1948.

VICTORIA.

COUNTRY ROADS BOARD.

THIRTY-FIFTH ANNUAL REPORT

FOR YEAR ENDED 30TH JUNE, 1948.

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

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COUNTRY ROADS BOARD.

THIRTY-FIFTH ANNUAL REPORT.

Exhibition Building,
Carlton, N.3,
1st November, 1948.

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, 1948.

FINANCE.

During the year the receipts from motor registration fees and fines paid into the Country Roads Board Fund amounted to £2,133,684 compared with £1,908,848 during the preceding year, an increase of £224,836. The cost of collection and refunds totalled £170,129 leaving a net revenue of £1,963,555.

Under the terms of the Federal aid roads and works agreement 1937, the sum of £68,331 was received. This amount represented the receipts in respect of the month of June, 1947, which were not actually received by the State until July, 1947.

As indicated in the previous annual report the Federal aid roads and works agreement has been replaced by the *Commonwealth Aid Roads and Works Act*, 1947, which came into operation on 1st July, 1947. During the year 1947–48 an amount of £750,813 was received under the provisions of Section 6 (1) of that Act and was available for construction, reconstruction, maintenance, and repair of roads, with the exception of one-sixth of that amount (£125,135 10 0) which was allotted for expenditure on other works connected with transport.

In addition the sum of £174,000 was made available in accordance with Section 6 (4) of the Commonwealth Aid Roads and Works Act for expenditure upon the construction, reconstruction, maintenance, and repair of roads through sparsely populated areas, timber country, and rural areas and for the purchase of road-making plant.

The total gross receipts credited to the Country Roads Board Fund, and the amounts received under the Federal aid roads and works agreement 1937, and the *Commonwealth Aid Roads and Works Act* 1947, amounted to £3,001,692 for the year. During the financial year 1946–47 the total receipts paid into the Country Roads Board Fund and derived from Federal aid roads and works agreement was £2,721,872.

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, £15,178 was expended during the year. A balance of £221,585 remained at 30th June, 1948.

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 1947–48 was £3,726,398 which was the highest allocation made from the Country Roads Board Fund since the inception of the Board. The allocation for the financial year 1946–47 was only £2,390,195. The amount expended in the year 1946–47 was £1,416,659 and in the year 1947–48 £1,770,883.

The amount standing to the credit of the Country Roads Board Fund at the 30th June, 1948, was £20,446.

Federal Aid Roads Account.

The following amounts were expended during the year from funds available under the Federal aid roads and works agreement 1937 and the *Commonwealth Aid Roads and Works Act* 1947.

	£
Construction of developmental and main roads	334 407
Isolated settlers' roads	24,813
Provision towards maintenance of roads previously constructed from moneys provided by the State and the Commonwealth	891,674
Restoration and re-building of bridges	57,973
Removal of drift sand, bush fire restoration works, &c.	6,030
Flood damage repair	13,662
Construction and reconstruction on school-bus routes	9,742
Total	1,338,301

For the maintenance and repair of public roads adjoining or of approach to properties of the Commonwealth within the State of Victoria, an amount of £9,197 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 £3,407, and £5,790 was carried forward to the ensuing financial year.

At the 30th June, 1948, a credit balance of £501,448 was shown in the Federal aid roads account, but, after making provision for unexpended amounts allotted to municipalities during the year, for assistance towards the maintenance of roads and bridges, commitments on contracts entered into, works in progress by direct labour, and land acquisition the actual credit balance is £110,448.

Commonwealth Aid Roads and Works Act 1947.

The following amounts were expended during the year from funds available under the above Act, viz., Clause 6 (1) £435,902 and Clause 6 (4) £76,273.

The amount unexpended at 30th June, 1948, from funds available under Clause 6 (1) was £189,775, but this was fully covered by commitments in respect of contracts and direct labour works in hand.

The unexpended amount under Clause 6 (4) was £97,726, but this was covered by commitments with the exception of £50,000 which was set aside for the purchase of road-making plant for use in areas where the purchase of such plant is beyond the resources of the local authorites. Owing to the extreme shortage of suitable plant the Board was unable to make arrangements for its purchase during the year, and as deliveries under contracts entered into by the Board over two years ago for supply of machinery suitable for hiring to local authorities are still outstanding, it is evident that more immediate relief to municipalities concerned can be given at this juncture by the direct expenditure of the amount on actual road works, especially in view of the inadequacy of the funds available from this source to this State to meet the need for developmental road works.

MUNICIPALITIES' REPAYMENTS IN RESPECT OF PERMANENT WORKS.

The Country Roads Act 1928 provides that the Board shall, before the 1st January in each year, apportion half the amount expended from loan moneys on permanent works on main roads and State highways during the preceding year between the various municipalities benefited thereby. It was also provided that the municipalities should pay the amount due at the rate of 6 per cent. per annum to cover interest at the rate of 4½ per cent. and the balance sinking fund, thus redeeming indebtedness in 31½ years.

As the rate of 4½ per cent. is excessive under prevailing conditions the Government approved the preparation of a Bill to provide for the reduction of interest to 3½ per cent. and the annual rate of payment including sinking fund to 5 per cent. With the revised terms the redemption period will be 35 years.

The necessary legislation has been passed by Parliament and the Act cited as *The Country Roads* (*Permanent Works*) *Act* 1948 (No. 5278) will apply in respect of any permanent works commenced on or after the 1st July, 1948.

MAIN ROADS.

An amount of £2,496,681 was allocated during the year for the maintenance, improvement, and reconditioning of 9,806 miles of declared roads. The amount expended was £1,282,781 and commitments amounting to £331,866 were outstanding at the end of the year. Provision of £1,485,768 was made from the Country Roads Board Fund and £1,010,913 from moneys available under the Federal Aid Roads and Works Agreement.

The length of reseals for the twelve months extended over 359 miles whilst new seals on sections previously sealed, but which required reconstruction, comprised 16·43 miles. New seals, being extensions of the bituminous surface treated system, totalled 200 miles. The total of the lengths dealt with was 575·43 miles, being an increase of 154·13 miles on the previous year.

New bridge projects initiated totalled 34, and 7 existing bridges were largely reconstructed, the total cost of the projects being £80,125.

In accordance with the powers conferred on the Board under the provisions of the Country Roads Act, municipal contributions towards the cost of maintenance 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 £74,357 for the year, which resulted in the total municipal contributions being reduced to approximately one fourth of the total cost.

Under Act No. 4415, relief to the extent of £220,683 was granted to country 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 :—

Ballarat–Colac Road (*Buninyong Shire*).—Resheeting with gravel of 5½ miles south of Sebastopol, comprising a section where necessary reconstruction had been postponed during the war period.

Geelong–Hamilton Road (*Colac Shire*).—Strengthening by resheeting with fine crushed rock and sealing 16 ft. wide of 6 miles east of Cressy. Quarrying and crushing of stone was carried out by direct labour. This work completed the provision of a sealed road between Geelong and Hamilton.

Upper Goulburn Road (*Broadford and Seymour Shires*).—Reconstruction of 3½ miles between Trawool and King Parrot Creek including widening of narrow sections to improve visibility, and gravel surfacing.

Warburton–Woods Point Road (*Upper Yarra Shire*).—Realigning, widening, and surfacing in preparation for sealing of 6 miles. The original road was rough, narrow, and tortuous, and the work, which is portion of the proposed construction between Warburton and the dam site at Walsh's Creek, a distance of 15 miles, is required primarily for use by the Melbourne and Metropolitan Board of Works during the construction of the proposed dam, and the cost is being borne by that Board. (Plates Nos. 1 to 4).

Plate No. 1.—Proposed improvement to alignment at Crooked Creek.

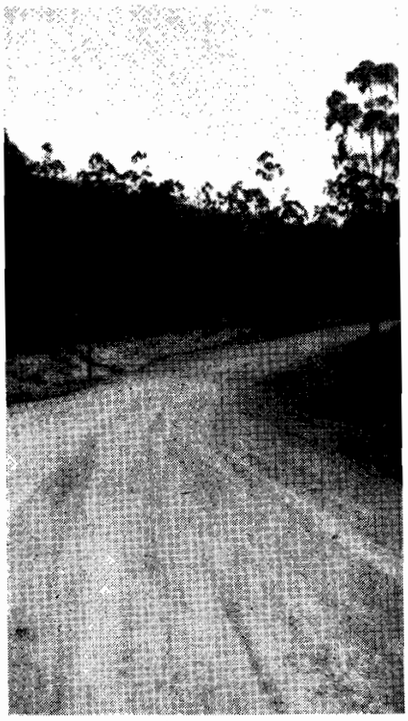


Plate No. 2.—Showing old road crossing new road at Two Mile Creek.

Plate No. 3.—Installation of 75-in. multi-plate culvert at McDonald's Creek.

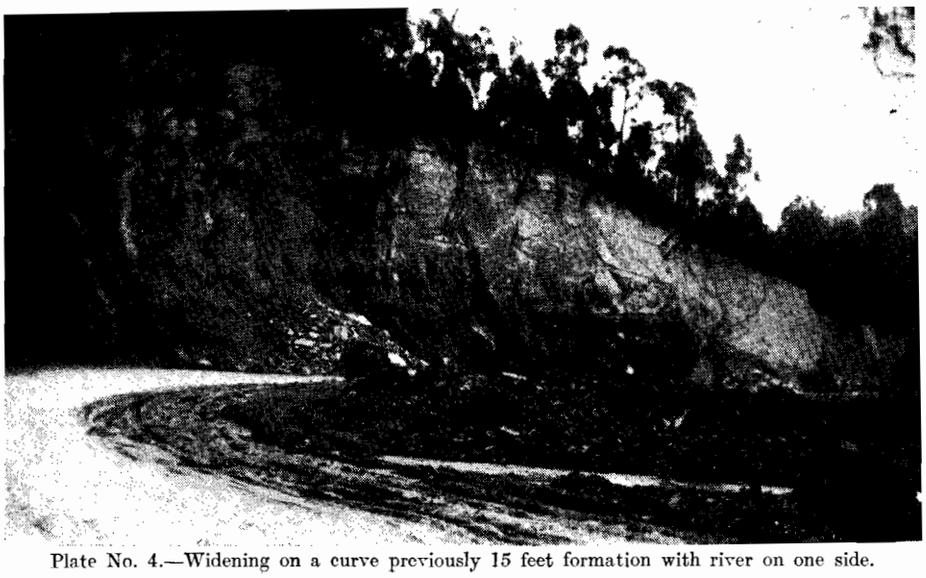


Plate No. 4.—Widening on a curve previously 15 feet formation with river on one side.

STATE HIGHWAYS.

With a view to further assisting municipal councils consideration was given to the extension of the State highway system to embrace a number of additional roads which were considered to be of sufficient importance, and with the approval of the Governor-in-Council the following State highways were declared during the financial year, the total length being 925 miles :—

Bass Highway.—From South Gippsland Highway near Nyora via Anderson and Dalyston to Wonthaggi.

Bellarine Highway.—From Geelong to Queenscliff.

Borung Highway.—From Charlton via Donald to Warracknabeal.

Glenelg Highway.—From Ballarat via Skipton and Hamilton to Casterton.

Maroondah Highway.—From Union Road, Surrey Hills, via Lillydale, Healesville, Alexandra, Yarck, and Merton to Mansfield.

Midland Highway.—From Shepparton via Stanhope to Elmore.

Nepean Highway.—From Glenhuntly Road via Frankston to Portsea.

Northern Highway.—From the Hume Highway at Kilmore via Heathcote to Elmore.

North-Western Highway.—From Ballarat via Avoca, St. Arnaud, and Donald to Birchip.

Ouyen Highway.—From Calder Highway at Ouyen via Murrayville to the South Australian border.

Ovens Highway.—From Wangaratta via Myrtleford to Bright.

Pyrenees Highway.—From the Calder Highway at Castlemaine via Maryborough and Avoca to Ararat.

South Gippsland Highway.—From Nyora via Korumburra and Leongatha to Meeniyan.

Generally the roads now comprising these new State highways had been declared main roads, and the municipal councils contributed towards the cost of their maintenance, as provided by the Country Roads Act. In future the full cost of maintenance will be charged to the Country Roads Board fund.

At the end of the year the length of declared State highways was 3,846 miles. The work of primary importance consisted of patrol maintenance, resealing, and light resheeting of unsealed sections.

In addition, some progress was made with reconstruction of long sections which had failed extensively due to—

(*a*) difficulties of undertaking regular maintenance and strengthening works during the war,

(*b*) increasing heavy traffic throughout the State, and

(*c*) the light standard of original construction of some sections, which was deemed adequate for the volume and type of traffic at the time.

The principal works put in hand were the following :—

Bass Highway.—Reconstruction and sealing of 10 miles, which completes sealing from the South Gippsland highway to a point ½ mile south of the Corinella road. A further section of reconstruction is in hand with a view to sealing. (Plates Nos. 5 and 6.)

Borung Highway —Reconstruction of 6 miles in the Warracknabeal Shire.

Priming and sealing with bitumen of 2·2 miles east of Donald.

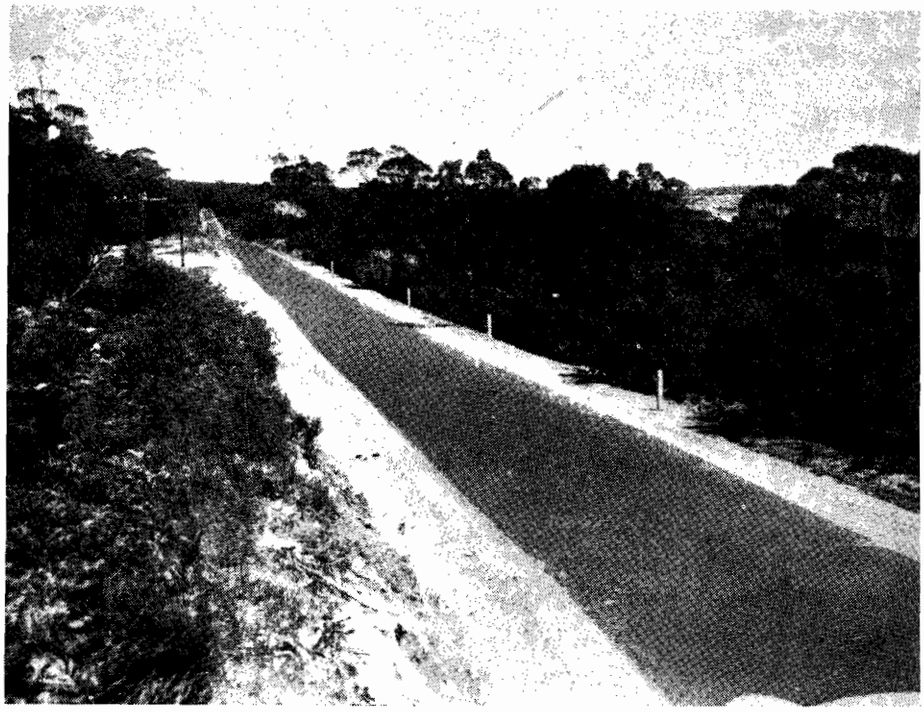
Calder Highway.—Reconstruction on improved alignment 1·6 miles north and south of Taradale.

Henty Highway.—Reconstruction in gravel of 6·25 miles between Heywood and Milltown. (Plate No. 7.)

Reconstruction in penetration macadam and fine crushed rock sealed with bitumen of ·58 mile in Portland Borough.

Priming with tar of 9·39 miles near Dooen preparatory to sealing.

Loddon Valley Highway.—Strengthening with sand-clay of section between Campbell's Forest and Serpentine preparatory to sealing. (Plates Nos. 8 and 9.)



Plates Nos. 5 and 6.—Bass Highway—completed sections north of Grantville.

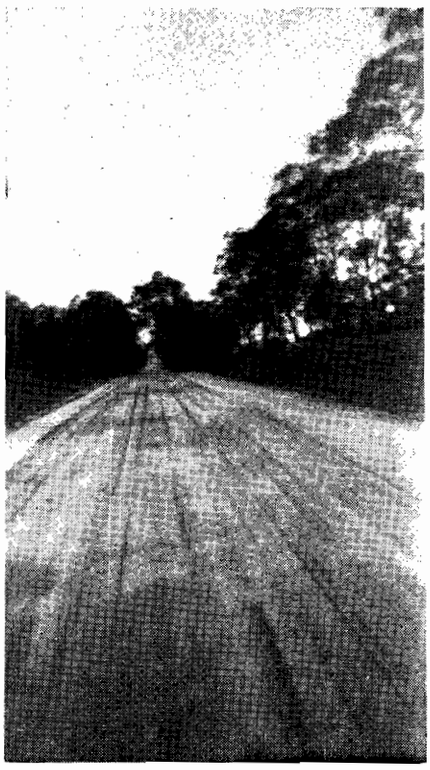
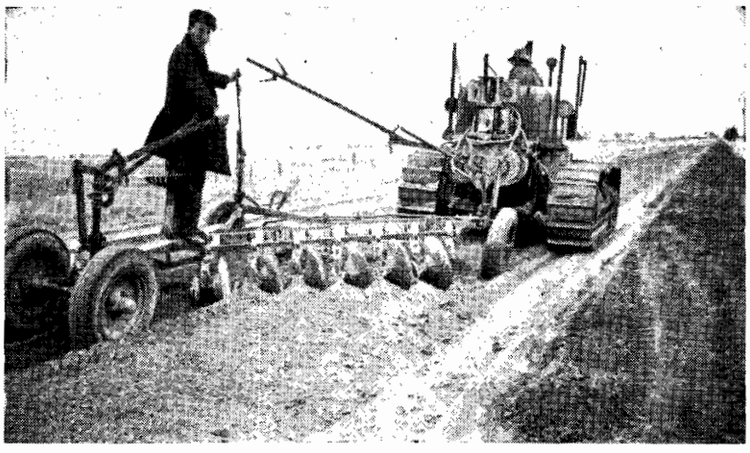
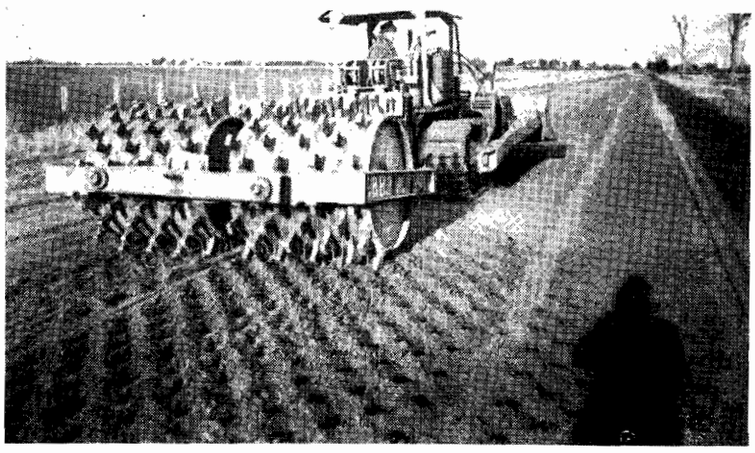


PLATE No. 7.—Henty Highway. Reconstructed section between Heywood and Milltown.





PLATES Nos. 8 and 9.—Loddon Valley Highway south of Serpentine. Sand-clay road under construction.

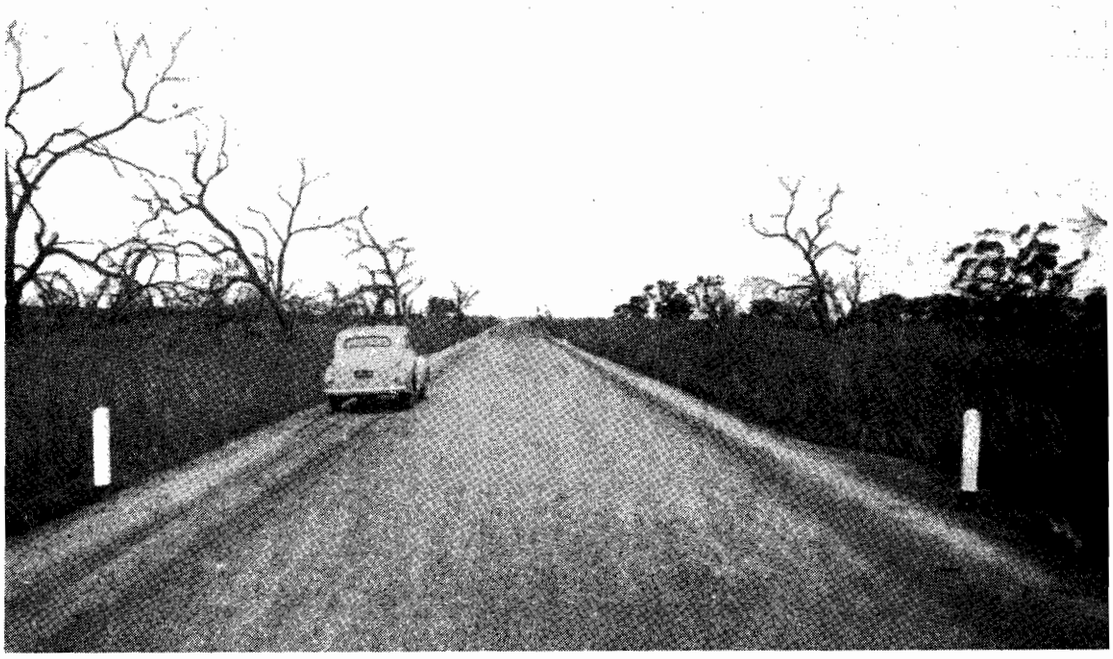


Plate No. 10.—Murray Valley Highway. Newly-sealed sand-clay pavement at Murphy's Swamp, 10·8 miles north-west of Echuca.

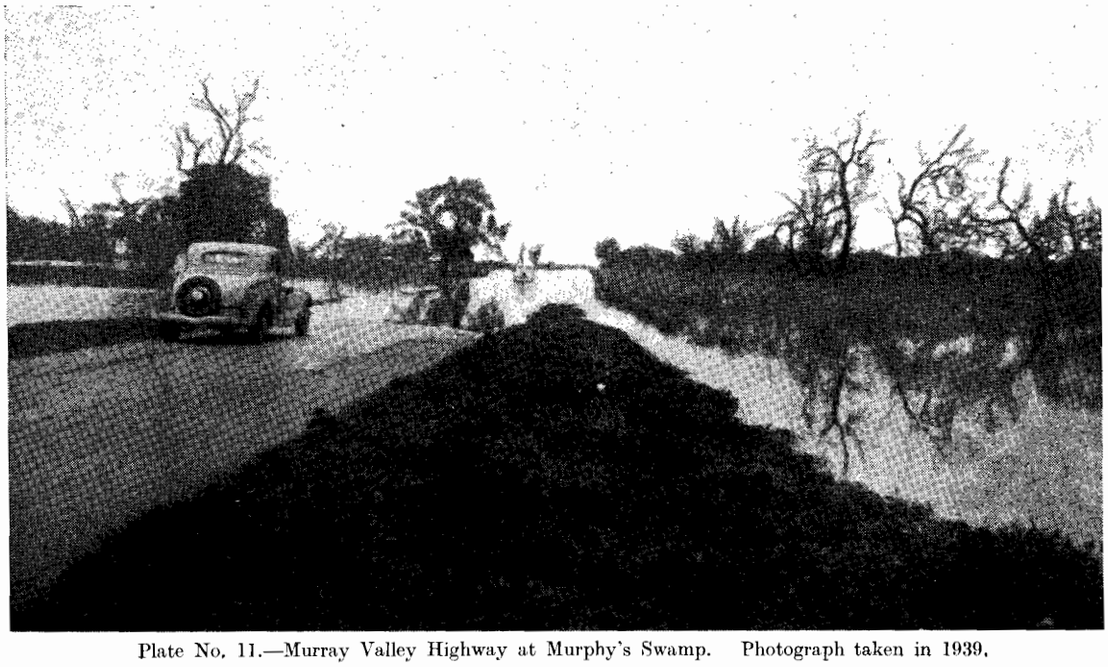


Plate No. 11.—Murray Valley Highway at Murphy's Swamp. Photograph taken in 1939.

