1949.

VICTORIA.

COUNTRY ROADS BOARD.

THIRTY-SIXTH ANNUAL REPORT

FOR YEAR ENDED 30TH JUNE, 1949.

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

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COUNTRY ROADS BOARD.

THIRTY-SIXTH ANNUAL REPORT.

Exhibition Building,
Carlton, N. 3,
1st November, 1949

The Honorable J. A. Kennedy, M.L.C.,
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 (No. 3662), the Board has the honour to submit to you, for presentation to Parliament, the report of its proceedings for the year ended 30th June, 1949.

FINANCE.

During the year the receipts from motor registration fees and fines paid into the Country Roads Board Fund amounted to £2,322,224 compared with £2,133,684 during the preceding year, an increase of £188,540. The cost of collection and refunds totalled £188,507 leaving a net revenue of £2,133,717.

An amount of £853,971 received under the provisions of Section 6 (1) of the *Commonwealth Aid Roads and Works Act* 1947 was available for construction, reconstruction, maintenance, and repair of roads, with the exception of one-sixth of that amount (£142,328) which was allotted for expenditure on other works connected with transport.

In addition the sum of £348,000 was made available in accordance with Section 6 (4) of the same Act for expenditure upon the construction, reconstruction, maintenance and repair of roads through sparsely populated areas, timber country and rural areas.

The total gross receipts credited to the Country Roads Board Fund, and the amounts received under the *Commonwealth Aid Roads and Works Act* 1947, amounted to £3,381,867 for the year. During the financial year 1947–48, the total corresponding receipts amounted to £3,001,692.

From the loan authorization of £500,000 for the construction and reconstruction of metropolitan roads and bridges, passed by Parliament under Acts 4188, 4414 and 4498, £37,768 was expended during the year. A balance of £83,817 remained at 30th June, 1949.

COUNTRY ROADS BOARD FUND.

The total amount allocated for reconditioning and maintenance work on main roads, State highways, tourists' roads, forest roads and Murray River bridges during the year 1948–49, was £1,393,276.

The amount standing to the credit of the Country Roads Board Fund at the 30th June, 1949, was £440,833 which covers commitments in respect of expenditure incurred by municipalities but not claimed at that date, and liabilities entered into on account of works commenced, but not completed.

Commonwealth Aid Roads and Works Act, 1947.

The following amounts were expended on roads and bridges during the year from balances available under the Federal-aid Roads and Works Agreement 1937 and provision from the *Commonwealth Aid Roads and Works Act* 1947.

	£
Maintenance of classified roads to assist Municipalities	842,345
Construction of roads of a developmental character	342,594
Restoration and rebuilding of bridges on unclassified roads ..	24,570
Assistance on construction of soldier settlement roads	14,578
Construction, reconstruction and maintenance of school bus routes ..	8,552
Isolated settlers' roads	19,438
Flood damage repair	7,422
Removal of drift sand, bush fire restoration works, &c.	76
Provision towards maintenance of roads previously constructed with moneys provided by the State and the Commonwealth ..	41,243
Total	1,300,818

For the maintenance and repair of public roads adjoining or of approach to property of the Commonwealth within the State of Victoria an amount of £5,790 was available under the terms of the Federal-aid Roads and Works Agreement, which amount had been committed from the previous year. The expenditure was £3,247.

At the 30th June, 1949, credit balances shown in the Commonwealth Aid Roads and Works Account were £360,404 under Section 6 (1) and £181,070 under Section 6 (4). These amounts were covered by expenditure incurred but not reimbursed or works for which provision had been made.

Balances at End of Year.

The following table shows balances and accumulations of and expenditure from reserve funds during the last thirteen financial years :—

FLUCTUATIONS IN EXPENDITURE FROM REVENUE AND LOAN FUNDS 1938 TO 1949.

—	Revenue.	Balance Brought Forward.	Loan Fund.	Total.	Expenditure.	Balance Carried Forward.
	£	£	£	£	£	£
1938–39..	2,579,703	145,238	57,866	2,782,807	2,681,173	101,634
1939–40..	2,645,841	101,634	2,235	2,749,710	2,649,184	100,526
1940–41..	2,409,930	100,526	575	2,511,031	2,186,349	324,682
1941–42..	1,972,814	324,682	..	2,297,496	1,503,339	794,157
1942–43..	1,626,397	794,157	..	2,420,554	1,302,548	1,118,006
1943–44..	1,736,257	1,118,006	..	2,854,263	1,362,324	1,491,939
1944–45..	1,864,109	1,491,939	..	3,356,048	1,509,865	1,846,183
1945–46..	2,227,706	1,846,183	..	4,073,889	1,903,228	2,170,661
1946–47..	2,709,508	2,170,661	9,979	3,890,148	2,871,834	2,018,314
1947-48..	2,891,158	2,018,314	15,178	4,924,650	4,121,447	803,203
1948–49..	3,396,622	803,203	407,304A	4,607,129	3,655,013B	952,116C

A. £369,535 Act No. 5363. £37,769 Act No. 3662.

B. Owing to the depletion of reserves and (with rising costs) increased risk of over-expenditure, it became necessary to reduce considerably the rate of expenditure during 1948–49.

C. Includes £369,535 expenditure transferred to loan account in June, 1949, and £582,581 representing commitments on contracts, &c., and amounts approved for expenditure by Councils.

At first sight it may appear that the rate of utilization of reserves of revenue funds has been unduly diminished during 1948–49 as compared with the previous two years or with typical pre-war years. However, as referred to elsewhere, provision was made near the end of the year for the expenditure of loan moneys on permanent improvement works on State highways, tourists' roads and forest roads, such moneys to be available as from the 1st July, 1948, which permitted £369,535 to be treated as loan expenditure instead of being charged against the Country Roads Board Fund, as had been planned at the beginning of the year. The legislation authorizing this action was passed late in the year, so that it was not possible to authorize new works and to expend before the 30th June the money thus released. The transfer to loan funds of the expenditure actually incurred has correspondingly increased the balance of revenue funds available for allocation in the new financial year.

For a number of reasons, and especially in view of rapidly rising costs of road and bridge works, some lessening in rate of expenditure was in fact necessary during the year to obviate the very real risk of expenditure exceeding available revenue. In some cases allocations made in the previous financial year, but not committed at 30th June, 1948, could not be "re-voted" or had to be considerably reduced by making a partial "re-vote". Assistance to municipalities on new works of a developmental character or in maintenance of older works was confined to exceptionally urgent items. Even on roads where there are statutory obligations regarding maintenance, allocations were much less than amounts applied for by municipal councils or (on works directly supervised by the Board) by its own engineers. The position was set out in an explanatory memorandum addressed to all municipal councils by the Minister of Public Works. Some particulars of the steep rise in costs are given in the following table :—

RISING COSTS—1939-1949.

—	1938-39.	1947-48.	1948-49.	Percentage Increase to—	
				1947-48.	1948-49.
	d.	*d.*	*d.*		
Labour cost per square yard for initial bituminous surface treatment	1·33	3·02	3·51	126	163
	s. d.	*s. d.*	*s. d.*		
Average cost of mineral covering aggregate (screenings, &c.), per cubic yard	12 10	24 10	29 2	93	127
Cost of typical concrete bridges per square foot ..	20 0	42 0	46 0	110	130
Cost of typical timber and steel bridges per square foot ..	12 0	29 0	34 0	141	183

Provision of Loan Moneys.

The Country Roads (Financial) Act 1949 which was passed by Parliament in May, 1949, authorized the raising over a period of five years from the 1st July, 1948, of additional loan moneys to the extent of £5,000,000 for the carrying out of permanent works on State highways, tourists' roads and forest roads. It is provided that, as is already the case for maintenance works on the same class of roads, the works shall be carried out without contribution by municipalities. Moreover, the full amount of interest and sinking fund will be charged to the Country Roads Board Fund.

In view of the fact that the State had assumed full responsibility for the maintenance of State Highways, tourists' roads and forest roads, it was considered equitable that the same condition should apply to permanent works on such roads.

Owing to the accumulation of work to be undertaken a very long period would have elapsed before many important works could have been put in hand, had it been necessary to rely entirely on annual revenue and Commonwealth aid funds. In addition, it is now possible to utilize the whole of the latter funds for the assistance of the municipalities in the maintenance of main roads, as well as the construction and maintenance of roads of a developmental character.

As only a short period of the financial year remained after the Act had been passed an extensive programme of fresh construction works could not be put in hand with the loan moneys, but, as mentioned earlier, completed improvements to the value of £369,535 were financed by transferring the expenditure to the new loan account, and a limited programme of urgent new works was authorized to be commenced in the closing weeks of the year.

MAIN ROADS.

An amount of £1,529,930 was allocated during the year for the maintenance, improvement and reconditioning of 9,734 miles of declared roads. The amount expended was £1,087,120 and commitments amounting to £282,652 were outstanding at the end of the year. Provision of £1,065,353 was made from the Country Roads Board Fund and £464,577 from moneys available under the Commonwealth Aid Roads and Works Act.

The length of reseals for the twelve months extended over 315·79 miles, whilst new seals on sections previously sealed, but which required reconstruction, comprised 49·76 miles. New seals, being extensions of the bituminous surface treatment system, totalled 102·53 miles. The total of the lengths dealt with was 468·08 miles, being a decrease of 107·35 miles on the previous year.

New bridge projects initiated totalled 19, and the reconstruction of 4 existing bridges was completed, the total cost of the projects being £21,683.

In the apportionment of main road maintenance expenditure of the previous financial year in accordance with the provisions of the Country Roads Act, municipal contributions were reduced below one-third of the total cost in the case of declared main roads carrying traffic not of local origin or timber traffic. Assistance given in this way amounted to £74,660 for the year, which resulted in the total municipal contributions being reduced to approximately 25 per cent. of the total cost.

Under Act No. 4415, relief to the extent of £210,578 was granted to municipalities on account of interest and sinking fund payments in respect of main roads and developmental roads for the year.

Among the more important works directly supervised by the Board's staff were the following :—

Bellarine Shire.

Portarlington–Queenscliff Road.—Re-sheeting with gravel of 4 miles.

Wallington–Ocean Grove Road.—Reconstruction and sealing of additional 2½ miles including a deviation at Fenwick where reverse 90° bends were replaced by easy curves of reasonable speed value.

Orbost Shire.

Cann Valley Road.—Reconstruction, priming and sealing of 4 miles between Cann River township and Noorinbee.

Warracknabeal Shire.

Birchip–Warracknabeal Road.—Reconstruction of one mile.

STATE HIGHWAYS.

The principal works undertaken during the year consisted of the following :—

Bass Highway.—Reconstruction, strengthening and sealing of 3 miles of thinly sanded formation between Glen Forbes and Bass Township. It had become quite impossible for the Shire Council to maintain this section of old road satisfactorily under the greatly intensified traffic using it.

Borung Highway.—Commencement of stage construction between Warracknabeal and Litchfield consisting of 3·7 miles with a base course of 3 inches. A long length of this highway is merely formed and becomes badly rutted in winter.

Calder Highway.—Reconstruction of weak rough section including improvement of sharp vertical curves, rubbling and sealing 7·75 miles near Nowingi. Re-alignment and re-sheeting of weak limestone pavement between Mittyack and Nunga over a length of 6 miles. Reconstruction and sealing of one mile through the township of Red Cliffs. Reconstruction, realignment and sealing of ·7 mile through the township of Merbein.

Henty Highway.—Application of bituminous primer seal to 11·61 miles between Heywood and Myamyn. Reconstruction with gravel of 5·36 miles between Milltown and Myamyn. Extension of sealing by 9·39 miles northerly from Dooen. Realignment and widening of 1·17 miles at the south approach to the township of Hopetoun.

Loddon Valley Highway.—Completion of strengthening with sand clay of 13 miles between Campbell's Forest and Serpentine. Strengthening preparatory to sealing of 8 miles between Serpentine and Durham Ox.

Midland Highway.—Reconditioning and sealing of 6 miles of narrow old pavement between Byrneside and Mooroopna, subject to dense traffic including cartage of fruit to canneries.

Murray Valley Highway.—Completion of heavy reconstruction of 1·5 miles near Mount Alfred. Initial treatment bitumen surfacing including surface preparation of 4·51 miles east of Yarrawonga and 1·71 miles west of Yarrawonga. Completion of reconstruction including strengthening of pavement on 5·88 miles west of Yarrawonga. Reconstruction and strengthening and initial treatment bitumen surfacing of 1·02 miles between Wodonga and Huon. Re-sheeting 7·2 miles of thinly sanded formation between Cobram and Strathmerton, formation 30 feet wide, pavement 20 feet wide, thickness 7 inches approximately (old and new pavement). Re-sheeting in sand clay 4·74 miles between McCoys bridge and Wyuna West. Strengthening and re-alignment of 11·82

miles and sealing of 16·62 miles between Echuca and Kerang. This road had been lightly constructed and sealed from 1930 to 1935 and had failed entirely under present traffic. As a temporary measure 8 miles of old sealed road which had also failed were sheeted with limestone. Re-sheeting of 8½ miles between Nyah and Lake Powell.

Northern Highway.—Reconstruction in gravel of ·7 mile north and south of Kilmore Creek bridge. Widening, re-sheeting with granitic sand and sealing of 7¼ miles of very rough road between Moranding and Pyalong. Construction of twin cell 5 feet by 5 feet reinforced concrete culvert 30 feet between kerbs, at the junction of the Northern Highway and the Warriwitue forest road south of Heathcote.

North-Western Highway.—Construction of 1·6 miles and re-sheeting of 1·3 miles near Redbank. Reconstruction and sealing of 2·2 miles near Buloke, thus extending the sealing west from Donald. Reconstruction of 2 miles near Cope Cope which had failed.

Omeo Highway.—Re-sheeting of 25 miles of worn gravel pavement between Tambo Crossing and Swifts Creek. There is increased timber traffic on this section due to establishment of large saw mills at Swifts Creek. Light re-sheeting of 7 miles north of Glen Wills. Widening of curves and light re-sheeting between Razorback and Lightning Creek.

Ovens Highway.—Completion of reconstruction of 6·5 miles between Tarrawingee and Everton. Construction of 3 cell reinforced concrete culvert near Everton.

Princes Highway East.—Reconstruction of 16,000 feet of narrow formation between Cabbage Tree and Bellbird. (Plate No. 1.) Priming and sealing of 2,300 feet in the township of Cann River.

Plate No. 1. Reconstruction of Princes Highway East near Cabbage Tree.

Princes Highway West.—Reconstruction with scoria and sealing 2·88 miles between Dennington and Illowa. Reconstruction of failed sections in two cuttings to improve visibility over the sharp crests—length 600 feet and 800 feet respectively—5 miles east of Winchelsea.

South Gippsland Highway.—Completion of reconstruction and sealing of 1 mile which had failed at Lang Lang. Reconstruction of section subject to flooding between main canal and Rossiter Road, Kooweerup. Re-sheeting of 5 miles of gravel pavement near the boundary between the Alberton and Rosedale Shires.

Sturt Highway.—Preparatory strengthening 2 miles with limestone.

Western Highway.—Widening existing 18 feet sealed pavement to 22 feet and re-sheeting including realignment and regrading of curves in sections which had failed under heavy traffic between 90·11 and 93·75 east of Trawalla—total length 2·78 miles. Reconstruction by widening and re-sheeting of 8·79 miles of weak plastic limestone sections between Dimboola and the South Australian border. Widening of pavement through township of Kaniva from 19 feet to 30 feet. Construction of rigid frame concrete bridge at Hurley's near Great Western.

TOURISTS' ROADS.

The principal works undertaken during the year consisted of general maintenance, the amount expended being £73,338. The total length of proclaimed tourists' roads at the end of the year was 402 miles.

Among the more important major works undertaken were the following :—

Grampians Road.—Improvement of narrow side cutting at Mirranatwa Gap and provision of turn-tables.

Horn Road (Mount Buffalo).—Provision of culverts and drains, and strengthening of pavement.

Mount Victory Road (Grampians).—Re-sheeting over sections between Halls Gap and Zumstein's.

Ocean Road.—Strengthening by re-sheeting, and sealing 14 feet wide, between Lorne and the Cumberland River. A continuous seal coat is now completed on the densely trafficked section between Torquay and Cumberland River.

A commencement was made with the widening of the very narrow sections between Lorne and Apollo Bay. One bad section at Cape Patten was completed and another was commenced at Mt. Defiance, between the Cumberland River and Wye River.

Corrective measures to control a serious land-slip at Eastern View were undertaken, and a retaining wall was constructed on the beach to arrest further slipping action and to protect the toe against erosion by the sea. The retaining wall consists of ironbark piled forms with log sheeting forming a continuous crib which had been filled with sand to provide the necessary weight for stability. (Plates Nos. 2 and 3.)

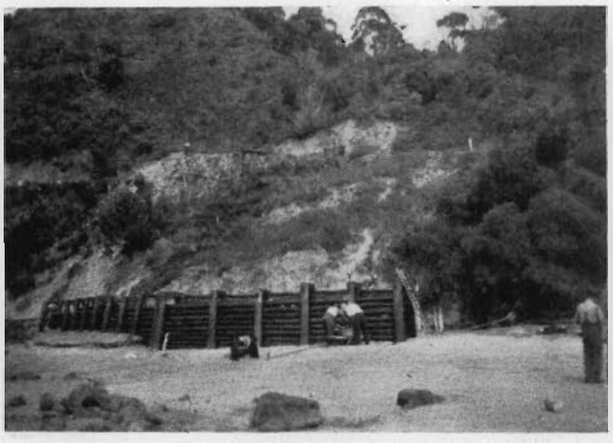


Plate No. 2. Ocean Road. Log-crib wall at toe of landslip at Eastern View.

Plate No. 3. Details of construction of log-crib wall.

Light re-sheeting with gravel of 18 miles between Princetown and Peterborough.

Phillip Island Road.—Reconstruction and sealing of ·5 mile in San Remo township.

Widening and re-sheeting with ironstone gravel to serve as a base course for a top course of fine crushed rock over a length of 3 miles between Newhaven and Cowes where the old lightly gravelled formation was completely worn out.

Silverband Road (Grampians).—Re-sheeting and improvement of one curve.

DEVELOPMENTAL ROADS.

Applications totalling £1,870,000 were received from municipal councils for the provision of funds for the construction of roads of a developmental character to be financed from funds available under the *Commonwealth Aid Roads and Works Act* 1947.

The amount expended during the year was £397,791 supplemented by £76,206 contributed by the Councils from their own funds.

The Board also allocated a total of £39,875 for roads to serve the properties of isolated settlers.

An amount of £50,330 was allocated to Councils to assist in the maintenance of roads of a developmental character on which Federal aid or other funds provided by the State had previously been expended on construction ; £41,244 was expended, in addition to which municipal contributions totalled £6,156.

BRIDGES.

As in the previous financial year the bridge construction work carried out during the year was far below that necessary to maintain a steady programme to bring the bridge structures throughout the State into a satisfactory condition within a reasonable period, particularly in view of the increase in heavy haulage by motor vehicles, and the wide distribution of such traffic throughout the State. The difficulties encountered were due to such factors as limited funds available for allocation, shortage of professional officers for the preparation of plans and designs, scarcity of contractors, man-power, and materials.

Material for use in bridge construction, comprising in the main squared timber, mild steel plates, sections and rounds for reinforcement, and cement, is in very short supply. In addition squared timber obtainable is of relatively poor quality. During the year quantities of steel received were less than normal requirements, and in an endeavour to relieve the position orders have been placed for supplies from overseas. Aided by the importation of 250 tons from England the quantity of cement obtained was sufficient to enable the bridges to be constructed to the limits of available steel, although the cost is considerably in excess of the local materials.

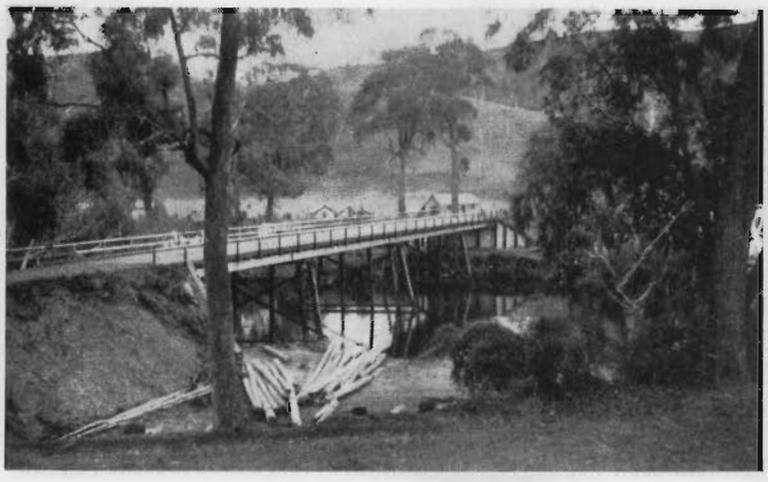


Plate No. 4. New Bridge over Macalister River at Licola.

In an endeavour to conserve steel for essential reinforced concrete work more use has been made of mass concrete construction than in the past. This class of construction was used in a concrete culvert on the Licola-road which comprises mass concrete wing walls and abutments with mass concrete deck supported by secondhand steel rails.

During the year, 86 bridge projects of a total value of £77,606 were initiated, bringing the total number of structures erected or in course of erection by the Board and municipal councils to 3,375. Of the 86 new projects 39 of a total value of £42,138 were supervised by the Board, and 47 of a total value of £35,468 were supervised by municipalities.

The figures quoted cover new bridges and bridges largely reconstructed only, but because of the difficulties referred to it was necessary to keep in service many old structures which, under normal conditions, would have been replaced. In these circumstances, patching and strengthening of old structures throughout the year was particularly extensive. Typical of the measures adopted was the strengthening of Beazley's Bridge over the Avon River on the Navarre-road in the Shire of Kara Kara. In this case strengthening rolled steel joists were placed beneath the central 35-ft. strut and straining piece type central spans, whilst weak stringers elsewhere in the structure were tommed. Although funds had been made available for a new structure at this site it has not yet been possible to put the work in hand.

The overtaking of arrears of bridge construction, maintenance and repair has also been delayed as a result of the necessity to provide for urgent bridge reconstruction or entirely new structures on particular roads to meet special requirements of other

authorities, which works would not have been required for some considerable time under normal conditions. Typical routes on which structures are required are the following :—

For the State Electricity Commission.—Roads from Wangaratta and Wodonga to serve the Kiewa scheme ; also structures on deviations at Morwell.

For the State Rivers and Water Supply Commission.—Deviations and new construction necessitated by the Rocklands and Cairn Curran Reservoirs.

For the Melbourne and Metropolitan Board of Works.—Deviations and new construction necessitated by the construction of the Upper Yarra Dam.

For the Forests Commission.—Reconstruction and improvements on the Licola road.

Some of the major works put in hand or completed during the year were the following :—

Hamilton–Macarthur–Port Fairy Road.—Construction of single cell 10′ x 10′ reinforced concrete culvert at Deep Creek.

Glenelg Highway.—Construction of single-span timber and rolled steel joist bridge over Wennicott Creek, seven miles west of Coleraine.

Plate No. 5. Old timber bridge over Jamieson River at Jamieson. New bridge in course of construction.

Henty Highway.—A new reinforced concrete bridge over Ti-Tree Creek at the Rocklands Dam deviation.

Licola Road.—New rolled steel joist and timber bridge over the Macalister River at Licola. (Plate No. 4.)

Mansfield–Woods Point Road.—New rolled steel joist and timber bridge over the Jamieson River. (Plates Nos. 5 and 6.)

