COUNTRY ROADS BOARD

VICTORIA

FIFTY-SIXTH ANNUAL REPORT

FOR YEAR ENDED 30TH JUNE, 1969

PRESENTED TO BOTH HOUSES OF PARLIAMENT
PURSUANT TO ACT No. 6229

COUNTRY ROADS BOARD

Chairman	**I. J. O'Donnell**
Deputy Chairman	**R. E. V. Donaldson**
Member	**J. D. Thorpe**

PRINCIPAL OFFICERS

HEAD OFFICE

Chief Engineer	**H. S. Gibbs**
Secretary	**N. L. Allanson**
Accountant	**R. G. Cooper**
Deputy Chief Engineer	**H. P. George**
Deputy Chief Engineer—Works	**R. C. Handley**
Deputy Chief Engineer—Road Design	**J. H. Townley**
Deputy Chief Engineer—Bridges	**T. H. Russell**
Deputy Chief Engineer—Mechanical	**G. M. Langham**
Deputy Secretary	**C. C. Liddell**
Deputy Accountant	**R. J. C. Bulman**

DIVISIONAL OFFICES

Division	*Divisional Engineer*
Bairnsdale	**W. H. Dolamore**
Ballarat	**E. T. Oppy** (Acting)
Benalla	**A. J. Pryor**
Bendigo	**L. Upton**
Dandenong	**F. W. Docking**
Geelong	**W. F. Neville**
Horsham	**L. M. Jones**
Metropolitan	**H. W. P. Hobbs**
Traralgon	**A. Jacka**
Warrnambool	**F. G. Lodge**

60 Denmark Street
Kew
March, 1970

The Honourable M. V. Porter, M.L.A.,

Minister of Public Works

State Public Offices

Melbourne 3002

Sir,

In accordance with the requirements of Section 128 of the Country Roads Act 1958, No. 6229, the Board has the honour to submit to you for presentation to Parliament the report of its proceedings for the year ended 30th June, 1969.

The Board thanks you, Sir, for your continued support and interest in its activities and wishes to place on record its appreciation of the continued co-operation and assistance of other State Ministers, Government Departments, State instrumentalities and municipal councils.

The Board also pays tribute to the continued loyal co-operation and work done by its staff and employees throughout the year.

We have the honour to be,

Sir,

your obedient servants

I. J. O'DONNELL, O.B.E., E.D., B.C.E., F.I.E.Aust., F.A.I.M., Chairman.

R. E. V. DONALDSON, A.A.S.A. (Senior), J.P., Deputy Chairman.

J. D. THORPE, F.I.E.Aust., M.S.E., M.I.T.E.(U.S.)., Member.

N. L. ALLANSON, A.A.S.A. (Senior), J.P.,
Secretary

COUNTRY ROADS BOARD

FIFTY-SIXTH ANNUAL REPORT, 1968-69

CONTENTS

During 1968/69 the Board

- **Expended $61,992,000 on new roads and bridges and the maintenance and improvement of existing roads and bridges.**
- **Constructed 25.5 miles of additional dual carriageways.**
- **Commenced the construction of 179 new bridges.**
- **Sealed or resealed with bitumen 2,925 miles of road.**
- **Eliminated in conjunction with the Victorian Railways Department 3 railway level crossings by the construction of road overpasses and deviations.**
- **Constructed 4 pedestrian overpasses to serve schools.**
- **Planted 57,250 trees and shrubs on road reserves.**

ANNUAL REPORT 1968/69

REVIEW

COMMONWEALTH ASSISTANCE FOR ROADS

As the Commonwealth Aid Roads Act 1964 was due to expire on 30th June, 1969, the Board, in conjunction with the Commonwealth Bureau of Roads, spent much time during the year preparing basic information about Victoria's road conditions and needs for inclusion in the Bureau's report to the Commonwealth Minister for Shipping and Transport on "Commonwealth financial assistance to the States for roads". In Victoria, the collection and processing of primary data was co-ordinated by the Board with the assistance of municipal councils.

The Bureau investigated the state and usage of the road systems throughout Australia and its report aimed to provide advice in time for the Commonwealth Government and Parliament to determine the Commonwealth's policy regarding financial assistance to the States for roads and road transport which might operate after 30th June, 1969. As a result of the Commonwealth Government's consideration of the Bureau's report the Commonwealth Aid Roads Act 1969, passed in June 1969, provides total grants to the States of $1,252,050,000 for the five-year period, an increase of 67% over the previous five years. Victoria will receive $254,400,000 in yearly amounts of:—

1969/70	$38,160,000
1970/71	$43,460,000
1971/72	$49,820,000
1972/73	$57,240,000
1973/74	$65,720,000

The amount paid to Victoria in financial year 1968/69 under the terms of the Commonwealth Aid Roads Act 1964 was $33,113,030.

INCREASE IN C.R.B. EXPENDITURE

The Board's expenditure on the principal road network of the State has steadily increased over recent years in an endeavour to meet the demands of modern road traffic. The expenditure has resulted in wider pavements, larger lengths of dual carriageways, wider and stronger bridges and the elimination of railway level crossings.

The Board is directly responsible for the development of State highways, tourists' roads, forest roads and by-pass roads declared or proclaimed under the provisions of the Country Roads Act. In conjunction with municipal councils the Board is responsible for the development of declared main roads. The total length of such declared or proclaimed roads at 30th June, 1969, was 14,534 miles. In addition, the Board assists municipal councils by allocating funds for expenditure on approximately 20,000 miles of unclassified roads each year. Details of the Board's expenditure over the last five years are shown below:—

	Expenditure on Roads and Bridges				
	Board's Funds			Special Projects Fund	Total
	Within Metropolitan Planning Area		Outside Metropolitan Planning Area		
	Old area of 688 sq. miles	New area (as from 1/7/68) of 1,942 sq. miles			
	$000	$000	$000	$000	$000
1964/65	12,066	—	38,686	—	50,752
1965/66	12,183	—	39,478	1,654	53,315
1966/67	12,653	—	41,791	3,311	57,775
1967/68	16,186	—	42,479	2,652	61,317
1968/69	—	22,053	39,939	3,055	65,047

ROADS (SPECIAL PROJECTS) FUND

During the year the Board expended $3,055,000 on works financed from the Roads (Special Projects) Fund.

This fund, which is under the control of the State Treasurer, continues to be of immense benefit in accelerating the State's programme of major works.

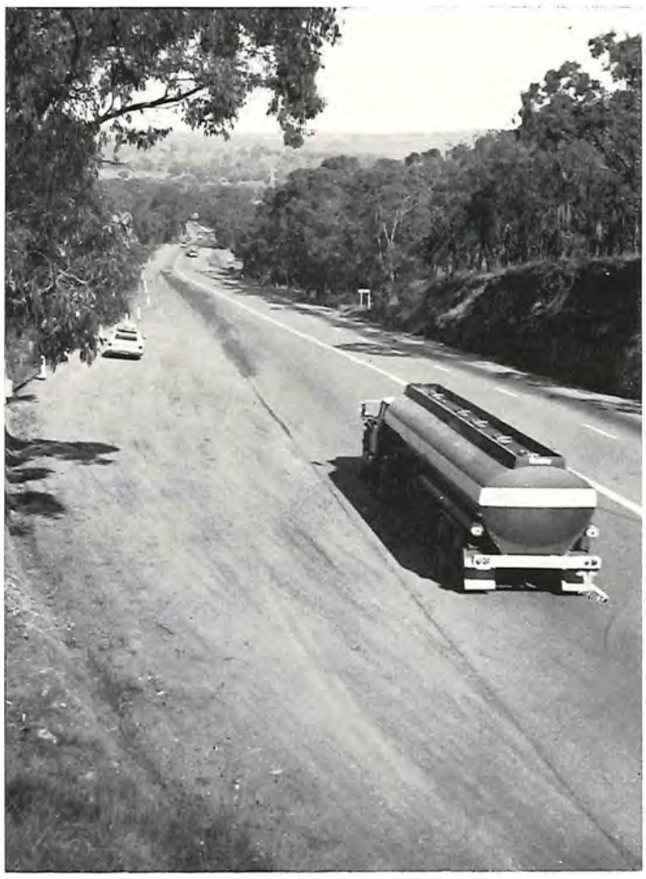
Progress to date and the expenditure incurred on the various Special Projects for which the Board is responsible are shown on pages 17 and 18 of this report.

CONTRIBUTION TO TRAFFIC SAFETY

The Board is aware of the importance of its role in reducing the exposure to risk of conflict between vehicles, pedestrians, and fixed objects, and is convinced that its programme of road improvements is having a beneficial effect on traffic safety.

Freeway construction (such as the route to the new Melbourne Airport at Tullamarine) provides new roads which eliminate the exposure to risk of conflict with crossing vehicles and pedestrians through the inbuilt features of interchanges and grade separated crossings. The replacement of railway level crossings by overpasses or underpasses and the conversion of single pavement roads to dual carriageways are examples of the Board's contribution to traffic safety.

Less obvious are the effects of many other types of improvement which are commonly made as part of the regular works programme throughout the State. Widening, realignment, and resurfacing of road pavements improve conditions for controlling vehicles; rest areas strategically located on heavily trafficked highways allow drivers to relax during the course of a journey; additional climbing lanes and truck parking bays reduce the risk of collision with slow-moving or stationary vehicles.



Calder Highway, Shire of Marong—Parking bay at Big Hill.

In urban areas road improvements such as road markings, direction signs and channelized intersections assist traffic and reduce the risk of collisions.

In 1967 a "Committee Convened to Make Recommendations on Means by which the Road Toll Could be Reduced" submitted a report to The Chief Secretary in which it was suggested that "a 50-mile length of Rural road should be selected and all traffic engineering measures which are known to reduce accidents and would be practical to use, should be applied throughout (this) length of road."

Following discussions between the Traffic Commission and the Board it was agreed that the section of rural road should be the Princes Highway East from Beaconsfield to Moe.

A survey to record existing conditions and to establish the possibilities for implementing improvements has been carried out in consultation with the Traffic Commission. The survey included such items as traffic signs, curves, guide posts, guard fencing, roadside obstructions, pavement markings, median end and intersection treatments, pedestrian crossings, parking and street lighting. In addition, the Commission's accident records for the period 1961 to 1966 have been analysed to provide base data from which any significant reduction of accidents in future years can be determined.

Preliminary clearing of timber has been commenced preparatory to implementing specific traffic engineering measures which could be expected to improve road safety.

TREES ON ROAD RESERVES

The provision of modern road facilities at times necessitates the removal of trees already growing within the defined road reserve. Wherever possible the Board retains stands of suitable timber providing they do not interfere with sight distance or otherwise form hazards to traffic.

In relation to road pavements, trees and shrubs have more than an aesthetic value. The shade and shelter which they provide and the relief from monotony contribute to maintaining driver alertness. On dual carriageways headlight glare from approaching vehicles is reduced by foliage at an appropriate height.

The Board's planning of road construction works takes into account the need to preserve or replace suitable species of trees, shrubs, and ground cover, and its engineers have the benefit of advice from specialists in the field of horticulture and landscaping.

During the past four years more than 187,000 trees and shrubs have been successfully planted on declared road reserves.

During this financial year 57,250 trees and shrubs were planted.

PAVEMENT MARKINGS

The presence of markings on road pavements has a legal significance when these markings are in accordance with certain provisions of the Road Traffic Regulations. Other markings provide aids or warnings to drivers and thus play an important role in accident prevention. Centre line striping and pavement marking on roads under the Board's care are continually being maintained and extended throughout the State.

Attention has recently been given to the placing of continuous white lines on the outer edges of sealed pavements, and a total of about 50 miles of road has been so marked as a trial to investigate its effects. So far edge lining has been restricted to short sections of high volume roads, sections of road where appreciable curvature is associated with relatively steep grades, where fogs or icy conditions are prevalent, and on the approaches to certain intersections and bridge railings. Investigations so far carried out indicate that:—

(i) on high volume roads there may be some slight reduction in the cost of edge and shoulder maintenance with edge lines;

(ii) there is little or no significant change in the placement of vehicles across the pavement where edge lines are used;

(iii) in general motorists tend to drive with the centre line as their indicator;

(iv) edge lines may be of some value at night, or in foggy or wet weather;

(v) there may be some slight reduction in accidents on curved roads.

Edge lining is relatively costly, but the Board proposes to increase the mileage of edge lining where warranted by conditions.

ROAD AND RAIL BRIDGES

The legal height limit for vehicles without permits in Victoria is 13 feet, but many railway bridges over roads do not provide a clear passage to this dimension and a clear indication to drivers of the safe height available is required.

A determined effort has recently been made by the Board, with the co-operation of the Victorian Railways and municipal councils, to place and maintain clearance signs on railway bridges over all roads, including unclassified roads, together with appropriate advance warning signs. All costs involved are being met by the Board.

The Board has for some time considered the need to have certain road bridges over railways strengthened in order to avoid serious restriction in the movement of heavy loads by road. With the co-operation of the Victorian Railways Department, a programme for strengthening bridges in order of priority has been prepared on the basis of the Board undertaking the necessary design and construction and the cost of the work being apportioned 75% to the Country Roads Board and 25% to the Victorian Railways.

Strengthening of the bridge over the railway line on the Hume Highway at Broadford was completed during the year, and work commenced on the bridge north of Seymour. Similar work will be carried out on the Calder Highway bridges at Malmsbury and Woodend before extending the scheme to other parts of the State.

OVERDIMENSIONAL LOADS

The natural gas and oil exploration activities off the coast of eastern Victoria required the movement by road of unusually large materials and equipment to South Gippsland during the year. The Board would like to record its thanks to the public, the Victoria Police, and municipal councils for their co-operation and assistance in this task which was of great importance to the development of Victoria.

In the Melbourne Metropolitan area instances have occurred of vehicles carrying overdimensional loads diverging from the route specified in the permit issued by the Board. Whilst the law requires the Board in issuing its permits to set out in detail the names of the roads which the driver of the vehicle is to follow, it can be extremely difficult for that driver to locate street names in their correct sequence, particularly when the driver is an interstate operator not conversant with Melbourne.

As an additional safeguard the Board has approached municipal councils in the Melbourne Metropolitan area with the proposal that each route be marked by signs bearing numbers on coloured backgrounds to conform with the route indicated on the permit. It is expected that the routes will be marked in the near future.

Special consideration has been given by the Board to the increasing use of large freight containers carried to and from ships by overdimensional road transport. The Board has advised the industry that it is prepared to issue period permits to allow skeletal semi-trailers with a distance between the outer axles of bogies of 18 ft. 1 in. or more to carry a gross load of 13 tons on each bogie when conveying 20 ft. I.S.O. containers on their way to or from a ship on designated routes within 25 miles of the Melbourne container wharf.

BUSHFIRES

In January, 1969, bushfires occurred in various areas throughout the State with Yea, Alexandra, Maldon and Lara being the centres which suffered the most damage.

In many instances, Board's plant and operators were employed extensively in lengthy and dangerous fire-fighting operations. Credit is due to the operators and supervisory personnel who willingly worked long hours in difficult circumstances, providing valuable assistance in keeping loss of life and property damage to a minimum.

LITTER

Previous reports of the Board have drawn attention to the problem of increasing amounts of litter being deposited on road reserves by the motoring public. Disposal of unwanted rubbish is unpleasant and costly and diverts the Board's patrolmen from their main task of maintaining the road and road furniture. Litter bins have been provided in many places, particularly where vehicles are likely to stop, but proper attitudes by the public are needed to ensure any significant solution to the litter problem.

LAND ACQUISITION

It is unfortunate that in many locations roads cannot be widened, dual carriageways constructed or new roads constructed without acquiring land. The Board considers that the compensation paid in each individual case places the owner of land acquired by the Board in a comparable overall financial position to that obtaining prior to the acquisition.

The total amount paid by the Board during the year from all available funds for the acquisition of land was $6,248,000.

SNOW CLEARANCE

Because of the growing popularity of skiing, the clearing of snow from access roads to mountain resorts in the Victorian Alps has become an important part of the Board's activities during the winter months.

The demand for clear roads requires the permanent stationing during winter months of teams of plant operators in properly equipped accommodation, and the daily use of efficient snow clearing machinery for the particular locality and altitude. Well-designed protective clothing and heated cabins are provided for the operators, who are often called upon to work from early morning to late at night.

Snow can show great variation in density and condition. Australian snow tends to be wet and, when freshly fallen, is up to three times as heavy as European snow. Light falls may be cleared by graders with suitably designed blades, but heavier falls are most satisfactorily cleared by using machines which throw the snow clear of the road surface.

On the Mount Buffalo Tourists' Road and the Mount Buller Tourists' Road, satisfactory use is being made of a power grader and a Rolba R400 snow blower on each approach road. On the Alpine Tourists' Road near Mount Hotham the heavy snowfalls and frequent wind drifts require the use of a larger R1500 machine to maintain access from both the Omeo and Harrietville approaches to Hotham.

Snow clearing, previously carried out by the State Electricity Commission, between Mount Beauty and Falls Creek, on the Bogong High Plains Tourists' Road, is now being undertaken by the Board.

MAJOR WORKS COMPLETED

The magnitude and complexity of many of the individual freeway and bridge projects recently undertaken by the Board require the use of the most modern engineering and administrative knowledge and equipment. Undertakings such as the Strathmore By-pass Road, the Lower Yarra Freeway, and the Phillip Island Bridge will provide road facilities which will be equal to world standards.

Some of the major works which were completed during the year and which were financed from the Board's funds or the Roads (Special Projects) Fund are:—

New Routes

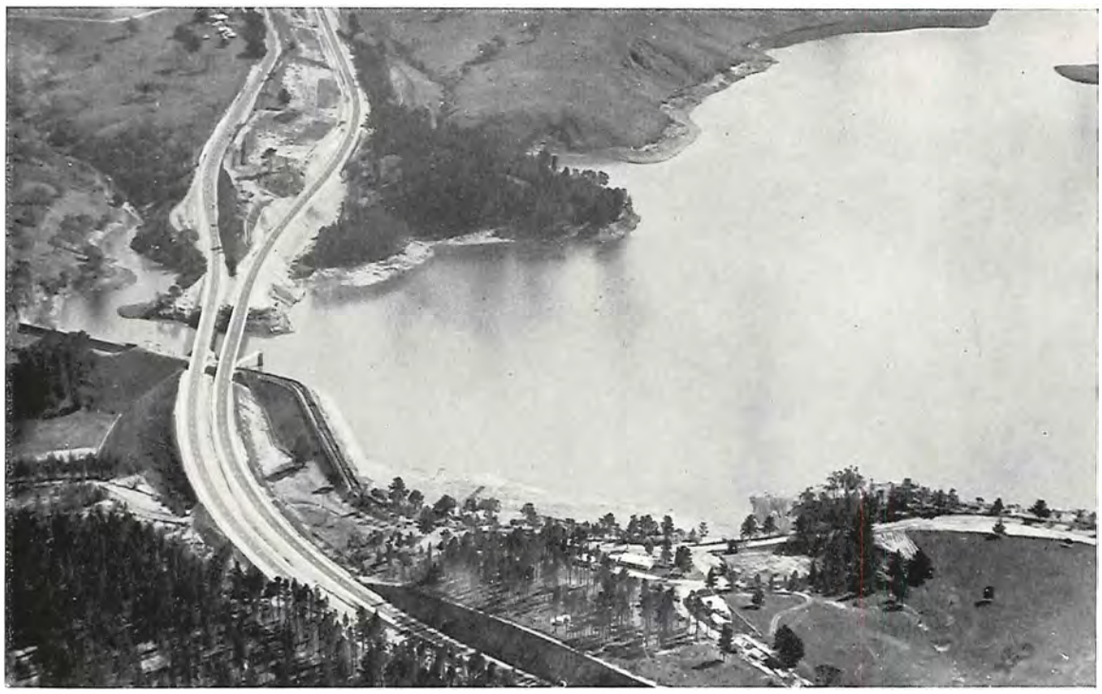
Marlo-Cape Conran Road	Construction of 11.0 miles of tourist road between Marlo and Cape Conran as Special Project No. 14.
Princes By-pass Road (Moe Section)	Construction of 3.8 miles of new road by-passing the City of Moe as Special Project No. 9.

Special Project No. 14—Marlo—Cape Conran Road.

Princes Highway East, Shire of Berwick—Dual Carriageways east of Narre Warren.

Dual Carriageways

Princes Highway West	Construction of 1.2 miles in Warrnambool City.
Princes Highway East	Construction of 3.7 miles from east of Hallam to Berwick.
Glenelg Highway	Construction of 0.9 miles in Hamilton.
Midland Highway	Construction of 1.7 miles between Weddell Road and Vines Road, West Geelong.
Murray Valley Highway	Construction of 0.8 miles near Swan Hill.
Western By-pass Road	Construction of 4.0 miles east and west of Pykes Creek Reservoir as part of Special Project No. 7.
Nepean Highway	Construction of 0.8 miles between Bay Road and Centre Dandenong Road, Moorabbin. Construction of 0.9 miles between Wooralla Drive and Tower Road, Mt. Eliza, as part of Special Project No. 13.
Burwood Highway	Construction of 0.8 miles between Acacia Road and the railway bridge, Ferntree Gully.
Maroondah Highway	Construction of 2.3 miles between Stirling Road and Brushy Creek, North Croydon.



Western Highway, Shire of Ballan —Dual Carriageways and bridges at Pykes Creek Reservoir.

Bridges

Princes Highway West	Construction of a ten span prestressed concrete beam and reinforced concrete bridge 800 feet long by 28 feet between kerbs over the Glenelg River near Dartmoor, Shire of Portland.
Western Highway	Construction of a four span prestressed concrete beam and reinforced concrete bridge 355 feet long by 28 feet between kerbs over Pykes Creek Reservoir, Shire of Ballan.
Maroondah Highway	Construction of a five span prestressed concrete beam and reinforced concrete bridge 301 feet long by 28 feet between kerbs over the Goulburn River, Shire of Alexandra.

FINANCE

Total receipts by the Board for the year amounted to $76,077,429 and together with the balance of $1,369,276 brought forward from the previous year made available an amount for expenditure of $77,446,705. In addition the Government allocated to the Board from the Roads (Special Projects) Fund the sum of $3,799,000 for expenditure on approved Special Projects.

RECEIPTS

The Board's receipts are obtained from the following main sources:—

1. Fees under the Motor Car Act:
   (a) Motor registration fees less cost of collection (metropolitan bus registration fees and the specified proportion of registration fees paid to the Roads (Special Projects) Fund are excluded).
   (b) Two-thirds of additional motor registration fees levied on first registration and subsequent change of ownership, less cost of collection.
   (c) Trailer registration fees less cost of collection other than the amount paid to the Roads (Special Projects) Fund.
   (d) One-quarter drivers' licence fees, less one-quarter cost of collection.
   (e) Drivers' licence testing fees, less cost of collection.
   (f) One-half of driving instructors' licence fees less one-half cost of collection.
   (g) Examiners' licence fees—motor car roadworthiness examinations.
   (h) All fees from the issue of authorized log books less cost of collection.
2. All moneys received under Part II of the Commercial Goods Act (ton mile tax).
3. Municipal contributions to expenditure on declared main roads as provided for in the Country Roads Act.
4. Small amounts of loan money. During the year 1968/69, however, an amount of $3,000,000 was provided by the Government towards the cost of the construction of the Lower Yarra Freeway.
5. Receipts under the Commonwealth Aid Roads Act.

The following table shows the receipts by the Board for the financial year 1968/69 compared with those in financial year 1967/68.

STATE SOURCES	1967/68	1968/69
Motor Car Act	$26,805,336	$28,888,595
Commercial Goods Vehicles Act	7,247,586	7,841,757
Municipalities Repayments	1,845,339	1,931,449
Loan Funds	987,000	3,389,000
Special Grant from State Treasury	700,000	783,650
General Receipts	380,118	519,513
	$37,965,379	$43,353,964

COMMONWEALTH AID ROADS ACT 1964	1967/68	1968/69
General Purposes	$18,380,641	$19,478,253
Rural Roads	12,514,479	13,245,212
	$30,895,120	$32,723,465

Grand Total	$68,860,502	$76,077,429

EXPENDITURE

Expenditure in the form of cash payments during the financial year 1968/69 amounted to $74,397,401 leaving a cash balance of $3,049,303 to be carried forward into the financial year 1969/70. The receipts under the Commonwealth Aid Roads Act were fully expended.

The following table compares expenditure from the Board's funds in the year 1968/69 with 1967/68.

Item	1967/68	1968/69
Construction and maintenance of roads and bridges	$58,665,569	$61,992,156
Capital Expenditure (plant, workshops, offices, etc.)	1,980,170	2,193,639
Salaries, operating accounts and other administration expenditure	5,816,225	6,460,035
Statutory payments to Tourist Fund, Transport Regulation Fund, and contribution to Australian Road Research Board	1,139,282	1,445,529
Interest and Sinking Fund payments	2,189,778	2,306,042
	$69,791,024	$74,397,401

SHARING THE COSTS OF ROADWORKS

The Country Roads Act provides that no more than one-half of the amount expended on permanent works and one-third of the amount expended from the Country Roads Board Fund on main roads during the preceding financial year shall be apportioned between the various municipalities benefited thereby. The Act also provides that the amount apportioned to a council in respect of expenditure charged to the Country Roads Board Fund may be reduced where the cost of maintenance is excessive due to motor traffic not of local origin or to timber traffic. The revenue, valuation and rating of the municipality and its financial obligations for loan expenditure on permanent works are taken into account in deciding the level of contribution by a council.

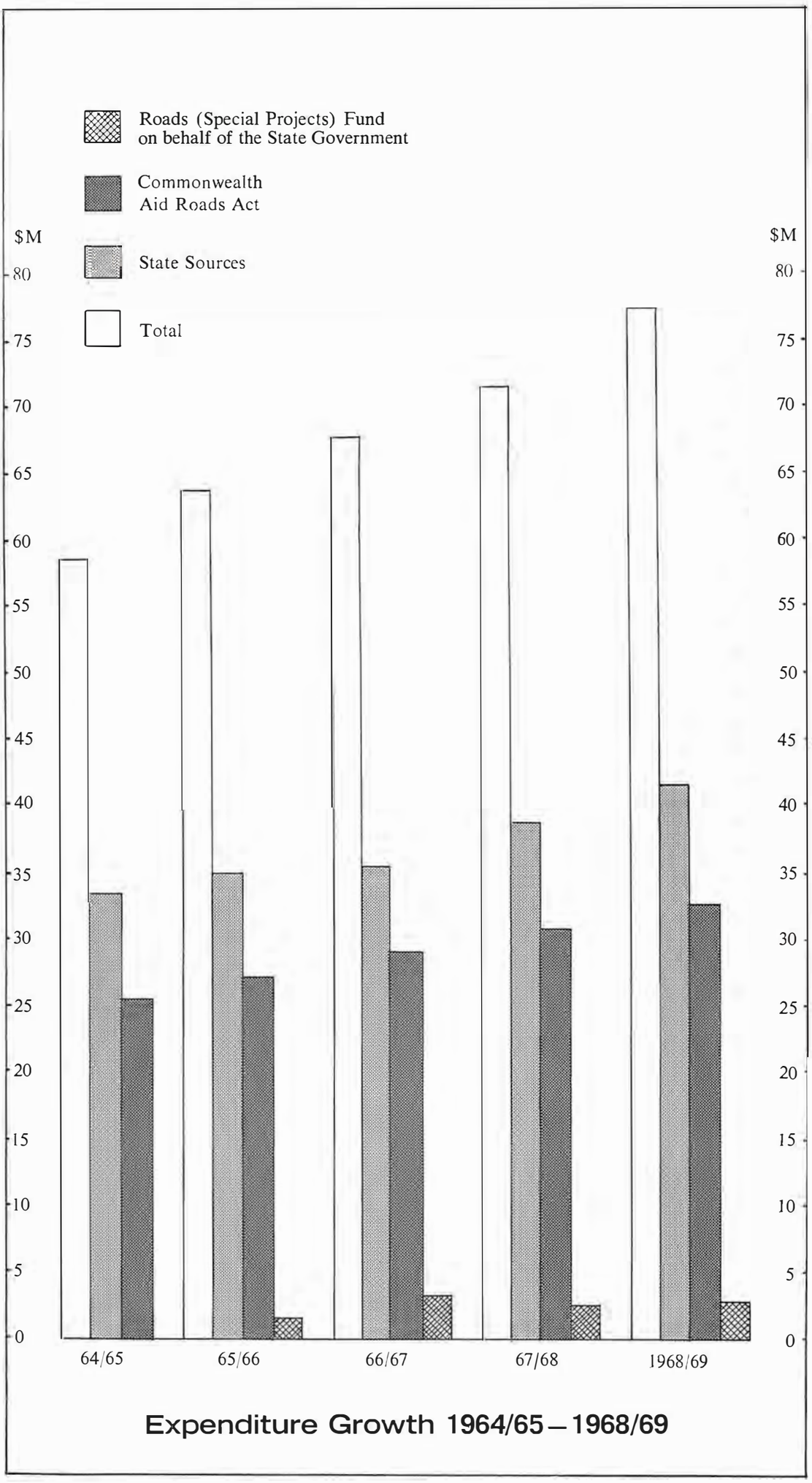
In September, 1968, expenditure on main roads in financial year 1967/68 was apportioned in accordance with the Country Roads Act resulting in the following distribution of expenditure other than Loan Fund expenditure:—

Expenditure from Country Roads Board Fund	$10,395,187
Expenditure from Commonwealth Aid Road moneys	3,395,384
Expenditure from proceeds of ton/mile tax (Commercial Goods Vehicles Act)	2,232,232
TOTAL	$16,022,803
Amount apportioned to councils	$1,830,704

Municipal councils were therefore required to bear only 11.4% of the total expenditure on main roads. The previous year's contribution by municipal councils amounted to 11.0% of total expenditure on main roads.