Midland Highway.—Extension of sealing east of Corop and near Stanhope for length of 7½ miles.

Reconstruction of 2·2 miles of old gravel road between Barjarg and Maindample.

Construction of deviation to eliminate sharp curves south of Swanpool.

Murray Valley Highway.—Reconstruction to provide 25 ft. formation o narrow sections near Burrowye and near Mount Alfred.

Reconstruction of rough sealed macadam section of 2·71 miles west of Yarrawonga.

Strengthening and sealing with bitumen of 2·31 miles south from McCoy's bridge.

Strengthening of pavement between Echuca and Swan Hill, the total length treated being 15 miles, of which 11·55 miles were sealed. (Plates Nos. 10 and 11.)

North-Western Highway.—Reconstruction, realignment, and resheeting of 8·18 miles between Redbank and Stuart Mill commenced.

Omeo Highway.—Resheeting of approximately 6 miles immediately north of Bruthen.

Ovens Highway.—Reconstruction and sealing of old gravel road between Tarrawingie and Everton.

PLATE No. 12.—Maroondah Highway. Advanced direction sign near Lilydale.

Princes Highway East (*Eastern Gippsland Section*).—Clearing and forming 9,600 ft. at McKenzie River, together with construction of a 210 ft. rolled steel joist and timber bridge.

Clearing for Mount Raymond deviation, total length 21,500 ft.

Reconstruction through township of Cann River preparatory to sealing.

Princes Highway West.—Reconstruction in gravel and sealing 5·5 miles between Heywood and Lyons.

South Gippsland Highway.—Reconstruction preparatory to sealing of 4 miles between Lang Lang and Nyora.

Sturt Highway.—Extension of sealed pavement by 13·42 miles and re-treatment of 1·4 miles.

Western Highway.—Realigning, widening, strengthening, and sealing total length of 2½ miles in three sections between Ballan and Gordon.

Resheeting with base course of limestone 3·3 miles between Gerang Gerung and Nhill prior to application of top course of fine crushed rock.

Widening of pavement from 16 ft. to 19 ft. at the western approach to Horsham over a length of 2·95 miles, fine crushed rock being produced by direct labour from the Dooen quarry.

DEVELOPMENTAL ROADS.

Applications totalling £1,404,000 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. As a considerable sum from the old Federal aid roads and works agreement 1937 was also held in reserve a large allocation was possible and at the commencement of the financial year, provision of £885,380 was made to cover new works and commitments in respect of works commenced in the previous year.

The amount expended during the year was £342,127 supplemented by £76,164 contributed by the Councils from their own funds.

The Board also allocated a total of £57,776 for roads to serve the properties of isolated settlers. For some years, within the limits of available funds, the Board has made grants of this nature generally subject to an additional 10 per cent. contribution by the municipalities concerned, and in this way settlers in remote localities receive the benefit of a constructed access road where the cost would have been beyond the means of the Council to provide.

In some cases Councils, especially those having full-time engineers, and being sufficiently well equipped with construction plant, have been in a position to complete almost their full programme of construction works or have been able to let contracts for amounts close to the engineer's estimate. A common practice has been to invite tenders for the supply and cartage of gravel or fine crushed rock and to undertake the forming and spreading by direct labour. Where Councils have been without the services of full-time engineers, poor progress has generally been made with these and other necessary road works.

An amount of £119,579 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; £69,527 was expended, in addition to which municipal contributions totalled £17,804.

TOURISTS' ROADS.

The principal works undertaken during the year consisted of general maintenance, the amount expended being £98,662. The total length of proclaimed tourists' roads at the end of the year was 402 miles.

Ocean Road.—From time to time damage is caused to this road as a result of land slips and sea erosion. On account of the location of the road this is inevitable, but protective works are undertaken as funds and labour become available. (Plate No. 14.)

It may be recalled that on rocky sections of this road the original construction (which was undertaken largely with direct labour by returned soldiers from the war of 1914–18) was only of single lane width. As funds became available the next stage was to construct passing places at "blind" corners and gradually the road has been made suitable for two lanes of ordinary passenger car traffic, provided that drivers exercise special caution. However, to-day there is an increasing percentage of extraordinary traffic on the road, such as 'buses, timber trucks, commercial

vehicles and private cars drawing caravan trailers. This accentuates the need for very careful driving, bearing in mind the unavoidably tortuous alignment and the steeply sloping and rocky nature of the hill sides.

It is recognized that extensive widening must be carried out particularly on the section between Lorne and Apollo Bay. As the work will involve the use of much heavy earth and rock-moving plant, the employment of a great deal of labour and the expenditure of a large sum, it will be necessary for further improvements to be spread over a period of years and for users of the road to continue to exercise the utmost care. A commencement has been made with widening a section near Cape Patten. (Plate No. 13.)

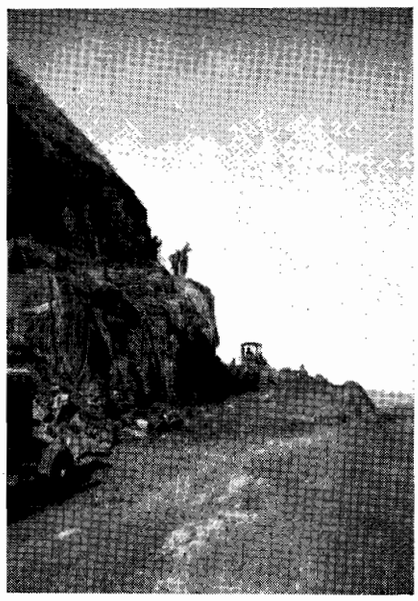


PLATE No. 13.—Widening at Cape Patten.

The resheeting and subsequent sealing of a number of weak sections between Eastern View and Hordern Vale covering a total length of 9 miles was undertaken.

Phillip Island Road.—A length of 3 miles from the San Remo bridge towards Cowes was resheeted with a mixture of loamy gravel and dune sand to serve as a base course for a top course of fine crushed rock.

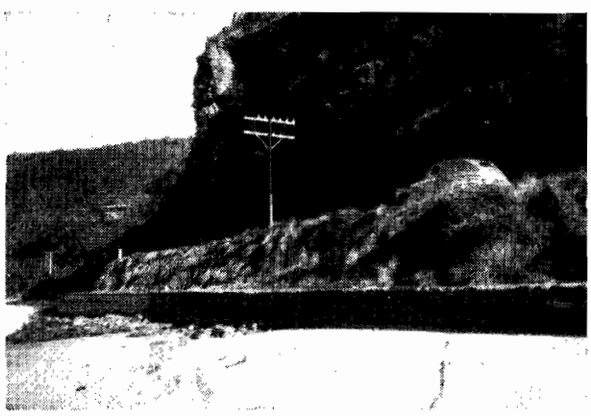


PLATE No. 14.—Ocean Road at Cathedral Rock. Extension of stone wall to check erosion. (Note sanding up at old section–darker color.)

Grampians Road.—Resheeting of 2·1 miles between Bellfield and Dairy Creek was undertaken and a commencement made with surfacing between the Borough Huts and the second Wannon Crossing, a base course having been spread over 4·38 miles.

FOREST ROADS.

Proclaimed Roads.

During the year, the following additional roads were proclaimed forest roads under the provisions of the *Country Roads* (*Forest Roads and Stock Routes*) *Act* 1943 bringing the total length to 241 miles at the end of the year :—

Tatong–Tolmie Road	22·7 miles
Forrest–Apollo Bay Road (extension)	·93 miles
Reefton–Spur Road	13·02 miles

The total amount expended on the maintenance of forest roads during the year was £28,782 which was charged against the Country Roads Board Fund without any contribution by councils.

Drummond–Vaughan Road (*Glenlyon Shire*).—A length of 3 miles between the Loddon River and the Newstead and Mount Alexander Shire boundary was reformed and gravelled, thus completing the construction and surfacing of the road to provide an all-weather connection between Drummond and Vaughan.

Works for Forests Commission.

Benwerrin–Mount Sabine Road (*Winchelsea Shire*).—Surfacing of 5 miles was completed, and extension of the formation from Mount Cowley to Mackie's mill commenced. Completion of this extension was prevented by the onset of winter weather.

Mount Cole Road.—The work consists of the construction of 8 miles of road from Raglan into the Mount Cole forest area. Formation and surfacing have been completed from Raglan to the forest boundary, a distance of 2·8 miles; formation is practically completed within the forest area for a length of 16,000 ft. and culverts have been placed. Owing to wet conditions, it was necessary to cease work in May.

Licola Road.—The strengthening of this road and its extension in the newly exploited forest areas beyond the present terminus made considerable progress during the year. When completed the road will be extensively used for the transport of large quantities of timber and will play an important part in the Forests Commission's operations.

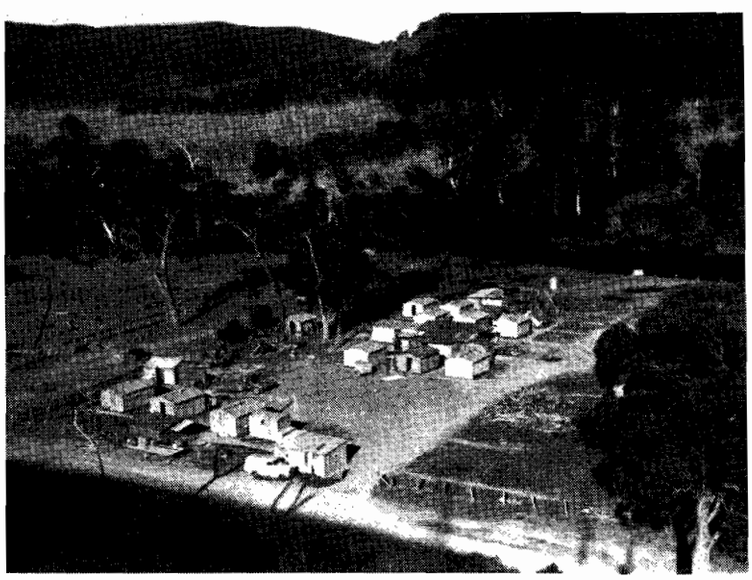


Plate No. 15.—Basin Flat camp–Licola Road.

During the year clearing was completed to Crescent Creek, a distance of 12·1 miles; 10·3 miles of formation was completed from Licola Bridge north-westerly towards Crescent Creek; and 6½ miles of gravelling completed from Licola bridge. (Plates 15 and 16.)

The expenditure in the financial year 1947–48 was £33,316, towards which the Forests Commission is contributing £11,388.

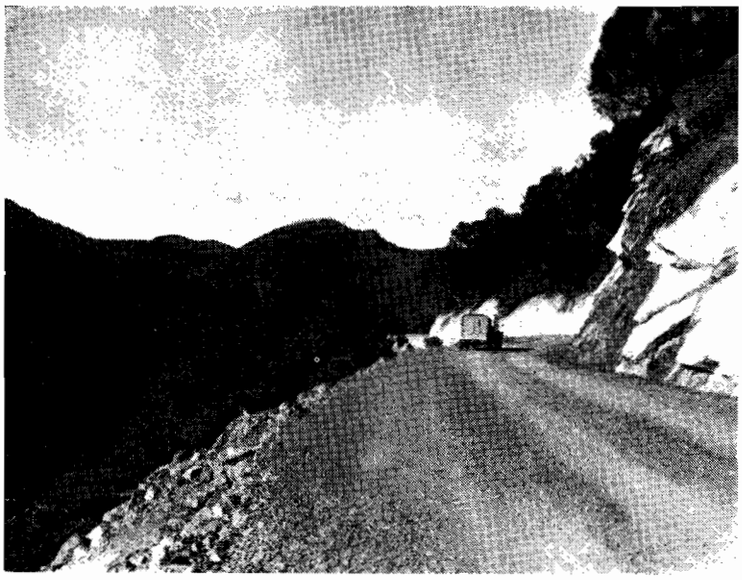


PLATE No. 16.—Licola Road—completed section.

BRIDGES.

A wartime survey of bridges on roads under the Board's control and on many important unclassified roads where municipalities look to the State for assistance showed that not less than £1,000,000 was required for reconstruction of old bridges throughout the State. In considering applications from municipal councils the Board has, therefore, given special attention to providing for bridge renewals, with a view to eliminating many of the limitations on gross vehicle loads which are necessitated by the presence of weak old structures on important routes. An especially liberal basis was generally adopted in the allocations for this type of work. Minor maintenance and repairs were also provided for on a more extensive scale than previously.

Whilst large allocations were made several causes have combined to prevent adequate progress from being made with the programme of work. In some cases councils have not succeeded in obtaining the necessary full-time engineers or in employing adequate staffs to enable plans and specifications to be prepared. In other cases, contractors have not come forward to tender for works advertised, or tenders have been abnormally high. Again, shortages of manpower and materials have delayed the commencement or progress of works approved to be undertaken either by contract or direct labour. It appears that in present circumstances only a small proportion of the total necessary works can be completed each year.

However, during the year 121 bridge projects of a total value of £169,165 were initiated, bringing the total number of structures erected or in course of erection by the Board and municipal councils to 3,289. Of the 121 new projects, 23 of a total value of £52,342 were supervised by the Board, and 98 at a total cost of £116,823 were supervised by municipalities.

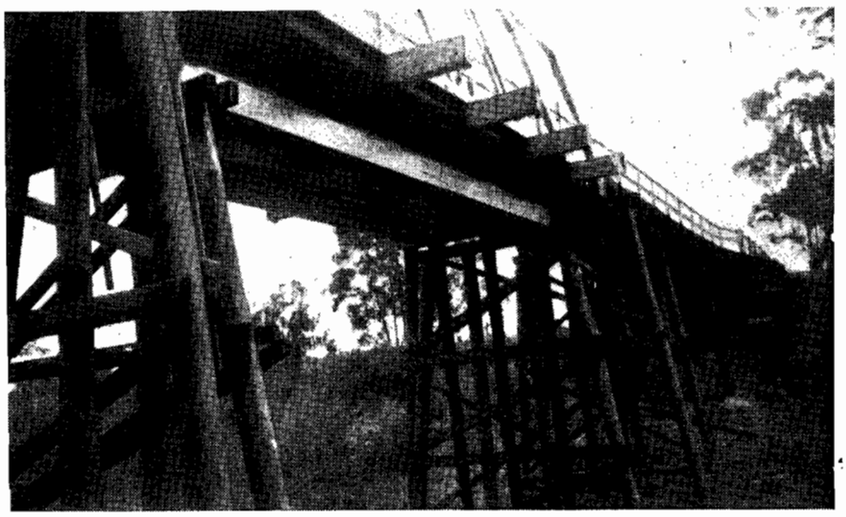
Some of the major works carried out during the year were the following :—

Calder Highway.—Three new reinforced concrete bridges were constructed at Ravenswood, Marong, and Inglewood to replace old timber structures, the first mentioned being on a greatly improved alignment. (Plate No. 17.)

Princes Highway East.—Boggy Creek bridge at Nowa Nowa. Strengthening joists were placed beneath the 60-ft. timber truss span, a number of piles were replaced, and 50 per cent. of the decking renewed. (Plates Nos. 18 and 19.)

Genoa River bridge at Genoa. Repairs were effected to one pier which had completely failed, a number of piles were replaced, and the structure generally reconditioned.

Plate No. 17.—Calder Highway. New reinforced concrete bridge over Bullock Creek near Ravenswood.



Plates Nos. 18 and 19.—Princes Highway East. Bridge over Boggy Creek at Nowa Nowa. Showing joists and new supporting piers.

Princes Highway West.—Bridge over Glenelg River at Dartmoor. Practically the whole of the deck system was renewed and the roadway widened to 20 feet.

Bridge over Merri River at Dennington. The superstructure was strengthened to cater for increased loading.

Bridge over Surry River at Narrawong. Strengthening work was undertaken.

Western Highway.—Decayed timber bridges over Charleycombe Creek and Dunn's bridge near the township of Middle Creek were replaced by reinforced concrete structures.

A new 2-cell reinforced concrete culvert was constructed at "Skrymes" near Great Western.

Grampians Road.—Mokepilly Creek bridge near Hall's Gap. A temporary bridge was erected pending provision of a permanent structure. (Plate No. 20.)

PLATE No. 20.—Grampians Road. Old bridge over Mokepilly Creek.

SWAN-STREET BRIDGE.

At the 30th June, 1948, 76 concrete piles had been completed, 53 of which had been driven, 43 in pier No. 4, and 10 in pier No. 3. The false work in pier No. 3 had been completed and the pile frame and winch placed in position to drive the concrete piles. Work had been commenced on the construction of the forms for the casting of the base of No. 4 pier and the sinking of two shafts at the Batman Avenue abutment was in hand. (Plate No. 21.)

The total expenditure on the work to the 30th June, 1948, was £25,157.

(Reproduction of artist's drawing)

PLATE No. 21.—Swan-street Bridge.

SOLDIER SETTLEMENT ESTATE ROADS.

The Board continued its co-operation with the Soldier Settlement Commission in connexion with the construction of roads in soldier settlement estates.

Subdivisional plans for a large number of estates have been submitted to the Board by the Commission, indicating priority of works required.

As previously reported, the Board had arranged to make some provision for the construction of the principal road in each estate, subject to the municipal council under whose supervision the work would be carried out contributing to the cost. The Commission subsequently requested the Board to investigate and control the work on all roads on the understanding that the Commission and municipality concerned would provide on a contributory basis for the subsidiary roads.

In arriving at a basis for such grants, the Board has taken into consideration the financial position of the municipalities affected, the cost of the work involved in the particular estate and the aggregate responsibility of the municipalities in respect of estates in their areas. During the year the requirements of 30 estates were investigated or were in the course of investigation and finality was reached in the following cases :—

Shire.	*Estate.*
Ararat	Yalla-Y-Poora.
Ararat, Mortlake, and Mount Rouse	Narrapumelap (Nos. 1 and 2)
Berwick	Harewood Park
Glenelg	Hindson's and Talisker
Hampden	Larra
Hampden	Marida Yallock No. 1
Hampden	Wiridgil
Hampden	Gala
Lillydale	Ferndale
Mortlake	Berrambool
Mortlake	North Station
Numurkah	Murray Valley
Ripon	Mount Emu
Ripon	Mooramong
Waranga	Burnewang
Wimmera	Domaschenz

The total amount of grants was as follows :—
Soldier Settlement Commission, £25,750.
Country Roads Board, £29,380.
Municipalities, £7,919.

BROWN COAL PROJECTS.

YALLOURN.

In the last annual report reference was made to the work being carried out by the Board's organization in assistance to the State Electricity Commission for the removal of overburden and winning of coal from the old brown coal mine at Yallourn. During the year the quantity of overburden removed was 831,234 cu. yds. and the coal production 193,601 tons ; plant consisting of 8 bulldozers, 2 tractors, 1 power grader, and 1 front-end loader, the property of the Board, was in use in addition to plant owned by the Commission. At the 30th June, 120 men were employed, the maximum number at any one time during the year being 163. The expenditure incurred in the year 1947–48 was £66,958.

WENSLEYDALE.

In order to facilitate the cartage of coal from the brown coal mine at Wensleydale in the Shire of Winchelsea, arrangements were made by the Board to undertake reconstruction work on the Winchelsea–Dean Marsh Road, together with new bridges at Barwon River. The work carried out to the end of the year consisted of :—

(*a*) Strengthening with gravel and fine crushed rock and sealing to a width of 20 ft. 7 miles of road between the Princes Highway at Winchelsea and Yan Yan Gurt.

(*b*) Two new bridges over Barwon River at Karngun to replace old weak structures (work partly completed).

(*c*) Strengthening and sealing of road leading from Princes Highway to the Winchelsea railway yards.

(*d*) Strengthening of road and erection of bridge over Wormbete Creek on by-pass road via Wurdale for use during construction of bridges on main road.

The expenditure incurred in the year 1947–48 was £47,248.

BOY SCOUTS' JAMBOREE.

During the year requests were made to the Board for road reconditioning work to be put in hand to provide for the extensive traffic anticipated on roads approaching the site of the Boy Scouts' International Jamboree to be held at the end of 1948 at "Yarra Brae", a property at Wonga Park made available by the Hon. Lewis Clifford. It is estimated that 10,000 boys from various countries will be in camp on the occasion.

Following conferences and inspections by representatives of the Police Department, Transport Regulation Board and Country Roads Board when the problems associated with transport were discussed, details of the road requirements were prepared, involving widening and resheeting Yarra Road from the Maroondah Highway near Croydon to "Yarra Brae" and similar work on the Warrandyte–Wonga Park Road including a new bridge over Narr-meian Creek. The total estimated cost of the necessary work including the bridge reconstruction is £20,000, and in view of the national importance of the event and the public interest involved the Government approved of the Board undertaking the work.

As the roads serve an extensive area of productive land utilized for fruit growing and poultry farming the Councils concerned, viz., Shire of Lillydale and Shire of Doncaster and Templestowe willingly agreed to bear a share of the cost which was fixed at £2,500.

SNOW REMOVAL.

With a view to assisting the Board in considering proposals to be adopted at the appropriate time for keeping open for traffic certain roads which are now snowbound during the winter months, arrangements were made for the divisional engineer at Benalla (Mr. H. S. Gibbs) and the divisional engineer at Bairnsdale (Mr. W. H. Dolamore) to visit areas in New South Wales at Mt. Kosciusko and Kiandra, in order to observe the methods adopted there. The roads with which the Board is mostly concerned are the higher section of the Omeo Highway north of Omeo, the Alpine Road between Harrietville and Omeo and the Mount Buffalo Road, all of which are in the north-eastern portion of the State. (Plate No. 22.)

PLATE No. 22.—Omeo Highway. Snow scene north of Glen Wills.

By the courtesy of the Department of Main Roads, N.S.W., the Board's officers were able to gather a great deal of valuable information and submitted comprehensive reports of their observations. Following the investigation the Board obtained two

4-wheeled drive "Matador" trucks to be fitted with snow ploughs. These vehicles are of such a type that they can be used for transport or on road works when not required for snow clearing work. In the first instance trials will be made on the Harrietville–Mt. St. Bernard section of the Alpine Road, the surface of which is in a suitable condition for use of the vehicles.