Maroondah Highway.—New reinforced concrete bridge over the Acheron River near St. Fillans.

Princes Highway West—Construction of five-span reinforced concrete bridge over the Moyne River at Rosebrook.

Strengthening of timber bridge over railway line at Dartmoor.

Warburton–Woods Point Road. — New structures at McMahon's, Braham's, Crooked and Starvation Creeks.

Warrnambool – Caramut Road. — Completion of sub-structure of Cassidy's Bridge over the Merri River and commencement of the superstructure.

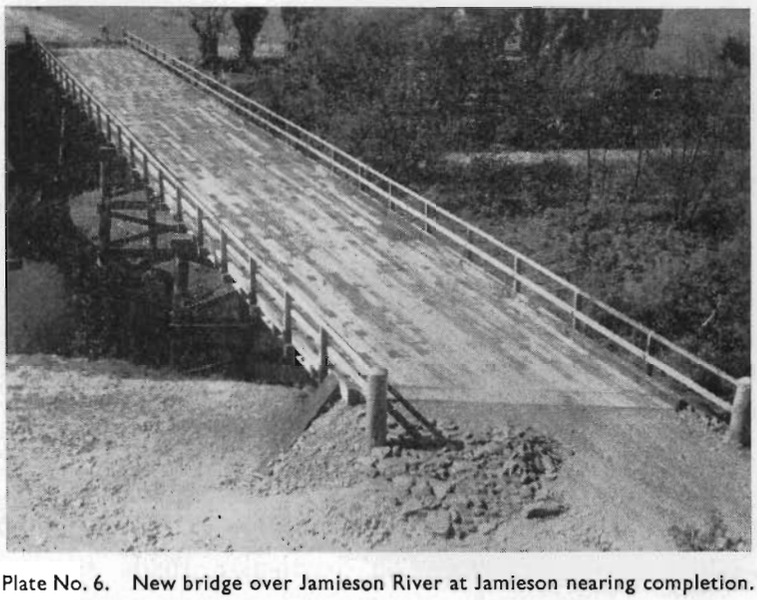


Plate No. 6. New bridge over Jamieson River at Jamieson nearing completion.

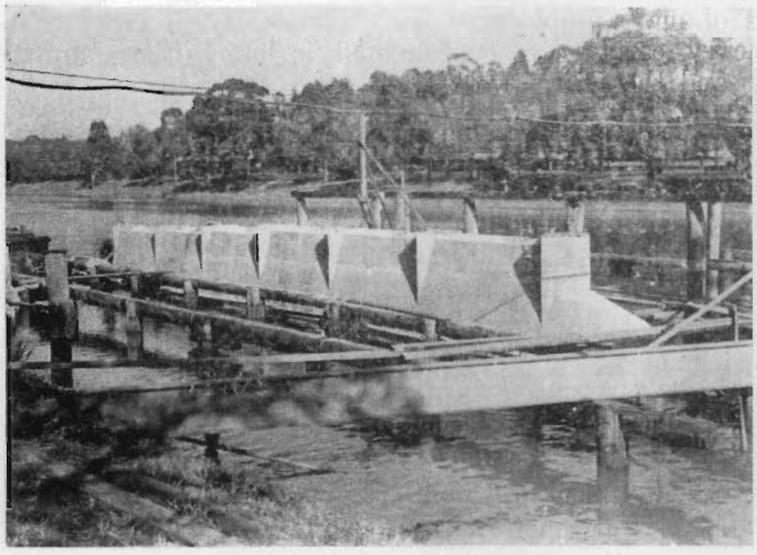


Plate No. 7. Completed pier of Swan Street Bridge.

Metropolitan Bridges.

Slow progress has been made with work at Swan-street, due particularly to the difficulty in obtaining materials and suitable labour, although the greater part of the difficult underwater work has been completed. Plate No. 7 shows a completed pier and Plate No. 8 illustrates concreting of another pier.

Plans and specifications for the reconstruction of bridges over Darebin Creek and Merri Creek in Bell-street have been prepared and work will be proceeded with as soon as conditions are favourable.

Bridge Inspections.

The services of the Board's Bridge Inspecting Engineer have proved invaluable in ascertaining the condition of and defining the extent of renewals or repairs necessary to bridge structures.

As some time must elapse before the whole of the bridges on State highways and main roads, which number more than 4,000, can be examined under present conditions the Board had hoped to be able to appoint additional staff, but has in fact, owing to resignations, experienced difficulty in maintaining existing establishments.

The Board is satisfied that considerable savings will result by regular inspections of bridge structures as its experience in the past has shown that extensive reconstruction works have been necessary as a result of neglected maintenance at the proper time.

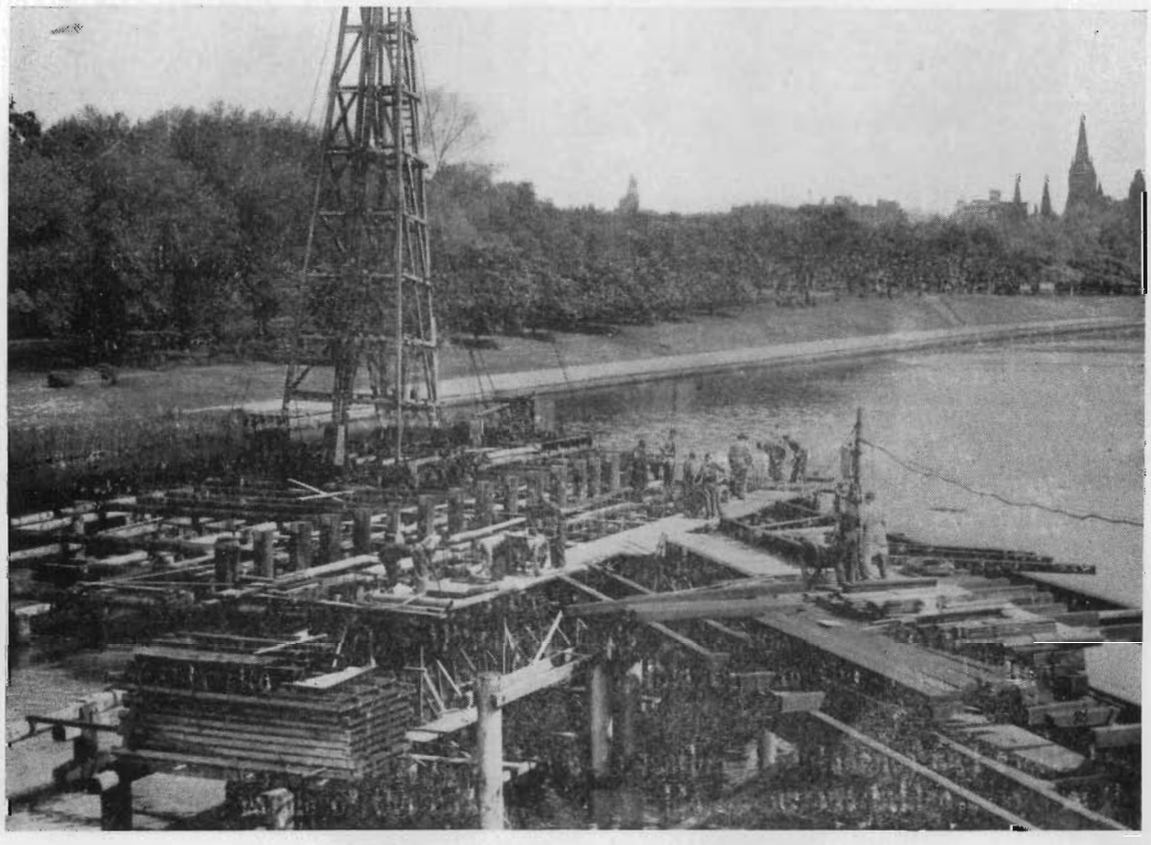


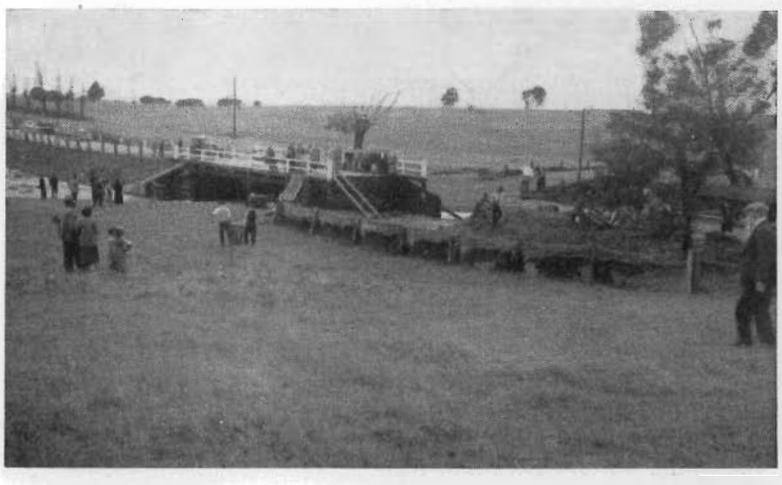
Plate No. 8. Swan Street Bridge. General view of work in progress.

Owing to the restricted work which it has been possible to undertake it has been necessary to concentrate on roads of major importance such as recently declared State highways and roads on which heavy cartage is contemplated including those to the Rocklands and Cairn Curran dams and the Kiewa works.

If additional officers are available later it will be possible to undertake the work according to a prepared plan and to render assistance to municipalities for the inspection of any particular or important structures.

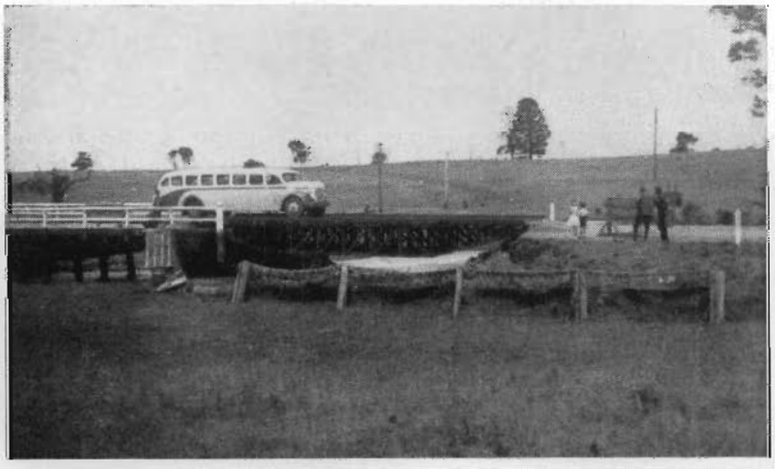
FLOOD DAMAGE.

During the year considerable damage was caused to roads and bridge structures in the Bairnsdale Division following heavy rain and consequent flooding. On 31st December, 1948, and 1st January, 1949, 7½ inches of rain fell, when damage was caused to bridges on the Princes Highway at Bosse Swamp, Bunga Creek and Salt Creek as well as numerous culverts and road formations. The main damage occurred at Salt Creek bridge where flood waters caused a gap approximately 8 feet deep to the natural surface over a length of 45 feet. Action was taken immediately to provide a temporary crossing by means of army commercial built up girders which had been kept in store for emergency use. Although the break occurred at 6 a.m. on the 1st January, the traffic was able to proceed at 5 p.m. on the 2nd. (Plates Nos. 9 and 10.) The cost of effecting repairs to the Highway was approximately £1,800.



In addition repairs to slips and scours on the Omeo Highway, Bonang Highway, and South Gippsland Highway were necessary involving an expenditure of approximately £550.

In June, 1949, further heavy rain fell with the result that all streams east of Rosedale were in flood. In addition heavy falls of snow on the Bonang Highway caused considerable damage and necessitated the removal of a large number of trees and the restoration of road surfaces. The estimated cost of restoring damage to State highways caused by the abnormal conditions in June amounted to £2,100 apart from the damage to main roads and unclassified roads.



Plates Nos. 9 and 10. Princes Highway East. Salt Creek Bridge. Showing damage by flood to approaches and repairs by army girder span.

WORKS FOR OTHER AUTHORITIES.

Within the provision of the *Country Roads (Works and Evidence) Act* 1948, the following works for other authorities have formed an important section of the Board's activities :—

Roads for Forests Commission.

As mentioned in previous reports the Board has, at the request of the Forests Commission and generally at its cost, undertaken extensive works in or approaching forest areas to facilitate intensive timber extraction.

Maffra Shire—Licola–Crescent Creek Road.—Completion of forming and surfacing with gravel of 12¼ miles from the end of the main road at Licola Creek, the formation being 20 feet wide with an average grade of 6 per cent. and minimum curve radius of 100 feet.

From Crescent Creek saddle construction of logging formations along the main ridge has been commenced, approximately 6 miles having been cleared, 4 miles formed and 2 miles gravelled.

Ripon Shire—Raglan–Mount Cole Road.—Work commenced in February, 1947, was recommenced after the 1948 winter period on 6th December, 1948, and completed at the end of April, 1949. The work consisted of the construction of 34,000 feet from Raglan into and through the Mount Cole forest area, comprising forming the full length and surfacing with ¾-inch mine tailings and granitic sand of 22,000 feet.

Winchelsea Shire—Benwerrin–Mount Sabine Road.—Grubbing, clearing and forming between Mount Cowley and Mackie's Mill.

Surfacing (first stage) of 23,000 feet between Todd's Corner and Mackie's Mill.

This is an old declared developmental road and the cost has been shared by the Board with the Forests Commission in equal parts.

Yallourn North Brown Coal Mine.

The work commenced by the Board in January, 1947, was continued in the operations of overburden removal and coal winning until 31st March, 1949, when the State Electricity Commission resumed coal winning and the Board's operations were confined to overburden removal. The work carried out by the Board during 1948–49, consisted of removing 1,005,500 cubic yards of overburden, and winning 318,529 tons fo coal.

Morwell Projects.

The Board has been actively concerned in the work of the Morwell Co-ordinating Committee constituted by the Government to facilitate detailed planning of the work of the various authorities sharing in the development of the Morwell brown coal field by the State Electricity Commission. Besides numerous investigations relating to future road projects the following works were put in hand by the Board on behalf of and at the cost of the Commission :—

Midland Highway Deviation.—As the operations of the Commission will necessitate utilizing an area which is now traversed by the Midland Highway south of Morwell a deviation will be necessary from the present highway at Eel Hole Creek along the western side of the Morwell–Mirboo railway to Morwell, consisting of 3½ miles of new construction, including one subway and one bridge. The construction work, with the exception of sealing, which will be undertaken in the coming summer, was completed during the year.

Jeeralang West Road.—As the Commission will require the use of an area covering at least 2 miles of the Jeeralang West Road near Morwell, the relocation of the road to the east of its present position and designed to join the Princes Highway East at Waterhole Creek has been necessary. Of the required 2¾ miles of new construction, approximately 1½ miles of clearing, forming, grading, and surfacing, together with the necessary culverts, side drains and fencing, was completed at the 30th June, 1949.

Housing Commission Estate at Morwell.

At the request of the Housing Commission the Board undertook on its behalf the construction of 8,347 feet of streets comprising forming, grading, and surfacing, together with the construction of footbridges, kerbs, channels, and sub-surface pipe drainage. The work was commenced in October, 1948, and at the 30th June, 1949, the street and pavement construction was 90 per cent. complete, kerb and channelling 20 per cent. and pipe drainage 80 per cent.

Warburton–Woods Point Road.

Plate No. 11. Warburton–Woods Point Road. Widening in progress near Muddy Creek.

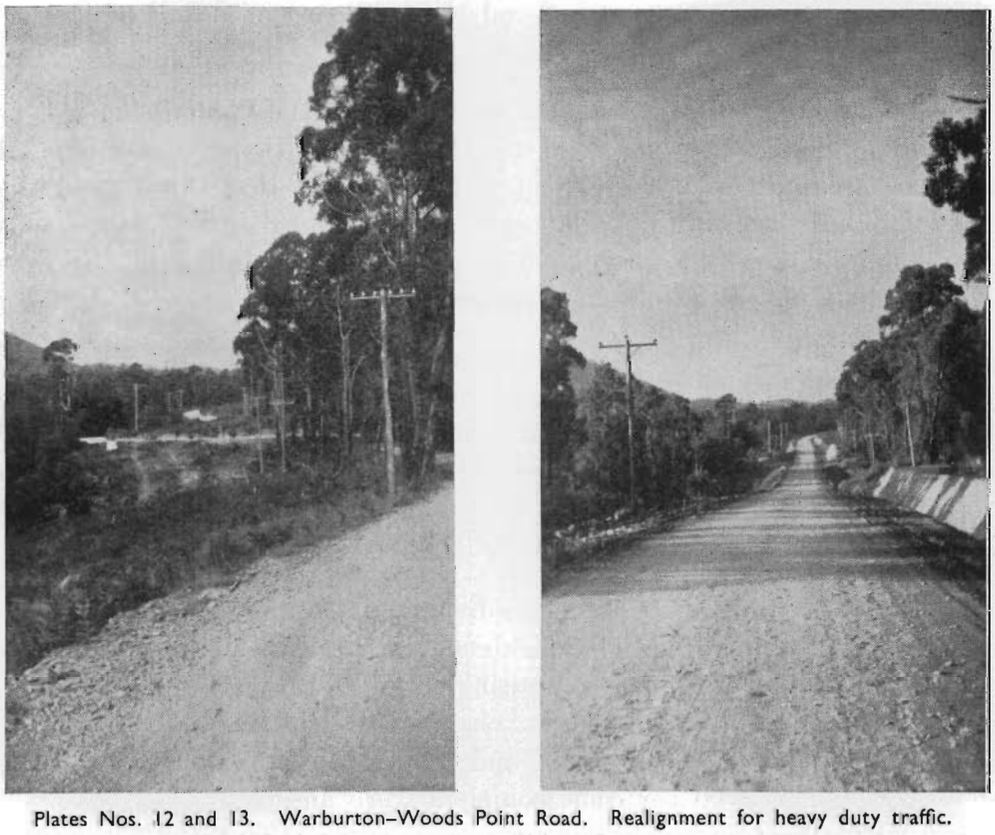
The work which is being carried out on behalf of the Melbourne and Metropolitan Board of Works to provide improved road conditions between Warburton railway station and the proposed dam site at Walsh's Creek has been continued. During the year 1948–49 the section of 4·4 miles previously constructed was sealed, and a further 3·8 miles between East Warburton and Starvation Creek was formed and surfaced. A commencement was made with the construction of the deviation between Warburton and Big Pats Creek and a 2-span rolled steel joist and timber bridge over Starvation Creek. (Plates Nos. 11, 12 and 13.)

Truganina Explosives Reserve Road.

The full length of the road (7·4 miles) between Deer Park and Altona was strengthened by re-sheeting with fine crushed rock and sealed with bitumen, thus providing a good riding surface for vehicles carrying explosives, and a cross connexion for traffic between the Western Highway and the Princes Highway at Laverton. The work was carried out at the request of the Public Works Department with special funds provided for the purpose.

Deviation of the Henty Highway at Rocklands Dam.

The work, which has been rendered necessary as a result of the proposed inundation of the existing highway following the construction of the Rocklands Dam on the Glenelg River between Cavendish and Cherrypool, consists of clearing, forming, gravelling and sealing 8·03 miles. The major portion of the cost is being borne by the State Rivers and Water Supply Commission as a charge against the cost of constructing the dam.



Plates Nos. 12 and 13. Warburton–Woods Point Road. Realignment for heavy duty traffic. Left—before construction. Right—after construction.

Buchan Caves Road.

Reforming, grading and gravelling of 1,794 feet of the road in the Buchan Caves Reserve, from the entrance at the Buchan–Gelantipy Road. This work is being carried out at the request of the Department of Lands and Survey with special funds provided for the purpose.

Commonwealth Work.

Bendigo Ordnance Factory Roads.—Re-sealing of 39,100 square yards of roadway.

Essendon Aerodrome.—Re-sealing of east–west runway—length 5,803 feet, width 200 feet, area 133,062 square yards. Priming and sealing 39,097 square yards on taxi-ways.

Flinders Naval Base Roads.—Bituminous pre-mix drag surfacing of 28,000 square yards of roadway.

Mangalore West Aerodrome.—Construction of new apron, taxi-way and terminal building area, together with regrading of existing taxi-ways.

Sale East R.A.A.F. Aerodrome.—Reconstruction of 90° runway by transferring 5 inches of the existing runway to form shouldering, mixing the next 3 inches of the existing gravel with 4 inches of Avon River gravel and providing a top course of 8 inches of selected Dutson gravel; the surface to be eventually sealed and covered with $\frac{1}{4}$ inch toppings. The dimensions of the strip are 7,000 feet by 150 feet with graded over runs of 400 feet at each end. During the year 75 per cent. of the main runway had been completed and 32,000 yards of gravel hard standing had been primed and consolidated.

SOLDIER SETTLEMENT ESTATE ROADS.

Following requests by the Soldier Settlement Commission the Board, in conjunction with the municipal councils concerned, investigated the programmes of road construction in new Estates acquired for soldier settlement. Recommendations made by the Board for the details of works to be undertaken and for assistance in finance by the Board and the Councils, were approved by the Commission.

Grants were made for works in the following Estates during the year:—

Shire.	*Estate.*
Ararat	Burrumbeep
Ararat and Mount Rouse	Narrapumelap No. 3
Ararat, Mortlake, and Mount Rouse	Narrapumelap South
Bairnsdale	Rosehill
Berwick	Harewood Park
Bulla and Romsey	Clarkefield
Donald	Taylor Bros.
Dundas	Ardachy
Glenelg	Bella Vista
Glenelg	Talisker and Hindson's
Glenelg	Sandford House
Hampden	Marida Yallock No. 2
Hampden	Marida Yallock No. 3
Hampden	Gnarpurt
Huntly and Rochester	Kamarooka
Leigh and Bannockburn	Tall Tree
Mansfield	Wairere and Duerin
Marong	Yarraberb
Minhamite and Belfast	Tarrone
Mortlake	Mount Fyans
Mortlake	Chamallack
Mount Rouse	Nareeb
Numurkah	Murray Valley
Portland	Ardgarton
Ripon	Mount Emu
Rochester	Cockbill's
Rosedale	Carey's
Towong	Walwa
Tungamah	Murray Valley
Wannon	Brung Brungle
Wannon and Glenelg	Tulse Hill
Waranga	Burnewang
Warrnambool and Mortlake	Boortkoi

The total amounts of the grants were as follows :—

Soldier Settlement Commission, £72,482.
Country Roads Board, £20,950.
Councils, £14,482.

The progress made with the more extensive works which are being carried out under the supervision of Shire Engineers, and some of which had been commenced in the previous year, is indicated hereunder :—

Ararat Shire.

Narrapumelap Estate No. 1.—Forming and surfacing of 4½ miles of east-west road.
Narrapumelap Estate No. 2.—Construction of spur road.
Yalla-Y-Poora Estate.—
Coburn's Road.—Forming and partial gravelling of 4·8 miles.
Mount William Road.—Forming and surfacing 7·33 miles.
Ritchie's Road.—Partial completion of 2 miles.
Yalla-Y-Poora Road.—Section 1.—Forming and surfacing 2·4 miles.

Dundas Shire.

Ardachy Estate Road.—Forming, grading and gravelling 9,400 feet.
Brung Brungle Estate Road.—Forming, grading and gravelling 4,600 feet.

Glenelg Shire.

Hindson's Estate Roads.—Forming and surfacing of 5·88 miles.

Hampden Shire.

Gala Estate.—
Eight Mile Lane.—Forming and gravelling 1·5 miles.

