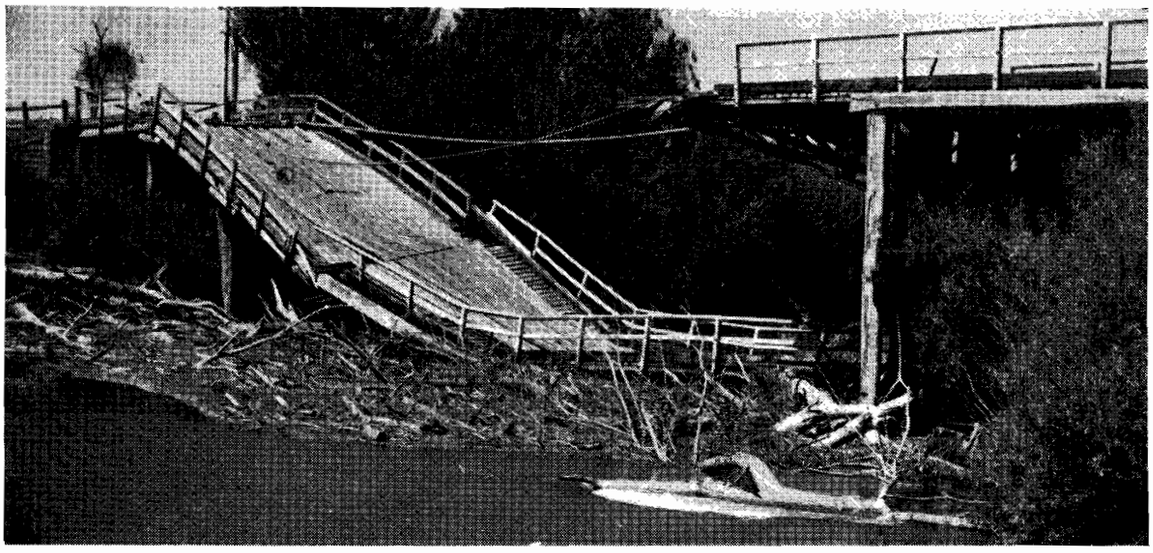
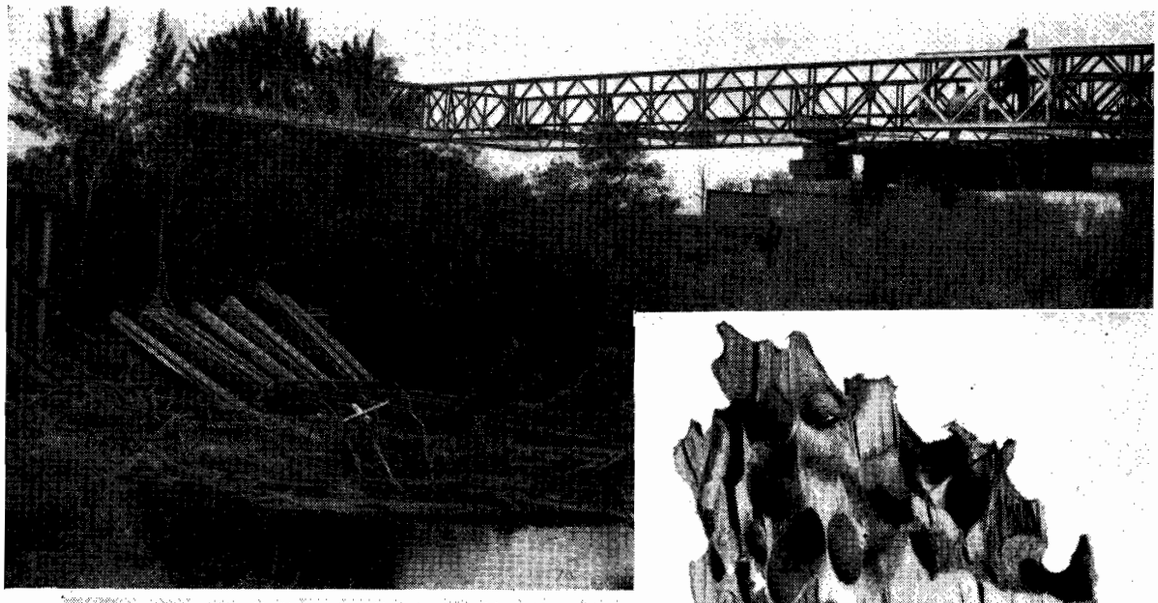
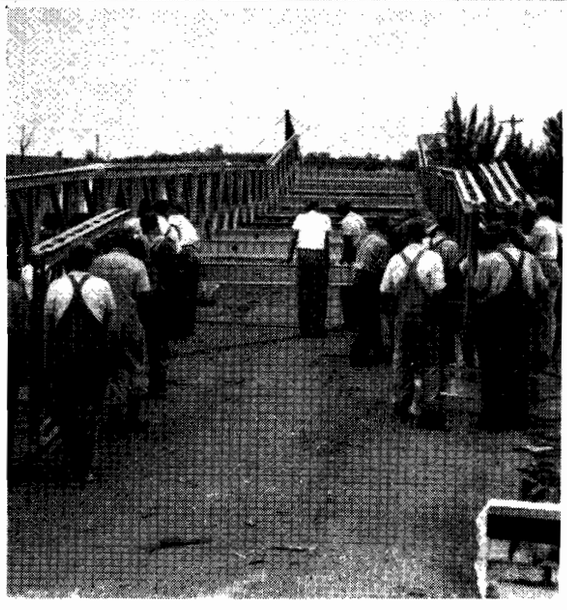


Plate No. 32.—Bridge over Mitchell River at Wy Yung on the Bairnsdale-Bullumwall Road which collapsed on 27th January, 1956, owing to the presence of teredo in the piles.





Plates Nos. 33 and 34.—A "Bailey" bridge was placed across the gap of 130 feet.

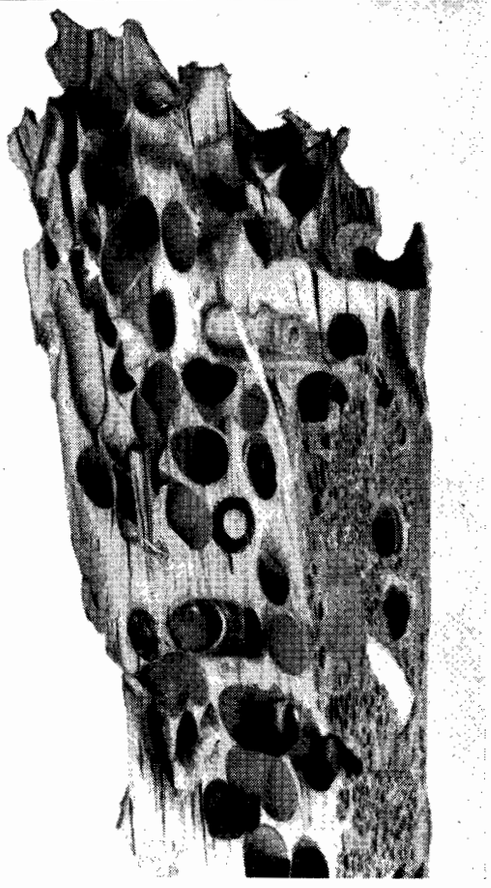


Plate No. 35.—A section of one of the piles riddled with teredo.

FLOOD DAMAGE—MURRAY VALLEY HIGHWAY

Plate No. 36.—A detour behind a levee bank at 36 miles, looking towards Swan Hill.

Plate No. 37.—Levee banks holding back flood water from the Murray River at 33 miles.

Plate No. 38.—Levee banks at Kerang.

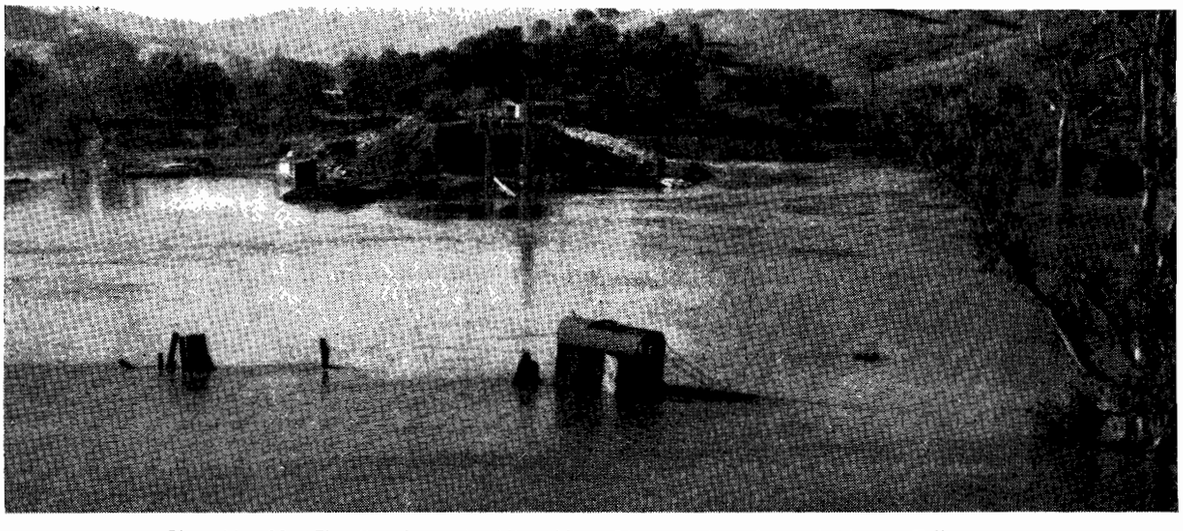


Plate No. 39.—Flooding from the Mitta Mitta River at site of new bridge at Tallangatta.

FLOOD DAMAGE ON STATE HIGHWAYS

Plate No. 40.—The failed seal on the Loddon Valley Highway at 71 miles after flooding.

Plate No. 41.—Section of Midland Highway east of Corop which failed after flooding.

Plate No. 42.—Typical failures on the Hume Highway north of Wangaratta after flooding from the Ovens River.

FLOOD DAMAGE—CALDER HIGHWAY

Plate No. 43.—A heavy transport being assisted by a bulldozer on a detour at Culgoa.

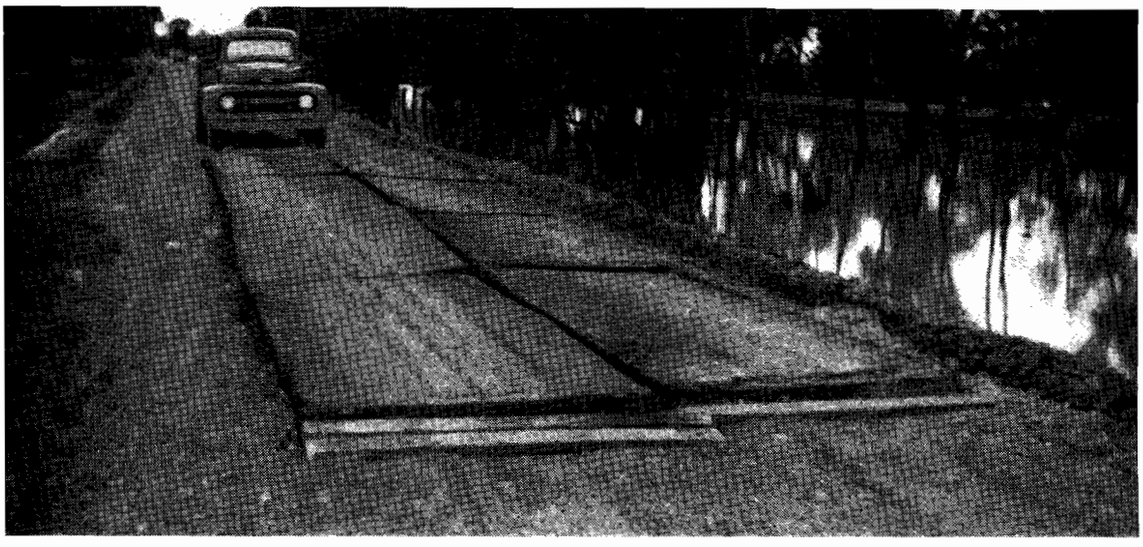


Plate No. 44.—Timber mats used to reinforce a section of failed pavement at Culgoa.

Plate No. 45.—A flooded section north of Charlton.

WORK ON SPECIAL PROJECTS

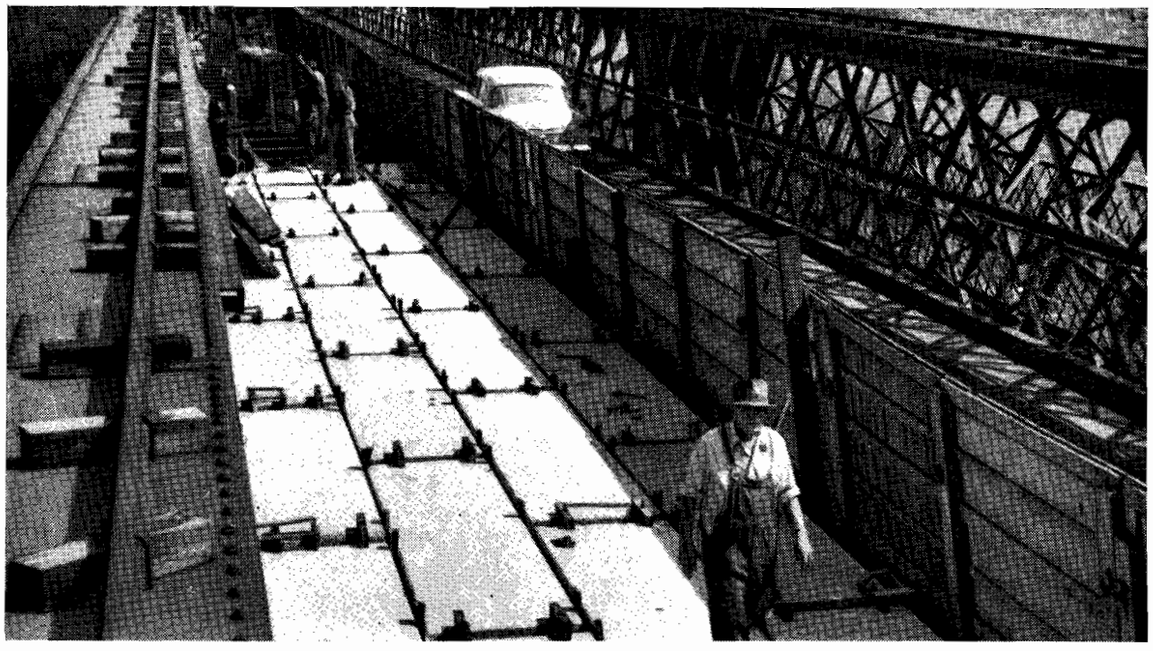


Plate No. 46.—Redecking in progress on the Chandler Highway bridge over the River Yarra, Cities of Heidelberg and Kew.

Plates Nos. 47 and 48.—The Big Desert Road north of Kaniva. The natural scrub (*left*) has been replaced by knee-deep clover (*right*).

Plate No. 49.—Work in progress on bridge over the Wallagaraugh River in East Gippsland.

between Charlton and Wycheproof, the highway became impassable, and all traffic had to be detoured via the Borung Highway and the St. Arnaud–Wycheproof Road. Apart from the actual flooding, the prolonged wet conditions resulted in the serious deterioration of many miles of this highway, particularly between Inglewood and Charlton, and between Wycheproof and Nandaly.

Following the flooding in May, 1956, of an outlet branch of the Avoca River known as Tyrell Creek, a length of the highway north of Culgoa, alongside an old billabong known as " Frog Hollow " was inundated and subsequently completely failed, a heavily-laden semi-trailer becoming bogged in the centre of the pavement.

Arrangements were immediately made by the Board for repairing this flooded section of the highway by raising, draining, and sheeting it. No sooner had a commencement been made to instal a culvert and build up the road over it when a second flood came down the Tyrrell Creek, inundating the whole work and necessitating the detouring of traffic for about a mile around Shire roads to the west while efforts were being made to restore the highway for traffic. The position was further aggravated when further heavy rain turned the unsurfaced portions of the detour into a quagmire, notwithstanding the efforts made to improve them. The traffic using the detour was assisted as far as possible by the employees of the Board with power graders and tractors, involving almost as much effort as in the reconstruction itself.

As special measures were necessary to restore the traffic to the main route, the Board's engineers despatched to Culgoa a number of timber sections in the nature of timber " mattresses " which had just been released from temporary bridge works near Melbourne. These were delivered to the job by road and placed immediately on the weak section of the highway to complete a length of about 200 feet of timbered causeway. In other words, portion of one of the most important interstate highways is now " back to corduroy ". However, the measures taken greatly minimized delay and inconvenience to traffic.

The Campaspe River flooded a section of 1½ miles of the Northern Highway north of Rochester nine times during the year, forcing traffic to use a detour of some 25 miles through Bamawm. The shouldering on this section was washed out to a depth of 6 inches over most of this length, and was restored with crushed sandstone from the Board's crushing plant at Corop.

The Murray Valley Highway suffered very badly from the flooding of the Murray and Avoca Rivers. The Avoca River flood reached the highway at Mystic Park early in June, and an additional waterway had to be provided through the formation by the construction of a temporary timber bridge. The section between Boundary Bend and Lake Powell was flooded by the River Murray, and was closed to all traffic between the 9th September and the 10th October, 1955, and again from the 15th June, 1956. Indications are that it will be closed until late in 1956. Local traffic was able to detour over local roads, but through traffic was forced to make a long detour, extending from Piangil through Manangatang to Robinvale or Ouyen.

The Wallanjoe Swamp section of the Midland Highway, between Corop and Stanhope, was flooded in July, 1955, and again in June, 1956, and on each occasion the sealed floodways broke up badly and had to be filled with heavy sandstone. Rain during February, 1956, caused general flooding between Corop and Mooroopna, water covering the pavement in nine places to a maximum depth of 17 inches and resulting in extensive damage to the pavement.

Following heavy rains in July, August, and October, 1955, floods which occurred in many parts of the Division caused serious damage to main and unclassified roads, particularly in the Shires of Charlton, Cohuna, Deakin, Kerang, Korong, Maldon, and Rochester. Further heavy rains in May and June, 1956, maintained the high level in many streams, especially the Campaspe, Loddon, and Avoca Rivers, and many roads over a wide area were flooded as the financial year concluded.

WORKS FOR OTHER AUTHORITIES.