An investigation was also made of the use by the Department of Main Roads of the "snow-mobile" which is a tracked vehicle used for travelling over the snow. This particular type of vehicle is not now available in Australia, but the Board is investigating the possibility of adapting a Bren gun-carrier to enable it to function as required.

FINANCING FUTURE ROAD WORKS.

As a result of the general increase in the cost of materials, additional consessions to employees, taxation, &c., the cost of works carried out by the Board has considerably increased, whilst on the other hand the work to be undertaken has accumulated. During the war years, the roads deteriorated as adequate restoration works could not be undertaken and a programme of progressive improvements could not be contemplated. Although the whole of the available funds were not spent during that period and certain reserves were built up, the actual receipts were much less than if normal conditions had prevailed, with the result that the value of accumulated work was far in excess of the reserves.

It is estimated that from the year 1940–41 the amount lost to the Country Roads Board Fund as a result of failure to achieve the normal increases of revenue was not less than £3,500,000 and for the same reason the receipts under the Federal-aid roads and works agreement were reduced by approximately £3,000,000.

In these circumstances the Board is faced with an extremely large programme of works at a time when costs are abnormally high and are tending to increase still further.

Moreover, the demands on the roads are increasing as a result of heavy traffic such as log and timber carting so essential to home building developing following the inability of the railways system to cope with the increased output. In addition, the transport of loads of large dimensions which cannot be accommodated by the railways is increasing. From time to time also the roads are called upon to carry additional traffic on account of restrictions imposed on rail traffic for various reasons. Types of traffic which are increasing in bulk as well as in length of haul, include whole milk, fruit, tomatoes, wheat, potatoes, firewood, brown coal, crushed stone, building materials, machinery, manufactured goods, and general merchandise.

At the 30th June, 1948, the total length of declared roads, i.e., State highways, main roads, tourists' roads, and forest roads, for which the Board has a statutory obligation for maintenance was 14,295 miles. Generally speaking the work required on these roads consists firstly of patrol and general maintenance, supply of maintenance materials, periodical resealing of sealed sections, resheeting of unsealed sections and maintenance of bridges. Secondly, reconstruction of old bridges as referred to separately is a costly item. Thirdly, funds are needed for such progressive improvement works as sealing of the more heavily trafficked sections of these roads, the surfacing of unsurfaced lengths, and the improvement of alignment of old sections which are considered dangerous for modern traffic, so as generally to raise the standard of construction and the traffic bearing capacity of weak links in the road system.

Apart from works on "declared roads" developmental projects having the character of capital works have for twenty years been chiefly financed with the assistance of revenues made available under the Federal aid roads and works agreements of 1927 and 1937, and in the latter part of the period municipal councils have been given some assistance in the maintenance of completed works of this type. Many of the roads concerned have subsequently been included in the "declared system" of roads, but a large volume of work remains to be done on them and on unclassified roads in order adequately to serve the surrounding communities and productive areas.

It is estimated that, whereas the classified systems of roads as stated above embraces 14,295 miles, the more important unclassified roads total approximately 50,000 miles, whilst, according to the Government Statist, an additional 43,000 miles of less

important roads serve Crown lands, forest areas and private holdings where, in spite of the sparseness of settlement, trafficable access roads are nevertheless essential, and in some cases require to be of a high standard of construction to carry the heavy loads traversing the areas. The maintenance of unclassified roads is a responsibility of municipalities, and is proving a serious burden upon the Councils.

Unless means for increasing funds at the Board's disposal are found road works in future years will be still more severely curtailed, being confined to the barest essential maintenance of existing assets on "declared" roads with no margin available for effecting necessary improvements. The sum available from Commonwealth consolidated revenue for expenditure on roads other than main roads and State highways, as now prescribed in the *Commonwealth Aid Roads and Works Act* 1947 and amended recently, must of course be devoted to roads of a developmental character, but the State of Victoria receives only 17·4 per cent. of the total provision for all States. Representations were made that the Commonwealth Government should amend the Act to double the amount made available from Customs and excise duties, i.e., to provide the proceeds of sixpence per gallon instead of three pence as at present. This would have yielded an additional £819,145 to this State, which would have been available either for road works or, at the discretion of the State, for other works connected with transport.

CENTRAL PLANNING AUTHORITY.

Following the investigations by the State Regional Boundaries Committee, which recommended that to facilitate the investigation of resources and the planning of future development the State be divided into thirteen regions, and the setting up by the Government of the Central Planning Authority, arrangements are being made for the appointment of regional committees for each of the regions.

The Board is co-operating as far as possible with these committees and is directly represented on three of the committees by its Divisional Engineers, viz, :—

East Gippsland Region	..	Mr. W. H. Dolamore, Divisional Engineer, Bairnsdale
Loddon Region ..	..	Mr. F. West, Divisional Engineer, Bendigo
Wimmera Region ..	..	Mr. C. C. Perrin, Divisional Engineer, Horsham

CONFERENCE OF STATE ROAD AUTHORITIES OF AUSTRALIA.

The Tenth Conference of State Road Authorities of Australia, which was held at the offices of the New South Wales Department of Main Roads in Sydney on the 15th and 16th September, 1947, was attended by the Chairman and Members of the Board and representatives of all State Road Authorities as well as a representative of the Commonwealth Department of Works and Housing.

A matter of great importance discussed was the legal limits of dimensions and loading of motor vehicles, which enabled the various State Authorities to submit unanimous recommendations to the Australian Transport Advisory Council dealing with such aspects as maximum axle loads, tire loads, length of vehicles, &c., which are considered reasonable in the light of recent developments in the construction of motor vehicles and having regard to the standards and costs of road and bridge construction.

Other matters discussed related to the purchase of plant, route numbering, uniform statistics, International Roads Congress, &c.

In addition to meeting in conference the delegates had an opportunity by courtesy of the Department of Main Roads of inspecting works in progress. As a result of such inspections delegates are enabled to introduce into their own work practices being developed in the State visited.

The Ninth Conference of Senior Technical Officers and the Fourth Conference of Testing Officers of the State Road Authorities were held in Adelaide between 12th and 17th April, 1948. At these Conferences opportunity was taken to discuss a large number of matters of mutual interest, and recommendations were made for consideration at the next Conference of the Road Authorities to be held in Hobart in November, 1948.

CONFERENCE OF MUNICIPAL ENGINEERS.

A further conference of Municipal Engineers convened by the Board was held on the 12th and 13th November, 1947, when technical matters of interest to engineers in their work as related to road and bridge design and construction were discussed. A record of the proceedings of the conference has been forwarded to Municipal Engineers throughout the State.

The Board considers that these conferences are of great value to engineers to enable them to bring to notice results of their local experience and to obtain explanations of latest methods adopted by the Board. At the same time opportunity is given for them to discuss among themselves in an informal manner problems which arise from time to time in their work.

At the last conference 100 municipal engineers, apart from engineers in the Board's service, attended, which is an indication that municipal councils had realized its importance by granting their officers the necessary leave of absence. This recognition by the Councils is appreciated by the Board.

DECENTRALIZATION.

The Board has continued the policy of decentralization, as outlined in previous reports, but delays have occurred owing principally to the housing position.

Ballarat.

A new divisional office has been established at Ballarat at the old Court House building in Camp-street, which will be adapted to the Board's requirements as early as possible. A residence for the assistant divisional engineer has been erected and is in occupation. Others which will be occupied by the divisional engineer and the divisional office clerk respectively are in course of erection, and tenders will shortly be invited for a residence for the engineering assistant.

Benalla.

At Benalla four prefabricated houses have been obtained from the Housing Commission, and three have been erected adjacent to the Board's workshop. These are occupied at the present time by one of the assistant engineers, the workshop foreman, and a fitter from the workshop. The fourth, which has been erected in Maude-street, is occupied by another assistant engineer.

Tenders have been invited for three brick veneer houses which, when available, will be occupied by the divisional engineer and by the two assistant engineers temporarily occupying prefabricated houses. The existing residence now occupied by the divisional engineer will be made available for another officer as soon as the new residence for the divisional engineer is completed.

Plate 23 shows prefabricated house erected at Benalla.

Bendigo.

At Bendigo the Board has been unable to proceed with any work at the building purchased for reconstruction as an office, and in the meantime the office staff continues its somewhat congested occupation of a section of the public offices.

The Board was able to obtain from the Housing Commission four prefabricated houses for erection on land forming portion of the workshop site at Bendigo. These are occupied by the workshop foreman, and three other employees at the workshop. Other houses are in course of erection.

Geelong.

On the 2nd February, 1948, the Geelong divisional organization was transferred from Head Office to Geelong, and is now located in portion of the old Police Department building in McKillop-street. As soon as conditions are favourable the

necessary alterations to the building will be carried out to provide permanent accommodation. The Divisional Engineer's residence, erected by the Public Works Department on land adjoining the office, has been completed and the divisional engineer is in occupation. In addition, two other new staff residences were occupied.

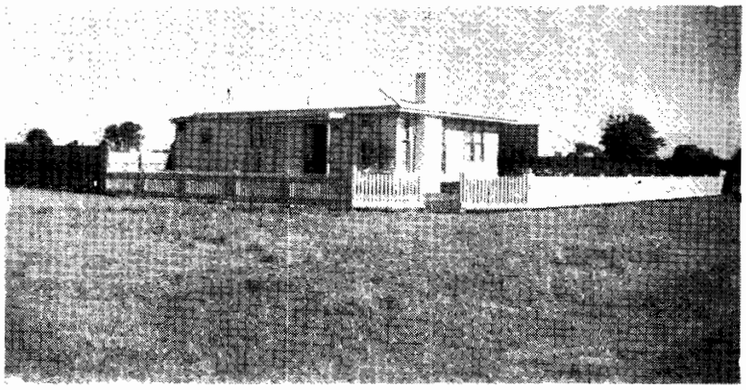


PLATE No. 23.—Prefabricated residence at Benalla.

HORSHAM.

An office has been established at Horsham in temporary premises formerly used as a public library. This accommodation will be used until a permanent building can be erected on land in Firebrace-street owned by the Board. A house in Wallis-street purchased by the Board is occupied by the divisional engineer.

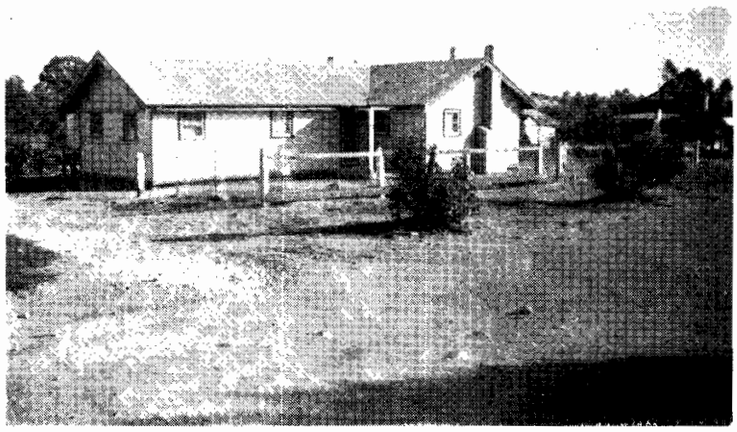


PLATE No. 24.—Patrolman's residence at Ouyen—converted army hut.

GENERAL.

It is the Board's intention that as soon as the complete organization is established in each division plans and specifications submitted by municipal engineers shall be examined at the divisional office and reimbursement of expenditure by municipal councils shall be made from those offices. In addition, workshop accommodation will be provided to enable plant repairs to be undertaken.

Under present conditions the complete programme cannot be undertaken at once, but some progress is being made as accommodation becomes available and staff is allotted.

Arrangements have already been made for the examination of plans and specifications at Geelong and Bendigo offices, and accounts are now being paid from the Bendigo office. Divisional accountants have been appointed for Geelong Warrnambool, Benalla, and Ballarat divisions.

The workshop organization is now well established at Bendigo, where a total of 25 fitters, mechanics, carpenters, painters, storemen, &c., are employed. During the year blacksmith's and welders' shops and a tool store were added. The year's work consisted of general overhauls, major repairs, running repairs, and field repairs, the number of individual jobs being 243. Progress is being made with the development of workshop facilities at Geelong and Horsham. At Benalla a total of eight workshop and stores personnel are employed.

ROAD-MAKING PLANT.

In view of the necessity of carrying out its works expeditiously and economically the Board is endeavouring to build up its plant units. As a result of the hold-over of works during the war years, urgent reconstruction and improvement works have accumulated, whilst the Board has been called upon to undertake important works to facilitate the cartage of timber and the extraction of brown coal as well as important developmental works to assist the primary producer.

As much plant as possible is being obtained from local manufacturers but the manufacture of tractors of the size and type required in road making is practically confined to U.S.A. Whilst the Board is aware of the difficulty of obtaining this plant in view of the dollar restrictions, it considers that the construction and maintenance of roads is of such importance for the maintenance and extension of production in both primary and secondary industry that sufficient importations of such plant should be permitted to enable worn out units to be replaced and additional units purchased to cope with urgent works.

The serious position with regard to the acquisition of new tractors applies also to spare parts required in the maintenance and repair of existing imported units. Under normal conditions it would not be economical to keep much of this plant in operation on account of its obsolete and worn out condition and the heavy and constant work which it has been called upon to perform. Many of the units should be discarded, but it is necessary to keep them in operation as far as possible.

The serious nature of the position is revealed by the fact that at the end of the financial year out of a total of 110 tractors owned by the Board, of which 72 are used as bulldozers, 35 were in workshops for repairs and 38 were in the field but should be overhauled, leaving only about 25 per cent. which were fully effective.

The difficulty experienced in obtaining plant has prevented the Board's making satisfactory progress with its proposal for establishing a "pool" of road-making plant at each divisional headquarters, such plant to be available for hire to municipalities. For the same reason it was not possible to purchase plant for use of municipal councils, although £50,000 was set aside for that purpose, under Clause 6 (4) of the Commonwealth Aid Roads and Works Act.

Following upon a conference of departments and instrumentalities concerned convened by the Government under the chairmanship of the Minister for Public Works, a Committee has been appointed to ascertain the total shortages in spare parts and replacement units, and to arrange for "pooling" of supplies of parts which it may be possible to manufacture locally. The Board is represented on this Committee and has undertaken to include the requirements of municipal councils in the figures reported to the Committee.

INSTRUCTION OF PLANT OPERATORS.

By courtesy of the Department of Main Roads, New South Wales, arrangements were made for the Board's Research Engineer, Mr. F. Hosking, and Plant Inspector, Mr. R. Wade, to attend a course of field instruction on the care and operation of plant held at Bateman's Bay, New South Wales, in January, 1948. The object of the visit was to enable the methods adopted in New South Wales for the instruction of operators of heavy plant to be observed, with a view to a suitable system being put into operation in this State.

As a result the Board has approved a proposal, which will be put into operation when the organization can be set up, for engineers, roadmasters, overseers, and gangers to be brought to a central location and given instruction in servicing, maintenance, theory of operation and demonstrations of the use of plant.

In the meantime two experienced plant operators have been selected and given the necessary instruction with a view to their appointment as plant instructors. Their duties will embrace visiting works on which plant is used, to instruct operators in the correct method of operation, servicing, and maintenance of such equipment as power graders, tractors, scoops, rippers, compressors, &c.

In view of the heavy expenditure involved in the purchase of this class of plant, the shortage and the difficulty experienced in having repairs effected, it is necessary to obtain the maximum value from what is available. It is therefore considered that the appointment of the plant instructors will be an important factor in achieving that object, and will afford a nucleus for the organization of an instructional school to be developed later.

UNATTENDED STOCK ON STATE HIGHWAYS.

In November, 1935, Parliament passed the *Country Roads (Impounding of Cattle) Act* 1935, which provides that any cattle which may be found wandering on any State highway may be impounded by any officer of the Board. Immediately on the passing of the Act the Board appointed a ranger to patrol the highways and to take the necessary action under the Act. Whilst the operations of this officer had the effect of curbing the menace to traffic of wandering stock, it was recognized that additional officers were required to ensure attention to highways throughout the State, particularly in certain districts where offences were prevalent, and following the extension of the State highway system.

On representations being made to the Minister, approval was given for the appointment of two additional officers who have taken up duty and will be located at country centres.

In the first six months of the year 1947–48, reports of 199 offences were submitted by the officer who was then operating. Warnings were issued to 138 offenders; proceedings were instituted in 61 cases and 59 convictions obtained, the fines amounting to £118 and costs £22 18s.

EXPERIMENTAL WORK.

Sand-asphalt.

As a continuation of the Board's policy of endeavouring to obtain the maximum value from local materials experimental lengths of sand-asphalt have been laid on the Calder Highway near Pier Millan using Mallee sand obtained from the roadside, as the mineral aggregate.

In all, thirteen sections of varied ingredients were laid; the sand-asphalt was spread on a limestone pavement which had been primed with tar and spread with a tack coat of bituminous cutback; a "Barber Greene" continuous type of twin shaft pugmill mixer was used to mix sand with the bituminous binder.

Inspection on completion revealed that all sections were in satisfactory condition, and it is proposed to keep the work under observation, particularly during the hot weather, with a view to development of the most satisfactory methods. Details are given in the Chief Engineer's report.

TREE PLANTING.

Experimental plantations were commenced near Winchelsea on the Princes Highway West in the autumn of 1946 with the preparation of the ground, and the first trees were planted in August of that year; the plantations were extended during the following year, the new ground being prepared in the autumn and the trees planted during October and November. One of the objects of the experiment is to determine the most suitable type of tree for the windswept conditions between Geelong and Colac.

Up to the present all of the trees planted in 1946 consisting of 72 *Eucalyptus punctata* (Grey Gum), 20 *Eucalyptus cosmophylla* (Cup Gum), and 20 *Lambertiana horizontalis*, have survived, whilst of 1,087 consisting of fifteen types planted in 1947, 571 survived. The experience showed that certain types were quite unsuitable for the locality and that others grew very well until affected by frost. These experiments are being carried out in conjunction with the "Save the Forests Campaign".

PHOTOGRAPHY.

During the year additional sound films have been prepared, the principal ones being :—

Bituminous Roads No. 1, showing details of the methods adopted for completing a dust-free bitumen-surfaced road.

Road Reconnaissance, showing the operations in road location in the Australian Alps under snow conditions.

A silent film illustrating various phases of the construction and maintenance of roads, entitled "Men at Work—Gazette No. 1" has also been produced.

These films, with those previously produced, have proved of great educational value to the Board's technical staff and municipal engineers, and form a permanent record of current developments in methods associated with road construction.

The Board has also taken the opportunity of showing the films in different parts of the country as it is considered that municipal councils and the public generally should have an opportunity of becoming acquainted with the operations of a Government organization. Communications received by the Board indicate that the films have not only proved of entertainment value but municipal councils have been encouraged in their efforts for the adoption of more modern and economical methods in carrying out road works.

As a part of the Board's policy of making life more congenial in road construction camps arrangements have been made for programmes of films including the Board's own productions to be shown to the employees. In order to make this possible in remote areas where electric current is not available, a generator manufactured at the Board's workshops has been installed.

TRAFFIC LINE MARKING.

The work of marking traffic lines which has proved of such value to the travelling public has continued, the work carried out during the year 1947–48 comprising the painting and re-painting of 1,381·33 miles of State highways, main roads and tourists' roads and 25 miles on behalf of municipalities and other bodies. The total expenditure was £11,447 9s. 7d., of which £212 6s. 3d. was a charge against municipal councils. The total quantity of paint used was 8,573 gallons or an average of 6·09 gallons per mile. The total cost per mile including labour, materials, and plant hire was £8 2s. 8d.

The average consumption of paint during the preceding year was 7·53 gallons per mile and the cost per mile £9 6s. The reduced cost during the year 1947–48 was due to the more efficient operation of a new plant.

The Board now has two complete plants in operation. (Plate 25).

TRAFFIC COUNTS.

Prior to the war arrangements were made to take traffic counts on all State highways and important main roads in the latter part of the summer. During the war, however, it was necessary to suspend these, but in 1946 the Board decided to revert to the practice of taking the counts annually which embraces single day (12-hour) counts at all stations and seven-day counts at selected positions. As far as possible the same stations are adopted each year in order that fluctuations might be observed. The last count was taken in March, 1948.

The information, when tabulated, is of very great value to the Board as indicating the trends of traffic and providing a guide as to the type and width of pavement for which provision should be made and the extent of works which should be undertaken on particular roads.

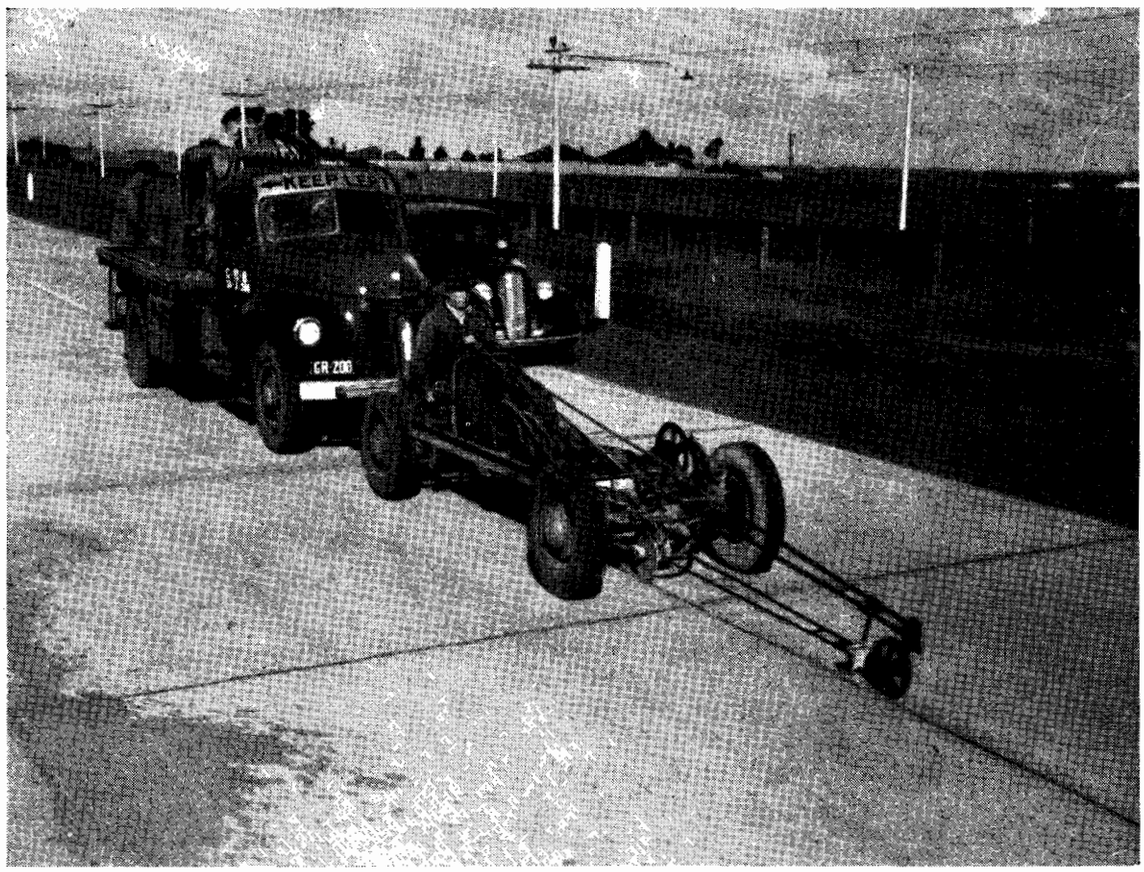


PLATE No. 25.—Line marking machine.