Gnarpurt Estate.—
Hope's Road.—Forming ·7 mile.
Lower Darlington Road.—Forming and gravelling 1·7 miles.

Larra Estate.—
Anderson's Road.—Forming ·28 mile.
Burns' Road.—Forming ·75 mile.
Hurry's Road.—Forming 1·14 miles and gravelling ·9 mile.
Kurwelton-Larra Road.—Forming and gravelling 1·71 miles.
Lower Darlington Road.—Forming and gravelling 1·5 miles.

Marida Yallock No. 2 *Estate.—*
Bateman's Road.—Provision of temporary road.
County Boundary Road.—Forming and gravelling ·7 mile.
Hose's Road.—Provision of temporary road.
Robertson's Road.—Forming ·64 mile.
Vagg's Road.—Forming commenced.

Wiridgil Estate.—
Tonks' Road.—Forming and gravelling ·93 mile.
Wiridgil Estate Road.—Forming 1·29 miles.

Leigh Shire.

Tall Tree Estate Road.—
Grubbing of boulders, forming and gravelling of 12,733 feet; construction of combined floodway and dam at Stony Creek.
Grubbing of boulders on additional 3,400 feet.

Mortlake Shire.

Berrambool Estate Road.—Forming, grading and gravelling of 3,403 feet.
Chamallak Estate Road.—Forming of 5,000 feet and surfacing (80 per cent. complete.)
Mount Fyans Estate Roads.—Forming, grading and gravelling 16,800 feet (40 per cent. complete).
North Station Estate Road.—Forming, grading and gravelling of 41,883 feet.

Numurkah Shire.

Murray Valley Estate Roads.—Re-sheeting with gravel ½ mile ; forming 438 chains ; re-forming 92 chains ; re-shaping 470 chains.

Ripon Shire.

Mooramong Estate Road.—Re-forming and gravelling of ·75 mile.

Mount Emu Estate Road.—Re-forming and gravelling 7·78 miles.

Rochester Shire.

Cockbill's Estate Road.—Forming and sanding 2,200 lineal feet.

Kamarooka Estate Roads.—Forming and sanding 5,256 feet and 16,170 feet in separate sections.

Tungamah Shire.

Murray Valley Estate Roads.—Forming, re-forming, and surfacing 10·3 miles—formation 22 feet wide, boxed out and surfaced with river sand to a width of 15 feet and consolidated depth of 3 inches.

Waranga Shire.

Burnewang Estate Roads.—Forming, re-forming, draining and gravelling of two sections, totalling 17,690 feet, with formation width of 30 feet and pavement 15 feet wide tapered section, spread at the rate of 19 cubic yards loose per 100 feet.

Wimmera Shire.

Domaschenz Estate Roads.—Loaming 10,600 feet and preparation of 6,600 feet for loaming.

Surveys have been completed and plans prepared for work in the following Estates :—

Romsey Shire.

Clarkefield Estate.

Warrnambool Shire.

Boortkoi Estate.

Ararat Shire.

Edgarley Estate.

Burrumbeep Estate.

ACTS AFFECTING THE COUNTRY ROADS BOARD.

During the financial year 1948–49, the following legislation affecting the Country Roads Board was enacted :—

Country Roads (Permanent Works) Act 1948 (*No.* 5278).

Provision is made for the reduction from 6 per cent. to 5 per cent. of the annual payment by municipalities in respect of permanent works on main roads and State highways, to operate in the case of such works commenced on or after the 1st July, 1948. The rate of interest included in the payment has been reduced from 4½ per cent. to 3½ per cent., the balance of the payment representing sinking fund.

Country Roads Act 1948 (*No.* 5290).

The powers, functions and duties conferred upon municipal councils by the *Local Government (Streets) Act* 1948 are conferred also upon the Country Roads Board so far as relates to the declaration of the alignment, widening and opening up of State highways, main roads, developmental roads, tourists' roads and forest roads.

The *Local Government (Streets) Act* 1948, *inter alia*, gives power to a council to fix a new alignment for either or each side of a street and to acquire from the owners the land between the old alignment and the new alignment ; also to fix the alignment for new streets and to acquire land between the alignments so fixed.

Country Roads Board Fund (Amendment) Act 1948 (*No.* 5326).

Provision is made for the application to the financial year 1948–49 of the *Country Roads Board Fund Act* 1932 (*No.* 2) which provides for exception from the fees to be paid into the Country Roads Board Fund of the fees for licences to drive motor cars and for suspension of the annual payment from Consolidated Revenue into that fund.

11239/49.—2

Country Roads (Works and Evidence) Act 1948 (*No.* 5335).

The Board with the consent of the Governor-in-Council may at the request and on behalf and at the expense of the Commonwealth of Australia or any Department or other public authority construct or maintain any works not otherwise authorized by the Country Roads Acts and for which the Board is suitably equipped.

In any prosecutions or legal proceedings under the Country Roads Acts or any other Act a certificate of the Secretary or Acting Secretary of the Board that a road is or at any specified time was a State highway, main road, tourists' road, forest road or developmental road shall, until the contrary is proved, be evidence of the fact so stated therein.

Country Roads (Financial) Act 1949 (*No.* 5363).

Provision is made for loan moneys to the extent of £5,000,000 to be raised for the carrying out of permanent improvements and permanent works on State highways, tourists' roads and forest roads. No municipality shall be required to contribute towards the cost of any works which are financed by moneys issued and applied under the Act, but the sinking fund and interest are treated as a charge against the Country Roads Board Fund. The Act came into operation as from the 1st July, 1948.

COMMONWEALTH AID FOR ROADS.

The Commonwealth Act (the terms of which were set out in the Board's Thirty-fourth Annual Report) came into operation on the 1st July, 1947, and provides for the allocation of funds over a period of three years. As the Act will operate for a further one year only, representations are being made for an extension of the provision over a further period of at least ten years, in order that future planning may be facilitated. It is also being urged that the allocation to the States be on a more liberal basis, having in view the extensive development of road transport, and the large amount of revenue derived from duty on motor spirit which is retained by the Commonwealth.

The first formal agreement entered into by the Commonwealth Government with the States relating to the provision of funds for road works operated from the 1st July, 1926, although some grants had been made from time to time prior to that date. That agreement operated over a period of eleven years to the 30th June, 1937, after which a further agreement covering ten years to the 30th June, 1947, was entered into. This was followed by the existing Act which expires on the 30th June, 1950. In each case the distribution to the States has been on the basis of three-fifths population and two-fifths area.

The total amount paid by the Commonwealth to the States in respect of the period 1st July, 1926, to 30th June, 1949, was £69,372,000 of which £12,248,000 was received by Victoria.

In the allocation of the funds available the Board has paid particular attention to the interests of municipalities in order that they might obtain the maximum benefit from the grants. Generally they have been made for the following classes of work:—

(*a*) Main Road Maintenance.—Grants from Commonwealth aid revenues have been made for many restoration works in order to supplement the ordinary maintenance provision from the Country Roads Board Fund. As this supplementary provision is made without requiring any contribution by municipalities other than their usual small proportion of the Country Roads Board Fund expenditure, the financial obligations of the councils towards the total cost of the main road works have been correspondingly eased.

(*b*) Construction and reconstruction of unclassified roads which are generally of a developmental character.—These grants have been subject to contributions by councils, the rate of contributions being determined having regard to such factors as the nature and extent of the work, the financial resources of the councils, and the interests served.

(*c*) Roads to isolated settlers' properties.—Grants generally not exceeding £150 are made for the construction of short lengths of roads serving the properties of settlers isolated from the general road system. Councils are required to contribute at least 10 per cent. to supplement these grants.

(*d*) Maintenance of unclassified roads.—For some years grants have been made generally on the basis of £2 (Board) plus £1 (Council) to assist councils in the maintenance of unclassified roads, particularly those which have

been constructed with funds provided by the Board in the past, or with Government funds. It is not intended, however, that the provision so made plus the councils' minimum contribution shall represent the full extent of the maintenance work required, but is to be looked upon as assistance to the councils in carrying out their responsibilities.

NEED FOR ADDITIONAL REVENUE.

In the last two years increases made in Commonwealth Aid have been fixed amounts from Commonwealth consolidated revenue and not related to petrol taxation. Under the Commonwealth Act, State highways and main roads have been specifically excluded from sharing in these additional funds. The provision of loan funds by the State has relieved the immediate acute financial position as regards State highways, and has thus in turn afforded some relief on main roads, especially in permitting some urgent restoration and improvement works to proceed. However, the problem of maintenance remains, and year by year the burden of maintenance to be borne by the Board grows heavier, due to a combination of factors. These include :—

(i) the increase in mileage of " declared " roads ; the following table shows the growth in miles of roads for which statutory obligations regarding maintenance are placed upon the Board :—

—	1930. Miles.	1939. Miles.	1949. Miles.
Main roads	5,692	6,815	9,734
State highways	1,511	2,633	3,846
Tourists' and forest roads	Nil	350	716

It may be noted that these increases in the Board's obligations have considerably relieved the burden of municipal councils, especially when taken in conjunction with further factors which follow.

(ii) the general increase in costs ; statistics relating to this factor are given elsewhere in the report, indicating an increase of the order of 100 per cent. from 1939 to 1949, with costs continuing to rise sharply.

(iii) the increase in the number of vehicles using the roads ; this is shown by the following totals of motor vehicle registrations in Victoria, (excluding motor cycles).

—	1930.	1939.	1949.
Numbers	154,066	235,157	317,155
Per Cent.	100	153	206

It should be noted that for a variety of reasons the increase in revenue (as shown hereunder) has not been commensurate with this increase in traffic.

—	1930.	1939.	1949.
Gross Revenue	2,506,294	2,654,124	3,821,723
Per Cent.	100	106	152

(iv) the increase in proportion of heavy trucks, as shown by the following records :—

—	1930.	1939.	1949.
Percentage of heavy trucks at typical traffic census point	5	8·5	9·6

(v) the increase in range of heavy vehicles. Cases of long distance heavy haulage are becoming commonplace, relate to both passenger traffic and a wide variety of products, and involve not merely "arterial" but all classes of roads; even the more local heavy traffic serving country factories, markets, or railway stations is on a much intensified scale as regards mileages travelled per annum.

(vi) the relatively light standard of construction of much of the additional mileage of "declared" roads; in the case of main roads older sections, having increased in importance, have been declared as State highways, and roads constructed to developmental standards in the past have similarly become main roads, so that, as a whole, the task of maintaining main roads has become heavier. As already noted the placing upon the Board of the major share in financing the work affords considerable relief to the municipal councils concerned. It must also be remembered that the Board is carrying an increasingly heavy burden of interest and redemption funds on capital works—now over £520,000 per annum; moreover, revenue funds are required for works of improvement of the main roads, loan funds having been discontinued for that purpose for some years owing to the inability of municipalities to sustain their interest and redemption payments.

(vii) the similarly "low cost" nature of many of the pre-war State highways; as noted elsewhere there are many sub-standard sections, and progressive failures are in evidence, even on old State highways, which were quite satisfactory for pre-war traffic. A period of years must elapse before the programme of capital works now authorized is completed, and in the meantime the task of maintenance is very severe and involves a large financial drain on available revenue.

Recommendations have been made regarding means which might be adopted to derive increased revenues both from Commonwealth and State sources. Pending the result of a detailed survey of road requirements referred to later, an approximate estimate of the current revenue shortage, based on a wide knowledge of the system of roads under the Board's jurisdiction and of the urgent needs on other roads of a developmental character, indicates that additional expenditure is still required at the rate of some £2,000,000 per annum if adequate headway is to be made in the restoration of old assets, the overtaking of deferred maintenance, and the progressive improvements of the road system of the State to a standard even approaching the new demands of post-war road transportation.

PROGRAMME OF ROAD IMPROVEMENT.

There is, indeed, a vast amount of road and bridge restoration, construction and maintenance to be done throughout the State on all types of roads to fit them in some degree for the new era of heavy road transportation which has been ushered in by the Second World War.

Those to whom requests for funds for these works are being addressed need to be made aware just how great is the problem facing State and local road authorities. In order to enable the Board to form a comprehensive idea of the condition of roads throughout the State, the work required to place them in a satisfactory condition over a period of years, and the total cost thereof, an investigation of the requirements covering the next ten years has been put in hand. The programme is being prepared with the co-operation of municipal councils on the basis of (*a*) the completion of the majority of the "declared" roads within ten years to a standard capable of carrying large vehicles of existing maximum legal weight and size, and (*b*) the carrying out of the more essential works on "undeclared" roads during that period.

It is not intended that the lists of works prepared in framing this programme shall necessarily be regarded as committing either the municipalities or the Board to the details or priorities which may be submitted, but reliable data will thus be obtained for estimating financial requirements over an extended period.

The information required is being prepared in three main categories, viz., (*a*) maintenance of existing asset, covering patrol maintenance, re-sheeting, re-sealing and bridge maintenance, (*b*) improvement such as first seal extensions, bridge construction and improvement of existing assets, and (*c*) road "furniture" such as warning signs, traffic lines, guide posts, trees and essential protection of roadsides from fire and scour.

The initial preparation of lists of works has been entrusted to the Board's Divisional Engineers, and municipal councils have been invited to facilitate the necessary co-operation of their engineers. The final assembly of the cost will be undertaken by the Planning Research Division under the Chief Engineer.

In necessary approaches which have already had to be made for additional funds, State-wide estimates have had to be based on over-all statistics of road mileages, on a general knowledge of the existing conditions, and on averaged costs of various types of work. The completion of the "ten year plan" will provide a much more detailed estimate with a higher degree of accuracy. In the United States such surveys, as reported by the Chief Engineer when describing his impressions of his mission abroad in 1946, are regarded to-day as indispensible to rational planning of road facilities on a State-wide basis. If funds are made available on a sufficiently long-term basis, the road authorities concerned can arrange methodical programmes of work throughout the term of years decided upon. At present both State and local road authorities experience a great deal of frustration and their operations are rendered discontinuous, inefficient and sometimes ineffective, by lack of assurances to themselves, their staffs and to contractors, that a steady flow of works is in prospect. As transportation continues in some fashion, whether the roads be good or bad, the State pays for its roads whether it plans the work or not, and pays less if it is enabled intelligently to plan the work ahead.

RESTRICTION OF LOADING ON ROADS.

In view of the light construction of certain State highways and main roads and their rapid deterioration, coupled with the rapidly increasing volume of heavy traffic, the Board has found it necessary to take action under the provisions of the Motor Car Act to restrict the weight of motor vehicles, including the weight of the load, to 6 tons. The Board is concerned that this action was necessary to protect the weak sections of road and retain them in use to a reasonable standard by general traffic. As funds and labour become available to strengthen the pavements and the necessary work can be undertaken, the full weights as prescribed by the Motor Car Act will be allowed.

The principal State highways on which restrictions are imposed at present are as follows :—

Bonang Highway.—between Orbost and the New South Wales border.
Borung Highway.—between Donald and the eastern boundary of Donald Shire.
Calder Highway.—between Ouyen and Redcliffs.
Henty Highway.—between Dooen and Warracknabeal ; also between Hopetoun and Nunga.
Loddon Valley Highway.—between Eaglehawk and Kerang.
Murray Valley Highway.—between Yarrawonga and Hattah.
North Western Highway.—between Donald and the northern boundary of Donald Shire.
Princes Highway East.—between Orbost and the New South Wales border.
Sturt Highway.—between Mildura and the New South Wales border.
Western Highway.—between Horsham and the western boundary of Dimboola Shire.

In addition, similar restrictions have been imposed on a considerable number of main roads.

PLANT.

Considerable difficulty is still being experienced in obtaining the necessary plant to enable the Board to carry out its works as expeditiously and economically as could be desired. At the end of the year the Board had 100 crawler tractors, and it is estimated that if these were worked efficiently and then replaced when their further use became uneconomical at least twelve new machines would be required each year. For the last ten years the Board has acquired only six new crawler type tractors, in addition to a number of secondhand machines obtained through Commonwealth organizations. Whilst the latter items have been of some use, their condition has been such that considerable expenditure and much labour by skilled tradesmen has been necessary to place them in condition for work and keep them in commission. The possibility of securing new or re-conditioned heavy crawler tractors in England or from Europe is one important investigation to be undertaken by the Board's Engineer for Bridges during his current mission abroad.

A tender for six locally built medium power graders was accepted early in 1946, but up to date only four of the units have been delivered ; towards the end of 1947 tenders were accepted for twelve heavy power graders, but only three have been delivered. As the Board's

crushing and screening plant is obsolete, tenders were invited for four new units in January, 1948; up to date none has been delivered and there is no indication when delivery will be effected.

Adequate patrol maintenance of roads is foremost in the Board's policy. For this work suitable trucks are essential, and although endeavours have been made since 1947 to obtain 22 vehicles to replace obsolete units only eight have been delivered, and the establishment of new patrol gangs is being hampered by the difficulty in obtaining additional vehicles.

BITUMINOUS SURFACE TREATMENT.

Organization of Work.

Having regard to the extensive work carried out in all parts of the State with the Board's bituminous surfacing plant, involving an expenditure of approximately £500,000 per annum, and the fact that the period during which the work can be undertaken is limited to the months between October and May, a thoroughly organized system covering the operations throughout the State is essential. General management and functional control of the system are exercised by the Asphalt Division of the engineering branch of the Board's staff.

It is the practice of the Board in common with other State Road Authorities in the Commonwealth to invite tenders in January returnable in March for the estimated bitumen requirements for the ensuing financial year. As soon as the allocation of funds is known, about August, divisional and municipal engineers are asked to requisition for the supply of bituminous materials and the use of the necessary plant. Early in October, a preliminary itinerary for each bituminous surfacing gang is prepared and as far as possible each gang is confined to a Division. The preliminary programme is subject to change throughout the season, having regard to such factors as availability of mineral aggregate, the stage of preparation of the pavement to be treated, weather conditions, relative urgency of the work, proximity of works, &c.

At the end of each season the bituminous surfacing plant is returned to the Mechanical Engineer and equipment to the Asphalt Division's store for overhaul and replacement during the winter months. As far as possible, the personnel, who are generally skilled workmen, are then engaged on other works in the respective divisions in order that they may be available in the following spraying season. The work in the summer requires frequent movement of gang and plant from one centre of operation to another, the time spent at any one centre being only a few days. Such a roving life may not appeal to every workman, but mobile kitchens and readily pitched encampments are provided to minimise the inconvenience to the personnel. It has been found essential for effective and reliable work to treat each gang as a complete unit. It is not satisfactory to count on obtaining local men at the numerous centres of operation.

Cost of Works.

As an illustration of the rising costs of works comparison has been made between the cost of re-sealing an area of 126,575 square yards of pavement between Castlemaine and Bendigo in 1925–26 and similar work in 1947–48. For the earlier work 60–70 penetration bitumen was applied at the rate of 0·21 gallons per square yard, and covered with sand and gravel at the rate of 1 cubic yard to 98·5 square yards. The latter work was carried out with 0·20 gallons per square yard of fluxed binder covered by one cubic yard of aggregate to 80 square yards.

The total cost of the work in 1925–26 was 5·18d. per square yard, whilst in 1947–48 it was 12·24d. or an increase of 136 per cent. Whilst the comparison in this instance has been made using the cost in 1925, the costs of similar work remained practically constant until 1938–39. From that season onwards costs have continued to rise. Further details of rising costs in the last three years have been given earlier in this report, and statements covering a four-year period are contained in the report of the Chief Engineer.

Bulk Handling of Bitumen.

Following on the establishment of bitumen refineries in Australia the Board has had under consideration the adoption of a system of bulk handling for some portion of future programmes. For the 1949–50 season a limited system will be operating, the material involved being handled by the contractors' road tankers direct from the refinery to the job.

To assist the Board to examine alternative systems for bulk handling in a more extensive way for future seasons, Councils have been requested to furnish maps of their municipal districts showing the surface treated length of each main road at the 30th June, 1949.

SNOW REMOVAL.

The Board has continued its trials of various classes of snow removal plant. An experiment has been conducted with a light 4-wheel drive truck to which was fitted a blade 10 feet wide capable of being turned at an angle of 45° to either side, and being raised or lowered from the driver's cabin. Although experimental work was carried out on the Alpine Road leading to Mount Hotham under abnormal conditions, from observations made it is apparent that the plant will be quite satisfactory for the removal of snow as it falls, and certain features have been noted for improvement in the future. Up to the 30th June, 1949, using this unit the road on the Omeo side of Mount Hotham was kept open to within 2 miles of the chalet. Previously when accidents occurred on the ski fields it had taken 10 to 14 hours to reach a doctor. During the time the plant was in operation 4 accidents occurred, and owing to the work carried out it was possible to convey the victims to the Omeo Hospital in about $3\frac{1}{2}$ hours. Appreciation of the Board's operations has been expressed by the patrons of the chalet.

Plate 14 shows maintenance measures for keeping the Omeo Highway open to traffic during a snow period.

Plate No. 14. Omeo Highway. Snow clearing with light power grader.

LAND ACQUISITION FOR ROAD DEVIATIONS.

In former years land for the construction of new main or developmental roads was the principal reason for road deviations. In recent years, however, acquisition of land for improvement of existing roads has considerably increased. When it is necessary to reconstruct a weak or failed section of road, as is common with increasing heavy traffic, it is frequently possible to provide a shorter road with improved and safer conditions by the acquisition of adjoining land. Land purchase is also necessary, particularly at acute angles, either to improve bad bends or to provide for safe visibility. From time to time for similar purposes it is necessary to acquire at intersections areas of land from allotments on which immediate building is proposed or where it is likely in the near future. Action has also been taken to widen the road reserves along certain narrow State highways and main roads where it is apparent that increasing traffic will in due course call for one or more additional carriageways. In some such cases ribbon development or land subdivisions in expectation thereof have come under notice, and the acquisition of the land at an early stage in the development has been necessary so as to save present or future owners expense and inconvenience in removing or altering residences or business premises.

ROAD SAFETY.

Accident Reports.

The Board continues to receive from its patrolmen reports on a uniform basis relating to traffic accidents on State highways and sections of main roads which are maintained under its direct supervision. A careful scrutiny of these reports, on which supervising engineers indicate possible causes or contributory causes, is made with a view to determining whether road improvements are justified to prevent repetition.

During the year 1948–49, reports of 229 accidents were received. These indicated that 55 persons were killed in 47 accidents and 183 injured in 102 accidents. In some cases evidence of the circumstances was directly available to those preparing the reports, whilst in others data made available by the police were utilized.

The various alleged causes, or contributory causes, are classified under the following headings, the statistics for the accidents recorded being as shown. In the case of some accidents several contributory causes are shown, so that percentage figures for the various causes cannot be given.