Extensive use was again made of the Board's organization by Commonwealth and State authorities during the year for carrying out certain special projects at their cost. The total expenditure involved (£817,727) was less than the previous year's total of

WORK FOR OTHER AUTHORITIES

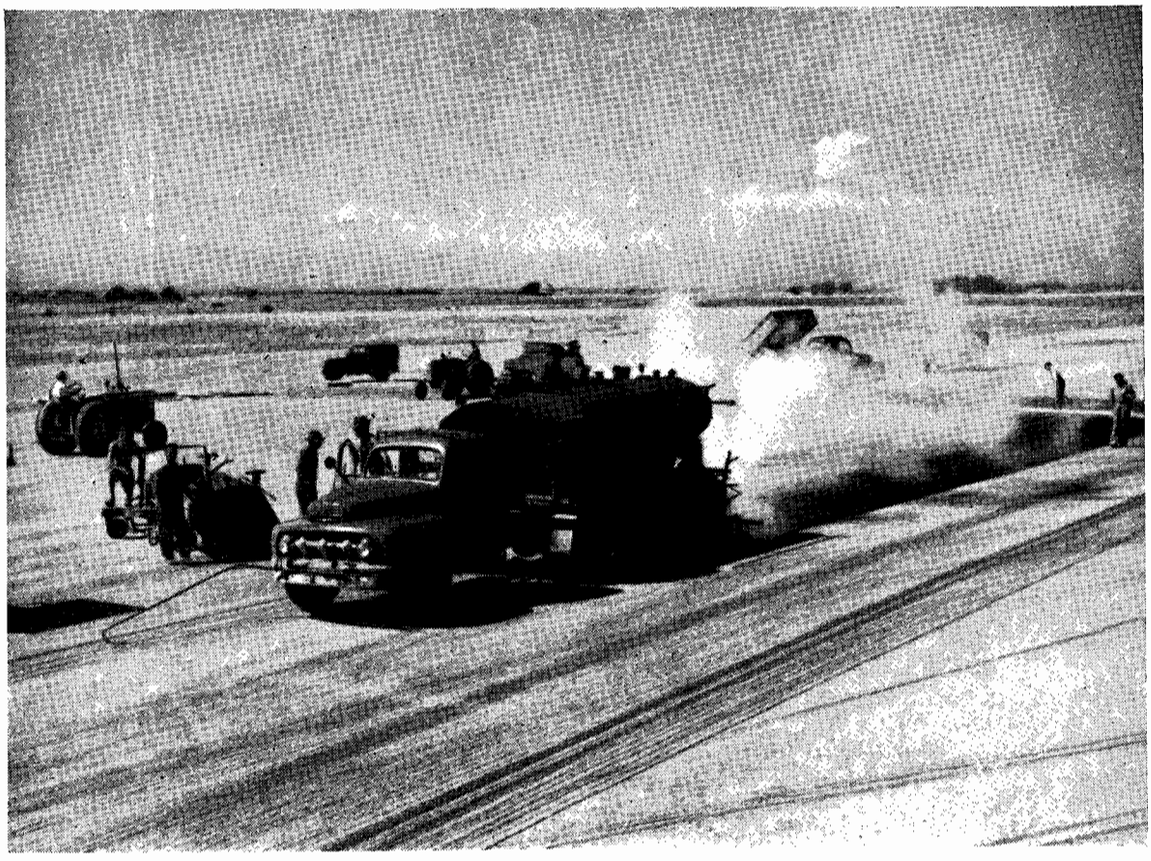


Plate No. 50.—Resealing end of main runway, R.A.A.F. Aerodrome, Sale.

Plate No. 51.—Snow clearance at the parking area at Dingo Dell, Mt. Buffalo.

£925,649, but it nevertheless represents a very considerable effort in manpower and plant on the part of the Board. The greater portion of the expenditure was incurred on State projects, only £44,479 being expended on behalf of the Commonwealth.

The works undertaken are summarized hereunder :—

Department or Authority.	Description of Works.	Expenditure Chargeable to Authority.
		£
Department of Public Works	Reconstruction of the Chandler bridge over the River Yarra at Fairfield Big Desert Road at Kaniva Grounds and playing areas at various State Schools	52,583
Forests Commission of Victoria	Road works in the Shires of Maffra (Licola Road) and Orbost (Wallagaraugh Bridge)	2,547
Gas and Fuel Corporation	Road works in Morwell area	6,715
Housing Commission, Victoria	Road works in connexion with the Ballarat, Moe, Morwell, and Norlane Housing Estates	28,119
Latrobe Valley Development Advisory Committee	Works on Tanjil East and Moe–Yallourn Roads ..	8,806
Melbourne and Metropolitan Board of Works	Road works necessitated by the construction of the Upper Yarra Dam Resealing the Black's Spur section of the Maroondah Highway	2,959
Melbourne and Metropolitan Tramways Board	Installation for tramway purposes on new bridge over the Merri Creek in Bell Street, Coburg	4,955
Soldier Settlement Commission	Road works to serve Soldier Settlement Estates throughout Victoria	60,496
State Electricity Commission	Road and bridge works at Kiewa Valley, Morwell, &c.	52,136
State Rivers and Water Supply Commission and Murray River Commission	Road and bridge works associated with Eildon and Hume Weir projects, &c.	538,804
Victorian Inland Meat Authority ..	Road works at Ballarat	1,566
Victorian Railways Department ..	Road works at Mt. Buffalo and Morwell ..	13,796
Commonwealth Department of Works ..	Construction and sealing works on aerodromes, repeater stations, and depots	44,479

SOLDIER SETTLEMENT ESTATE ROADS.

An amount of £141,028 was expended during the year in connexion with the construction of roads to serve estates purchased by the Soldier Settlement Commission, this expenditure being distributed over 40 different estates. Of this sum, the Board contributed £62,980, the municipal councils £17,552, and the Commission the balance of £60,496. With the exception of a few isolated cases in which the expenditure represented the completion of schemes commenced some years ago at varying rates of contribution from the interested bodies, the bulk of the expenditure was on the basis which has now become established for such works, namely 4 parts Commission, 3 parts Board, and 1 part Council.

The total expenditure on all road and bridge works to serve Soldier Settlement areas since the inception of the scheme now passes the £1,000,000 mark, the relevant figures being :—

	£	£
Soldier Settlement Commission	626,064	
Country Roads Board	254,335	
Municipal Councils	120,019	
		1,000,418

The expenditure during the year, which was only £18,878 less than the expenditure in the previous financial year, indicates that a great deal of work of this nature is still being undertaken, and represents quite a substantial effort in manpower and plant. The greater portion of the work has been done under the supervision of the municipal councils, whose co-operation is greatly appreciated. For the whole post-war period, expenditure in the Minhamite Shire (£140,451) is by far the highest in any single municipality, with Hampden Shire (£91,426) and Numurkah Shire (£86,069) next in order.

SPECIAL PROJECTS.

Big Eildon Project.

The following works made necessary because of the raising of the Eildon Dam by the State Rivers and Water Supply Commission were carried out during the year :—

(*a*) Completion of 3·25 miles of new realignment on the Maroondah Highway through Bonnie Doon and completion of a new bridge 1,200 feet long over Brankeet Creek.

(*b*) Completion of 3·1 miles of new deviation on the Jamieson-Woods Point Road north from Jamieson, and (*c*) construction of 0·6 miles of road deviation over Corduroy Hill on the same road.

(*d*) Continuation of construction and gravelling of approximately 19 miles of unclassified roads in the vicinity of Bonnie Doon.

Hume Weir Project.

Works necessitated by the raising of the Hume Weir included the following, which were put in hand during the year :—

1. Murray Valley Highway—
   - (*a*) Deviation at Ebden.
   - (*b*) Deviation at the junction with the Omeo Highway at Tallangatta.
   - (*c*) Deviation at mileage 52·85 east of Granya.
   - (*d*) Deviation at Tatonga.
   - (*e*) Construction of bridge and approaches over Koetong Creek.
   - (*f*) Construction of new bridge over Mitta Mitta River at Tallangatta.
2. Deviation of Yabba Road approximately 2½ miles south of Tallangatta.
3. Deviations on the Bethanga Road at mileages 1·6, 2·3, 3·0, 3·6, 5·3, and 7·2, together with the "Toorak" connexion.

DECENTRALIZATION.

At the Ballarat Divisional Depot, a brick veneer utility block was constructed by contract, and a 100-ft. x 26-ft. lean-to type plant shelter erected.

A timber casting floor laid at the Bendigo Precasting Depot in 1951 was replaced by a concrete slab 80-ft. x 10-ft. Steel forms were also manufactured for casting "U" slabs and piles, replacing timber forms covered with galvanized iron. A weigh batcher of the "swinging" type was installed for correct proportioning of aggregates for the production of concrete.

Apart from certain developments still to be undertaken in connexion with the precasting of reinforced-concrete bridge components, the Geelong Divisional Depot is now well developed and is functioning fully, both on the stores side and on the mechanical maintenance side. Owing to the Barwon Terrace storage and bituminous mixing depot being some distance from the main depot with accompanying security risk, land immediately opposite the main depot was purchased during the year to overcome this problem.

Portion of this land is below maximum flood level, but it is proposed to gradually raise it above flood level by placing filling as it becomes available from local projects. Some progress to this end has already been made.

At the precasting yard, installation of aggregate storage bins to feed by gravity to a weigh batcher is in progress, and the completion of this facility together with a mono rail to convey concrete where required will mean much more economical production.

12934/56.—3

At the Horsham Divisional Depot, the workshop was increased by the addition of 50 feet, now giving an area of 150 feet x 60 feet, and work on developing the precasting yard has almost been completed. Two steel gantries have been manufactured and erected. The yard is now capable of producing 800 cubic yards of precast concrete per annum.

Patrol Depots at Nhill and St. Arnaud have been further developed, and a house has been erected for the Patrolman at Nhill.

ROADMAKING MATERIALS.

In the Ballarat Division, an extensive deposit of granitic sand was investigated and developed at Mt. Bolton on Mr. A. C. Pearse's property immediately north of Learmonth. A quantity of 20,000 cubic yards of material has already been removed, and it is estimated that approximately 500,000 cubic yards remain. In addition, a deposit of approximately 60,000 cubic yards of granitic sand was found on Mr. A. C. Fisken's property near Lal Lal, of which 6,000 cubic yards have been removed.

During the year a length of approximately 5 miles of the Midland Highway between Elmore and Corop was constructed with soft sandstone crushed through the 30-in. x 15-in. primary section of the Board's Goodwin Barsby "Goliath" crusher, as a sufficient quantity of hill gravel was not available in the area. After extensive prospecting for roadmaking material, a new quarry was opened near allotment 199, Parish of Corop, and 27,000 cubic yards of stone were crushed and placed on the road. The stone consisted of soft sandstone or mudstone, and, although not of high quality, was the best obtainable. The maximum crushed size was $3\frac{1}{2}$ inches, with 8 to 12 per cent. passing a 36 sieve and a plasticity index varying between 13 and 16.

Owing to the demands for aggregate for bituminous surface treatment work in the Bendigo Division having, in recent years, exceeded the supply from normal sources, the Board set up the complete Goodwin Barsby crushing plant, consisting of primary and secondary crushers and elevating screens and bins at Mt. Burrumboot, 6 miles south of Corop, to crush aggregate in four sizes between $\frac{1}{4}$ inch and $\frac{3}{4}$ inch. The stone deposit, which is of diabase, was worked out of an existing quarry. A characteristic of the stone is that the Los Angeles abrasion loss is 8·2 per cent., as a result of which it causes excessive wear on crusher jaws but retains a non-skid surface on sealed roads for a longer period than softer stone. The quantity of aggregate produced by the Board was approximately 6,000 cubic yards.

A deposit of soft sandy limestone has been opened up on the Bellarine Peninsula and has been extensively used over the past two years. It is located near Point Lonsdale, and adjoins the old Point Lonsdale–Ocean Grove Road. This development is particularly satisfactory in view of the difficulty in recent years in obtaining a sufficient quantity of satisfactory gravels or limestone on the Peninsula. Crushed rock from the Geelong area has also been in short supply and expensive, and for some jobs it has been necessary to obtain granitic sand from the You Yangs area.

Up to the 30th June, 1956, approximately 70,000 cubic yards of this sandy limestone has been used. The greater part of the recent widening and reconstruction of the Bellarine Highway between Leopold and Geelong has been done using this material with an armour coat of fine crushed rock to increase the shear resistance of the surface layer. In addition, this limestone has been used extensively in connexion with the reconstruction and sealing of the Point Lonsdale–Ocean Grove and Portarlington–Queenscliffe Roads, and a number of shire roads. These works could not otherwise have been done because of the lack of sufficient natural materials suitable for supporting a sealed coat and the difficulties in obtaining crushed materials.

It is estimated that the use of this limestone has saved £50,000 over a period of two years, and at the same time has enabled a greater mileage to be undertaken and completed.

Approximately 25,000 cubic yards of broken sandstone has been obtained from a quarry located about 3 miles south of the Western Highway at Lillimur for use in the reconstruction of a length of 4·75 miles of the highway near Kaniva. The quarry in question had been worked previously, the material won having been crushed and used as pavement material, but on this particular project a method of breaking the stone instead of crushing was employed.

After experimenting with various types of drills and bits, the 2-inch diameter star bit was adopted for use on $1\frac{1}{4}$-inch diameter round steel, but, as the work progressed, trouble was experienced with this type of drill and bit, the drill steel breaking near the shank or in the bit. A further experiment was then carried out using the old integral steel, with a chisel cutter $1\frac{3}{4}$-inch wide with a clean cutting edge. With this type of cutter, the drilling rate was increased to approximately 3 feet per minute, whilst the drill became easier to withdraw as a result of the cutter clearance obtained. This type of drill was then adopted and used for the remainder of the work.

The aim in blasting was to produce spalls in greater than 18-inch maximum size, and, to this end, experiments were carried out which indicated that a drilling pattern based on the first row of holes being 6 feet from the face with two other rows at 9-ft. spacing was best for the stone being blasted. The holes were from 8 feet to 10 feet deep, and electric firing was used throughout with delayed-action detonators, 20 to 30 holes holes being fired per blast. Fracturing was readily achieved, and it was noted that loading of the blasted material was much more efficient when the material was only fractured in blast and not fragmented and blown into a heap in the quarry. Secondary blasting was not necessary, as the few large spalls obtained (less than 50 cubic yards in 25,000 cubic yards) were broken down by one or two passes of a class 2 tractor.

The material, after delivery to the road bed, was further broken down by one or two passes of a class 4 tractor and double-drum sheepsfoot roller, after which it was suitable for grading and consolidating.

The actual cost per cubic yard by breaking was 3s. 5d., with an average output of 490 cubic yards per day. The estimated cost for crushing was 13s. 6d. per cubic yard, with an estimated output of 400 cubic yards per day. By way of comparison, the actual cost for crushing in 1951–52 was 10s. 3d. per cubic yard, with an average output of 101 cubic yards per day.

The only disadvantage experienced with the method of breaking was that it was difficult to spread isolated loads on the road bed at places where the finished level was low after the top course had been spread, due to the uneven "grading" of the broken material, i.e., containing stones and spalls up to 9-inch maximum size.

Although the material used had a maximum plasticity index of 12, the average of all tests was 9·5. Material similar to this has been widely used in the Horsham Division over the last ten years, and not given serious trouble except on the section of the Western Highway opposite the Horsham High School, where the high plasticity index of the material may have been a contributory cause of the failure. In a few other places, minor troubles were caused by sandy pockets finding their way on to the road.

Apart from this somewhat plastic sandstone, there is very little better road material available close to most of the roads in the Division, and for present traffic it seems to be generally satisfactory. The addition of cement may be necessary when traffic becomes heavier.

The commencement of the production of aggregate for bituminous surfacing at the quartz porphyry quarry near Stawell was referred to in the 42nd Annual Report. A total quantity of 25,000 cubic yards of 4-inch to 6-inch spalls was produced at an average daily rate of 286 cubic yards. A contract was let for the secondary crushing, but the contractor withdrew his plant after producing 1,500 cubic yards.

A start was, therefore, made towards the end of the financial year to instal both the primary and secondary crushing units to produce screenings by direct labour. The personnel of a bituminous surfacing gang was employed on the project, which serves the dual purpose of providing employment for key personnel during the winter period and also assisting in overcoming the ever-acute position in the Division as far as aggregate spalls are concerned.

Limestone for Macadam.

The Warrnambool City Council owns and has operated for many years a limestone quarry in the Albert Park reserve in that City, and has established its own crushing plant, which produces crushed stone for a type of construction which has become standard in the populous area of the City, sometimes termed "modified macadam", but more in the nature of tar penetration.

This material, which is a soft limestone, with a Los Angeles test loss of 39 (except for a few veins of harder material) is in fact the only roadmaking material available within the limits of the City. The method of construction adopted by the Council in using it has been to place a bottom coat of the crushed limestone and bind it with screenings and dust to form a waterbound macadam base 3-inch thick, on top of which is placed a further 3-inch course of crushed stone rolled and penetrated at the rate of one-third of a gallon of tar, quarry fines being then applied and rolled into the surface. This is followed by the application of a further one-third of a gallon of tar. After allowing the surface to be trafficked for some time, it is sealed with bitumen, using basalt screenings. In practice, it has been found that, where the tar surface has been trafficked for a year, no difficulties are experienced in applying the bituminous seal coat.

This method of construction has proved to be quite satisfactory in the built-up area of this City, preventing dust and providing surfaces for the heavy traffic to which most of the streets are subjected, including frequent passenger bus services. The stone is easily consolidated, and is reasonably cheap at 16s. per cubic yard. The Board has also made use of this material and method of construction for widening narrow sections of the Princes Highway near Warrnambool.

The Board has been investigating the question of using the crushed limestone for its own works in the Warrnambool Division, where the preference for pavement materials on economic grounds has been in the following order :—

1. Buckshot gravel.
2. Scoria (volcanic tuff).
3. Soft limestone deposits obtained by ribbing and dozing.
4. Crushed limestone of the type used by the Warrnambool City Council.
5. Crushed basalt either as fine crused rock or broken metal.

Scoria Supplies.

As gravel supplies along the coastal area of the Warrnambool Division are now exhausted, it has become necessary to extend the use of other cheap local material as much as possible. Although scoria from Tower Hill has been used for highway work over a considerable area, it is suitable only as a bottom course or where covered with a bitumen seal coat. There are, however, large supplies available at Tower Hill near Koroit, which will be so used within economic limits. The Board recently put down at Garvoc an experimental section with crushed scoria from Mt. Warrnambool in the Panmure area, and, although this material is somewhat soft and plastic, it is used extensively by the Warrnambool Shire Council on unsealed roads. The results of the experimental section will determine the scope for the material in future. The price ex bins is approximately 10s. 6d. per cubic yard.

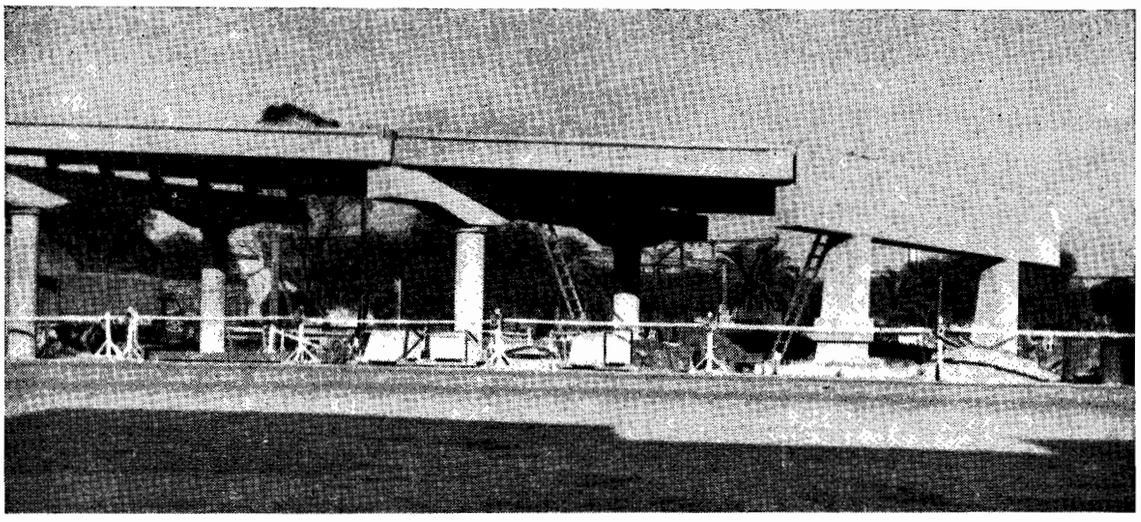
During last year, the Board obtained by Contract 14,000 cubic yards of crushed limestone from the property of the Arcadia Cement Company at Port Fairy at approximately £1 per cubic yard, this material being similar to that used by the Warrnambool City Council. The Board, however, used it as a crushed rock up to 3-inch maximum size, and found that the larger size broke down under constant rolling and produced a pavement which has been satisfactorily primed with crude horizontal retort tar and sealed with bitumen.