TRAFFIC CONTROL.

OFFENCES.

The Board continued to receive a large number of reports of offences against the Motor Car Act, an increasing number affecting interstate operators, particularly relating to the carriage of excessive loads, although permits are granted on a liberal scale for increased weights above those specifically laid down in the Act.

The following statement shows the number of cases for which convictions were obtained during the year :—

Speeding (freight vehicle)	222
Speeding (passenger vehicle)	9
Exceeding 13 tons of gross weight	195
Exceeding 10 tons of gross weight	7
Exceeding 6 tons load limit	68
Exceeding conditions of special permit	66
Exceeding 7½ tons on one axle	1
Exceeding 3 tons on trailer axle	7
Exceeding two-thirds of vehicle weight on one axle	1
Exceeding 8 feet wide	15
Exceeding 12 feet high	3
Refusing to allow vehicle to be weighed	7
Failing to carry permit	1
Total	602

The total fines imposed amounted to £4,182 15s. and costs, £82. 0s. 6d.

ISSUE OF PERMITS.

Increasing numbers of applications for the issue of permits are being received, especially to cover large and heavy loads. In 1946–47 the number of permits issued was 4,743, whilst in the year 1947–48 the number was 7,373, or an increase of 55 per cent. The following statement shows the types of permits issued :—

Exceeding 6 tons load limit	1,292
Exceeding 13 tons load limit but not 15 tons	1,049
Exceeding 15 tons but not exceeding 20 tons	769
Exceeding 20 tons but not exceeding 30 tons	501
Exceeding 30 tons	96
Exceeding 8 feet wide	1,890
Exceeding 12 feet high	882
Exceeding legal length	866
Miscellaneous	28
Total	7,373

Since the war many applications have been received for permits to exceed the width and height of loads involving the removal of army buildings. (Plate No. 26.) This aspect has given the Board a great deal of concern as it has been anxious to assist as much as possible transport of these buildings, which in some cases were acquired for residential purposes. On the other hand, it has been necessary to exercise great care to ensure that authority is not given for the use of roads where danger to other road users might result. In many cases the cartage has been allowed after the buildings have been reduced in width by cutting into sections.

From time to time applications for permits to carry particularly heavy loads are received, an example being an application by the Commonwealth Department of Supply and Development to transport a furnace weighing 40 tons from Ballarat to Mulwala, via Geelong, Melbourne, and Benalla. The load was carried on a 32-tired trailer weighing 20 tons, thus making the gross weight 60 tons, the maximum height being 15 feet, length 68 feet and width 18 feet. The prime mover was a " Diamond T " 3-axle vehicle fitted with ten tires. Special precautions were taken to protect road surfaces and bridge structures and to ensure safety of other road users. Arrangements were made for an officer of the Board to travel with the load in order to observe its effects. (Plates Nos. 27 and 28).

DIVISIONAL OFFICERS.

Following the resignation of Mr. R. C. Jones to take up a position with the Commonwealth Department of Works and Housing, the position of Divisional Engineer, Dandenong Division, became vacant and was filled by the transfer of Mr. L. T. Butler, Divisional Engineer at Bendigo. His position was filled by the transfer of Mr. F. West, Divisional Engineer at Stawell.

With the establishment of Divisional Offices at Ballarat and Horsham and the closing of Stawell office, two vacancies arose and were filled by the appointment of Mr. F. F. O'Brien to Ballarat and Mr. C. C. Perrin to Horsham. Both of these officers had held positions as assistant divisional engineer for long periods during which they obtained considerable experience in the Board's operations and its associations with municipal councils.

MISSIONS ABROAD OF TECHNICAL OFFICERS.

Chief Engineer.

As indicated in the last annual report, the Board's Chief Engineer, Mr. C. G. Roberts, M.C., B.Sc. (Eng.) London, A.M.I.C.E., A.M.I.E. (Aust.), C.E., left Australia on the 22nd June, 1947, for a mission abroad to study recent advances in engineering matters, and returned on the 28th January, 1948 after visiting the United Kingdom and United States of America. Following his return Mr. Roberts presented a report setting out the result of his observations and containing recommendations for future action. Approval for this report to be printed and circulated has been given.

The Board wishes to place on record its keen appreciation of the valuable assistance rendered to Mr. Roberts by high officials in the countries visited by him, who so generously gave of their time and the benefit of their long experience.

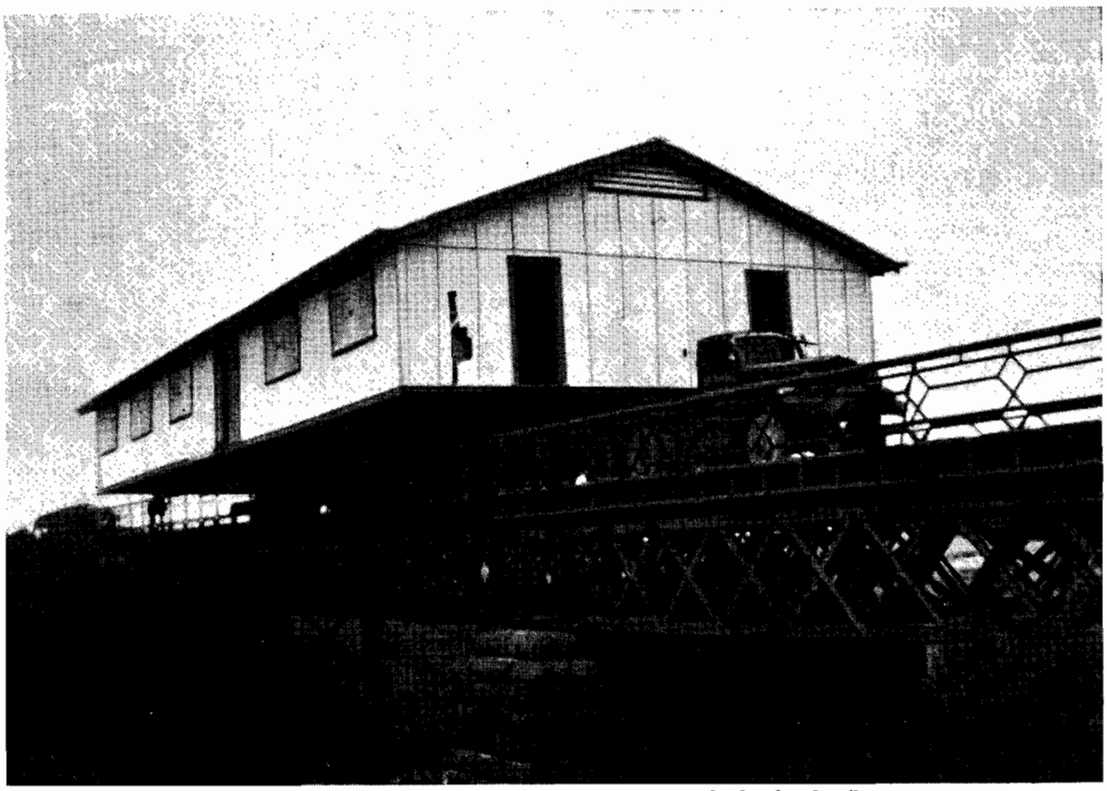


PLATE No. 26.—Army hut elevated to pass over bridge hand rail.

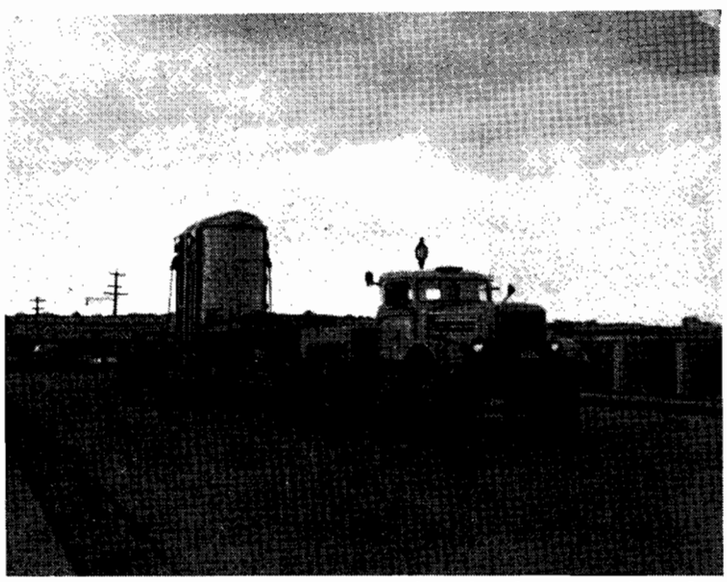


PLATE No. 27.—Transformer transported on float having 8 axles and 42 tires, gross weight 96 tons.

PLATE No. 28.—Furnace transported on trailer having 4 axles and 32 tires, gross weight 60 tons.

Senior Testing Engineer.

As a result of the mission abroad of Mr. C. G. Roberts, the Board is of opinion that considerable benefit will accrue by sending other officers, particularly those engaged in specialized fields, to observe at first hand in other parts of the world the progress made in those fields.

As laboratory research and testing of materials have become an increasingly important section of road engineering necessitating expansion of the Board's laboratories and expert control of an enlarged staff of research engineers, chemists, and physicists, the Government approved of Mr. A. H. Gawith, M.C.E., A.M.I.E. (Aust.), Senior Divisional Engineer, Materials Research Division, undertaking a mission oversea in order to examine the latest methods adopted by major road research organizations and laboratories in the United Kingdom, Western Europe, and U.S.A., and to enable him to represent the Board at the Second International Conference for Soil Mechanics and Foundations Engineering held in Holland in June, 1948.

STAFF.

During the year there was an exceptionally large number of changes in the personnel of the Board's staff. At the 1st July, 1947, the total of the staff was 316, consisting of 126 permanent (112 male and 14 female), and 190 temporary (115 male and 75 female). The total at the 30th June, 1948, was 346, consisting of 199 permanent (185 male and 14 female), and 147 temporary (72 male and 75 female).

The nett increase of staff was 30, the new appointments being 80 and resignations 50. Additional appointments to the permanent staff were 74 (72 male and 2 female) principally by transfers from the temporary staff.

Amongst officers who retired from service during the year, Mr. L. H. Archibald, Divisional Engineer, Bairnsdale, had completed 20 years in that capacity.

DEATH OF OFFICERS.

It is with deep regret that the Board records the death of the following officers :—

Mr. E. J. Hicks, who died on 15th July, 1948, held the position of Accountant of the Board since 1928. He joined the service on 1st March, 1916, after occupying the position of Shire Secretary at Chiltern and holding office as a Councillor of that Shire.

Mr. P. A. Westcott, who died on 27th April, 1948, was employed as a draftsman, having been transferred to the service from the Railways Department in March, 1933.

Mr. L. J. R. Sibbett, who died on 4th November, 1947, was appointed Traffic Officer on 10th June, 1940, with headquarters at Stawell.

The Board deplores the passing of these three officers, who rendered faithful and valuable service during their term of office.

EMPLOYEES.

Working Conditions.

Approval has been given for the granting of concessions to employees of the Board, dealing with hours of work, increases of wages and extension of leave privileges as summarized below :—

1. *40-hour Working Week.*—Employees working under the terms of an agreement with the Australian Workers' Union were granted a 40-hour working week as from 1st July, 1946, and following a judgment of the Full Arbitration Court, the concession was extended to practically all employees as from January, 1948.

2. *Marginal Increases.*—Following the Full Arbitration Court judgment on 26th June, 1947, granting increases in margins for skill ranging up to 16s. per week to employees employed under the Metal Trades Award, increases have also been granted under other Awards and Determinations to other classes of tradesmen and employees, including carpenters, painters, and plant operators.

3. *Leave Concessions.*—In June, 1948, the Government approved the following improved conditions in respect of leave for employees :—

(*a*) *Long Service Leave.*—Six months leave on full pay after 20 years service.

(*b*) *Annual Leave.*—Commencing from 1st July, 1948, employees with five years or more continuous service to be granted annual leave on the basis of three working weeks per annum in lieu of two weeks.

(*c*) *Sick Leave.*—After completion of five years service employees to be credited as from 1st July, 1948, with sick leave on a basis of eight days on full pay and eight days on half pay, per annum, such leave to be cumulative. This concession will not apply to employees whose wage rate is loaded in lieu of paid sick leave.

(*d*) *Special Leave on account illness due to war disabilities.*—As from 1st January, 1948, where the illness of an employee is certified as directly attributable to war service, leave may be granted on the basis of eight days each calendar year of service. Such special leave shall be cumulative provided that the total accumulated leave shall not at any time exceed sixty (60) days.

Number of Employees.

Whilst the largest number employed at any one time was 1,951, the number of individual engagements was 4,003, whilst 3,559 men either left of their own accord, were discharged, or were transferred to other work.

MOTOR REGISTRATION.

During the year 329,271 vehicles, including traction engines and motor cycles, were registered.

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 27,192 in the figures of the financial year 1947–48 :—

Vehicles.	Financial Year 1946–47.		Financial Year 1947–48.		Increase.	Decrease.
Private—						
New	6,122		12,164		6,042	
Secondhand—Re-registered ..	9,874		7,896			1,978
Renewals	137,859		147,271		9,412	
		153,855		167,331		
Commercial—						
New	3,221		5,686		2,465	
Secondhand—Re-registered ..	6,247		4,200			2,047
Renewals	41,426		47,364		5,938	
		50,894		57,250		
Primary Producers—						
New	1,412		3,293		1,881	
Secondhand—Re-registered ..	2,982		2,466			516
Renewals	53,548		55,233		1,685	
		57,942		60,992		
Hire		3,263		3,710	447	
Licenced under Omnibus Act		780		869	89	
Trailers		9,100		9,929	829	
Traction Engines, &c.		73		107	34	
Motor Cycles		26,172		29,083	2,911	
Total		302,079		329,271	31,733	4,541

ACCOUNTS.

Statement of accounts for the year ended 30th June, 1948, 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 :—

—	£ s. d.	Under Board's Supervision. £ s. d.	Under Councils' Supervision £ s. d.	Total. £ s. d.
1. State Highways—				
Maintenance and reconditioning	.. ..	1,026,071 1 5	155,311 1 4	1,181,382 2 9
2. Main Roads—				
Permanent Works (Swan-street Bridge)	.. ..	15,178 0 4	..	15,178 0 4
Construction and restoration	75,743 0 1	191,590 4 8	1,167,771 7 11	1,359,361 12 7
Maintenance and reconditioning	1,283,618 12 6			
3. Developmental Roads—				
Construction and maintenance	411,654 11 11	45,464 7 4	391,003 4 3	436,467 11 7
Roads for Isolated Settlers	24,812 19 8			
4. Tourists' Roads—				
Maintenance	.. ..	93,242 8 11	5,419 11 10	98,662 0 9
5. Forest Roads Maintenance—				
Construction	559 14 5	7,351 10 0	21,990 8 5	29,341 18 5
Maintenance	28,782 4 0			
6. Murray River Bridges and Punts—				
Maintenance	.. ..	3,653 1 2	350 9 11	4,003 11 1
7. Roads adjoining Commonwealth properties—				
Maintenance	.. ..	891 13 1	2,515 6 3	3,406 19 4
Total	.. ..	1,383,442 6 11	1,744,361 9 11	3,127,803 16 10

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.

	£ s. d.
Commonwealth Government	97,034 3 8
State Instrumentalities	187,965 15 8
	284,999 19 4

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 Victorian municipal councils and their officers is also gratefully acknowledged.

We have the honour to be,

Sir,

Your obedient servants,

W. L. DALE, Chairman.

F. M. CORRIGAN, Member.

D. V. DARWIN, Member.

R. F. JANSEN, Secretary.

CHIEF ENGINEER'S REPORT.

Country Roads Board Office,
Melbourne,
15th November, 1948.

THE CHAIRMAN,

SIR,

I have the honour to submit the following report on certain engineering work carried out during the year 1947–48.

PLANNING.

During the year, one of the Board's senior technical officers was appointed Planning Research Engineer. With the provision of the necessary assistance, this officer will be able to collect, collate, and present the detailed information necessary to assist the Board in making major decisions in relation to financial and engineering programmes.

SHOULDER AND PAVEMENT WIDTHS.

It has, for some time, been felt that a standard method of fixing road widths in terms of volume, type and speed of traffic, and nature of soil was desirable in order to secure uniformity throughout the Board's system. The following tentative proposals for two-lane roads have been approved for twelve months' trial.

RECOMMENDED MINIMUM WIDTHS OF SURFACING, IN FEET.

Traffic Density Classification.															
Vehicles per hour	8 to 20			20 to 30			30 to 100			100 to 200			Over 200		
Vehicles per 12-hour day ..	64 to 160			160 to 240			240 to 800			800 to 1,600			Over 1,600		
Design Speed.	Type of Traffic.														
	P	M	T	P	M	T	P	M	T	P	M	T	P	M	T
30 m.p.h.	16	18	20	16	18	20	18	18	20	20	20	20	22*	22*	22*
40 ,, ...	16	18	20	18	18	20	18	18	20	20	20	22*	22*	22*	22*
50 ,, ...	18	18	20	18	18	20	20	20	20	20	22	22	22	22	24*
60 ,, ...	20*	20*	20	20	20	20	20	20	22*	22	22	22	22	22	24*
70 ,, ...	20*	20*	20	20	20	20	20	22*	22	22	22	24	24*	24*	24

* Where shoulders flush with the pavement and fully capable of supporting vehicles *at all times* are provided, pavements two feet less in width may be considered.

"P" denotes roads on which the traffic is exclusively passenger vehicles or where the character and percentage of trucks using the road has little effect on the movement of passenger vehicles.

"T" denotes roads on which the percentage of trucks is so high, and the character of truck traffic is such, that the speed of traffic is reduced frequently and passenger vehicles are confronted with the problem of passing slower moving vehicles frequently.

"M" denotes mixed traffic in which slow moving vehicles impede traffic only occasionally. Most roads are in the "M" class.

The above minimum widths do not include :—

(*a*) Curve widening, which should generally be provided in accordance with present standards. Attention is drawn to the special widening adopted for roads carrying "T" type traffic, e.g., roads for extraction of forest products.

(*b*) The usual allowance of one or two feet additional pavement width should be allowed over and above the proposed width of seal. For roads to be sealed, the tabulated widths are *net* sealed widths.

Roads intended for use as two-lane roads should not be paved wider than 24 feet, as extra width encourages their use as three-lane roads.

Shoulders.—It is considered that shoulders should be at least of the following minimum widths on two-lane roads.

Traffic Density Classification.	Minimum Shoulder Width.
8 to 50 vehicles per hour	4 feet
30 to 100 vehicles per hour	6 feet
Over 100 vehicles per hour	8 feet

COAL WINNING FOR THE STATE ELECTRICITY COMMISSION.

During the year, operations were continued at the Brown Coal Mine, Yallourn North, in removing overburden and winning coal for the State Electricity Commission.

The total quantities handled were :—

Overburden, excavated and removed to dump	831,234 c. yds. (loose)
Coal excavated, crushed, and loaded on rail	193,601 tons.

While most of the plant used was provided by the Commission, an average of six heavy tractors and one heavy power grader belonging to the Board were employed on the works, chiefly on the removal of overburden. During the summer months the plant employed on removing overburden worked three shifts per day and kept a good margin of uncovered coal available. When working three shifts the strength of the camp varied between 140 and 160 men.

SAND-CLAY CONSTRUCTION ON THE MURRAY VALLEY AND LODDON VALLEY HIGHWAYS.

Reference has been made in previous Annual Reports to the use of sand-clay mixtures as a pavement material. Because of the depletion of supplies of naturally occurring gravels and granitic sands, suitable in themselves for pavement construction, increasing use has been made of crushed material in certain areas. In other localities, however, notably in the northern and north-western parts of the State, deposits of rock or gravel suitable for crushing are scarce and scattered but clean coarse sands are relatively abundant. For secondary roads carrying light traffic these sands have been freely utilized in the past for light surfacings, the sand stabilizing the top inch or so of the soil of which the formation is composed.

In the Bendigo Division, during the year two major projects utilizing laboratory designed and controlled sand-clay mixtures for permanent pavement construction on State Highways have been undertaken. On the Loddon Valley Highway between Campbell's Forest (mileage 17·4 from Bendigo) and Serpentine (mileage 31·0), a length of 13·46 miles is under construction, the total designed pavement depth being from 7 to 7½ inches. On the Murray Valley Highway between Echuca and Wharparella (mileage 5·0–14·80 from Echuca), a length of 9·80 miles is being resheeted with sand-clay to give a total pavement thickness of from 9 to 11 inches. Pavement thicknesses were designed by the methods set out in the Annual Report for the year ending 30th June, 1945, after complete tests of subgrade materials, examination of traffic densities and consideration of climate, &c.

The specifications called for compliance of the sand-clay mixture with the following :—

Grading.—Mixture to be uniformly graded from maximum size of sand (approximately 3/16 in.) to clay, for maximum density and between the following limits :—

Pass	3/16-in.	100 per cent.		Desirable	100 per cent.
,,	No. 7	70–87	,,	,, 75	,,
,,	No. 14	48–70	,,	,, 57	,,
,,	No. 36	28–50	,,	,, 37	,,
,,	No. 52	24–46	,,	,, 33	,,
,,	No. 100	17–38	,,	,, 25	,,
,,	No. 200	12–30	,,	,, 18	,,

Atterberg Tests :—

Liquid limit not to exceed 25 per cent.
Plasticity Index from 2 to 6 per cent.
Linear Shrinkage not greater than 3 per cent.

A survey of sand and clay available was made in each case and laboratory tests carried out to decide the proportions required to produce suitable mixtures. During the actual work, it was found necessary to vary the proportions because of practical difficulties encountered in mixing and compaction and also to test and use other materials not included in the original investigations. A mobile laboratory was used for field control of proportions, grading, and linear shrinkage, and for investigation of the degree of compaction achieved at various stages of the work.

It was found necessary to depart from the grading considered to be ideal for the maximum size of particle encountered, because of the difficulty of compacting this material within a reasonable space of time. A mix containing from 25 per cent. to 30 per cent. passing a No. 200 sieve and smoothly graded for larger sizes, and with a P.I. for the fraction passing a No. 36 sieve within the specified range gave the best results, the setting up period being about six weeks. A silty clay loam was found to possess the most desirable properties for an admixture with sand if only one binding material is used.

Tables I., II., III., and IV. give typical test results on the materials used and mixtures obtained.

TABLE I.—SAMPLE TEST RESULTS ON FINISHED PAVEMENT—LODDON VALLEY HIGHWAY.