Human and Mechanical Defects—	
Carelessness and faulty driving	140
Mechanical defects	22
High speed	48
Intoxication alleged	11
Alignment—	
Curve too sharp for average speed on section	20
Poor visibility round curve	2
Grade—	
Poor visibility over vertical curve	1
Steep grade	4
Shape of Pavement—	
Excessive crossfall	—
Insufficient cant on curve	1
Irregularities affecting steering	1
Insufficient width	3
State of Surface—	
Slippery black surface	2
Slippery wet gravel, sand or limestone	4
Slippery formation	5
Loose screenings, gravel or sand	6
Signs, &c.—	
Insufficient direction or warning signs	1
Misleading direction or warning signs	—
Insufficient barriers or lights	—
Misleading barriers or lights	—
Poor marking of curve	—
Weather Conditions—	
Poor visibility, rain or fog	11
Wet road	10
Light—	
Darkness	20
Dusk	6
Headlight glare	12
Sun in eyes of driver	8
Surface reflection	—
Miscellaneous—	
Railway crossing	4
Narrow bridge or culvert	6
Narrow bank on cutting	1
Wandering stock	6
Bad condition of shoulders	1
Tree on road	1
Other causes	20

It is apparent that the human factor is most important. Drivers of road motor vehicles are not subject to discipline or signal systems in the same way as railways personnel. A road user may attempt to travel on any part of the road (or off it) at any moment. He exercises his own judgment in following, overtaking, or passing other vehicles or in parking his own, and regulates his path and speed merely within the limitations of that judgment. The Board's traffic and supervising engineers in common with those of road and other authorities in other countries have made special studies of the practices of drivers, particularly in their customary clearances in traffic manoeuvres. With an increasing number of vehicles of the maximum width of 8 feet, increasing speed capabilities of heavy

vehicles and increasing number of long vehicles, an additional burden is being placed on road authorities to provide extra widths of carriageway both on straight and curved sections of road so as to build the necessary added safety into the road. To provide this for all existing roads will take time, effort and funds, but it is a very essential part of any realistic programme of road improvement.

Direction Boards and Warning Signs.

During the year 1310 boards consisting of direction and information, advanced direction, supplementary direction, warning, school and traffic instruction signs were supplied for erection at 640 new sites and 247 damaged boards were replaced.

Traffic Line Marking.

The work of repainting worn lines and marking new ones comprised a total length of 1809 miles of State highways, main roads and tourists' roads, and 16 miles on behalf of municipalities. The expenditure involved was £9,850, or an average of £5 7s. 11d. per mile. The total quantity of lacquer used was 6,312 gallons, or an average of 3·51 gallons per mile. The average consumption during the preceding year was 6·09 gallons per mile and the cost £8 2s. 8d. per mile, which indicates that a considerable saving is now being effected. This is due mainly to the greater efficiency of the new plant which is now in use, and the reduction in length of the painted line; early in the last financial year the 40 feet "cycle" was changed from 15 feet line and 25 feet space to 10 feet line and 30 feet space.

TRAFFIC OFFENCES.

During the year there was a marked increase in the number of offences against the Motor Car Acts as revealed by the following statement, indicating the number of cases for which convictions were obtained in the years 1947–48 and 1948–49 :—

—	1947–48.	1948–49.
Speeding (freight vehicle)	222	282
Speeding (passenger vehicle)	9	10
Exceeding 13 tons gross weight	195	272
Exceeding 10 tons gross weight	7	11
Exceeding 6 tons load limit	68	120
Exceeding conditions of special permit	66	176
Exceeding 7½ tons on one axle	1	18
Exceeding 3 tons on trailer axle	7	9
Exceeding two-thirds of vehicle weight on one axle	1	1
Exceeding 8 feet wide	15	6
Exceeding 12 feet high	3	2
Refusing to allow vehicle to be weighed	7	48
Failing to carry permit	1	..
Other offences	..	5
Total	602	960

The total amount of fines imposed amounted to £9,109 and costs £123 13s. as compared with £4,182 15s. and £82 0s. 6d. respectively in 1947–48, the increase in fines being 117 per cent.

The Board is concerned at the incidence of this increase, in view of the fact that, generally, non-compliance with the relevant provisions of the Motor Car Acts involves damage to or excessive wear and tear on road pavements and bridge structures, and many of the offences have the effect of increasing the dangers of road transport.

So far as enforcement of the law is concerned, difficulty has been experienced in the case of offences involving interstate operators owing to the procedure necessary for the service of information and the collection of fines. For the period 1st July, 1948, to 31st December, 1948, of the fines inflicted on Victorian operators, 3·3 per cent. remain unpaid, whilst in respect of interstate operators the amount represents 23 per cent. Recommendations have been made to secure improvement of the Commonwealth laws in this matter.

ISSUE OF PERMITS.

The development of heavy road transport is revealed by the following statement which shows the comparative number of permits issued for the years 1947–48 and 1948–49.

—	1947–48.	1948–49.
Exceeding 6-ton load limit	1,292	1,333
Exceeding 13-ton load limit but not 15 tons	1,049	1,342
Exceeding 15 tons but not exceeding 20 tons	769	875
Exceeding 20 tons but not exceeding 30 tons	501	612
Exceeding 30 tons	96	179
Exceeding 8 feet wide	1,890	2,124
Exceeding 12 feet high	882	934
Exceeding legal length	866	1,039
Miscellaneous	28	52
Total	7,373	8,490

Whilst the increase for all types of permits for the year 1948–49 was 15 per cent. over the previous year, there was a considerably higher increase for the heavy lifts which, in the case of loads over 30 tons, was 86 per cent.

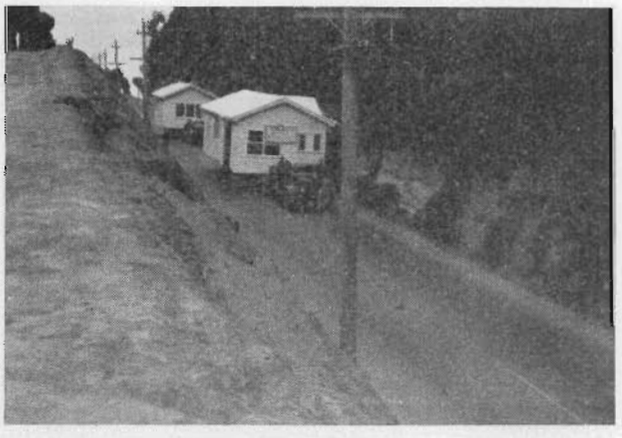


Plate No. 15. Cartage of prefabricated house on Heidelberg-Eltham Road at Eaglemont.

It was recognized that in the years immediately following the war there would be a good deal of activity in the cartage of wide loads consequent on the removal of huts from military and other establishments. However, the applications for permits to remove wide structures is still increasing, partly as a result of the cartage of prefabricated houses. This class of cartage is giving the Board a great deal of concern, and it has been found necessary to refuse certain applications in order to obviate extremely dangerous conditions or the severe disorganization of road traffic. (Plate No. 15.)

OFFENCES AGAINST COUNTRY ROADS ACTS.

During the year reports of 686 offences against the *Country Roads (Impounding of Cattle) Act* 1935 for allowing cattle to wander unattended on State Highways were received. Warnings in respect of first offences were given in 636 cases; in the remaining cases prosecutions were instituted, with the result that 43 convictions were obtained, the fines amounting to £65 15s.

Action was taken in the following cases for other offences against the Country Roads Acts :—

—	Number.	Fines.
		£
Destruction of timber	8	19
Projections on wheels of vehicles	1	3
Removal of materials from highway	2	2

TREE PLANTING.

In the Thirty-fourth Annual Report reference was made to the avenue of trees being planted on the Goulburn Valley Highway in the vicinity of Arcadia, at the cost of Mr. J. E. Woodburn, as a memorial to his son, Sgt.-Observer Calder Fenton Woodburn, who lost his life whilst serving with the R.A.A.F. during the war. The work carried out during the 1949 season comprises the planting of 392 trees, making a total of 2,437 planted since 1945. The avenue extends over a length of 11·7 miles, from the intersection of the highway with the Violet Town–Murchison Road to Seven Creeks.

The Board has been pleased to co-operate in this scheme which, in addition to constituting a unique memorial, has had the effect of considerably enhancing the natural beauty of the landscape.

The general conditions relating to labour and supply of materials have prevented any considerable extension of the tree planting throughout the State, but provision is made for the maintenance of existing plantations on State highways and main roads.

DECENTRALIZATION.

Considerable difficulty is still being experienced in giving full effect to the Board's decentralization proposals, particularly owing to the housing shortage and the delay in having building works executed.

The following statement indicates the further progress made during the financial year :—

Bairnsdale.

One cottage has been moved from Gunyah and four prefabricated houses have been erected on the storeyard site. An army hut after reconditioning and additions has been converted into a building suitable for use as a workshop and store. Lathes and other machinery required for plant repair work, together with saw and planer for carpentry work, have been installed, and seven tradesmen are employed in the workshop. (Plates Nos. 16 and 17.)

Plate No. 16. Bairnsdale depot. Sections of prefabricated houses before erection.

Ballarat.

A residence for the Assistant Engineer is now in course of erection, and a building block for the Divisional Accountant has been purchased.

For the provision of a workshop and storeyard an area of 7¼ acres at Sebastopol has been acquired, portion by purchase from a private owner and the remainder by permissive occupancy from the Department of Lands and Survey.

A prefabricated house has been erected on the storeyard site for the Divisional Roadmaster. Preliminary plans for stores and workshop buildings have been prepared.

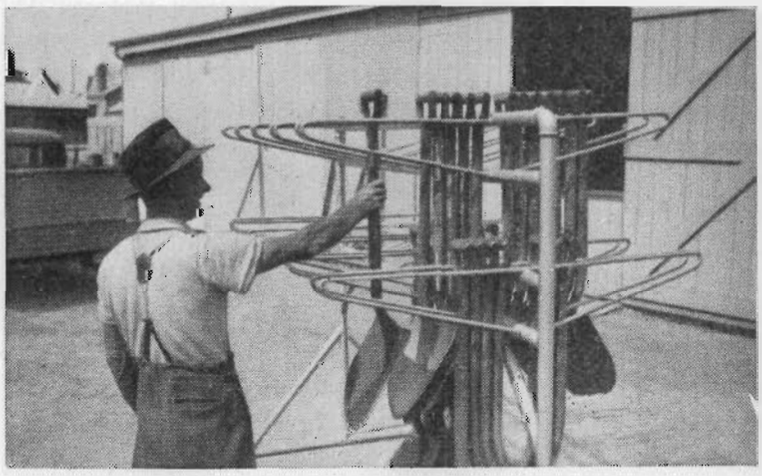


Plate No. 17. Shovel rack at Bairnsdale depot.

Benalla.

Residences for the Divisional Engineer and Assistant Divisional Engineer respectively are in course of construction. A residence for the Divisional Traffic Officer has been purchased. The workshop and storeyard personnel is 14.

Bendigo.

Tenders have been let for the erection of four houses on portion of the storeyard site set aside for residences, and satisfactory progress has been maintained. On completion these residences will be occupied by members of the Divisional office staff and senior storeyard employees. Construction of the storeyard office is in progress. The workshop and storeyard personnel is 24.

Geelong.

The whole of the former police building in McKillop-street has been taken over by the Board as a divisional office and the necessary alterations to adapt it to requirements are in hand. Residences which have been completed are occupied by the Divisional Traffic Officer and an office clerk; further residences to be occupied by the Divisional Accountant and an Assistant Engineer are in course of construction. The workshop and storeyard personnel is now 6.

Horsham.

Rooms in the Horsham Public Library are still being used to provide temporary office accommodation. Plans for a permanent office building to be erected on land in Firebrace-street have been prepared, but work has been deferred until conditions in the building industry are more favourable.

The site acquired for workshop and storeyard has been fenced, graded and surfaced, and a steel framed hut erected as a temporary workshop pending provision of permanent buildings. Two prefabricated houses have been erected on land adjoining the storeyard site. The workshop and storeyard personnel is 6. (Plates Nos. 18 and 19.)

Plate No. 18. Prefabricated houses at Horsham depot.

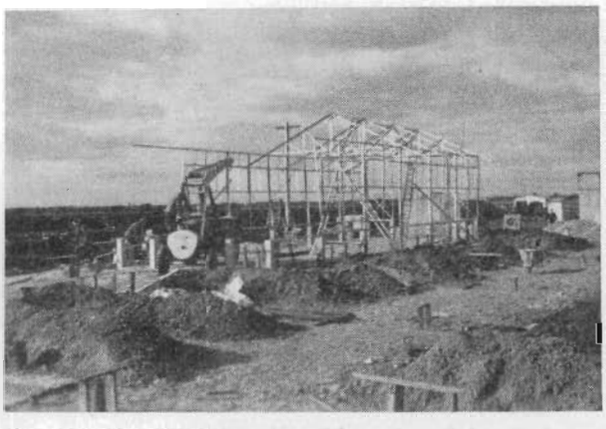


Plate No. 19. Prefabricated steel-framed workshop in course of erection at Horsham depot.

Traralgon.

The Traralgon divisional staff is still located in Melbourne, but areas of land for divisional offices and staff residences have been purchased. The transfer of staff to Traralgon will be effected as soon as accommodation can be provided.

Warrnambool.

A house erected for the Assistant Divisional Engineer is now occupied and two additional blocks of land for staff residences have been purchased.

General.

The general oversight of works carried out by municipal councils with funds provided by the Board, together with the control of works under the direct supervision of the Board, is entrusted to all Divisional Engineers. Trade accounts are paid from all divisional centres located away from head office and it is hoped that in due course similar arrangements may be made for the payment of municipal claims.

Plans and specifications prepared by municipal engineers are examined at Ballarat, Bendigo and Geelong. This service will be extended to other divisions as soon as the necessary qualified staff is available.

CONFERENCE OF STATE ROAD AUTHORITIES OF AUSTRALIA.

The Eleventh Conference, which was held in Hobart in September, 1948, was attended by representatives of the Road Authorities of all States. Amongst the matters discussed were those submitted by the Australian Transport Advisory Council dealing with the classification of roads and the adoption of a master plan of road construction.

Other subjects considered were of a diverse nature, such as those relating to the dimensions and loading of motor vehicles, uniform procedure for the invitation of tenders for the supply of bitumen, route numbering, representation on committees of the Standards Association of Australia dealing with the loading of structures and the timber industry, purchase of plant and spare parts, invitation of the United States Public Roads Administration for officers to attend a short course for highway engineers, future representation at the Permanent International Association of Road Congresses. Opportunity was also taken by the delegates to inspect construction works being carried out in Tasmania, particularly those under the control of the Hydro-Electric Commission.

Recommendations submitted to the Conference by the Ninth Conference of Senior Technical Officers, held in Adelaide in April, 1948, were considered. The Tenth Conference of those officers was held in April, 1949.

During the year, owing to retirement or transfer to other fields, Messrs. W. L. Dale, Chairman of the Country Roads Board, J. R. Kemp, Main Roads Commissioner for Queensland, and G. D. Balsille, Director of Public Works for Tasmania, each of whom has been associated with the Conference since its inception in 1934, severed their association with it.

CONFERENCE OF MUNICIPAL ENGINEERS.

A further conference of municipal engineers convened by the Board was held on the 17th and 18th May, 1949. Earlier conferences had been held in the latter part of the calendar year, but in view of a wish having been expressed for a change, the municipalities were circularized, with the result that the majority of the councils favoured the early part of the year.

At the last conference numerous subjects of an engineering, financial or administrative nature, with which municipal engineers are concerned mutually with the Board, were discussed, such as (*a*) the application of aerial photography to road location and design, and the facilities available, (*b*) " ribbon development " of main arteries, (*c*) present design standards and trends with reference to loadings, widths and types of construction required for various types of roads, and (*d*) Australian production and bulk handling of bitumen.

The conference was attended by 103 municipal engineers, apart from engineers in the Board's service. A field inspection and study was organized of works being carried out for the Melbourne and Metropolitan Board of Works on the Warburton–Woods Point Road where a demonstration of the methods of use of clearing and earth-moving equipment and other roadmaking plant was witnessed. Tunnelling and other works at McVeigh's dam were also inspected by courtesy of the Board of Works.

PUBLICATIONS.

The following printed publications were issued during the year :—

1. " Report of the Chief Engineer (Mr. C. G. Roberts, M.C., B.Sc. (Eng.), A.M.I.C.E., A.M.I.E., Aust.) on his visit to the United Kingdom and the United States of America in 1947." This report of 76 pages summarized the observations made and impressions gained by Mr. Roberts, and is divided into the following sections—General Impressions, Road Research and its Application, Planning—City—Town, Highway Planning, Traffic and Safety Studies, Traffic Signs, Lights, &c., Surveys and Plans, Geometric Design, Pavement Thickness, Construction Methods, Observed Pavement Practice, Maintenance, &c., Plant, Staff and Employees, Bituminous Surfaces, Bridges.

2. " Road Facts, 1949." This pamphlet shows by means of graphs and tables how the funds available to the Board have been derived in recent years, the distribution of expenditure over various classes of roads, the rate of growth of vehicle registration and of gross receipts, the general trend of costs, the growth in mileages of " declared " roads and the annual expenditure over a period of years on unclassified roads. The

pamphlet was distributed to all municipal councillors in Victoria and has been a means of clarifying the subject of the Board's " ways and means " and removing some common misconceptions.

3. " Report of Conference of Municipal Engineers, November, 1947." This report includes technical papers relating to production and use of tungsten-carbide tipped drills, to the statistical relationships between certain simplified soil tests, and to the question of the road in relation to town planning.

PHOTOGRAPHY.

Since the establishment of the Board's film section eleven documentary films have been completed. During the year " Bituminous Roads No. 2 " having as its theme the corrective retreatment of a worn bituminous surface road was completed together with " Gazette No. 2 " featuring the work of a traffic inspector, the use of a roughometer, the construction and driving of concrete piles at the Swan Street bridge, and roadside views at Healesville and Warburton. A film dealing with the construction of a typical timber and steel bridge is in the course of preparation. Numerous applications for the screening of the Board's films have been made ; during the year 41 presentations were given to various organizations and 20 to the personnel of the Divisional Offices and Camps.

RETIREMENT OF MR. W. L. DALE.

After association with the Board since its inception in 1913, Mr. W. L. Dale, A.S.A.A., F.C.I.S., L.C.A., retired on the 30th June, 1949. Mr. Dale, who had been in the employ of the Melbourne City Council, was appointed first Secretary of the Board, and held that position until 30th June, 1929, when he was appointed a member, following the retirement of Mr. A. E. Callaway. On 2nd January, 1945, he succeeded Mr. L. F. Loder as Chairman of the Board, which office he held on retirement.

In the early years of the Board's operations Mr. Dale was largely responsible for initiating systems dealing with administrative procedure and finance. His experience as Secretary and his subsequent long membership of the Board gave him a detailed knowledge of the State and of the Board's relationships with municipalities which was most valuable in his term as Chairman during the immediate post-war period.

STAFF.

At the 1st July, 1948, the total of the Board's staff was 346, consisting of 199 permanent officers (185 male and 14 female) and 147 temporary officers (72 male and 75 female). The total at the 30th June, 1949 was 363 consisting of 208 permanent (195 male and 13 female) and 155 temporary (75 male and 80 female) representing a total net increase of seventeen. As the number at Head Office was reduced by four, there was an increase of 21 in other parts of the State. The total of new appointments during the year was 80 and the loss of staff by retirement or resignation 63.

Following the death of Mr. E. J. Hicks as recorded in the last Annual Report Mr. G. C. Griffiths, Deputy Accountant was appointed to the position of Accountant as from 7th September, 1948.

On 20th March, 1949, Mr. A. E. Mann, F.I.C.A. who joined the Board's service on the 20th March, 1916, and held the position of Deputy Accountant retired. During his long service with the Board Mr. Mann carried out his important duties in a very efficient and conscientious manner.

On 1st March, 1949, Mr. H. P. George, A.M.I.E. (Aust.), C.E., who held the position of Traffic and Location Engineer left the Board's service to take up the position of Chief Technical Officer of the Town and Country Planning Board. Mr. George was originally appointed as a pupil in engineering on 21st May, 1923, and subsequently served in various sections of the Engineering Branch.

MISSIONS ABROAD OF OFFICERS.

Materials Research Engineer.

In the Thirty-fifth Annual Report reference was made to the approval given for Mr. A. H. Gawith, M.C.E., A.M.I.E. (Aust.), Senior Divisional Engineer, Materials Research Division, to undertake a mission overseas in order to examine methods adopted in major

road research organizations abroad. Mr. Gawith left in May 1948, and returned to Melbourne on the 4th November, 1948, after visiting United Kingdom, Europe, and United States of America.

Approval has been given for printing his report which includes a survey of the principles on which the research and routine organizations of the Board should be extended and records new developments in testing techniques. His recommendations should, in due course, improve the usefulness and efficiency of this division of the Engineering Branch.

Engineer for Bridges.

In view of an extensive programme of urgent bridge building required throughout the State involving the eventual expenditure of over £1,000,000 the Board considered that a visit abroad by its Engineer for Bridges (Mr. I. J. O'Donnell, O.B.E., B.C.E., A.M.I.E. (Aust.), would be justified, particularly to enable him to investigate economic designs adopted in Great Britain and Europe. The proposal was approved by the Government, and Mr. O'Donnell left by air on the 17th June, 1949. Whilst abroad he will also make personal enquiries in connexion with the acquisition of heavy crawler tractors from sterling areas and the purchase of steel rods and sections.

OFFICE ACCOMMODATION.

Owing to the congested condition of the accommodation in the western annexe of the Exhibition Building representations were made to the Exhibition Trustees with a view to obtaining an additional area in the main portion of the building. The Trustees acquiesced in this request and an area of 7,200 square feet was made available. This has enabled provision to be made for a more commodious and conveniently designed Board room as well as more suitable offices for the Chief Engineer, Deputy Chief Engineer, Highways Engineer and other senior engineers, in addition to complete accommodation for the officers of the Dandenong Division. The detailed design and supervision of the extension was undertaken by the Chief Architect's Branch of the Public Works Department.

INDUSTRIAL.

Wages Awards.

An agreement governing wage rates and working conditions dated 18th March, 1946, between the Australian Workers' Union and the Board was superseded on the 29th October, 1948, when the Commonwealth Arbitration Court announced a new construction award binding the Union and the Board as parties.

The award governs the rates of pay of approximately 50 per cent. of the Board's employees and the working conditions of approximately 70 per cent. of employees. It liberalized certain conditions of employment and provided for increases in margins for skill, ranging from 3s. per week to 12s. per week ; it also provided for overtime calculation and the employment of cook-house personnel in a more satisfactory manner.

In January, 1949, approval was given for a general reclassification of the Board's patrol employees, which embraced 234 employees and involved wage increases ranging from 3s. to 20s. per week. This reclassification was necessary in order to provide a proper relative position between the patrol employees and those whose wage rates have been prescribed by industrial tribunals.

In May, 1949, the Commonwealth Arbitration Court announced a new transport workers' award which prescribed an increase of 10s. per week in the margins for skill of all motor vehicle drivers and under which 300 employees of the Board benefited.

Amenities.

Approval has been given for the provision of a canteen at the Board's central workshops and storeyard at South Melbourne where approximately 200 men are employed. The work will be put in hand as soon as conditions in the building industry permit.

Number of Employees.

During the year the maximum number of employees in the Board's service at any one time was 2,087. During the year, 1,849 were actually engaged and 2,134 ceased employment either of their own accord or were discharged.

MOTOR REGISTRATION.

During the year, 359,142 vehicles, including traction engines and motor cycles, were registered in Victoria.

The number of motor vehicles of various classes registered for the past two financial years, as set out in the following statement, shows an increase of 29,871 in the figures of the financial year 1948–49 :—

Vehicles.	Financial Year 1947–48.		Financial Year 1948–49.		Increase.	Decrease.
Private—						
New	12,164		18,312		6,148	
Secondhand—Re-registered ..	7,896		8,693		797	
Renewals	147,271		158,038		10,767	
		167,331		185,043		
Commercial—						
New	5,686		7,234		1,548	
Secondhand—Re-registered ..	4,200		4,320		120	
Renewals	47,364		52,077		4,713	
		57,250		63,631		
Primary Producers—						
New	3,293		4,232		939	
Secondhand—Re-registered ..	2,466		2,891		425	
Renewals	55,233		56,451		1,218	
		60,992		63,574		
Hire		3,710		3,958	248	
Licences under Omnibus Act		869		949	80	
Trailers		9,929		10,272	343	
Traction Engines, &c.		107		68		39
Motor Cycles		29,083		31,647	2,564	
Total		329,271		359,142	29,910	39

ACCOUNTS.