Within the limits of funds available the Board made allocations to municipal councils for works on unclassified roads. The expenditure incurred from the allocations made by the Board in financial year 1968/69 compared with 1967/68 was as follows:—

	1967/68		1968/69	
	C.R.B.	Council Contribution	C.R.B.	Council Contribution
Construction and reconstruction	$11,802,554	$3,188,851	$12,394,163	$3,071,729
Patrol maintenance	1,633,275	726,076	1,574,782	734,563
TOTALS	$13,435,829	$3,914,927	$13,968,945	$3,806,292



Expenditure Growth 1964/65—1968/69

ROAD CONSTRUCTION AND MAINTENANCE

THE DECLARED ROAD SYSTEM

At 30th June, 1969, the total length of roads declared or proclaimed under the Country Roads Act was 14,534 miles consisting of:—

State highways—	4,460 miles.
By-pass roads—	43 miles.
Tourists' roads—	483 miles.
Forest roads—	461 miles.
Main roads—	9,087 miles.

Although many requests were received during the year to declare particular roads as State highways or main roads the Board was not in a position to undertake the additional financial responsibility of significantly extending the declared road system.

State Highways:

State highways are the principal road arteries forming interstate connections and links between provincial centres of importance. The Board is responsible for the total cost of all works on State highways required to cater for the needs of through traffic. The total expenditure during the year in State highways was $18,349,000, including $1,739,000 from the Roads (Special Projects) Fund.

In addition to improvements in the form of realignments, widening of sealed pavements, and resurfacing, a feature of the year's programme on State highways was the provision of a further 25.5 miles of dual carriageways on the more heavily trafficked routes.

Details of the more significant works completed during the year are listed in Appendix 1.

South Gippsland Highway, Shire of South Gippsland.
Reconstruction on an improved alignment north of Foster.

By-pass Roads:

By-pass roads are freeway-type roads providing safe direct routes for heavy volumes of traffic. A distinguishing feature of by-pass roads is that access is controlled. Traffic is permitted entry to and exit from a fully developed by-pass road only at planned interchanges.

Traffic crossing a by-pass road at other points is taken directly over or under the through carriageways. The full cost of works on by-pass roads is borne by the Board. During the year $11,682,000 was expended on the construction of new by-pass roads and on the purchase of land for future by-pass roads.

The major by-pass road project completed during the year was the first stage of the Princes By-pass Road (Moe Section) which is 3.75 miles long and by-passes the City of Moe. A single 24 ft. sealed carriageway has been provided, with earthworks and grade separated structures which can accommodate future duplicate pavements. Work is continuing on the Strathmore By-pass Road and the Lower Yarra Freeway which is referred to in more detail on page 15 of this report. Further works are included in Appendix 1.

Tourists' Roads:

Tourists' roads proclaimed under the provisions of the Country Roads Act are constructed, improved and maintained by the Board to provide access to places of special attraction to tourists in both summer and winter.

The Board's expenditure on proclaimed tourists' roads during the year was $2,793,000.

Details of the more significant works carried out on tourists' roads are listed in Appendix 2.

Alpine Tourist Road. Reconstructed Section in the Shire of Omeo.

Forest Roads:

Forest roads are roads so proclaimed under the provisions of the Country Roads Act and are situated within or adjacent to any State forest or in areas which are considered to be timbered, mountainous, or undeveloped. The cost of all construction and maintenance on forest roads is met by the Board, but approximately half the work carried out in the State is undertaken by municipal councils on behalf of the Board.

The total cost of construction and maintenance of forest roads during the year was $678,000.

Appendix 2 lists the more important works completed during the year.

Licola Forest Road near the MacAlister River, Shire of Maffra.

Main Roads:

Main roads form the secondary network of roads, linking centres of population with other centres or with areas of settlement. Generally main roads are constructed and maintained by municipal councils to the satisfaction of the Board, except in some cases the Board undertakes this work to assist the Council concerned. An amendment to the Country Roads Act which became effective on 15th January, 1969, provides that the Board may undertake works on main roads with the consent of the Minister of Public Works. Prior to this time it was necessary to obtain the approval of the Governor-in-Council. The financing of main road works is explained on page 8 of this report under the heading of "Sharing the Costs of Roadworks".

As in previous years the Board was not able to allocate sufficient funds to satisfy the applications for funds received from municipal councils. The following table shows the applications, allocations and expenditure on main roads for the financial years 1967/68 and 1968/69.

Item		1967/68	1968/69
		$'000s	$'000s
A	Applications	31,204	32,262
B	Allocations	22,628	22,576
C	Expenditure	16,769	16,940
		%	%
B	as percentage of A	72.5	69.8
C	as percentage of B	74.1	75.0

A summary of the more important works completed on main roads during the year is contained in Appendix 3.

Unclassified Roads:

Unclassified roads are under the care and management of municipal councils, and each year the Board provides financial assistance towards the cost of construction and maintenance works on unclassified roads generally in accordance with priorities allotted by municipal councils.

The applications for funds, together with allocations made and expenditure incurred, are shown below:—

Item		1967/68	1968/69
		$'000s	$'000s
A	Applications	43,266	44,195
B	Allocations	17,793	18,857
C	Expenditure	13,468	13,969
		%	%
B	as percentage of A	41.1	42.7
C	as percentage of B	75.7	74.1

A list of the more significant unclassified road works carried out with the financial assistance of the Board appears in Appendix 4.

LINE MARKING

The Country Roads Act gives power to the Board to place and maintain marks, lines, or other indications for the regulation of traffic on State highways, main roads, tourists' roads, and by-pass roads. In addition the Board assists with the line marking of other roads on behalf of municipal councils.

To meet the requirements of the annual line marking programme the Board employs two large highway striping machines and ten smaller machines.

During the year the Board maintained traffic lines on 3,869 miles of State highways, 1,848 miles of other declared roads, and 450 miles of unclassified roads—a total of 6,167 miles. Over 42,000 gallons of paint was used.

Reflective glass beads—spheres ranging from 0.0025 inches to 0.005 inches in diameter—were applied to all markings at a rate of approximately 20 lbs. weight per mile of single broken line.

BITUMINOUS SURFACING

A bituminous surface protects the pavement materials from damage and provides a smooth surface for the passage of vehicles. Dust-free surfaces are provided in summer and a mud-free surface in winter. Without a bituminous surface the maintenance of road surfaces would be considerably more difficult and costly, involving the use of heavy plant and resultant inconvenience to the travelling public.

A bituminous surface is provided by the use of spraying techniques or hot mix techniques. The sprayed technique is the application of a bituminous binder covered immediately by aggregate which is compacted by rolling. The binder is applied by spraying at a designated rate onto the pavement surface by a mobile bitumen sprayer. The aggregate is spread uniformly by a rotating belt spreader. The plant and techniques used in these operations have been designed and developed by the Board to a high degree of efficiency to provide an economical type of bituminous surface on a large network of roads. The Board's 22 bituminous surfacing units, together with plant owned by municipal councils and contractors, completed 2,809 miles of sprayed work during the year at a cost of approximately $7,105,600, and for which the Board purchased 29,206 tons of bitumen and 285,111 cubic yards of aggregate.

South Gippsland Highway, Shire of South Gippsland. Sealing in progress north of Foster.

The plant mix technique involves the spreading by a mechanical paver of a carefully designed mixture of aggregate and bitumen produced from fixed mixing plants. This type of work is more costly than sprayed work and is used on heavily trafficked roads, mainly in urban areas. The final surface provides smooth riding qualities and low noise level. During the year, contractors operating fixed plants used 175,000 cubic yards of aggregate and 12,300 tons of bitumen to produce 212,320 tons of bituminous concrete on 116 miles of roads.

The total mileage of bituminous surfacing work completed during the year, including both sprayed work and plant mix work, amounted to 2,925 miles at a cost of $9,559,626.

The Board also purchased approximately 14,150 tons of bituminous materials such as cut-back bitumen, tars, and bitumen emulsions. Of this quantity portion was used for priming pavements prior to sealing, the remainder being required for the maintenance of sealed pavements.

The following types of work were carried out during the year:—

287 miles of sealing widened pavements.

25 miles of initial sealing on dual carriageways.

420 miles of restoration of seal coats on reconstructed sections.

1,343 miles of maintenance retreatments.

131 miles sealed on behalf of other State and municipal authorities.

719 miles of extensions to the bituminous sealed road system of the State, including 133 miles of roads declared or proclaimed under the Country Roads Act.

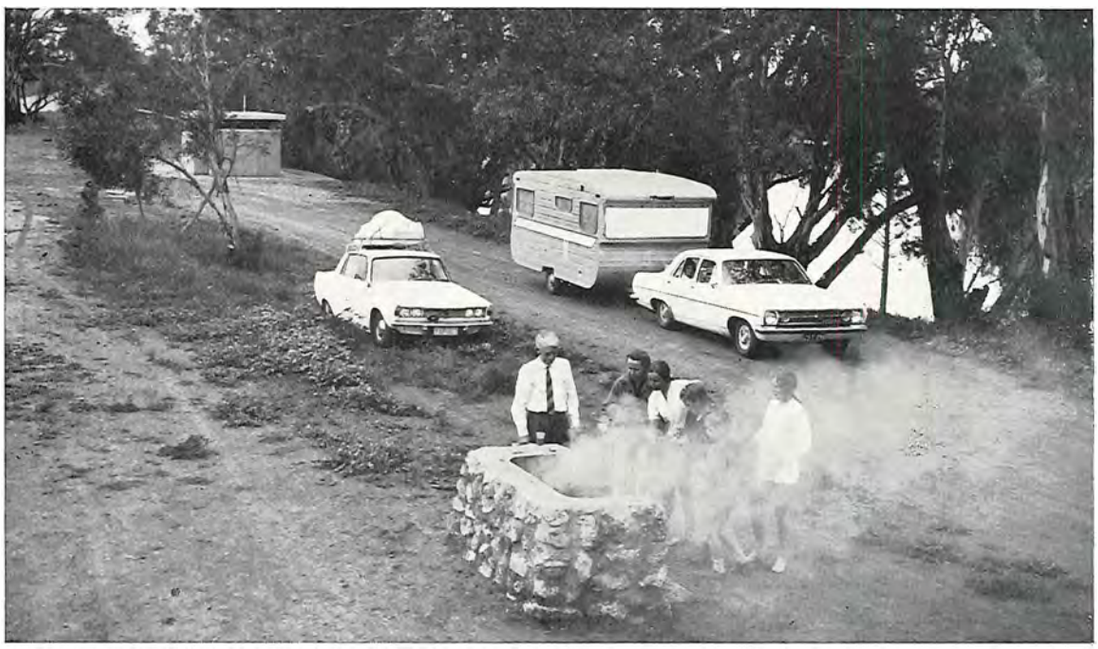
ROADSIDE DEVELOPMENT

Roadside development has always been an important consideration and has been actively pursued by the Board within the limits of available funds. It has been possible only in recent years to intensify activities towards the development of what might be termed the complete highway providing a balanced combination of safety, utility, economy, and beauty.

Such factors as the preservation of flora, conservation of landscape features, rehabilitation of cleared areas, and erosion control are important aspects of the Board's road design practices. More than 57,000 trees and shrubs were planted on the Board's declared road reserves during the current year.

The primary road system of Victoria provides a means by which motorists may travel several hundreds of miles in a single day, resulting in a demand for frequent stopping places where travellers can relax, enjoy a meal, or view the surroundings from a safe position clear of the road pavement.

The most highly developed stopping places provided by the Board are designated as Rest Areas, and are characterized by complete separation from the road formation. Adequate signs indicate properly designed points of entry and exit, and picnic table-bench units, fireplaces, and litter bins are provided. Water supply and toilet blocks are being progressively introduced where proper maintenance of these facilities can be assured.



Rest area at Boundary Bend on the Murray Valley Highway, Shire of Swan Hill.

Water supply and toilets are available to motorists at the rest area sites at—

Boundary Bend on the Murray Valley Highway.
Garfield on the Princes Highway East.
Blind Joe's Creek near Rosedale on the Princes Highway East.
Cherrypool on the Henty Highway.

These facilities will be extended to other existing rest areas at—

Lara on the Princes Highway West.
Box's Cutting west of Beaufort on the Western Highway.
Albert River near Alberton on the South Gippsland Highway.
Warby Springs near Wangaratta on the Hume Highway.
Dadswell's Bridge on the Western Highway.

Other forms of stopping places for motorists include wayside stops, scenic viewpoints and parking bays.

Wayside stops are small rest areas with parking space, table-bench units, a litter bin, and perhaps a fireplace.

Scenic viewpoints provide safe parking space for travellers to admire the scenery or points of special interest.

Parking bays are available for drivers of heavy commercial vehicles to stop for relaxation clear of the main carriageway.

CONTRACTS

Contracts Under the Board's Direct Supervision

Details of the types of contracts entered into and their respective values are shown in the following table:—

Type of Contract	Number of Contracts	Value $
Road Construction (Major Works over $60,000)	17	5,975,235
Road Construction (Minor Works under $60,000)	11	234,568
Supply of Roadmaking Materials	68	1,507,786
Bituminous Treatment and Supply of Bituminous Materials and Aggregate	85	3,604,850
Bridge Construction	30	2,000,367
Manufacture of Bridge Components and Fabricated Steel	21	688,491
Supply of Reinforced Concrete Pipes and Box Culverts	21	670,000
Supply of Road and Bridge Construction Equipment	46	1,400,133
Divisional Facilities	4	37,690
Miscellaneous Services and Stores	18	1,010,909
	321	$17,130,029

The above contracts include 13 having a value of $1,280,047 being financed from the Roads (Special Projects) Fund.

Contracts Under Councils' Supervision

During the year the Board approved the acceptance by municipal councils of 377 tenders for a total amount of $5,522,308 for road and bridge works for which the Board allocated funds in whole or in part.

The Board also approved the use of 92 municipal contracts for the supply of materials for works financed partly from funds provided by the Board.

Lower Yarra Crossing Approach Roads

Construction of the Lower Yarra Freeway—the 4.1 miles of western approach road to the West Gate Bridge extending from the Princes Highway West to Williamstown Road—commenced during the year.

Right of way clearance and main drainage works have been completed, and much of the freeway length has been fenced. Pedestrian overpass bridges have been provided at Rosala Avenue, Altona North, and Wembley Avenue, Spotswood.

Contracts worth $3.6 million were let for the construction of the main 4 or 6 lane freeway carriageways, associated roadworks, and the twin bridges over the Newport-Sunshine railway as follows:—

(a) The construction of 2.6 miles of the main carriageways from Kororoit Creek to Cranbrook Street.

Citra Australia $1,992,597

(b) The construction of 10,440 feet of road works at the Western Interchange with the Princes Highway West.

Withers Constructions Pty. Ltd. $708,536

(c) The construction of 3,175 feet of Blackshaws link Road between the Princes Highway West and Doherty's Road.

Roche Bros. Pty. Ltd. $243,153

(d) The construction of a two span concrete bridge 238 feet long, 28 feet wide, and with a 6 feet footway on the extension of Blackshaws Road over the freeway.

C.B.P. Holdings Pty. Ltd. $47,600

(e) The construction of a three span concrete bridge 201 feet long, 28 feet wide, and with a 6 feet footway over Kororoit Creek.

C.B.P. Holdings Pty. Ltd. $48,963

(f) The construction of two pedestrian overpasses over the freeway, one at Rosala Avenue, Altona North, and the other at Wembley Avenue, Spotswood.

M. D. McCarthy $59,048

(g) Drainage works consisting of 5,900 feet of underground drains between Millers Road and Blackshaws Road.

Morgan Drainage Pty. Ltd. $29,446

(h) Drainage works involving 11,000 feet of underground pipe drains between Stony Creek and Millers Road.

C.B.P. Constructing Co. Pty. Ltd. $104,324

(i) Fencing the whole freeway length.

Cyclone K-M Products Pty. Ltd. $46,350

(j) Supply and delivery of concrete beams, reinforced concrete deck slabs and footway slabs for two bridges.

May's Vibrated Concrete Pty. Ltd. $82,786

(k) Supply and delivery of 755 tons of steelwork and bearings for the bridges over the Newport-Sunshine railway.

Steelcrete (Aust.) Pty. Ltd. $80,598

(l) The construction of twin 6-span steel and reinforced concrete bridges 410 feet and 413 feet long, each 52 feet between kerbs over the Newport-Sunshine railway.

McDougall-Ireland Pty. Ltd. $209,725

(m) Manufacture and delivery of 28 prestressed concrete beams 35 feet long and 28 beams 59 feet long for the bridges over Millers Road.

May's Vibrated Concrete Pty. Ltd. $21,560

To the east of the River Yarra, the works to be carried out by the Country Roads Board as part of the Lower Yarra Crossing Project consist of:—

(a) the construction of a short length of Cook Street as a divided six-lane controlled access roadway from Graham Street to a point opposite Bertie Street, Port Melbourne, to provide direct access to the West Gate Bridge;

(b) the construction of a six-lane divided roadway along Rogers Street from Bertie Street, Port Melbourne, to Lorimer Street in the City of South Melbourne;

(c) the development of Graham Street, Ingles Street and portions of Boundary, Brady and Montague Streets to provide four-lane capacity for through traffic.

Improvements to Graham Street comprise widening to approximately 75 feet between kerbs, and the provision of a median 13 feet wide, from a point 800 feet northerly from Plummer Street, Port Melbourne, to Foote Street, South Melbourne. This includes the replacement of the existing gated rail crossing over the Port Melbourne railway by an overpass providing two carriageways 26 feet wide separated by a narrow median.

Improvements to Ingles Street comprise a signalized intersection at Rogers Street, conversion of the existing crossing over the Port Melbourne railway to a dual carriageway boom-gated crossing, and the reconstruction of Ingles Street extending into Dorcas Street and terminating at Ferrars Street, to provide two carriageways varying between 28 and 33 feet wide separated by a median.

Improvements to Boundary, Brady and Montague Streets comprise:

(a) a channelized intersection at the junction of Rogers, Lorimer and Boundary Streets;

(b) reconstruction of Boundary Street from Rogers Street to Brady Street to provide two carriageways 30 feet wide separated by a median;

(c) reconstruction of Brady Street from Boundary Street to Johnson Street to 46 feet between kerbs, and improvement of 500 feet of Montague Street between Johnson and Munro Streets, which will provide a four-lane undivided carriageway throughout this section.

SPECIAL PROJECTS

The Roads (Special Projects) Act 1965 has been in operation since 1st July, 1965. Its prime purpose was to provide funds to enable an accelerated programme of major road and bridge works to be pursued. The Act increased motor registration fees for private vehicles, business vehicles and commercial vehicles by approximately 22%, 44% and 50% respectively, and provided for the consequent additional revenue to be paid into a new fund entitled the "Roads (Special Projects) Fund".

Motor registration fees were further increased as from 1st March, 1968, by approximately 12%. In all, approximately one-third of the total amount of registration fees is paid into the Roads (Special Projects) Fund. The total amount expended by the Board from the fund to 30th June, 1969, was $10,672,000.

Works to be financed from the Roads (Special Projects) Fund must be approved by the Governor-in-Council on the recommendation of the Treasurer of Victoria. Each financial year the Board submits recommendations through the Minister of Public Works to the Treasurer for Special Projects to be carried out or commenced during the year. The Board's recommendations have aimed at extending the construction of dual carriageways on the heavily trafficked State highways radiating from Melbourne in addition to the Board's own major works programme, and the extension of the mileage of roads of tourist interest throughout the State.

Special projects commenced by the Board prior to 30th June, 1969, are detailed below:—

Project No.	Project	Length (Miles)	Progress of Works
2.	**Hume Highway**—Extension of the four lane divided highway from Craigieburn to Wallan.	11.0	Duplication has been completed from Craigieburn to the foot of Beveridge Hill, a distance of approximately 8.5 miles. The deviation at Beveridge is almost completed.
5.	**Western Highway**—Extension of the four lane divided highway from Deer Park to west of Bacchus Marsh (including the by-pass of Bacchus Marsh).	23.3	12.5 miles of divided highway have already been constructed. Construction of the by-pass of Bacchus Marsh is to commence in 1969/70.
6.	**Princes Highway East**—Extension of the four lane divided highway from Doveton to east of Narre Warren.	4.6	Work completed.
7.	**Western Highway**—Construction of a four lane divided highway from west of Myrniong to east of Ballan (including a new deviation at Pykes Creek Reservoir and a second bridge over the reservoir).	4.0	Work completed.
8.	**Hume Highway**—Extension of the four lane divided highway from south to north of Tallarook, including a by-pass of Tallarook.	4.5	Two miles of dual carriageway have been constructed south of Tallarook. Work on the remaining sections of the project is in progress.
9.	**Princes Highway East**—Construction of the Princes By-pass Road (Moe Section).	3.6	Work completed.
10.	**Princes Highway East**—Construction of a two lane deviation and a bridge at Hospital Creek near Orbost.	5.5	Work completed.

continued overleaf

Project No.	Project	Length (Miles)	Progress of Works
11.	**Maroondah Highway**—Extension of the six lane divided highway from Stirling Road, North Croydon, to Brushy Creek.	2.0	Opened to traffic. Minor works to be completed.
12.	**Taylor Bay Road**—Construction of a new road from Taylors Road to Maintongoon Road to link Eildon township with Bonnie Doon.	9.7	Work completed.
13.	**Nepean Highway**—Extension of the four lane divided highway from beyond Old Mornington Road to south of the turnoff to Manyung including a four lane by-pass of Mt. Eliza.	2.0	Work completed.
14.	**Marlo-Cape Conran Road**—Construction of a new road for tourists to Cape Conran.	11.0	Work completed.
15.	**Jamieson-Licola Road**—Construction of a new road to link Licola in Maffra Shire with Jamieson in Mansfield Shire.	10.6	Opened to traffic. Minor works to be completed.

In addition to the above projects, the approval of the Governor-in-Council has been obtained to commence 7 new projects:—

Project No.	Project	Length (Miles)
16.	**Western Highway**—Construction of a four lane divided highway from east of Gordon to east of Ballarat, including the by-pass of the townships of Gordon, Wallace and Bungaree.	11.0
17.	**Hume Highway**—Construction of a four lane divided highway from south of Wallan to north of Broadford.	19.5
18.	**Peterborough-Childers Cove Road**—Construction of a tourist road between Peterborough and Childers Cove.	14.0
19.	**Mt. Abrupt Road**—Construction of a tourist road from north of Dunkeld to join the Grampians Road south of Mirranatwa Gap.	16.0
27.	**Mulgrave By-pass Road**—Construction of a four lane divided by-pass road from west of Stud Road to and including the interchange with Eumemmerring By-pass Road.	2.7
28.	**Eumemmerring By-pass Road**—Construction of a four lane divided by-pass road from the interchange with the Mulgrave By-pass Road to south of the Princes Highway East interchange.	1.0
29.	**Mornington Peninsula By-pass Road**—Construction of a two lane carriageway from the Nepean Highway near Palmerston Avenue, Dromana, to Eastbourne Road.	5.0

Special Project No. 9—The Princes By-pass Road (Moe Section) west of Moe.

Special Project No. 15. The Jamieson-Licola Road. Construction in progress near Mount Skine.

MATERIALS RESEARCH

The testing and investigation of soils and roadmaking materials forms the greater part of the work of the Board's Materials Research Division. Some of the other investigations which are carried out concern structural steels, foundation problems, the quality of bitumen and line marking paints, and the location of new sources of roadmaking materials.

These activities require the services of professional officers in the fields of civil and mechanical engineering, chemistry, physics, metallurgy, electronics, geology and geophysics, together with skilled technicians.

In co-operation with the Australian Road Research Board the Materials Research Division has commenced a study of seasonal variations in the strength of road pavements as measured with the Benkelman Beam apparatus. The purpose of the study is to determine whether seasonal variations due to changes in temperature or in subgrade moisture conditions are sufficient to warrant adjustment of the results of pavement strength tests according to the season of the year when the measurements are made.

Site laboratories with the necessary testing facilities have been established at some of the larger projects being undertaken by the Board. At the Lower Yarra Freeway and the Strathmore By-pass Road, the provision of these laboratories has resulted in more efficient control of earthworks and pavement construction.

BRIDGES

NEW BRIDGES COMMENCED

During the year the construction of 179 bridges estimated to cost $6,690,000 was commenced both under the Board's direct supervision and under municipal supervision. The number and estimated cost of bridge projects commenced in financial years 1967/68 and 1968/69 are shown below:—

	1967/68		1968/69	
	Number	Estimated Cost	Number	Estimated Cost
Bridges commenced under the Board's supervision	65	$5,540,000	71	$4,640,000
Bridges commenced under municipal supervision with financial assistance from the Board	89	$1,930,000	108	$2,050,000
Total bridges commenced	154	$7,470,000	179	$6,690,000

LARGE BRIDGES COMPLETED IN RURAL AREAS

Some of the larger bridges completed under the supervision of the Board's staff in rural areas of Victoria during the financial year included:—

(a) **Glenelg River Bridge—Princes Highway West—Shire of Portland;** A ten span prestressed concrete beam and reinforced concrete bridge 800 feet long by 28 feet between kerbs over the Glenelg River on a new alignment of the Princes Highway West near Dartmoor.

(b) **Pykes Creek Reservoir—Western Highway—Shire of Ballan;** A four span prestressed concrete beam and reinforced concrete bridge 355 feet long by 28 feet between kerbs, together with a single span bridge 47 feet long, thus completing the duplication of the Western Highway bridges over the Pykes Creek Reservoir at 43.6 miles.

(c) **Wannon River Bridge—Glenelg Highway—Shire of Dundas;** A three span prestressed concrete beam and reinforced concrete bridge 181 feet long by 28 feet between kerbs over the Wannon River on the Glenelg Highway at 193.2 miles near Wannon.

(d) **Goulburn River Bridge—Maroondah Highway—Shire of Alexandra;** A five span prestressed concrete beam and reinforced concrete bridge 301 feet long by 28 feet between kerbs over the Goulburn River on the Maroondah Highway at 79.3 miles near Alexandra.

(e) **Princes By-pass Road—City of Moe;** Five steel girder and reinforced concrete overpass and underpass structures on the Princes By-pass Road at Moe. The structures range in length from 74 feet to 321 feet, and in width from 28 feet to 44 feet between kerbs.

Some of the larger bridges completed during the year under municipal supervision with financial assistance from the Board included:—

(a) **King River Bridge—Bright Road—City of Wangaratta;** A six span steel girder and reinforced concrete bridge 262 feet long by 28 feet between kerbs, plus a footway 5 feet wide, over the King River on the Bright Road in the City of Wangaratta.

(b) **Barwon River Bridge—Inverleigh-Winchelsea Road—Shires of Bannockburn and Winchelsea;** A six span prestressed concrete beam and reinforced concrete bridge 270 feet long by 24 feet between kerbs replacing two very old timber bridges over the Barwon River on the Inverleigh-Winchelsea Road.

(c) **Edi Bridge over King River—Edi-Cheshunt Road—Shire of Oxley;** A six span prestressed concrete beam and reinforced concrete bridge 271 feet long by 24 feet between kerbs over the King River on the Edi-Cheshunt Road at Edi.

(d) **Merri Creek Bridge—Mahoney's Lane—City of Broadmeadows;** Widening of the existing concrete substructure and replacement of the timber deck with a wider steel girder and reinforced concrete superstructure 131 feet long by 28 feet between kerbs plus a footway 6 feet wide.

(e) **Boggy Creek Bridge—Traralgon-Maffra Road—Shire of Maffra;** A five span high strength U slab and reinforced concrete bridge 175 feet long by 28 feet between kerbs over the Boggy Creek on the Traralgon-Maffra Road in the Shire of Maffra.

Princes Highway West, Shire of Portland. The Glenelg River Bridge at Dartmoor during construction.

Glenelg Highway, Shire of Dundas. New Concrete Bridge over the Wannon River near Wannon.

Princes Bypass Road (Moe Section) A reinforced concrete bridge providing grade separation.

Bright Road, City of Wangaratta. New bridge over the King River.

New bridge over the King River on the Edi-Cheshunt Road, Shire of Oxley.

METROPOLITAN BRIDGES AND OVERPASSES.

Included amongst the major structures in the metropolitan area on which work proceeded under the direct supervision of the Board's staff were:—

(a) Lower Yarra Freeway, forming the western approach to the new crossing of the Yarra River. Plans were completed and contracts let for 11 road bridges and two pedestrian overpasses estimated to cost approximately $2,200,000.

(b) Strathmore By-pass Road. Five of the eight bridge structures on the Strathmore By-pass Road were completed, and work is in progress on the remaining three structures. The total cost of these bridgeworks is estimated to be approximately $2,900,000.

View looking west along the Strathmore By-pass Road under construction, showing the bridge structure.

(c) Hopetoun Bridge over the Maribyrnong River on Dynon Road in the Cities of Footscray and Melbourne. The bridge is expected to be completed early in 1970 at a cost of $1,100,000. It will be 483 feet long with duplicate road pavements each 26 feet wide, and with two footways each 7 feet wide.

(d) Pedestrian Overpasses. Three pedestrian overpasses were completed during the year under the Government's scheme for the replacement of school crossings on the more heavily trafficked routes, namely:—

(i) Maroondah Highway at the Blackburn State School.

(ii) Nepean Highway at Dane Road near the Moorabbin State School.

(iii) Maroondah Highway at Peel Street, Mitcham, near the St. John's Roman Catholic School.

The cost of these overpasses is being met by the State Government, the municipal council concerned and the Board, in equal proportions.

In addition, the Board constructed a pedestrian overpass on the Nepean Highway at Wooralla Drive near the Mt. Eliza State School as part of the project to provide duplicate carriageways on this section of highway.

Nepean Highway, Shire of Mornington. Pedestrian overpass at Mount Eliza.

BRIDGE AND CULVERT MATERIALS

The total length of reinforced concrete pipes supplied throughout the State for bridgeworks towards which the Board provided funds showed a considerable increase over previous years. A total of 253,000 lineal feet valued at $493,000 was supplied. Corresponding figures for the previous year were 150,000 lineal feet at a cost of $314,000.