Sample No.	4805 A 348	4805 A 343	4805 A 322	4805 A 273	4805 A 256	4805 A 274	4805 A 220	4805 A 243
Mileage	17·8	19·25	21·0	23·80	24·5	25·6	26·0	26·7
Percentage Passing ⅜ in.	98·4	98·0	100·0	100·0	100·0	100·0	100·0	100·0
,, ,, No. 7	83·8	84·4	89·4	83·4	79·6	85·0	85·8	83·8
,, ,, ,, 14	66·3	65·6	68·4	54·6	53·3	59·7	57·9	57·8
,, ,, ,, 36	40·6	34·1	37·7	28·4	29·4	30·8	32·8	32·4
,, ,, ,, 52	36·2	28·2	31·0	26·6	27·6	28·0	30·9	29·2
,, ,, ,, 200	24·5	17·6	20·0	21·0	21·2	21·0	23·6	20·2
Liquid Limit	19·6	18·6	19·6	20·9	22·1	20·9	23·6	21·1
Plastic Limit	15·2	16·2	14·3	17·2	16·4	15·9	16·2	14·5
Plasticity Index	4·4	2·4	5·3	3·7	7·7	5·0	7·4	6·6
L.S.	2·2	..	2·2	2·9	4·0	2·7	..	..
Mix Proportions (sand : clay)	3 : 1	3 : 1	4 : 1	5 : 1	4 : 1	4 : 1	5 : 1	4 : 1

TABLE II.—TESTS ON MATERIALS USED—LODDON VALLEY HIGHWAY.

Materials	Coarse Sand (Rothacker's).	Coarse Sand (Leahy's).	Silty Clay Loam (Hamilton's).	Silty Loam (Cochlan's).
Sample No.	4805 A 178	4805 A 224	4805 A 312	4805 A 222
Percentage Passing 3/16 in.	89·4	93·7	100·0	100·0
,, ,, No. 7	76·4	72·4	99·9	99·5
,, ,, ,, 14	55·0	37·0	99·8	98·8
,, ,, ,, 36	22·7	6·8	98·7	95·8
,, ,, ,, 52	14·6	6·0	95·5	92·8
,, ,, ,, 200	7·1	4·6	62·7	67·6
Liquid Limit	26·0	19·0	23·5	20·4
Plastic Limit	17·0	17·5	14·2	14·8
Plasticity Index	9·0	1·5	9·3	5·6
L.S.	2·0	..	4·4	2·6
Remarks	Too Plastic	Good	Fair when mixed with Leahy's sand	Good

TABLE III.—FIELD AND LABORATORY TESTS ON RESULTANT SAND–CLAY MIXES—MURRAY VALLEY HIGHWAY.

Sample No.	M.V. 381	4805 A 373	M.V. 534	M.V. 518	4805 A 392	M.V. 528	M.V. 531	M.V. 525
Mileage	5·10	5·75	6·8	7·2	7·50	7·75	8·25	9·0
Percentage Passing $\frac{3}{16}$ in.	99·3	99·8	99·7	100·0	99·8	99·6	99·2	99·5
" " No. 7	89·3	94·8	91·8	92·4	92·2	92·3	87·7	92·8
" " " 14	67·8	75·2	69·2	64·4	66·0	72·4	63·7	74·1
" " " 36	38·5	46·4	43·2	33·8	35·2	43·7	37·0	42·3
" " " 52	30·4	40·7	32·5	27·3	30·9	35·9	30·0	33·4
" " " 200	21·0	29·7	26·6	20·5	21·6	26·2	22·0	25·1
Liquid Limit	..	20·5	..	..	19·8	..	..	..
Plastic Limit	..	15·2	..	..	14·8	..	..	..
Plasticity Index	..	5·3	..	..	5·0	..	..	..
L.S.	1·5	..	2·8	2·0	3·6	2·8	3·0	3·0
Sand/Clay Mix Proportions	1 : 2	1 : 2	4 : 1½ : 1	4 : 1½ : 1	4 : 1½ : 1	4 : 1½ : 1	4 : 1½ : 1	4 : 1½ : 1

1 : 2 = 2 parts pit overburden : 1 part clean sand.
4 : 1½ : 1 = 4 parts sand : 1½ parts sandy loam : 1 part silty loam.

TABLE IV.—TESTS ON MATERIALS USED—MURRAY VALLEY HIGHWAY.

Material	Sand	Sandy Loam	Silty Clay Loam	Overburden
Sample No.	4805 A 382	4805 A 380	4805 A 379	4805 A 531
Percentage Passing $\frac{3}{16}$ in.	99·6	100·0	100·0	99·8
" " No. 7	85·6	99·4	99·9	95·5
" " " 14	42·9	89·7	99·8	86·0
" " " 36	10·9	63·2	99·3	54·7
" " " 52	8·3	56·8	98·8	43·7
" " " 200	4·3	37·6	88·9	27·1
Liquid Limit	..	18·5	25·0	14·5
Plastic Limit	..	14·0	16·0	11·1
Plasticity Index	..	4·5	9·0	3·4
L.S.	N.P.	..	5·0	0·8

Various methods of dry mixing were employed, the equipment used being :—

Power Graders ;
Cultivator (Disc) ;
Harrows (24-Disc Tandem Arrangement) ;
Pulvimixer (" Seaman ").

Mixing.—On the Loddon Valley Highway project only two materials were mixed together, in proportions varying between 3 sand and 1 clay to 4 sand and 1 clay. The sand was first spread on the old pavement and bladed to a layer of even thickness, the clay soil was then added and also bladed to a layer of even thickness Mixing was achieved with a disc cultivator, having seven 20-inch diameter discs spaced 15 inches apart on independent axles, the planes of the discs being set at an angle of 45° to the direction of movement of the cultivator. Approximately six passes were required for thorough mixing. Final blading to shape and surface mixing was carried out with a power grader.

On the Murray Valley Highway spreading methods were similar but in the initial stages mixing was carried out with the power grader. The material was bladed to windrows at the sides, then spread and windrowed to the centre—final spreading and blading to shape being also done with power grader. A tandem disc harrow having 24 discs was later obtained and used for mixing. This unit as supplied was intended for work in heavy ground and was not particularly suited to the light mixing work, the discs being keyed to the shafts and unable to revolve as desired because of the tight bearings supporting the shafts. With modifications to the bearings this implement would be useful for this class of work. A " Seaman " pulvimixer, with rotating power driven blades was used at the latter end of the work and gave the best results of all methods of mixing employed. The materials were initially spread and partly mixed with a power grader; finally three or four passes of the pulvimixer produced an intimate mixture of fine tilth. With dry materials clay lumps were well broken down and dispersed. This type of mixer requires only a light tractor for towing and guiding. Figs. 1, 2, 3, and 4 illustrate the types of plant used for mixing.

Consolidation.—Compaction of the sand-clay mixtures was carried out at a moisture content at or near the optimum value for each mixture. Artificial watering was used when necessary. The " Seaman " pulvimixer was found to give excellent dispersion of moisture through the mix if used after artificial surface watering. Three methods of compaction were employed; sheepsfoot rolling, rolling with pneumatic-tired multi-wheel roller, and trafficking. As expected with a relatively non-cohesive material, the sheepsfoot roller was not effective and compacted only about two inches of a six-inch layer of sand–clay after ten or twelve passes. The multi-wheel roller was more successful, proving effective for thicknesses up to four inches loose. Final compaction was, however, only achieved after many weeks under traffic, consolidation of the pavement edges being achieved by forcing traffic to utilize a half width pavement only on short sections at a time. *In situ* density tests taken at intervals on the Loddon Valley Highway show that the degree of compaction achieved varied from 90 per cent. to 98·5 per cent. of the Modified A.A.S.H.O. densities for the mixtures with an avergage of 95 per cent. Comparable figures for the Murray Valley Highway were minimum 93·5 per cent., maximum 100 per cent., and an average of 97 per cent.

BITUMINOUS SURFACE TREATMENT.

General.—It is disturbing to note that not only has the total cost of each type of work increased, but that materials, labour, stores, and plant hire have each increased in cost for every type of work.

It has been generally assumed that, to maintain the Board's system of sealed roads, reconstruction and fresh initial treatment is necessary every 25 years, and that resealing is, on the average, required every ten years.

PLANT USED FOR MIXING SAND-CLAY.

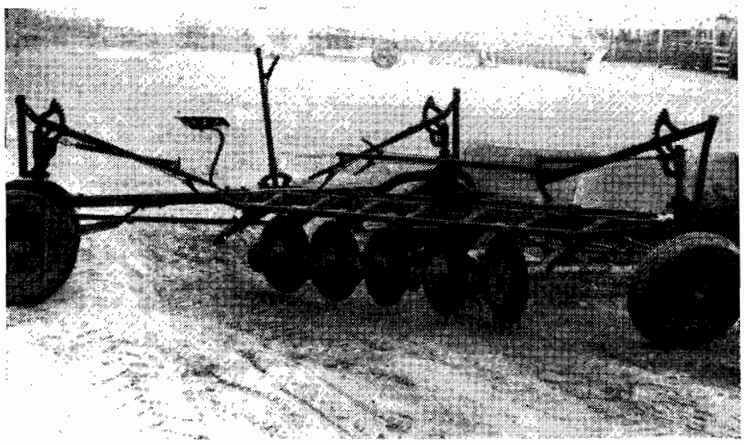


Fig. 1.
Disc Cultivator.

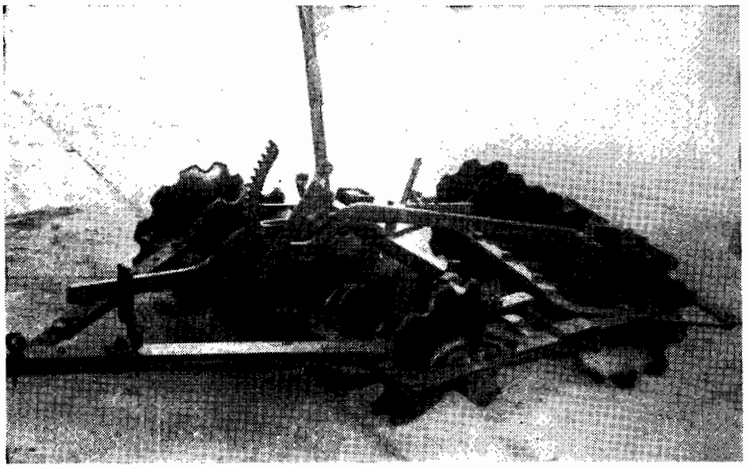


Fig. 2.
Tandem Disc Harrow.

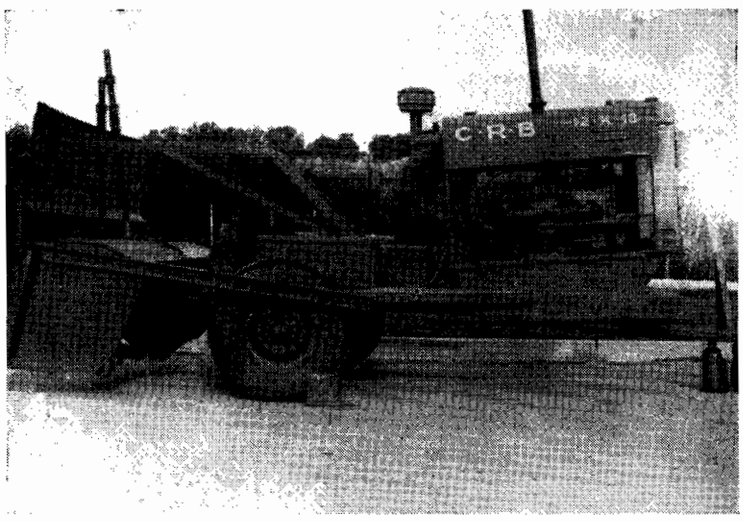


Fig. 3.
"Seaman" Pulvimixer.
(Side View.)

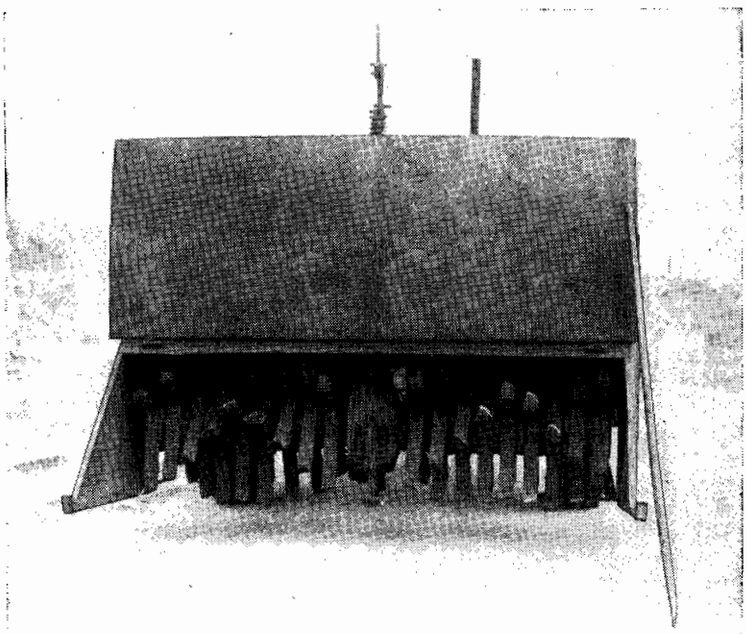


Fig. 4.
"Seaman" Pulvimixer.
(Rear View.)

On this basis, 231 miles of reconstructed road should have received a fresh initial treatment while 500 miles of sealed road should have been resealed. Only 68 miles of the first type of work was carried out and 556 miles of the second. These figures indicate that the mileage of reconstruction of old "black" roads was well below that necessary to maintain present standards, particularly in view of wartime arrears of work and increasing traffic. The mileage of resealing was also barely sufficient, as half of the work was of a light nature.

It will be seen from Table IX. that costs were approximately double those prevailing before the war.

Types of Work.—Except for three lengths of experimental sand asphalt no new type of work was carried out. A considerable advance in the use of adhesion agents was made. The use of a light type of initial treatment where traffic is low, was extended. In order to retreat as great a length as possible, half of the length retreated used a rate of application of binder of 0·15 gallon per square yard. The quantity of surface corrective type of retreatment was increased, the plant mix process being used except for isolated works on which the roadmix procedure was adopted. For initial treatments on roads carrying 100 or less vehicles per day, the width of seal was, except in special circumstances, fixed at 12 feet.

The Surface Treated System.—The total length of the surface treated (black) system was increased by 289 miles, including 7 miles on unclassified roads. Details of the declared and treated systems is given in Table V.

TABLE V.—TOTAL MILES IN THE DECLARED AND TREATED SYSTEMS.

Type of Road.	Miles.			
	At 30.6.47.		At 30.6.48.	
	Declared.	Treated.	Declared.	Treated.
State Highways	2,921	1,931	3,846	2,643
Main Roads	9,596	3,747	9,806	3,316
Tourists' Roads	393	95	402	96
Forest Roads	205		241	
Totals	13,115	5,773	14,295	6,055
Percentage treated ..	..	44	..	42·3

Work Carried Out.—Table VI. sets out details of the mileage of work carried out during the years 1946–47 and 1947–48, with plant owned by both the Board and the Municipalities. Table VII. gives details of work carried out on roads under the Board's control.

TABLE VI.—MILEAGE CARRIED OUT DURING 1946–47 AND 1947–48.

Work Carried Out by—	Miles.	
	1946–47.	1947–48.
C.R.B. plant on C.R.B. roads	653	873
Municipal plant on C.R.B. roads	7	54
Total work on C.R.B. roads ..	660	927
C.R.B. plant on Municipal roads	43	43
C.R.B. plant for the Commonwealth ..	25	..
Total on other than C.R.B. roads	68	43
Grand Total	728	970

Cost of Work.—The total cost of the 927 miles of work carried out on declared roads was about £519,000, being :—

Materials—	£	%	£	%
Bituminous ..	213,079	41		
Aggregate ..	14,500	28		
			358,079	69
Labour			83,089	16
Stores			14,373	3
Plant Hire			63,122	12
Total			518,663	100

Table VIII. sets out details of the average costs for 7,704,227 square yards of work throughout the State carried out and costed by the Board during the year. The general increase in every item comprising the total cost of each type of work is referred to in the opening remarks. It should be noted that the low operating charges for plantmix work using Scoria aggregate were due largely to the size of the dumps and the use of an adhesion agent in the binder, which made it possible to dispense with drying the aggregate. The daily output from the plant was greatly increased by these factors and the figures provide striking evidence of the economies possible with a large uninterrupted rate of output.

TABLE VII.—MILEAGE 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.							
				Prime and Seal.		Reseals Binder in Gal./Sq. Yd.							
Roads.	Control.	P.M.	P.	E.	R.	0·10.	0·15.	0·20.	0·25.	P.M.S.	R.M.S.	State Highways.	Other Roads.
State Highways	Direct ..	0·3	5·5	43·3	36·7	0·9	42·9	34·8	1·4	17·1	2·6	185·5	..
	Municipal ..	..	..	37·5	3·5	1·6	9·4	12·9	..	7·8	1·2	73·9	..
Other Roads ..	Direct ..	..	3·0	30·2	8·5	..	4·3	15·2	..	0·7	..	..	61·9
	Municipal ..	..	5·2	178·3	19·3	1·3	223·2	95·9	1·5	69·7	11·3	..	605·7
Totals		0·3	13·7	289·3	68·0	3·8	279·8	158·8	2·9	95·3	15·1	259·4	667·6
		14·0		357·3		445·3				110·4			
		371·3				555·7						927	
		927											

Abbreviations :—

Initial Treatments.—P.M., Penetration macadam. P., Priming only (part completed work). Prime and Seal: E., Extensions to the existing system R., Initial treatments on reconstructed lengths of previously sealed pavements.

Retreatments.—P.M.S., Plantmix seals. R.M.S., Roadmix seals.

TABLE VIII.—AVERAGE COST OF THE WORK CARRIED OUT DURING 1947–48.

Cost in Pence per Square Yard for Initial Treatments and Reseals and in Shillings and Pence per Cubic Yard (loose measurement) for Roadmix and Plantmix Seals.

Subdivision.	Nature of the Work.									
	Initial Treatments.		Retreatments.							
			Reseals.				Roadmix Seal.	Plantmix Seals.		
	Prime Only.	Prime and Seal (Primer 0·2) (Binder 0·25).	Nominal Rate of Application of Binder in Gallon per Square Yard.				¾" loose.	Crushed Aggregate and Seal Coat.	Crushed Aggregate without Seal Coat.	Scoria Aggregate without Seal Coat.
			0·10.	0·15.	0·20.	0·25.	Shillings and Pence per Cubic Yard (Loose.)			
Square yards costed ..	115,129	3,049,474	54,702	2,235,266	1,351,940	27,420	63,577	297,281	236,035	273,403
	d.	*d.*	*d.*	*d.*	*d.*	*d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*
Materials ..	2·52	13·00	3·75	6·67	8·65	10·81	92 1	64 2	56 5	42 2
Labour	1·45	3·02	1·23	1·49	1·88	2·00	14 4	16 7	16 8	8 0
Stores	0·20	0·47	0·11	0·26	0·33	0·34	2 2	3 9	4 2	1 5
Plant Hire ..	0·93	2·21	0·82	1·15	1·38	1·35	14 3	14 8	14 2	6 6
Totals ..	5·10	18·70	5·91	9·57	12·24	14·50	122 10	99 2	91 5	58 1
							1 cu. yd. loose to 50 sq. yds.	The average rate of application for plantmix work was 1 cubic yard loose to 42 square yards		

The cost of roadmix seal in pence per square yard was :— Materials 22·11d., Labour 3·44d., Stores 0·53d., Plant hire 3·43d.; Total 29·51d.

For all work—Average prices— Bitumen.—£18 8s. 5d. per ton net f.o.w. Melbourne.
Aggregate.—24s. 10d. per cubic yard in stacks by roadside. Primer.—Crude vertical retort tar, 7d. per gallon in drums f.o.r. Melbourne.

Table IX. shows the trend in cost of an initial treatment (Prime and Seal) over a period of twenty years. So little change has taken place in this process that it can be taken as a reasonable indication of the cost trend for this class of work.

TABLE IX.—AVERAGE COST OF INITIAL TREATMENTS.

(*Prime and Seal. Primer* 0·2 *galls./sq. yd. Binder* 0·25 *gall./sq. yd. Aggregate* 1 *cubic yard to* 65 *sq. yds.*)

Year.	Average Cost in Pence per Square Yard.	Labour Percentage of Total Cost.
1927–28	9·2	17
1932–33	9·3	18
1937–38	8·6	15
1942–43	12·3	19·5
1947–48	18·7	16

Bitumen.—An adequate supply of bitumen was obtained from the Commonwealth Oil Refineries, who imported it from the Anglo-Iranian refineries at Abadan on the Persian Gulf, this being a Sterling area. The average price f.o.w. Melbourne was £18 8s. 5d. per ton net.

During the year the production of bitumen was commenced in Australia at two refineries in Sydney, while considerable progress has been made by the Vacuum Oil Company in the construction of their refinery at Paisley, a western suburb of Melbourne.

Mineral Aggregate.—No change was made in the grading of mineral aggregates. The specification was amended to improve the quality under heavy traffic by specifying that where the traffic exceeds 350 vehicles per day the stone from which the aggregate is produced shall be of Class 1. By and large the quality of aggregate supplied during 1947–48 was the poorest for many years. The total quantity used on Board roads was 116,800 cubic yards at an average cost of 24s. 10d., a total cost of £145,000. In spite of the use of lower grade materials the average price shows a rise of 2s. 8d. per cubic yard over 1945–46 and 1946–47.

The average price per cubic yard in stacks by the roadside was :—

Material.	Price per Cubic Yard.	
	1945–46.	1947–48.
	s. d.	*s. d.*
Screenings	24 3	26 0
Gravel	21 3	27 7
Sand	12 5	14 5
Scoria	9 3	10 8
All aggregate ..	22 2	24 10

Plant Operation.—A total of eleven sprayers and one plantmix unit were put into the field.

Table X. sets out an analysis of how their time was spent, based on a possible daily output of ten loads.

Table XI. gives plant operating figures for the season.

TABLE X.—ANALYSIS OF THE OPERATION OF ALL SPRAYERS.

Season 1947–48.

Unit Size in Gallons and Their Number	400/11, 12, 13, 15, 21, 22, 23.	600/1.	1000/31, 32.
	Percentage of Total Time.		
Spraying	29·3	35·3	30·9
Moving	11·5	20·9	15·1
Weather	25·7	11·5	19·1
Holidays	7·8	8·3	6·9
Mechanical Delays	4·1	1·1	2·7
Other delays	21·6	22·9	25·3
	100·0	100·0	100·0
Details of "other delays"—			
Poor organization ..	3·2	1·2	3·5
Long leads	3·5	6·0	6·3
Short sections	8·7	13·7	6·0
Road not ready	2·7	0·4	2·9
No aggregate	0·8	1·1	2·5
No bituminous materials ..	0·8	..	0·5
Insufficient labour ..	0·3	..	0·2
Special Conditions ..	0·6	0·5	1·6
Cleaning plant	1·0	..	1·8
	21·6	22·9	25·3

TABLE XI.—PLANT OPERATING FIGURES.