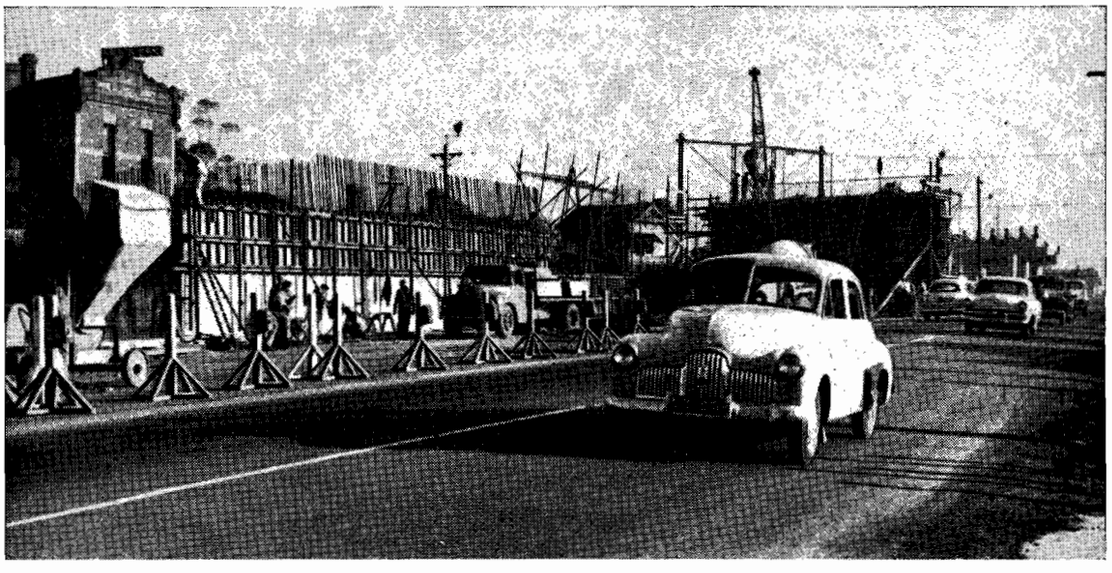
ELIMINATION OF RAILWAY LEVEL CROSSINGS.

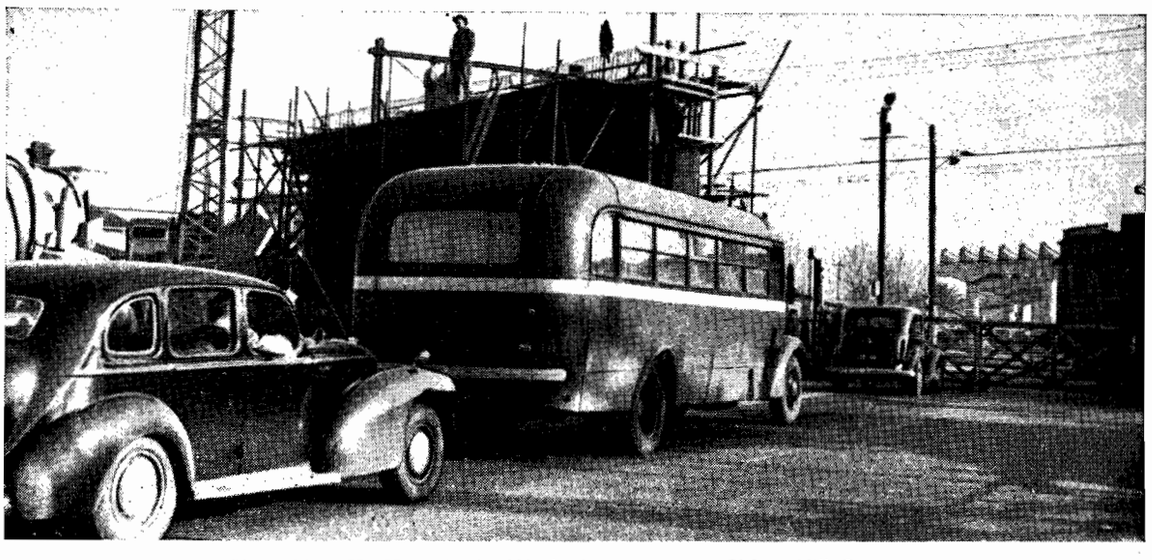
Reference was made in the 42nd Annual Report to the creation of a Level Crossings Fund to be applied towards (*a*) the elimination of level crossings or the provision of alternative routes to enable traffic to avoid level crossings, (*b*) the provision of lights, signs, and lighting at and the improvement of approaches to level crossings, and (*c*) generally reducing danger at level crossings.

The largest project embarked upon was the elimination of the level crossing at the Clifton Hill railway gates, at the commencement of the Heidelberg-Eltham (main) road, where a schedule of rates contract was let to Lewis Construction Co. Pty. Ltd. for the bulk of the work involved in the construction of a road overpass structure estimated to cost £240,000. The work was commenced in February 1956, and was well in progress at the 30th June. Plates Nos. 52, 53, and 54 show portions of the work in progress.

CLIFTON HILL OVERPASS







Plates Nos. 52, 53, and 54.—Works in progress at Clifton Hill Overpass.

Work was also commenced by the Railways Department on the overpass at Dandenong, where the Dandenong–Frankston Road crosses the main Gippsland railway line at grade. The Board carried out the construction of a by-pass track for road traffic during the construction of the new facility.

The construction of the deviation of the Hume Highway through the township of Glenrowan, designed to avoid two railway crossings, was well advanced, and other schemes carried out included the Woodvale deviation on the Bendigo-Pyramid Road, the deviation of the Maryborough–Ballarat Road north-west of Clunes, and deviations of the Main Whittlesea Road at Yan Yean and Mernda.

The total expenditure by the Board on these works during the year, together with expenditure on the provision of warning signs, &c., regrading at certain railway level crossings, and the improvement of visibility at others, amounted to £141,664, making the total expenditure out of the Level Crossings Fund since it was created in 1954, £181,797. An expenditure of £51,664 has also been incurred by the Railways Department out of this Fund, which was in credit at the 30th June, 1956, to the extent of £474,138.

BOARD'S INSPECTIONS.

It has been the practice of the Board right from its inception to take every opportunity of making detailed inspections as required in company with municipal Councillors and officers, not only of roads under its jurisdiction but of unclassified roads on which its funds have already been expended or on which grants have been sought by the Councils concerned. In the post-war period such inspections have been proceeding throughout the municipalities of the State in systematic rotation. It is customary to leave the preparation of the itinerary to the respective Councils, which thus have the opportunity to acquaint the Board both with their achievements and their aspirations.

Experience has shown that the Board is able to visit from 25 to 30 municipalities in twelve months. At this rate it takes about six years for the Board to visit all municipalities throughout the State.

A special inspection was carried out by the Board in March, 1956, of the Dargo High Plains area, a region of alpine country forming a large part of two municipal districts. The party which included representatives of the Shires of Bright and Avon proceeded from Bright via Harrietville and Mt. St. Bernard to Dargo. The Board has in recent years allotted small sums for improvement and maintenance of the route between the declared tourists' road at Mt. St. Bernard and the declared main road at Dargo, but much of this section of 45 miles is in a primitive state, in part being unformed across swampy ground. The Dargo High Plains consist of approximately 5,000 acres of pasture, with three homesteads, the oldest of the three having been built with "pit-saw" timber milled on the Plains. As on other alpine holdings cattle are grazed on the plains and the surrounding hillside leaseholds during the summer, and are mustered and driven from the area on the hoof before each winter.

The knowledge gained on the inspection will serve the Board in good stead when its finances will permit of greater assistance being given with the development of the principal "through" road traversing the area.

Another inspection of a special nature was carried out by the Board in March, 1956, by arrangement with the Mansfield Shire Council, of a proposed additional road link from Mansfield to Central Gippsland. Over the years, the Board has opened up a road across the Dividing Range from Mansfield to Moe via Woods Point, Matlock, and Walhalla, this road being now maintained under the direct supervision of the Board except for a few miles near Mansfield and Moe. About eleven years ago the Forest Commission located a new forestry road connecting Heyfield and Licola with the high country commencing at Crescent Creek saddle to facilitate the extraction of timber from the Great Dividing Range north-west from Licola. By arrangement with the Commission, an investigation was subsequently made by the Board's officers which showed that the best route for a connecting road between Licola and Mansfield to provide general communications would cross the Divide at one of the low saddles some miles north of Mt. Skene. It was found that a road could be located generally free from snow. This scheme was not, however, proceeded with, and the Commission then built a road to its own requirements at its own cost. The Commission is also constructing a forestry road from Jamieson towards Mt. Skene.

The purpose of the inspection arranged by the Mansfield Shire Council was to interest the Board in the plan of linking the two forestry roads to form an additional route from Mansfield to Central Gippsland.

PHOTOGRAPHY.

During the year, 54 screenings of Board's films were given to schools, clubs, other organizations, and the camping areas along the Ocean Road, reaching audiences totalling approximately 7,600 persons. Forty-seven film programmes were loaned and, from the borrowers' reports, these programmes were viewed by approximately 6,400 persons.

The Board's mobile film unit serviced Board's camps in locations remote from townships. A total of 117 screenings was given to audiences totalling 2,558, using films hired from commercial distributors supplemented by the Board's own films.

During 1955–56, the film unit photographed work on the Bonnie Doon bridge and the Johnston Street bridge, and has under production Gazette No. 11 and a film "Signs and Lines".

SCREENING OF FILMS AT HOLIDAY RESORTS.

As part of a general educational policy to make the general public more "road conscious," arrangements were made to hold a series of open-air screenings of the Board's films during the Christmas and New Year holidays, 1955-56, at camping areas along the Ocean Road. At the same time, the opportunity was given to local authorities to take up collections to aid local hospitals and Red Cross activities. Unfortunately, the severe weather conditions which prevailed during the holiday period adversely affected attendances, but nevertheless the experiment enabled information concerning road and bridge works to reach many campers who would not otherwise have been aware of the Board's extensive operations and needs.

Screenings were given at the Cumberland River and Wye River camping ares, at the Lorne Foreshore area, at Anglesea, and at Apollo Bay, and a total sum of £60 was donated by the campers to hospitals at Anglesea, Apollo Bay, and Lorne.

ROYAL SHOW.

Since 1953, the Board has been an exhibitor at the Royal Agricultural Show, having been accommodated at a stand in the Industrial Hall, the purpose of the exhibition being to bring the work and functions of the Board more prominently before the general public. The interest shown in the Board's exhibit in the initial years of this experiment was so pronounced that the Board has endeavoured, so far without success, to obtain space for the erection in the Show Grounds of a small permanent structure.

At the 1955 Show, the Board's display included a panel with illuminated transparencies and a showing of the Board's films, together with models of the proposals for the new bridge over the Yarra River at King Street.

Officers of the Board were in attendance throughout the Show period.

CONTROL OF HEAVY TRAFFIC.

There has been a further increase in the number of vehicles carrying goods interstate on a variety of arterial and cross-country routes. This has been reflected in a corresponding increase in the number of offences taken to court, particularly that of overloading. During continuous checks on traffic using the Hume Highway, conducted at Seymour over a period of four and a half days in April, 1956, it was found that approximately one truck in every eight was offending in some way against the provisions of the Motor Car Act, whilst an average of one in every eleven and a half trucks was overloaded to an extent that warranted prosecution. It was noted particularly that commercial vehicles were operating to an increasing extent on Sundays, and that approximately one in seven was offending in some way or another.

As the result of further appeals to higher Courts, chief of which was the case of Nilson v. the State of South Australia, payment of registration taxes on vehicles operating entirely interstate has been ruled to be contrary to the meaning of Section 92 of the Commonwealth constitution. Operators domiciled in New South Wales are using special number-plates in a series numbered ISA–000 onwards, for which a fee of 25s. per annum is made, whilst some others, domiciled in South Australia, are operating their trucks without number-plates or registration discs, and without the name of the operator being painted on the vehicle.

This latter procedure is presenting the Board and other Victorian authorities with many problems. Not only are Victorian operators providing themselves with accommodation offices in neighbouring States to avoid the payment of the Victorian registration fees, but the lack of means of identification of vehicles from South Australia which are offending against the Motor Car Acts also makes it very difficult to trace drivers who give incorrect names and addresses. The absence of any means of identification of the vehicle itself makes the work of the Board's traffic officers very difficult.

Court Cases.

The total number of offences against the Country Roads and Motor Car Acts reported for the year rose by 1,012 in 1954–55 to 4,258 in 1955–56, an increase of 31·2 per cent., and, of this number, 3,909 resulted in successful prosecutions, an increase of 904, or 30·1 per cent. Of the offences reported, prosecutions were successfully launched in 91·8 per cent. of the cases, written warnings were given in 2·5 per cent., 2·7 per cent. of the summonses were unserved, 1·7 per cent. were withdrawn, and 1·3 per cent. were dismissed.

Fines and costs from the prosecutions resulted in a net total of £45,877 8s. 10d. This represents an increase of £14,270 2s. 4d. or 44·2 per cent. over the 1954–55 total. The costs included in the year's figures (£1,018 3s. 10d.) were 120 per cent. higher than those for the previous financial year, due mainly to the amount of stamp duty on all informations issued being doubled during the year.

During the year, following successful prosecutions instituted by the Board in the lower courts, four appeals to General Sessions were heard.

Of these, two were dismissed and the convictions confirmed, and one was dismissed but the penalty reduced, whilst, in the fourth case, in which A. Crabtree was charged with being the owner of a vehicle detected overloaded, the Court of General Sessions stated a case to the full Supreme Court, which found against the Board. The decision in this case resulted in similar defences being brought forward in Courts of Petty Sessions, with consequent dismissals, or withdrawals by the Board.

Of the two cases reviewed by the Crown Solicitor on behalf of the Board, one was dismissed on the case law in the matter of Myers v. Crabtree, whilst the other was upheld and the case referred back to the Court of Petty Sessions for a conviction to be recorded. The grounds on which the magistrate originally dismissed the charge was that it was incumbent on the prosecution to prove that a permit under Section 32 of the Motor Car Act No. 5616 was not in existence, but this view was not upheld by the Supreme Court.

Motor Car Act.

Fines resulting from 3,582 successful prosecutions under the Motor Car Act totalled £44,451 15s., an increase of £13,794 19s., or 45·1 per cent., over the 1954–55 figures. The average fine per case rose from £11 7s. 9d. to £12 8s. 2d., an increase of 9 per cent. Of the 3,582 convictions recorded, 2,572 (72 per cent.) were for overweight, 662 (18 per cent.) for speed, 333 (9 per cent.) for excess dimensions over the legal limits, and the remainder for refusing to weigh and failing to carry permits. In 27 of the speed offences, in addition to fines being imposed, the offenders' driving licences were cancelled by the Court for periods from two months to two years. A list of the individual highways on which the offences occurred, with a bulk total for main roads, is set out on page 24. It is significant that 58·3 per cent. of all offences were detected on the Hume Highway, and it is estimated that 50 per cent. of all offences related to vehicles travelling interstate.

Country Roads Act.

The number of offences against the Country Roads Act increased from 356 in 1954–55 to 362 in 1955–56, 347 of the latter total relating to unattended stock on State highways.

The average fine (£2 15s. 7d.) inflicted by the Court upon owners of unattended stock on highways was still too low to be a real deterrent, but amending legislation passed by Parliament in the autumn session of 1956 providing for minimum fines for repeated offenders should help to meet the position.

LOCATION OF TRAFFIC OFFENCES, 1955–56.

State Highway.	Overload Offences.	Speeding Offences.	Other Offences.	Total.	Percentage.
Bass	..	..	..	..	..
Bellarine	..	..	..	..	..
Bonang	1	1	..	2	..
Borung	..	..	..	..	..
Calder	210	65	17	292	7·6
Glenelg	2	2	3	7	..
Goulburn Valley	13	5	..	18	..
Henty	..	..	..	..	..
Hume	1,605	449	192	2,246	58·3
Loddon Valley	35	3	..	38	1·0
Maroondah	14	..	..	14	..
Midland	18	14	2	34	0·9
Murray Valley	42	17	..	59	1·5
Nepean	7	2	..	9	..
Northern	..	..	1	1	..
North Western	..	..	..	..	..
Omeo	4	..	..	4	..
Ouyen	..	..	..	..	..
Ovens	..	..	..	..	..
Princes East	232	75	49	356	12·5
Princes West	161	46	10	217	5·6
Pyrenees	17	9	3	29	..
South Gippsland	..	..	..	..	..
Sturt	..	..	..	..	..
Western	242	51	40	333	8·6
Main roads	142	39	16	197	5·1
Tourists' roads	4	..	1	5	..
Forest roads	..	..	..	..	..
Total	2,749	778	334	3,861	100·0
Percentage	71	20	9	..	..

It is difficult to gauge the effect of climatic conditions and the availability of food and water on the practice of turning out stock to graze on roads, but it is highly probable that the very good season this year had a considerable bearing on the reduction in the number of stock detected. The actual number of head of stock fell from 3,722 to 2,667. The accident record also showed a distinct improvement, an analysis of accidents for the period of twelve months ended the 31st March, 1956, having revealed that only seven were attributed to unattended stock, no persons being killed and only one injured.

Permits.

The number of permits issued for 1955–56 was 5,064, an increase of 406 (9 per cent.) over the total for the previous year. These included 3,971 for single trips and 1,093 annual permits, approximately one-third of the latter being for height (mainly car bodies) and width (loose hay), and the remainder for weight on roads on which load limits had been imposed.

Nearly half (1,918) of the single-trip permits related to excess weights, and included 786 for gross loads over 20 and up to 30 tons, 806 over 30 and up to 40 tons, and 33 over 40 tons. Twenty of the last-mentioned group were for or on behalf of Government Departments connected with defence or State development.

Closing of Roads.

Following the usual practice, a number of weak roads subject to excessive damage in the winter was closed from 1st June to the 31st October, 1955, to trucks exceeding 6 tons gross weight, and permits were issued based on an approved schedule. Gross load limits of 6 tons of a more permanent nature, imposed under the provisions of the Motor Car Act, were lifted on some sections of road on which improvements had been effected and which were able to withstand heavier traffic. Roads from which limits were lifted included portion of the Henty Highway from Hopetoun to Lascelles, the Little Yarra Road in the Shire of Upper Yarra, the Donald–Minyip Road in the Shire of Dunmunkle, the Hopetoun–Rainbow Road in the Shire of Dimboola, and portion of the Walhalla Road between Gooding and Erica, a total of 56 miles. The list of " limit " roads was added to during the year by the inclusion of a section of the Benalla–Tocumwal Road in the Shire of Cobram, between the Murray Valley Highway and the Murray River, a length of 9 miles. The approximate mileage of roads on which " permanent " load limits are at present imposed is 1291.