The total length of reinforced concrete box culvert sections supplied was 20,800 lineal feet at a cost of approximately $214,000. This represented an increase of 55% over the previous year.

Corrugated steel pipes and culverts used were estimated to be worth $88,000 compared with $52,000 in the previous year. Corrugated steel guardrail used was valued at $106,000 for 97,800 lineal feet.

Increases were noted in the use of reinforcing steel, with 4,100 tons supplied to a value of $612,000. Over nine hundred tons of rolled steel girders were used during the year.

There was a 54% increase over last year in the production of precast concrete U slab bridge units produced in the Board's precasting yards. An amount of 8,300 tons valued at approximately $283,000 was produced during the year. Production of precast reinforced concrete piles remained almost constant with 5,700 tons being produced at a cost of $149,000.

The use of prestressed concrete bridge units increased considerably compared with previous years. Total usage was 8,100 tons valued at $442,000 compared with 3,370 tons valued at $177,000 for the previous year.

PEDESTRIAN OVERPASSES

In May, 1965, the Government announced that it has decided to create a special fund to assist in financing works to eliminate school crossings on State highways. The Government, the Board, and the municipal council concerned would each contribute one-third of the cost of construction of an overpass or underpass.

During the financial year 1965/66 the Board invited municipal councils in the Melbourne Metropolitan Planning Area to apply for subsidies on a two-to-one basis for the provision of grade separated school crossing facilities over State highways. Up to 30th June, 1969, approval has been given for the construction of pedestrian overpasses at eight locations over State highways in the Melbourne Metropolitan Planning Area.

The scope of the scheme was extended in June, 1967, when the Government agreed that applications for subsidies could be invited from councils of provincial cities in respect of crossings on State highways, and from councils in the metropolitan area for crossings on main roads and important arterial roads. To date approval has been given for the construction of four crossings over the Board's declared main roads and two crossings over unclassified roads in the Melbourne Metropolitan Planning Area. No overpasses over State highways in provincial cities have been approved.

Pedestrian overpass at Mitcham. Maroondah Highway, City of Nunawading.

Priorities for the replacement of school crossings are determined by the Traffic Commission, in conjunction with the Board. They are assessed on a formula which takes the following factors into account:—

(a) traffic volumes;
(b) average speed of traffic during the period children are travelling to and from the school;
(c) the number of children crossing the road during this period;
(d) the age range of the children;
(e) the type of road to be crossed (single or divided carriageway and their widths).

The pedestrian overpasses approved to 30th June, 1969, are listed below:—

Municipality	Road	Approximate Location	Progress
Sunshine City	Western Highway	Braybrook State School	Completed
Sunshine City	Western Highway	Braybrook High School	Completed
Footscray City	Princes Highway West	Ormond Road near Kingsville State School and Corpus Christi Denominational School	Completed
Moorabbin City	Nepean Highway	Dane Road near Moorabbin State School	Completed
Nunawading City	Maroondah Highway	Blackburn State School	Completed
Nunawading City	Maroondah Highway	St. John's Roman Catholic School, Mitcham	Completed
Mordialloc City	Nepean Highway	Parkdale State School	Design completed
Essendon City	Buckley Street	Leslie Road near St. Columba's Girls' College, Lowther Hall Girls' College and Penleigh Girls' School	Investigation proceeding
Collingwood City	Johnston Street	Clarke Street near St. Euphrasia Roman Catholic School	Investigation proceeding
Heidelberg City	Heidelberg Road	Silk Street, Rosanna, near Rosanna Golf Links, State School and Roman Catholic School	Investigation proceeding
Box Hill City	Burwood Highway	Bennettswood State School	Investigation proceeding
Box Hill City	Canterbury Road	St. Leo's College	Investigation proceeding
Frankston City	Frankston-Flinders Road	Davey Street near Frankston State School and Roman Catholic School	Investigation proceeding
Melbourne City	Boundary Road	North Melbourne State School	Investigation proceeding

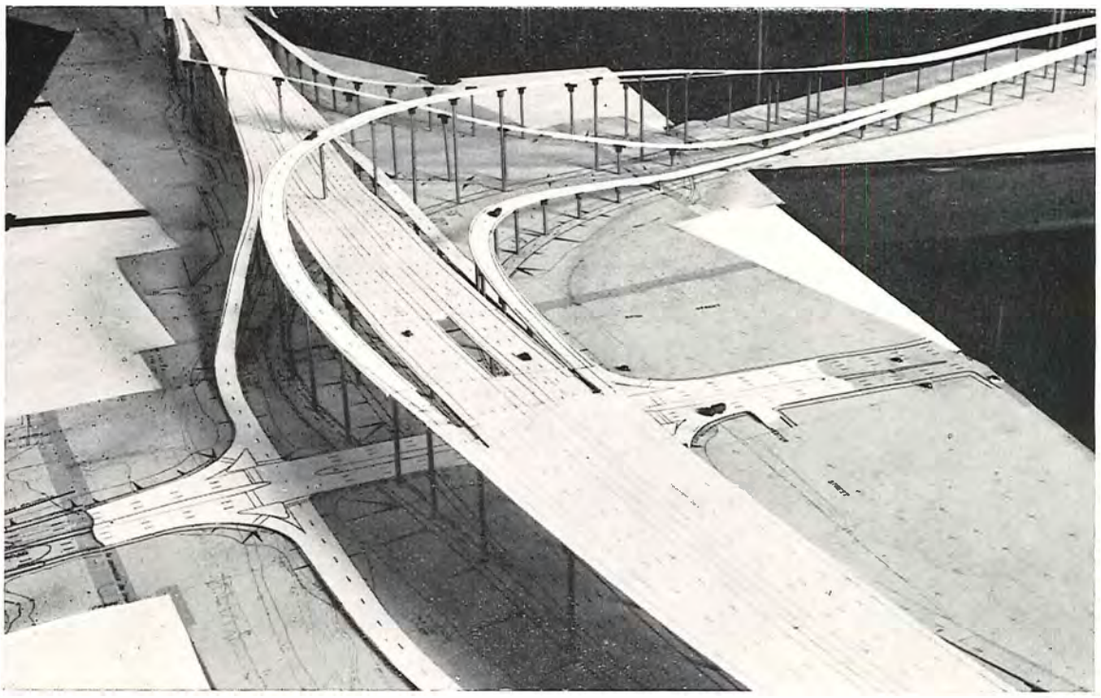
ROAD DESIGN

Models are useful aids in the design of roads. It is essential that the design engineer can visualize the finished roadway as it will appear to the community, and especially to the drivers of vehicles. Even experienced designers find some difficulty in determining all the implications of this if they examine only the conventional plans and elevations produced during the design process.

During the year, the Board purchased a British-made *Three Dimensional Design System* which enables simple models to be produced more accurately than could be done with previous methods.

The apparatus consists of a number of half-hexagon tables which are arranged to conform to the configuration of the alignment to be studied. These are levelled to provide a true working surface on which plans are laid. One-eighth inch diameter steel pins are then inserted to level at intervals along the kerb lines or the centre-line of each carriageway. The table tops are constructed of a material into which the pins can be pressed by hand and held firmly. When the pins are set to level and capped with rubber seatings, a cardboard cutout of the road surface is fitted to define the levels, curves and margins of the road pavements.

Road design is a three-dimensional concept, and there are many advantages if planning can be done in three dimensions. The comparison of alternative interchange layouts is often difficult to visualize from two dimensional plans, but in model form the design problems associated with each scheme are quickly appreciated. Special viewing devices are used to enable alignments to be examined as they would appear to motorists, allowing practical assessment of safety features, aesthetic considerations and driver sight distances.



The Three Dimensional Design System for simple but accurate models.

ELIMINATION OF RAILWAY LEVEL CROSSINGS

The progressive elimination of railway level crossings on busy roads continued during the year, and the following projects were completed:—

Princes Highway West—East Winchelsea—Shire of Winchelsea

A steel and reinforced concrete road over rail overpass bridge 120 feet long and 28 feet between kerbs. The Country Roads Board was the constructing authority.

Fish Creek—Foster Road—Hoddle—Shire of South Gippsland

A steel and reinforced concrete road over rail overpass bridge 126 feet long and 20 feet between kerbs on an improved alignment. The Country Roads Board was the constructing authority.

The apportionment of expenditure on level crossing elimination projects is generally Country Roads Board 45%, Victorian Railways 20%, and the Level Crossings Fund 35%. Expenditure during the year amounted to $1,427,000, of which the Board contributed $527,000.

Other projects under construction during the year were:—

Canterbury Road—Canterbury—City of Camberwell

A steel and reinforced concrete rail over road overpass bridge 71 feet between abutments. The Victorian Railways is the constructing authority for the bridge structure. Lowering of the road surface under the bridge and improvements to adjacent streets is being carried out by the Board.

Somerville Road—Yarraville—City of Footscray

Work commenced on a road over rail overpass to provide for four lanes of traffic in Somerville Road. The Victorian Railways is the constructing authority, and the Board is responsible for constructing the approaches and roadworks.

Princes Highway West—Garvoc—Shire of Warrnambool

Work commenced on the construction of a road over rail overpass of the Melbourne-Warrnambool railway line. The Country Roads Board is the constructing authority.

Princes Highway East—Traralgon

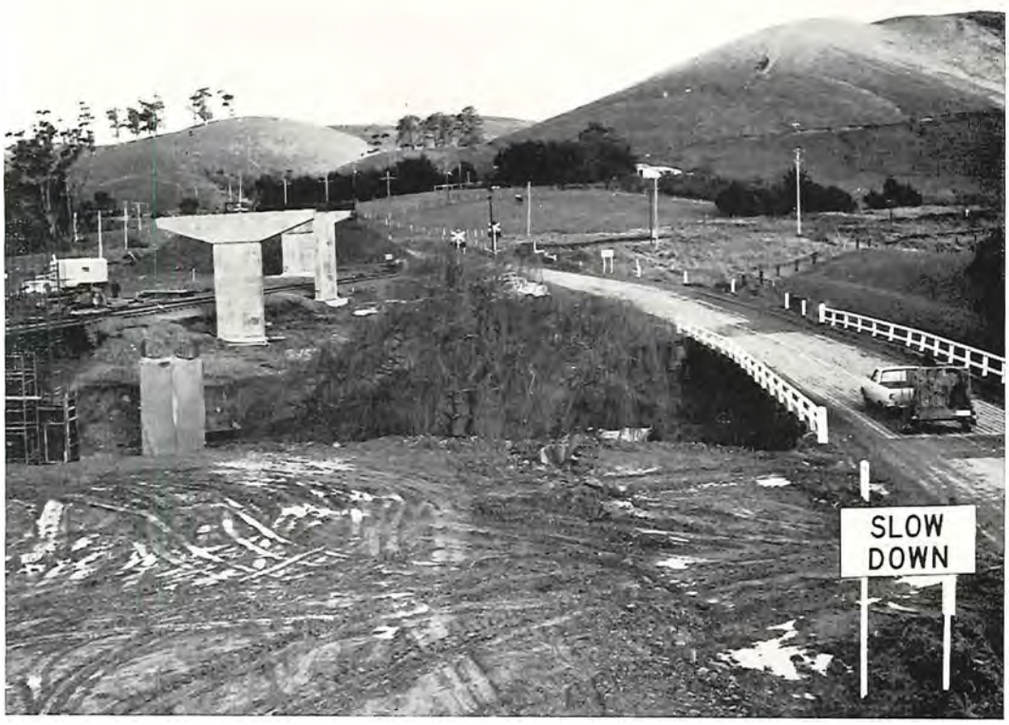
Work commenced on the construction of a two lane road bridge 50 feet wide over the Traralgon-Maffra railway line, provision has been made for future duplication of the bridge. The Victorian Railways is the constructing authority.

South Gippsland Highway—Loch—Korumburra Shire

Work commenced on the construction of a combined overpass structure spanning Alsops Creek and the south-eastern railway line to eliminate the present railway level crossing and the narrow timber road bridge over Alsops Creek. The Country Roads Board is the constructing authority.

Calder Highway—Elphinstone—Metcalfe Shire

Work commenced on the construction of a road over rail overpass on a deviation of the Calder Highway. The Country Roads Board is the constructing authority.



South Gippsland Highway, Shire of Korumburra. Construction of an overpass of the south-eastern railway line and Alsops Creek.

NATIONAL PARKS AUTHORITY

The Government again provided $100,000 for work on roads and associated purposes in or adjacent to National Parks. The amount of $100,000 made available was allocated in conjunction with the National Parks Authority for work on roads in or near:—

The Mt. Buffalo National Park

The Fraser National Park

The Kinglake National Park

The Wyperfeld National Park

The Wilson's Promontory National Park

The Ferntree Gully National Park

The Mount Richmond National Park.

At the 30th June, 1969, $562,511 has been expended from the total provision of $600,000 made available by the Government since 1st July, 1963.

TOURIST DEVELOPMENT AUTHORITY

Since financial year 1960/61 the Government has provided an amount of $200,000 per annum for expenditure by the Board in conjunction with the Tourist Development Authority on roads of tourist interest other than proclaimed tourists' roads. The careful selection of projects on which this money has been expended has greatly increased the accessibility of many of the tourist attractions of the State.

The $200,000 made available in financial year 1968/69 enabled allocations to be made for the following works giving access to places which offer attractions to tourists:—

The Mt. Pinneger access road in Alexandra Shire.

The Mt. Difficult Lookout access road in the Grampians tourist area.

The access road to Mt. Baw Baw via Mt. Gwinear.

Cape Nelson Lighthouse Road in the Shire of Portland.

The access road to Lake Burrumbeet in the Shire of Ripon.

Truemans Road in the Shire of Flinders.

Wannon-Nigretta Falls Road in the Shire of Dundas.

The access road to Mt. Rouse.

At the 30th June, 1969, $1,696,579 had been expended from the total provision of $1,800,000 made available by the Government since 1960/61.

The Board is required to make an annual payment into the Tourist Fund amounting to 2 per cent of the amount credited to the Country Roads Board Fund from receipts under the Motor Car Act. An amount of $536,107 was paid by the Board during the year. The Tourist Fund is administered by the Tourist Development Authority.

RURAL FINANCE AND SETTLEMENT COMMISSION

Expenditure from the Board's funds during the year in the Heytesbury Settlement Area amounted to $24,000, while $8,000 was expended on the commencement of another road development scheme in the Rochester Irrigation Area.

The provision of adequate roads to serve the Heytesbury Settlement Area was commenced by the Board in 1955/56, the costs to be shared between the Rural Finance and Settlement Commission (one-half), the Board (three-eighths) and the Heytesbury and Otway Shire Councils (one-eighth). The total expenditure from the Board's funds to 30th June, 1969, has been $1,082,000, representing the construction of 69.2 miles of roads in Heytesbury Shire, 64.4 miles in Otway Shire, and 20.5 miles of roads common to both municipalities. Responsibility for the future maintenance of almost 100 miles of roads has been accepted by the Councils. The area of land now served by roads is estimated to be 100,000 acres.

An over-dimensional load on the Princes

CONTROL OF HEAVY TRAFFIC

Under the provisions of the Motor Car Act the Board is the authority charged with the responsibility of issuing permits for vehicles and loads exceeding the legal weight or dimensions to travel—

(a) on State highways, main roads, tourists' roads, forest roads, and by-pass roads declared or proclaimed under the provisions of the Country Roads Act; and

(b) on a journey which includes travelling over unclassified roads in two or more greater metropolitan municipalities. The greater metropolitan municipalities for the purposes of the Motor Car Act are defined as the cities of Box Hill, Brighton, Broadmeadows, Brunswick, Camberwell, Caulfield, Chelsea, Coburg, Collingwood, Dandenong, Essendon, Fitzroy, Footscray, Hawthorn, Heidelberg, Keilor, Kew, Malvern, Melbourne, Moorabbin, Mordialloc, Northcote, Nunawading, Oakleigh, Port Melbourne, Prahran, Preston, Richmond, Ringwood, St. Kilda, Sandringham, South Melbourne, Springvale, Sunshine, Waverley, and Williamstown, and the shires of Altona, Berwick, Cranbourne, Croydon, Doncaster and Templestowe, Eltham, Ferntree Gully, Flinders, Frankston, Hastings, Lillydale, Mornington and Whittlesea.

The following table sets out the number and type of permits issued in financial year 1968/69 compared with those issued in financial year 1963/64:—

	1963/64	1968/69	% Increase
Single trip permits issued at Head Office	11,536	17,653	53
Single trip permits issued at Divisional Offices	3,205	6,582	105
Annual permits issued at Head Office	2,316	2,808	21
14-Day permits issued	1,600	—	—
90-Day permits issued	—	389	—
Container permits issued	—	56	—
Total number of permits issued	18,657	27,488	47
Included in this total were permits for:—			
70 tons gross and over	187	393	110
100 tons gross and over	22	29	32

The increase in the number of permits issued is some reflection of the State's industrial and commercial expansion.

The Board also has power to prosecute for offences under the Motor Car Act relating to weight, height, length, width and speed where the offence occurs on a State highway, main road, tourists' road, forest road or by-pass road. The Board also has similar authority in respect of unclassified roads in the greater metropolitan municipalities.

The Board's Traffic Officers submitted a total of 8,466 offence reports during the year resulting in $325,077 in fines and costs payable into Consolidated Revenue.

LEGISLATION AFFECTING THE BOARD

Legislation enacted during the year which affected the Board included the following:—

Country Roads (Declarations) Act 1968 No. 7769

The purpose of this Act was to reduce the number of matters which, under the Country Roads Act, required the approval or confirmation of the Governor-in-Council. Amendments were made to the following Sections of the Country Roads Act 1958:—

Section 21

This section relates to the declaration of new roads and deviations from and widenings to existing main roads. When the construction work has been completed and the road is fit to be used as as public highway the Board by resolution declares the new road or deviation or widening to be a main road or part thereof. The confirmation of the Governor-in-Council was required to the Board's resolution. The amendment to this section removes the necessity to obtain the confirmation of the Governor-in-Council.

Section 22

Under this section the Board was required to obtain the approval of the Governor-in-Council to the carrying out of all works of permanent improvement on main roads. The section was amended to provide the Board with the authority to approve such works being carried out.

Sections 23 and 24

These sections impose a statutory obligation on municipal councils to carry out all permanent works on and the maintenance of declared main roads in their municipal districts. The Act also provided that the Governor-in-Council may by order direct that any permanent works or maintenance specified in such order shall be carried out by the Country Roads Board. The amendment removed reference to the Governor-in-Council and provides for the approval of the Minister to give the Board the authority to carry out such permanent works and maintenance.

Section 58

This section was amended to enable the Board to discontinue rescinded, declared or proclaimed roads at any time subsequent to the declaration of deviations of such roads.

Motor Car (Further Amendment) Act 1968 No. 7777

Amongst other things this Act made provision for:—

(1) an increase in the maximum legal width of motor vehicles from 8′ to 8′2½″;

(2) the Board's Traffic Officers to have power to prosecute those who contravene the provisions of the Motor Car Act relating to speed, weight and dimensions of vehicles on any road within the greater metropolitan municipalities.

Footscray (Lower Yarra Crossing Access Road) Land Act 1969 No. 7793

This Act authorized the Footscray City Council to sell part of certain lands held in trust for public park or recreational purposes to the Board for the construction of an access road to the Lower Yarra Freeway.

FILMS AND DISPLAYS

During the year the Board's film unit produced a 16 m.m. colour sound film entitled "Special Projects" showing the accelerated programme of road works made possible by the Roads (Special Projects) Fund.

Photographs of the Board's works and municipal works carried out with financial assistance from the Board were displayed at the Royal Agricultural Show, the International Motor Show, and a road safety display at the Southland Shopping Centre. A feature of the Board's exhibition at the International Motor Show was a display of eleven large transparent colour photographs which depicted projects in each of the Board's Divisions. Much use has been made of the Board's 19 feet long model of the Lower Yarra Freeway, which has been on public display at the University of Melbourne and at several locations in the Williamstown and Altona areas. The model was also incorporated in the Royal Agricultural Show and International Motor Show displays.

Increasing use is being made of visual aids in staff training where overhead projectors, slide projectors, and 16 m.m. cinema projectors are frequently employed to advantage.

Screenings of the Board's films were given on seven occasions during the year to clubs and organizations.

The Board's exhibit at the 1969 International Motor Show.

MUNICIPAL INSPECTIONS

During the year Members of the Board inspected thirty municipalities in various parts of the State. The municipalities were the Shires of Bacchus Marsh, Belfast, Berwick, Euroa, Flinders, Huntly, Kaniva, Lowan, Mirboo, Narracan, Orbost, Romsey, Shepparton, Sherbrooke, Towong, Violet Town, Wangaratta, Warragul, Warrnambool, Whittlesea and Wycheproof, the Borough of Port Fairy, the Town of Bairnsdale and the Cities of Altona, Footscray, Kew, Moe, Shepparton, Wangaratta and Warrnambool.

The Board is most appreciative of the co-operation and hospitality extended by the councils of these municipalities.

Through these inspections the Board Members maintain an up-to-date knowledge of road conditions throughout the State, and from discussions with councils and their officers gain first-hand information of local problems and requirements.

The main points noted during the inspections were the continued development taking place with the opening up of areas in various parts of the State—developments in which the municipal councils play a considerable part, and the expanding use of bulk transport of primary produce.

These factors further emphasize the value of good roads.

DEPUTATIONS

Owing to other commitments it was not possible for the Board to make time available to receive all deputations requested, but during the year thirty-one deputations from municipal councils and local organizations were received.

It is necessary to consider local needs against the broad background of the State's development, and as requests for additional work inevitably hinge upon the provision of increased funds, the Board was not in a position to meet all requests made by local representatives. The information provided and the exchange of information at these deputations is of value to the Board in assessing future road needs.

CONFERENCES

MUNICIPAL ENGINEERS

Each year the Board convenes a three-day conference of municipal engineers. The twenty-fifth conference held on 12th and 13th February, 1969, was attended by 240 engineers, including representatives of most municipalities in the State, and a certain number of visiting municipal engineers from New South Wales, South Australia and Tasmania. Representatives of various Commonwealth and State Government departments and authorities, Members of the Board and senior engineers of the Board also attended.

The conference was officially opened by the Hon. M. V. Porter, M.L.A., Minister of Public Works.

In addition to matters of municipal engineering, the conference covered the broad theme of current developments in road design, planning and transportation generally. Papers were submitted on a variety of subjects including planning and management of roads and regions in other countries, conservation, containerization, urban road layout, planning and construction of municipal sports and recreation facilities, decentralization and local government, services on roads, urban parking on and off streets, development of Mildura Shire, noise level for plant operators, legislative changes affecting town planning, acquisition of land for road purposes, and road safety. There were discussions on the development and use of plant, mechanical street sweeping, roading for residential subdivisions, movement of overdimensional loads, and developments in bridge construction. Films and slides on research work by the California Division of Highways on testing safety aspects of road furniture and road design shown by a visiting engineer from the U.S.A., were of particular interest.

The conference closed on 14th February with an inspection of works on the Lower Yarra Crossing approach roads and West Gate Bridge, arranged in conjunction with the Lower Yarra Crossing Authority.

The Board expresses appreciation to the engineers who presented papers or led discussions at the conference, and to the Lower Yarra Crossing Authority for its assistance.

MUNICIPAL ASSOCIATION CONFERENCES

The Board was represented at Municipal Association conferences held throughout the State during the year.

The following conferences were attended:—

1. Municipal Association of Victoria: 76th Annual Session held at Melbourne on 9th and 10th October, 1968—opening session attended by the Board Members.

2. Western District Municipal Association conferences: at Portland on 20th September, 1968—attended by Mr. F. G. Lodge, Divisional Engineer, Warrnambool; and at Cobden on 28th March, 1969—attended by Mr. J. D. Thorpe, Member.

3. Goulburn North-East Municipalities Association conference held at Mansfield on 27th March, 1969—attended by Mr. A. J. Pryor, Divisional Engineer, Benalla.

4. Gippsland Municipalities Association conference held at Wonthaggi on 28th March, 1969—attended by Mr. F. W. Docking, Divisional Engineer, Dandenong, and Mr. R. Patterson, Assistant Divisional Engineer, Traralgon.

5. Northern District Municipal Association conference held at Castlemaine on 22nd April, 1969—attended by Mr. L. Upton, Divisional Engineer, Bendigo.

6. North Western Municipalities Association conference held at Edenhope on 30th May, 1969—attended by Mr. L. M. Jones, Divisional Engineer, Horsham.

These conferences provide a valuable link in the communications between the Board and municipal councils. The Board is grateful to the Associations for the opportunity of being represented at these meetings.

NATIONAL ASSOCIATION OF AUSTRALIAN STATE ROAD AUTHORITIES

The National Association of Australian State Road Authorities originated from the conference of State Transport Ministers in 1933 when it was considered that road authorities of all States should meet from time to time. Meetings of the Association are now held twice each year and are attended by the heads of the following organizations which make up the Association:—

Department of Main Roads, New South Wales;
Country Roads Board, Victoria;
Main Roads Department, Queensland;
Highways and Local Government Department, South Australia;
Main Roads Department, Western Australia;
Department of Public Works, Tasmania;
Commonwealth Department of Works.

The object of the Association is to ensure as far as possible uniformity of policy and practice, and to exchange information on all aspects of road and bridge construction and usage, planning and administration. Detailed technical work of the Association is done by specialist committees formed of representatives of the various State Road Authorities.

The thirty-seventh meeting, the main meeting of the Association during the year, was held in Brisbane from 11th to 15th November, 1968, under the chairmanship of Mr. C. N. Barton, Commissioner of Main Roads, Queensland. Items on the agenda included reports from Standards Association of Australia Committees, technical publications and guides produced by N.A.A.S.R.A., plant and equipment, accident statistics, road signs, pavement marking and road furniture, Road Needs Survey 1969-79 and statistics, National routes, secondment of officers to Papua and New Guinea and study courses for African and Asian engineers.

The half-yearly meeting, the thirty-eighth meeting of the Association, was held in two parts, in Sydney on 12th May, 1969, and in Wellington, New Zealand, on 21st May, 1969, under the chairmanship of Mr. H. A. Lowe, Commissioner for Main Roads, Queensland. In addition to items carried forward from the thirty-seventh meeting, major items on the agenda were S.A.A. Committee reports, specification for mechanical bitumen sprayers, acceptance requirements for concrete bridge units, skid resistance of bituminous surfacing, amendment to Post and Telegraph Act (damage to P.M.G. plant and use of road reserves by P.M.G.), road vehicles standards and preparation of a manual of uniform traffic control devices. A joint meeting of N.A.A.S.R.A. and the National Roads Board, New Zealand, was also held to exchange information on road planning and needs studies, property acquisition procedures, vehicle dimensions and highway lighting.

Mr. I. J. O'Donnell, Chairman, represented the Board at these meetings.

A special meeting of the Heads of the State Road Authorities was held on 10th March, 1969, in the Board's Head Office to consider the report and recommendations of the Commonwealth Bureau of Roads following the N.A.A.S.R.A. Road Needs Survey 1969-79.

AUSTRALIAN ROAD RESEARCH BOARD

The Australian Road Research Board was established by the National Association of Australian State Road Authorities in 1960 to undertake scientific research into problems associated with roads and traffic in Australia, in addition to the research carried out by the road authorities. Heads of the State Road Authorities and the Director-General, Commonwealth Department of Works, constitute the Board. Mr. I. J. O'Donnell was re-elected Deputy Chairman of the Board at the Fifth Annual General Meeting in Sydney on 12th May, 1969.

An Advisory Council meets twice each year to give guidance on fields of research and to co-ordinate the activities of eight Specialist Committees.

The Board is financed by the six State Road Authorities which contribute on the percentage basis adopted by the Commonwealth Government for Commonwealth Aid Roads grants, and by the Commonwealth Department of Works which contributes up to 10% of the Board's expenditure. In 1968/69 the Board's expenditure was approximately $1 million.

Conferences are held every second year, the Fourth Conference being held in Melbourne from 18th to 23rd August, 1968. Over 600 delegates attended, representing a number of overseas countries and all Australian States. Papers were presented on all aspects of road engineering including planning, construction, maintenance and use of roads. Symposia were also arranged on compaction equipment, transport planning, terrain evaluation, field measurement and local government engineering.

Three meetings of Directors were held during the year, the eleventh meeting in Melbourne on 21st August, 1968; the twelfth in Brisbane on 13th November, 1968; and the thirteenth in Wellington, New Zealand, from 20th to 22nd May, in conjunction with a joint meeting with the National Roads Board. The thirteenth meeting considered financial and staffing matters, planning for new permanent accommodation for the Board and progress reports on research by the Board's Bituminous Materials Committee, Brittle Fracture Panel, Compaction Committee, Stabilization Comittee, Traffic Engineering Committee, Human Factors Committee and the Bridge Engineering Committee of N.A.A.S.R.A. A programme for new research projects was approved and decisions made to form a Road Structures Committee and a Bridge Sub-panel of the Transport Planning Committee.

PERSONNEL

The number of personnel employed by the Country Roads Board at 30th June, 1968, and 30th June, 1969, was:

	1969	*1968*
Salaried Staff	1,337	1,297
General Staff	870	858
Award Employees	2,285	2,301
	4,492	4,456

Recruitment

During the year 186 new officers were recruited to the Board's staff to fill approved additional positions and vacancies caused by resignations and retirements. In order to ensure the recruitment of staff of satisfactory quality, officers of the Board's Personnel Section visited more than 50 secondary schools during the year and made arrangements for senior secondary school students to visit Head Office. The Board was also represented at 35 careers nights conducted throughout the State.

Final year civil engineering students from the University of Melbourne and Monash University were given an insight into the Board's activities and an indication of the career opportunities available. As a consequence, the Board recruited an excellent group of young professional officers at the close of the 1968 academic year.