Sprayer	400-gallon Sprayers 11, 13, 14, 15, 16, 21, 22, and 23.	Sprayers 600/1, 800/33, 1000/31 and 32.
	Total and or Average.	
Truck Engines—		
Total days in field less holidays and plant stored	912	301
Miles run	43,852	16,133
Miles per day	48	53
Total gallons petrol used	6,505	3,402
Miles per gallon	6·7	4·7
Loads sprayed	2,859	923
Gallons of petrol used per load	2·27	3·6
Miles per load	15·3	17·3
Lubricating Oil—		
Pints of oil used	1,081	534
Miles per gallon	324	241
Pumping Engines—		
Gallons of petrol used	2,227	924
Loads per gallon	1·2	1·0
Lubricating Oil—		
Pints of oil	689	123
Loads per pint	4·15	7·5
Cleaning Oil—		
Gallons of oil used	3,861	1,982
Gallons per load	1·2	2·1
Heating—		
Gallons of fuel used	25,019	13,328
Gallons per load	8·7	14·4
Primer and Binder Sprayed—		
Gallons of primer	294,459	221,233
Gallons per load	424·6	749
Gallons of binder	809,665	440,874
Gallons per load	378	702
Total gallons of primer and binder	1,104,124	662,107
Average gallons per load	382	717

Adhesion Agents.—Field and laboratory work with adhesion agents commenced in 1946–47 was continued. The problem of increasing adhesion between binder and aggregate has, in recent years, been given considerable attention by the chemist. Below is a *résumé* of the position to date.

In general, three problems present themselves :—

(i) To increase adhesion between binder and aggregate when this is low, owing to the nature of the aggregate.

(ii) To promote adhesion where none could exist owing to the presence of a film of water on the aggregate.

(iii) To strengthen adhesion against the attack by water in cases where, under normal conditions, insufficient adhesion would have developed by the time the attack commenced.

An adhesion agent is a chemical compound which, when dissolved in the binder or applied to the surface of the aggregate, will greatly increase the mutual affinity between the binder and the aggregate. With suitable agents, this affinity can be increased to such an extent that even if the aggregate is wet with water it will, under the action of the adhesion agent, be preferentially wetted by the binder. Wetting by the binder in this case means that the intimate contact obtained between binder and aggregate will be such that the water will be displaced and the bond strength between binder and aggregate so increased that stripping of the binder from the aggregate is avoided.

Adhesion agents are, in general, polar compounds in which one part of the molecule has an affinity for water, and the other part of the molecule has an affinity for hydrocarbons. Such compounds include amine derivatives, quaternary ammonium salts, quaternary phosphonium salts, and heavy metal soaps.

Known methods of dealing with the commonest problem, that of obtaining adhesion to a bituminous binder in the presence of water, are :—

(i) Mixing at a high temperature ;

(ii) Precoating the wet aggregate with hydrated lime, and incorporating in the binder a compound with which the lime will react, such as a fatty acid, a phenol, or a sulphonated oil ;

(iii) Incorporating an adhesion agent in the binder, without any pretreatment of the wet aggregate ;

(iv) Applying an adhesion agent in solution form to the surface of the wet aggregate, without any addition being made to the binder.

In certain experimental work, using the wet-sand process, procedure (ii) above was used, the lime-reacting compound being a proprietary preparation. A tar phenol, cresylic acid, can also be used in the same way. For normal field work, owing to the trouble in obtaining and applying lime, methods (iii) and (iv) above have been adopted.

The efficacy of any adhesion agent is dependent upon the following factors : —

(i) Nature of the Aggregate.

(ii) Variations in the aggregate.

(iii) Condition of the aggregate.

(iv) Nature of the basic binder and its viscosity.

(v) Quantity of binder.

(vi) Method of preparing the binder.

(vii) Quantity and nature of the moisture.

(viii) Time when the moisture attack occurs.

In the laboratory the following additives and procedures have been tested and found to successfully promote adhesion between a bituminous binder and a wet aggregate :—

(i) Fatty acids (specifically a mixture of oleic and stearic acids) dissolved in the binder and applied to wet aggregate coated with lime.

(ii) A quaternary ammonium salt (specifically cetyl pyridinium bromide) dissolved in the binder and applied to wet aggregate without any other treatment.

(iii) A compound of the amine soap-polyamide type dissolved in the binder and applied to wet aggregate without any other treatment.

(iv) The agent in (ii) above dissolved in creosote and sprayed on to wet aggregate, no adhesion agent being added to the binder.

(v) The agent in (iii) above dissolved in diesel fuel oil and sprayed on to wet aggregate, no adhesion agent being added to the binder.

For premixed work some 12,000 cubic yards of bituminous macadam has been produced using wet aggregate and the materials and procedure in (iii) above.

For sprayed work some 25,000 cubic yards of many types of dry slightly hydrophilic and wet hydrophobic aggregate have been most successfully dealt with using the materials and procedure in (v) above.

The aggregate to be treated is normally stacked by the road-side. It is loaded into trucks for delivery to a mechanical spreader by a mobile aggregate loader consisting essentially of a gathering spiral, a line of buckets, and a delivery chute. Many methods of applying between 1½ and 2 gallons of the mixture per cubic yard of aggregate were tried. Variations in the quality of the aggregate

and the rate of feed and difficulties at the stack led to the use of a hand-operated pressure pump, 30 feet of delivery hose and a fine jet spraying the mixture at the gathering spirals. An intelligent operator soon becomes expert. The aggregate running down the delivery chute materially assists in obtaining uniform cover.

The process in (iv) has not been adopted in the field owing to the difficulty in readily obtaining supplies of creosote.

The material in (ii) above can be used in procedure (iv) without difficulty and in procedure (v) only if it is first treated to make it miscible in a petroleum oil.

In the case of dry hydrophobic aggregate of small size and large surface area or if coarse in size but coated with fines due to winter production, considerable success has been obtained by priming them with diesel fuel oil without the use of any adhesion agent.

Sand Asphalt using Coarse Sand.—Two types of sand asphalt were laid experimentally, one using a coarse, rough surfaced, water borne sand and the other a fine, one sized, smooth surfaced, wind blown material.

In June, 1943, on the Prince's Highway West, east of Laverton, under a traffic of 1,500 to 2,000 vehicles per day, a short length of sand asphalt 1 inch in loose thickness was laid. No filler was used, the sand was premixed and laid hot and left unsealed. It is still in good condition. The sand used was obtained from Koo-wee-rup and tested as follows :—

Sieve B.S.	Percentage by Weight Passing.
$\frac{3}{8}$ in.	100
$\frac{3}{16}$ in.	98
No. 7	86
,, 14	49
,, 25	17
,, 52	2
,, 100	1
,, 200	0·5
Grain shape	Angular to rounded
Grain surface	Indented to smooth
Surface area sq. ft/lb.	16
S.G.	2·656
Weight lb./cu. ft. loose	92

Following the success of this work, 3,700 feet of sand asphalt was laid in February, 1948, in good warm weather, on the Geelong–Portarlington Road, between the Salt Works corner and the Moolap School. The traffic using this section, per twelve-hour count, was :—

Pneumatic tired buses	17
,, ,, heavy trucks	24
,, ,, light trucks	37
,, ,, private cars	111
,, ,, motor cycles	25
Heavy horse vehicles	4
Light ,, ,,	7
	225

Lara sand having the following properties was used :—

Sieve B.S.	Percentage by Weight Passing.
$\frac{3}{8}$ in.	100
$\frac{3}{16}$ in.	93
No. 7	66
,, 14	37
,, 25	22
,, 52	12
,, 100	4
,, 200	3
Grain shape	Angular to rounded
Grain surface	Indented to smooth
Surface area sq. ft./lb.	23
Weight lb./cu. ft. loose	98

Details of work were :—

Tack coat	Bitumen 100 : oil 10 : kerosene 20, at 0·075 gallons per square yard.
Binder	Roadoil ; Bitumen 100 : oil 5, at 12 gallons per cubic yard.
Sand	Warm, 150° F.
Application	1 cubic yard loose to 63 square yards.
Gritting	Half length dry gritted $\frac{1}{8}$″ aggregate at 1 cubic yard to 500 square yards.
Seal	Half length surface enrichment seal at 0·1 gallons per square yard and $\frac{1}{4}$″ aggregate at 1 cubic yard to 250 square yards.

From early observations it appears that this type of sand and work can be used successfully, provided that the amount of steel-tired and/or hoofed traffic is low and that all hoofed traffic can be excluded from the work for a period of seven days. It would appear that a surface enrichment seal should not be applied until the work has been laid for some time.

In May, 1948, under cold and wet weather on the Prince's Highway West at Laverton, Job 501/H/639, 6,800 feet of sand asphalt at 1 cubic yard loose to 35 square yards was laid using the same materials and procedures as on the Geelong–Portarlington Road. A tack coat was used but no surface enrichment seal coat, surface gritting only being used. The same basic roadoil binder was used but, owing to the low working temperature, considerable cutting back with power kerosene was necessary to obtain reasonable dragging qualities. The traffic being carried is as follows :—

	Per 12-hour Day.
Motor cars	845
Utilities and Vans	235
Two-axle trucks	248
Three-axle trucks	85
Four-axle trucks	2
Five-axle trucks	2
Trailers	42
Two-axle buses	18
Three-axle buses	1
Motor cycles	40
Horse drawn vehicles	3
	1,521

The low working temperatures made it difficult to obtain good joints without either a very light cutback binder or a power operated tamping-levelling type of spreader.

Sand Asphalt Using Mallee Sand.—The high cost and poor quality of mineral aggregate in the north-west area (Mallee) of the State made it desirable to investigate the possibility of using the Mallee sand (Loess). The acquisition of a mobile pug mill bituminous mixer enabled the work to be undertaken. A total of thirteen sections was laid using variations of three porcesses. Below is set out details of the materials used. Table XII. is a summary of the details of each section.

Processes.—

(i) A wet sand process ;
(ii) Sand asphalt ;
(iii) D.S.I.R. of Great Britain process for using fine grained materials.

Location.—Job 535/H/662, Calder Highway, 255·424 to 256·686 miles near Pier Millan between Sea Lake and Ouyen.

Traffic.—52 vehicles per day ; 12 hour count.

Date.—July, 1948.

Mixer.—A continuous type twin shaft pug mill producing a cold mixed material for drag spreading cold.

Weather.—Cold—45–50° F., wet and windy.

Pretreatment.—The premixed sand asphalt was laid on a limestone pavement which had been primed with a crude horizontal retort tar at 0·2 gallons per square yard and given a bituminous cutback tack coat at 0·1 gallons per square yard.

Materials.—

Mallee Sand :—

Sample 48–05–A24.

Calder Highway 258·9 miles.

Grading.

Sieve.	Sample 48–05–A24. Percentage by Weight Passing.	Average Grading of 30 Samples.
No. 14 ..	100	100
„ 25 ..	99·5	99·3
„ 36 ..	96·5	96·9
„ 52 ..	75	83
„ 100 ..	24·1	31·4
„ 200 ..	10·6	10·1

Plastic limit .. .. Non plastic.
Wt./cu. ft. loose .. 83 lb.
Wt./cu. yd. .. .. 2,241 lb.
Surface area sq. ft./lb. .. 81.
Grain shape .. .. Round.
Grain surface .. .. Smooth to polished.
Centrifuge kerosene equivalent .. .. .. 2·8.

Gypsum (Copi) :—

From Henty Highway near Bronzewing.

Grading.

Sieve.	Percentage by Weight Passing.
No. 100	100
„ 200	91·4

Wt./cu. ft loose .. .. 30 lb.
Wt./cu. yd. .. .. 810 lb.

Hydrated Lime :—

Wt./cu. ft. loose .. 40 lb.
Vol./bag .. .. 1·25 cu. ft.
Wt./bag .. .. 50 lb.

Binder :—

Basic material.—80/100 penetration bitumen ; 87 penetration at 77° F. ; 5,250 stokes at 122° F ; 10·15 lb./gal.

Cutter.—Power kerosene ; 0·0095 stoke at 122° F ; 8·3 lb./gal.

Cutbacks.—Prepared on the job as required.

Use.	Parts by Volume at 60° F. Bitumen 80/100.	Asphaltic Oil.	Power Kerosene.	Viscosity Stokes at 122° F.
Tack Coat ..	100	10	20	17·5
Binder ..	100	0	20	50
„ ..	100	0	25	25
„ ..	100	0	30	12·5
„ ..	100	0	35	7·5
„ ..	100	0	40	5
„ ..	100	0	45	3·5

Spreading wetting, adhesion, soap forming agent :—

A lime-reacting proprietary preparation : 9·8 lb./gal.

Native Asphalt :—(D.S.I.R. process).

3 to 5 penetration 77° F. Native asphalt (Epureé).

Material.	Percentage by Weight.
Bitumen	35
Residue	65

S.G. 1·400.

Powdered and mixed with lime before being sent to the work in bags.

TABLE XII.—DETAILS OF EACH EXPERIMENTAL SECTION OF SAND ASPHALT.

Material, &c.	Process. Wet Sand.								Sand Asphalt.		D.S.I.R. of G.B.		
Section No.	1	2	3	4A	4B	9A	9B	10	5	6	7	8A	8B
Application 1 cu. yd./sq. yds.	35·5	56·3	71·1	39·6	33·3	54·4	55·0	32·2	44·4	90·0	70·0	36·0	37·0
Loose thickness (approx.)	1″	−¾″	½″	−1″	+1″	−¾″	−¾″	+1″	+¾″	⅜″	½″	1″	1″
Mixing characteristics	Easy	Easy	Easy	Easy	Easy	Easy	Easy	Poor	Good	Good	Easy	Easy	Easy
Dragability	Fair	Fair	Fair	Fair	Fair	Fair	Fair	Bad	Good	Fair	Fair	Fair	Fair
Mix :— Sand lb.	100	100	100	100	100	100	100	100	..	..	100	100	100
Gypsum lb./100 lb. sand	1	1	4·5	4·5	1	4·5	1	4·5	..	..	..	..	..
Lime lb./100 lb. sand	0·09	0·09	0·09	0·09	0·09	0·09	0·09	0·09	..	..	2	2	1
Water lb./100 lb. sand	6	6	6	6	6	6	6	6	..	..	..	..	..
80/100 Bitumen lb./100 lb. sand ..	4·4	4·5	5·3	5·3	6	6	6·1	6·1	6·07	6·07	4·8	4·8	4·8
Dope ; percentage of bitumen by weight ..	2	2	2	2	2	2	2	..	..	..	..	..	..
Cutback—Stokes 122° F.	50	50	50	50	50	50	50	50	7·5	7·5	3·5	3·5	3·5
Residual Binder gals./cu. yd.	9·8	9·9	11·6	11·6	13·3	13·3	13·4	13·5	13·4	13·4	10·7	10·7	10·7
Native Asphalt lb./100 lb. sand ..	..	..	..	..	..	..	..	..	..	..	6	6	3
Total Cutback gals./cu. yd. loose ..	11·8	11·9	13·9	13·9	16	15·9	16·1	16·2	18·1	18·1	15·4	15·5	15·4
Filler lb./100 lb. sand	11·5	11·5	14·7	14·7	11·5	14·7	11·5	14·7	10·6	10·6	12·6	12·6	11·6
Filler/Binder ratio weight	2·6	2·55	2·8	2·8	1·9	2·45	1·9	2·4	..	..	..	..	..

BRIDGES.

Loading.—Previous reports have indicated the growing tendency to heavier loading, not only under the normal system of road transport, but also in the incidence of special cases, such as the transport of heavy pieces of machinery to centres where new industries are being set up. The increase in the number of such " special cases " has been notable this year. In addition, the requirements of large public undertakings has necessitated and will continue to require the cartage of heavy loads of machinery, houses, &c., over structures on roads which, up to the present, have been subjected only to very light loading.

To cater for very heavy loads a special transporter has been constructed by the Munitions Department. This transporter provides for the load to be distributed fairly evenly over 18 ft. width of structure. During the recent movement of a 40-ton pay load on this transporter, deflection and stress measurements were made on the steel trusses in the bridge over Sunday Creek on the Hume Highway near Seymour. These measurements indicated that the special transporter was very effective in distributing the load over practically the full width of the structure, and that actual stresses very closely approached those developed by calculations. Illustration Fig. 5 indicates the assembly of this transporter.

Reference was made in the Board's Annual Report of 1944 to the passage of a gross load of 81·6 tons over Lynch's Bridge, Maribyrnong. The recent movement of a transformer from the wharf to Newport for the State Electricity Commission entailed a gross load of 97 tons over this bridge. Deflection and extensometer readings during the passage of this load were made, and the general behaviour of the bridge as far as distribution and stresses followed closely the lines enunciated in 1944. The bridge has a skew of $32\frac{3}{4}$ degrees and cross-frames are parallel to the piers. Illustration Fig. 6 indicates the loadings of the various axles in this case.

Geometry and Design.—Under present day conditions, it is essential that bridges should form an integral part of the road, and their geometry must agree with the section of the road in which they are located. This does not present any great difficulty in the case of a concrete structure. A bridge was recently constructed on a superelevated horizontal curve, with curbs parallel to the centre line of the road, and with the longitudinal grading a vertical curve joining two down grades. Although the bridge had to be built on a considerable skew the result is very pleasing in appearance and the riding qualities are excellent.

When the road is flat the drainage of the deck of a bridge is provided by a cross camber either in the deck or in the added surfacing material. In the case of a timber and steel bridge, surfacing material should not be placed over the timber deck as this would accelerate decay. It is necessary, therefore, to build the camber into the bridge. Illustration Fig. 7 indicates how it is suggested this be constructed.

Handrails on a bridge present to the average motorist an obstacle which reduces the effective width, the higher the handrail the greater being the reduction. As an experiment, it is proposed to try certain structures with wider kerbs. A wooden prototype of one type is now in use on the Maroondah Highway on a 30 ft. wide structure, and it is proposed to construct another on a 22 ft. wide concrete structure on the same Highway. The kerbs will be precast and the illustration Fig 8 indicates the type.

Concrete.—As mentioned in previous Annual Reports, with proper selection of aggregate and attention to mixing and placing, quite high strength concrete can be obtained consistently. Where the Board is satisfied with the degree of control, higher working stresses can be used. The establishment of testing laboratories in the Divisions has helped considerably in raising the quality of concrete produced, and it is expected that as experience is obtained and staff trained to the desired standard, the effect will be felt to a greater degree. The practice followed is for the Shire Engineer or the Contractor to submit samples of proposed materials to the Divisional Engineer. Following the testing of these, a tentative mix is designed and cylinders made, while at the same time a copy of the mix proposed and calculations are submitted to Head Office for comment.

Pipes.—During the year the Board has continued the practice of supplying only branded concrete pipes to works carried out with its funds. High demand for cement, steel, and labour, and in addition the requirements for water supply and housing schemes, have resulted in an acute shortage of concrete pipes for the Board's works. Every endeavour has been made to keep up the standard, but in some cases it has been necessary to accept pipes containing seven bags of cement per cubic yard as opposed to the specified nine bags. The strength of a pipe very largely depends on the correct positioning of the steel reinforcement. The thickness of concrete walls has been reduced to the limit to save weight in cartage and handling and the margin for cover is a minimum. Where the steel is very close to the surface of the concrete, rusting and spalling of concrete is inevitable and such a pipe is worse than a pipe without steel. The Board purchased through the Disposals Commission some corrugated metal pipes, and except where ground water is corrosive, these can be expected to have a life of up to 40 years. Literature from various sources indicates that opinions differ on this, and that locations and ground conditions play a major part in the life of such pipes.

Bridge Inspections.—During the year the Board's Bridge Inspecting Engineer has carried out inspections on special routes. From his inspections and from experience elsewhere, it is evident that greater attention must be paid to timber piles where they enter the ground. In a large number of cases it has been found that for a distance of approximately 4 feet below ground level, the timber piles have rotted badly, even though apparently good above ground. In three cases during the year, truss spans have been " let down " by such deterioration of piles. Periodical creosoting of the piles by means of cresote poured into holes (subsequently plugged) just above ground level is part of essential maintenance.

Protection of Steel Work.—For many years the Board has been constructing timber bridges in which the timber stringers have been replaced by rolled steel joists, due to the fact that the quality and availability of timber for this important part of a timber bridge had deteriorated. Provided these steel joists are given adequate protection, they can be considered to have an indefinite life, and a high salvage value. Standard stock lengths are used. Up to about ten years ago, the practice was to erect these joists without any treatment, to allow rusting to lift the mill scale and then to brush thoroughly and apply two coats of a red lead paint consisting of 33 lb. of red lead to 1 gallon of raw linseed oil, with little or no driers. A surface coat was then applied, generally two coats of an aluminium paint made up on the job with 4 lb. of aluminium dust per gallon of vehicle, the latter consisting of equal parts of raw linseed oil and tung oil with a pint of drier. The difficulty and cost of removing the rust and mill scale have led to a treatment which can be called " pickling ", followed immediately by a first coat of protective paint. This treatment is done in large vats, the bath consisting of very dilute solutions of sulphuric and/or phosphoric acid which leave an inert and stable iron compound on the surface. While the girder is still " warm " the protective coat is applied. Three types of protective coating or primer have been tried, the red lead mixture above, a 50/50 mixture of red lead and graphite in oil and a zinc chromate in oil.

In many cases the joists used by the Board are subject to the electric arc welding process—either in splicing or in fitting crossframes, and in these cases the injurious fumes developed when a red lead mixture is used in the primer militate against its use. The Board's present practice is to use a zinc chromate primer which is slightly more

electro positive to steel than the red lead. After erection a further coat of "Non Setting Red Lead Primer" is given. The ingredients of this are as follows :—

27 lb. non-setting red lead,
4⅔ pints raw linseed oil,
⅔ pint stand oil.

Directions: Stir well; add one pint of gold size per gallon on the day the paint is used.

The final protective coats of alumimium paint are then given. Present day practice is to use 2–2½ lb. of aluminium powder per gallon of vehicle instead of 4 lb. as in earlier work. For field work on unpainted girders and others where rust has started, the technique is to thoroughly scrape, chip and brush and then apply two coats of the above "Non Setting Primer". It has been found that pneumatic descalers and rotary brushes are excellent for this work, but the present day cost of field work indicates that a large saving can be made by thorough treatment immediately the joists are received from the mills.

Costs of the "pickling" and initial priming are at present approximately £3 5s. per ton.

The Board's practice is to keep in close touch with the results of weathering and weatherometer tests on paint, but it is realized that, although these can be taken as general guides, the best test is that of time in the actual position of use, and that quite a lot depends on the method of application. When paint is applied by brush particular care is necessary on edges, particularly those on the bottom flanges. When time and opportunity permits, it is proposed to develop a system of spraying for treatment of the Board's bridges.

Use of Precast Slabs.—On the Board's system of roads, there are many small culverts constructed with masonry walls for piers and abutments and a timber deck. Many of these timber decks have been used under fills of considerable depths, only the superior quality of the timber used giving them a long life. Proposals for replacing these timber decks, when the walls are quite sound, have led to the adoption of the detail shown in illustrations Figs. 9 and 10 which give the sizes for spans of 6 ft. and 10 ft. At present a project is in hand for redecking seventeen culverts with slabs of this nature, and it is anticipated that considerable information as to their practicability and economy will be obtained. In addition to the economy in materials the salvage value of these slabs is evident.