Collection of Fines.

The collection of outstanding fines, a duty being carried out by a member of the police force on loan to the Board, proceeded very satisfactorily during the year, the total of £5,742 1s. 9d. collected being £446 9s. 3d. greater than that for the previous year. The percentage of 1954–55 fines still uncollected at the 30th June, 1956, was 7·3 per cent., however, compared with 5 per cent. of the 1953–54 fines uncollected at the 30th June, 1955.

Staff.

Appointments during the year of one traffic officer and one assistant traffic officer brought the strength of the traffic section to thirteen, plus an office staff of three, whilst in addition five members of the Mobile Traffic Section of the Victorian Police have been seconded by the Chief Commissioner for duty with the Board. Four of these five officers commenced duty only in February last, and the full effect of their work has not yet been reflected in the financial return, as the lag in bringing cases before the Courts is of the order of twelve weeks, but the co-operation of the Chief Commissioner and the keenness and efficiency of his officers are greatly appreciated by the Board. Including the three Stock Inspectors, the total strength of the section was 24.

TRAFFIC LINE MARKING.

The total mileage of roads maintained in a " striped " condition during the year 1955–56 was 2,215 miles, an increase of 28 miles over the previous year's figure. This total comprised State Highways, 1,727 miles, other declared roads, 446 miles, and " Sundry Debtors " roads (roads not under the Board's jurisdiction) 42 miles.

In order to maintain a line on this length of road, it was necessary to paint 3,783 miles of standard stripe, i.e., a line consisting of 10-ft. dashes and 30-ft. gaps, made up of 2,774 miles of State Highways, 828 miles of other declared roads, and 181 miles of undeclared roads.

The total expenditure on this type of work during the financial year was £24,166, and the average cost per mile of standard stripe £6 8s. The total quantity of lacquer used was 12,835 gallons, with an average rate of application per mile of standard stripe of 3·4 gallons.

The following table sets out the mileages treated and retreated by standard stripe during each year since 1949–50 :—

Year.	State Highways.	Main Roads and Tourists Roads.	Undeclared Roads (for other Authorities and Municipal Councils).	Total Mileage.
1949–50	1,750	295	45	2,090
1950–51	1,569	313	57	1,939
1951–52	1,988	358	53	2,399
1952–53	2,110	550	106	2,766
1953–54	2,377	645	197	3,220
1954–55	2,664	651	188	3,503
1955–56	2,774	828	181	3,783

The length of " standard stripe " painted exceeds the length of road maintained because :—

(*a*) Many roads are striped twice per year ;

(*b*) Some roads are three-lane roads ;

(*c*) There are many double lines.

The unit costs per mile of standard stripe have varied from £4 5s. 9d. in 1949–50 to £7 17s. in 1952–53, with a reduction to £6 8s. in 1955–56.

BITUMINOUS SURFACING.

Weather conditions during the financial year 1955–56 had a very adverse effect on the Board's bituminous-surfacing programme in the Benalla Division.

Following a rainfall of about 40 inches in 1955 in Benalla, where the average annual fall is only 26 inches, it was not possible to commence the programme until late November, 1955. From the 1st January to the middle of April, 1956, the rainfall in Benalla totalled about 18 inches as compared with the normal 4 inches for the same period. In consequence of these very wet conditions, the programme was carried out only under very great difficulties.

Two 800-gallons spraying units together with two 400-gallons priming units were engaged on the bituminous-surfacing work in this Division, but, owing to the conditions which prevailed, it was deemed advisable to terminate the spraying programme much before the usual time in the interests of good quality work.

The bad weather in this particular division not only seriously affected the spraying programme, but also very seriously affected the progress of the reconstruction works necessary as a preliminary to further sealing. To summarize the position, (*a*) reconstruction on about 25 miles of main roads (for which funds had been provided for reconstruction and sealing) was so retarded that these lengths could not have been sealed within the normal spraying season even if the weather had permitted ; and (*b*) a further 10 miles of main roads (for which funds had been provided for reconstruction and sealing) were reconstructed but could not be sealed.

LIGHT TEMPORARY SEALING.

During the year, a section of 17,000 feet of the Princes Highway West approximately 3 miles west of Colac was widened, resheeted, and lightly sealed, the following procedure being adopted :—

Work was commenced in May, 1955, the resheeting completed at the end of October, and a light prime and seal was applied to hold the pavement for a period up to six months until finally sealed. For the temporary seal coat, the pavement was primed full width with vertical retort tar plus light tar oil in the proportions of 100 : 50 at the rate of 0·08 gallons per square yard, sealed with a binder of 80–100 bitumen, asphaltic oil, and power kerosene, 100 : 5 : 15, plus wetting agent, at the rate of 0·146 gallons per square yard, and covered with clean scoria of average size $\frac{1}{4}$ inch at a rate of 1 cubic yard to 92·5 square yards.

Priming was done one day and this area sealed the following day, weather permitting, the surface condition being surface dry to very damp with the absorption of the primer to a stage when the pavement was trafficable, varying from two and a half to eight hours, depending upon surface and weather conditions. One small primed area withstood traffic without sealing for four days without excessive maintenance.

Prior to the final seal being applied, i.e., from three to four months after temporary sealing, the work had a " sand-paper " finish, with the depth of scoria not less than $\frac{1}{8}$ inch, and no maintenance of this scoria seal has been necessary.

This work was carried out for a cost of $10\frac{1}{2}$d. per square yard and is an example of the Board's constant endeavour to reduce maintenance costs during the period between the road construction and the application of the final seal coat.

EXPERIMENTAL QUARRY DRILLING.

During October, 1955, a series of experimental drillings was carried out in the McKenzie Creek area, near Horsham, the sites selected being at the McKenzie Creek quarry, at the Donnybrook Quarries Pty. Ltd. quarry 1 mile south of the McKenzie Creek, and on the old Hamilton Road reserve near the McKenzie Creek bridge. The plant employed was one 250-cub.-ft. compressor, one wagon drill, and six integral steel drill rods tungsten carbide inserts, lengths 7 ft. 10 in., 15 ft. 9 in., and 21 feet, and diameters $1\frac{7}{16}$ inch, $1\frac{3}{8}$ inch, and $1\frac{5}{16}$ inch. The compressor was operated at 80 lb. per square inch, and all holes were drilled on a slope of 10 degrees from the vertical.

The object of the experimental drilling was to obtain a relative comparison between the McKenzie Creek quartzise and similar rock at an alternative local quarry. The average drilling time at McKenzie Creek was 8·4 seconds per square inch or 0·61 feet per minute, whilst the corresponding figures for the alternative quarry were 5·17 seconds per inch or 0·97 feet per minute. The Los Angeles loss at McKenzie Creek is 40 per cent. to 50 per cent. Based on drilling time, a Los Angeles loss of 63 per cent. to 78 per cent. at the alternative quarry might be expected. The actual tests indicated that the Los Angeles loss at the alternative quarry is 63 per cent. to 74 per cent.

From the experiments carried out, it would appear that the drilling rate in similar types of stone, conducted under the same conditions, will give an indication of the hardness of the stone, and use is being made of these results in exploratory drilling to try and find harder stone in this area.

ROTATING BELT SPREADERS.

Following upon the visit of the late Mr. H. H. Gray to Sweden in 1955, whilst investigating overseas practice in relation to bituminous surfacing, the Board received from the Chairman of the State Road Institute, Stockholm, advice that the Institute was very much attracted by the rotating aggregate belt spreader developed by the Board's Engineers, and had been studying the drawings with much interest. He also stated that the Institute was anxious to test such a machine with the local aggregate.

Arrangements were accordingly made for one of these units to be forwarded to Sweden by the manufacturers (John Thompson Combustion Engineering Pty. Ltd.), and full particulars of the Board's experience with the machine, which had given it great satisfaction, were also forwarded.

This transaction was the direct result of Mr. Gray's mission abroad, in the course of which useful information regarding the properties of bitumen was exchanged between the two bodies. The Board was gratified to know that a machine which had been designed by its own engineers had attracted so much attention abroad. The Institute will advise the Board in due course of its experience with the machine.

LEGISLATION AFFECTING THE BOARD.

An important enactment passed by Parliament in June, 1956, was the *Country Roads Act* 1956 (No. 5978), part 2 of which deals with " by-pass roads," the first stage in this State of " motor-way " legislation. The Act enables the Board to apply to a by-pass

road its usual powers of compulsory acquisition, and lays down certain principles relating to compensation, access rights, and finance. Other sections of the Act are designed to enable revenue money to be used for permanent works, to authorize the Board to require the removal of obstructions to drainage on private property adjacent to declared roads, and to provide for the making of by-laws prohibiting or regulating excavating and placing in the vicinity of declared roads. In addition, provision is made for increased penalties for offences against the *Country Roads (Impounding of Cattle) Act* 1935, and for the Board to make contributions from the Country Roads Board Fund towards the cost of establishing pounds, &c.

Other Acts passed during 1955-56 which affected the Board included the following :—

Public Works Loan Application Act 1955 (No. 5921).

This Act provides for the application from loan moneys of various amounts for the special purposes set out in the schedule to the Act, of which the following concerns the Board :—

> " For meeting payments required to be made by the Treasurer of Victoria under the provisions of the *Napier-street Bridge Act* 1954 in connexion with the construction of a new bridge between Melbourne and Footscray—£55,000."

Transport Regulation Act 1955 (No. 5930).

This Act, *inter alia*, repealed the provision in the *Transport Regulation (Amendment) Act* 1954 (No. 5848) that moneys standing to the credit of the Transport Regulation Fund at the 30th June in each year should be paid into the Country Roads Board Fund.

Commercial Goods Vehicles Act 1955 (No. 5931).

This Act provided for the owners of certain commercial vehicles to pay to the Transport Regulation Board a charge at the rate of one-third of a penny per ton-mile as compensation for wear and tear caused thereby to public highways in Victoria, all moneys received from this source to be paid into the Country Roads Board Fund to the credit of a special account to be called the " Roads Maintenance Account ".

Melbourne and Metropolitan Board of Works Act 1956 (No. 5982).

This Act implemented the powers of the Melbourne and Metropolitan Board of Works to enable it to construct and maintain roads and bridges, and authorized it to utilize any municipal council or public authority (other than the Country Roads Board) to carry out works on its behalf.

Road Traffic Act 1956 (No. 5983).

This Act provided for the setting up of a Traffic Commission of three members, drawn from the Country Roads Board, the Melbourne and Metropolitan Board of Works, and the Police Department respectively, to provide a traffic engineering service on a State-wide basis, including the metropolitan area.

CONFERENCE OF STATE ROAD AUTHORITIES OF AUSTRALIA.

The 18th Conference, which was held at the office of the Main Roads Department, Brisbane, from the 19th to the 23rd September, 1955, was attended by the representatives of the several State Road authorities throughout the Commonwealth, together with the Director-General of the Commonwealth Department of Works. Officers of the Commonwealth Department of Shipping and Transport were also in attendance for portion of the conference.

The agenda of 61 items included the availability of bitumen supplies, traffic engineering research, certain standard specifications for materials and signs, route numbering, road-design standards, rural-road research, the selection and testing of gravels, and standard conditions of contract for road and bridge works, as well as various aspects of road statistics, and the estimation of future road financial needs. Consideration was also given to the appointment of a full-time executive engineer to assist in the work of the conference throughout the year.

Arrangements were made for the next conference of the State Road Authorities to be held in Adelaide in September, 1956, and for the various Committees of the Conference to meet as follows :—Principal Technical Committee, Perth, April, 1956 ; Bridge Design Committee, Brisbane, March, 1956 ; Materials Research Committee, Sydney, December, 1955 ; Plant and Equipment Committee, Melbourne, November, 1955 ; and Traffic Engineering Committee, Melbourne, February, 1956.

CONFERENCE OF MUNICIPAL ENGINEERS.

The 12th Conference of Municipal Engineers, convened by the Board, was held in the Auditorium at the Police Headquarters Building, Melbourne, on the 23rd and 24th May, 1956, and was once again very well attended by municipal engineers from all parts of the State.

As in previous years, the municipal engineers were invited some time prior to the Conference to submit items for inclusion in the agenda, and details of these items, with comments of the Board's officers on the points raised, were prepared and sent to all municipal engineers in advance so as to save time at the conference.

The Conference was opened by the Honorable Sir Thomas Maltby, M.L.A., Minister of Public Works, who expressed his appreciation of the manner in which local government engineers carried out their work in co-operation with the Country Roads Board and the Public Works Department. He referred to the growing responsibility of engineers, due largely to the country's increasing prosperity, and asked for State-wide support and co-operation in bringing the new Traffic Act into effect. He also stressed the present stringent financial situation, and stated that, after a good deal of world travel, he had nowhere seen greater value obtained for the ratepayers' money than in Australia.

Items dealt with on the agenda included the early priming of crushed rock, soil stabilization, the maintenance of timber bridges, precast concrete bridges, and an extension and precis of recent legislation and regulations dealing with pedestrian crossings, parking, and limited access roads. On the day following the Conference, arrangements were made for a pile-driving demonstration by officers of the Board's bridge division and an inspection of soil stabilization at Geelong.

MOTOR REGISTRATION.

Registrations effected during the year under the Motor Car Act totalled 686,483, an increase of 7½ per cent. on the registrations effected during the previous year, as compared with an increase in that year of 12½ per cent. over the total for 1953–54.

Details of registrations are set out hereunder :—

Vehicles.	Financial Year 1954–55.		Financial Year 1955–56.		Increase.	Decrease.
Private—						
New	51,894		53,660			
Secondhand—						
Re-registered	19,907		19,628			
Renewals	378,860		419,714			
		450,661		493,002	42,341	..
Commercial and Hire—						
New	10,038		11,898			
Secondhand—						
Re-registered	5,030		4,594			
Renewals	78,514		81,741			
		93,582		98,233	4,651	..
Primary Producers—						
New	4,505		4,567			
Secondhand—						
Re-registered	3,630		3,375			
Renewals	43,331		46,924			
		51,466		54,866	3,400	..
Licences under Motor Omnibus Act ..		768		736	..	32
Trailers		12,032		12,010	..	22
Traction Engines, &c.		3		4	1	..
Motor Cycles		29,150		27,632	..	1,518
Total		637,662		686,483	50,393	1,572

ACCOUNTS.

Statement of accounts for the year ended 30th June, 1956, appear in the appendix.

The following statement shows the expenditure on road construction, maintenance, &c., from moneys at the disposal of the Board in the Treasury. Other expenditure was, of course, incurred for purchase of machinery and buildings, for interest and sinking fund payments, and for administration.

—	Under Board's Supervision.			Under Council's Supervision.			Total.		
	£	s.	d.	£	s.	d.	£	s.	d.
1. State Highways—									
Construction	854,103	18	1	107	12	8	854,211	10	9
Maintenance and reconditioning	2,540,993	9	2	99,976	10	7	2,640,969	19	9
2. Main Roads—									
Construction	216,206	4	8	124,197	8	3	340,403	12	11
Maintenance and reconditioning	405,747	2	3	3,136,985	11	7	3,542,732	13	10
3. Unclassified Roads—									
Construction, reconstruction, &c.	167,748	10	6	1,306,779	10	4	1,474,528	0	10
Maintenance	36,231	8	11	384,579	11	5	420,811	0	4
4. Tourists' Roads—									
Maintenance and reconditioning	332,908	9	3	9,931	0	5	342,839	9	8
5. Forest Roads—									
Maintenance and reconditioning	106,956	8	8	37,727	13	9	144,684	2	5
6. Murray River Bridges and Punts—									
Maintenance and reconditioning	14,374	7	8	36,109	4	7	50,483	12	3
	4,675,269	19	2	5,136,394	3	7	9,811,664	2	9

In addition to the amounts shown on the statement, the following expenditure was also incurred during the year :—

	£	s.	d.
Works on behalf of the Commonwealth Government ..	44,478	16	2
Works on behalf of State Instrumentalities, &c.	773,248	9	2
Flood and Bush Fire Damage	57,950	8	7
Railway Level Crossings	141,664	8	9
A.M.P. Project, Kaniva Shire	538	16	1
Napier Street Bridge	1,073	15	9
Municipalities Forest Road Improvements	6,257	12	7
	1,025,212	7	1

ACCIDENTS TO EMPLOYEES.

During the financial year 1955–56 employees of the Board were involved in 561 accidents, and it is satisfactory to note that this number was exactly 100 fewer than in the previous financial period. The number of fatal accidents was also reduced from 8 to 4.

The general nature of the accidents, many of which were of a minor character, is summarized hereunder :—

Fatal	4
Strains and sprains	83
Fractures	20
Eye injuries	93
Bruises and lacerations	113
Burns	19
Injuries to limbs	64
Poisoned	5
Head injuries	11
Infections	36
Heart strain	2
Miscellaneous	111
	561

The Board co-operated very closely with the National Safety Council in its campaign to reduce accidents, and takes full advantage of the Council's "Safety" posters and literature.

STAFF.

Since the 1st July, 1955, the total number of officers on the Board's staff has increased from 499 to 532, made up as follows :—

	Total.
Permanent staff—338 males, 52 females	390
Temporary staff—83 males, 59 females	142
	532

Of these officers, 302 are located at the head office, Exhibition Building, 55 at the Central depot and workshops at Montague, 27 at the new offices at Drummond-street, Carlton, and 148 at the various country divisional centres.

Forty-four male officers and eighteen female officers resigned during the year, and new appointments totalling 95, comprising 66 males and 29 females, were made. Despite the increase in the total staff for the year, there is still a pressing need for competent female typists, stenographers, and machine operators, and particularly for qualified engineering officers.

STAFF CHARITIES FUND.

This fund again received substantial support from a number of members of the Board's staff by way of contributions deducted from each fortnightly pay. The total sum contributed during the year was £374 14s. 4d., an increase of approximately £24 over the normal contributions for the previous year, not including the special appeal for the New South Wales Flood Relief Fund.

A total amount of £368 10s. was contributed to 26 charities throughout the State, including various metropolitan and country hospitals, the Junior Legacy Club, the Institute for the Blind, and various appeals by or on behalf of the Returned Soldiers, Sailors and Airmen Imperial League of Australia. The usual donations on a " bulk " basis were also made to several special button-day appeals by purchasing buttons or badges for each contributor to the Fund. The balance of £128 on hand at the 30th June, 1956, will be used to meet the commitments which will arise later in the calendar year.

OFFICERS AND EMPLOYEES.

The Board again desires to place on record its sincere appreciation of the loyal and efficient service rendered by its officers and employees during a year which was in many respects an extremely difficult one. The large programme of works carried out made heavy demands upon both office and outdoor personnel, and the position was often aggravated by the frequent changes in personnel. Notwithstanding these conditions, the Board is satisfied that an excellent job was done by all concerned.

ACKNOWLEDGMENTS.

The sincere thanks of the Board are tendered to the Hon. Sir Thomas Maltby, E.D., M.L.A., for his help and interest in its work.

The Board also desires to place on record its thanks and appreciation for the co-operation and assistance of officers of Government departments, other State instrumentalities, and municipal councils, as well as the road authorities in other States. The happy co-operation between all concerned has contributed largely to the successful carrying out of the year's work.

We have the honour to be,

Sir,

Your obedient servants,

D. V. DARWIN, Chairman.

C. G. ROBERTS, Deputy Chairman.

W. H. NEVILLE, Member.

R. E. V. DONALDSON, Secretary.

COUNTRY ROADS BOARD.