Statement of accounts for the year ended 30th June, 1949, and the Country Roads Board Fund and balances as at that date 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, including expenditure under special appropriations :—

—	Under Board's Supervision.			Under Councils' Supervision			Total.		
	£	s.	d.	£	s.	d.	£	s.	d.
1. State Highways—									
Maintenance and reconditioning	458,146	17	9	111,913	2	11	570,060	0	8
Construction	324,540	9	6	..			324,540	9	6
2. Main Roads—									
Permanent Works (Swan-street Bridge) ..	37,768	13	1	..			37,768	13	1
Construction and restoration	3,327	8	2	8,977	0	5	12,304	8	7
Maintenance and reconditioning	86,644	11	9	1,000,475	10	1	1,087,120	1	10
3. Developmental Roads—									
Construction and maintenance	41,283	3	4	397,751	11	2	439,034	14	6
Roads for Isolated Settlers	..			19,438	5	7	19,438	5	7
4. Tourists' Roads—									
Maintenance	65,608	11	10	7,731	6	5	73,339	18	3
Construction	44,137	9	2	..			44,137	9	2
5. Forest Roads—									
Construction	857	0	11	..			857	0	11
Maintenance	5,606	7	6	15,686	8	9	21,292	16	3
6. Murray River Bridges and Punts—									
Maintenance	5,563	1	7	382	18	10	5,946	0	5
7. Roads adjoining Commonwealth properties—									
Maintenance	..			3,246	10	10	3,246	10	10
Total	1,073,483	14	7	1,565,602	15	0	2,639,086	9	7

In addition to the amounts shown in the above Statement, the following expenditure was incurred during the year in respect of works carried out on behalf of the Commonwealth Government and several State Instrumentalities, &c. :—

	£	s.	d.
Commonwealth Government	74,277	9	10
State Instrumentalities, &c.	348,376	3	1
	422,653	12	11

OFFICERS AND EMPLOYEES.

Again the Board has to express its appreciation of the efficient manner in which all officers and employees loyally carried out the demands made upon them.

ACKNOWLEDGMENTS.

The thanks of the Board are tendered to the Honorable J. A. Kennedy, M.L.C., Minister of Public Works, for his help and interest in the Board's work.

The Board also desires to record its appreciation and thanks to officers of Government Departments, State Instrumentalities, and the Road Authorities of other States for their assistance. The active co-operation of the Victorian municipal councils and their officers is also gratefully acknowledged.

We have the honour to be,

Sir,

Your obedient servants,

D. V. DARWIN, Chairman.

F. M. CORRIGAN, Member.

R. F. JANSEN, Member.

W. H. NEVILLE, Secretary.

CHIEF ENGINEER'S REPORT.

Country Roads Board Office,
Melbourne,
28th October, 1949.

THE CHAIRMAN,

SIR,

I have the honour to submit the following particulars of certain engineering work carried out during the financial year 1948–49.

PAVEMENT DESIGN.

Following the development of correlation between the California Bearing Ratio test and the simpler soil tests, to which reference was made in the report for the year ending 30th June, 1947, a method of pavement design employing simple tests has been developed to give pavement thicknesses substantially the same as those obtained by the method described in the Annual Report for the year ended 30th June, 1945.

The requirements which this method attempts to fulfil are that :—

1. The tests required should be simple, and the results should be obtainable quickly, so that the subgrade can be evaluated at a reasonably large number of points along the road.
2. Any climatic factors which may be taken into account should be readily obtainable from published data.
3. Any traffic factors taken into account should be obtainable from 12-hour traffic counts, without calculation.
4. The equation for pavement thickness should be in a form suitable for graphical or tabular calculation.

The following procedure is that in use at present.

(*a*) The tests required are :—

(i) The percentages passing British Standard Sieves Nos. 7, 36, and 200.

(ii) The Liquid Limit and Plastic Limit.

(iii) The Linear Shrinkage from the liquid limit, determined on material passing the No. 36 B.S. sieve, by direct measurement of a 10-inch bar.

(*b*) The average local rainfall is estimated from the isohyetal map of Victoria published by the Commonwealth Bureau of Meteorology.

(*c*) The average number of trucks and buses counted in both directions on a two-lane road during a 12-hour-day count at the date of construction, plus 50 per cent., unless there is reason to anticipate a greater or less growth of traffic. Cars and utility trucks are neglected in estimating pavement thickness.

(*d*) The overall value of the soil is estimated as a probable California Bearing Ratio by means of tables, and from this California Bearing Ratio and the factors (*b*) and (*c*) above the pavement thickness is estimated by means of an alignment chart.

The first two of the three formulae used for estimating the probable value of the California Bearing Ratio were determined by the method of multiple correlation with a large number of California Bearing Ratio test results, while the third curve was fitted graphically. The formulae are :—

(1) Log_{10} (C.B.R.) $= 1{\cdot}67 - 0{\cdot}0051A + 0{\cdot}0019B - 0{\cdot}017C - 0{\cdot}00039BC.$

(2) Log_{10} (C.B.R.) $= 1{\cdot}89 - 0{\cdot}014D - 0{\cdot}0045A + 0{\cdot}0052\frac{B}{A} - 0{\cdot}000046\left(\frac{B}{A}\right)^2 - 0{\cdot}0037E.$

(3) $\text{(C.B.R.)} = 4{\cdot}5 + \frac{(20 - G)^2}{18}$

where

A = percentage passing the No. 36 B.S. sieve.

B = percentage passing the No. 200 B.S. sieve.

C = linear shrinkage from the liquid limit, as a percentage.

D = plasticity index.

E = percentage passing the No. 7 B.S. sieve.

G = group index (as defined in Highway Research Board " Proceedings ", Vol. 25, 1945, p. 378).

(C.B.R.) = California Bearing Ratio at 95 per cent. Modified A.A.S.H.O. compaction on soaked specimen.

In practice, the first two equations are solved from tables, and the third from a graphical chart. The results from the three methods are averaged and, should any marked discrepancy arise, the test results are checked.

Pavement thickness is estimated from an alignment chart based on the formulae—

$$T = \left(\frac{N}{1000}\right)^{0.1}\left(\frac{R}{50}\right)^{0.3}\left\{16\sqrt[3]{\frac{20}{(\text{CBR})}} - 8\right\}$$

where

T = thickness in inches.

R = average annual rainfall in inches.

N = number of trucks and buses

This is an approximation to the Californian thicknesses for " average highway traffic

when $N = 1000$, and

$R = 50$.

The alignment chart is reproduced as Figure 1.

Special consideration must be given to the case of roads with more than two lanes or where unusual types of traffic are encountered. In such cases it is usual to revert to the calculation of " equivalent repetitions of a 5,000 lb. wheel load " as described in the report for the year ending 30th June, 1945.

Full information on the use of the method, with tables and graphs, has been issued as Technical Bulletin No. 4, of 25th January, 1949.

PLANT.

Efficiency.—Mechanical plant is now used not only because of its economy, but because without its aid it would be impossible to carry out the Board's work under present-day conditions. Attention is, therefore, being given to the operating efficiency of all major units.

Two kinds of efficiency have been adopted in order to assess the mechanical and overall efficiency :—

(*a*) Mechanical efficiency =

$$\frac{\text{Days worked}}{\text{Working days less days lost for reasons other than plant breakdown or overhaul}} \times 100 \text{ per cent.}$$

(*b*) Overall efficiency =

$$\frac{\text{Days worked}}{\text{Working days}} \times 100 \text{ per cent.}$$

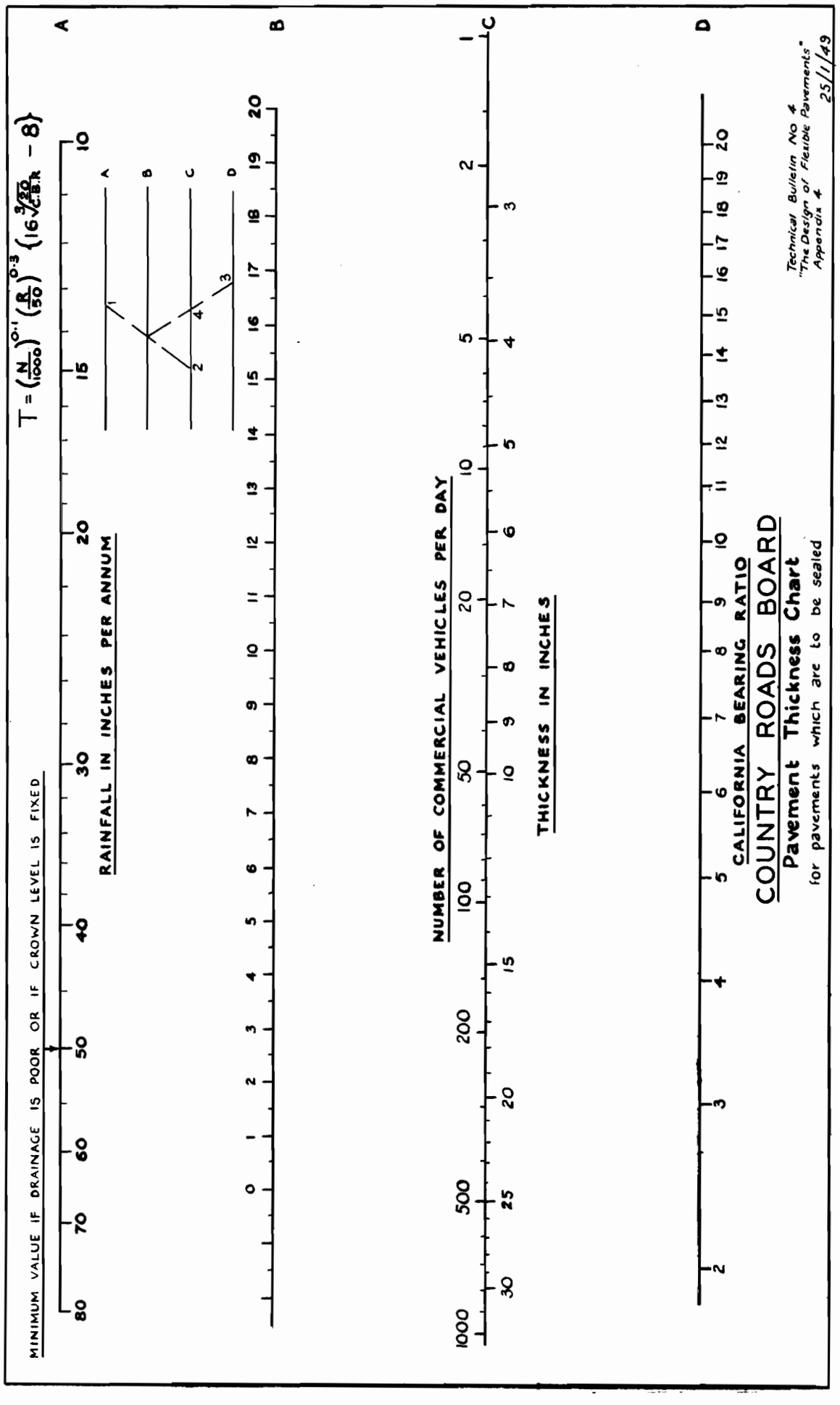

MINIMUM VALUE IF DRAINAGE IS POOR OR IF CROWN LEVEL IS FIXED
$T = \left(\frac{N}{1000}\right)^{0.1} \left(\frac{R}{50}\right)^{0.3} \left\{16\sqrt[3]{\frac{320}{C.B.R}} - 8\right\}$
A
B
C
D
RAINFALL IN INCHES PER ANNUM
NUMBER OF COMMERCIAL VEHICLES PER DAY
THICKNESS IN INCHES
CALIFORNIA BEARING RATIO
COUNTRY ROADS BOARD
Pavement Thickness Chart
for pavements which are to be sealed
Technical Bulletin No 4
"The Design of Flexible Pavements"
Appendix 4
25/1/49

Fig. 1.

A summary of the figures for certain important classes of plant, for the last two years, is given in Table I. below :—

TABLE I.—PLANT EFFICIENCY.

Type of Plant.	Number of Units in Group.	Average Age of Units in Group.	Overall Efficiency.		Mechanical Efficiency.	
			1947–48.	1948–49.	1947–48.	1948–49.
		Years.	%	%	%	%
Crawler Tractors—						
Class 1	11	3	42	27	45	33
Class 2	39	3·7	39	33	50	45
Class 3	14	3	34	21	37	36
Class 4	13	3	55	33	64	47
Power Graders—						
Heavy—Tandem Diesel ..	46	4·5	72	57	73	76
Medium—Dual Wheel Diesel	6	13	61	64	62	76
Light—Single Drive, Hand Controlled	9	17	48	28	52	42
Light—Single Drive, Power Controlled	20	5	72	49	73	56
"Speed Patrols"	7	2	..	74	73	88

Notes.—

(*a*) The above figures do not take account of approximately 21 tractors and 6 power graders which, owing to repair difficulties, and the need for concentrating on better machines, did not work at all during the year 1947–48, and 14 tractors and 1 power grader laid up for similar reasons in 1948–49. If these machines are included in the summary, both overall and mechanical efficiencies are lower.

(*b*) Most of the tractors and some of the graders were obtained from "Disposals" in various degrees of condition. The ages given are from date of acquisition by the Board.

The drop in overall efficiency was partly due to the wet working season. The mechanical efficiency of certain types of plant was lower, probably because machines received from "Disposals" and set to work with minor overhaul in 1947–48 became due for major attention last year.

The difference between mechanical and overall efficiencies invites attention to the necessity for making full and efficient use of the limited amount of plant in the field. While the figures are depressing, largely due to shortage of spare parts, repair facilities and labour, and to the difficulty of getting new machines, they are valuable as a spur to those responsible for the maintenance and effective use of the plant.

Maintenance.—The volume of plant maintenance and construction work carried out during the past financial year by the Board's workshops was substantially the same as for the preceding year, the output being limited by the shortage of skilled fitters, spare parts, and adequate workshop space. However, constant effort has been made to improve the quality of the work, principally by more extensive checking and testing after overhaul. Shortage of spare parts has made it necessary to manufacture many tractor and other machine parts. Outstanding amongst these have been large final drive gears for crawler tractors which, together with their gear-cutting hobs, were made in conjunction with local manufacturers. Field maintenance has also been improved by supplying resident fitters on major construction jobs with more complete equipment, e.g., small mobile workshops, lifting and plant washing gear.

Following reports of the prolonged engine life obtained by the American Navy by chrome plating of cylinder liners, efforts have been made to have this work done locally. Crankshafts have been plated and have been in successful operation for long periods, but it has taken about six months' effort in conjunction with local plating firms to successfully plate and grind liners. It is expected that these liners will give from two to four times the normal life of a non-plated liner.

Decentralization of workshops has been carried one step further by the erection of workshops at Bairnsdale and Horsham.

PLANS AND SURVEYS.

Use of Aerial Photography.—The past year has been particularly interesting because of the greatly increased use of aerial photography and photogrammetry as aids to the solution of a variety of engineering problems. This has been made possible by the increased coverage of the area of the State by aerial photography, and the availability of the five "Wild" A.6 Stereo plotting machines in the Department of Lands and Survey for the preparation of topographical maps for Government departments.

Victoria has a total area of 87,000 square miles, and a contract has been let for photography covering 62,000 square miles, of which 55,000 square miles has been completed. Most of the remaining area of 25,000 square miles, however, has already been photographed by the R.A.A.F. for defence purposes, and photographs of these areas can be obtained, although the photographs are not all suitable for photogrammetry. Private companies are now taking a keen interest in this work, and one firm is installing complete multiplex stereo equipment, so that they will be able to prepare topographical maps in addition to aerial photography.

During the year several extensive topographical maps have been prepared and used to investigate new road proposals. Generally, these have been at a scale of 500 ft. to 1 inch with contours at 20 ft. intervals, although some maps have been prepared at 200 ft. to 1 inch. Under present circumstances, it is even possible to obtain a 10-ft. contour interval, provided that the photographs are of a sufficiently high standard and the ground control is adequate.

The cost of aerial photography and photogrammetry already done on Board projects has been of the order of £6 per square mile.

Aerial photography has been found of great value in the determination of catchment areas, provided that precautions are taken to ensure by ground inspection that there are no complications in the less clearly defined portions of the ridge lines, and that due allowance is made for scale errors due to large differences in elevation.

Experience with aerial strip photographs at a large scale (100 ft. to 1 inch), as used by the Railways Department, has been very satisfactory, particularly in the study of a project involving proposed widening of the Highway Reserve on the Prince's Highway East. These large scale photographs have been found very reliable with regard to scale, and the definition is very satisfactory. The clear picture given of all improvements, land use, and nature of cultivation greatly facilitate assessment of the cost of such widening projects. It is proposed to extend this type of work to the preparation of record plans of some of the newer State Highways. Accurate mileages will be marked on the pavement just prior to the strip being flown, so that a photographic record of highway mileages will be obtained at the same time.

The Board has a "Fairchild" Stereo-Comparator, which is a small portable stereo plotting instrument capable of producing topographical maps. This machine, which requires a skilled and experienced operator, has been used in Head Office for contouring limited areas, but is not used for large projects in view of the better machines and facilities which have recently become available through the Department of Lands and Survey. A limited amount of preparation of mosaics or photomaps has also been done in Head Office to facilitate study of particular projects. It is hoped to be able to equip Divisional offices with simple mirror stereoscopes in the near future, so that aerial photos may be studied under local conditions. A few pocket stereoscopes are in use for field study of aerial photos.

Tacheometry.—Concerning surveys generally, more extensive use is now being made of tacheometry, the office work of reducing calculations being much simplified by the "Redmond" tables which are now available. Except in very easy country, it is undoubtedly better practice to obtain topographic information about a traverse line, and design the final centre line in the office after several trials have been made, than to expect a surveyor to obtain the most suitable alignment in the field, without a clear view of all the factors involved. Tacheometry is

greatly superior to the former practice of taking wide cross sections by slow methods in broken country as it enables a more complete picture of the shape of the country to be obtained. The location and elevation of critical points can also be determined more rapidly.

CONSTRUCTION.

Tungsten Carbide Rock Drills.—Experience over the last two years has led to the use of rock drills tipped with tungsten carbide cutting edges for drilling hard rocks. The advantages and disadvantages of this type of drill are :—

Advantages—

(*a*) Negligible loss of gauge, making it possible to drill a hole of constant diameter, with a saving in drilling costs and possible economy in explosives.

(*b*) Reduction in dust produced.

(*c*) Greater speed of drilling.

(*d*) Saving in time taken up in replacing drills or bits.

Disadvantages—

(*a*) High initial cost.

(*b*) Possibility of detachment of cutting edge from bit (less frequent now than formerly).

The results of tests carried out while drilling an altered Microdiorite, having a Mohr's Hardness of five to six, but very hard to drill, are summarized in Table II. below :—

TABLE II.—TESTS ON ROCK DRILLS.

Licola, June, 1947, 1¼ inch *diameter chisel tips.*

Drill Tip.	Penetration Speed.	Depth Drilled.	Wear.
	ft./min.	ft.	
Tungsten Carbide ..	0·330	70	·009 in. per 100 ft.
Ordinary Drill Steel ..	0·079	5	3·5 drills per ft.

Licola, April, 1949. *All bits tested had tungsten carbide tips.*

Type of Bit.	Bit Diameter.	Depth Drilled.	Hammer Weight.	Air Pressure.	Penetration Speed.	Volume of Rock Removed.
	in.	ft.	lb.	lb./sq. in.	ft./min.	cu. in/ min.
Cross ..	1·62	2	32	75	·106	2·63
Chisel ..	1·36	46	32	61	·160	2·76
Cross ..	1·36	16	32	75	·191	3·42
Chisel ..	1·52	17	32	75	·175	3·6
Cross ..	1·52	7	32	75	·180	3·82
Chisel ..	1·36	52	32	75	·235	3·91
Cross ..	1·62	4	60	60	·196	4·84
Chisel ..	1·62	6	60	60	·207	5·06
Chisel ..	1·36	25	60	52	·298	5·31
Chisel ..	1·36	10	60	60	·380	6·70

In this test, only the 1·36 inch chisel bits (two used) did enough work to show any measurable wear.

The wear shown was :—

Bit.	Length Bored.	Actual Loss of Gauge.*	Wear per 100 ft. Bored.
	ft.	in.	in.
A	75	·0040	·0057
B	58	·0010	·0017

* See Fig. 2.

Costs vary with tip diameter and nature of bit. At the present time (August, 1949) tungsten carbide tips from various manufacturers cost :—

Diameter.	Detachable Type Bits.		Chisel Type Brazed into Rod.
	Cross.	Chisel.	
in.	£ s. d.	£ s. d.	£ s. d.
1⅞	7 14 0	4 19 0	..
1⅝	6 17 0	4 16 0	..
1½	6 3 0	4 10 0	..
1½	..	..	4 3 0
1 3/16 ..	5 9 0	4 2 6	..

In hard rock, a tungsten carbide bit may be expected to drill 75 feet before requiring regrinding ; regrinding costs approximately 10s. per tip. Regrinding is necessary when the distance across the cutting edge (measured at the centre of the insert) is $\frac{3}{32}$ inch to $\frac{1}{8}$ inch. (See Fig. 2.)

The average total life of tungsten carbide bits in hard rock should be approximately 350 feet to 450 feet.

Drill steel is, of course, an extra charge on the above costs. It has been found that the tungsten carbide tips frequently outlast the drill steel and that tips are lost due to fatigue fracture of the steel. It is not known what life may be expected from steel, but it appears that when this known a record of the footage drilled by each piece of steel should be kept and steel discarded as it nears the end of its life. Better locally manufactured drill rod steels are expected on the Australian market shortly.

Tractor Performance.—A summary of crawler tractor operations on work carried out on the Wood's Point-road, between February, 1948, and February, 1949, is given in Table III. The tractors used were mainly Class 2, their number varying from three to ten at various stages of the work. The figures are interesting when compared with those previously given in Table I. for the overall and mechanical efficiency of a number of major items of plant, and stress the need for better maintenance facilities and

TABLE III.—SUMMARY OF CRAWLER TRACTOR OPERATION FIGURES—WOOD'S POINT-ROAD, 1948–49.

Item.	Spring, Autumn, and Winter Work. 22.2.48 to 26.11.48.		Summer Work. 29.11.48 to 18.2.49.		Year's Work. 22.2.48 to 18.2.49.	
	Hours.	Percentage.	Hours.	Percentage.	Hours.	Percentage.
Clearing	378	7·2	30	1·0	408	4·9
Ripping	58	1·3	207	6·6	265	3·2
Dozing	1,502	28·6	993	32·0	2,495	29·9
Scooping	211	4·0	602	19·3	813	9·7
Consolidating	102	2·0	193	6·2	295	3·6
Culvert Construction ..	..	..	50	1·6	50	0·5
Total Productive Time	2,251	43·1	2,075	66·7	4,326	51·8
Wet Conditions	1,006	19·2	28	0·9	1,034	12·4
No Driver	140	2·7	92	3·0	232	2·8
Tracks Off	52	1·0	43	1·4	95	1·1
Moving on Job	54	1·0	31	1·0	85	1·0
No Work Available ..	40	0·8	..	..	40	0·5
Mechanical Failure—						
Engine	284	5·4	24	0·8	328	3·9
Transmission	165	3·2	287	9·2	452	5·4
P.C.U.	41	0·8	148	4·7	189	2·3
A.O.	811	15·5	138	4·4	949	11·3
Servicing	91	1·8	32	1·0	123	1·5
Other Causes	290	5·5	219	6·9	509	6·0
Total Non-productive Time	2,974	56·9	1,042	33·3	4,016	48·2
Total Time	5,225	100·0	3,117	100·0	5,342	100·0
Cubic yards moved (including gravel and stripping)	37,571		50,257		87,838	
Cubic yards per hour actually worked (dozing and scooping)	21·8		31·5		25·8	

Notes.—

(*a*) During the period 22nd February, 1948, to 26th November, 1948, 50 per cent. of the material moved was "shot" rock which required double handling, i.e., from bench to road and from road to fill.