Retirements

During the year the following officers retired after substantial service with the Board:

Staff		Years of Service
Chomley, M. D. (Miss)	Senior Correspondence Clerk	41
Pearce, M. J. M. (Miss)	Senior Stenographer	31
Abery, B. R.	Deputy Chief Engineer—Bridges	39
Attridge, F. J.	Contracts Officer	33
Holt, L. L. G.	Engineering Assistant	28
Martin, E. H.	Engineering Assistant	33
Perrin, C. C.	Deputy Chief Engineer—Works	47
Stirling, J. B.	Films Officer	22
General Staff		
Baker, A. E.	Foreman	35
Borrman, F. N.	Patrolman	39
Cook, A.	Patrolman	33
Curtis, H. J.	Patrolman	32
Fleming, E. C.	Patrolman	35
Gilliland, J. L.	Patrolman	32
Harvey, J.	Superintendent of Works	33
MacKenzie, E.	Superintendent of Workshops	32
McMinn, W. S.	Patrolman	35
Smith, W. H.	Foreman	40

It is with regret that the death of the following personnel is recorded:

Staff		Years of Service
O'Brien, F. F.	Divisional Engineer, Ballarat	43
General Staff		
Codd, R. K.	Truck Driver	15
Dean, G. J.	Patrolman	18
Murray, F. W.	Overseer	26
Parkinson, J. R.	Superintendent of Works	28

It is with the deepest regret that the Board records the death of Mr. F. F. O'Brien, Divisional Engineer, Ballarat. Mr. O'Brien, who died suddenly on 14th April, 1969, joined the Board in 1927 as an engineering assistant. He was Assistant Divisional Engineer, Bendigo, from 1936 until his appointment in 1948 as Divisional Engineer in the newly formed Ballarat Division.

Mr. O'Brien's energetic service to the welfare of the Ballarat Division, both as the Board's representative and as a member of the community, will be sadly missed.

Industrial Relations

During the year the Board was concerned in industrial matters affecting most classifications of its personnel.

The Association of Professional Engineers continued its case for increases in the salaries of professional engineers generally and its claim for the revision of the salaries of the Board's senior engineers.

A new industrial agreement was made between the Board and the Municipal Officers' Association and other allied Associations providing for increased salaries of officers in the administrative, technical, female, general and supervisory divisions. The agreement was made following arbitrated decisions in another area of State employment which affected similar classes of officers.

Wage increases occurred in the Awards covering the Board's plant operators, carpenters, builders' labourers and construction workers. An interim increase was also granted to transport drivers. A log of claims for a new Australian Workers' Union Construction and Maintenance Award was also under discussion.

The cost to the Board of the wage and salary increases which occurred during the financial year was estimated to be $1,600,000 per annum, including the increase resulting from the National Wage Case of 1968.

Apprentices

During the year the Board experienced no difficulty in recruiting 17 apprentices for training in Motor Mechanics and Structural Steel. The total number of apprentices under training as at 30th June, 1969, was:—

Fitting and Turning	11
Motor Mechanics	51
Painter	1
Welders	4
Total	67

National Service Training

At 30th June, 1969, ten officers were undergoing National Service training.

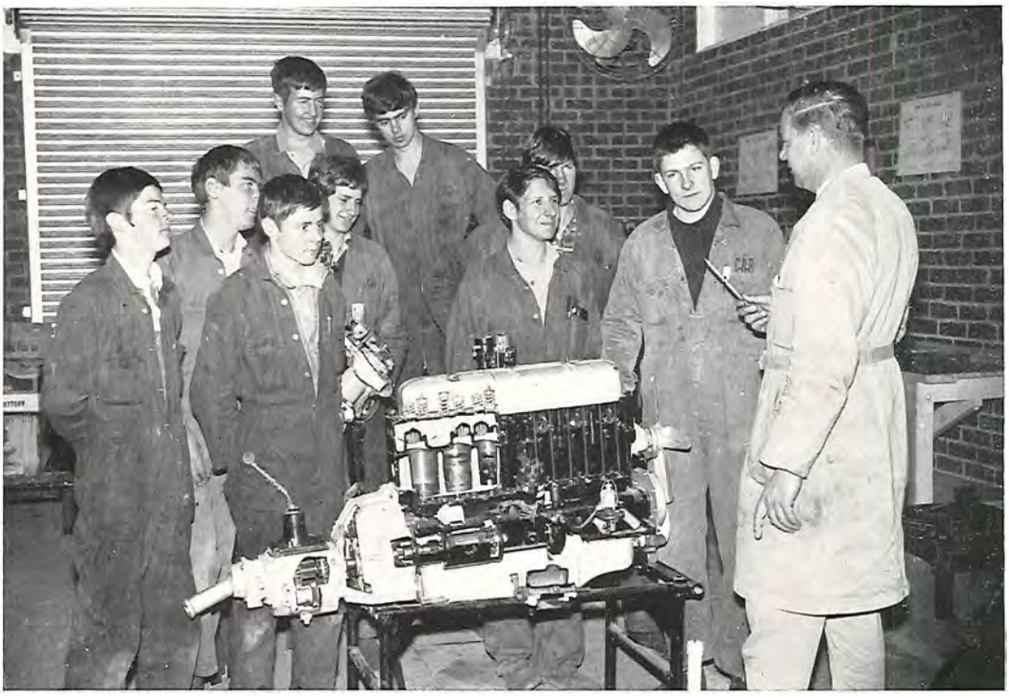
Training

The Board's annual training programme was designed once again to meet clearly defined needs.

The programme provided for in-service training courses and for certain officers to attend specific external courses of study. The in-service courses were designed by the Principal Training Officer with the assistance of the Training Steering Committee and other appropriate senior officers.

In-service training courses conducted during the year included:—

COURSES	DURATION
Communication courses	Two, three day courses and one, two day course.
Induction of Cadets	One, two day course.
Induction of new Salaried Staff	Five, one day courses.
Induction of newly appointed Supervisory Staff	One, two day course.
Contract administration courses for Supervising Engineers	Three, five day courses.
Computer appreciation courses	One, three day course, one, two day course and one, one day course.
Valuation course for Compensation Investigating Officers	Seven lectures each of one and a half hours' duration.
Training within industry (Job Instruction) courses for Workshop Foremen	Two, two day courses.
Training within industry (Job Instruction) appreciation course for Engineers	One, three day course.
Industrial relations course for Workshop Foremen	One course of four evenings.
Conferences in regional Divisions for Overseers and Patrolmen	Four, one day conferences.
Engineering survey course	One, two day course.



Apprentices receiving instruction at the Board's Central Depot, Syndal.

Selected officers were sponsored by the Board to attend the following external courses:—

The Australian Administrative Staff College—

Advanced Course.

Intermediate Course.

The University of New South Wales—

Traffic Planning and Control Course.

Construction Management Course.

Master of Engineering Science degree in Traffic Engineering.

Seven Colombo Plan Fellows received training with the Board for periods ranging from two weeks to three months. The Fellows came from Malaysia, Pakistan, Burma, the Philippines, Ceylon and Indonesia.

Cadetships

At 30th June, 1969, the Board had 46 cadets at the Universities and at the Royal Melbourne Institute of Technology. The cadets are studying Civil Engineering, Mechanical Engineering, Applied Science, Surveying and Economics.

The following table shows the number of cadets in training during the 1969 academic year:

Subject	Year of Training				Total
	1st	2nd	3rd	4th	
Civil Engineering	6	12	9	8	35
Mechanical Engineering	–	1	–	–	1
Science	2	–	1	1	4
Surveying	–	–	1	4	5
Economics	–	–	1	–	1
Total	8	13	12	13	46

Two special cadetships were awarded to officers to enable them to complete the final year of Diploma Courses on a full-time basis. One officer is completing the Diploma of Geology and the other the Diploma of Civil Engineering.

OFFICE ACCOMMODATION

TRARALGON DIVISION

In 1950 a Divisional Office was established in Traralgon. A prefabricated house on the depot and workshop site in Dunbar Road served the initial staff of six for approximately two years until a galvanized iron building was converted for office purposes. As the staff increased over the years additional temporary office accommodation was added.

Land in Kay Street, Traralgon, was purchased in 1963 as the site for permanent offices, and planning for a modern single-storey building was commenced in 1966 by the Board's Consultant Architects, Leith and Bartlett Pty. Ltd. A contract was awarded in February, 1968, to Allan Grieve Pty. Ltd. of Morwell for the construction of a fully air-conditioned building with a total floor area of approximately 10,700 square feet.

Designed to suit the residential environment in which it is situated the new divisional office and laboratory has concrete floors and brick walls supported on reinforced concrete piers and beams. Steel beams support the roof, which is covered with galvanized steel decking. Demountable partitions are aluminium framed and the floors are vinyl tiled. The accommodation has been designed to cater for a staff of 41, the present establishment consisting of 28 officers.

Country Roads Board and local representatives attended the ceremony to mark the opening of the new offices by the Minister of Public Works on 19th February, 1969.

The Dandenong Divisional office at Nunawading.

DANDENONG DIVISION

During the year the Board purchased Nunawading City Council's former administrative offices facing the Maroondah Highway, Nunawading, to provide a separate divisional office for the Dandenong Division.

The office is a two-storeyed brick building of approximately 7,500 square feet and is conveniently situated for the establishment of the administrative centre of the Division.

Some alterations to the internal layout of the building were necessary to meet the needs of the Division. On 29th March, 1969, the Dandenong Division with a staff of approximately forty officers transferred from Head Office to Nunawading.

The Board now has nine self-contained divisional offices situated at Ballarat, Bairnsdale, Benalla, Bendigo, Geelong, Horsham, Nunawading, Traralgon and Warrnambool.

APPENDIX 1

STATE HIGHWAYS AND BY-PASS ROADS

SIGNIFICANT WORKS COMPLETED DURING FINANCIAL YEAR 1968/69

BASS HIGHWAY

BASS SHIRE	Widening 2.0 miles between The Gurdies and north of Deep Creek.

BELLARINE HIGHWAY

BELLARINE SHIRE	Widening 0.5 mile to provide four traffic lanes through Leopold.

BONANG HIGHWAY

ORBOST SHIRE	Widening 4.0 miles north of Orbost to provide a sealed pavement 20 feet wide.

BURWOOD HIGHWAY

SHERBROOKE SHIRE	Construction of 0.8 mile of dual carriageways between Acacia Road and the railway bridge, Ferntree Gully.

CALDER HIGHWAY

GISBORNE, AND NEWHAM AND WOODEND SHIRES	Construction of climbing lanes on a 3.3 mile section through the Black Forest.

Calder Highway, Shire of Gisborne and Newham and Woodend. A climbing lane through the Black Forest.

CANN VALLEY HIGHWAY

ORBOST SHIRE	Reconstruction and realignment of 3.0 miles north of Noorinbee to provide a sealed pavement 20 feet wide.

GLENELG HIGHWAY

HAMILTON CITY	Construction of 0.9 mile of dual carriageways each 32 feet wide in Hamilton.
DUNDAS SHIRE	Construction of 1.0 mile of approaches to new bridge at Wannon.
GRENVILLE SHIRE	Construction of 0.3 mile of dual carriageways through the Township of Linton.

GOULBURN VALLEY HIGHWAY

YEA SHIRE	Reconstruction of 1.0 mile east of Yea. Widening, resheeting, and partial reconstruction of 0.9 mile west of Yea.

HAMILTON HIGHWAY

MORTLAKE SHIRE	Reconstruction of 5.3 miles west of Mortlake to provide a sealed pavement 24 feet wide. Reconstruction of 3.0 miles and curve improvements west of Hexham to provide a sealed pavement 24 feet wide.
MT. ROUSE SHIRE	Reconstruction of 2.8 miles east of Penshurst to provide a sealed pavement 24 feet wide.

HENTY HIGHWAY

ARAPILES SHIRE	Widening 3.6 miles between Mockinya and Wonwondah North to provide a sealed pavement 24 feet wide.
WARRACKNABEAL SHIRE	Widening 2.9 miles south of Warracknabeal to provide a sealed pavement 24 feet wide.

Henty Highway, Shire of Arapiles. Widened section between Mockinya and Wonwondah North.

HUME HIGHWAY

WANGARATTA SHIRE	Reconstruction and realignment of 0.7 mile at Bowser railway crossing to provide a sealed pavement 24 feet wide.

KIEWA VALLEY HIGHWAY

YACKANDANDAH SHIRE	Reconstruction of 2.8 miles north of Dederang to provide a sealed pavement 22 feet wide.

LODDON VALLEY HIGHWAY

GORDON SHIRE	Widening 7.8 miles between Durham Ox and Hawkinstone to provide a sealed pavement 24 feet wide.

McIVOR HIGHWAY

STRATHFIELDSAYE SHIRE	Reconstruction of 4.2 miles west of Axedale to provide a sealed pavement 24 feet wide.

MAROONDAH HIGHWAY

CROYDON SHIRE	Construction of 2.3 miles of dual carriageways between Stirling Road and Brushy Creek, North Croydon, as Special Project No. 11.

MAROONDAH HIGHWAY *continued*

LILLYDALE SHIRE	Reconstruction of the intersection with the Yarra Glen-Yea Road.
ALEXANDRA SHIRE	Construction of 1.1 miles of approaches to the Goulburn River Bridges at Alexandra.
ALEXANDRA AND MANSFIELD SHIRES	Reconstruction of 4.5 miles between Kanumbra and Merton Gap.
MANSFIELD SHIRE	Reconstruction of 0.7 mile, including the intersection with the Benalla-Maindample Road at Maindample.

MIDLAND HIGHWAY

CORIO SHIRE	Construction of 1.7 miles of dual carriageways between Weddell Road and Vines Road.
BUNINYONG SHIRE	Realignment of 0.6 mile at Clarendon to provide a sealed pavement 24 feet wide and replacement of a bridge over Williamson's Creek with a 4 cell culvert.

Midland Highway, Shire of Buninyong. Realignment and new culverts at Clarendon.

Midland Highway, Shire of Newstead. Widened section at Campbells Creek.

CRESWICK SHIRE	Widening and realignment of 2.1 miles north of Newlyn to provide a sealed pavement 24 feet wide.
DAYLESFORD AND GLENLYON SHIRE	Reconstruction and realignment of 2.2 miles at Mt. Franklin to provide a sealed pavement 22 feet wide.
NEWSTEAD SHIRE	Widening and reconstruction of 1.7 miles at Campbell's Creek to provide a sealed pavement 22 feet to 48 feet wide.
BENALLA SHIRE	Reconstruction of 3.4 miles north-west of Benalla to provide a sealed pavement 24 feet wide.
MORWELL SHIRE	Reconstruction of 1.1 miles between Yinnar and Boolarra to provide a sealed pavement 24 feet wide.

MURRAY VALLEY HIGHWAY

UPPER MURRAY SHIRE	Reconstruction of 4.1 miles between Pine Mountain Creek and Tintaldra to provide a sealed pavement 20 feet wide.
COBRAM SHIRE	Reconstruction of 0.5 mile east of and through Cobram township to provide a sealed pavement 20 feet wide.
COHUNA SHIRE	Reconstruction of 5.0 miles between Gunbower and Cohuna to provide a sealed pavement 24 feet wide.
SWAN HILL CITY	Construction of 0.8 mile of dual carriageways each 34 feet wide.
SWAN HILL SHIRE	Widening and reconstruction of 3.8 miles north of Piangil to provide a sealed pavement 20 feet wide.
	Widening 4.2 miles at Boundary Bend to provide a sealed pavement 20 feet wide.
	Reconstruction of 5.3 miles west of Wemen to provide a road pavement 18 feet wide.

NEPEAN HIGHWAY

MOORABBIN CITY	Construction of dual carriageways from Bay Road to Centre Dandenong Road.
	Construction of a pedestrian overpass at Moorabbin State School.
MORNINGTON SHIRE	Construction of 0.9 mile of dual carriageways between Wooralla Drive and Tower Road, Mt. Eliza.
	Widening 1.8 miles between Dava Drive and Balcombe Creek.
FLINDERS SHIRE	Reconstruction of the intersection with the Mornington-Dromana Road at Dromana.
	Widening, resheeting, and partly reconstructing 0.4 mile between St. Paul's Road and Continental Hill, Sorrento.

Nepean Highway, Shire of Flinders. Intersection treatment at Dromana.

NORTHERN HIGHWAY

PYALONG SHIRE	Reconstruction and widening of 2.3 miles from Kurkurac Creek to High Camp.
WARANGA SHIRE	Reconstruction of 3.1 miles south of Elmore to provide a sealed pavement 24 feet wide.
ROCHESTER SHIRE	Reconstruction of 2.0 miles north of Rochester to provide a sealed pavement 24 feet wide above flood level.

Northern Highway, Shire of Rochester. Reconstruction with lime stabilisation north of Rochester.

NORTH WESTERN HIGHWAY

LEXTON SHIRE	Reconstruction of 2.6 miles south of Lexton to provide a sealed pavement 24 feet wide.
DONALD SHIRE	Widening of 6.8 miles from Cope Cope to south of Donald to provide a sealed pavement 24 feet wide.

OMEO HIGHWAY

TOWONG SHIRE	Reconstruction and realignment of 2.1 miles north of Spring Creek to provide a sealed pavement 20 feet wide.
	Reconstruction of 1.6 miles north of Mitta Mitta to provide a sealed pavement 20 feet wide.
OMEO SHIRE	Widening 4.2 miles north of Mt. Wills to provide a road pavement 22 feet wide.
	Reconstruction and realignment of 3.4 miles between Omeo and Black Camp Creek to provide a sealed pavement 20 feet wide.

OVENS HIGHWAY

BEECHWORTH SHIRE	Reconstruction of 0.7 mile at Brookfield railway crossing to provide a sealed pavement 24 feet wide.

PRINCES BY-PASS ROAD

MOE SECTION	Construction of 3.8 miles of a new route to by-pass the City of Moe, including ¾ mile of dual carriageways with earthworks and grade separated structures which can accommodate future duplicate carriageways. Special Project No. 9.

PRINCES HIGHWAY EAST

BERWICK SHIRE	Construction of 3.7 miles of dual carriageways from east of Hallam to Berwick.
	Reconstruction of 1.0 mile through Berwick township and the construction of climbing lanes over Berwick Hill.
	Widening and resheeting of 0.7 mile between Toomuc Creek and the Koo-Wee-Rup Road.
	Reconstruction of 1.0 mile east of Garfield.
BULN BULN SHIRE	Reconstruction and realignment of 2.3 miles between Robin Hood and Drouin, including the provision of climbing lanes, to provide a sealed pavement 24 feet wide.
MOE CITY	Widening and strengthening 0.6 mile of the western approach to Moe to provide a sealed pavement 24 feet wide.
BAIRNSDALE SHIRE	Widening and strengthening 2.5 miles, including curve improvements, to provide a sealed pavement 24 feet wide.

Princes Highway East, Shire of Berwick. Reconstruction to provide climbing lanes on Berwick Hill.

Omeo Highway, Shire of Omeo. Reconstructed section between Omeo and Black Camp Creek.

PRINCES HIGHWAY WEST

HAMPDEN SHIRE	Widening and resheeting 1.6 miles at Boorcan to provide a sealed pavement 24 feet wide.
WARRNAMBOOL CITY	Reconstruction of 1.2 miles through Warrnambool to provide dual carriageways each 35 feet wide.
PORTLAND SHIRE	Reconstruction of 5.6 miles west of Heywood to provide a sealed pavement 24 feet wide.

Princes Highway East, Shire of Buln Buln. Reconstruction and realignment between Robin Hood and Drouin.

PYRENEES HIGHWAY

ARARAT SHIRE	Reconstruction of 0.7 mile west of Elmhurst to provide a sealed pavement 24 feet wide. Widening of 3.5 miles at Dunneworthy to provide a sealed pavement 24 feet wide.

Pyrenees Highway, Shire of Ararat. Reconstructed section west of Elmhurst.

SOUTH GIPPSLAND HIGHWAY

CRANBOURNE SHIRE	Reconstruction of 2.0 miles south-east of Cranbourne. Reconstruction of 0.8 mile on an improved alignment through Tooradin. Widening, realignment, and resheeting of 1.8 miles at Yallock Creek near Koo-wee-Rup.

KORUMBURRA SHIRE	Reconstruction and realignment of 1.4 miles between Loch and Bena to provide a sealed pavement 24 feet wide.
SOUTH GIPPSLAND SHIRE	Reconstruction and realignment of 1.7 miles at Foster North to provide a sealed pavement 22 feet wide.
ALBERTON SHIRE	Widening and strengthening 2.8 miles east of Yarram to provide a sealed pavement 24 feet wide.

WESTERN BY-PASS ROAD

BALLAN SHIRE	Construction of 4.0 miles of dual carriageways on an improved alignment east and west of Pykes Creek Reservoir, including the construction of duplicate bridges at the reservoir. Special Project No. 7.

WESTERN HIGHWAY

ARARAT SHIRE	Reconstruction of 2.1 miles west of Buangor to provide a sealed pavement 24 feet wide.
WIMMERA SHIRE	Reconstruction and realignment of 1.0 mile at Green Lake to provide a sealed pavement 24 feet wide.
KANIVA SHIRE	Reconstruction of 2.3 miles west of Kaniva to provide a sealed pavement 24 feet wide. Widening of 4.0 miles between Lillimur and Serviceton to provide a sealed pavement 24 feet wide.

Western Highway, Shire of Wimmera. Reconstruction and realignment at Green Lakes.

WIMMERA HIGHWAY

KARA KARA SHIRE	Widening of 4.8 miles east of Gre Gre to provide a sealed pavement 24 feet wide.

APPENDIX 2

TOURISTS' ROADS AND FOREST ROADS

SIGNIFICANT WORKS COMPLETED DURING FINANCIAL YEAR 1968/69

TOURISTS' ROADS

ALPINE ROAD	Reconstruction and curve improvement of 1.9 miles between Cobungra Station and Victoria River to provide a pavement 24 feet wide.
MOUNT BUFFALO ROAD	Sealing 1.8 miles on the Chalet Road and 1.0 mile of re-alignment and sealing on the Horn Road.
MOUNT BULLER ROAD	Widening 1.3 miles to provide a formation 25 feet wide.
OCEAN ROAD	Reconstruction and realignment of 1.1 miles between Windy Point and the Cumberland River. Reconstruction of 0.9 mile near the Aire Settlement Road junction.
WILSONS PROMONTORY ROAD	Reconstruction and realignment of 0.6 mile north of Tidal River to provide a sealed pavement 20 feet wide, and the construction of a three span reinforced concrete bridge 28 feet between kerbs over Darby River.

Sealing a further section of the Mount Buffalo Tourists' Road.

FOREST ROADS

BRUTHEN-BUCHAN ROAD	Widening various sections to provide a sealed pavement 20 feet wide in the Shire of Tambo.
DEAN MARSH-LORNE ROAD	Reconstruction and sealing on a major realignment 3.0 miles south of Dean Marsh in the Shire of Winchelsea.
FORREST-APOLLO BAY ROAD	Reconstruction of 0.9 mile in the Shire of Otway.
LAVERS HILL-COBDEN ROAD	Reconstruction of 1.0 mile and sealing of 1.5 miles in the Shire of Otway.
MEREDITH-STEIGLITZ-MAUDE ROAD	Sealing 2.0 miles in the Shire of Bannockburn.
WALHALLA ROAD	Widening 0.7 mile between Erica and the Thompson River in Narracan Shire.

Dean Marsh-Lorne Forest Road, a realigned section north of Dean Marsh, Shire of Winchelsea.

APPENDIX 3

MAIN ROADS

SIGNIFICANT WORKS COMPLETED DURING FINANCIAL YEAR 1968/69

BAIRNSDALE DIVISION

AVON SHIRE	Dargo Road—Construction of 2.1 miles of new road on an improved alignment.
BAIRNSDALE SHIRE	Bairnsdale-Dargo Road—Reconstruction and realignment of 1.2 miles to provide a sealed pavement 18 feet wide.
OMEO SHIRE	Benambra Road—Reconstruction and realignment of 3.2 miles to provide a sealed pavement 12 feet wide.
ORBOST SHIRE	Buchan-Orbost Road—Reconstruction of 5.7 miles to complete the sealing between Buchan and Orbost.
TAMBO SHIRE	Gelantipy Road—Widening and realignment of 0.9 miles to provide a sealed pavement 18 feet wide.

Benambra Road, Shire of Omeo. Reconstruction to provide a sealed pavement 12 feet wide.

Sebastopol-Smythesdale Road, Shire of Grenville. Reconstructed section at Smythesdale.

BALLARAT DIVISION

ARARAT SHIRE	Ararat-Halls Gap Road—Widening 3.9 miles between Moyston and Pomonal to provide a sealed pavement 22 feet wide.
GRENVILLE SHIRE	Sebastopol-Smythesdale Road—Reconstruction of 2.1 miles at Smythesdale to provide a sealed pavement 20 feet wide.
RIPON SHIRE	Skipton Road—Reconstruction of 1.8 miles south of Lake Goldsmith to provide a sealed pavement 20 feet wide.

BENALLA DIVISION

BEECHWORTH SHIRE	Beechworth Road—Reconstruction of 2.2 miles to provide a sealed pavement 20 feet wide.
BENALLA SHIRE	Benalla-Yarrawonga Road—Widening 3.0 miles to provide a sealed pavement 20 feet wide.
BRIGHT SHIRE	Bright-Tawonga Road—Sealing 2.0 miles to a width of 20 feet.
GOULBURN SHIRE	Heathcote-Nagambie Road—Reconstruction and realignment of 2.5 miles to provide a pavement 20 feet wide.
MANSFIELD SHIRE	Benalla-Maindample Road—Reconstruction and realignment, installation of flashing lights at railway level crossing, and construction of a two span reinforced concrete bridge 61 feet long and 24 feet between kerbs.
	Mansfield Road—Reconstruction and realignment of 1.2 miles to provide a sealed pavement 20 feet wide.

Benalla-Yarrawonga Road, Shire of Benalla. Widened section near Bungeet.

MYRTLEFORD SHIRE	Happy Valley Road—Reconstruction and realignment of 1.4 miles to provide a sealed pavement 20 feet wide.
SEYMOUR SHIRE	Highlands Road—Reconstruction of 2.3 miles to provide a sealed pavement 18 feet wide.
UPPER MURRAY SHIRE	Tallangatta-Corryong Road—Reconstruction of 0.7 mile to provide a sealed pavement 24 feet wide.
YACKANDANDAH SHIRE	Yackandandah-Wodonga Road—Reconstruction and realignment of 0.9 mile to provide a sealed pavement 20 feet wide.

BENDIGO DIVISION

CHARLTON SHIRE	St. Arnaud-Wycheproof Road—Pavement reconstruction of 3.0 miles to provide a sealed pavement 18 feet wide.
COHUNA SHIRE	Cohuna-McMillan's Road—Reconstruction and realignment of 0.85 mile, including the construction of a new bridge and culvert.
DEAKIN SHIRE	Echuca-Kyabram Road—Widening 4.6 miles to provide a sealed pavement 22 feet wide.
EAST LODDON SHIRE	Bendigo-Pyramid Road—Widening 3.5 miles to provide a sealed pavement 22 feet wide.
ECHUCA CITY	Echuca-Nathalia Road—Installation of a large multi-cell culvert, 5 cells each 72 inch diameter.
GORDON SHIRE	Boort-Kerang Road—Reconstruction of 1.6 miles to provide a sealed pavement 20 feet wide.
KERANG SHIRE	Koondrook-Murrabit Road—Reconstruction of 1.0 mile to provide a sealed pavement 24 feet wide.
	Murrabit Road—Construction of a bridge 90 feet long and 22 feet wide over Pyramid Creek.
STRATHFIELDSAYE SHIRE	Strathfieldsaye Road—Widening 4.0 miles to provide a sealed pavement 22 feet wide.
WARANGA SHIRE	Tatura-Rushworth Road—Reconstruction of 2.0 miles to provide a sealed pavement 20 feet wide.
WYCHEPROOF SHIRE	Donald-Swan Hill Road—Reconstruction of 3.5 miles to provide a sealed pavement 20 feet wide.

DANDENONG DIVISION

BROADMEADOWS CITY	Pascoe Vale Road—Resurfacing 3.5 miles with bituminous concrete 44 feet wide.
CRANBOURNE SHIRE	Koo-Wee-Rup-Longwarry Road—Reconstruction and widening of 2.5 miles to provide a sealed pavement 20 feet wide.
	Lyndhurst Road—Reconstruction of 1.0 mile to provide a sealed pavement 24 feet wide.
CROYDON SHIRE	Mt. Dandenong Road—Construction of 0.7 mile of dual carriageway between the Shire boundary and the railway bridge.
DONCASTER AND TEMPLESTOWE CITY	Doncaster Road—Reconstruction of the intersection with Wetherby Road.
	Heidelberg-Doncaster Road—Construction of a deviation via Sybilla Street, including reconstruction of the intersection with Bulleen Road.
ELTHAM SHIRE	Eltham-Yarra Glen Road—Construction of 0.8 mile of dual carriageways through Eltham.
KNOX CITY	High Street Road—Reconstruction of 1.3 miles east of Dandenong Creek.
MORNINGTON SHIRE	Moorooduc Road—Reconstruction of 2.3 miles south of Tyabb Road.
RINGWOOD CITY	Canterbury Road—Construction of 0.3 mile of dual carriageways at Heathmont.
SHERBROOKE SHIRE	Belgrave-Hallam Road—Reconstruction and realignment of 0.8 mile south of Belgrave.
SPRINGVALE CITY	Dandenong-Frankston Road—Reconstruction and widening of 0.8 mile.
WAVERLEY CITY	Springvale Road—Reconstruction of 0.8 mile south of Highbury Road.
WHITTLESEA SHIRE	Whittlesea-Yea Road—Construction of 0.5 mile by-passing Whittlesea shopping centre, reconstruction of the intersection with Wallan Road, and the widening of 1.5 miles east of Whittlesea.