STATEMENT OF RECEIPTS AND PAYMENTS FOR YEAR ENDED 30TH JUNE, 1956.

(Adjusted to nearest pound.)

—		Country Roads Board Fund.	*Commonwealth Aid Roads Act* 1954.		Loan Funds.		Total.
			Sec. 9 (2).	Sec. 9 (3).	Permanent Works.	Restoration of Flood and Bush Fire Damage.	
RECEIPTS.	£	£	£	£	£	£	£
Balances at 1st July, 1955		173,812	..	..	..	..	173,812
Motor Car Registration Fees	4,886,681						
Additional Registration Fees	462,259						
Drivers' Licence Fees ..	199,852						
Fines	180,635						
	5,729,427						
Less Cost of Collection ..	544,717						
		5,184,710	..	..	..	..	5,184,710
Municipalities Repayments—							
Permanent Works—Main Roads ..	10,123						
Maintenance—Main Roads ..	490,987						
		501,110	..	..	..	..	501,110
Advance from Public Account—Act 5978 ..		500,000	..	..	..	..	500,000
Moneys provided by *Commonwealth Aid Roads Act* 1954		..	2,531,860	1,898,715	..	..	4,430,575
Proceeds from *Commercial Goods Vehicles Act* 5931		215,786	..	..	..	..	215,786
Receipts from State Loan Funds—							
Act 3662		..	..	..	632,195	..	632,195
Act 5363		..	..	..	402,805	..	402,805
Act 5763—Flood and Bush Fire Damage ..		..	..	..	..	57,950	57,950
Fees and Fines under Country Roads Act ..		1,170	..	..	..	..	1,170
General Receipts		23,639	..	..	..	..	23,639
		6,600,227	2,531,860	1,898,715	1,035,000	57,950	12,123,752
PAYMENTS.							
Construction and Maintenance of Roads and Bridges—							
Main Roads		2,517,373	1,092,856	..	272,907	6,155	3,889,291
State Highways		1,326,633	1,406,456	..	762,093	..	3,495,182
Tourists' Roads		342,839	..	..	..	..	342,839
Forests Roads		144,684	..	..	..	..	144,684
Unclassified Roads—							
Construction and Maintenance ..		..	32,548	1,441,980	..	51,795	1,526,323
Federal Maintenance		..	..	420,811	..	..	420,811
Murray River Bridges and Punts ..		14,560	..	35,924	..	..	50,484
Traffic Line Marking		21,466	..	..	..	..	21,466
Plant Purchases		627,011	..	..	..	..	627,011
Traffic Lights		1,857	..	..	..	..	1,857
Interest and Sinking Fund Payments		745,873	..	..	..	..	745,873
Interest and Sinking Fund Payments—Great Ocean Road		1,000	..	..	..	..	1,000
Payment to Tourists Resorts Fund		72,109	..	..	..	..	72,109
General and Administrative Expenditure ..		692,942	..	..	..	..	692,942
		6,508,347	2,531,860	1,898,715	1,035,000	57,950	12,031,872
Balances at 30th June, 1956 ..		91,880	..	..	..	..	91,880

NOTES. The amount shown under *Commonwealth Aid Roads Act* 1954 Sec. 9 (2) does not include the amount expended on other works connected with transport in terms of that Act, as such expenditure is not disbursed by the Board.

Relief to Municipalities, granted under Acts 4140 and 4415, amounted in 1955-56 to £144,477.

AUDITOR-GENERAL'S CERTIFICATE.

The accounts of the Country Roads Board for the year ended 30th June, 1956, have been audited. In my opinion the above statement of Receipts and Payments fairly presents in summary form the transactions during that period.

E. A. PEVERILL,
Auditor-General.
19th February, 1957.

C. G. GRIFFITHS,
Accountant,
19th October, 1956.

COUNTRY ROADS BOARD.

Loan Liability at 30th June, 1956.

—			Main Roads.			Developmental Roads.			Total.		
	£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.
Permanent Works—												
Main Roads	6,697,747	8	2									
State Highways	4,933,371	9	6									
Tourists' Roads	55,292	10	3									
Forests Roads	1,083	18	11									
				11,687,495	6	10	..			..		
Developmental Roads	..	..	..	..			6,425,757	10	11	18,113,252	17	9
Discount and Expenses	..	..	..	197,249	19	4	241,063	5	4	438,313	4	8
Total Amount Borrowed	..	..	..	11,884,745	6	2	6,666,820	16	3	18,551,566	2	5
Less Redemption of Loans—												
Redemption Funds	..	..	..	85,219	1	1	646,386	7	4	731,605	8	5
Main Roads Sinking Fund	..	..	..	285,688	7	7	..			285,688	7	7
Developmental Roads Sinking Fund	..	..	..	..			55,083	0	2	55,083	0	2
State Loans Repayment Fund	..	..	..	999,539	1	3	..			999,539	1	3
National Debt Sinking Fund	..	..	..	1,035,186	15	11	1,437,849	0	1	2,473,035	16	0
				2,405,633	5	10	2,139,318	7	7	4,544,951	13	5
Loan Liability at 30th June, 1956	..	..	..	9,479,112	0	4	4,527,502	8	8	14,006,614	9	0

CHIEF ENGINEER'S REPORT

Country Roads Board Office,
Melbourne,
1st December, 1956.

THE CHAIRMAN,
SIR,

I have the honour to submit a report on matters of technical interest included in work carried out during the financial year 1955–56.

MECHANICAL DIVISION.

Employees.

The total average number of employees at the Central and Divisional Workshops, excluding staff, transport drivers, mechanical plant operators, storemen, painters, and divisional carpenters, was 281 compared with 267, 262, 250, 220, and 205 respectively, for the previous years. There was a slight increase of fitters in the Divisional Workshops, whilst the turnover of fitters in the Central Workshops was approximately 30 per cent.

Volume of Work.

Tables 1, 2, and 3 show work carried out by Central and Divisional Workshops and outside firms, field repairs, and Workshops jobs in 1955–56 and in the previous years :—

TABLE 1.—PLANT OVERHAULED.

Major items only, excluding bituminous plant.

Type of Plant.	Central Workshops.	Divisional Workshops.	Private Firms.	Total, 1955–56.	Total, 1954–55.	Total, 1953–54.
Crawler tractors	4	1	6	11	5	10
Wheel tractors	..	5	..	5	7	..
Front end loaders	..	12	..	12	12	40
Heavy graders	17	5	5	27	31	24
Patrol graders	..	14	..	14	..	..
Compressors	2	8	3	13	8	15
Scoops	2	..	3	5	4	5
Crushing plant	1	..	..	1	1	..
Pumps	..	32	..	32	42	..
Concrete mixers	1	1	3	5	1	..
Shovel	..	1	3	4	1	..
Totals	27	79	23	129	112	94

TABLE 2.—FITTERS SENT TO FIELD REPAIRS.

1953–54.	1954–55.	1955–56.
790	918	719

TABLE 3.—LIST OF JOBS.

Type of Job.	1953–54.	1954–55.	1955–56.
Workshops	5,164	5,316	6,054
Drummond-street Service Station	..	804	1,111
Transport	1,338	1,658	1,600

Table 1 shows some increase in plant overhauls while Table 2 probably indicates that better maintenance and inspection has reduced the number of field jobs. Table 3 shows an increase in workshop activities due largely to an increase in bituminous plant. It also shows the increased relief from minor jobs given to the Central Workshops by the Drummond-street service station.

Due to an increase in plant, and the longer spraying season resulting in less time being available for bituminous plant overhauls in the winter months, the overhaul position of other major plant is unsatisfactory because the bituminous plant is normally given the highest priority within the limited scope of the workshop and labour capacity available.

Workshops.

(*a*) *Central Workshops.*—In view of the projected move to Syndal, these workshops have only had the minimum essential maintenance attention. However, some new machine tools and plant were obtained to help cater for both present and future requirements, e.g., radial drill, universal grinder, metal spraying unit, dynamometers, spray booth, baking oven, valve seat grinder, and a small industrial cleaner.

(*b*) *Divisional Workshops.*—The capacity to deal with all classes of work has been steadily improved, and these workshops deal with all field repairs in all except the Metropolitan and Dandenong Divisions, these two being the responsibility of the Central Workshops.

Design, Manufacture, and Purchase of New Plant.

The design staff of the Division spent a considerable portion of the year improving existing machinery designs on parts standardization, some advance planning on Syndal workshop and on road signs.

The design of an 8,000-gallons mobile bitumen storage tanker was completed, and a prototype is now under construction.

The designs of a mobile cookhouse, a 20-ton capacity concrete bodied pneumatic tyred roller, a Los Angeles abrasion machine, and a pavement drilling machine are nearing completion. The design of a new type of aggregate loader is in progress.

The Division supervised the supply by contract of the following plant items:—

15 Wheeled tractors	20 Track type tractors
3 Bitumen road tankers	12 Wheeled front end loaders
1 Track type front end loader	2 Concrete mixers
7 Rotary road brooms	6 Bitumen storage tankers
5 Sludge pumps	4 Diesel road rollers
7 Bitumen sprayers	17 Roadman's cabins
2 Excavators	4 Dumpers
2 Aggregate loaders	15 Multi-wheel rollers
2 Belt spreaders	12 Heavy power graders
15 Pumps	1 Trench roller
2 O.H.T. cranes	15 Water sprayers
10 Water tanks and stands	6 Mobile offices
2 Tender trucks	4 Weigh batchers
1 Semi-trailer	6 Spreader carriers
2 Caravans	6 Patrol trucks
48 Huts	30 Lighting sets
8 Tray trucks	3 Winches
1 Mobile crane	

In addition to the above, the Division supervised the purchase of a considerable number of air tools, machine tools, and transport vehicles.

Plant.

New plant, cars, and utilities, to the value of £655,802 were purchased during the year, and while the rate of replacements has improved, it is still insufficient to make up losses and to make it possible to dispose of machines which, with the very limited repair facilities available, should have been sold. For example, the ages of some bitumen sprayer chassis and aggregate loaders are up to 14–16 years, and a number of other plant items and vehicles have also reached the end of their economical life.

Due to an increase in the volume of work, the staff of the Division was increased slightly, but is still inadequate in the drawing office and on the clerical side.

Road Signs.

The following signs were dealt with in the Paint Shop during the last financial year:—

3,467 Warning signs ..	= 5,829	metal signs covered with baked enamel
1,586 Work signs		
776 Route markers ..		
474 Arrow boards ..	= 1,658	generally all made from wood
200 Road Works in Progress boards		
71 Advance direction signs		
772 Direction boards ..		
141 Special signs		
Total number ..	7,487	

All warning signs (with the exception of the red triangle) are made from 10-gauge galvanized steel plate. All work signs are made from 20-gauge galvanized steel plate, and are all interchangeable on new style tripods. (Previously, the signs were welded to the tripod.) Advance direction boards are now being made in metal and the letters reflectorized with black "Scotchlite".

All Divisions have now been supplied with a routing machine and a set of templates and should be able to manufacture their own direction boards.

Equipment.

An applicator capable of fixing at least two hundred 2-ft. squares of "Scotchlite" per day, is in operation. Specially designed dipping tanks, spray booth, and oven have been installed, and all metal warning signs and work signs are spray painted and baked.

Silk screens have been made and are in full use for all standard signs, and this process has been found to be at least 25 times faster than normal sign writing.

Syndal Workshops.

Substantial progress has been made towards the projected establishment of the new Central Workshops and Stores buildings at Syndal. The land has been fenced, most of the major excavations have been completed, and the erection of the main workshop has been started.

TRAFFIC ENGINEERING.

Transportation Surveys.

During the year a series of transportation surveys was carried out on behalf of the Committee on Transport Economic Research set up by the Australian Transport Advisory Council.

(*a*) *Persons per Vehicle.*—A study was carried out to determine the number of persons (including the driver), travelling in passenger cars, utilities and vans up to 10-cwt. carrying capacity, and buses, both for the metropolitan area and for the remainder of the State. Observations were taken at eight checking points within the metropolitan area, and at 25 points in the country. The results of this survey are summarized in Table 4.

TABLE 4.—SUMMARY OF RESULTS OF "PERSONS PER VEHICLE" SURVEY.

Class of Vehicle.	Persons (including the driver) per Vehicle.	
	Metropolitan Area.	Country Area.
Passenger cars	1·65	2·28
Utilities and vans up to 2-tons carrying capacity	1·49	1·84
Passenger buses	20	18

TABLE 5.—SUMMARY OF RESULTS OF METROPOLITAN AREA WEIGHT SURVEYS.

Class of Vehicle and Carrying Capacity.	Trip Lengths Under 50 Miles.						Trip Lengths Over 50 Miles.					
	Outer Metropolitan.			Inner Metropolitan.			Outer Metropolitan.			Inner Metropolitan.		
	Average Load. tons cwt.	Percentage Empty.	Trip Length. miles.	Average Load. tons cwt.	Percentage Empty.	Trip Length. miles.	Average Load. tons cwt.	Percentage Empty.	Trip Length. miles.	Average Load. tons cwt.	Percentage Empty.	Trip Length. miles.
		%			%			%			%	
Commercial Vehicles 10 cwt. to 2 tons ..	0– 8	34	16	0– 8	33	14	0– 7	35	62	0–14	11	97
Commercial Vehicles 2 tons to 3 tons ..	0–15	29	17	0–15	27	12	1– 0	23	87	..	..	..
Commercial Vehicles 3 tons to 5 tons ..	1– 5	33	18	1–19	22	15	1–12	26	103	2– 4	23	84
Rigid Vehicles 5 tons and over	2– 2	35	18	3– 9	25	15	3– 8	21	97	4– 5	14	96
Articulated Vehicles up to 9 tons	3– 2	45	38	5– 3	32	14	4– 2	36	74	6–10	25	598
Articulated Vehicles 9 tons and over ..	4–13	38	26	6– 8	28	23	4–11	37	171	8–13	15	331

NOTE.—The size of sample varied for each class of vehicle, but in all cases, with the possible exception of trip lengths of over 50 miles in the inner metropolitan area, was sufficiently large to insure, with a high degree of certainty, that the results are reliable. In the inner metropolitan area it was not possible to record a large sample of vehicles with trip lengths of over 50 miles because there are only a limited number of this type of trip made.

TABLE 6.—SUMMARY OF RESULTS OF COUNTRY AREA WEIGHT SURVEYS.

Class of Vehicle and Carrying Capacity.	Results Classified According to Trip Lengths.						Results Classified According to Destination.					
	Trip Lengths Under 50 Miles.			Trip Lengths Over 50 Miles.			Interstate Vehicles.			Intrastate Vehicles.		
	Average Load. tons cwt.	Percentage Empty. %	Trip Length. miles.	Average Load. tons cwt.	Percentage Empty. %	Trip Length. miles.	Average Load. tons cwt.	Percentage Empty. %	Trip Length. miles.	Average Load. tons cwt.	Percentage Empty. %	Trip Length. miles.
Commercial Vehicles 10 cwt. to 2 tons ..	0– 4	67	22	0– 5	47	109	..	..	..	0– 5	69	35
Commercial Vehicles 2 tons to 3 tons ..	0–10	63	20	1– 4	20	125	0– 9	40	241	0–15	49	47
Commercial Vehicles 3 tons to 5 tons ..	1– 7	49	22	2– 3	18	155	1–15	20	428	1–12	41	48
Rigid Vehicles 5 tons and over	2–16	44	21	3–18	39	235	7–14	..	1,164	2–17	44	31
Articulated Vehicles up to 9 tons	4– 5	37	37	6– 9	18	487	7– 9	12	624	3–14	38	86
Articulated Vehicles 9 tons and over ..	5–11	33	37	7– 9	24	268	9–19	7	436	5– 4	38	82

NOTE.—The size of sample varied for each class of vehicle, but in all cases was sufficiently large to insure, with a high degree of certainty, that the results are reliable.

(*b*) *Weight Surveys.*—Details of truck loadings and trip lengths were ascertained at a total of seven checking points within the metropolitan area, and at 23 points in the country.

In country areas weighings were usually carried out by means of loadometers, although weighbridges were used when they were suitably located. Drivers were questioned regarding their trip lengths. In the metropolitan area it was impracticable to stop trucks and weigh them, because of the delay and hazard to traffic that would result. Instead, business reply post cards were handed to drivers, who were requested to complete them, and return them by post. The results of the weighing surveys are set out in Tables 5 and 6. Fig. 1 illustrates the business reply card used to obtain details of truck loadings and trip lengths within the metropolitan area.

COUNTRY ROADS BOARD

To the Driver or Owner,

We are compiling reliable records of what road transport does for the community.

YOUR CO-OPERATION IS REQUESTED

in answering the following questions about the trip you were making when this card was handed to you:—

1. What was the approximate weight of your load? (If empty show as zero)
   .....tons.....cwt.
2. What was the approximate length of the trip?
   .....miles.
3. What is the registered load carrying capacity of your vehicle?
   .....tons.....cwt.

This is a
TRANSPORTATION SURVEY
all information being used for
RESEARCH PURPOSES ONLY

Please mail this card as soon as possible.

☐ T ☐ S THANK YOU

Fig. 1.

Automatic Traffic Counters.

Twenty automatic traffic counters of the type developed by the Board, and described in the last Annual Report, have been built and distributed to Divisions. These are being operated by Divisional staff to carry out special traffic counts, and are lent to municipalities on request.

Permanent Automatic Count Stations.

In order to obtain details of the traffic using Victorian roads, a 12-hour count is conducted in March of each year on all State highways, and some main roads throughout the State, all other main roads and tourists' and forest roads being covered once every five years. However, a one-day count of traffic on any particular road does not always give a true indication of the traffic that it carries throughout the year, because of daily, weekly, and seasonal variations.

To obtain complete traffic records for the whole State it would be necessary to install a large number of recording traffic counters at selected points to give hourly variations for each day throughout the year.

At present permanent automatic counting stations are operating at—

Princes Highway West	..	Corio
Princes Highway West	..	Pirron Yallock
Hume Highway ..	..	Glenrowan
Maroondah Highway	..	Box Hill

and have operated at—

Princes Highway East	..	Oakleigh
Nepean Highway	..	Mordialloc.

A summary of the results obtained at several of the above stations is given in Tables 7 and 8.

TABLE 7.

Location of Station	Princes Highway East, Oakleigh.	Princes Highway East, Oakleigh.	Nepean Highway, Mordialloc.	Princes Highway West, Corio.	Maroondah Highway, Box Hill.
Period of Count	16.2.53–15.2.54.	15.2.54–14.2.55.	6.3.54–4.3.55.	25.12.54–24.12.55.	11.4.55–10.4.56.
Monday	8,371	10,377	8,726	5,397	15,706
Tuesday	8,834	10,910	7,924	4,633	14,606
Wednesday	8,396	10,372	7,742	4,485	14,370
Thursday	8,316	10,176	7,844	4,462	15,238
Friday	9,378	11,249	8,584	5,059	15,259
Saturday	8,572	10,473	10,756	5,631	16,883
Sunday	10,614	12,303	14,305	7,508	16,878
Annual average day	8,926	10,837	9,421	5,309	15,561
Annual average week day	8,659	10,617	8,164	4,804	15,036

TABLE 8.—RELATIONSHIP BETWEEN CERTAIN HIGH TRAFFIC VOLUMES AND THE ANNUAL AVERAGE DAY.