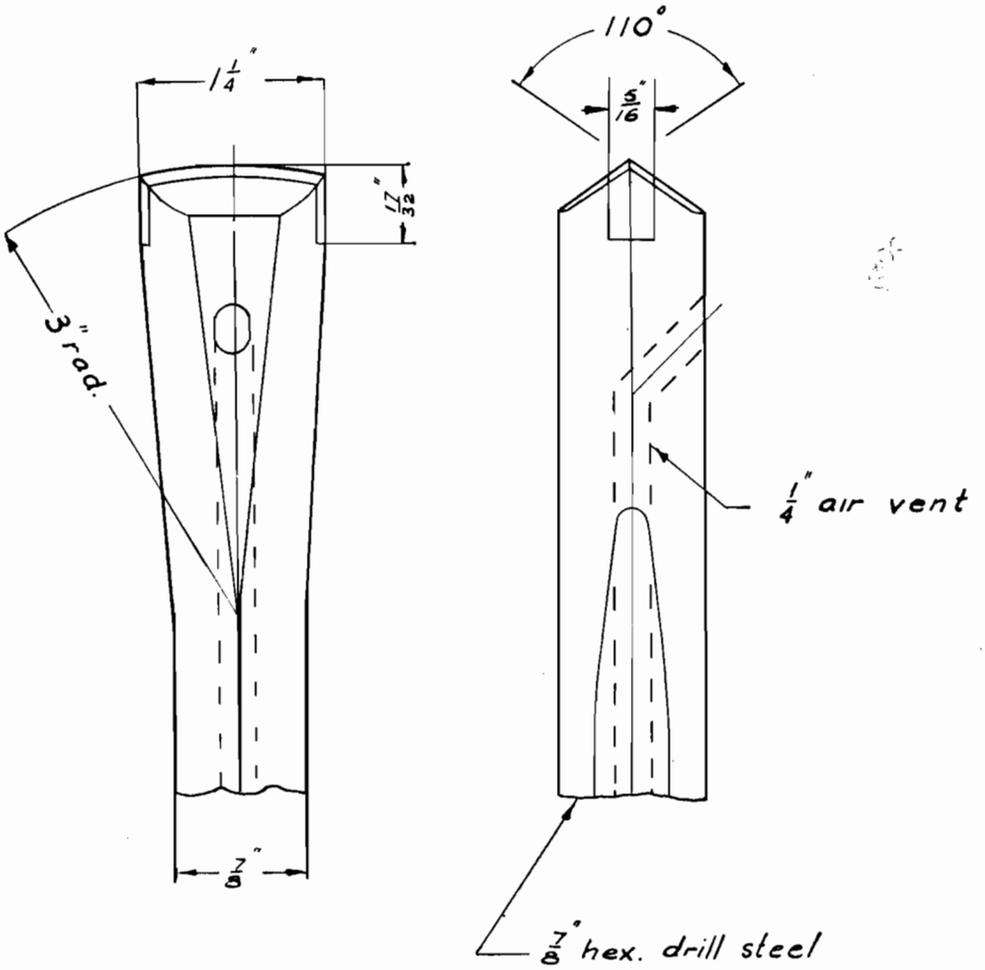
(*b*) During the period 29th November, 1948, to 18th February, 1949, 13 per cent. of the material moved was "shot" rock.

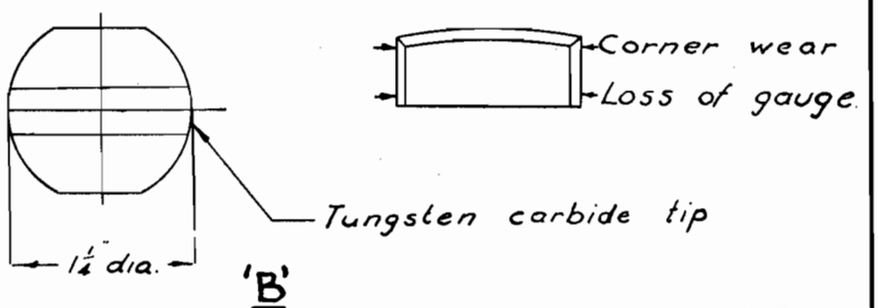
(*c*) Most of the material moved was endhauled and provision had to be made to pass traffic (220 vehicles for 12 hour count) through the work during operations.

TUNGSTEN CARBIDE DRILL

'A'

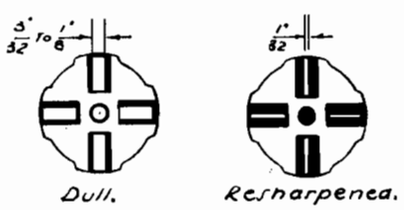
CHISEL BIT INSERT IN DRILL STEEL





'B'

DIAGRAM SHOWING DULL AND RESHARPENED CROSS BIT



J.C.S.

Fig. 2.

the provision of new machines as the old ones reach the end of their useful life. Of this work, during the summer period, when the maximum amount of plant was being used, the time lost due to mechanical failure fell from 23 per cent. to 14 per cent. following the provision of a resident fitter and a small workshop on the job.

ROUGHOMETER.

In the 1946–47 report, details and photographs of a single-wheel, trailer-type roughometer were given. The machine was constructed in accordance with a design published by the Division of Tests, Public Roads Administration, U.S.A.

During the past year the instrument has been travelled over all bituminous surfaces on State Highways, totalling approximately 2,640 miles, to obtain a roughness rating for each mile. This survey indicates that the mean index of irregularity of these sections is 200 units per mile, with a range from 110 to 390 units per mile. The standard deviation is 40, indicating that two-thirds of the mileage has an index of irregularity between 160 and 240.

Readings have also been taken on several lengths of road before and after the application of plant-mix corrective type seal coats. Although the number of sections has not been large, the figures in Table IV. give rates of application of drag spread bituminous seal coats which are tentatively suggested as sufficient to improve the riding qualities of a surface of given index of irregularity to one having an index of irregularity of approximately 150 units per mile. These figures do not allow for material required for reshaping the cross section.

TABLE IV.—RATES OF APPLICATION OF CORRECTIVE RETREATMENT.

Condition of Existing Surface.		Application.	General Classification of the Work.
Index of Irregularity. Units per Mile.	General Description.	One loose cubic yard covers—	
		sq. yds.	
201–230 ..	Fair ..	50	Light
231–260 ..	Poor ..	40	Medium
261–300 ..	Rough ..	30	Heavy
+ 300 ..	Very rough ..	25	Very heavy

Development of this use of the machine is anticipated when additional ones are built and staff becomes available to carry out further detailed investigations into the relation between the index of irregularity and the quantity of material required for satisfactory correction.

BITUMINOUS SURFACE TREATMENT.

Statistical Information.—Experience has shown that a stable pavement, protected from the abrasive action of fast moving traffic and the elements by means of a thin bituminous surface treatment, will carry practically all the rural traffic of Victoria. The mileage of black road in the Board's system and the cost of initial bituminous surface treatment and retreatment is, therefore, of vital importance to the Board's economy.

Fig. 3 shows the increase in total mileage of the Board's declared roads, and the mileage of black road included in the total, from June, 1925, to June, 1948. Figs. 4, 5, and 6 indicate the rising costs of labour, materials, and finished work over the same period.

Extent and Cost of Work, 1948–49.—Tables V. and VI. set out the extent of the bituminous surface treatment carried out during the year, while Tables VII. and VIII. give the average cost of various types of work for the season and the average cost of screenings or gravel, stacked by the roadside.

TABLE V.—MILEAGE CARRIED OUT DURING 1947–48 AND 1948–49.

Work Carried Out by—	Miles.	
	1947–48.	1948–49.
C.R.B. plant on C.R.B. roads	873	734
Municipal and hired plant on C.R.B. roads ..	54	50
Total work on C.R.B. roads ..	927	784
C.R.B. plant on Undeclared roads	..	39
C.R.B. plant on Municipal roads	43	55
Municipal and hired plant on Undeclared roads	..	4
C.R.B. plant for the Commonwealth Government	..	27
Total on other than C.R.B. roads ..	43	125
Grand Total	970	909

TABLE VI.—MILEAGE OF VARIOUS TYPES OF WORK CARRIED OUT ON ROADS UNDER THE BOARD'S CONTROL.

Type of Road.		Length in Miles.										Summary of Work.	
		Nature of the Work.											
		Initial Treatments.				Retreatments.							
Roads.	Control.	P.M.	P.	Prime and Seal, and Seal on Existing Primer.		Reseals—Binder in Gal./Sq. Yd.				P.M.S.	R.M.S.	State Highways.	Other Roads.
				E.	R.	0·10.	0·15.	0·20.	0·25.				
State Highways	Direct ..	..	11·6	48·1	55·0	31·4	91·5	23·2	..	1·4	..	262·2	..
	Municipal ..	..	..	3·9	5·9	14·0	8·2	9·7	..	2·0	..	43·7	..
Other Roads ..	Direct ..	..	..	12·2	6·3	..	..	11·3	..	..	..	..	29·8
	Municipal ..	..	1·6	90·1	45·5	26·6	161·3	115·4	2·3	3·7	2·4	..	448·9
Totals		..	13·2	154·3	112·7	72·0	261·0	159·6	2·3	7·1	2·4	305·9	478·7
		13·2		267·0		494·9				9·5		784·6	
		280·2				504·4							
		784·6											

Does not include 17 miles of initial treatment (extension) or 26 miles of retreatments on Undeclared Roads.

Abbreviations:—
Initial Treatments. .. P.M.—Penetration Macadam.
P.—Primer seal or heavy primer on partly completed work.
Prime and Seal.—
E.—Extensions to the existing bituminous surfaced system.
R.—Initial treatments on reconstructed lengths of previously sealed pavements.
Retreatments .. P.M.S.—Plantmix seals.
R.M.S.—Roadmix seals.

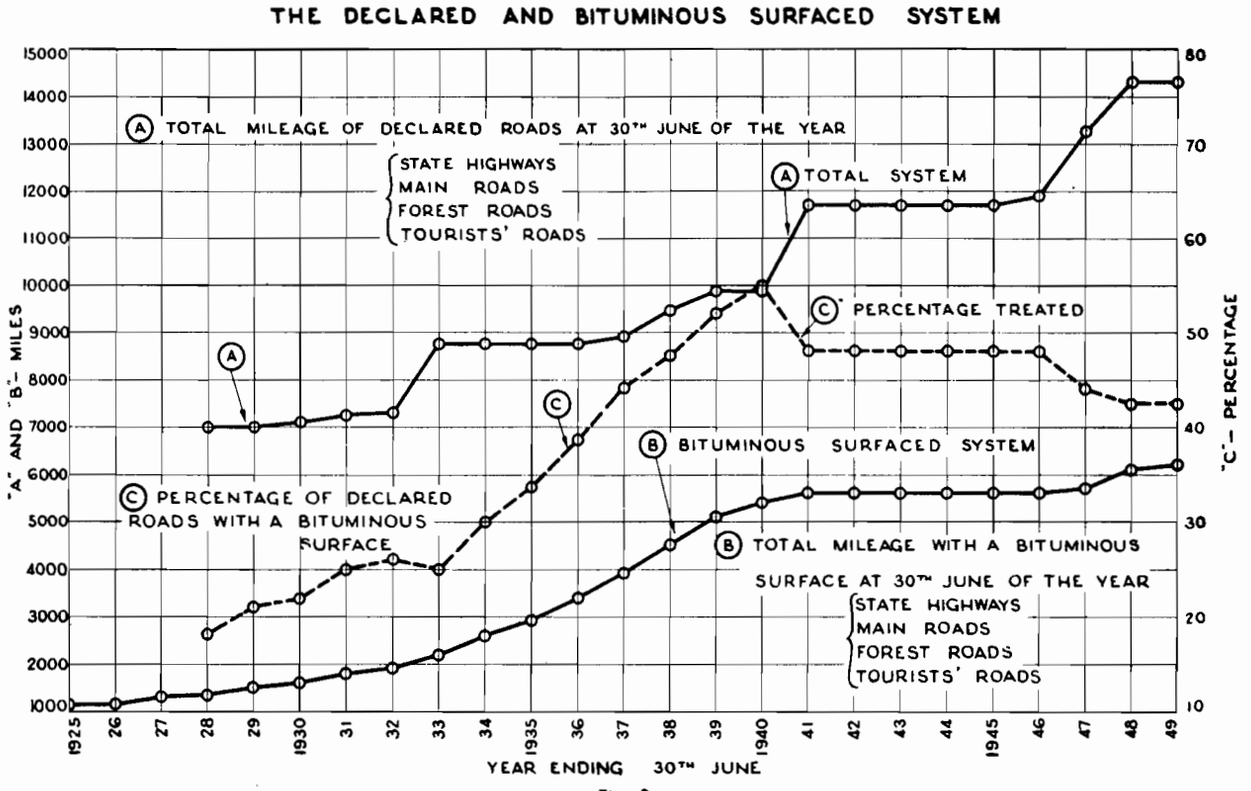

THE DECLARED AND BITUMINOUS SURFACED SYSTEM
(A) TOTAL MILEAGE OF DECLARED ROADS AT 30TH JUNE OF THE YEAR
STATE HIGHWAYS
MAIN ROADS
FOREST ROADS
TOURISTS' ROADS
(A) TOTAL SYSTEM
(C) PERCENTAGE TREATED
(B) BITUMINOUS SURFACED SYSTEM
(C) PERCENTAGE OF DECLARED ROADS WITH A BITUMINOUS SURFACE
(B) TOTAL MILEAGE WITH A BITUMINOUS SURFACE AT 30TH JUNE OF THE YEAR
STATE HIGHWAYS
MAIN ROADS
FOREST ROADS
TOURISTS' ROADS
"A" AND "B" - MILES
"C" - PERCENTAGE
YEAR ENDING 30TH JUNE

Fig. 3.

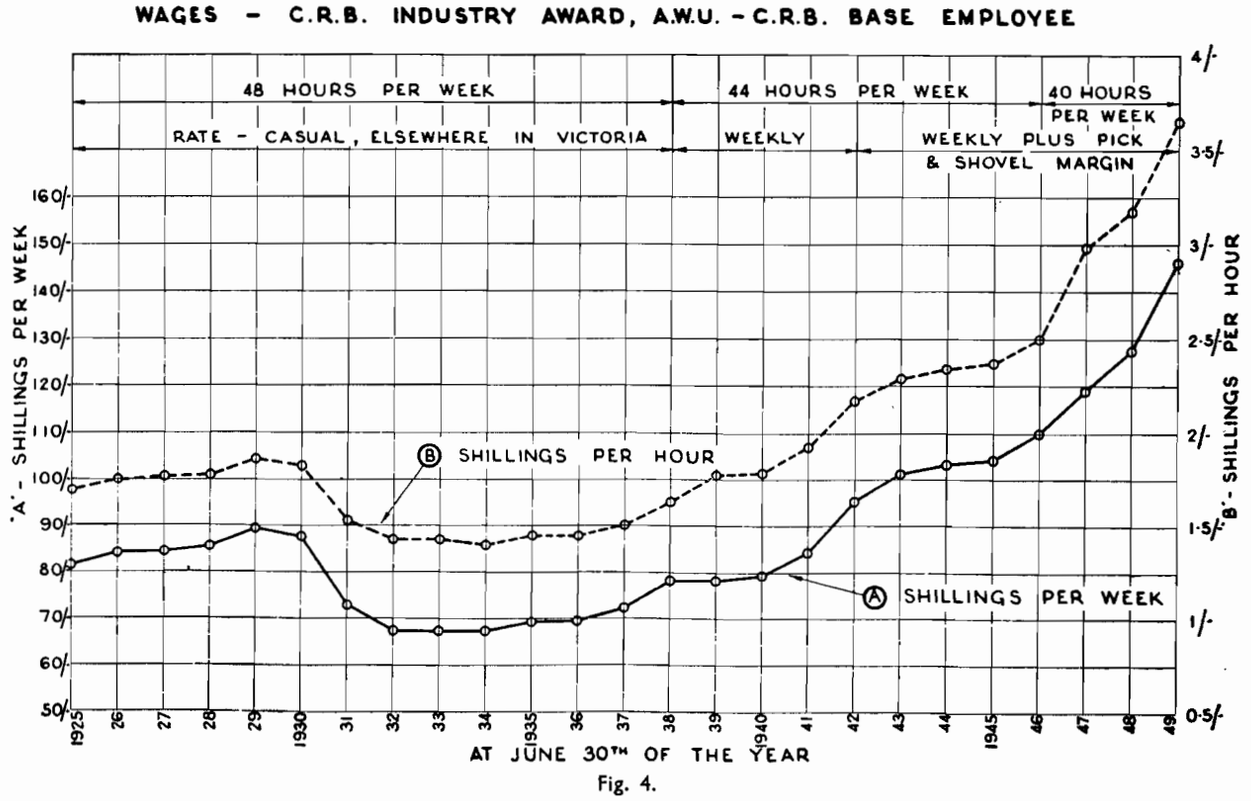

WAGES - C.R.B. INDUSTRY AWARD, A.W.U. - C.R.B. BASE EMPLOYEE
48 HOURS PER WEEK
RATE - CASUAL, ELSEWHERE IN VICTORIA
44 HOURS PER WEEK
WEEKLY
40 HOURS PER WEEK
WEEKLY PLUS PICK & SHOVEL MARGIN
(B) SHILLINGS PER HOUR
(A) SHILLINGS PER WEEK
"A" - SHILLINGS PER WEEK
"B" - SHILLINGS PER HOUR
AT JUNE 30TH OF THE YEAR

Fig. 4.

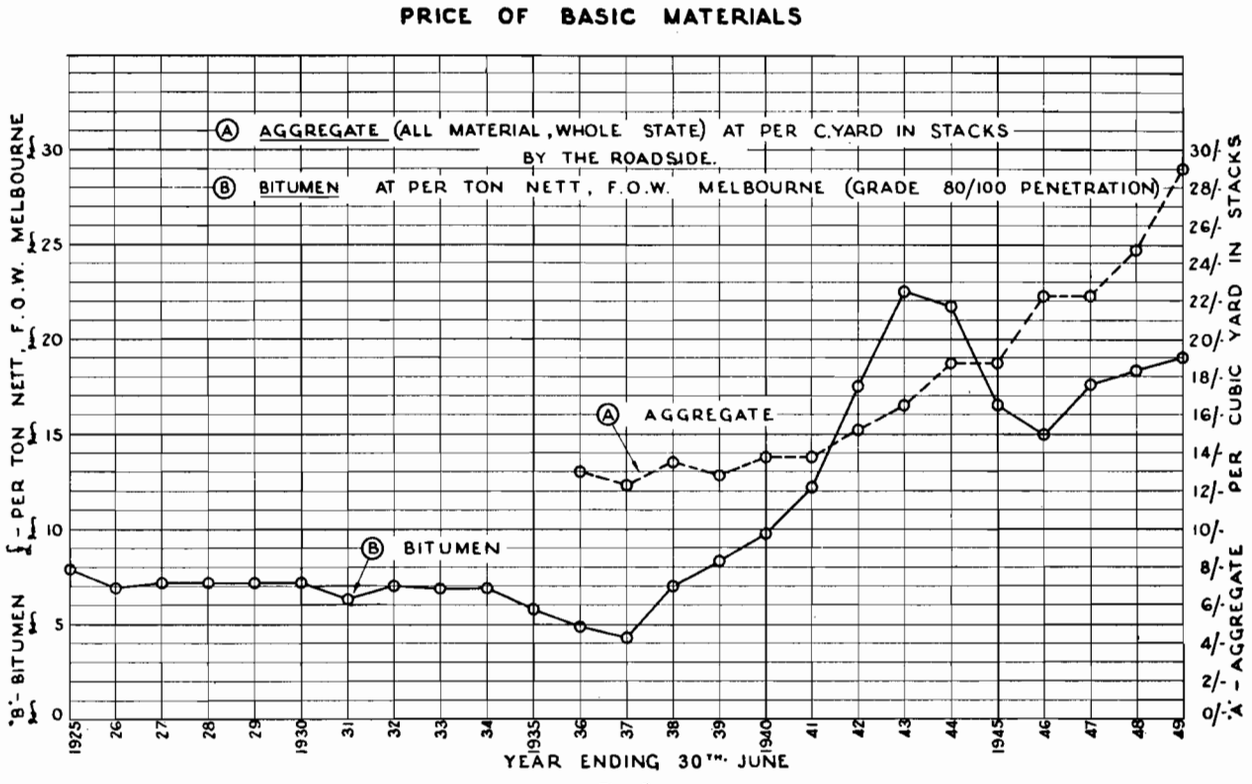

PRICE OF BASIC MATERIALS
(A) AGGREGATE (ALL MATERIAL, WHOLE STATE) AT PER C.YARD IN STACKS BY THE ROADSIDE.
(B) BITUMEN AT PER TON NETT, F.O.W. MELBOURNE (GRADE 80/100 PENETRATION)
(A) AGGREGATE
(B) BITUMEN
"B" - BITUMEN £ - PER TON NETT, F.O.W. MELBOURNE
"A" - AGGREGATE PER CUBIC YARD IN STACKS
YEAR ENDING 30TH JUNE

Fig. 5.