Moorooduc Road, Shire of Mornington. Reconstructed section south of Tyabb Road.

GEELONG DIVISION

BARRABOOL SHIRE	Anglesea Road—Reconstruction of 1.5 miles to provide a sealed pavement 24 feet wide.
COLAC SHIRE	Colac-Ballarat Road—Reconstruction of 1.2 miles to provide a sealed pavement 24 feet wide.
COLAC CITY	Colac-Beech Forest Road—Reconstruction of 0.2 mile to provide a sealed pavement 40 feet wide.
GEELONG CITY	Geelong-Portarlington Road—Construction of 0.4 mile of dual carriageways.
GISBORNE SHIRE	Bacchus Marsh Road—Widening 1.5 miles to provide a sealed pavement 18 feet wide.
LEIGH SHIRE	Colac-Ballarat Road—Reconstruction of 1.6 miles to provide a sealed pavement 18 feet wide.
NEWHAM AND WOODEND SHIRE	Tylden Road—Widening 1.0 mile to provide a sealed pavement 18 feet wide.
OTWAY SHIRE	Beech Forest-Lavers Hill Road—Reconstruction of 2.0 miles. Gellibrand Road—Realignment of 0.9 mile.
ROMSEY SHIRE	Gisborne-Kilmore Road—Redecking the bridge over Riddells Creek to provide a width of 28 feet between kerbs.
SOUTH BARWON SHIRE	Lower Duneed Road—Reconstruction and widening of 3.2 miles to provide a sealed pavement 20 feet wide.

Geelong-Portarlington Road, City of Geelong. Dual carriagways east of Garden Street.

METROPOLITAN DIVISION

ALTONA CITY	Millers Road—Reconstruction and duplication between Civic Parade and Kororoit Creek Road, including a new bridge over Kororoit Creek.
FOOTSCRAY CITY	Hyde Street—Continuation of duplication between Napier Street and Somerville Road.
HEIDELBERG CITY	Heildelberg-Eltham Road—Reconstruction and widening between St. James Road and Lower Plenty Road.
KEW CITY	Studley Park Road—Reconstruction between Banool Avenue and Hume Street.
PRESTON CITY	Whittlesea Road—Continuation of reconstruction and duplication from Curtain Street to Grimshaw Street.
ST. KILDA CITY	Beach Road—Reconstruction and duplication between Shakespeare Grove and Shelley Street, including new bridge over Elwood Canal.

TRARALGON DIVISION

ALBERTON SHIRE	Albert River Road—Construction of a three span reinforced concrete bridge at Hiawatha. Yarram-Traralgon Road—Reconstruction and realignment of 2.0 miles to provide a sealed pavement 20 feet wide.
BULN BULN SHIRE	Westernport Road—Construction of 1.4 miles on an improved alignment.
KORUMBURRA SHIRE	Korumburra-Wonthaggi Road—Realignment of 1.2 miles to provide a sealed pavement 20 feet wide.
WARRAGUL SHIRE	Hazeldene Road—Reconstruction of 2.2 miles.

Albert River Road, Shire of Alberton. New reinforced concrete bridge at Hiawatha.

WARRNAMBOOL DIVISION

DUNDAS SHIRE	Natimuk-Hamilton Road—Reconstruction and widening of 1.0 mile, including the replacement of three bridges by one new bridge, one culvert and levee banks.
HAMPDEN SHIRE	Camperdown-Ballarat Road—Reconstruction and widening of 2.4 miles to provide a pavement 20 feet wide. Foxhow Road—Reconstruction and widening of 1.8 miles to provide a pavement 13 feet wide.
MINHAMITE SHIRE	Warrnambool-Penshurst Road—Reconstruction of 2.8 miles to provide a sealed pavement 20 feet wide.
WANNON SHIRE	Coleraine-Edenhope Road—Reconstruction of 5.2 miles to provide a pavement 20 feet wide.

APPENDIX 4

UNCLASSIFIED ROADS

SIGNIFICANT WORKS COMPLETED DURING FINANCIAL YEAR 1968/69

BAIRNSDALE DIVISION

AVON SHIRE	Munro-Stockdale Road—Reconstruction of 1.6 miles to provide a sealed pavement 18 feet wide.
ORBOST SHIRE	Mallacoota Foreshore Road—Reconstruction of 1.1 miles to provide a sealed pavement 18 feet wide.

BALLARAT DIVISION

ARARAT SHIRE	Geelong Road—Reconstruction of 3.0 miles to provide a sealed pavement 12 feet wide.
	Parrie Yalloak Road—Reconstruction of 2.8 miles to provide a sealed pavement 12 feet wide.

BENALLA DIVISION

BEECHWORTH SHIRE	Everton-Markwood Road—Construction of a five span reinforced concrete bridge 175 feet long, 24 feet between kerbs.
EUROA SHIRE	Pine Lodge Road—Construction of a four span reinforced concrete bridge 120 feet long, 24 feet between kerbs.
WANGARATTA SHIRE	Eldorado-Tarrawingee Road—Reconstruction and realignment of 2.0 miles to provide a sealed pavement 18 ft. wide.
WODONGA SHIRE	Castle Creek Road—Reconstruction and realignment to provide a sealed pavement 18 feet wide.
YACKANDANDAH SHIRE	Osbornes Flat Road—Reconstruction and realignment of 1.2 miles to provide a sealed pavement 18 feet wide.

Osbornes Flat Road under reconstruction in the Shire of Yackandandah.

BENDIGO DIVISION

DEAKIN SHIRE	Taripta Road—Reconstruction of 1.9 miles to provide a sealed pavement 18 feet wide. Top Creek Road—Reconstruction of 1.7 miles to provide a sealed pavement 18 feet wide.
ECHUCA CITY	McKenzie Street—Reconstruction of 0.7 mile to provide a sealed pavement 30 feet wide.
KERANG SHIRE	Richardson's Road—Reforming and resurfacing 7.9 miles to provide a pavement 12 feet wide.
MILDURA CITY	Thirteenth Street—Reconstruction of 0.4 mile to provide a sealed pavement 48 feet wide.
ROCHESTER SHIRE	Hunter-Lockington Road—Reconstruction of 2.5 miles to provide a sealed pavement 12 feet wide.

DANDENONG DIVISION

ALEXANDRA SHIRE	Taylor Bay Road—Construction of 1.1 miles south of Eildon. U.T. Creek Road—Reconstruction of 1.4 miles near Haines Saddle.
CRANBOURNE SHIRE	Billington Avenue—Reconstruction of 1.9 miles to provide a sealed pavement 24 feet wide.
KNOX CITY	Scoresby Road—Reconstruction of 1.2 miles between Boronia Road and Burwood Highway.
SHERBROOKE SHIRE	Lower Mt. Morton and McNicol Roads—Reconstruction of 1.0 mile at Belgrave South.

Billington Avenue, Shire of Cranbourne. Reconstructed section prior to sealing.

GEELONG DIVISION

BARRABOOL SHIRE	Forest Road—Sealing an additional 2.0 miles of pavement 18 feet wide.
BELLARINE SHIRE	Wallington-Curlewis Road—Reconstruction of 1.1 miles to provide a sealed pavement 18 feet wide.
COLAC SHIRE	Carlisle-Colac Road—Reconstruction and realignment of 1.1 miles to provide a sealed pavement 18 feet wide.
KYNETON SHIRE	Spring Hill-Trentham Road—Reconstruction of 1.2 miles.
WERRIBEE SHIRE	Derrimut Road—Reconstruction of 1.8 miles to provide a sealed pavement 24 feet wide.
WINCHELSEA SHIRE	Mountside Road—Reconstruction of 1.1 miles to provide a sealed pavement 12 feet wide.

METROPOLITAN DIVISION

COBURG CITY	Gaffney Street—Reconstruction between Cumberland Road and Northumberland Road.
DIAMOND VALLEY SHIRE	Grimshaw Street—Reconstruction and widening between Watsonia Road and Plenty Road.
FOOTSCRAY CITY	Whitehall Street—Continuation of reconstruction between Napier Street and Somerville Road to provide dual carriageways.
OAKLEIGH CITY	Centre Road—Reconstruction between Westall Road and Doncaster-Mordialloc Road.
SOUTH MELBOURNE CITY	Canterbury Road—Reconstruction and duplication between Fraser Street and Kerford Road.
SUNSHINE CITY	St. Albans Road—Continuation of reconstruction and widening between Elm Street and Main Street.

TRARALGON DIVISION

ALBERTON SHIRE	Tap Tap Road—Reconstruction of 1.1 miles west of Gelliondale to provide a sealed pavement 20 feet wide.
KORUMBURRA SHIRE	Outtrim-Leongatha Road—Reconstruction and widening of 1.1 miles.
MORWELL SHIRE	Whitelaws Track—Reconstruction of 2¼ miles south of Yinnar.
ROSEDALE SHIRE	Rosedale-Longford Road—Reconstruction and widening of 1 mile, including realignment and the installation of flashing lights at the level crossing over the Sale railway line.
TRARALGON SHIRE	Minniedale North Road—Reconstruction of 2.2 miles southeast of Traralgon.

WARRNAMBOOL DIVISION

HAMPDEN SHIRE	Skipton-Geelong Road—Reconstruction of 2.8 miles to provide a sealed pavement 20 feet wide.
GLENELG SHIRE	Casterton-Dartmoor Road—Reconstruction of 2.2 miles to provide a sealed pavement 12 feet wide.

APPENDIX 5

MOTOR REGISTRATION

Registrations under the Motor Car Act effected during the year 1968/69 totalled 1,459,365, an increase of 8.6% over the registrations effected during the preceding year. Excluding trailers from the calculations, the increase is 6.2%

Vehicle	Financial Year 1967/68		Financial Year 1968/69		Increase	Decrease
Private—						
New	99,293		102,766			
Secondhand						
Re-registered	30,321		33,898			
Renewals	880,806		940,563			
		1,010,420		1,077,227	66,807	—
Commercial and Hire—						
New	14,467		15,659			
Secondhand						
Re-registered	4,525		4,668			
Renewals	109,592		112,487			
		128,584		132,814	4,230	—
Primary Producers' Trucks—						
New	3,732		4,262	—		
Secondhand						
Re-registered	3,946		4,576			
Renewals	75,082		77,927			
		82,760*		86,765†	4,005	—
Licences under the Motor Omnibus Act		799		692	—	107
Trailers		106,614		145,212	38,598	—
Motor Cycles		14,324		16,655	2,331	—
TOTAL		1,343,501		1,459,365	115,971	107

* Includes 42,407 No-fee Tractors.

† Includes 44,956 No-fee Tractors.

APPENDIX 6

COUNTRY ROADS BOARD

STATEMENT OF RECEIPTS AND PAYMENTS FOR YEAR ENDED 30TH JUNE, 1969
(Adjusted to nearest Dollar)

—		Country Roads Board Fund		Loan Funds	Commonwealth Aid Roads				Total
		Act 6229	Act 6222 Road Maintenance Account		Act 1964 Sec. 5 (1)	Act 1964 Sec. 5 (2)			
RECEIPTS		$	$	$	$	$	$	$	$
Balance as at 1st July, 1968		1,369,276	..	..	..	..	..	..	1,369,276
Motor Car Act 1958 (No. 6325)									
Motor Car Registration Fees	28,786,587								
Additional Registration Fees	1,848,566								
Drivers' Licence Fees	809,063								
Drivers' Licence Testing Fees	249,132								
Trailer Registration Fees	587,880								
Examiners' Licence Fees	8,054								
Sale of Log Books	10,975								
	32,300,257								
Less Cost of Collection	3,411,662								
		28,888,595	..	..	..	..	..	28,888,595	
Municipalities Contributions—									
Permanent Works—Main Roads	100,745								
Maintenance Works—Main Roads	1,830,704								
		1,931,449	..	..	..	..	..	1,931,449	
Commercial Goods Vehicles Act No. 6222		..	7,841,757	..	..	..	..	7,841,757	
Public Works Loan Application Act No. 7746		783,650	..	..	..	..	..	783,650	
Fines—*Country Roads Act* No. 6229		2,243	..	..	..	..	..	2,243	
General Receipts		517,270	..	..	..	..	..	517,270	
State Loan Funds Act No. 6229		..	..	3,389,000	..	..	..	3,389,000	
									43,353,964
Commonwealth Aid Roads Act 1964		..	..	..	19,478,253	13,245,212	..	..	32,723,465
		33,492,483	7,841,757	3,389,000	19,478,253	13,245,212	..	..	77,446,705
PAYMENTS									
Road Expenditure									
Main Roads—									
Construction and Reconstruction		8,041,297	..	224,234	3,932,518	..	12,198,049		
Maintenance		2,357,074	2,375,768	..	9,582	..	4,742,424		
								16,940,473	
State Highways—									
Construction and Reconstruction		4,198,229	..	164,766	6,612,430	..	10,975,425		
Maintenance		168,719	5,465,989	..	..	..	5,634,708		
								16,610,133	
By-pass Roads—									
Construction and Reconstruction		2,400,798	..	3,000,000	5,131,914	..	10,532,712		
Maintenance		112,614	..	..	..	..	112,614		
								10,645,326	
Tourists' Roads—									
Construction and Reconstruction		14,014	..	..	849,245	1,365,393	2,228,652		
Maintenance		564,308	..	..	..	..	564,308		
								2,792,960	
Forest Roads—									
Construction and Reconstruction		..	..	..	..	422,964	422,964		
Maintenance		..	..	..	..	255,170	255,170		
								678,134	
Unclassified Roads—									
Construction and Reconstruction		..	..	..	2,715,335	9,006,551	11,721,886		
Maintenance		..	..	..	51,925	2,195,134	2,247,059		
								13,968,945	
Murray River Bridges and Punts		85,789	..	..	..	..	..	85,789	
Traffic Line Marking		270,396	..	..	..	..	..	270,396	
									61,992,156
Statutory Payments									
Interest and Sinking Fund	2,306,042								
Metropolitan Transportation Survey	18,592								
Traffic Commission Fund	270,671								
Tourist Fund	536,107								
Transport Regulation Fund	434,855								
Transportation Research	10,000								
		3,576,267	..	..	..	..	..	..	3,576,267
Contribution to Australian Road Research Board		..	..	..	175,304	..	..	..	175,304
Capital Expenditure									
Plant Replacement and Additions	1,582,807								
Buildings, Workshops, etc.	610,832								
		2,193,639	..	..	..	..	..	..	2,193,639
Management and Operating Expenditure		6,460,035	..	..	..	..	..	..	6,460,035
		30,443,179	7,841,757	3,389,000	19,478,253	13,245,212	..	..	74,397,401
Balance at 30th June, 1969		3,049,304	..	..	..	..	..	..	3,049,304

NOTE.—Relief to Municipalities granted under Act 6229 Section 32 amounted in 1968/69 to $31,973.78.

R. G. COOPER,
Accountant,
12th November, 1969.

AUDITOR-GENERAL'S CERTIFICATE

The accounts of the Country Roads Board for the year ended 30th June, 1969, have been audited. In my opinion the above Statement of Receipts and Payments fairly presents in summary form the transactions during that period.

A. J. A. GARDNER,
Auditor-General,
28th November, 1969.

APPENDIX 7

COUNTRY ROADS BOARD

LOAN LIABILITY AS AT 30TH JUNE, 1969

	Main Roads, etc.	Developmental Roads	Total
	$	$	$
Permanent Works			
Main Roads	16,675,149.90		16,675,149.90
State Highways	15,671,476.46		15,671,476.46
By-pass Roads	3,000,000.00		3,000,000.00
Tourists' Roads	227,316.44		227,316.44
Forest Roads	2,167.89		2,167.89
Developmental Roads		12,851,515.09	12,851,515.09
Discount and Expenses	693,533.73	573,208.95	1,266,742.68
Total Amount Borrowed	36,269,644.42	13,424,724.04	49,694,368.46
Less Redemption of Loans			
Redemption Funds	170,438.11	1,292,772.73	1,463,210.84
Main Roads Sinking Fund	571,376.76		571,376.76
Developmental Roads Sinking Fund		110,166.02	110,166.02
State Loans Repayment Fund	2,951,514.60		2,951,514.60
National Debt Sinking Fund	5,299,340.85	5,586,367.30	10,885,708.15
	8,992.670.32	6,989,306.05	15,981,976.37
Loan Liability at 30th June, 1969	27,276,974.10	6,435,417.99	33,712,392.09

APPENDIX 8

WORKS EXECUTED ON BEHALF OF COMMONWEALTH AND STATE GOVERNMENT AUTHORITIES, ETC., FOR THE YEAR ENDED 30th JUNE, 1969

(Adjusted to nearest Dollar)

Departments	Description of Works	Expenditure	
		$	$
Commonwealth—			
Department of Works	Access roads to various Commonwealth establishments and to Tullamarine Freeway.	130,864	130,864
Victoria—			
Lower Yarra Crossing Authority	Authority's share of costs of acquiring land in connection with Williamstown Road Interchange as part of Lower Yarra Crossing Project.	65,610	
State Rivers and Water Supply Commission	Construction of various bridges over Commission channels, completion of roadworks in connection with Lake Nillahcootie deviation.	21,892	
Rural Finance and Settlement Commission	Roads in Commission land settlement projects throughout the State.	24,458	
Lands and Survey Department	Roadworks in Kaniva and Lowan Shires.	51,466	
Public Works Department	Bituminous sealing of Echuca Fruit Fly Block.	3,578	
Melbourne City Council	Roadworks and bridgeworks on Dynon Road Bridge over railway line and approaches.	108,408	
Melbourne and Metropolitan Board of Works	Roadworks in Healesville Shire, Sherbrooke Shire and Bell Street Interchange of the Strathmore By-pass Road and M. & M.B.W. Route 14.	297,123	
Premier's Department	Roadworks—Wonderland and Sundial Roads in Stawell Shire.	300	
Tourist Development Authority	Development of rest areas on State highways at selected locations throughout the State.	6,522	579,357
State Treasury	Kings Bridge—Proceeds of rental of properties acquired in connection with the construction of Kings Bridge less sundry expenditure.	5,733 Cr.	
,, ,,	Grade separation projects, etc., charged to Level Crossings Fund ($676,553) and Railways Department ($340,236).	1,016,789	
,, ,,	Improvements to various roads adjacent to State Forests to facilitate the extraction of timber and charged to the Municipalities Forest Roads Improvement Fund.	51,609	
,, ,,	Construction of roads and bridges charged to the Roads (Special Projects) Fund.	3,054,544	
,, ,,	Maintenance and reconstruction of various roads, providing unemployment relief in drought affected areas.	115,861	
			4,233,070
			4,943,291

APPENDIX 9

SENIOR OFFICERS

(Engineers, Class 5; Administrative and other officers Class 6 or above)

Chief Engineer's Branch

Advance Planning Engineer	Mr. F. Hosking
Asphalt Engineer	Mr. S. B. Deany
Assistant Bridge Engineer	Mr. N. C. Haylock
Assistant Deputy Chief Engineer, Road Design	Mr. W. S. Brake
Assistant Mechanical Engineer	Mr. T. Ashcroft
Engineer for Plans and Survey	Mr. N. S. Guerin
Materials Research Engineer	Mr. A. H. Gawith
Member, Traffic Commission	Mr. A. A. Strempel
Principal Title Survey Officer	Mr. T. C. Lester
Programme Engineer	Dr. K. G. E. Moody
Right of Way Engineer	Mr. A. M. Noble
Senior Design Engineer, Direct Works	Mr. K. N. Opie
Senior Design Engineer, Municipal Works	Mr. B. Addis
Senior Engineer, Construction	Mr. B. A. Watson
Traffic and Location Engineer	Mr. R. T. Underwood

Secretary's Branch

Administration Officer	Mr. M. R. Clarke
Administration Officer (Personnel)	Mr. F. E. Williams
Assistant Secretary (Administration)	Mr. E. C. Howlett
Assistant Secretary (Personnel)	Mr. G. C. Rogers
Deputy Estates Officer	Mr. F. L. O'Brien
Estates Officer	Mr. D. T. Veitch
Industrial Officer	Mr. R. C. Howard
Legal Officer	Mr. D. Carty-Salmon
Personal Assistant to the Chairman	Mr. C. E. W. Porritt
Principal Methods Officer	Mr. W. Murray
Principal Traffic Officer	Mr. W. S. Steel
Principal Training Officer	Mr. R. C. Billinge

Accountant's Branch

Assistant Accountant	Mr. D. G. Proudfoot
Budget Officer	Mr. S. K. Gavin
Controller of Stores	Mr. E. J. King
Costing Officer	Mr. J. L. White

Principal officers of the Board are listed in a preface to this report.

APPENDIX 10

CHIEF ENGINEER'S REPORT

Country Roads Board
Melbourne

THE CHAIRMAN,

Sir,

I have the honour to report on matters of technical interest carried out during the year 1968/69. The report is divided into four major subdivisions corresponding to the four sub-branches of the Chief Engineer's Branch, followed by some matters of a general engineering nature.

CONTENTS

WORKS SUB-BRANCH

1. ROAD CONSTRUCTION AND MAINTENANCE

Slurry Method of Lime Stabilization

A successful trial was made of lime stabilization of a clay subgrade, using a slurry of lime in water. This method of lime spreading is widely used in the U.S.A., but may not have been used previously in Victoria. The slurry method was used to try to overcome the inaccuracies of distribution, the waste of lime, and the inconvenience associated with the spreading of dry lime.

The trial was effected on a section of the Northern Highway, in the Board's Bendigo Division. Naturally occurring pavement materials are not plentiful in much of this area, and the importation of materials is costly. Lime stabilization of the freely occurring clays offers an economical method for subgrade improvement.

The usual practice is to spread dry lime either by manual raking, or by towing sheets of reinforcing mesh behind a tractor. The spreading is followed by rotary hoeing the lime into the subgrade, and water is added by means of tankers and soil stabilizers to bring the moisture content to 5% above optimum. The lime concentration resulting from these methods is not uniform. Chemical analyses of samples show large deviations from an average value of lime content. One cause, common to both methods, is the windrowing of lime to the side by the tyres and blades of the rotary hoes (this lime, from 10 to 20% of the amount spread, is graded back over the subgrade before rolling and watering). Manual spreading is inherently uneven. Mesh spreading produces a plane surface, but wheeltracks and other unavoidable irregularities in the subgrade surface cause variations in the depth of lime. With either method, strong winds cause losses of up to 25% of the lime used. The manual method, in particular, is unpleasant to the workers employed and to the public.

In the trial, the bulk lime was transferred, by pneumatic discharge facilities from road vehicles, to a pre-mixing tank. This tank was made from a converted boiler of 7,200 gallons capacity, and was fitted with a 2 inch compressed air reticulation system and a 3 inch slurry recirculation system, which produced turbulence to ensure an even mixing of the lime and water. Using the pneumatic facilities, it took 15 minutes to feed 10 tons of lime into 5,000 gallons of water in the tank (approximately 1 part lime to 2 parts water by weight). The slurry was thoroughly mixed and ready for use immediately the lime addition was completed. Recirculation of the mixture through the 3 inch system was continued so long as slurry was held in the tank. The slurry was pumped in 1,500 gallon lots into 2,000 gallon road tankers, which had also been modified to provide recirculation to prevent settling. The tank, and the tankers, must be flushed clean of any residual lime at the end of each day.

Prior to incorporation of the lime slurry, the subgrade, previously placed, compacted and trimmed to level, was ripped with a grader, and very finely pulverized with 5 or 6 passes of rotary hoes. The tankers and soil stabilizers, linked by long 3 inch hoses, then travelled over the subgrade. As it was considered desirable not to alter the water spraying facilities of the tankers to enable the requisite 4% of lime to be spread in one pass, the slurry was pumped through the stabilizers' spray bars into the stabilizers' mixing boxes, where the slurry was incorporated directly with the subgrade material (Plate 1).

To ensure addition of slurry at the correct rate, the stabilizer operators referred to scales fitted to the back of each tanker. The scales were graduated to show the gallons of slurry remaining in the tankers, against the distance in feet which should have been run. By reference to the scales, and to pegs at the roadside, the operators adjusted their speeds to achieve the correct addition.

It was found necessary to make two further passes of a rotary hoe, to achieve uniform distribution of lime (such additional mixing would not have been effective in the case of dry spreading methods, in achieving the desired uniformity). The lime content of the subgrade, following the slurry method of incorporation, was much closer to the required 4% than with the other methods used.

The addition to the clay subgrade of extra water, through the lime slurry, has not been found to be a disadvantage generally, as this type of work is always carried out during the summer months. After the slurry stabilization process, the moisture content of the subgrade was found to be approximately 3 to 4% above the optimum level, and in this circumstance, several types of rollers, used in various combinations, were found suitable for achieving the required compaction.

The costs of stabilizing a 6 inch consolidated depth of clay subgrade by the use of lime slurry in this trial, and by the use of hand spreading methods on recent work, were as follows:—

Lime slurry method	$3.30 approx. per cubic yard
Hand spreading	$2.70 „ „ „ „

Both of the above costs include the cost of 4% of lime.

It is considered that the cost of the slurry method would be reduced to approximately the same cost as for hand spreading on jobs where greater lengths could be treated daily. In any case, the higher costs of the slurry method would appear to be acceptable because of the more accurate control of lime content achieved and the greater convenience to the public and the workmen.

Plate 1—Lime Stabilization by Incorporating Lime Slurry into the Subgrade.

Pedestrian Overpasses

The Board is involved in all aspects of a scheme approved by the State Government to provide pedestrian grade separations, either overpasses or subways, at selected locations where school children need to cross busy roads. In addition, the Board is also constructing pedestrian overpasses on by-pass roads and other new routes as integral aspects of the complete road improvement.

Proposals for grade separations under the Government scheme are submitted, with supporting statistics, by Councils to the Traffic Commission. A full assessment of priorities is made by representatives of the Commission and the Board, on the following basis:—

(a) traffic volumes;

(b) average approach speed of traffic;

(c) number of children crossing the road;

(d) age range of the children;

(e) type of road to be crossed, e.g. undivided or divided;

(f) any other special features.

The Board is responsible for the preliminary investigations in consultation with Council officers, and for design, land acquisition, relocation of services, and construction of the adopted proposals following the request of the Council concerned.

During the preliminary investigation (for proposals under the Government scheme, or for Board's projects), thought is given to alternatives of location, and versatility of the structure for all road users. Alternatives arise out of consideration of factors such as the following:—

(a) whether one or more schools are to be catered for.

Studies of the use of overpasses near single schools showed that almost all the walking children used them. Primary school children with bicycles wheeled them over the overpasses, but many secondary school children rode their bicycles across the nearest intersection.

Where several schools are served by a single overpass, existing at-grade crossing places which are more conveniently located than the overpass will continue to be used by some children, even though the overpass is sited as close as possible to the direct line of movement of the majority of children.

(b) the roadway to be crossed is less than 100 feet wide.

A conventional ramped overpass, requiring 290 feet of ramps, might cross as little as 40 feet of roadway. To encourage use of an overpass at such a site, consideration is given to provision of stairs which have shorter total slope length (70 feet) than ramps. Alternatively, a subway is considered as this requires only 160 feet of ramps or 40 feet of stairs. The decision is influenced by the suitability of the area for a subway, and the number of potential users with bicycles.

(c) the intensity of development of a proposed site.

The land abutting the roadway may be intensely developed. Sufficient space for the ramps or stairs may necessitate an overpass site which is remote from the present crossing. The increased walking distance may then be a deterrent to use of the grade separation.

(d) catering for a significant number of adult pedestrians.

The need to cater for adult pedestrians is most relevant in shopping areas when an existing at-grade pedestrian crossing is to be abolished on completion of the overpass or subway. The pedestrian movements and the types of pedestrian involved, e.g. elderly people, and women with prams, are counted. The studies of overpass usage showed that less than half the adults who crossed between the adjacent intersections used the overpasses.

(e) planned future development of an area.

Future road widenings and flarings may require spans longer than the present roadway would need. Construction of a road grade separation nearby might make an existing pedestrian grade separation unnecessary. Possible land use changes should also be studied with a view to placement of a pedestrian grade separation so as to suit possible future pedestrian movements.

The overpasses so far completed have been almost exclusively for the use of single schools located on divided highways (Plates 2 and 3). However, at most of the sites recently approved, several of the above problems have been encountered.

Awareness of the problems has led to a method of examination of sites for pedestrian grade separations, which includes:—

(i) a study of pedestrian movements and compositions. The results of such studies are generally shown diagrammatically, as in the example at Figure 1.

(ii) a study of the potential conflicts of vehicular and pedestrian traffic, set out as in Figure 2.

(iii) an inventory of the physical features of possible locations, including buildings, services, school entrances, bus stops, etc., as shown in simplified form at Figure 3.

Plate 2

Plate 3

Plates 2 and 3 above—Two Views of a Pedestrian Overpass, Nepean Highway, Moorabbin.