Location.	Annual Average Daily Count.	Percentage of Annual Average Daily Counts in Certain Hourly Volumes for Year.				
		Max. Hour.	10th Highest.	20th Highest.	30th Highest.	50th Highest.
Princes Highway East (1953)	8,926	15·1	13·5	13·0	12·5	11·9
Princes Highway East (1954)	10,837	13·8	12·0	11·1	10·8	10·3
Nepean Highway	9,421	23·2	19·8	18·9	17·9	16·8
Princes Highway West	5,309	30·2	22·8	21·2	20·0	17·8
Maroondah Highway	15,561	13·9	11·2	10·4	10·1	9·7

It is not, however, possible to establish similar stations throughout the State to obtain a satisfactory coverage, because of a shortage of suitable meters and of staff. In any case, on the majority of Victorian roads it is doubtful if traffic volumes are as yet such that a detailed knowledge of hourly traffic volumes is necessary. On these roads the immediate need is a more complete picture of seasonal variations so that figures obtained at the annual census may be corrected to give a more accurate annual average day.

With a view to obtaining a State-wide record of seasonal variations, semi-permanent counting stations have been established at the following locations :—

Princes Highway East	.. Nowa Nowa
Midland Highway	.. Mt. Clear
Ovens Highway ..	.. Between Wangaratta ane Tarrawingee
Calder Highway ..	.. South of Ouyen
Maroondah Highway	.. Between Alexandra and Koriella
Ocean Road ..	.. North of Lorne
Loddon Valley Highway	.. South of Serpentine
South Gippsland Highway	.. East of Welshpool
Henty Highway ..	.. South of Cavendish.

These stations are being operated for one week of each month by Divisional staff, making use of the counters mentioned in the last paragraph. Seven 24-hour counts will be obtained at each of them per month, and over a period of one year should give a good indication of seasonal trends.

Origin and Destination Surveys.

During the year a number of origin and destination surveys were carried out, mainly in connexion with intersection designs and by-pass studies.

The normal method was to record the registration numbers of all vehicles entering and leaving the study area so that vehicle paths could be traced through the area, or by variations of this method. However, in one instance it was necessary to estimate the amount of traffic that might use a proposed route along the north bank of the Yarra river through the City of Richmond, and the above method was not practicable.

In order to obtain the desired information, business reply post cards (Fig. 2) were handed to motorists as they passed selected control points, and they were requested to complete the cards, and return them by post.

COUNTRY ROADS BOARD

To help us in planning better traffic routes.

YOUR CO-OPERATION IS REQUESTED

in answering the following questions about the trip you were making when this card was handed to you :—

1. In which street and suburb did the tripstart ?

.....

2. In which street and suburb did the trip finish ?

.....

3. Please tick those of the following roads in Richmond, Burnley, and Prahran you used during the trip :

Swan-street	Burnley-street
Madden-grove	Mary-street
Alexandra-avenue	Church-street
Grange-road	Punt-road

Mailing of this card to-day will help us.

THANK YOU.

C ☐ T ☐
U ☐ B ☐

Fig. 2.

Largely due to the co-operation of the Police Department, the survey was successful, and 55 per cent. of the cards handed out were returned by post. Courtesy squad cars were invaluable as they made it possible to explain the survey to motorists well in advance of the census points, and a minimum of interference was caused to traffic.

Road Capacity Studies.

Further studies into the capacity of two-lane roads have been carried out, and are a continuation of those set out in Research Memorandum No. 12 : " Traffic Behaviour and Road Capacity Study ".

The recent set of studies aimed at determining the effect of pavement width on the practical capacity of two-land rural highways. They suggest that the practical capacity of a level tangent section of a two-lane rural highway under Victorian conditions, based on the vehicle spacing concept, and adopting a 72 per cent. level of congestion (Research Memorandum No. 12) is as set out in Table 9.

TABLE 9.—EFFECT OF PAVEMENT WIDTH ON PRACTICAL CAPACITY.

Pavement Width. (feet)	Practical Capacity. (passenger cars per hour)
26	1,160
24	920
22	770
20	670
18	600

These findings are similar to those quoted in the Highway Capacity Manual for U.S.A. conditions, and it seems that, until more detailed studies are carried out, American figures can very reasonably be applied to Victoria so far as peak traffic consisting almost entirely of passenger cars is concerned.

Radar Speed Meter.

The need often arises to measure vehicle speeds in connexion with research studies into road capacity, visibility, and geometric design standards, and as a basis for the establishment of speed limits.

Up to the present time speeds have been measured by the use of either—

(*a*) Enoscopes, which measure average vehicle speeds over a given distance, generally 176 feet, or

(*b*) Pressure contact apparatus, which measures average vehicle speeds over a much smaller distance, generally 18 feet.

Both of these methods require a certain amount of setting-up, and, in addition, at certain locations have the obvious disadvantage that motorists are aware that speed checks are being made. In order to assist in the measurement of speeds, and to ensure that unbiased results are obtained, the Board has purchased a Microwave (Radar) Speed Detector, developed by the Dominion Physical Laboratory of New Zealand.

As yet, the use of the apparatus has been limited to testing and experiment, and it is too early to comment on its general suitability for speed measurement in Victoria.

PLAN PRINTING AND REPRODUCTION.

During the year a power guillotine, a second small offset printing machine and a "Varityper" have been obtained. This has reduced the Board's dependence on private firms and has enabled work to be completed more expeditiously.

The small offset machine is now used for general printing, and the large machine is used for work requiring large multi-plates. It also enables highway record plans to be prepared, using aerial photographs. Paper is now bought in bulk relatively cheaply and cut to required size.

The "Varityper" enables copy for art work plates, pamphlets, special reports, &c., to be made within the section.

The following production figures indicate the increase in work carried out over the previous year:—

Offset machine	..	June, 1955—60,000 runs
		June, 1956—86,000 runs
Plan printing	..	June, 1955—3,600 prints
		June, 1956—5,800 prints.

Highway Record Surveys.

During the year the record surveys of two highways were completed, namely, the Midland Highway, Section 3, and the Bellarine Highway. A total length of 100 miles.

These record survey plans are compiled in the following manner:—

(*a*) Strip mosaics of the highway showing topography 600 feet each side of the pavement at an approximate scale of 300 feet to an inch, are prepared from air photos.

(*b*) A plate is then made of the mosaic on a reduced scale of 500 feet to an inch. A blue impression is taken on tin plate and overlay information indicating miles and decimals, pavement and culvert details, &c., plotted in black thereon.

(*c*) A separate plate is then made of these details.

(*d*) Prints in quantity are then produced showing all details by superimposing the black overlay plate on the sepia print of the mosaic.

The cost of preparing these plans by the above method is approximately one-third that by normal survey, means.

BITUMINOUS SURFACING.

Extent of Work.

During the season 1955–56, 1,587 miles of bituminous surfacing work was carried out. Although a much greater length of work had been proposed, the total length of work done was 55 miles less than the 1954–55 total, mainly because of the protracted spell of adverse weather experienced during what is considered to be the normal spraying season.

The percentage comparisons with the work carried out in 1954–55 are:—

Work on declared roads	..	11·8 per cent. less than 1954–55
Work on unclassified roads	..	76·9 per cent. more than 1954–55
Work for other authorities	..	25·4 per cent. less than 1954–55.
All work	.. .. ..	3·3 per cent. less than 1954–55.

Table 10 sets out the mileages of work under the different headings for 1954–55 and 1955–56 seasons. This work included the extension of the declared system by a length of 450 miles, thus increasing the total length treated to 8,571 miles, or 59 per cent. of the declared system of 14,430 miles (see Table 11).

TABLE 10.—LENGTH OF WORK CARRIED OUT IN 1954–55 AND IN 1955–56.

Type of Road and Plant Used.	Miles.	
	1954–1955.	1955–1956.
(*a*) Work on Declared Roads—		
(i) Board's plant	1,242	1,089
(ii) Municipal plant ..	25	28
	1,267	1,117
(*b*) Work on Unclassified Roads to which the Board contributes—		
(i) Board's plant	149	284
(ii) Municipal plant ..	37	45
	186	329
(*c*) Work for other authorities done by Board's plant—		
(i) Municipalities	125	96
(ii) State Instrumentalities ..	2	9
(iii) Commonwealth of Australia	62	36
	189	141
	1,642	1,587

TABLE 11.—MILEAGE OF EACH TYPE OF WORK CARRIED OUT ON DECLARED ROADS DURING 1955–56.

Type of Road and Control of Work.		Length in Miles.																				Summary of Work.	
		Nature of the Work.																					
		Initial Treatments.										Retreatments.											
												Reseals.											
												Nominal Size of the Aggregate.					Two-Application Reseal.	R.M.S.	P.M.S.	Penetration Macadam.			
Road.	Control.	Duplication and Widening.		One-Application Seal Only.		Two-Application Seal Only.		I.T. Prime and Two-Application Seal.		I.T. Prime and Seal.												State Highways.	Other Declared Roads.
		Widen.	Duplication.	E.	R.	E.	R.	E.	R.	E.	R.	¾-in.	⅝-in.	½-in.	⅜-in.	¼-in.							
State Highways	Direct ..	35·97	1·75	..	10·92	..	..	..	2·09	52·01	54·81	27·18	62·90	30·90	32·50	44·26	11·91	..	..	..		367·20	..
	Municipal	2·06	..	..	..	..	..	..	..	..	2·60	..	6·70	1·00	..	..	..	..	1·63	..		13·99	..
Main, Tourist, and Forest Roads	Direct ..	0·45	0·38	3·12	3·11	..	..	..	..	25·21	4·50	3·15	2·71	0·82	82·9	..	..	..	6·98	..		..	58·72
	Municipal	1·18	..	38·31	8·29	6·09	..	9·97	..	315·07	47·19	17·05	46·75	105·01	66·21	11·60	..	0·28	2·81	0·77		..	676·58
		39·66	2·13	41·43	22·32	6·09	..	9·97	2·09	392·29	109·10	47·38	119·06	137·73	107·00	55·86	11·91	0·28	11·42	0·77		381·19	735·30
		41·79		63·75		6·09		12·06		501·39		478·94						12·47					
		625·08										491·41										1,116·49	
		1,116·49																					

Abbreviations.—E, Extension to the Bituminous Surfaced System. R, Initial Treatment on Reconstructed length of previously sealed pavement. R.M.S., Retreatment with Roadmix. P.M.S., Retreatment with Plantmix.

NOTE.—The Table does not include 283 miles of I.T.P. and S. Extensions, 8 miles of I.T.P. and S. Reconstruction, 4 miles of I.T.P. and S. Widening and 34 miles of Retreatment on undeclared roads to which the Board contributes funds.

TABLE 13.—AVERAGE COST OF B.S.T. WORK CARRIED OUT BY C.R.B. PLANT ON ALL ROADS FOR WHICH THE BOARD PROVIDED FUNDS DURING 1955–56.

(Cost in pence per square yard.)

Item.	Nature of the Work.																			
	Initial Treatments.								Retreatments.											
									Reseals.											
									Nominal Size or Gauge of Aggregate Used.											
	Seal Only—Binder. 0·25 gal. per sq. yd.		Seal Only—Two Applications of Binder and Aggregate.		I.T., Prime and Two-Application Seal.		Prime and Seal—Primer 0·20. Seal 0·25 gal. per sq. yd.		¾-in "E".		⅝-in. "F".		½-in. "G".		⅜-in. "H".		¼-in. and Sand.		Two-Application Re-Seal.	
Square yards costed ..	1,109,925		48,396		96,936		5,933,557		509,960		1,214,371		1,288,296		989,648		535,054		126,321	
	d.	%	*d.*	%	*d.*	%	*d.*	%	*d.*	%	*d.*	%	*d.*	%	*d.*	%	*d.*	%	*d.*	%
Materials	15·5	63·0	23·4	61·7	32·3	73·6	22·9	61·6	17·3	59·9	15·6	64·4	12·2	61·6	11·5	65·7	9·4	69·7	24·3	72·5
Labour	4·8	19·5	7·7	20·3	5·6	12·8	7·9	21·2	6·3	21·8	4·7	19·4	4·2	21·2	3·2	18·3	2·3	17·0	4·5	13·4
Stores	0·6	2·4	0·9	2·4	0·8	1·8	0·9	2·4	0·7	2·4	0·5	2·1	0·5	2·5	0·4	2·3	0·3	2·2	0·5	1·5
Plant Hire	3·7	15·1	5·9	15·6	5·2	11·8	5·5	14·8	4·6	15·9	3·4	14·1	2·9	14·7	2·4	13·7	1·5	11·1	4·2	12·6
Totals ..	24·6	100	37·9	100	43·9	100	37·2	100	28·9	100	24·2	100	19·8	100	17·5	100	13·5	100	33·5	100

TABLE 12.—MILEAGE OF WORK CARRIED OUT ON UNDECLARED ROADS DURING SEASON 1955–56.

Work.	Miles.
Initial treatments—	
Extensions	283
Reconstructed lengths of previously sealed pavements	8
Widening	4
	— 295
Retreatments	34
Total	329

A length of 133 miles of initial treatment was carried out on reconstructed lengths of previously sealed pavements, which represents only 1·6 per cent. of the treated system. Of the sealed length of the Board's road system, 6 per cent. or 491 miles was retreated, representing an average life of a seal of 16 years. This is not adequate to maintain the surfaces properly. If the rate of retreatment is not substantially increased in the immediate future, valuable assets will be dissipated. Of the length retreated, it was possible to carry out only 12 miles of work which provided some correction of surface irregularity. (See Table 11). Initial treatment was glso carried out on 40 miles of widening of the existing scaled pavements, and on 2 miles of duplication of traffic lanes.

Bituminous surfacing carried out on undeclared roads, as set out in Table 12 amounted to 329 miles of work, representing an increase of 143 miles on the total carried out last season. A further length of 141 miles of work was carried out for other authorities (see Table 10).

Bituminous Plant, Equipment and Materials.

This year seven 400-gallon and fifteen 800-gallon spraying units were engaged on the work, together with fifteen 2,000-gallon road tankers and twelve 2,000-gallon mobile storage tankers required for the transport and storage of bulk bitumen.

The total quantity of bitumen used was 14,610 tons, of which 12,624 tons or 86 per cent. was supplied in bulk. Advantage was again taken to obtain from a Sydney refinery 374 tons of this latter quantity in rail tank cars at N.S.W. border stations. Bitumen supplied in bulk from a refinery near Melbourne amounted to 5,846 tons and was distributed by rail up to the limit of the availability of the supplying company's rail tank cars. The remainder of 6,404 tons of bulk bitumen was delivered in road tankers. Action is now being planned to expand the field storage facilities in order to flatten out the peak demand, and so make more use of the rail tank cars for delivery in the off season.

Cost of Work.

Table 13 sets out details of the cost of work carried out by the Board's plant during the season on all roads to which the Board contributed funds. The table indicates that the average costs of sprayed bituminous surfacings were slightly higher than for the previous season. Although the bulk handling of bitumen was further expanded, the savings, because of this, were offset by the general increases in the costs of labour, plant, and aggregate, and, to some extent, by the very wet spell experienced in the latter part of the normal bituminous surfacing season.

Aggregate.

During the past season 177,845 cubic yards of aggregate were spread by the Board's plant, this total being 841 cubic yards less than the quantity handled during the previous season. The weighted average price per cubic yard of aggregate in roadside stacks is shown in Table 14. It will be noted that the table shows clearly that the upward trend of cost of aggregate continues.

TABLE 14.—AVERAGE PRICE OF AGGREGATE FOR BITUMINOUS SURFACING AT PER CUBIC YARD IN STACKS BY THE ROADSIDE.

Material.	Price per cubic yard.					
	1950-51.	1951-52.	1952-53.	1953-54.	1954-55.	1955-56.
	s. d.	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*
Screenings ..	35 9	39 11	40 3	41 11	44 5	44 10
Gravel ..	32 0	39 2	42 4	40 10	40 4	44 1
Sand ..	22 5	21 5	21 0	17 7	23 4	20 6
Scoria ..	7 8	18 2	17 3	15 7	12 1	18 4
Average price all aggregates	34 3	39 0	39 10	40 11	42 4	43 8

MATERIALS RESEARCH.

Moisture below Sealed Pavements.

Reference was made in the Chief Engineer's annual report for 1954–55 to the method of determining the moisture content of the subgrade by means of Gypsum Blocks. Sets were installed at the 178 mile post on the Western highway near Horsham, and periodical readings of moisture potential and temperature have been made throughout the year. The results to date indicate :—

1. *Moisture.*

(*a*) Beneath centre of road.—Very little variation in moisture content occurs. To a depth of 12 inches below the pavement the subgrade remains relatively dry, with a moisture potential (P.F.) of approximately 3·7. Below this, the subgrade is saturated and the Gypsum Blocks do not record.

(*b*) Five feet left and right of centre line.—The subgrade moisture content again remains relatively constant, but much wetter than at the centre. About 3 inches below the pavement, the P.F. is about 3.

(*c*) Ten feet left and right of centre line (at the edge of the seal).—The subgrade remains saturated throughout the year.

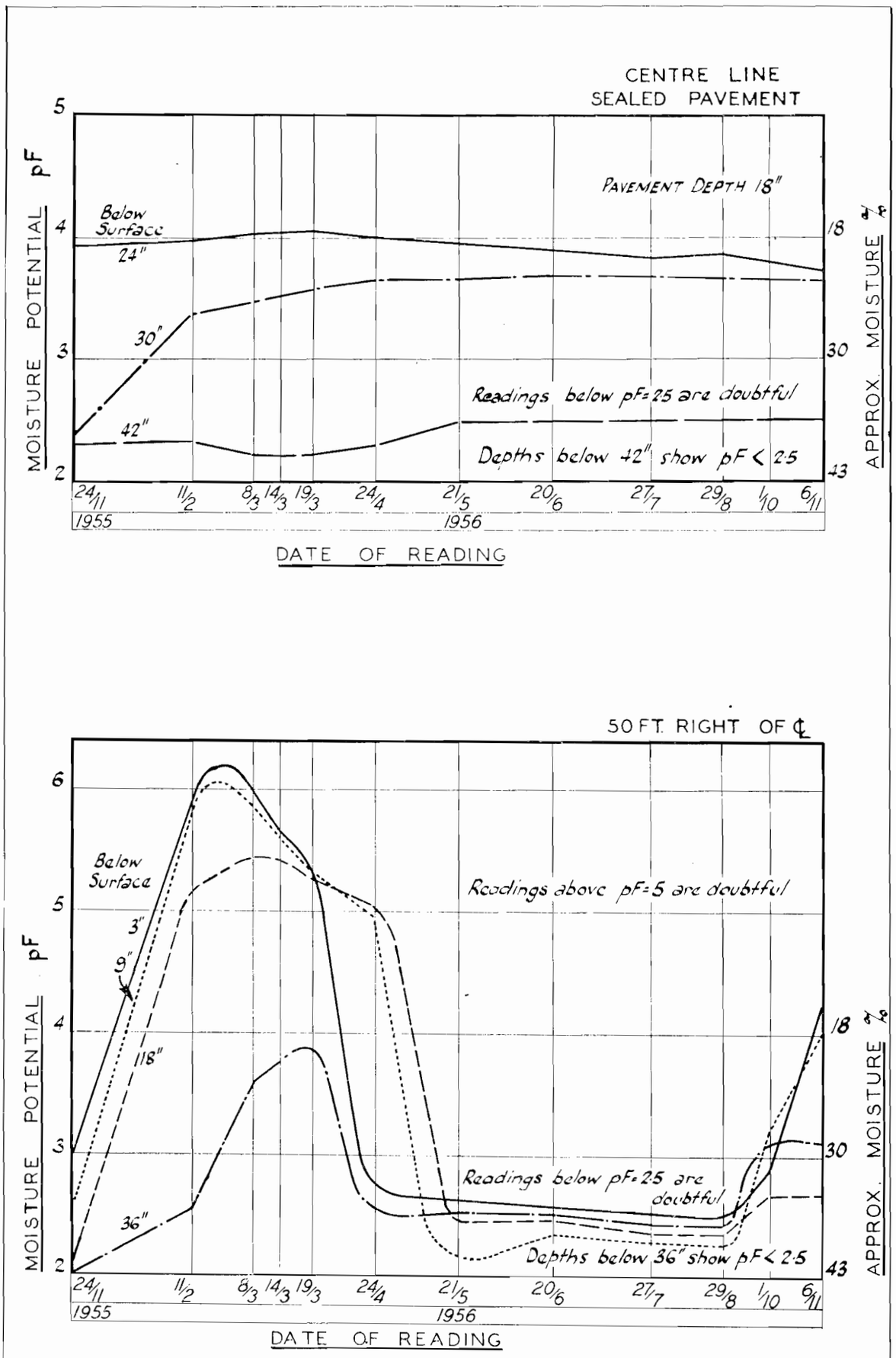
(*d*) Fifteen feet and 50 feet left and right of the centre line.—The subgrade follows the normal wetting and drying cycle to a depth of 4 feet; below this the subgrade is generally saturated.