They can be made under factory conditions and various devices can be incorporated to suit the particular lifting, curing, and installing methods best suited to local conditions. It is proposed to develop these slabs, and to effect further economy by prestressing the steel. Fundamentally this requires high tensile rods which are in very short supply at present. A certain amount of prestressing has, however, been done with mild steel reinforcement, and it is proposed to investigate the further development of precast slabs incorporating this feature of design for longer spans.

It is possible that, where foundation conditions are satisfactory, these slabs, seated on mass concrete or masonry walls, may prove more economical than special pipes.

LABORATORY.

Head Office Laboratory.—During the year, Head Office Laboratory was engaged in its normal functions of carrying out tests on the materials used in road and bridge construction, these comprising :—

(*a*) Bituminous materials and tars.
(*b*) Paints and lacquers.
(*c*) Lubricating and fuel oils.
(*d*) Concrete.
(*e*) Aggregates.
(*f*) Soils and gravels.

In the Chemical Laboratory, various adhesion agents, for promoting adhesion of bituminous binders to wet aggregates, were investigated. The scope of this work is outlined elsewhere in this Report, under the heading Bituminous Surface Treatment.

As the space available for testing soils and gravels was found to be insufficient, additional temporary accommodation was obtained in the shape of a disused army hut. The internal fittings are now being assembled and the hut is expected to be in use by the end of the year. The hut will also be used to accommodate an electrically-driven concrete mixer of the rotating pan type. This machine was imported from England for use in the production of experimental concrete and bituminous mixes. A number of these machines is in use in laboratories in England, where they are considered to be more suitable for the production of trial mixes than the tilting drum pattern.

Divisional Laboratories. — Divisional Laboratories at Benalla, Bairnsdale, Bendigo, Horsham, and Warrnambool are engaged in performing the simpler tests on soils, gravels, and aggregates. The results obtained in these laboratories are used to estimate pavement thickness required, as previously described. A laboratory at Geelong is also in the process of being equipped.

Mobile Laboratories.—Mobile Laboratories Nos. 1 and 2 are engaged in visiting road works at intervals for the purpose of sampling and testing subgrade materials at the site of the works.

Head Office Library.—The work of the Head Office Library, as described in the Chief Engineer's report for the year ending 30th June, 1947, is being performed by a Librarian and an Assistant Librarian.

Materials Research Engineer.—On the 11th May, the Materials Research Engineer, Mr. A. H. Gawith, M.C.E., A.M.I.E. Aust., left Melbourne on an official mission to Europe and the United States of America. The purpose of the mission was to attend the Second International Conference for Soil Mechanics and Foundation Engineering to be held at Rotterdam, Holland, in June, and to study overseas trends in the laboratory investigation of road-making materials and pavement design.

DISSEMINATION OF TECHNICAL INFORMATION.

In order to keep officers in the outer Divisions advised of matters of technical interest which are being considered at Head Office, or in other Divisions, it was decided to distribute suitable information from time to time in three forms, which are :—

(*a*) Research Memoranda ;
(*b*) Technical Bulletins ;
(*c*) Engineering Notes.

Research memoranda consist, generally, of detailed accounts of original research or investigation into the application of original research to practical problems. They are generally too technical to be of general interest. Technical Bulletins give a brief account of the result of research and its application in a form which can be understood by practicing engineers. They frequently consist of conclusions reached in papers distributed as Research Memoranda. Engineering Notes comprise information of practical and frequently minor application, culled from periodicals, observation, or any other source.

Distribution of Technical Memoranda is normally limited to Research and Testing Officers in Victoria and other States, and to engineers who are particularly interested in any particular subject. Technical Bulletins are distributed to heads of all divisions at Head Office and to Divisional Engineers, the latter being provided with a number of spare copies for the use of Shire Engineers. Should the latter evince a general interest in these bulletins, arrangements can be made later for all Shire Engineers to be included in the distribution list. Engineering Notes, being of minor interest, will only be issued to heads of divisions in Head Office, and to Divisional Engineers.

Yours obediently,

C. G. ROBERTS,
Chief Engineer.

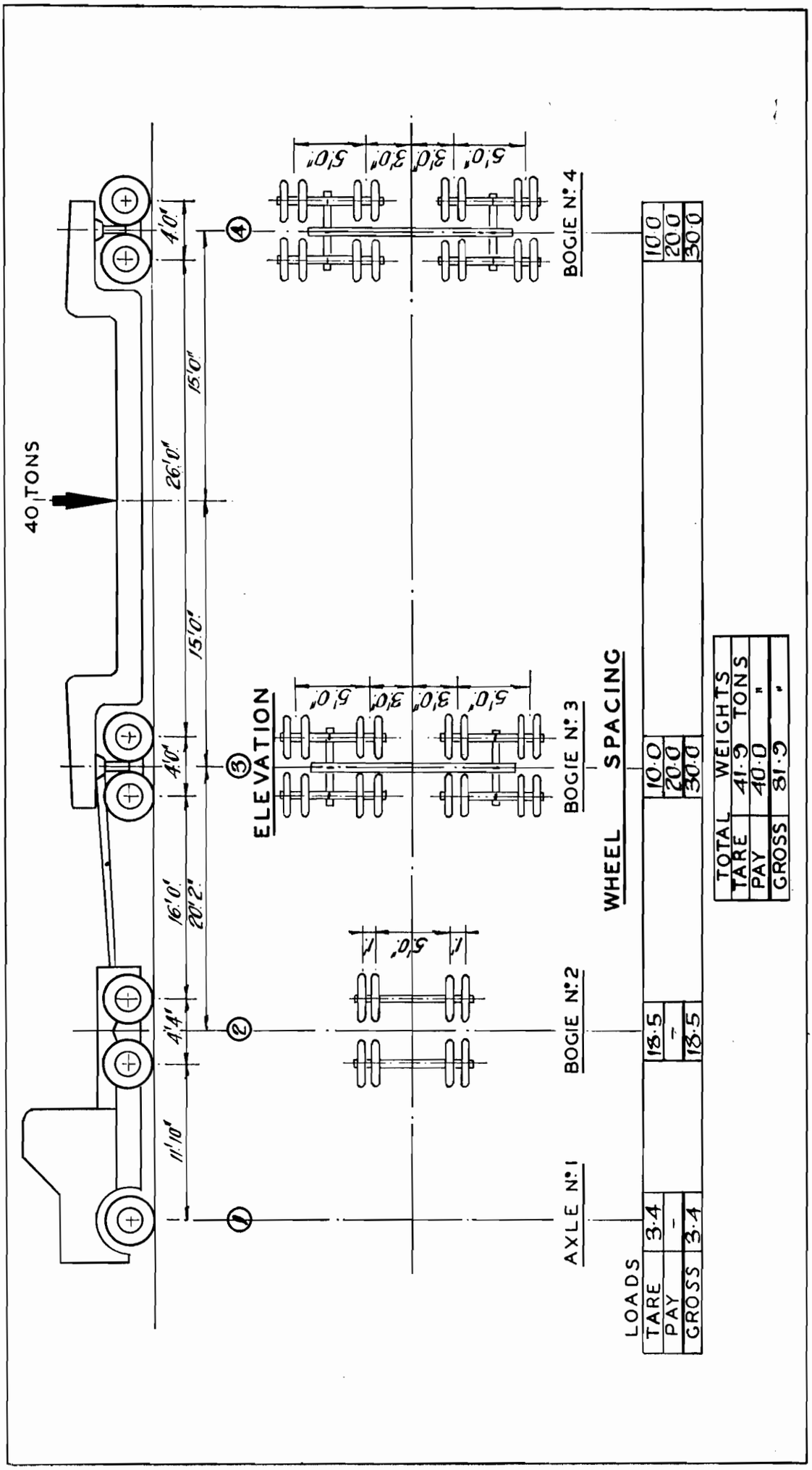

40 TONS
4'0"
26'0"
15'0"
15'0"
4'0"
16'0"
20'2"
4'4"
11'10"
ELEVATION
BOGIE N°4
BOGIE N°3
BOGIE N°2
AXLE N°1
5'0" 3'0" 5'0"
WHEEL SPACING
10·0
20·0
30·0
LOADS
TARE 3·4
PAY -
GROSS 3·4
13·5
-
13·5
TOTAL WEIGHTS
TARE 41·5 TONS
PAY 40·0 "
GROSS 81·5 "

Fig. 5.

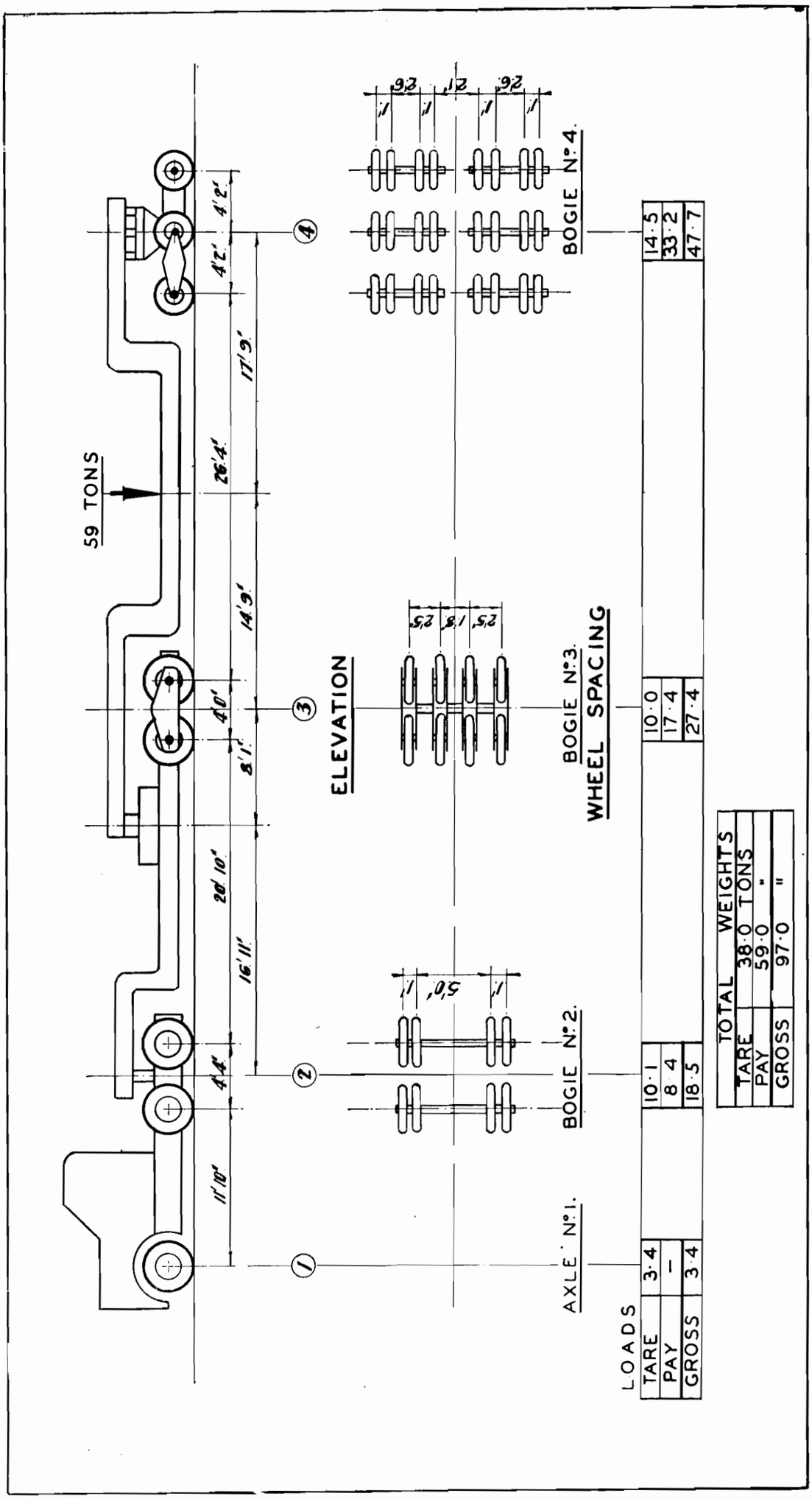

59 TONS
ELEVATION
WHEEL SPACING
AXLE N°1.
BOGIE N°2.
BOGIE N°3.
BOGIE N°4.
11'10"
4'4"
20'10"
16'11"
8'1"
4'0"
14'9"
26'4"
17'9"
4'2"
4'2"
LOADS
TARE 3·4
PAY —
GROSS 3·4
10·1
8·4
18·5
10·0
17·4
27·4
14·5
33·2
47·7
TOTAL WEIGHTS
TARE 38·0 TONS
PAY 59·0 "
GROSS 97·0 "

Fig. 6.

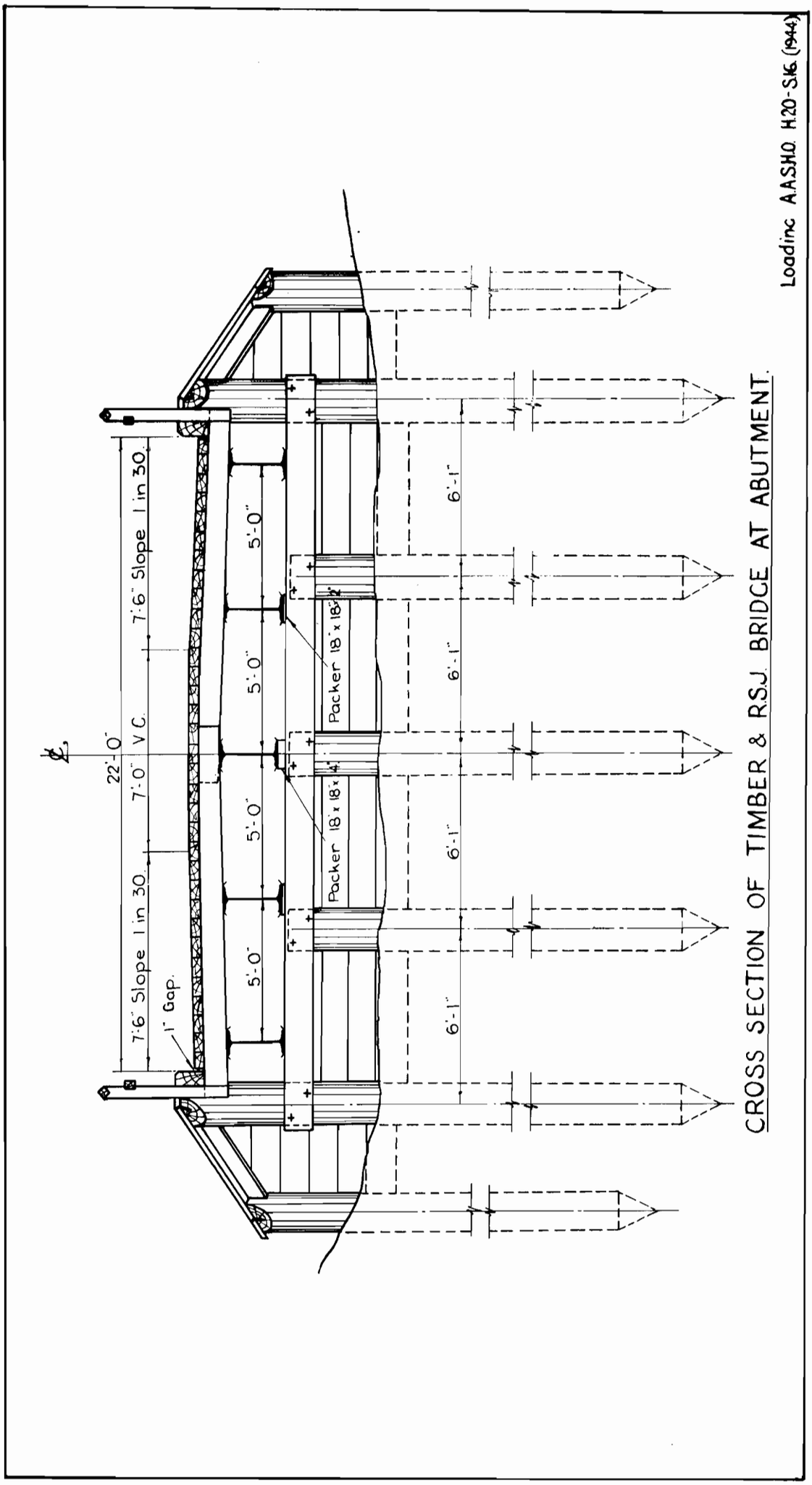
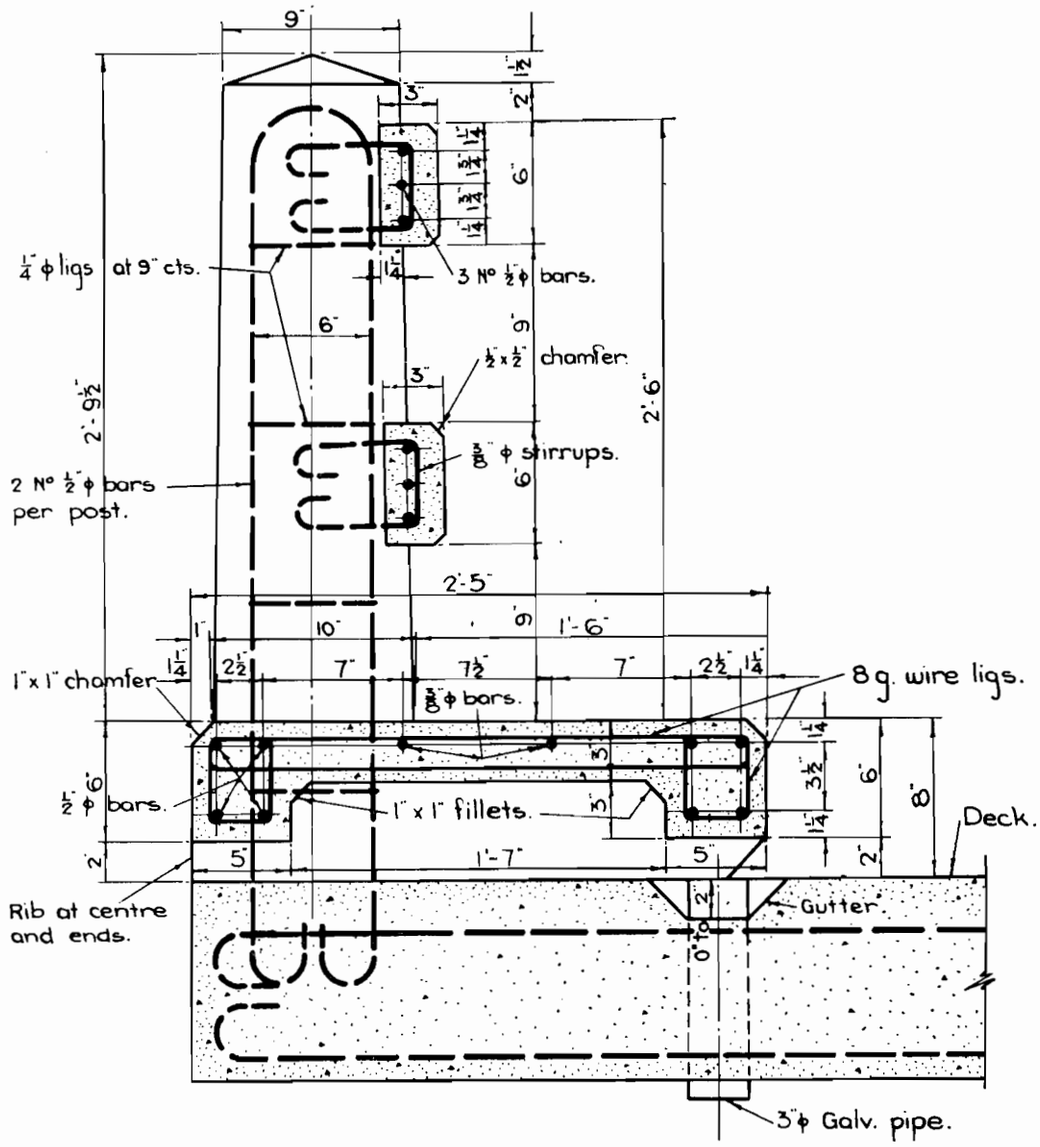
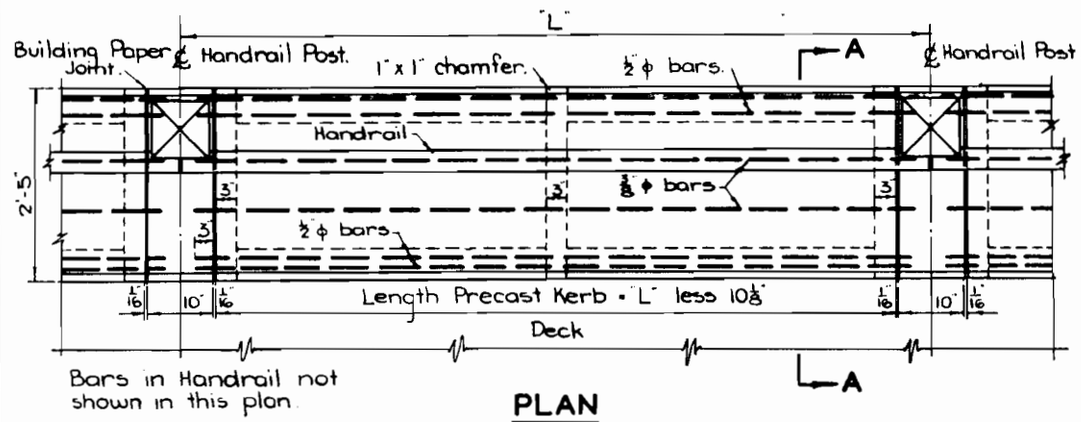

CROSS SECTION OF TIMBER & R.S.J. BRIDGE AT ABUTMENT.
Loading A.A.S.H.O. H.20-S.16. (1944)
22'-0"
7'-0" V.C.
7'-6" Slope 1 in 30
7'-6" Slope 1 in 30
1" Gap.
5'-0"
5'-0"
5'-0"
5'-0"
Packer 18" x 18" x 4"
Packer 18" x 18" x 4"
6'-1"
6'-1"
6'-1"
6'-1"

Fig. 7.