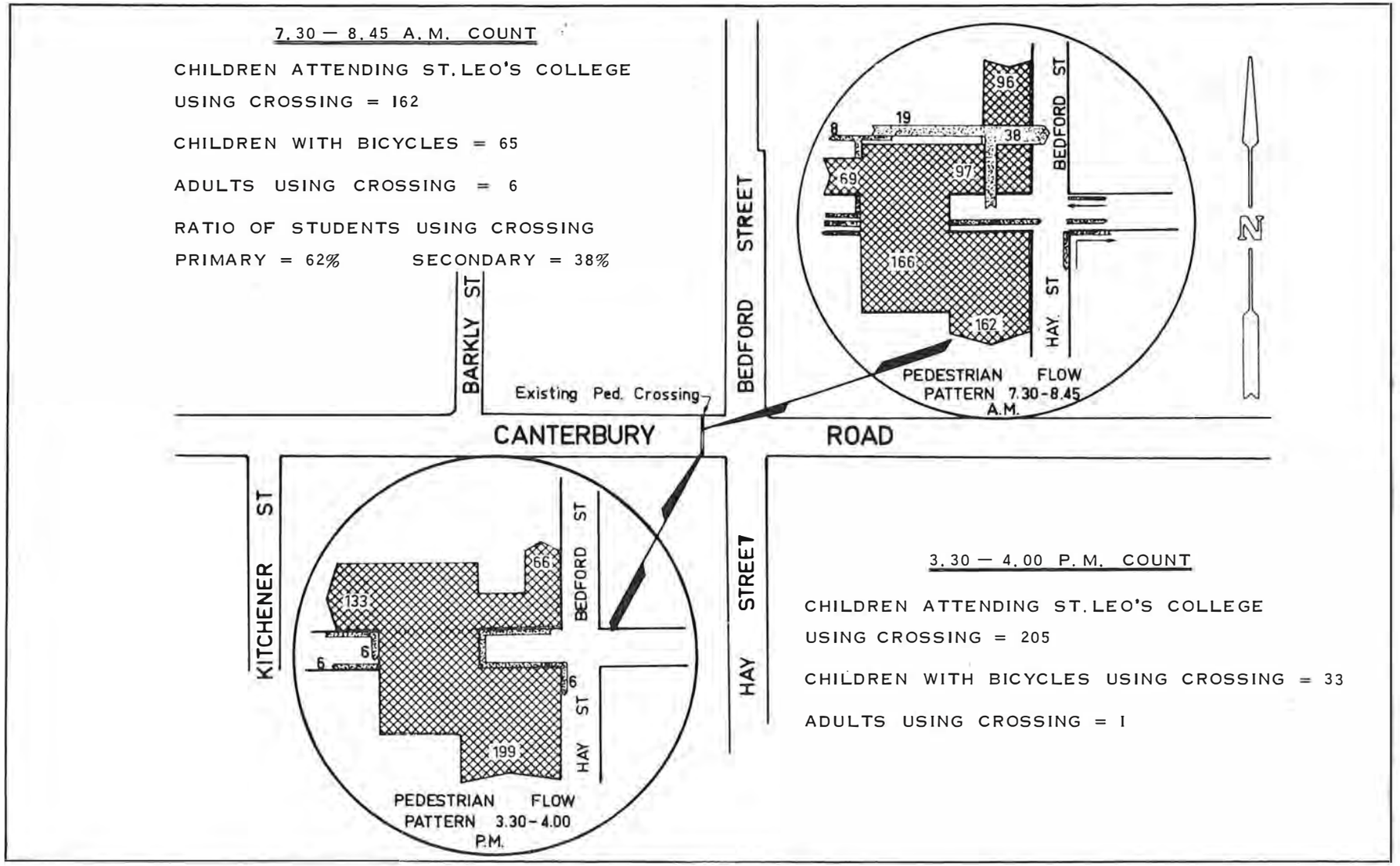


Figure 1—Pedestrian Overpass Investigation. Study of Pedestrian Movements and Composition.

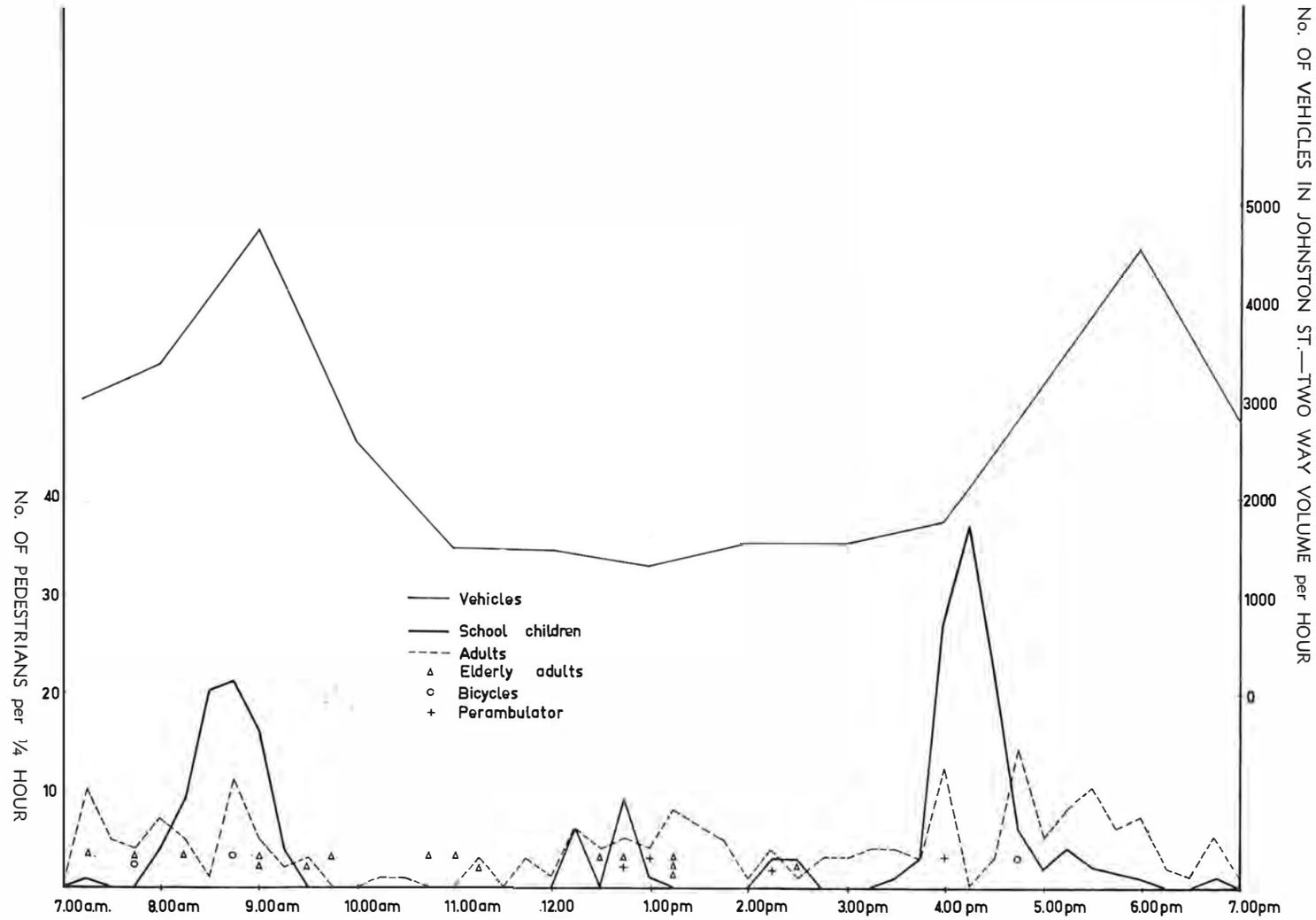


Figure 2—Pedestrian Overpass Investigation. Pedestrian and Vehicle Count. Johnston Street, Collingwood.

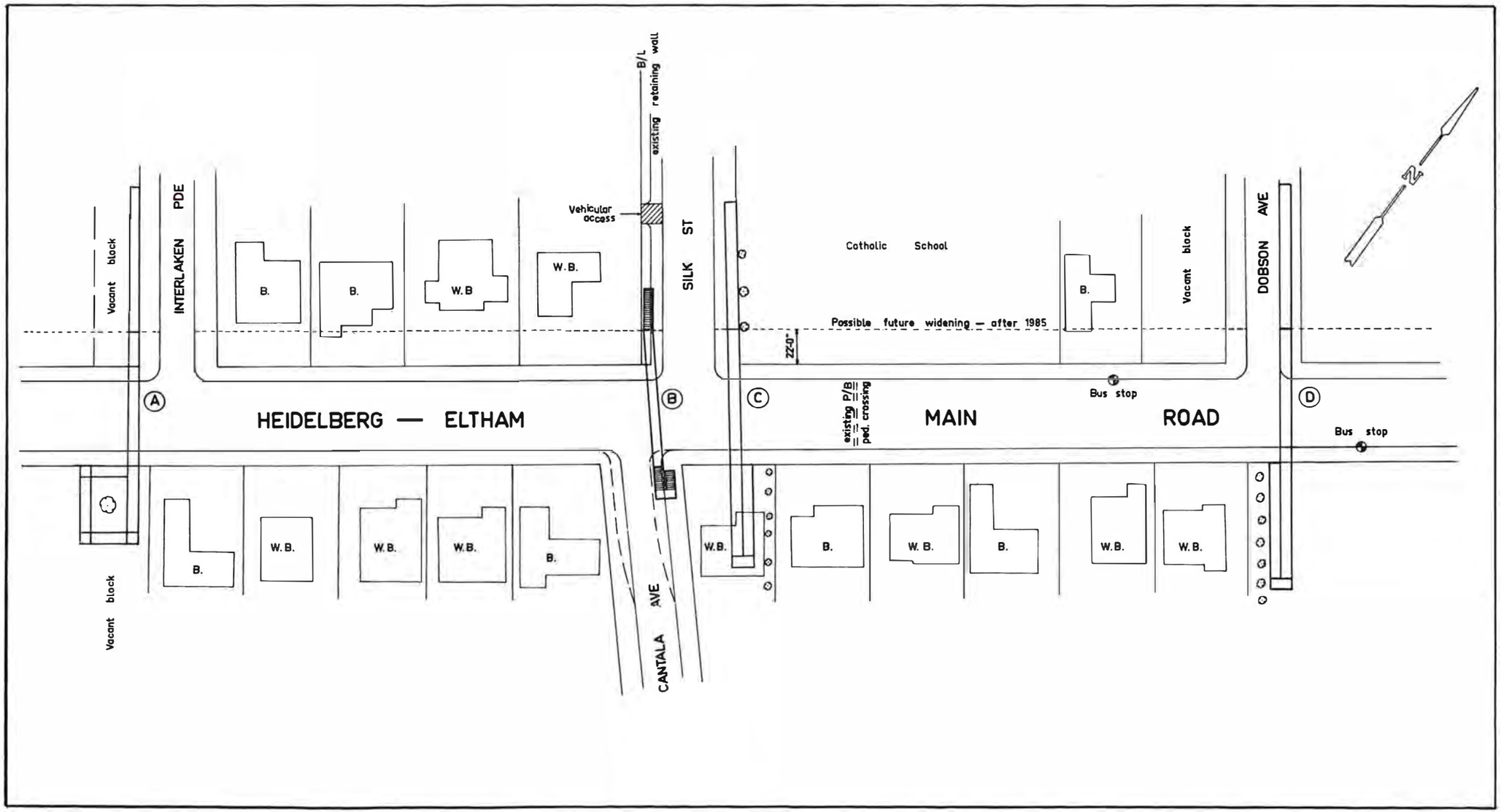


Figure 3—Pedestrian Overpass Investigation, Heidelberg. Plan Shows Possible Alternative Proposals, 'A', 'B', 'C' and 'D'.

Paving of Roads Subject to Snow Cover

Approximately 12 miles of the Mount Buffalo Tourists' Road and 6 miles of the Mount Buller Tourists' Road are above 3,500 feet elevation and subject to snow cover for significant periods each winter. The paving and sealing of these roads involve special considerations to eliminate the possibility of damage by frost heave and by wheel chains and other vehicular equipment. On the basis of information obtained from the Snowy Mountains Hydro-Electric Authority and overseas sources, certain design criteria and construction practices were adopted for the reconstruction and sealing of these roads at elevations above 3,500 feet.

Because the relatively fine subgrade materials of these roads are susceptible to frost heave, sufficient pavement depth must be provided to prevent frost penetration to the subgrade. For elevations up to 6,000 feet the maximum penetration has been found to be 9 inches, and so for elevations between 3,500 feet and 6,000 feet the pavement is applied over the full width of the formation to a minimum depth of 9 inches, although C.B.R. values alone indicated that depths of 5 inches to 7 inches would be adequate. The pavement materials for this type of road must have the following characteristics:—

(a) a relatively open grading to facilitate drainage and to prevent capillary rise in frost conditions.

(b) plasticity index not exceeding 6, to preserve the bond between the sealed surface and the pavement material if it is saturated by moisture penetrating the sealed surface.

Desirable gradings have a deficiency of material smaller than $\frac{3}{8}$ inch, and not more than 5% of material smaller than No. 200 mesh.

It is important that the bituminous surfacing be waterproof and capable of resisting damage from snow clearing equipment and from vehicles fitted with wheel chains. Waterproofing may be assisted by the addition of rubber to the binder.

These principles have been used since 1965/66 in the selection of base materials and bituminous surfacing treatments for the reconstruction of sections of both roads. The various materials and treatments were:—

(a) a hornfels fine crushed rock of open grading—approaching a one-sized grading. After compaction, which was very difficult to achieve satisfactorily, the fine crushed rock was penetrated with R90 bitumen and covered with $\frac{1}{4}$ inch or $\frac{3}{8}$ inch aggregate. The subsequent seal coats varied as follows. On one section, a double coat seal ($\frac{3}{4}$ inch/$\frac{3}{8}$ inch) with rubber in the binder was applied. On a second section, a special seal coat consisting of one application of binder without rubber and two applications of aggregate ($\frac{3}{8}$ inch and sand) was used to provide a surface of uniform texture. Portion of this second section was then given a double coat seal ($\frac{3}{4}$ in./sand) without rubber. The remainder of the second section was given no further treatment and its waterproofing qualities will be assessed over two or three years before the application of a bituminous concrete surface.

(b) a fine crushed river gravel which, though deficient in fine material, was far less one-sized than the hornfels material. This gravel was obtained from the Porepunkah area. The pavement was primed with a cutback bituminous primer followed by one of three types of bituminous treatment on separate sections for comparison, viz. either a double coat seal ($\frac{3}{4}$ inch/sand) with rubber in the binder, a double coat seal ($\frac{1}{2}$ inch/sand) with rubber in the binder or a $1\frac{1}{2}$ inch depth of $\frac{1}{2}$ inch nominal size bituminous concrete. On one shorter section, the Porepunkah river gravel was used in its natural state. This was primed with a light petroleum tar primer and half the length was covered with a double coat seal ($\frac{3}{4}$ inch/sand) and half with $1\frac{1}{2}$ inch depth of $\frac{1}{2}$ inch nominal size bituminous concrete.

(c) a naturally occurring hill gravel which was used on three trial sections. The untreated material, material stabilized with lime and material stabilized with calcium chloride, were used. The performance of these sections proved satisfactory and a further section was paved with the untreated hill gravel and primed and sealed with a double coat seal.

(d) a 6 inch hill gravel sub-base with a 3 inch base of fine crushed hill gravel from the same pit on one section and of fine crushed river gravel on a second section. The first section was primed with petroleum tar primer and sealed with a double coat seal ($\frac{3}{4}$ inch/$\frac{3}{8}$ inch) and the second section was primed with vertical retort tar and sealed with a double coat seal ($\frac{1}{2}$ inch/$\frac{1}{4}$ inch).

The performance of the various treatments has been generally satisfactory. Treatments (a) and (b) were carried out on the Mount Buffalo Road and (c) and (d) on the Mount Buller Road. The use of the hornfels material on the Mount Buffalo Road was discontinued after two seasons because of the inclusion of excessive amounts of soft weathered stone which would be liable to breakdown in service with consequent loss of voids and possible

failure of the pavement under snow and frost conditions. The crushed river gravel was found to be more satisfactory than the crushed hornfels as it could be more readily worked and produced a tighter surface and eliminated the need for the expensive penetration treatment for the hornfels. On the further section of the Mount Buller Road mentioned in (c), some damage has been caused to the sealed surface by snow clearing plant and wheel chains on vehicles and some failure has occurred in the bond between the seal and pavement material which had a high plasticity index. Observations of the performance of these pavements in service are continuing, and the laying of a surface course of bituminous concrete on the established primed and sealed surfaces could be the subject of future trials.

Average total costs of the paving and sealing treatments carried out to date have been $3 per square yard at Mount Buffalo and $2 per square yard at Mount Buller, the difference in costs arising mainly from the considerably longer leads for pavement material and the higher cost of bituminous surfacing on the Mount Buffalo Road work.

Direct Labour Road Construction Costs

The total cost of direct labour road construction works in 1968/69, approximately $11 million, was similar to the 1967/68 cost. Tables 1-4 give results of the analyses and comparative data averaged over five years.

The following comments compare 1968/69 data with the corresponding figures for 1967/68. The plant and labour percentages of total cost increased by 2.1 and 2.0 respectively, and the materials and stores percentages decreased by 3.2 and 0.9 respectively. Works overhead expenditure, formation costs and pavement costs did not change significantly.

TABLE 1—
DISTRIBUTION OF EXPENDITURE

	1968/69	Five Year Average 1964/65 to 1968/69
	%	%
Plant	34.2	32.5
Labour	37.0	35.2
Materials	21.2	23.9
Stores	7.6	8.4

TABLE 2—
WORKS OVERHEAD EXPENDITURE
(Percentage of productive costs)

	1968/69	Five Year Average 1964/65 to 1968/69
	%	%
Construction overhead expenses	9.9	9.8
Camp expenses	11.9	14.3
	21.8	25.1

TABLE 3—FORMATION COSTS

(Including distributed overhead expenditure)

	Rock		Earth Unclassified		Total	
	Quantity	Unit Cost	Quantity	Unit Cost	Quantity	Unit Cost
	Cu. yds.	$	Cu. yds.	$	Cu. yds.	$
1968/69	84,885	1.34	1,030,431	1.06	1,115,316	1.10
Five year average 1964/65 to 1968/69	164,918	1.38	1,350,303	1.05	1,515,221	1.13

TABLE 4—PAVEMENT COSTS

(Consolidated in place, including distributed overhead expenditure)

	Fine Crushed Rock		Coarse Crushed Rock		Gravel, etc.		Total	
	Quantity	Unit Cost	Quantity	Unit Cost	Quantity	Unit Cost	Quantity	Unit Cost
	Cu. yds.	$	Cu. yds.	$	Cu. yds.	$	Cu. yds.	$
1968/69	77,234	4.95	63,997	4.64	702,033	2.11	843,244	2.56
Five year average 1964/65 to 1968/69	97,647	5.30	50,289	4.27	977,328	2.10	1,125,264	2.48

2. TESTING OF MATERIALS AND RESEARCH

The following is a list of research subjects in the Materials Research Division during 1968/69. A number of these were completed, and work on the others will be continued in future years. Our knowledge of the behaviour of materials was extended by these investigations.

1. Studies of the weldability of high yield stress steel.
2. The development of techniques for ultra-sonic inspection of single pass fillet welds.
3. The possibility of determining the weights of passing vehicles by means of pavement deflection measurements, using embedded strain gauges.
4. The feasibility of vibration methods for compaction of silts.
5. The relevance of a vibratory method using a jack hammer and a very large cubical mould (2 feet x 2 feet x 2 feet) to determine the *in situ* density of lightweight aggregate scoria of 6 inch maximum size.
6. The development of techniques to allow *in situ* density testing of sub-base materials with maximum size up to 6 inches.
7. Study of the decrease in deflection of a pavement, as controlled and measured increments of bituminous concrete are placed.
8. The use of the Texas Ball Mill Test to assess some of the qualities required for roadmaking, in sandstones and mudstones.
9. The development of seismic and resistivity techniques to investigate land-slips.
10. The suitability of, and the scope for the employment of, seismic reflection methods in addition to present refraction techniques.
11. A comparison between the microscopic petrological properties of basic igneous rocks and results of the Washington Degradation Test.
12. A comparison of the Washington, Idaho and California Degradation Tests with each other and with selected rock properties.
13. Studies on the relative efficiency of various types of sieve shaker.
14. The development of reliable test methods for measuring aggregate-bitumen adhesion; also, the consequent determination of the relative efficiencies of adhesion agents.
15. The development of test methods to measure the rubber content of solutions.
16. The development of a method to distinguish between different forms of reflectorized sheeting.
17. The feasibility of determining, by chemical means, the secondary mineral content in rocks.
18. An investigation of changes in the skid resistance of roads with time and traffic; also, the relation between field performance and laboratory test values.
19. The use of new materials for BST aggregates to increase skid resistance.
20. The influence of changes in mix design and in material characteristics, on the skid resistance of bituminous concrete, including the development of a method for the laboratory determination of bituminous concrete polishing.
21. The formulation of principles for the design of dense cold-mixes suitable for pavement maintenance in Victoria.
22. Continuing studies into the relative weathering of various bituminous concrete mixtures containing different aggregates.
23. The development of a quick field method of analysis of bituminous mixes to yield full grading above No. 200 sieve.
24. A comparison of results from field laboratories with results from Head Office laboratory, on companion samples taken during plant control.
25. The measurement of relaxation of stress in reinforcing tendons.

26. General relationships between compressive strength, modulus of rupture, and indirect tensile strength, for normal concretes using local materials.

27. Studies of the time dependence of the elastic modulus of concrete.

28. Studies of the relation between long-term shrinkage of concrete and the type and brand of cement used.

29. The development of methods to measure the efficiency of adhesives at interfaces between old concrete and fresh concrete.

30. Continuing field studies into remote-reading piezometers, techniques of placing and reading these, and the efficiencies of various types; also, the measurement of pore pressures created by nearby pile driving.

31. Continuing pore pressure and settlement measurements on a test embankment to assess the effectiveness of sand drains.

32. The development of test techniques for a new type of consolidometer.

33. The applicability of a proposed method of obtaining field consolidation curves from laboratory results.

34. Studies into the extent of actual disturbance in an "undisturbed" sample.

35. A comparison of results of rapid and normal consolidation tests.

36. An examination of various methods of obtaining results more rapidly from plate loading tests.

37. The investigation of the settlements produced by static and vibratory loads, in a full-scale test, of footings on sand.

38. Studies to develop a supporting cradle for diamond drilling cores.

39. Studies of the effectiveness of plastic sample-tube sealers.

40. An investigation of factors affecting the efficiency of a vibro-separator removing sand particles from bentonite return drilling fluid.

41. The development, and field and laboratory calibration, of friction penetrometers.

42. The development of a technique for obtaining 10 inch diameter samples for a 10 inch consolidation cell.

43. Studies of the settlement-time and load-settlement relationships on a job pile driven in stages; also, comparison of observed behaviour with that predicted by various theories.

44. Studies on the statistical distribution of field density results for various jobs, materials and quarries, and comparison of these with Maximum Dry Densities found by laboratory tests of different types.

45. An investigation into the value of vibratory compaction test methods for cement-stabilized materials.

46. Differential effects of changes in grading and changes in stone toughness on vibratory compaction test results.

47. A comparison between the compaction efficiencies of various types of vibrating hammer.

48. The suitability of vibratory compaction tests for crushed rocks of large maximum size.

49. The suitability of dynamic compaction tests, using a large hammer and a large mould, for crushed rocks of large maximum size.

50. The relevance and accuracy of various formulae to correct Maximum Dry Density results on the minus $\frac{3}{4}$ inch fraction, to allow for larger sizes in the job material.

51. Studies on the statistical distribution of laboratory-tested characteristics of pavement materials from various sources for various jobs.

52. Studies on the comparative efficiencies of several types of large vibratory and non-vibratory sieves.

53. A study of the effect of cement plant dust filler on the characteristics of crushed rock.

54. Continuing studies on the differences in test results of toughness of rock, depending on size of aggregate used in the test.

55. A study of the differences between Average Least Dimension values found by estimation from grading and flakiness of aggregate, and those determined in a direct test.

56. A study of the effect, on test results, of grooves in the bowl of the Liquid Limit machine.

57. Studies on the relationship, for clays, between the California Bearing Ratio (C.B.R.) and the Iowa Bearing Value (I.B.V.).

58. Studies on the relationship, for stabilized materials, between C.B.R. and I.B.V.

59. A re-assessment of present methods of estimating subgrade C.B.R. from simple soil tests, including recalculation of all relationships using more rigorously specified data.

60. Studies on the variations of concrete strengths of locally produced normal concretes for all jobs from all plants, with particular attention to differences between different jobs from the same plant.

61. Studies of permeability of crushed rocks.

62. Studies of permeability of lime-stabilized clays.

63. Measurements of moisture potential of clays, and the relationship of this with job *in situ* moisture content.

64. Studies of long-term seasonal changes in strength and moisture content of road subgrades, as shown by changes in surface deflection measured by the Benkelman Beam.

65. An investigation of the strength and deflection properties of a very old concrete pavement; also an assessment of the deterioration and performance of the aggregate in the concrete.

66. A study of means of employing computer machine language programme amendments to speedily make small changes in set routines.

67. General studies of the methods and techniques of writing and operating with computer programmes to enable the better solving of certain *ad hoc* problems and the more precise achievement of specified aims.

68. A study of the relevance of various types of tensile test to the setting properties of materials of very low plasticity.

69. Possible applications of foamed bitumen as a stabilizing agent for sands, tuffs and scorias.

70. The measurement of crack arrest temperatures in A.S. A151 Steel.

71. The determination of strain rates under large loads moving on steel girder bridges.

72. A comparison of roughometer readings at various speeds.

73. A comparison of Bureau of Public Roads and Portland Cement Association roughometer readings.

74. Using the roughometer as a measure, a comparison of the riding qualities resulting from various methods of finishing compacted crushed rock.

75. Using the roughometer as a measure, a comparison of the riding qualities of slurry seals and bituminous concrete.

76. A study of the long-term variation of the riding quality of a road carrying little traffic, especially in respect to seasonal changes.

77. A study of the long-term changes in the riding quality of a road carrying very heavy traffic.

Further details of three of the above subjects are as follows:—

19. The use of new materials for BST aggregates to increase skid resistance.

    This study involves measuring the skid resistance performance of surface seals and bituminous concrete under various traffic conditions, and laboratory testing of the susceptibility to polishing ("Polished Stone Value" test) of different aggregates and bituminous mixtures.

    One method of providing a high skid resistance value suitable for dense city traffic has been developed in Great Britain. The process consists of applying a

surface seal using a $\frac{1}{8}$ inch one-sized calcined bauxite aggregate and a bitumen-extended epoxy resin binder. This aggregate resists polishing due to its hardness; and the binder, having high strength, adequately holds the small stones. A trial section has been laid around a 65 feet radius curve at the intersection of Punt Road and Brunton Avenue, City of Melbourne. The skid resistance value of the surface before treatment was 0.25, and after 4 months under traffic the new surface had a value of 0.65. As the cost of this treatment is high ($2 to $3 per square yard) it is applicable only to problem areas.

25. The measurement of relaxation of stress in reinforcing tendons.

The increasing use of prestressed concrete has focused attention on the problem of stress relaxation in reinforcing tendons. Low stress losses under service conditions may be achieved by using stabilized wire for the tendons, and the Board has specified stabilized material in certain recent structural designs.

The Board has instituted testing of relaxation in wire proposed for use in bridgeworks, in order to establish that the design requirements of low stress losses will be met. As no suitable machines were available commercially, a design was prepared by staff of the Materials Research Division (Figure 4). Four machines have been built to this design (Plate 4). The test is carried out on a 10 feet length of wire or strand for a period of 1,000 hours. All wire tested so far has complied with the specification requirements.

Plate 4—Equipment for the Measurement of Relaxation of Stress in Reinforcing Tendons.

70. The measurement of crack arrest temperatures in A.S. A151 Steel.

A current research project aims to determine the dynamic conditions under which certain newly-developed steels may be used. One such steel being tested is A.S. A151 Grade C, which has an allowable working stress of 27 kip/in.^{2}, a 35% increase over the steel used in Board's work at present. This project determines the temperature at which, under various stresses, cracks, once initiated, do not continue to propagate through the member under test. The transition temperature approach used in the tests is the accepted method of designing against brittle fracture for materials sensitive to strain rate or temperature.

Plate 5 shows a general view of the test equipment. Figure 5 sets out the test arrangement adopted for the project. Blocks are welded to the tension flange of the welded plate girder on either side of the area under test. A sharp notch is pressed into the flange between the blocks. The central section of the girder is brought to the test temperature with liquid nitrogen; the range of temperatures so far used is $-30°C$ to $+10°C$. The girder is loaded in pure bending to the required stress, usually at, or above, the normal working stress. An explosive powered gun is then used to drive a wedge between the blocks, tending to force them apart, and simultaneously, to initiate a crack extending from the root of the notch. Conditions in

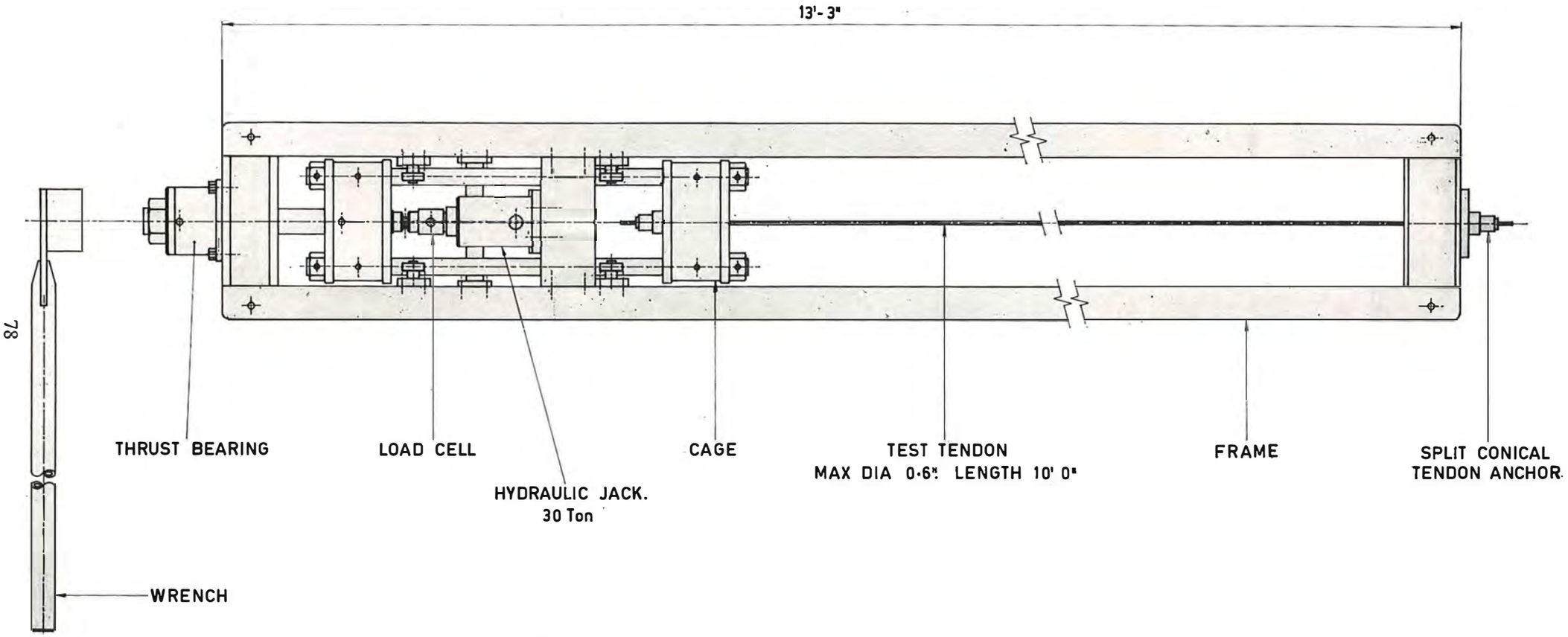


Figure 4—Plan of Equipment for Measurement of Relaxation of Stress in Reinforced Tendons.

the vicinity of the expected crack are measured and recorded by thermocouples and strain gauges.