Typical variations are shown in Fig. 3 for the centre line and 50 feet right of centre line.

2. *Temperature.*

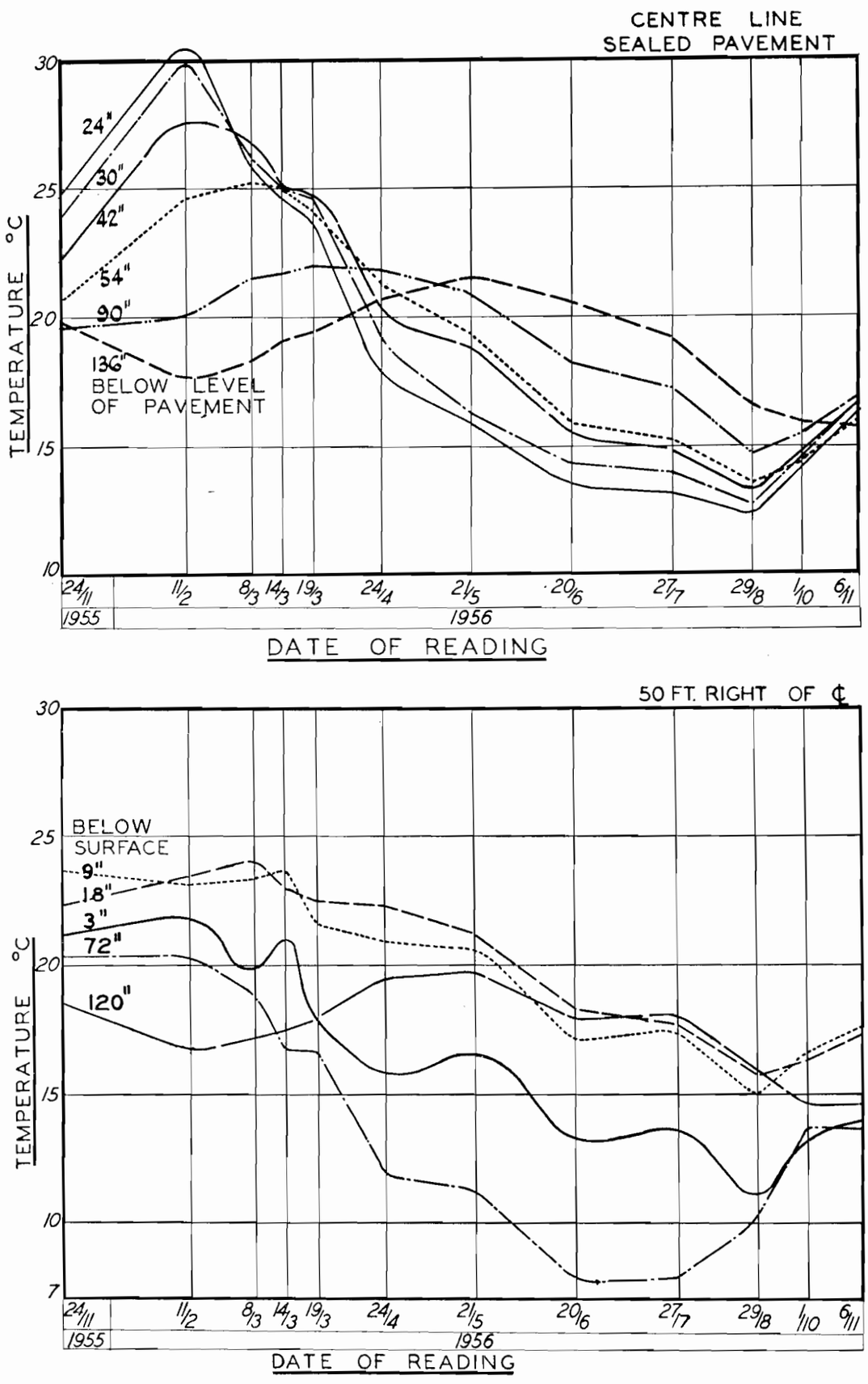
The variations in subgrade temperature for centre line and 50 feet right of centre line are shown in Fig. 4.

Generally, the temperatures beneath the sealed pavement follow a very similar pattern, showing typical summer and winter cycles, with a lag in the change of temperature with depth. Considerable variation in temperature is evident where the subgrade is not sealed.



VARIATION OF MOISTURE POTENTIAL OF SUBGRADE
WESTERN HIGHWAY 178 M

Fig. 3.



VARIATION OF TEMPERATURE
SUBGRADE - WESTERN HIGHWAY 178 M

Fig. 4.

Fig. 5.

Benkelmann Beam Pavement Deflection Indicator.

A new Benkelmann Beam Indicator has been constructed in accordance with a revised lightweight design (Highway Research Board Abstracts, September, 1954), and has been found to be exceedingly useful in assisting to determine the cause of failure of sealed pavement. Fig. 5 is a photograph of the Deflectometer in operation on the Western highway, measuring the deflection of the pavement under a known load.

Pavement Loading Testing Machine.

A unit was completed during the year and consists of a modified semi-trailer with a rear axle, four wheels in line, and arranged to be towed by any standard primer mover. The machine is supported on three jacks when a test is in progress, in order to eliminate any movement due to tyre deflection. A load of up to 20,000 lb. can be obtained by means of a three-speed rack-type jack for plate loading tests on circular plates of 100 sq. in., 500 sq. in., and 12 in.

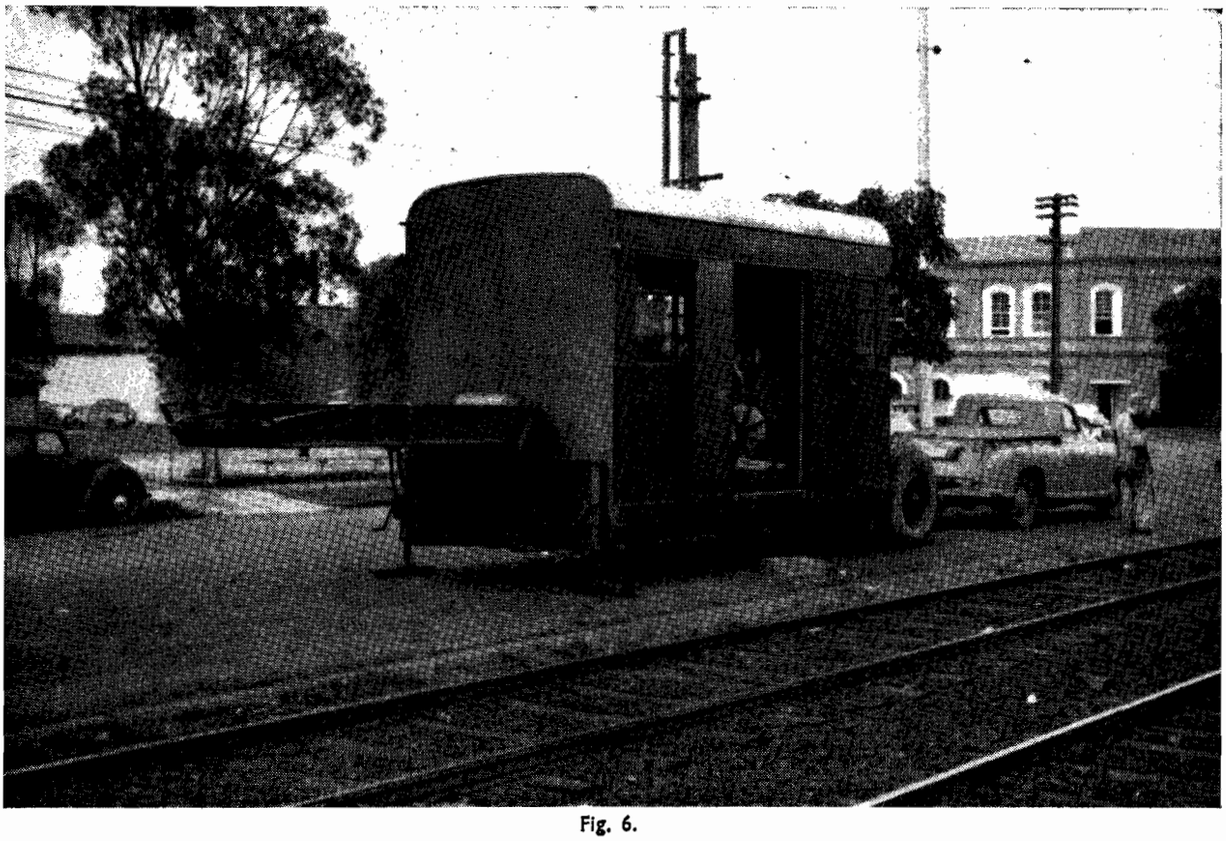


Fig. 6.

diameter, and for testing with a deep sounding cone. Measurement of the load is made by a proving ring or by a hydraulic capsule. Fig. 6 shows the unit carrying out a penetration test with a 10 sq. cm. cone to a depth of 95 ft. to investigate foundation conditions for the King Street Bridge.

Soil Stabilization.

Numerous investigations have been carried out to determine the improvement obtained by the addition of small amounts of cement and emulsion to plastic fine crushed rocks and gravels.

The procedure followed is that laid down in British Standard 1924 (1953) using the California Bearing Ratio as the criterion to determine the improvement obtained by the addition of stabilizer. Cement specimens are cured for seven days, at 68° F., and are then soaked for seven days and tested. Effects of the addition of the stabilizer on the Atterburg Tests are also determined.

From results to date it seems that considerable improvement can be made to plastic gravels and fine crushed rock. For the present, it is being assumed that if the stabilized material has a C.B.R. of 200 per cent. it should be satisfactory.

In addition to the laboratory investigations several minor experimental sections of roadway were constructed using a 5-ft. P & H stabilizer operated by a contractor.

(*a*) Stud Road, Dandenong.—From Clowes Street northerly from Dandenong for a distance of 0·54 mile to David Street, an existing layer of F.C.R., which was of 4-in. consolidated depth, was mixed with 2-in. (consolidated depth) of the underlying sandy soil and 6 per cent. of cement by volume, and for a further 300 feet northerly a top layer of 4 inches of F.C.R. was removed and replaced with natural sandy soil before a 6-in. consolidated depth of soil was stabilized by the addition of 8 per cent. cement.

(*b*) Wells Road, Chelsea.—The work consisted of adding a 6-in. consolidated depth of emulsion-stabilized sand-clay on top of a 2-in. consolidated depth of F.C.R., 26 feet wide from Thompson's Road southerly 1,000 feet. For 650 feet southerly a sand-clay mixture consisting of 20 per cent. clay (P.I. 50, passing 200 = 63 per cent.) from the Dandenong area, and 80 per cent. of local sand, was stabilized by the addition of 2 gallons of emulsion per sq. yd. On the next 350 feet of the sand-clay, consisting of a mixture of 62 per cent. of local sand, 38 per cent. of local clay (P.I. = 19; passing 200 = 21 per cent.) was stabilized by the addition of $1\frac{1}{2}$ gallons of emulsion per sq. yd.

(*c*) Beach Road, Mordialloc.—The western side of the existing pavement was widened by 10 feet for a distance of 0·43 mile, between Cromer Road and Charman Road to 9-in. consolidated depth. The work was carried out in two layers each of $4\frac{1}{2}$ inches depth, and consisted of a mixture of 62 per cent. of sand subgrade (pass 36 sieve = 80 per cent., pass 200 sieve = 14 per cent., non plastic) with 38 per cent. of Wells Road clay (Alnutts) (P.I. = 19, pass 200 = 21 per cent.), each layer being stabilized by the addition of $1\frac{1}{4}$ gallons of emulsion per sq. yd. On the northern 0·12 mile of the top course, the finished material consisted of subgrade sand stabilized by the addition of 2 gallons of emulsion per sq. yd.

(*d*) Western Highway, two sections.—17·74 to 17·84 miles, and 17·93 to 18·31 miles, the existing layer of plastic fine F.C.R. (P.I. = 12, pass No. 200 = 15 per cent.), 24 feet wide, 6 inches consolidated depth was stabilized by the addition of 3 per cent. of cement by volume.

Some difficulty was experienced with the emulsion stabilization on Wells Road owing to wet weather and aeration was necessary before the material could be compacted, but it was sealed and is now carrying traffic. Inferior fine crushed rock has been effectively stabilized with about 3 per cent. of cement, and it seems that the process will be applicable in many areas where the natural gravels obtainable are not of sufficiently good quality to be used untreated.

BRIDGES.

Design.

The most important matter was the revision and printing by the State Road Authorities of Australia of the "Highway Bridge Design Manual". Practice regarding the application of traction and braking forces, wind loadings, and combinations of loads have been more closely defined, and requirements for the use of roller and rocker bearings, arc welding, high tensile bolting, and composite design have been specified in the light of recent developments both local and overseas.

Revision of the Board's standard specifications and design standards has continued, but progress has been hampered by pressure of current work.

Precasting.

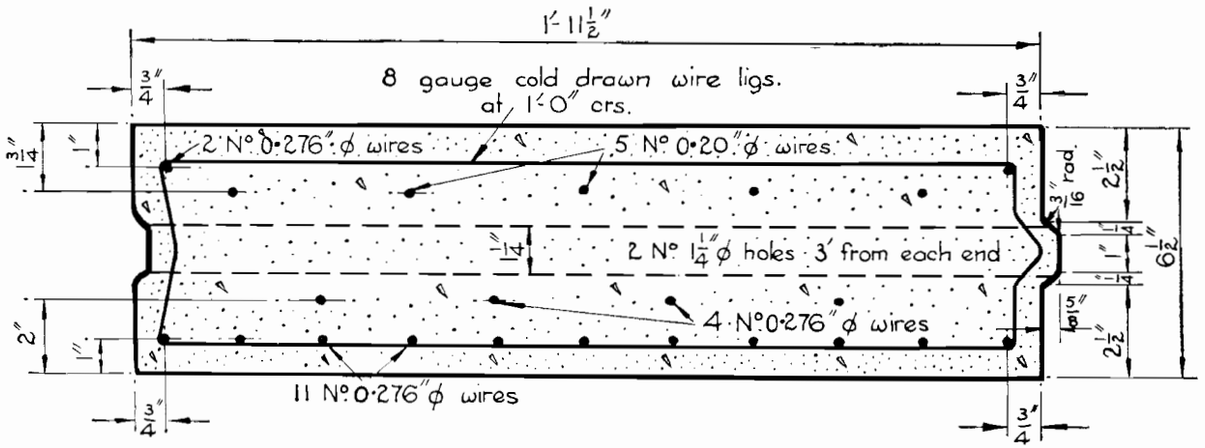
Reference was made in the 42nd Annual Report to the use of prestressed concrete slabs as deck forms for use with precast beam bridges. The width of the top flange of the precast beam stem is increased slightly to provide adequate seating for the one-inch thick slabs which carry the deck concrete. This technique has now been used successfully on the railway overpass at Clifton Hill, and the saving of time, reduction of construction cost under difficult conditions, and reduction of interference to rail traffic are very considerable

During the year data on costs obtained from various precasting depots throughout the State indicates that the cost of precast concrete units including all overhead costs varies from £25 to £51 per cubic yard including reinforcement. The factors responsible for this range include differences in types of units, variation in costs of raw materials, and differences in production and handling techniques. Steps are being taken to analyse the effect of the various factors so as to obtain maximum efficiency.

Precast Concrete Slabs.

There are many flood crossings throughout the State, which can only be eliminated by the construction of comparatively long bridges with deck level at only a very few feet above natural surface. A precast prestressed concrete unit of minimum structural depth has been developed for this purpose. This unit, spanning up to 15 feet, comprises a slab of $6\frac{1}{2}$ inches thickness and 2 feet wide, formed with tongued and grooved edges to assist in the lateral distribution of wheel loads. (See Fig. 7.) A typical arrangement in a bridge is shown in Fig. 8.

Before being adopted these units were subjected to laboratory tests at Melbourne University Engineering School to check design assumptions, construction techniques, and general behaviour. These tests showed that the distribution of wheel loads between slabs was most effective, approximately 40 per cent. of an applied load being carried by the loaded slab with the remainder distributed to adjacent slabs. When tested as a single slab, the cracking load was 1·6 times design load, and ultimate load 2·7 times design load. Failure occurred



CROSS SECTION TYPE I SLAB

NOTES :

1. H.T.S. Wire
   0·276" ϕ Initial prestress 10,000 lbs.
   0·20" ϕ Initial prestress 5,800 lbs.
2. Concrete
   28 day cylinder strength 5,000 p.s.i.
   at release cylinder strength 4,000 p.s.i.
3. Dimensions of groove as for tongue.
4. Tongue to be left off for 6' length where hole for tie bolt occurs.
5. End details similar to type II . Ref. drawing of prestressed slab bridges.

Weight : 1·09 T
Volume : 0·60 c.yd.
17 N° 0·276" ϕ wires
5 N° 0·20" ϕ wires

COUNTRY ROADS BOARD

15'-0" SPAN
PRETENSIONED SLAB CROSSING

DRAWN H.K.	CHECKED K.M.	SHEET No. 1
TRACED A.M.P.	DATE 30-11-56	

Fig. 7.