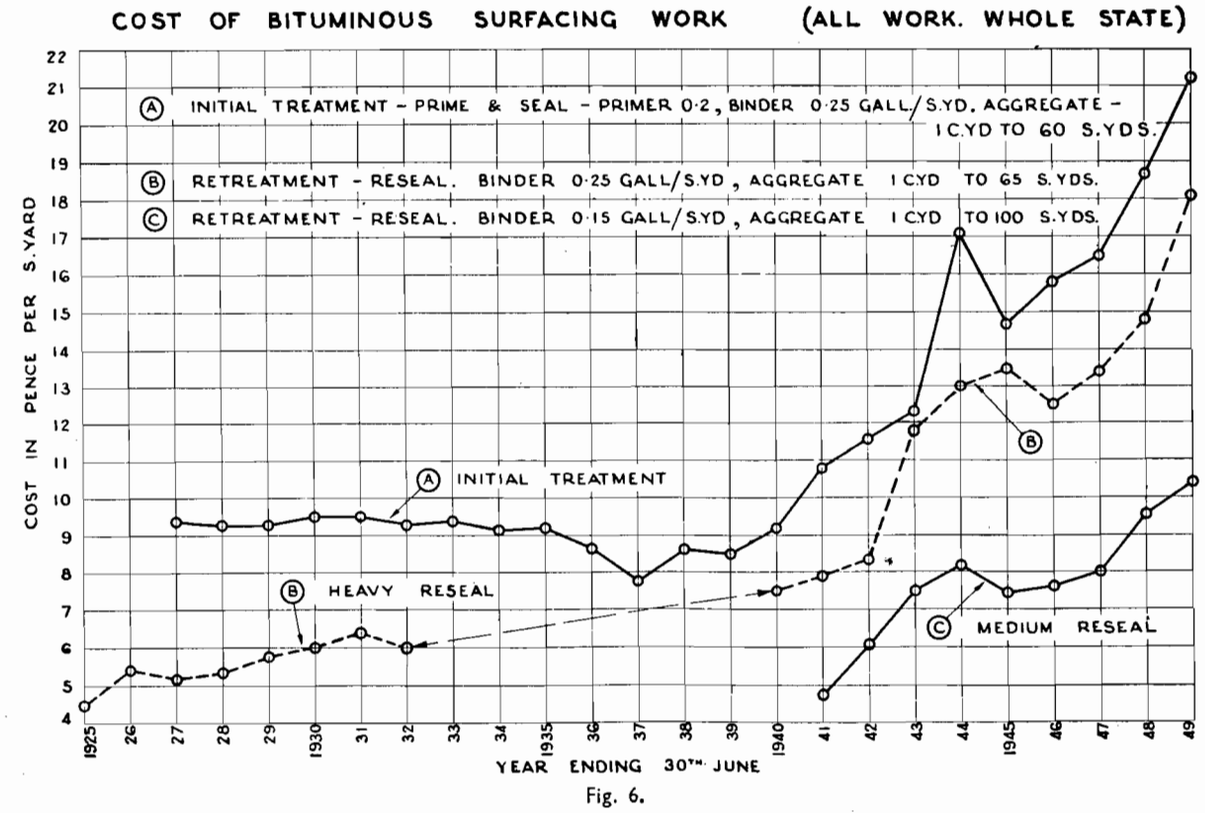

COST OF BITUMINOUS SURFACING WORK (ALL WORK. WHOLE STATE)
(A) INITIAL TREATMENT - PRIME & SEAL - PRIMER 0·2, BINDER 0·25 GALL./S.YD. AGGREGATE - 1 C.YD TO 60 S.YDS.
(B) RETREATMENT - RESEAL. BINDER 0·25 GALL/S.YD, AGGREGATE 1 CYD TO 65 S.YDS.
(C) RETREATMENT - RESEAL. BINDER 0·15 GALL/S.YD, AGGREGATE 1 CYD TO 100 S.YDS.
(A) INITIAL TREATMENT
(B) HEAVY RESEAL
(C) MEDIUM RESEAL
COST IN PENCE PER S.YARD
YEAR ENDING 30TH JUNE

Fig. 6.

TABLE VII.—AVERAGE COST OF WORK CARRIED OUT BY C.R.B. PLANT ON C.R.B. ROADS DURING 1948–49.

Cost in Pence per Square Yard.

Subdivision.	Nature of the Work.													
	Initial Treatments.						Retreatments—Reseals.							
	Prime Only.		Seal on an Existing Primer.		Prime and Seal. (Prime 0·2, Seal 0·25.)		Nominal Rate of Application of Binder in Gallons per Square Yard.							
							0·10.		0·15.		0·20.		0·25.	
Square yards costed ..	125,426		361,568		1,998,704		533,577		2,166,015		1,335,229		25,300	
	d.	%	*d.*	%	*d.*	%	*d.*	%	*d.*	%	*d.*	%	*d.*	%
Materials ..	5·27	66	12·49	68	14·63	69	4·16	65	7·30	70	9·85	71	10·41	72
Labour	1·48	19	3·31	18	3·51	17	1·30	20	1·62	16	2·24	16	1·97	14
Stores	0·29	4	0·42	2	0·52	2	0·15	2	0·29	3	0·34	2	0·38	3
Plant Hire ..	0·86	11	2·19	12	2·54	12	0·86	13	1·20	11	1·55	11	1·59	11
Totals ..	7·90	100	18·41	100	21·20	100	6·47	100	10·41	100	13·98	100	14·35	100

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

Material.	Price per Cubic Yard.		
	1945–46.	1947–48.	1948–49.
	s. d.	*s. d.*	*s. d.*
Screenings ..	24 3	26 0	30 0
Gravel	21 3	27 7	32 11
Sand	12 5	14 5	12 8
Scoria	9 3	10 8	12 5
Weighted Average ..	22 2	24 10	29 1

Resealing Costs, 1925–26 *and* 1947–48.—Table IX. below given an interesting comparision between the cost of resealing 126,575 square yards of the Calder Highway between Castlemaine and Bendigo in 1925–26 and the average cost of 1,351,940 square yards of similar work carried out in 1947–48. In each case the rate of application of binder was 0·2 gallons per square yard. The similarity between the percentages of the total costs spent on various parts of the work is interesting, and suggests that the increase in mechanization adopted over the years has just kept pace with the changes in social conditions during the period.

TABLE IX.—COMPARATIVE COST OF RESEALING, 1925–26 AND 1947–48.

Binder 0·2 Gallon per Square Yard.

Item.	Summary of Resealing Costs.			
	1925–26.		1947–48.	
	Pence per sq. yd.	Percentage of Cost.	Pence per sq. yd.	Percentage of Cost.
Bitumen	2·09	40·3	4·82	39·4
Screenings, Gravel, or Sand Materials.. ..	1·61	31·2	3·83	31·2
	3·70	71·5	8·65	70·6
Plant Hire	0·60	11·6	..	..
Fuel for Heaters and Stores	0·04	0·8	..	..
Plant and Stores ..	0·64	12·4	1·71	14·0
Wages and Supervision ..	0·84	16·1	1·88	15·4
Totals	5·18	100·0	12·24	100·0

Experimental Work—Sand Asphalt.—The experimental work carried out near Pier Millan in the Calder Highway referred to in detail in the report for 1947–48, appears to indicate that a process can be developed for using Mallee sand as the aggragate for thin bituminous surfacings under light traffic.

The work will be extended along the lines of adding filler to the natural wind-blown sand and warming the aggregate before mixing. The addition of filler is to increase the stability of the mixture and the warm mixing to overcome the curing disabilities connected with the use of a low viscosity medium curing cutback with a closely graded material of small maximum size.

BRIDGES.

Loading.—In the report for 1945–46 reference was made to the H20–S16 loading specified by the American Association of State Highway Officials in their "Specification for the Design of Highway Bridges". Details of the 1941 version of this loading were given, with details of the C.R.B. Class "A" loading previously used by the Board for comparison.

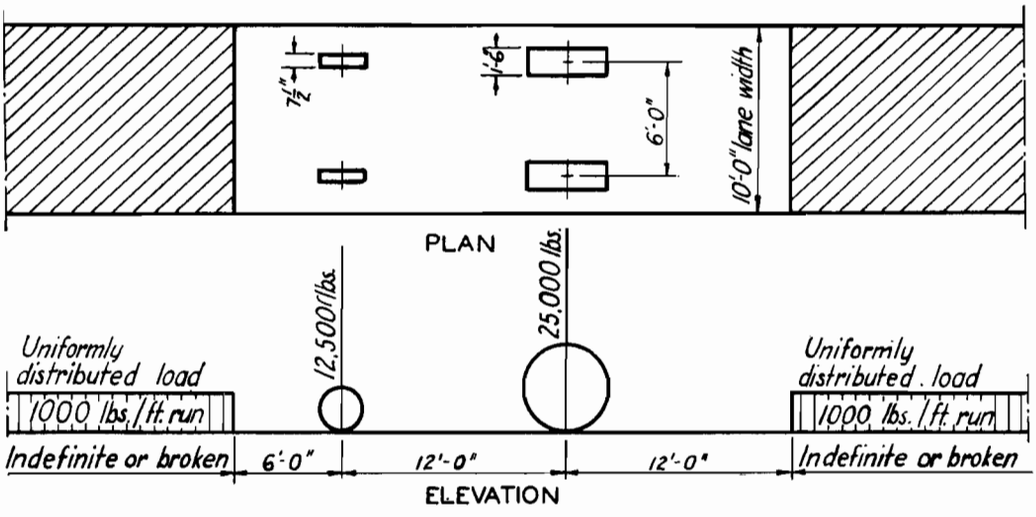
In the light of further experience the A.A.S.H.O., in 1944, amended their standard to a loading designated A.A.S.H.O. H20–S16–44. This has since been adopted by all Australian State Road Authorities for bridges on State Highways and Main Roads. Fig. 7 shows details of this amended loading together with details of the old C.R.B. Class "A" loading, for comparison. For the average Victorian bridge the new loading is approximately 28 per cent. heavier than the Class "A". The change in loading has its maximum effect on live load bending moments and shears with spans of 40 feet. With spans of 120 feet and over the effect is small.

The majority of Victorian bridges have spans ranging from 30 feet to 60 feet, so that practically all past bridge designs in Victoria are inadequate for the new loading. To cater for this situation the Board is preparing new standard drawings for use by the Board and municipalities. Due, however, to pressure of other work and staff shortages, it has been necessary to limit preparation of these new standards to immediate requirements only, and it will be some time before the work is completed.

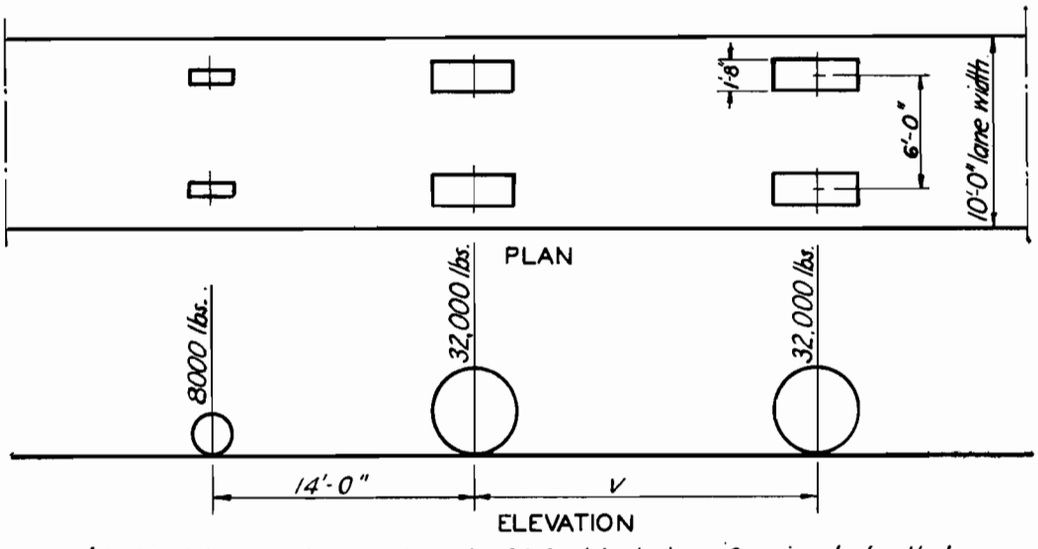
Precast Concrete.—In last year's report details were given of precast reinforced concrete slabs which were being used by the Board for redecking small culverts having spans up to about 10 feet. The conditions which led to the use of these slabs, viz., difficulties of obtaining sufficient skilled labour, particularly carpenters, for normal cast in place work, and the simplicity of manufacture of such units in a central casting yard, have suggested the extension of the method to larger structures.

Figs. 8 and 9 show some details of a type of precast bridge which it is proposed to construct on the Kiewa Wodonga-road in the Shire of Yackandandah. Of this route, which will serve the State Electricity Commission's Kiewa scheme, there are a number of old stuctures to be reconstructed. It is proposed to develop central casting yards to supply a number of bridges, the first "yard" being in Wodonga, where the amenities and facilities available should prove of considerable benefit. The number of "yards" required and the maximum economic haul will be a matter for experiment, but it is anticipated that the latter will provc considcrable.

DESIGN LIVE LOADS

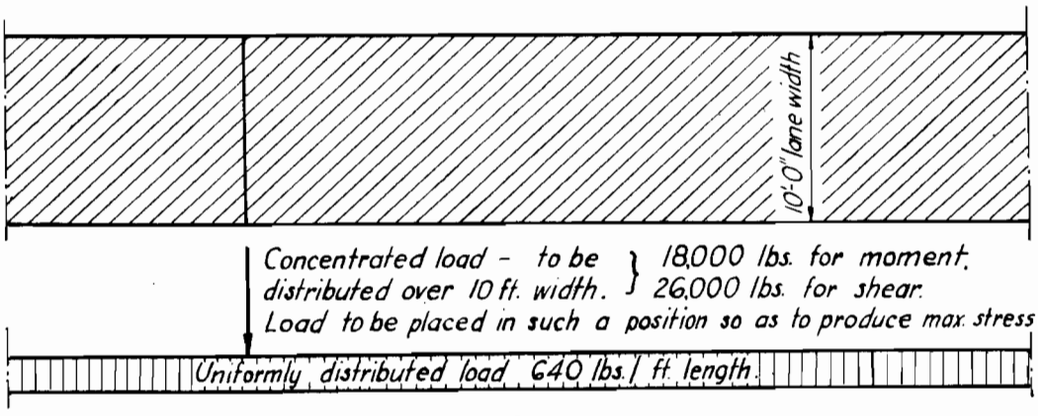


C.R.B. CLASS A LOADING



V = Variable spacing – 14 feet to 30 feet, inclusive. Spacing to be that which produces maximum stresses.

a. TRUCK LOADING



b. LANE LOADING

Loading to be used shall be that which produces the maximum stress.

A.A.S.H.O. 1944 H 20-S 16-44 LOADING

Fig. 7.

Referring to the details shown in Figs. 8 and 9, it is proposed that the piles, pier crossheads, and beam stems be precast in complete units and assembled on the sites. The decks will be cast *in situ* and this will necessitate forming-up on the job. However, these forms will be of standard dimensions and will be pre-cut and match-marked so that the minimum of skilled labour will be required for assembly. The beam stems will be strong enough to carry all dead loads without assistance from the deck or necessity for tomming. Attention is invited to the recesses to be cast into the top of the beam stems to cater for horizontal shear stresses between the beam stem and the deck.

Pre-stressing of the reinforcement may prove an advantage in this form of construction, particularly when handling stresses in long and relatively slender piles are considered. This aspect and the factory production of bridge components are subjects which are being closely studied by Mr. I. J. O'Donnell, the Board's Engineer for Bridges, during his visit to Europe.

Composite Steel and Concrete Bridges.—In previous reports, reference has been made to the construction of composite bridges of steel and reinforced concrete in which reinforced decks are cast on to steel beams or plate girders in such a manner that the two sections act as one unit in resisting bending and shear stresses due to live and dead loads. The Board has constructed a number of bridges of this type in the past, all with simple spans and constant depth, the maximum span being 70 feet.

When considering proposals for the reconstruction of Cassidy's Bridge over the Merri River on the Woolsthorpe–Caramut-road, it became evident that the composite type of structure had many advantages, as conditions were such that the length of the central span had to be at least 80 feet, while it was necessary to keep the deck level as low as possible to minimize the cost of the approach embankments.

Foundation conditions were satisfactory for a continuous structure, rock overlying the whole site, and it was accordingly decided to construct a continuous composite type structure with beams of variable depth. The saving in bridge depth at mid-span was considerable, the overall depth being 3 feet 6 inches, whereas, if a constant depth simple span type had been used, this dimension would have been 6 feet 6 inches. This will be the first time such a bridge has been constructed in Victoria.

A view of the structure in course of erection is shown in Fig. 10. It shows the completed piers and abutments, with the variable depth steel beams erected. The central section of these beams consists of standard 24 inches x 7½ inches x 95 lb. rolled steel joists, which were welded into position between the haunches in the field. The haunch sections were fabricated in Melbourne and transported in one piece to the site. The mild steel bars welded to the top of the beams to provide for horizontal shear between the steel and concrete portions of the composite section are clearly visible in the figure. The vertical props under each girder at the centre and quarter points are necessary to carry the dead load of the structure during erection of the girders and while the concrete deck is hardening.

On the right-hand side of the figure can be seen the " spill through " type of abutment adopted. This consists of a concrete crosshead and curtain wall, carried on reinforced concrete columns, one column being placed under each line of girders. To prevent earth spilling around the beam seats, this curtain wall is returned at right angles for a short distance at each end of the abutment.

The completed bridge will be 290 feet long, fixed bearings being provided at the two central piers with roller bearings at the other piers and the abutments. Width between kerbs will be 22 feet. A typical cross-section of the superstructure of the bridge is also shown in Fig. 10.

STAFF.

Engineer for Bridges.—Mr. I. J. O'Donnell, O.B.E., M.C.E., A.M.I.E.(AUST.), left Melbourne for the United Kingdom and Europe on the 16th June, 1949, for the purpose of investigating the latest design and construction practices in the countries he will visit. He is expected to return to Melbourne on the 28th November, 1949. Reports received indicate the value of the information he has obtained, particularly in relation to the application of methods of design and construction, and the organization of work, to achieve the greatest economy by striking a proper balance between the cost of materials and labour under present day conditions.

Acknowledgments.—It is desired to express appreciation of the loyal service to the Board of all members of the engineering staff at a time when shortage of essential materials and experienced staff and labour make their work very difficult.

Yours obediently,

C. G. ROBERTS,
Chief Engineer.

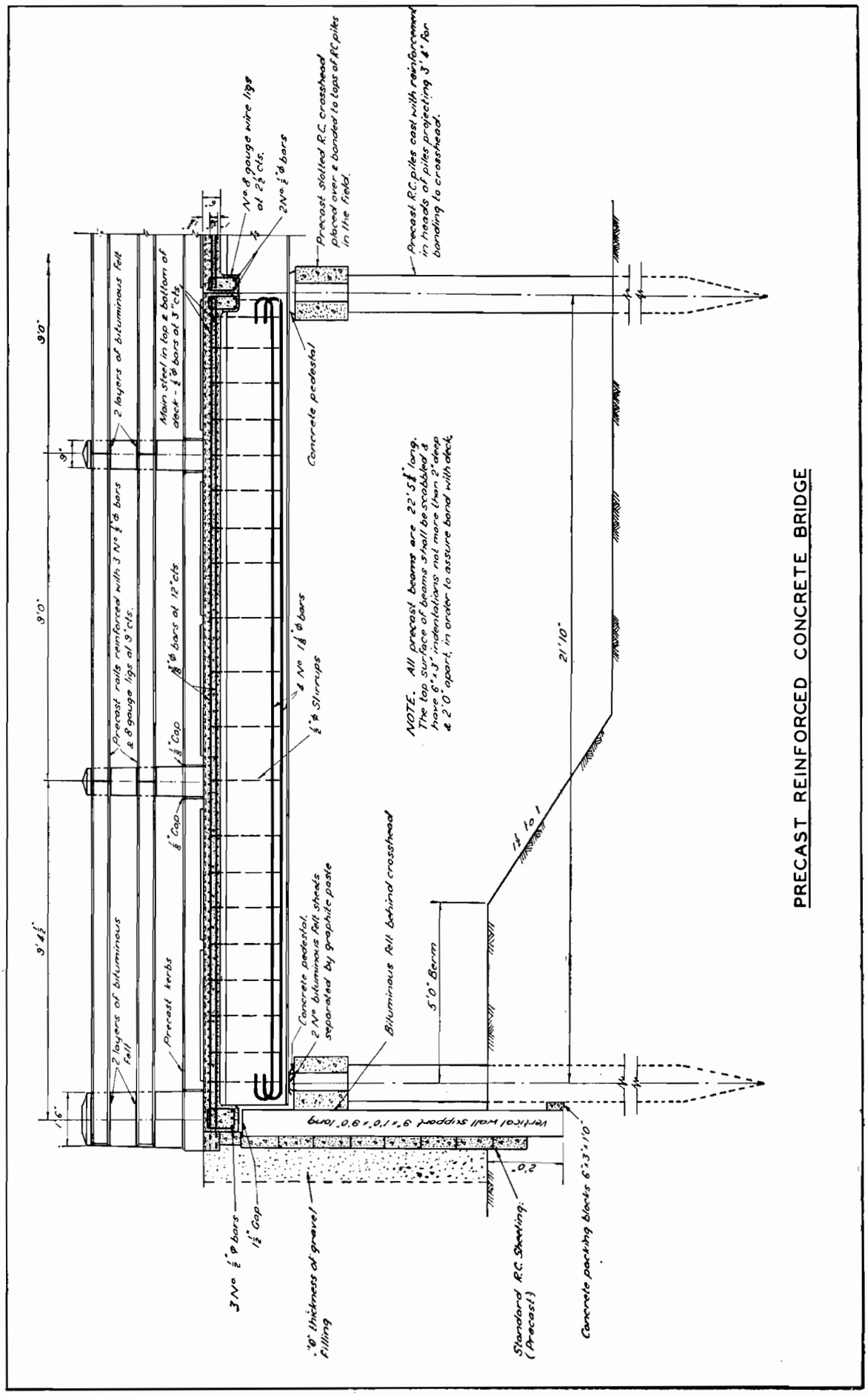

PRECAST REINFORCED CONCRETE BRIDGE
Precast R.C. piles cast with reinforcement in heads of piles projecting 3'-4" for bonding to crosshead.
Precast slotted R.C. crosshead placed over & bonded to tops of RC piles in the field.
No. 8 gauge wire ligs at 2½ cts.
2 No. ½" ϕ bars
Main steel in top & bottom of deck - ½" ϕ bars at 3" cts.
2 layers of bituminous felt
Precast rails reinforced with 3 No ½" ϕ bars & 8 gauge ligs at 9" cts.
Concrete pedestal
NOTE. All precast beams are 22'-5½" long. The top surface of beams shall be scabbled & have 6"x3" indentations not more than 2' deep & 2'0 apart, in order to assure bond with deck
4 No 1" ϕ bars
½" ϕ Stirrups
½" ϕ bars at 12" cts
¾" Cap
¾" Cap
2 layers of bituminous felt
Precast kerbs
Concrete pedestal.
2 No bituminous felt sheets separated by graphite paste
Bituminous felt behind crosshead
5'0" Berm
1½ to 1
21'10"
9'0"
9'0"
9'4½"
1'6"
9"
Vertical wall support 9"x1'0"x9'0" long
3 No ½" ϕ bars
1½" Cap
'9" thickness of gravel Filling
Standard R.C. Sheeting (Precast)
Concrete packing blocks 6"x3"x1'0"
0.2

Fig. 8.