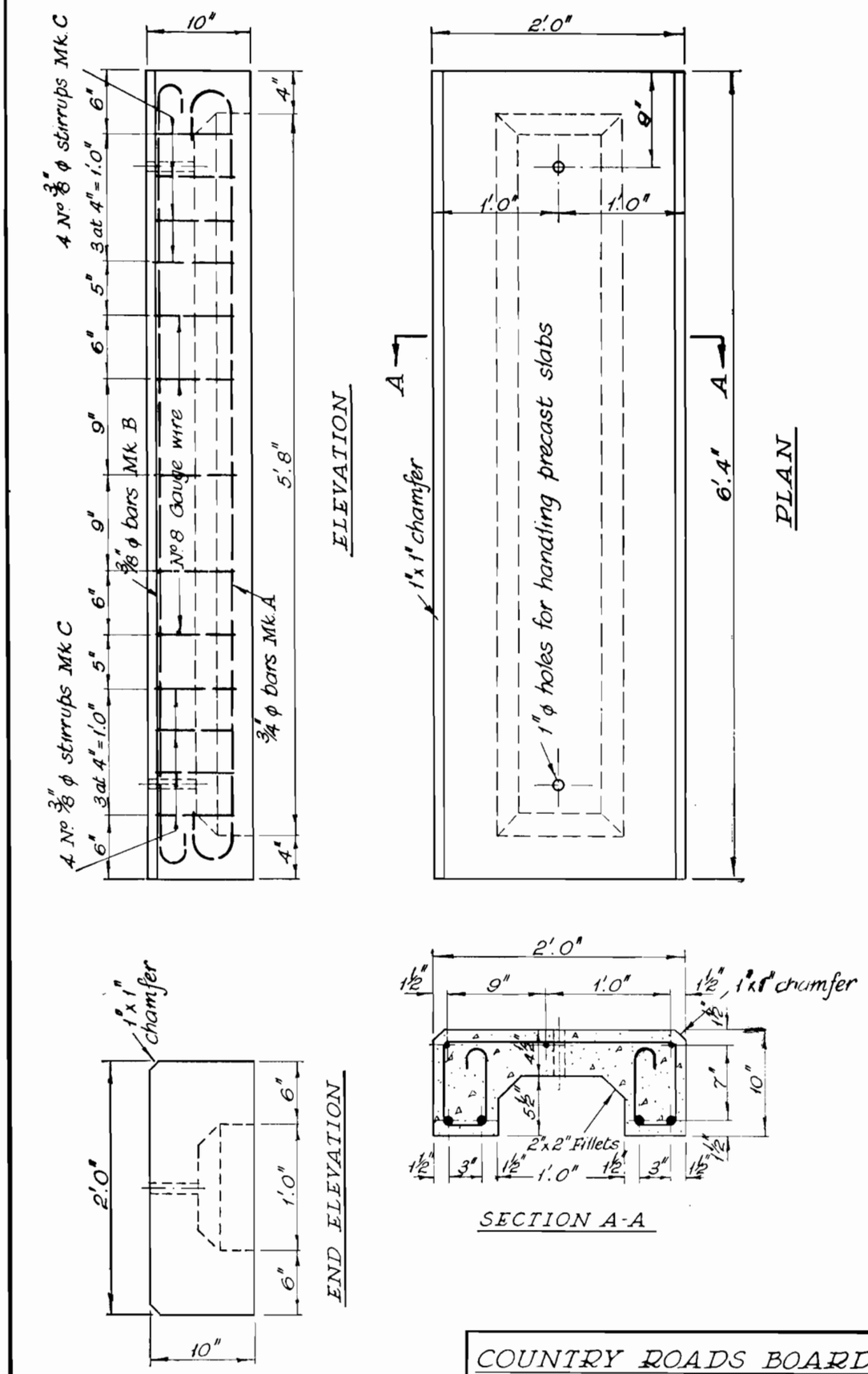
SECTION A-A



PLAN

COUNTRY ROADS BOARD		
DETAILS OF PRECAST KERBS FOR R.C. FLAT SLAB BRIDGES		
DRAWN H.G.D. TRACED J.E.	CHECKED DATE	REF. N°.

Fig. 8.



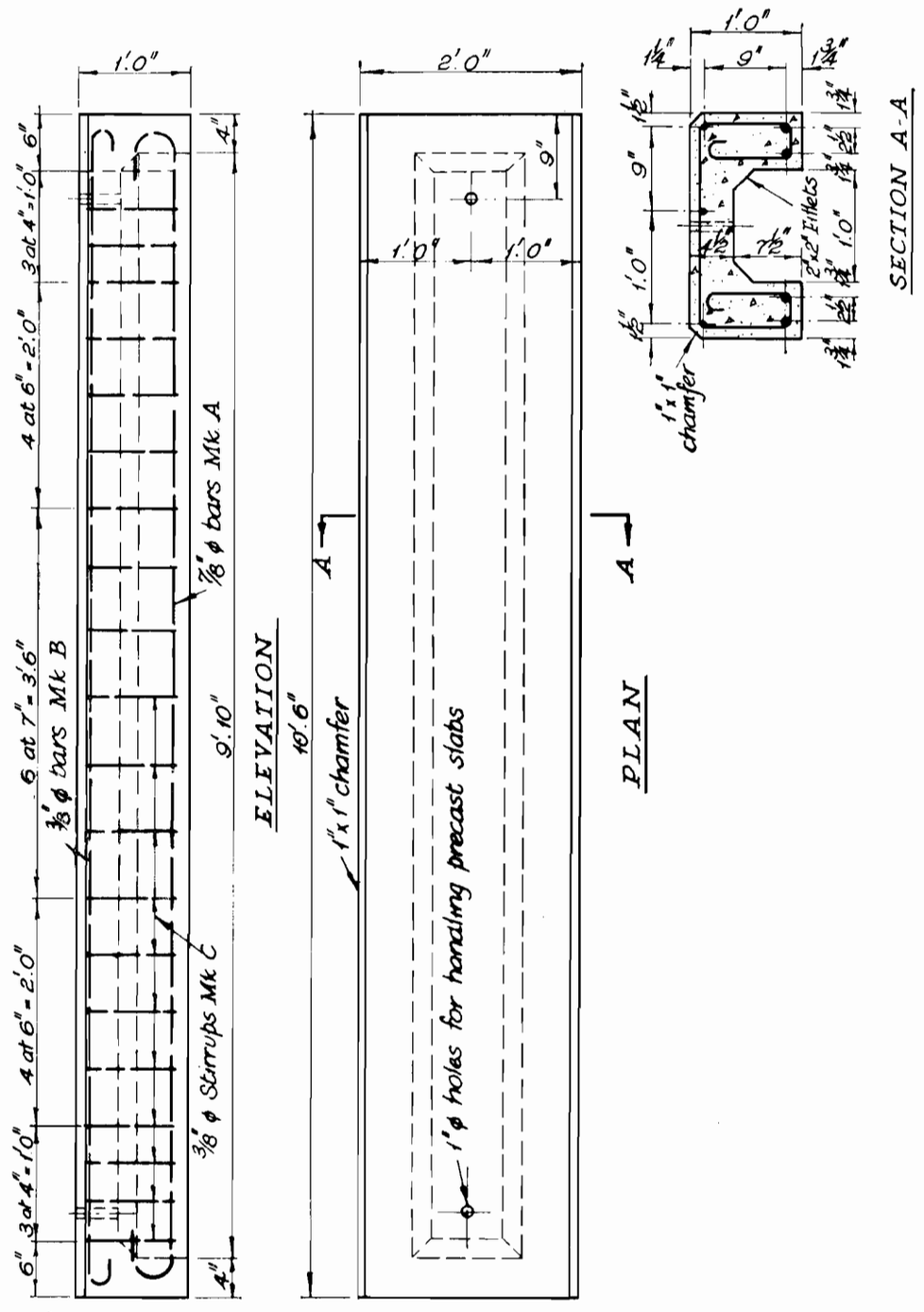
NOTES :-
1. The precast slabs shall be bedded in a 3 1 layer of cement mortar.
2. The top surface of the concrete precast units shall have two coats of bituminous emulsion

COUNTRY ROADS BOARD

REINFORCED CONCRETE "U"-TYPE SLAB FOR 6'0" SPAN

Drawn H.G.D	Checked
Traced P.M.V	Date

Fig. 9.



NOTES.-

1. The precast slabs shall be bedded in a 3:1 layer of cement mortar.
2. The top surface of the concrete precast units shall have two coats of bituminous emulsion.

COUNTRY ROADS BOARD		
REINFORCED CONCRETE "U"-TYPE SLAB FOR 10'.0" SPAN		
Drawn H.G.D. Traced P.M.V.	Checked Date.	

Fig. 10.

APPENDIX.

COUNTRY ROADS BOARD FUND.

RECEIPTS.

		£ s. d.	£ s. d.	£ s. d.	£ s. d.
1947.					
July 1.	To Balance		.. ..	.. ..	644,626 18 7
1948.					
June 30.	„ Motor Car Act No. 3741—				
	Registration Fees		2,101,130 16 6		
	Less Refunds		13,546 11 11		
			2,087,584 4 7		
	Fines	32,553 0 6			
	Less Refunds ..	45 15 0			
			32,507 5 6		
			2,120,091 10 1		
	Less Cost of Collection		156,536 14 4		
				1,963,554 15 9	
	„ Country Roads Acts Nos. 3662, 3741/13, 4332—				
	Fees and Fines..		730 9 0		
	Registration of Traction Engines ..		130 3 0		
				860 12 0	
	„ Acts Nos. 3662, 3741, 4332, 4585—				
	Costs		.. ..	118 18 11	
	„ Municipalities' Repayments—				
	Permanent Works—				
	Outer Metropolitan Roads	4,603 7 2			
	Relief Acts Nos. 4140, 4415	138,707 3 4			
			143,310 10 6		
	„ Main Roads Maintenance		159,594 11 5		
				302,905 1 11	
	„ Hire of Plant		230,981 10 5		
	„ Stores and Materials		598,080 5 5		
	„ Sundries		240,230 19 4		
				1,069,292 15 2	
					3,336,732 3 9
	„ Special Works Outstanding—				
	30th June, 1947—Recoup ..		.. ..	.. ..	14,444 13 9
	30th June, 1948—Credit ..		.. ..	.. ..	6,192 13 1
					4,001,996 9 2

PAYMENTS.

		£ s. d.	£ s. d.	£ s. d.
1948.				
June 30.	By Maintenance		.. ..	1,766,914 7 6
	„ River Murray Bridges and Punts		.. ..	4,003 11 1
	„ Interest and Sinking Fund—Municipalities' Repayments		.. ..	103,294 18 2
	„ Interest and Sinking Fund—Great Ocean Road ..		.. ..	1,000 0 0
	„ Recoup to Revenue Act No. 3944—			
	Interest—Main Roads		98,273 0 9	
	Developmental Roads		165,826 15 10	
	Sinking Fund Contributions		24,203 9 1	
	Exchange		31,795 1 0	
	Loan Conversion Expenses		180 17 5	
	Special Payment to National Debt Sinking Fund ..		1,058 4 2	
				321,337 8 3
	„ Relief to Municipalities—Acts Nos. 4140, 4415 ..		.. ..	220,682 14 4
	„ Stores and Materials		716,655 19 4	
	„ Plant Purchase and Repairs		326,850 5 6	
	„ Storeyards 1, 2, and 3		147,021 2 5	
	„ Sundry Debtors		82,616 1 2	
	„ Traffic Administration—			
	Motor Car Acts		4,805 6 7	
	Country Roads Acts		2,059 8 6	
	„ Bridge Inspections		1,794 8 6	
	„ Act No. 4332—Impounding of Cattle		673 0 10	
	„ Act No. 4609—Tourists' Resorts Fund		10,968 1 3	
	„ Act No. 4585—Traffic Line Marking		11,835 5 7	
	„ Act No. 5015—			
	Cremorne Bridge	514 0 0		
	Alexandra Avenue	1,473 5 11		
			1,987 5 11	
	„ Recoup to Revenue, Act No. 3782—Superannuation Charges		2,074 12 11	
	„ General Expenses—			
	Salaries, &c.	277,790 3 1		
	Less Recoup	22,813 15 6		
			254,976 7 7	
				1,564,317 6 1
	„ Balance		.. ..	20,446 3 9
				4,001,996 9 2

RECONCILIATION.

	£ s. d.
Balance as per Treasury Books	20,446 3 9
Add Transfers Outstanding	163,446 19 9
	183,893 3 6
Deduct Accounts in Transit	163,446 19 9
Balance as per Roads Board Accounts	20,446 3 9

REVENUE ACCOUNT, 30TH JUNE, 1948.

		£ s. d.	£ s. d.	£ s. d.
1948.				
June 30.	To Maintenance Works—General		829,744 1 8	
,,	Mansfield–Woods Point Road ..	4,649 11 4		
,,	Walhalla Road	1,988 13 5		
,,	Woods Point Road	4,667 1 7		
,,	State Highways	798,420 14 9		
,,	Tourists' Roads	98,662 0 9		
,,	Forest Roads	28,782 4 0		
			937,170 5 10	
				1,766,914 7 6
,,	River Murray Bridges and Punts		.. ..	4,003 11 1
,,	Contribution to Sinking Funds		25,823 14 6	
,,	Interest on Loans		77,471 3 8	
				103,294 18 2
,,	Recoup to Revenue, Act No. 3944—			
	Interest—Main Roads	98,273 0 9		
	Developmental Roads ..	165,826 15 10		
			264,099 16 7	
,,	Sinking Fund Contributions		24,203 9 1	
,,	Exchange		31,795 1 0	
,,	Loan Conversion Expenses		180 17 5	
,,	Special Payment to National Debt Sinking Fund ..		1,058 4 2	
				321,337 8 3
,,	Act No. 4395—Great Ocean Road—			
	Interest		483 0 0	
	Sinking Fund		517 0 0	
				1,000 0 0
,,	Tourists' Resorts Fund—Act No. 4609		.. ..	10,968 1 3
,,	Recoup to Revenue Act No. 3782—Superannuation Charges ..			2,074 12 11
,,	Relief to Municipalities		.. ..	220,682 14 4
,,	Audit Fee		744 17 8	
,,	Bridge Equipment		3,145 16 2	
,,	Bridge Inspections		1,794 8 6	
,,	Direction Boards and Warning Signs		4,159 17 11	
,,	Divisional Offices		5,616 9 7	
,,	Divisional Storeyards		14,217 5 11	
,,	Divisional Residential Properties		42,805 9 11	
,,	Gravel Sites and Metal Investigations		100 19 5	
,,	Instruments and Survey Equipment		1,238 4 3	
,,	Insurance of Staff		95 10 7	
,,	Motor Expenses		16,061 0 2	
,,	Offices—Exhibition Building		8,247 15 1	
,,	Office Expenses		6,992 7 10	
,,	Office Furniture		4,382 12 1	
,,	Patrol Garages		6 18 2	
,,	Patrolmen's Cottages		4,339 10 0	
,,	Storage Sites		713 19 11	
,,	Storeyard Equipment Repairs		168 6 0	
,,	Plans Purchase		1,820 2 3	
,,	Plant Purchase		150,078 7 5	
,,	Postage and Telegrams		2,261 5 5	
,,	Printing and Stationery		3,562 8 3	
,,	Salaries		124,686 1 8	

		£ s. d.	£ s. d.	£ s. d.
1947.				
July 1.	By Balance		.. ..	1,096,790 17 5
1948.				
June 30. ,,	Motor Car Act No. 3741—			
	Registration Fees 2,101,130 16 6			
	Less Refunds .. 13,546 11 11			
		2,087,584 4 7		
	Fines 32,553 0 6			
	Less Refunds .. 45 15 0			
		32,507 5 6		
		2,120,091 10 1		
	Less Cost of Collection	156,536 14 4		
			1,963,554 15 9	
,,	Country Roads Act No. 3662—			
	Registration of Traction Engines		130 3 0	
	Fees and Fines		730 9 0	
,,	Costs—Acts Nos. 3662, 3741, 4332, 4585		118 18 11	
,,	Plant Earnings	229,000 16 2		
	Deduct Working Costs	176,771 18 1		
			52,228 18 1	
,,	Sundry Earnings		734 1 10	
,,	Rents		2,057 13 9	
,,	Royalty on Gravel and Metal		98 19 5	
,,	Storeyard Cartage Earnings		19,123 4 6	
,,	Timber, &c., Revenue		400 16 3	
,,	Old Roads, Sale of		147 13 4	
,,	Materials, Sale of		19 10 0	
,,	Plans, Sale of		0 11 0	
,,	Chief Engineer's Mission Abroad		328 11 0	
,,	Maintenance Works—			
	Contributions Payable by Municipalities	205,953 2 10		
	Adjustment	481 12 9		
			205,471 10 1	
,,	Permanent Works—			
	Contributions Payable by Municipalities—			
	Outer Metropolitan Roads ..	4,603 7 2		
	Other Main Roads	128,603 1 0		
			133,206 8 2	
				2,378,352 4 1

„	Pay Roll Tax (Staff)		3,098 7 7		
„	Storeyard Cartage Expenditure		13,117 0 1		
„	Telephones		1,847 13 6		
„	Testing Materials		3,626 0 8		
„	Divisional Testing Materials		104 16 9		
„	Travelling Expenses		1,900 14 11		
„	Motor Car Acts Nos. 3741, sections 11–13, and 3901, sections 24–36		4,805 6 7		
„	Country Roads Board Acts		2,059 8 6		
„	Act No. 4332—Impounding of Cattle		673 0 10		
„	Act No. 4585—Traffic Linemarking		11,835 5 7		
„	Act No. 5015—				
	Cremorne Bridge	514 0 0			
	Alexandra Avenue	1,473 5 11			
			1,987 5 11		
„	Engineer for Tests Mission Abroad		630 16 7		
„	Experimental Works		268 4 5		
„	Advertising		1,762 14 6		
„	Engineers' Conference		63 1 0		
„	Wireless Licences		35 10 0		
„	Photography		1,333 17 4		
„	Cost Clerk Training		887 18 4		
„	Technical School Fees		54 13 2		
„	Legal Costs		300 0 0		
„	Storeyards 1, 2, and 3		7,154 8 6		
„	Investigation Surveys		221 10 2		
			455,007 9 1		
	Less Recoup		22,813 15 6		
				432,193 13 7	
	Balance		.. ..	612,673 14 5	
				3,475,143 1 6	3,475,143 1 6

BALANCE-SHEET AT 30TH JUNE, 1948.

LIABILITIES.	£	s.	d.
Contractors' Deposits	27,066	15	0
Sundry Liabilities	27,048	3	0
Revenue Account	612,673	14	5
Outstanding Special Works	6,192	13	1
	672,981	5	6

ASSETS.	£	s.	d.	£	s.	d.
Country Roads Board Fund				20,446	3	9
Maintenance Expenditure—						
Contributions Payable by Municipalities				205,953	2	10
Permanent Works—						
Contributions Payable by Municipalities (Subject to Relief)—						
Outer Metropolitan Roads	4,603	7	2			
Other Main Roads	128,603	1	0			
				133,206	8	2
Outstanding Accounts				28,057	18	9
Materials Stock—						
Storeyard	218,713	13	3			
Branches	39,537	3	9			
				258,250	17	0
Trust Fund				27,066	15	0
				672,981	5	6

SUMMARY SHOWING VALUE AS AT 30TH JUNE, 1948, OF BOARD'S ASSETS CHARGED TO FUND (not included in Balance-sheet).

	£	s.	d.
Residential Properties	73,493	7	5
Central Storeyards, Workshops, and Offices	41,130	0	0
Divisional Storeyards, Workshops, and Offices	36,559	0	0
Storage Sites	1,469	10	0
Workshop Machine and Hand Tools and Equipment	18,886	6	2
Testing Materials	6,043	13	0
Instruments	4,618	0	0
Bridge Equipment	8,854	0	0
Carried Forward	191,053	16	7

	£	s.	d
Brought forward	191,053	16	7
Furniture and Fittings	20,582	9	5
Furniture and Fittings (Motor Registration Branch)	8,292	5	0
Motor Cycles (Police Department)	5,251	3	8
Motor Cars	28,095	0	0
Motor Cars (Police Department)	14,485	16	6
	267,760	11	2
Working Plant	557,646	2	0
	825,406	13	2

COUNTRY ROADS BOARD LOAN ACCOUNT—ACT No. 3662.

RECEIPTS.	£	s.	d.
1947.			
July 1. To Balance Brought Forward	27	13	1
1948.			
June 30. „ State Loans Repayments Fund	15,119	16	4
„ Balance—Accounts in Transit	30	10	11
	15,178	0	4

PAYMENTS.	£	s.	d.	£	s.	d.
1948.						
June 30. By Permanent Works	15,926	19	1			
Less Refunds	748	18	9			
				15,178	0	4
				15,178	0	4

BALANCE SHEET AT 30TH JUNE, 1948.

LIABILITIES.	£	s.	d.	£	s.	d.	£	s.	d.
Interest on Permanent Works							19,155	7	2
Loan Securities Issued	4,893,775	1	6						
Add Increase in Expenses Renewal Loans	3,034	9	7						
				4,896,809	11	1			
Less Amount Repaid				80,000	0	0			
				4,816,809	11	1			
Deduct Discount and Expenses				107,941	15	3			
				4.708.867	15	10			
Less Securities Repurchased and Cancelled from National Debt Sinking Fund				568,594	3	2			
				4,140,273	12	8			
Less Redemption Funds	85,219	1	1						
Main Roads Sinking Funds	285,688	7	7						
Repaid to State Loans Repayment Fund	651,857	17	11						
				1,022,765	6	7			
							3,117,508	6	1
State Loans Repayment Fund							363,385	0	11
Contribution to National Debt Sinking Fund				597,388	4	8			
Less Net Loss on Repurchase of Securities (Including Exchange)				18,786	9	6			
							578,601	15	2
Loan Redemption Itimized Above							1,022,765	6	7
Country Roads Board Loan Account							30	10	11
							5,101,446	6	10

ASSETS.	£	s.	d.
Permanent Works	5,072,283	7	8
Interest Capitalized on Permanent Works —Act No. 3662	19,155	7	2
National Debt Sinking Fund (Cash in hand)	10,007	12	0
	5,101,446	6	10

DEVELOPMENTAL ROADS LOAN ACCOUNT—ACT No. 3662.

BALANCE-SHEET AT 30TH JUNE, 1948.

LIABILITIES.	£ s. d.	£ s. d.	£ s. d.
Loan Securities Issued	6,344,558 7 11		
Add Increase in Expenses Renewal Loans	4,228 6 11		
		6,348,786 14 10	
Deduct Discount and Expenses		162,925 10 0	
		6,185,861 4 10	
Less Securities Repurchased and Cancelled from National Debt Sinking Fund		878,038 0 8	
		5,307,823 4 2	
Less—			
Redemption Funds	646,386 7 4		
Developmental Roads Sinking Fund	55,083 0 2		
		701,469 7 6	
			4,606,353 16 8
State Loans Repayment Fund			239,896 6 1
Contribution to National Debt Sinking Fund		922,502 12 0	
Less Net Loss on Repurchase of Securities (including Exchange)		29,010 11 5	
			893,492 0 7
Loan Redemption Itimized 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
			6,535,240 8 3

ASSETS.	£ s. d.	£ s. d.
Permanent Works Expenditure	6,425,757 10 11	
National Debt Sinking Fund (Cash in hand)	15,453 19 11	
Contributions Payable by Municipalities—Act No. 3662, Section 86—(Subject to Relief)	94,028 17 5	
		6,535,240 8 3

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

RECEIPTS.	£ s. d.
1948.	
June 30. To 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.
1948.	
June 30. By Repayments 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, 1948.

E. A. PEVERILL,
Auditor-General,
20th December, 1948.

G. C. GRIFFITHS,
Accountant,
19th November, 1948.

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