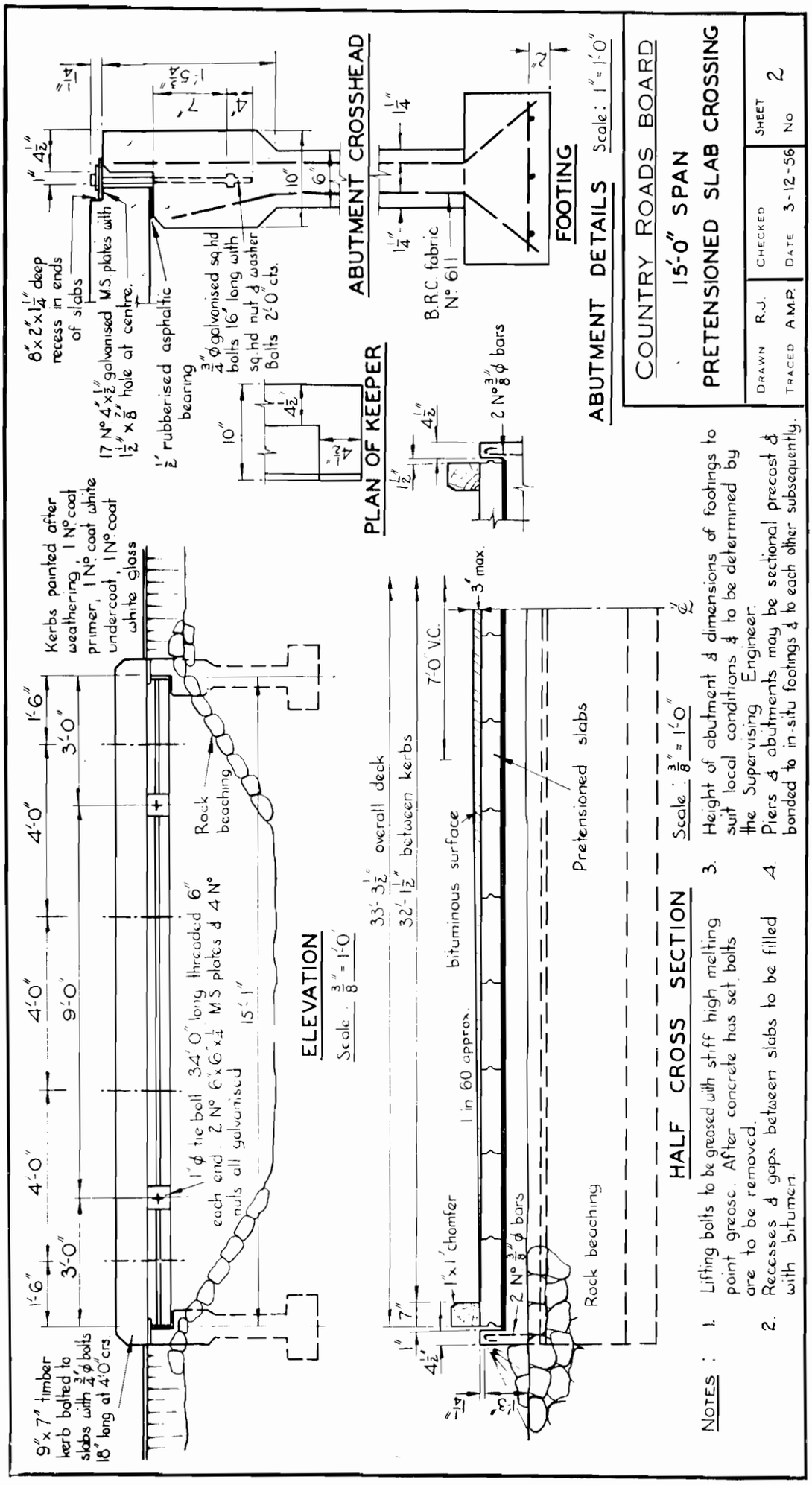
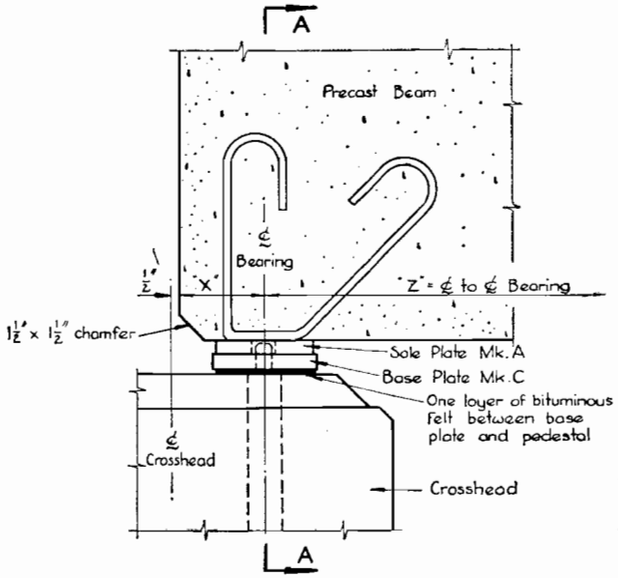
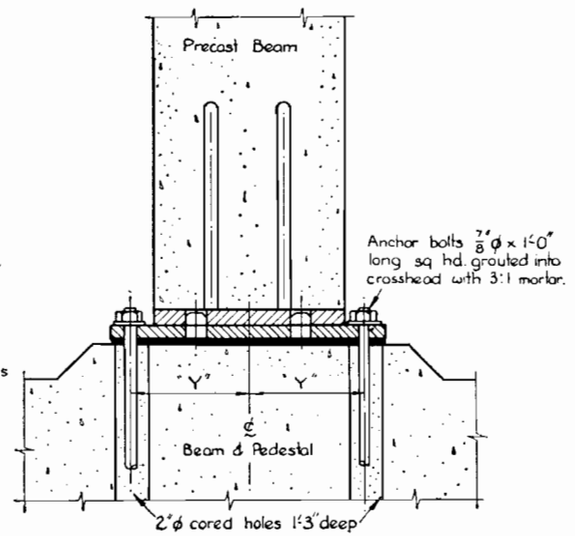

ELEVATION
Scale $\frac{3}{8}$" = 1'-0"
9"x7" timber kerb bolted to slabs with $\frac{3}{4}$"ϕ bolts 18" long at 4'0" crs.
1'-6"
4'-0"
4'-0"
4'-0"
1'-6"
3'-0"
9'-0"
3'-0"
1" ϕ tie bolt 34'0" long threaded 6" each end. 2 No 6"x6"x$\frac{1}{4}$ MS plates & 4 No nuts all galvanised
15'1"
Rock beaching
Kerbs painted after weathering, 1 No coat primer, 1 No coat undercoat, 1 No coat white glass
PLAN OF KEEPER
17 No 4"x$\frac{1}{2}$" galvanised MS plates with $1\frac{1}{2}$"x$\frac{7}{8}$" hole at centre.
$\frac{1}{2}$" rubberised asphaltic bearing
$\frac{3}{4}$"ϕ galvanised sq hd bolts 16" long with sq hd nut & washer
Bolts 2'0" crs.
10"
6"
8"x2"x$1\frac{1}{4}$" deep recess in ends of slabs
ABUTMENT CROSSHEAD
B.R.C. fabric No 611
FOOTING
2 No $\frac{3}{8}$"ϕ bars
ABUTMENT DETAILS
Scale: 1"=1'-0"
HALF CROSS SECTION
Scale: $\frac{3}{8}$" = 1'-0"
33'-3$\frac{1}{2}$" overall deck
32'-1$\frac{1}{2}$" between kerbs
7'-0" V.C.
bituminous surface
1 in 60 approx.
3' max.
1"x1' chamfer
2 No $\frac{3}{8}$"ϕ bars
Rock beaching
Pretensioned slabs
COUNTRY ROADS BOARD
15'-0" SPAN
PRETENSIONED SLAB CROSSING
DRAWN R.J.
TRACED A.M.P.
CHECKED
DATE 3-12-56
SHEET No 2
NOTES :
1. Lifting bolts to be greased with stiff high melting point grease. After concrete has set bolts are to be removed.
2. Recesses & gaps between slabs to be filled with bitumen
3. Height of abutment & dimensions of footings to suit local conditions & to be determined by the Supervising Engineer.
4. Piers & abutments may be sectional precast & bonded to in-situ footings & to each other subsequently.

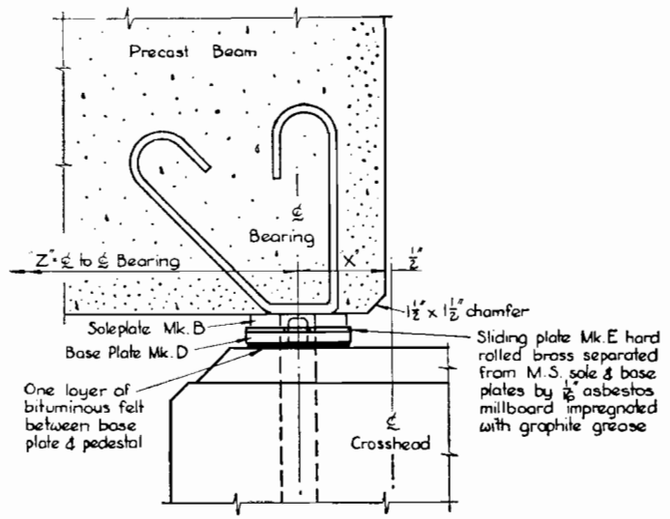
Fig. 8.



FIXED END BEARING



SECTION A-A



EXPANSION END BEARING

Length of Beam	Sole Plates Mk A, B	Base Plate Mk.C	Base Plate Mk. D	Sliding Plate Mk. E	Dimensions "X"	Dimensions "Y"	Dimensions "Z"	Weight lbs.
22'-6"	5" x ¾" x 9"	5½" x 1" x 1'-2½"	5½" x ¾" x 1'-2½"	5½" x 9"	5½"	6"	21'-6" ± ⅛"	79·1
30'-0"	5" x ¾" x 10½"	5½" x 1" x 1'-4"	5½" x ¾" x 1'-4"	5½" x 10½"	5½"	6¾"	29'-0" ± ⅛"	87·9
35'-0"	5½" x ¾" x 10½"	6" x 1" x 1'-4"	6" x ¾" x 1'-4"	6" x 10½"	5¼"	6¾"	34'-0½" ± ⅛"	95·2
40'-0"	5½" x ¾" x 11½"	6" x 1" x 1'-5"	6" x ¾" x 1'-5"	6" x 11½"	5¼"	7¼"	39'-0½" ± ⅛"	101·6

NOTES :

1. Sole plates Mk.A & Mk.B shall be levelled & securely held in the form to ensure that the bearing surfaces are coplanar.
2. Pintel holes in sole plates Mk.A & Mk.B should be plugged or covered to prevent the ingress of concrete.
3. Sole plates shall be placed in the forms and held so that the centre to centre spacing between soleplates does not vary from the specified spacing by more than ⅛".
4. The upper surface of pedestals shall be finished smooth and level and at the correct elevation
5. Weights given in the table include sole plates, base plates sliding plates and anchor bolts complete for one beam.
6. Base plates & sliding plates shall be assembled as specified above and tack welded to the sole plates in exact position before the precast beams are despatched from the precasting yard.

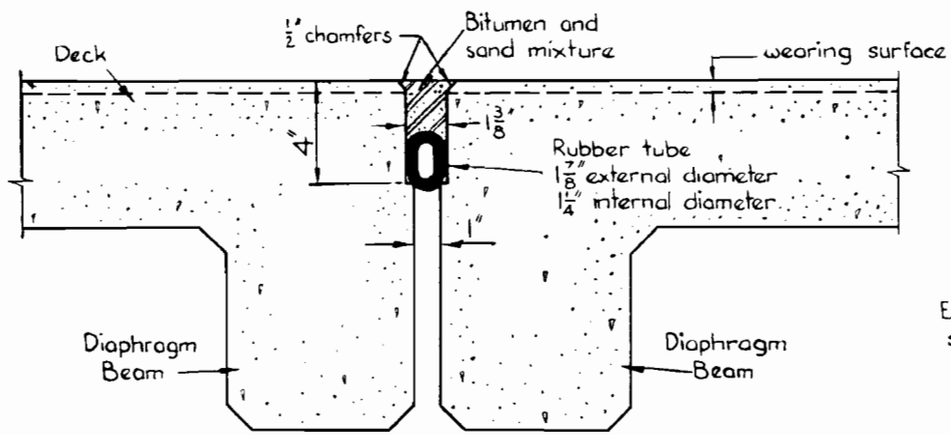
COUNTRY ROADS BOARD

END BEARING DETAILS FOR PRECAST BEAMS

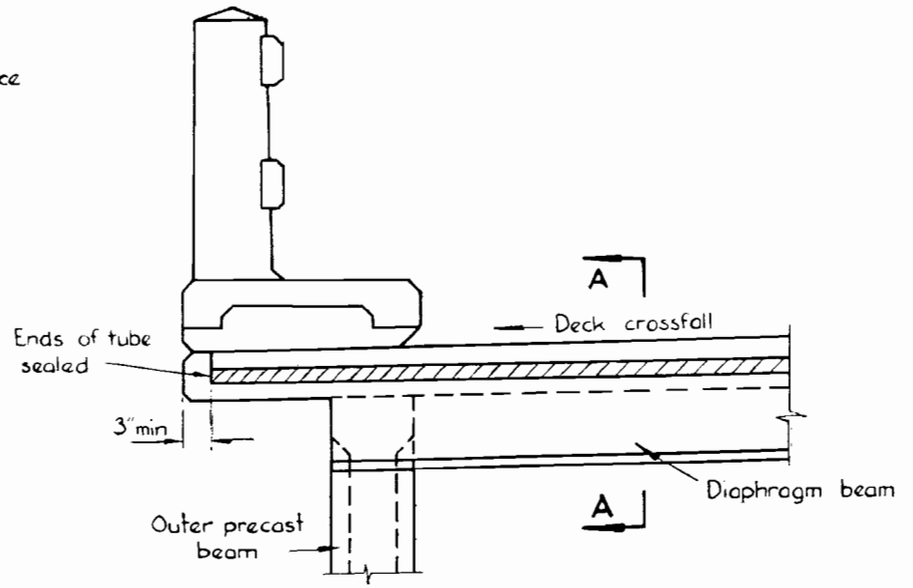
THREE SPANS & OVER

DRAWN K.M.	CHECKED	REF.
TRACED A.M.P.	DATE 19 8 55	NO. 14/55

Fig. 9.



SECTION A-A



LONGITUDINAL SECTION OF EXPANSION JOINT

NOTES :

1. Rubber tube will be supplied by the Board in the required lengths with the ends sealed.
2. Expansion gap in the deck is to be formed with shoulders as shown to retain the tubing.
3. Tube is to be placed by the contractor and the joint sealed with sand and bitumen filler.

COUNTRY ROADS BOARD

PRECAST BEAM BRIDGES

DECK EXPANSION JOINT

DRAWN TAW	CHECKED K.M.	REF No 64/55
TRACED A.M.P.	DATE 23-11-55	

Fig. 10.

by yielding of the reinforcement followed by crushing of the concrete in compression. No difficulty was experienced with bond and shear effects.

Expansion Details.

The design of economical and satisfactory expansion joints is a difficult problem of bridge engineering, but during the year bearing plate details for precast beam bridges were developed, which are expected to prove satisfactory. Also, a deck expansion joint suitable for a bridge of length up to 80 feet, utilizing a synthetic rubber tube was also designed. (See Fig. 9 and Fig. 10.)

Construction.

Considerable effort has been expended over the past years in the improvement of the technique of producing quality concrete. Progress in this direction, particularly for the small jobs which comprise the bulk of the Board's work, has been made by the purchase of swing weigh batchers (Fig. 11). In addition to the improvement in concrete quality, the reduction in manpower required for batching is of considerable importance, particularly in isolated districts. There is also a reduction in cost.

Fig. 11.

PLANS AND SURVEYS.

Eildon and Hume Reservoir Projects.

The design of deviations of State highways and other roads made necessary by these two major projects has absorbed a considerable amount of the time and energy of both survey and design personnel in this Division over the past four or five years. The work involved in both projects has been of a complicated nature, often involving detailed investigation of wide strips of territory on the lengths affected to ensure that the most economical design were obtained.

In addition to the considerable mileage of State highways and main roads involved in these projects, many miles of unclassified roads have been designed by this Division on behalf of municipalities whose design staff was not adequate to undertake the work.

The work of this Division on these projects is now well towards completion, and the transfer of survey and design staff on to ordinary work should enable better progress to be made with the Board's own programme.

State Road Authorities of Australia Policies on Road Design.

The Conference of State Road Authorities of Australia has recently published " A Policy for Geometric Design of Rural Roads " and this should materially assist to produce uniform design conditions, and more recently the Conference decided that a sub-committee of representatives of Victoria and New South Wales should commence preparation of a similar document dealing with the design of urban roads. The Board's staff has devoted much detailed attention to this project.

STAFF.

The engineering staff continued to give loyal service to the Board under conditions which at times are difficult owing to the fact that there are not sufficient members to provide the detailed supervision which is necessary.

In addition to the usual work with professional organizations, senior staff served on the following committees of the Standards Association of Australia :—

(1) Road Signs and Traffic Signals Sectional Committee ;

(2) Paint and Varnish Sectional Committee ; Victorian Panel on Priming, Undercoating, and Finishing Paints ; Victorian Panel on Testing ;

(3) Road Making Materials Sectional Committee ; Sub-Committee on Bitumen ; Drainage Pipes ; Concrete in Buildings.

Senior staff also served on committees of the National Safety Council of Australia, and on the Government appointed Speed Limit Signs Committee.

During the year a number of the staff presented short papers to the 12th Conference of Municipal Engineers, which was held on the 23rd and 24th of May. Details of these are as follows :—

Paper.	Author.
" The Design of Stronger Culverts in view of Higher Fills on Modern Highways "	I. J. O'Donnell, O.B.E., E.D., B.C.E., A.M.I.E.(Aust.)
" Early Priming of Fine Crushed Rock " ; " Prevention of Corrugations in Two-Application Sealing "	C. C. Perrin, C.E., A.M.I.E. (Aust.)
" Soil Stabilisation by P & H Machine " ; " Location and Use of Direction and Warning Signs "	J. D. Thorpe, C.E., A.M.I.E. (Aust.)
" The Maintenance of Sealed Pavements "	H. P. Wood, C.E., A.M.I.E. (Aust.)
" Bridge Maintenance for Shire and Municipal Engineers "	C. A. Masterton, M.C.E., C.E., A.M.I.E.(Aust.)

During the year, the *Road Traffic Act* 1956 came into operation and required the Board to nominate an officer experienced in traffic engineering to be a member of the Traffic Commission which was constituted by that Act.

The Board nominated Mr. J. D. Thorpe, C.E., A.M.I.E. (Aust.), the Assistant Highways Engineer, and this nomination was approved by the Governor-in-Council. Mr. Thorpe was subsequently appointed Chairman of the Commission.

Engineering Circulars.

The following Technical Bulletins and Engineering Notes were issued during the year :—

No.	Title.	Date of Issue.
	Technical Bulletins.	
11	Initial Bituminous Surface Treatment during Winter Months	July, 1955
12	Treatment of Railway Level Crossings	August, 1955
13	Estimation of Future Traffic ..	May, 1956
	Engineering Notes.	
54	Road Signs—Interim Specifications for Retro-reflecting Materials for Road Signs and Vehicles, and for Retro-reflectors for Road Signs and Vehicles	July, 1955
55	Methods of Handling Materials to Reduce Segregation	July, 1955
56	Rules for the Arrangement of Destinations on Advance Direction Signs	August, 1955
57	Guide Posts on Bridge Approaches	August, 1955
58	Avoiding Segregation of Crushed Sandstone Loaded into Trucks from Conveyor Belts	November, 1955
58A	Loading Trucks from the " Goodwin " Goliath Crusher	February, 1956

J. MATHIESON,
Chief Engineer.

By Authority: W. M. HOUSTON, Government Printer, Melbourne.