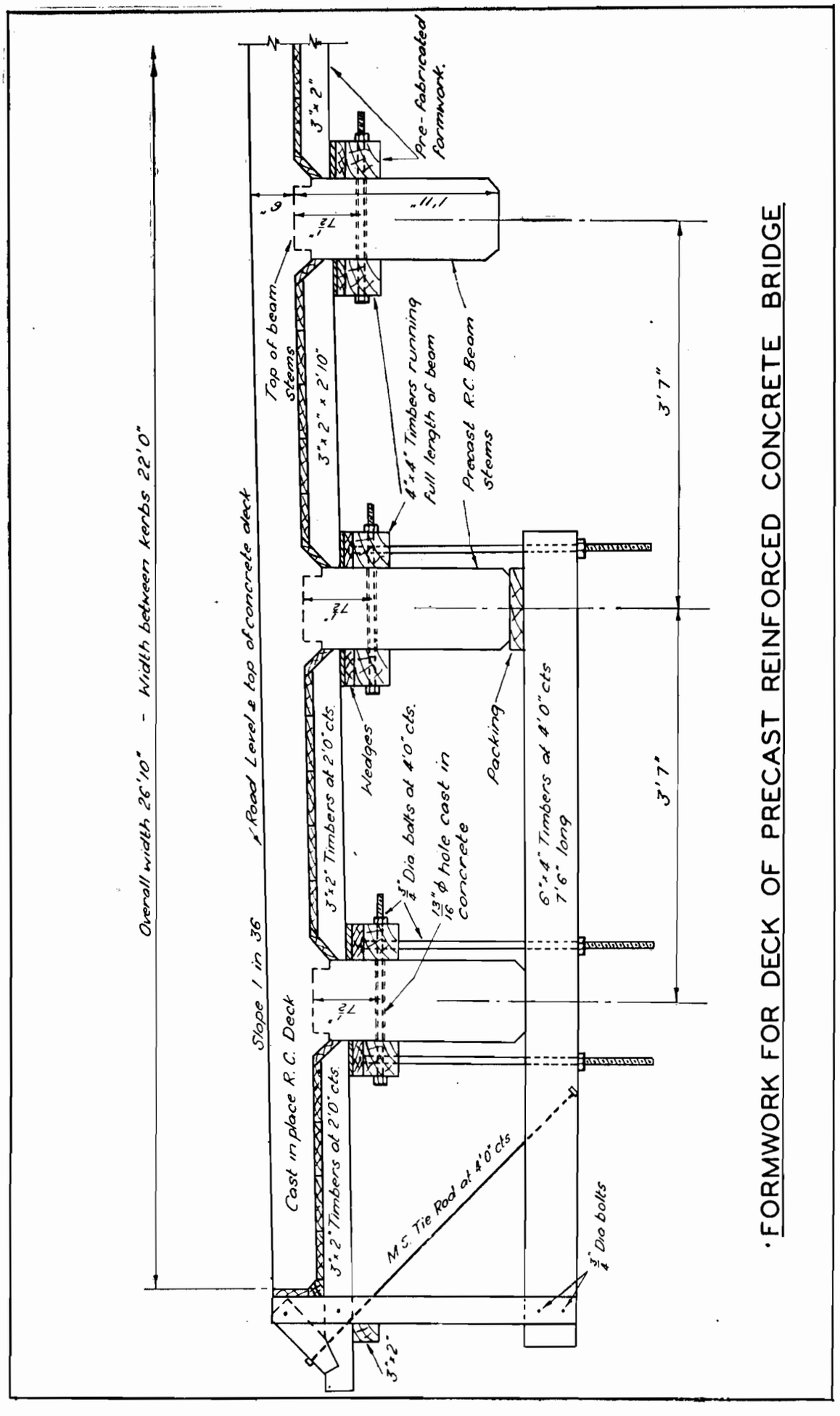
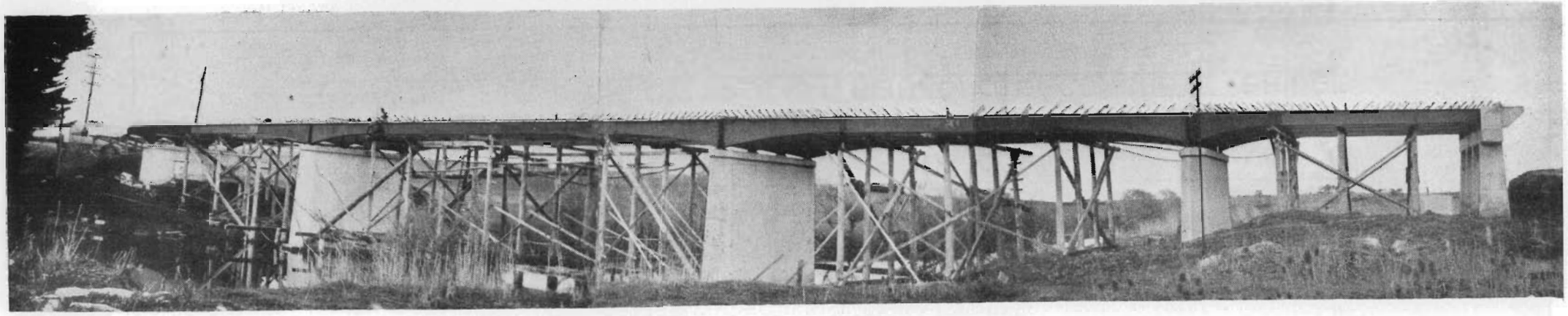
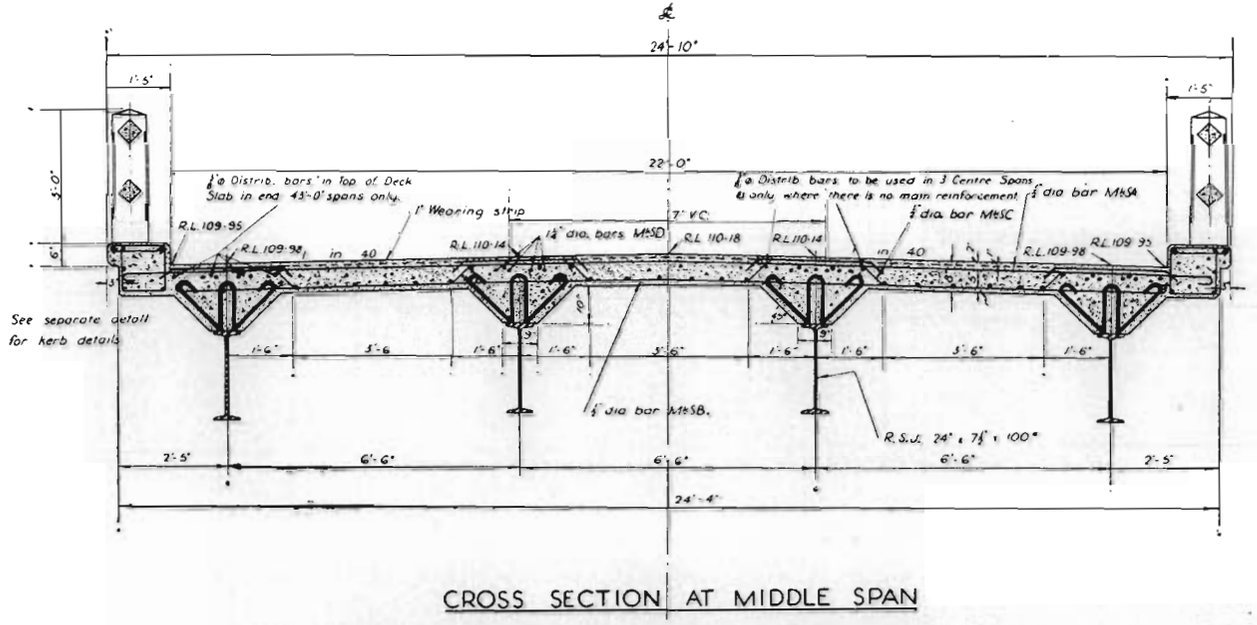

FORMWORK FOR DECK OF PRECAST REINFORCED CONCRETE BRIDGE
Overall width 26'10" - Width between kerbs 22'0"
Road Level & top of concrete deck
Slope 1 in 36
Cast in place R.C. Deck
Top of beam stems
Pre-fabricated formwork.
3"x 2"
3"x 2" x 2'10"
4"x4" Timbers running full length of beam
Precast R.C. Beam stems
3'7"
3'7"
3'7"
Wedges
Packing
3"x2" Timbers at 2'0" cts.
3"x2" Timbers at 2'0" cts.
3"x 2" Timbers at 2'0" cts.
3/4" Dia bolts at 4'0" cts.
13/16" ϕ hole cast in concrete
6"x4" Timbers at 4'0" cts 7'6" long
M.S. Tie Rod at 4'0" cts
3/4" Dia bolts
3"x2"

Fig. 9.

CASSIDY'S BRIDGE.



Bridge under construction—Formwork for deck not yet in place.



CROSS SECTION AT MIDDLE SPAN

Warrnambool Shire—Warrnambool–Caramut Road. Bridge over Merri River.

Fig. 10.

APPENDIX.

COUNTRY ROADS BOARD FUND.

STATEMENT OF RECEIPTS AND PAYMENTS FOR YEAR ENDED 30TH JUNE, 1949.

RECEIPTS.

	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Balance at 1st July, 1948				20,446 3 9
Motor Car Act No. 3741—				
Registration Fees		2,289,233 1 3		
Less Refunds		13,947 19 1		
		2,275,285 2 2		
Fines	32,990 15 11			
Less Refunds	31 0 0			
		32,959 15 11		
		2,308,244 18 1		
Less Cost of Collection		174,527 17 0		
			2,133,717 1 1	
Country Roads Acts Nos. 3662, 3741/13, 4332—				
Fees and Fines		514 15 11		
Registration of Traction Engines		88 4 0		
			602 19 11	
Acts Nos. 3662, 3741, 4332, 4585—				
Costs			137 18 5	
Municipalities' Repayments—				
Permanent Works—				
Relief Acts 4140, 4415		133,206 8 2		
Main Roads Maintenance		203,263 9 11		
			336,469 18 1	
Hire of Plant		230,976 8 3		
Stores and Materials		376,696 2 3		
Sundries		276,734 4 7		
			884,406 15 1	
				3,355,334 12 7
Special Works Outstanding—				
30th June, 1949—Credit				30,190 18 11
				3,405,971 15 3

PAYMENTS.

	£ s. d.	£ s. d.	£ s. d.
Maintenance			921,772 6 9
Murray River Bridges and Punts			5,946 0 5
Interest and Sinking Fund—Municipalities' Repayments			102,290 2 4
Interest and Sinking Fund Great Ocean Road			1,000 0 0
Recoup to Revenue Act No. 3944—			
Interest—Main Roads		100,269 16 3	
Developmental Roads		165,776 9 8	
Sinking Fund Contributions		23,430 19 9	
Exchange		28,736 10 2	
Loan Conversion Expenses		2,180 13 5	
Special Payment to National Debt Sinking Fund		1,058 4 2	
			321,452 13 5
Relief to Municipalities—Acts Nos. 4140, 4415			210,578 12 0
Stores and Materials		438,106 13 11	
Plant Purchase and Repairs		359,260 4 10	
Storeyards 1, 2, 3, and 4		172,687 15 2	
Sundry Debtors		94,039 11 10	
Traffic Administration—			
Motor Car Acts		6,435 17 6	
Country Roads Acts		2,758 4 8	
Bridge Inspections		1,854 6 6	
Act No. 4332—Impounding of Cattle		2,719 14 5	
Act No. 4609.Tourists' Resorts Fund		12,540 3 6	
Act No. 4585—Traffic Line Marking		9,869 9 3	
Act No. 5015—Cremorne Bridge, Alexandra Avenue		49 3 11	
Recoup to Revenue—Act No. 3782, Superannuation Charges		2,677 18 5	
General Expenses—			
Salaries, &c.	316,719 14 7		
Less Recoup	23,812 13 6		
		292,907 1 1	
			1,395,906 5 0
Special Works Outstanding—30th June, 1948—Credit			6,192 13 1
Balance at 30th June, 1949*			440,833 2 3
			3,405,971 15 3

RECONCILIATION.

	£ s. d.
Balance as per Treasury Books	121,061 14 10
Add Transfers Outstanding	583,001 2 10
	704,062 17 8
Deduct Accounts in Transit	263,229 15 5
Balance as per Country Roads Board Accounts	440,833 2 3

* NOTES.—Of the balance at 30th June, 1949, the sum of £369,534 19s. 7d. was obtained by transferring expenditure on State Highways, Tourists' and Forest Roads from Country Roads Board Fund to Country Roads Loan Act 5363.
A further amount of £30,190 18s. 11d. represents balance of advances from other departments for special works on their behalf.
The remainder, £41,107 3s. 9d., is fully committed or allocated for expenditure on works under the supervision of the Board and Municipalities.

REVENUE ACCOUNT FOR YEAR ENDED 30TH JUNE, 1949.

	£ s. d.	£ s. d.	£ s. d.
Maintenance Works—General	..	735,838 6 6	
Mansfield–Woods Point Road	5,533 9 7		
Walhalla Road	450 17 11		
Woods Point Road	7,061 18 1		
State Highways	78,256 15 2		
Tourists' Roads	73,338 3 3		
Forest Roads	21,292 16 3		
		185,934 0 3	
			921,772 6 9
Murray River Bridges and Punts	..	.. ..	5,946 0 5
Contribution to Sinking Fund		25,572 10 7	
Interest on Loans		76,717 11 9	102,290 2 4
Recoup to Revenue—Act No. 3944—			
Interest—Main Roads	100,269 16 3		
Developmental Roads	165,776 9 8		
		266,046 5 11	
Sinking Fund Contributions		23,430 19 9	
Exchange		28,736 10 2	
Loan Conversion Expenses		2,180 13 5	
Special Payment to National Debt Sinking Fund		1,058 4 2	
			321,452 13 5
Act No. 4395—Great Ocean Road—			
Interest		470 1 6	
Sinking Fund		529 18 6	
			1,000 0 0
Tourists' Resorts Fund—Act No. 4609	..	..	12,540 3 6
Recoup to Revenue, Act No. 3782—Superannuation Charges		..	2,677 18 5
Relief to Municipalities		..	210,578 12 0
Audit Fee		892 11 3	
Bridge Equipment		1,518 3 1	
Bridge Inspections		1,854 6 6	
Direction Boards and Warning Signs		6,395 11 11	
Divisional Offices		7,264 11 9	
Divisional Storeyards		23,254 5 11	
Divisional Residential Properties—Patrolmen's Cottages, Patrol Garages		45,100 17 9	
Engineer for Tests Mission Abroad		647 0 10	
Engineer for Bridges Mission Abroad		1,266 0 3	
Gravel Sites and Metal Investigation		104 3 4	
Instruments and Survey Equipment		752 9 10	
Insurance of Staff		109 14 1	
Long Service Leave—Employees		411 7 9	
Motor Expenses		18,842 5 3	
Offices, Exhibition Building		8,171 5 5	
Office Expenses		7,873 7 2	
Office Furniture		4,915 13 9	
Storage Sites		394 9 7	
Plans, Purchase		2,206 10 5	
Plant Purchase		145,340 4 11	
Postage and Telegrams		2,061 7 2	
Printing and Stationery		7,092 14 6	
Salaries		148,025 15 0	

	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Balance at 1st July, 1948	..	..	..	612,673 14 5
Motor Car Act No. 3741—				
Registration Fees		2,289,233 1 3		
Less Refunds		13,947 19 1		
		2,275,285 2 2		
Fines	32,990 15 11			
Less Refunds	31 0 0			
		32,959 15 11		
		2,308,244 18 1		
Less Cost of Collection		174,527 17 0		
			2,133,717 1 1	
Country Roads Act No. 3662—Registration of Traction Engines		..	88 4 0	
Fees and Fines		..	514 15 11	
Costs—Acts Nos. 3662, 3741, 4332, 4585		..	137 18 5	
Plant Earnings		235,480 5 11		
Deduct Working Costs		213,919 19 11		
			21,560 6 0	
Sundry Earnings		..	686 8 2	
Rents		..	3,519 11 11	
Royalty on Gravel and Metal		..	401 11 0	
Storeyard Cartage Earnings		..	20,724 14 0	
Timber, &c., Revenue		..	69 5 6	
Old Roads, Sale of		..	198 15 6	
Materials, Sale of		..	5 12 6	
Plans, Sale of		..	3 0 0	
Storeyard Equipment Repairs		..	979 8 6	
Maintenance Works—				
Contributions Payable by Municipalities		187,989 18 1		
Adjustment		2,689 12 11		
			185,300 5 2	
Permanent Works—				
Contributions Payable by Municipalities—				
Outer Metropolitan Roads		4,603 7 2		
Other Main Roads		119,352 0 0		
			123,955 7 2	
				2,491,862 4 10

Pay Roll Tax (Staff)		3,706 0 2	
Storeyard Cartage Expenditure		12,364 19 4	
Telephones		2,216 5 8	
Testing Materials		2,995 4 3	
Divisional Testing Materials		487 12 5	
Travelling Expenses		1,959 19 5	
Motor Car Acts Nos. 3741, section 11–13, and 3901, sections 24–36		6,435 17 6	
Country Roads Board Acts		2,758 4 8	
Act No. 4332—Impounding of Cattle		2,719 14 5	
Act No. 4585—Traffic Line Marking		9,869 9 3	
Act No. 5015—Cremorne Bridge, Alexandra Avenue		49 3 11	
Advertising		1,950 8 2	
Engineers' Conference		239 14 0	
Wireless Licences		33 0 0	
Photography		729 19 10	
Cost Clerk Training		242 5 2	
Technical School Fees		30 14 6	
Legal Costs		312 8 0	
Traffic Census		52 9 3	
Recoups—			
E. J. Kerr	26 0 0		
J. W. and T. H. Bilston	4 0 0		
E. J. Ryan	7 10 0		
		37 10 0	
Storeyards 1, 2, 3, and 4		26,431 2 1	
		510,116 19 5	
Less Recoup		23,812 13 6	
			486,304 5 11
Balance at 30th June, 1949		.. ..	1,039,973 16 6
			3,104,535 19 3

	3,104,535 19 3

BALANCE-SHEET AT 30TH JUNE, 1949

LIABILITIES.	£	s.	d.	ASSETS.	£	s.	d.	£	s.	d.
Contractors' Deposits	19,266	5	0	Country Roads Board Fund				440,833	2	3
Sundry Liabilities	12,661	14	5	Maintenance Expenditure—						
Outstanding advances for Special Works	30,190	18	11	Contributions Payable by Municipalities				187,989	18	1
Revenue Account	1,039,973	16	6	Permanent Works—						
				Contributions Payable by Municipalities (Subject to Relief)—						
				Outer Metropolitan Roads	4,603	7	2			
				Other Main Roads	119,352	0	0			
								123,955	7	2
				Outstanding Accounts				25,861	2	0
				Materials Stock—						
				Storeyard	232,322	19	4			
				Branches	71,864	1	0			
								304,187	0	4
				Trust Fund				19,266	5	0
	1,102,092	14	10					1,102,092	14	10

SUMMARY SHOWING VALUE AS AT 30TH JUNE, 1949, OF BOARD'S ASSETS CHARGED TO FUND (not included in Balance-sheet).

	£	s.	d.		£	s.	d.
Residential Properties	124,876	6	10	Brought forward	281,143	1	0
Central Storeyards, Workshops, and Offices	51,071	4	3	Furniture and Fittings	24,567	19	8
Divisional Storeyards, Workshops and Offices	52,808	17	9	Furniture and Fittings (Motor Registration Branch)	8,864	12	0
Storage Sites	1,829	17	4	Motor Cars (Police Department)	12,220	1	2
Workshop Machine and Hand Tools and Equipment	30,032	17	4	Motor Cycles (Police Department)	4,133	3	8
Testing Materials	6,317	3	2	Motor Cars	29,750	0	0
Instruments	4,740	14	4		360,678	17	6
Bridge Equipment	9,466	0	0	Working Plant	619,526	17	4
Carried forward	281,143	1	0		980,205	14	10

COUNTRY ROADS BOARD LOAN ACCOUNT—ACT No. 3662—FOR YEAR ENDED 30TH JUNE, 1949.

RECEIPTS.	£	s.	d.	PAYMENTS.	£	s.	d.
State Loans Repayment Fund	37,528	19	6	Balance at 1st July, 1948	30	10	11
Balance at 30th June, 1949	270	4	6	Permanent Works	37,768	13	1
	37,799	4	0		37,799	4	0

COUNTRY ROADS BOARD LOAN ACCOUNT—ACT No. 5363—FOR YEAR ENDED 30TH JUNE, 1949.

RECEIPTS.	£	s.	d.	PAYMENTS.	£	s.	d.
Loan Proceeds	400,000	0	0	Permanent Works	369,534	19	7
				Balance at 30th June, 1949	30,465	0	5
	400,000	0	0		400,000	0	0

BALANCE SHEET AT 30TH JUNE, 1949.

LIABILITIES.	£	s.	d.	£	s.	d.	£	s.	d.
Interest on Permanent Works							20,127	18	1
Loan Securities Issued	5,296,809	11	1						
Add Increase in Expenses—Renewal Loans	23,524	12	8						
				5,320,334	3	9			
Less Amount Repaid				80,000	0	0			
				5,240,334	3	9			
Deduct Discount and Expenses				131,466	7	11			
				5,108,867	15	10			
Less Securities Repurchased and Cancelled from National Debt Sinking Fund				613,886	16	7			
				4,494,980	19	3			
Less—									
Redemption Funds	85,219	1	1						
Main Roads Sinking Funds	285,688	7	7						
Repaid to State Loans Repayment Fund	677,430	8	6						
				1,048,337	17	2			
							3,446,643	2	1
State Loans Repayment Fund							400,914	0	5
Contribution to National Debt Sinking Fund				641,369	5	6			
Less Net Loss on Repurchase of Securities (including Exchange)				24,315	9	0			
							617,053	16	6
Loan Redemption Itemized above							1,048,337	17	2
Country Roads Board Loan Account Act No. 3662							270	4	6
							5,533,346	18	9

ASSETS.	£	s.	d.
Permanent Works	5,479,587	0	4
Interest Capitalized on Permanent Works—Act No. 3662	20,127	18	1
National Debt Sinking Fund (Cash in Hand)	3,166	19	11
Country Roads Board Loan Account—Act No. 5363	30,465	0	5
	5,533,346	18	9

DEVELOPMENTAL ROADS LOAN ACCOUNT—ACT No. 3662.

BALANCE-SHEET AT 30TH JUNE, 1949.

LIABILITIES.	£ s. d.	£ s. d.	£ s. d.
Loan Securities Issued	6,348,786 14 10		
Add Increase in Expenses—Renewal Loans	32,825 2 6		
		6,381,611 17 4	
Deduct Discount and Expenses		195,750 12 6	
		6,185,861 4 10	
Less Securities Repurchased and Cancelled from National Debt Sinking Fund		947,702 17 0	
		5,238,158 7 10	
Less—			
Redemption Funds	646,386 7 4		
Developmental Roads Sinking Fund	55,083 0 2		
		701,469 7 6	
			4,536,689 0 4
State Loans Repayment Fund			239,896 6 1
Contribution to National Debt Sinking Fund		990,129 11 0	
Less Net Loss on Repurchase of Securities (including Exchange)		37,537 11 5	
			952,591 19 7
Loan Redemption itemized above			701,469 7 6
Interest—Act No. 3662, Section 86/1		77,372 3 10	
Contributions Postponed		16,656 13 7	
			94,028 17 5
			6,524,675 10 11

ASSETS.	£ s. d.
Permanent Works Expenditure	6,425,757 10 11
National Debt Sinking Fund (Cash in Hand)	4,889 2 7
Contributions Payable by Municipalities—Act No. 3622, Section 86 (Subject to Relief)	94,028 17 5
	6,524,675 10 11

DEVELOPMENTAL ROADS INTEREST—ACT No. 3662—(SECTION 86/1).

RECEIPTS.	£ s. d.
1949. June 30. Interest on Account of Municipalities—Provided by Relief Act No. 3662, Section 86/1	77,372 3 10
	77,372 3 10

EXPENDITURE.	£ s. d.
1949. June 30. Payments to Treasury (Relief)	77,372 3 10
	77,372 3 10

AUDITOR-GENERAL'S CERTIFICATE.

The Accounts have been audited and compared with the books, with which they agree. Reconciliations have also been made with the books of the Treasury. Subject to the qualification that the balance-sheets do not include as assets permanent works and improvements resulting from expenditure from revenue moneys and extraneous funds, the several statements, in my opinion, exhibit a correct view of the affairs of the Board at the 30th June, 1949.

E. A. PEVERILL,
Auditor-General,
21st December, 1949.

G. GRIFFITHS,
Accountant,
31st October, 1949.

By Authority: J. J. GOUBLEY, Government Printer, Melbourne.