Results for A.S. A151 Steel are shown in Figure 6. Similar tests have been carried out on rolled mild steel sections.

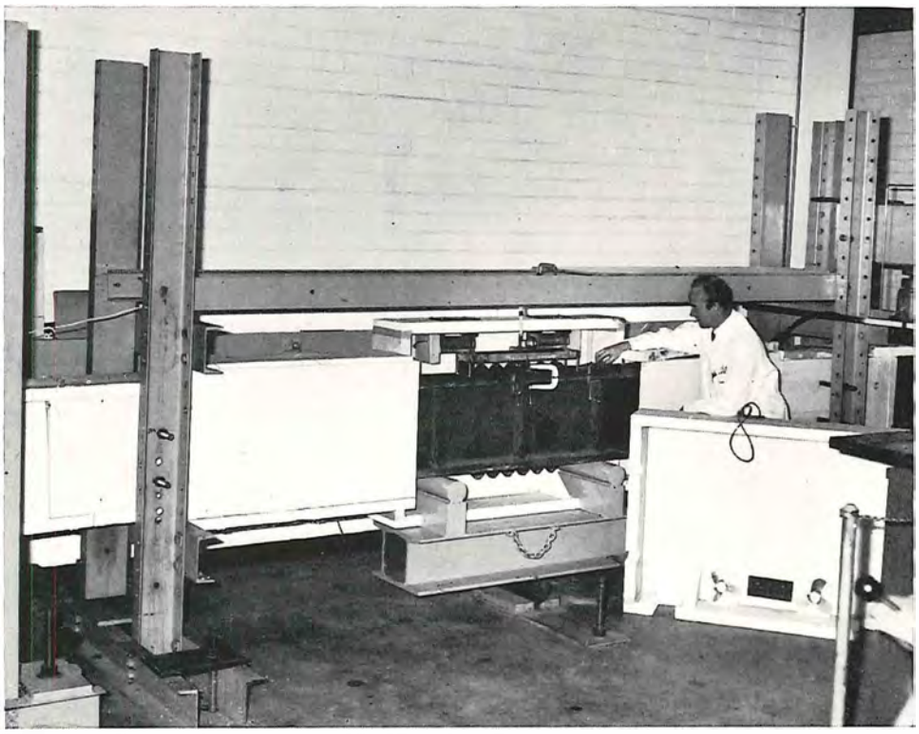


Plate 5—Equipment for the Measurement of Crack Arrest Temperature of Steel.

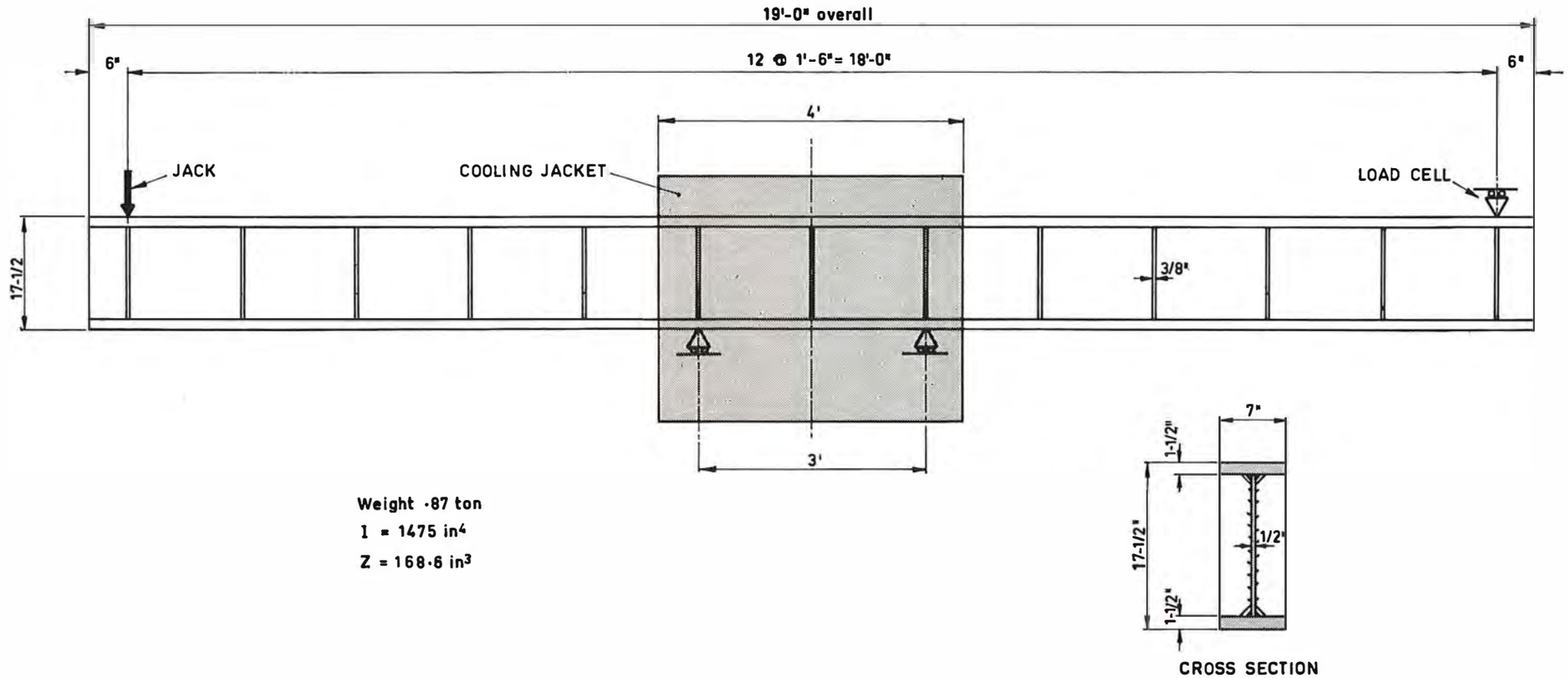


Figure 5—Diagrammatic Representation of Crack Arrest Temperature Test Equipment.

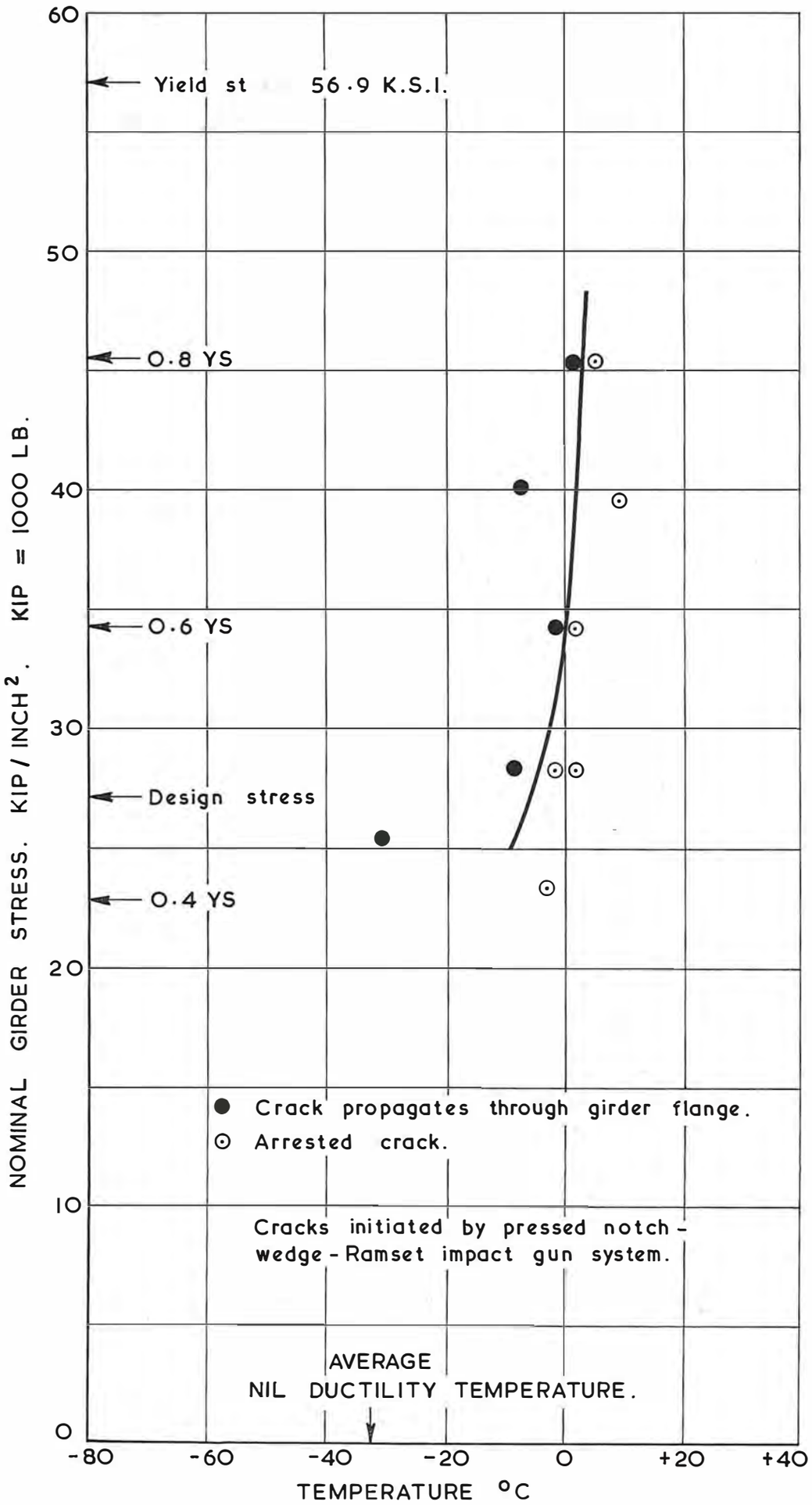


Figure 6—Crack Arrest Curve, for A.S.A151 Grade C Steel.

3. ROADSIDE DEVELOPMENT

Planting Activities

Nearly 60,000 trees were planted along roadsides by the Board in 1968/69, as part of a continuing programme of planting. In this programme, approximately 190,000 trees were planted in the 4 years 1965/66 to 1968/69. The planting programme is additional to development carried out as part of new construction works. Following these works, the whole of the road reserve is generally left in a condition such that the growth of grass and other plants can be developed, and controlled.

The expenditure by the Board on the landscaping and tree planting programme, in 1968/69, was $130,000, bringing the total for the 4 years 1965/66 to 1968/69 to $400,000 approximately.

Roadside Stopping Places

Construction was commenced of toilet blocks at two roadside rest areas in the Board's Traralgon Division, and a third in the Bendigo Division at Boundary Bend. Precast pebbled concrete slabs, produced at the Bendigo Divisional Depot, were used for all these jobs.

4. BITUMINOUS WORK

Extent of Work

The mileages of all types of bituminous surfacing completed during 1968/69 and 1967/68 are compared in Table 5, which shows that 2,925 miles were completed in 1968/69 compared with 3,078 miles in 1967/68, a decrease of about 5%.

TABLE 5—BITUMINOUS SURFACING WORK COMPLETED

Type of Road and Plant Used	1967/68		1968/69	
	Miles		Miles	
Work on roads to which the Board contributed funds:				
(a) C.R.B. declared roads:—				
(i) Board's plant	1683		1633	
(ii) Municipal plant	67		50	
(iii) Contractors' plant	79		90	
(b) Undeclared roads:—				
		1829		1773
(i) Board's plant	1059		948	
(ii) Municipal plant	46		47	
(iii) Contractors' plant	24		26	
		1129		1021
Sub-totals		2958		2794
(c) Work done for other Authorities by Board's plant (no Board contributions for these works):—				
(i) Municipalities	117		118	
(ii) State Instrumentalities	3		13	
(iii) Commonwealth Works	—		—	
		120		131
Totals		3078		2925

The length of sealed pavements on the Board's declared road system was increased by 133.0 miles in 1968/69, and the length on unclassified roads was increased by 586.0 miles as shown in Table 6. Reconstruction of existing sealed pavements, and restoration of the seal coat, amounted to 335.3 miles of the declared road system. This mileage was 2.6% of the length of sealed sections, compared with 3.0% in 1967/68 and 3.3% in 1966/67. Retreatments totalled 1,026 miles, or 8.8% of the length of sealed sections, compared with 7.5% in 1967/68.

Types of Work

Sprayed work (initial treatments and retreatments) was again the main type of work, and comprised 96.1% of the total length completed.

Plant mix work totalling 115.6 miles was completed, i.e. 3.9% of the bituminous surfacing mileage, compared with 109 miles and 3.4% in 1967/68 (details are set out in Table 6).

A total of 212,320 tons of bituminous concrete was supplied and spread by contractors operating fixed plants near Melbourne and Geelong.

TABLE 6—BITUMINOUS SURFACING WORK ON VARIOUS ROAD CATEGORIES

(On roads to which the Board contributed funds during 1968/69)

	State Highways	By-pass Roads	Tourists' and Forest Roads	Main Roads	Total Board's Declared System	Unclassified Roads	Totals
	Miles	Miles	Miles	Miles	Miles	Miles	Miles
Initial Treatments:—							
Extensions to sealed system—							
(a) Sprayed work	29.3	7.4	11.1	84.8	132.6	578.8	711.4
(b) Plant mix work	—	0.4	—	—	0.4	7.2	7.6
Reconstruction of lengths of previously sealed pavements—							
(a) Sprayed work	109.2	—	4.5	214.7	328.4	74.8	403.2
(b) Plant mix work	0.9	—	0.3	5.7	6.9	9.5	16.4
Widening of existing sealed pavements—							
(a) Sprayed work	76.5	—	6.7	168.3	251.5	32.7	284.2
(b) Plant mix work	1.3	—	—	1.4	2.7	0.4	3.1
Duplication of existing sealed pavements—							
(a) Sprayed work	18.7	—	—	0.6	19.3	0.4	19.7
(b) Plant mix work	0.7	—	—	4.1	4.8	0.7	5.5
Retreatments:—							
(a) Sprayed work	448.9	11.7	20.2	472.1	952.9	307.5	1260.4
(b) Plant mix work	50.6	2.9	0.6	20.2	74.3	8.7	83.0
Totals	736.1	22.4	43.4	971.9	1773.8	1020.7	2794.5

Cost of Work

The average unit cost of sprayed work completed by the Board's 22 bituminous surfacing units is shown in Table 7. The average costs of sprayed work increased slightly compared with those for 1967/68.

The average cost per ton of bituminous concrete supplied and spread was $11.65 compared with $12.98 for 1967/68.

Sprayed work represented 73%, and plant mix work 27%, of the total cost of the bituminous surfacing.

TABLE 7—AVERAGE COST OF SPRAYED BITUMINOUS SURFACING DONE BY C.R.B. PLANT

(On roads to which the Board contributed funds during 1968/69)
(Cost in cents per square yard)

Item	Nature of Work																			
	I.T.P. & S. ⅜ in. & Over		I.T.P. & S. ½ in.		I.T.P. & S. ⅜ in.		I.T.P. & S. ¼ in. & Sand		Primerseals		Two Application Seals		I.T.S.O. and Reseals ⅜ in. & Over		I.T.S.O. and Reseals ½ in.		I.T.S.O. and Reseals ⅜ in.		I.T.S.O. and Reseals ¼ in. & Sand	
Square Yards Costed	244,776		2,565,192		2,137,281		734,053		950,336		49,860		415,564		5,615,467		6,120,971		6,889,673	
	cents	%	cents	%	cents	%	cents	%	cents	%	cents	%	cents	%	cents	%	cents	%	cents	%
Material	18.2	44.3	18.8	53.1	16.2	55.1	13.3	56.3	10.1	42.6	26.5	57.8	14.5	51.3	14.2	54.8	11.3	55.5	9.3	59.5
Stores	1.8	4.4	1.3	3.7	1.0	3.4	0.8	3.4	0.9	3.8	1.6	3.1	1.0	3.5	0.8	3.1	0.6	2.9	0.4	2.6
Plant Hire	9.0	21.9	6.8	19.2	5.5	18.7	4.6	19.5	5.5	23.2	8.0	17.6	4.9	17.3	4.5	17.4	3.6	17.6	2.6	16.7
Labour	12.1	29.4	8.5	24.0	6.7	22.8	4.9	20.8	7.2	30.4	9.8	21.5	7.9	27.9	6.4	24.7	4.9	24.0	3.3	21.2
TOTALS	41.1	100.0	35.4	100.0	29.4	100.0	23.6	100.0	23.7	100.0	45.9	100.0	28.3	100.0	25.9	100.0	20.4	100.0	15.6	100.0

I.T.P. & S. indicates "initial treatment prime and seal"
I.T.S.O. indicates "initial treatment seal only"

MATERIALS

(a) Aggregate

Approximately 285,000 cubic yards of covering aggregate were used on sprayed work by the Board's plant, 36,000 cubic yards on sprayed work by municipalities and contractors, and 175,000 cubic yards in bituminous concrete.

Table 8 sets out the average cost of aggregate over the past five years, and shows that the 1968/69 average fell 2.2% below the 1967/68 average.

The 1967/68 Report referred to a preliminary inspection of an extensive field experiment, the purpose of which was to check design factors used in the determination of the rate of application of binder for a single application seal using limestone aggregate from Cowangie. A further inspection has been made, and it appears, after three years' service, that the present design factors are satisfactory when the aggregate is precoated with a light petroleum tar. This type of precoating material gave better results than an adhesion agent solution, which in turn was better than diesel fuel oil. Regular inspections of the work will continue over the next few years.

TABLE 8—AVERAGE PRICE OF AGGREGATE FOR SPRAYED BITUMINOUS SURFACING

(In roadside stacks)

Material	Prices per cubic yard				
	1964/65	1965/66	1966/67	1967/68	1968/69
	$	$	$	$	$
Screenings	4.92	5.04	5.04	5.19	5.01
Gravel	4.12	4.20	4.04	4.57	4.30
Sand	2.48	2.50	2.93	2.32	2.13
Scoria	2.90	2.78	2.90	2.80	2.93
Average price all aggregates	4.58	4.70	4.76	4.89	4.79

(b) Bitumen

The Board purchased directly 29,206 tons of bitumen which was distributed by road and rail by four marketing companies.

The installation at Benalla of two 8,000 gallon electrically heated bitumen tanks, similar to those at Horsham and Hamilton, was completed, and the tanks were in operation for the major portion of the 1968/69 season.

An investigation was commenced into the effects on bitumen and cutback bitumen, of transporting, handling and heating these materials. The investigation will continue during 1969/70. Results so far have indicated that these processes cause no alteration to the properties of R90 bitumen. The investigation has shown that sampling must be done with extreme care to avoid contamination.

(c) Primerseals

The use of primerseals to provide a lightly sealed surface immediately after the preparation of the pavement, particularly during the winter months, has increased considerably. By this procedure the high costs of maintenance of an unsealed pavement are avoided. Work is continuing in various parts of the State to evaluate the various types of primerbinders available.

BRIDGE SUB-BRANCH

DESIGN

Bell Street Bridge, Strathmore By-pass Road

The Bell Street bridge is an integral part of the Bell Street interchange on the Strathmore By-pass Road. The superstructure is the first of its type designed and constructed by the Board.

This bridge, construction of which is well advanced, is a high-level structure, spanning the North-East Railway, the Moonee Ponds Creek, and the northbound and southbound carriageways of the Strathmore By-pass Road (Figure 7). A locality plan and a photograph of a model of the project were included in the 1966/67 Report. The bridge is being constructed under contract by Henley Contractors Pty. Ltd., and post-tensioned by sub-contractor B.B.R. Australia Pty. Ltd.

The structure is a 5 span continuous segmental post-tensioned concrete box girder bridge, 28 feet between kerbs, with one 6 feet wide footway. The overall length is 692 feet, the main spans being 106, 115, 171, 171, and 85 feet, plus two 20 feet approach spans. The segments of the spine beam are of precast concrete 7 feet 11 inches in the longitudinal direction and 22 feet 6 inches wide, weighing approximately 32 tons. The side cantilevers are cast after erection and stressing of the spine beam. The superstructure is supported on 4 single column concrete piers, one of which is a fixed pier. The remaining three are hinged at the top and bottom. The hinges are formed by pot bearings of 1,340 ton capacity, 4 feet 9 inches in diameter. The abutments are of conventional construction with steel roller bearings.

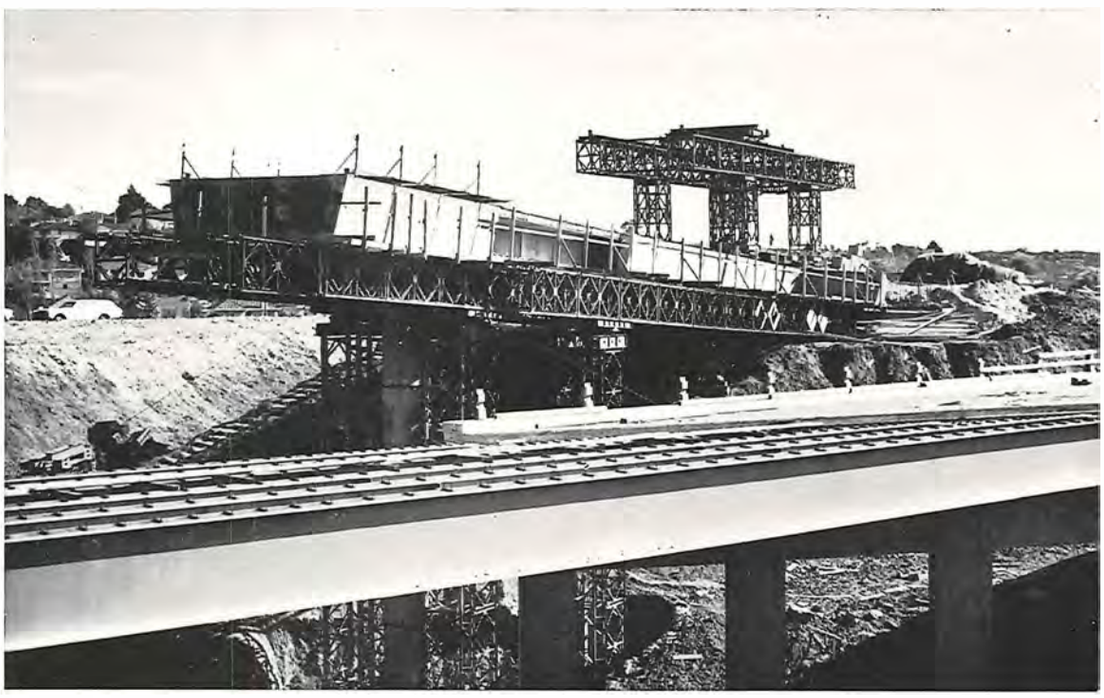


Plate 6—Western End of Bell Street Bridge Under Construction. The Structure in the Foreground is the Northbound Carriageway Bridge.

The bridge is being constructed using a span-by-span technique of post-tensioning. In this technique, each new section is attached to the completed stage which cantilevers beyond the last pier. The new section completes the span and also cantilevers beyond the next pier to form the start of the next span. After placing the segments (Plate 6) and casting the *in situ* concrete joints, the section is stressed, thus becoming self-supporting. The main advantages of this form of construction are that—

(i) the ratio of the moments at the piers to the moments at mid span can be controlled, thereby obtaining a more efficient use of the post-tensioning system,

(ii) the amount of falsework required to support the segments is reduced.

This type of construction requires complicated design procedures, which in turn necessitate extensive use of the Board's computer. Stringent control of the construction procedure is required.

In structures of this type where the post-tensioning tendons are coupled to the preceding stage, it is not possible to measure the friction losses in the tendons by normal methods.

Since a system of segmental construction has been adopted, considerable variations in friction losses can be expected. In view of these variations, and the need for close control of stresses, it is important to measure the friction losses. In order to make any required adjustments as construction proceeds, the Board is developing load cells to be inserted in the tendons at the junctions of the construction stages. The load cells are in a form of a 5 inch diameter high-tensile steel bar (A.S.S.A.B. 705) 1 foot 1 inch long, threaded at both ends for coupling directly to the standard B.B.R. fittings. Around the periphery, eight resistance strain gauges are attached in such a manner as to form a full Wheatstone bridge, thereby making the system independent of temperature variations. The load cells are being calibrated in the tensile testing machine at the Aeronautical Research Laboratories.

Since this technique for measuring the tendon loads necessitated the use of electronic equipment which was also suitable for strain investigations, and as verification of assumptions made in the design of the structure was expected to be valuable for future design work, it was decided to combine the investigations as follows:—

(i) Short-term and long-term tendon load losses.

It is hoped that independent tests being made on the resistance gauges will indicate that their stability is sufficient to enable both short-term and long-term variations in the tendon loads to be measured.

(ii) Differential thermal effects in the spine beam.

Significant stresses, resulting from the temperature differentials between the top and bottom surfaces of the superstructure can be locked into the structure during construction. The temperature differentials will be measured by thermocouples cast into the precast segments, and recorded continuously by equipment installed inside the structure. This information will be applied during construction to keep these thermal stresses to a minimum. Also, the results will be used to obtain a better understanding of the thermal stresses in the completed structure.

(iii) Deflections, settlements, and longitudinal variations due to thermal and post-tensioning effects.

Both short-term and long-term effects will be measured. A system of levelling will be used to measure deflections and settlements, and dial gauges will be used to measure the variations in the lengths.

(iv) Load distribution to the various elements of the superstructure.

Measurements will be obtained by the use of vibrating wire gauges and a form of resistance gauges, cast in the segments and cantilevers, and by the use of Demec gauges.

Strain measurements will be converted into stress readings, by means of hydraulically loaded concrete blocks cast at the same time as the segments.

The investigations are being carried out jointly by the Board's Materials Research Division, Engineering Survey Section, and Bridge Sub-branch.

Computer Usage for Bridge Design

The Board's computer was used for 425 hours of running time during 1968/69 in the design of 59 projects.

Use of various types of programmes was as follows:—

Programme Type	Number of Runs
Geometry	139
Continuous Beams	
(a) Deflections	35
(b) Moments and Shears	43
Two-Column Pier	11
Three-Column Pier	11
Analysis of R.C. Columns	
(a) Rectangular	74
(b) Circular	17
Prestressed Concrete Beams	35
Specifications	70

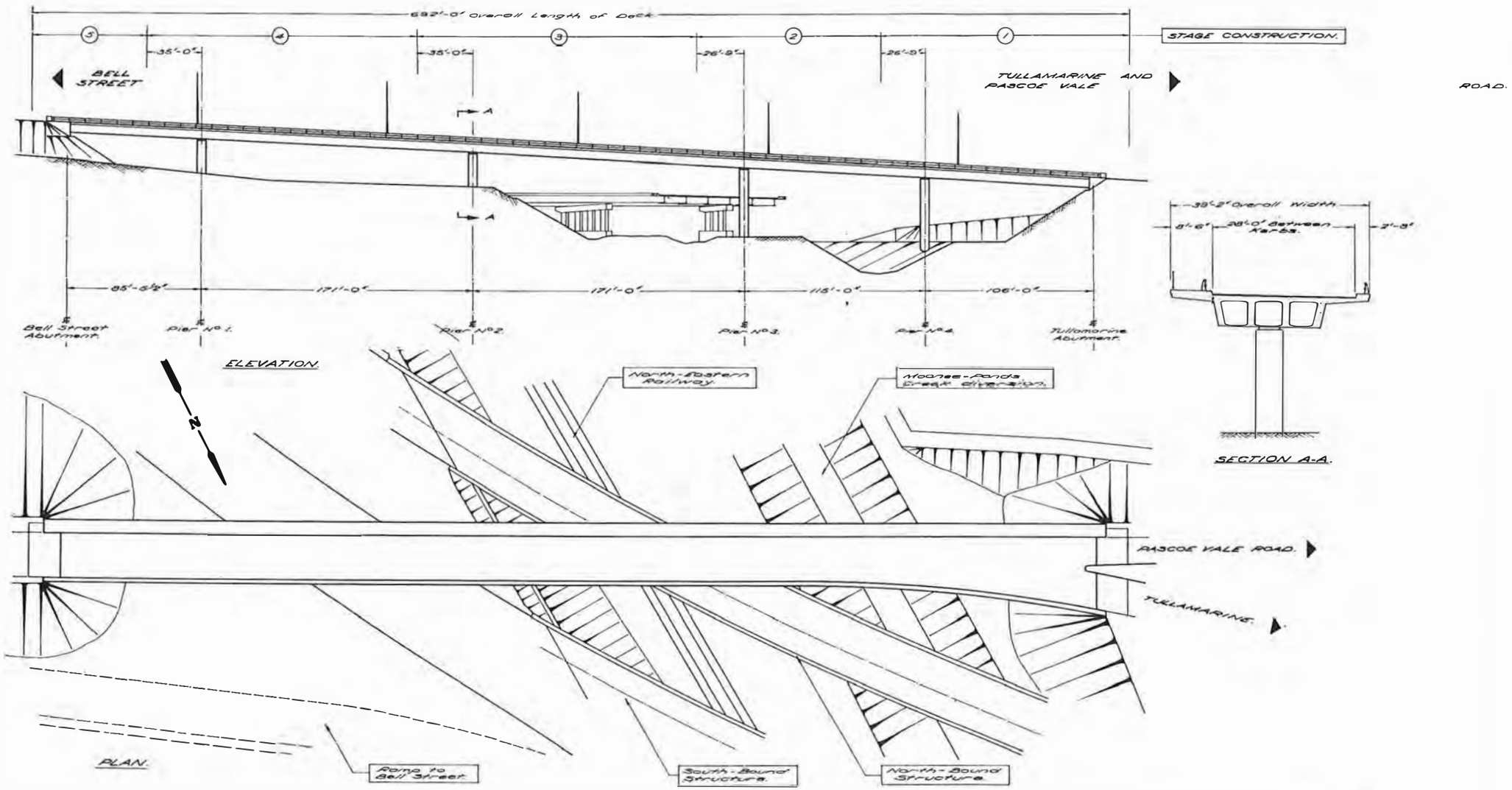


Figure 7—General Arrangement, Bell Street Bridge, Strathmore By-pass Road.

Some programmes have been modified and refined for increased efficiency. With an increase in the complexity of structures being designed, there is an increasing requirement for extensions to the existing programmes and for development of new programmes.

Developmental work, involving 237 hours of computer time in 1968/69, showed an increase of 45% compared with the previous year. Most developmental work has been on comprehensive design systems for both substructures and superstructures.

The Bridge Substructure Design System provides crosshead bending moment and shear force envelopes, column stresses and pile loadings for symmetrical two- or three-column piers. Further development for the design of other pier types and for abutments is intended.

The Bridge Superstructure Design System now under development can be used for the analysis of a multi-span continuous prestressed concrete bridge constructed in stages. Using an initial proposal for section and layout, the appropriate section properties are calculated. The effects of various loading types and combinations are then used to derive maximum and minimum extreme fibre stresses at selected points along the bridge. These results are provided in a summary which lists the load group and constructional stage for which the critical cases occur.

The Superstructure System was used for the design of the Bell Street bridge on the Strathmore By-pass Road. Construction of the superstructure is divided into 18 constructional stages; this involved analysis of 204 load cases for construction live loading. Bending moment envelopes for vehicular live load applied to the final stage were generated from 186 individual live load cases. Beam stresses were calculated and summarized for 11 points in each span, under 6 different groups of loading (viz. vehicular and construction live loads, dead load, prestress, settlement of supports and temperature effects).

The computer processing time for the Bell Street bridge was 35 hours. An equally complete analysis by conventional methods would have been prohibitive in design time.

ROAD DESIGN SUB-BRANCH

1. TRAFFIC ENGINEERING AND BY-PASS ROAD INVESTIGATIONS

Traffic Studies

The annual traffic census was conducted on Wednesday, 12th March, 1969. Twelve hour classification counts were taken manually at a total of 2,039 stations, 808 of which were on State highways.

The Highway Traffic Index (100 in the base year 1933) rose from 927 in 1968 to 1,035 in 1969, an increase of approximately 11%, which may be considered as reasonable in view of the small increase from 1967 to 1968.

An extended automatic count programme, consisting of a series of yearly continuous counts, was continued during 1968/69. The primary goals of the programme are the estimation of traffic patterns, and of the variability of traffic volumes, i.e. estimation of basic traffic volume patterns in Victoria. Sampling techniques are being used to detect the basic traffic volume patterns from the continuous counts. The value of the results will be that, to obtain estimates of volumes at specified locations not previously counted, it will only be necessary to take short sample counts at such locations; and, from the application of factors obtained from the continuous counts, it will be possible to provide estimates of volumes necessary for design, e.g. Annual Average Daily Volume and Design Hour Volume.

Line Marking

During 1968/69, the Board carried out line marking on 6,167 route miles of road, comprising 3,869 miles of State highways and by-pass roads, 1,848 miles on other declared roads, and 450 miles on unclassified roads, the last at the request and cost of municipalities.

The total length of equivalent standard stripe (i.e. 10 feet x 3 inch line, 30 feet gap) was 16,196 miles. The total cost of line and pavement marking painted by the Board in 1968/69 was $270,395, including work to the value of $40,274 by the Board's Regional Divisions. The average cost per mile of equivalent standard stripe painted by the main units was $12.91, compared with $12.89 in 1967/68.

Two new machines were placed in service in 1968/69. One was a self-propelled, self-contained line marking machine, designed and built at the Board's Syndal Depot. The design of this unit departs from the Board's previous design practice of having a line marker trolley pushed by a truck. The change has produced a machine of greater

manoeuvrability, for use in the metropolitan area and on minor roads in the country. The Board's larger unit is thus released for striping long lengths of State highway.

The second new machine was the Canterford line removal machine. It is used by a pavement marking group concerned mostly with intersection markings in the metropolitan area. This unit is hand propelled, and has a small petrol motor driving a 5 inch wide rotary cutting tool. On smooth surfaces, the machine will often remove all the unwanted paint. The bulk of thick paint deposits can be removed, so that chemical stripping is required only for the final cleaning up.

By-pass Roads Investigations

During the year the Board adopted in principle, for future planning purposes, a network of rural freeways and expressways. The routes, which have a total mileage of approximately 670 miles, generally comprise the major highways radiating from Melbourne. As far as practicable, all proposals for future major works on these routes will be planned and designed so as to fit into the future network.

Approval was given to the conversion to freeway standards of the Princes Highway West between the Maltby By-pass Road and the Corio overpass, by the construction of interchanges at Little River, Avalon and Lara, and the restriction of access elsewhere.

A layout was approved for the Gordon section of the Western By-pass Road (Figure 8). The section, approximately 6 miles long, will generally follow an old 3 chain reserve to the north of Gordon. A local road overpass will be provided at Cartons Road. A diamond interchange will be constructed where the by-pass road, at its western end, rejoins the alignment of the existing highway.

Metropolitan Transportation Study

Two engineers from the Board continued their work with the Metropolitan Transportation Study. The Transportation Committee has adopted a highway network, a rail network and a tram-bus network for submission to the Government. The networks are designed for meeting estimated traffic needs in 1985. The highway network includes 300 miles of freeway, 92 miles of new arterial surface roads, and 169 miles of widened surface arterials. Treatment of 39 existing intersections by flaring would be required.

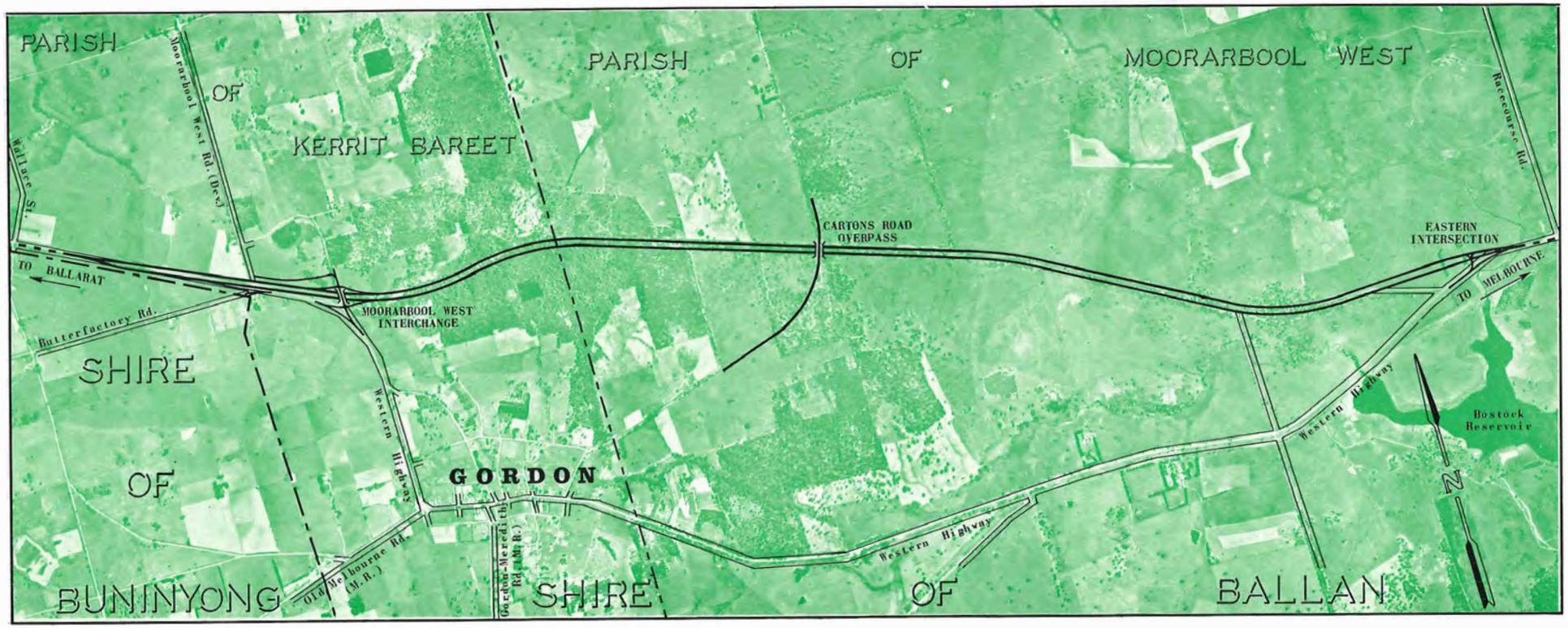


Figure 8—Western By-pass Road, Gordon Section.

2. ENGINEERING PLANS AND SURVEYS

Engineering Surveys

Head Office survey parties completed a total of 300 miles of survey during 1968/69, as follows:—

State highways	61 miles (including 8 miles of divided highways)
By-pass roads	125 miles
Other roads	36 miles
Ground control for photogrammetry	78 miles

Staff of Regional Divisions also completed a considerable mileage of surveys for road and bridge works. Two miles of minor surveys were carried out by consultants.

Plans for Road Construction

Final construction plans completed in, or under the direction of, Head Office during 1968/69 are compared with those produced during 1967/68, as follows (the figures in brackets refer to plans produced by consultants and are included in the figures not in brackets):—

	1967/68		*1968/69*	
(a) Route miles				
Undivided roads	73		27	
Divided roads other than freeways	9 (2)		9 (–)	
Freeways	4 (3)		15 (1)	
	86 (5)		51 (1)	
(b) Final plan sheets		%		%
Undivided roads	540	39	336	30
Divided roads other than freeways and grade separations	652 (48)	46	388 (–)	35
Freeways	212(147)	15	382 (22)	35
	1,404(195)		1,106 (22)	
(c) Separate projects	61 (2)		53 (1)	
(d) Estimated cost of roadworks	$8,410,000 ($1,100,000)		$8,460,000 ($ 113,000)	

Computer lists of levels of cross-sections and computer plots of cross-sections produced for some jobs are additional to the number of final plan sheets shown above.

Some of the larger jobs for which plans were completed, and their lengths in miles, include the following:—

Calder By-pass Road	Deviation including overpass over the railway at Elphinstone.	(2.0m)
Canterbury Road	Railway grade separation, Canterbury.	
Frankston By-pass Road	Duplication.	(2.3m)
Lower Yarra Freeway (including 4.2 miles of access roads)		(7.7m)
Marysville-Woods Point Tourists' Road	Reconstruction of two sections between Marysville and turn-off to Lake Mountain.	(2.8m)
Mt. Dandenong Tourists' Road	Tremont to Beauty Bend	(1.2m)
Nepean Highway	Reconstruction to provide six lanes south of Moorabbin.	(1.7m)
Nepean Highway	Duplication through Mornington.	(2.2m)
Northern Highway	Reconstruction south of Tooborac.	(3.0m)
Princes Highway East	Reconstruction through Drouin.	(0.7m)
Princes Highway East	Duplication in Foster Street, Sale.	(0.5m)
Princes Highway East	Maramingo Creek to N.S.W. border.	(1.4m)

Somerville Road	Railway grade separation, Yarraville.	
South Gippsland Highway	Loch to Bena.	(2.9m)
Warburton Highway	Deviations at Launching Place and Woori Yallock.	(3.4m)

Plans which are well advanced include:—

Calder Highway	Realignment north of Harcourt (Porcupine Hill).	(1.2m)
Maroondah Highway	Realignment, Healesville to M. & M.B.W. watershed.	(2.0m)
McIvor Highway	Duplication in outskirts of Bendigo.	(1.4m)
Mulgrave By-pass Road	Springvale Road to east of Dandenong.	(9.0m)
Princes By-pass Road	Haunted Hills section (Hernes Oak to Morwell)	(3.5m)
Princes Highway East	Divided road treatment, Grange Road to Chadstone.	(1.5m)
Princes Highway East	Duplication through Warragul.	(0.5m)
Western By-pass Road	Bacchus Marsh section.	(5.9m)

The plans for the Mulgrave By-pass Road include the short section of the Eumemmerring By-pass Road connecting the Mulgrave By-pass Road to the Princes Highway east of Dandenong (Figure 9). The design is being carried out by two consultants. The estimated cost of roadworks is $5,000,000.

The plans for the Bacchus Marsh section of the Western By-pass Road are being produced from detail ground survey information tied to the controls used for photogrammetry. A general description of this job was given in the 1967/68 Report. These survey methods are also being used in conjunction with the production of plans for the Gordon section of the Western By-pass Road.

Specifications

Comparative information for supply and construction contracts for the last two years is as follows:—

	1967/68	*1968/69*
Contracts for which specifications were prepared	134	140
Approximate total value of contracts	$8,800,000	$10,500,000
Specifications for construction contracts	20	22
Approximate total value of construction contracts	$5,100,000	$6,200,000

Two of the specifications for construction contracts were prepared in Regional Divisions, and the remaining 20 were prepared in Head Office. Of these, one was for the Tallarook By-pass Road, a Special Project with a contract value of $657,000; and four were for the Lower Yarra Freeway By-pass Road, for a total contract value of $3,000,000.

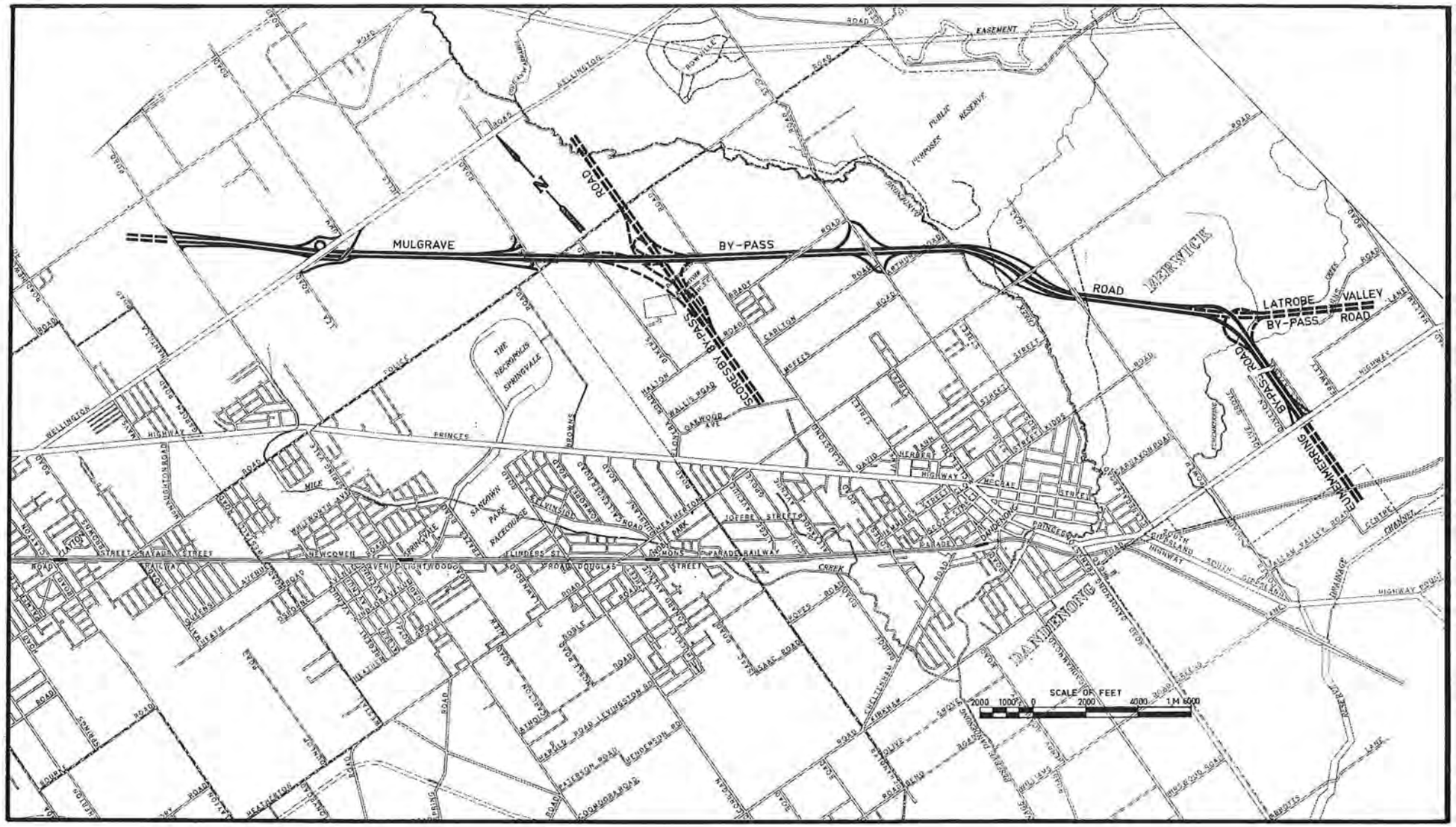


Figure 9—Mulgrave By-pass Road, Locality Plan.

3. TITLE SURVEY AND PRINTING

Title Surveys

A total of 400 survey plans were completed in 1968/69, and all except 21 were carried out by Board's surveyors. Forty-six of the plans related to by-pass roads. Some of the larger projects for which surveys were made included the Lower Yarra Freeway, Mornington Peninsula, Hume, Western and Princes By-pass Roads.

The Board's computer processed 320,300 survey lines, again exceeding the total for the previous year.

Drafting

A total of 794 Gazette plans were drawn, comprising 352 for Approving Orders in Council, and 442 for Declarations. Transfer documents totalling 1,102 were prepared.

Printing

The runs by the Offset and Multilith machines totalled over 5,214,500, showing an increase of 24% over the previous year. Two Engineering Manuals were printed, viz:—

Drafting Manual—Roadworks (two volumes).

Standard Costing System for Roadworks.

The manual, Design Tables and Standard Drawings for Roadworks, was partly printed, and additional copies of the Road Design Manual were printed.

Plan printing and Statfile reproduction showed an increase over the 1967/68 level.

4. RIGHT OF WAY

Plans

(a) Right of Way Plans

Right of way plans of declared main roads in the metropolitan area are being compiled at the rate of approximately 15 route miles per year. Right of way plans of all by-pass road projects are prepared as the projects develop. These plans, showing land tenure, access restrictions, restoration of access, adjacent subdivisions, leased and surplus land, major services, etc., in a pictorial form, are used extensively throughout the Board.

(b) Access Authorization Plans

Nine access authorization plans were prepared for by-pass road projects, so that the Board could authorize points of access as the by-pass roads were declared.

(c) Tenure Plans

Tenure plans were prepared for 7 new projects, involving approximately 30 miles of road.

(d) Highway Record Survey Plans

Highway record survey plans based on aerial photographs were completed for the Western Highway, Sections 2, 3, 4 and 5 (Ballarat to the South Australian border, 202 miles).

Strip maps were completed from aerial photography on the following State highways:—

Henty Highway Sections 1, 2, 3 and 4 (Portland to south of Ouyen)	243 miles
Princes Highway West Sections 3, 4 and 5 (Camperdown to S.A. border)	155 miles
Loddon Valley Highway	79 miles
Bass Highway	37 miles
	514 miles

Aerial photographs are now available for the full length of all State highways.

Odometer Surveys

Surveys were carried out for repositioning of mileposts on the Western Highway, Sections 3, 4 and 5 (Ararat to S.A. border).

Town Planning Schemes

Two sets of coloured plans were prepared for each of 19 principal statutory planning schemes on exhibition. A detailed examination was made of the schemes, and of all amendments to planning schemes.

Land Acquisition and Development

"Before and after" plans of subdivision were prepared for 5 arbitration cases, involving approximately 200 lots. Property enquiries have been maintained at an average of about 70 per week.

MECHANICAL SUB-BRANCH

1. DESIGN AND DEVELOPMENT

The following engineering design and development work has been completed or is in progress:—

(a) Aggregate belt spreader

The prototype 12 feet width belt aggregate spreader referred to in previous Reports has been under intermittent field tests. It will require some additional developmental work before it is suitable for unrestricted field use.

(b) Bitumen storage tanks

The construction, and installation at Benalla, of a pair of 8,000 gallon capacity electrically heated bitumen storage tanks was completed.

(c) Bitumen sprayer testing installation

The bitumen sprayer testing installation at Syndal, referred to in previous Reports, is now completed and sprayer testing and calibration will proceed shortly.

(d) Line marking machine

The construction of a medium size self-contained, self-propelled line marking machine was completed. It has been in continuous use for nearly twelve months, and has proved most satisfactory.

(e) Hydrostatic drives for pumping units on bitumen sprayers

The two alternative designs of hydrostatic drives for bitumen pumps on sprayers, described in the 1967/68 Report, were in use throughout the year. Both performed very satisfactorily, and for applications of this type it is planned for the future to use only hydrostatic drives.

(f) Paynesville Ferry

The Paynesville Ferry, for which the Sub-branch designed a propulsion system, was commissioned early in 1969 and is now in regular use, transporting passengers and vehicles to and from Raymond Island.

(g) Road brooms

Experiments are in progress to eliminate dust clouds created during rotary broom sweeping operations.

(h) Road profile gauge

A long-established practice in rural road construction is to use a shaped oregon beam as a profile gauge for checking camber and super-elevation. This beam is heavy to use, and because of its length is difficult to transport. A design was prepared for an aluminium gauge which can be dismantled into three separate sections. Trial units to this design are about to be manufactured.

(i) Bitumen sprayer

A start was made on assessment of the basic design requirements and main construction features of a new semi-trailer type bitumen sprayer of 1,000 gallon nominal capacity. The design should be sufficiently advanced for the manufacture of a prototype in the 1969/70 financial year.

2. NEW TYPES OF PLANT

The following major plant and machinery items of types not previously owned by the Board were acquired:—

(a) Mobile rock breaker

Coates two wheel, pneumatic tyred trailer type, model RBC4 Rockbuster, powered by a 6 cylinder 190 h.p. Caterpillar DB33C diesel engine which, by means of a multi-groove belt, drives a rotor at 1,000 r.p.m. The rotor is fitted with eighteen swinging manganese steel hammers of 40 lb. each, which cover a breaking width of 4 feet. The rotor height above, and its angle relative to, the surface on which the unit is towed, can be adjusted by hydraulic means. Heavy chain curtains are used to prevent the expulsion of broken rock at high velocity from under the breaking chamber. The breaking chamber, which partly surrounds the rotor, consists of bolt-on replaceable steel plates. The unit is towed at very low speeds, straddling windrows of pit-run oversize material, from which it produces low-cost crushed rock.

(b) Soil stabilizer

Howard Unimix model E80 stabilizer. This is a rotary-hoe type stabilizer, with an 80 inch wide cut and maximum mixing depth of 9 inches, which is towed from the three-point linkage of a pneumatic-tyred tractor. The rotor is driven from the tractor power take-off. Equipment for moistening the soil-stabilizer mixture is incorporated in the unit.

(c) Tractors—pneumatic tyred

(i) Ford model 5000 tractor powered by a 4 cylinder 65 h.p. diesel engine driving through an 8 speed conventional transmission and 24 to 1 ratio auxiliary gear reduction. This is used for towing the mobile rock breaker and the soil stabilizer at very low speeds.

(ii) Fiat model 450 tractor powered by a 3 cylinder 45 h.p. diesel engine driving through an 8 speed conventional transmission, and fitted with a 10 cubic feet capacity bucket Superlift front-end loader.

(iii) Zetor model 5545 four wheel drive tractor powered by a 4 cylinder 60 h.p. diesel engine driving through a 10 speed conventional transmission. It is fitted with power steering, a hydraulically controlled front dozer blade, and a small tipping trailer also powered from the tractor hydraulics.

(d) Truck

Ford model F700 tender truck powered by a 6 cylinder 139 h.p. petrol engine and fitted with an Evans steel tipping body of 6 cubic yards capacity.

(e) Water tanker

Freighter 3,000 gallon semi-trailer water tanker coupled to a Dodge model AT4/760 prime mover powered by an 8 cylinder 183 h.p. petrol engine. The tanker is fitted with a constant head device and air operated valving for a spray bar system enabling spraying to 8 feet, 10 feet, and 12 feet widths by gravity. The valves are operated from the prime mover cabin.

(f) Compressor

Holman model R025P rotary screw type compressor powered by a Ford model 590E 6 cylinder 75 h.p. diesel engine. The unit is mounted on a single axle trailer. The free air output of the compressor at 100 p.s.i. is 250 cubic feet per minute.

(g) Rollers

(i) McDonald model YE drawn plain drum rollers with a rolling width of 6 feet, an unballasted weight of 7¾ tons and a ballasted weight of 12¼ tons.

(ii) Moore model SP3607 self-propelled, pneumatic-tyred, multi-wheel roller powered by a 6 cylinder 110 h.p. Perkins model 6-354D diesel engine driving through a three speed torque converter power shift transmission. The maximum ballasted weight is 82,200 lb. and this provides tyre loads of up to 11,743 lb. on each of 7 wheels. The roller is partly ballasted with twenty removable steel billets each of 10 cwt. These are loaded and unloaded by air operated hoists which form an integral part of the roller. Final ballasting is achieved with water.

(h) Alternators

(i) Lister Blackstone 415/240 volt, 3 phase 50 cycle 22.5 KVA alternator set, comprising a Brush alternator, powered by a 3 cylinder 28.5 h.p. Lister model HA3 diesel engine. The unit is complete with electric starting. It is used for camp lighting.

(ii) Powamac 240 volt, 50 cycle 2 KVA alternator powered by a single cylinder 5 h.p. Briggs & Stratton engine. This unit is used as a power source for hand tools in remote locations.

(i) Rammer

Wacker model BS60Y rammer powered by a 2½ h.p. two stroke petrol engine. The nett weight of the unit is 115 lb. It has a stroke of up to 2⅜ inches and its impact rate is 450 to 630 per minute.

(j) Edge cutter

Page tractor-mounted rotary edge cutter. This is a hydraulically operated tractor attachment, with a disc cutter for the trimming of grass on the edge of medians. It is complete with a wipe off blade to remove dirt and grass from the top of kerbing.

(k) Pavement marking remover

Canterford line removing machine, powered by a single cylinder 8¼ h.p. Wisconsin petrol engine, which drives, by means of a belt, a rotary tool consisting of a series of hardened star cutters. The unit, mounted on rubber-tyred wheels, is controlled by a walking operator.

ADVANCE PLANNING

Road Needs Survey

During the year data collection for the 1969/74 Road Needs Survey was completed, and the data were supplied to the Commonwealth Bureau of Roads. The Bureau collected data from all States and submitted to the Commonwealth Government a report which resulted in an announcement at the Premiers' Conference, in March, 1969, of the provisions of a new Commonwealth Aid Roads Act to operate for five years commencing 1st July, 1969. Under the new Act, grants are to be allotted to functional classes of road, thus avoiding difficulties arising from the differing legal classifications in the various States.

The data collected outside the Melbourne area and outside the areas of major provincial cities include assessments of road section conditions. It is intended that these shall be continually revised so that essential basic data will be available for needs surveys at any time.

ENGINEERING COMPUTER SECTION

Use of the Board's IBM 1620 Computer During 1968/69

(a) Use by Board's Staff

A summary of the computer time used during 1968/69 by the Board's own staff is shown in Table 9. Additional details of the work processed and the programming work undertaken are contained elsewhere in this Report.

TABLE 9—IBM 1620 COMPUTER USAGE BY BOARD'S STAFF

User	Productive Hours	Developmental Hours	Total Hours
Bridge Sub-branch	425	237	662
Traffic and Location Section	404	102	506
Plans and Survey Section	412	16	428
Computer Section	244*	122	366
Advance Planning Division	176	28	204
Materials Research Division	142	46	188
Title Survey Section	166	—	166
Dandenong Division	24	7	31
Accountant's Branch	15	—	15
Secretary's Branch	265	56	321
Totals for 1968/69	2.273	614	2, 887

* Includes work processed by Computer Section for other Sections, and computer maintenance.

(b) Use by Other Bodies

Computer time was made available to the following Government departments and other bodies:—

Department of Crown Lands and Survey
Australian Road Research Board
Melbourne Metropolitan Transportation Study
Shire of Whittlesea
Shire of Melton

One firm of consulting engineers engaged by public authorities also made limited use of the Board's computer equipment.

These other bodies used 138 hours of computer time during 1968/69, a decrease of 39% from the previous year.

(c) Trends in Computer Usage

Computer usage by Board's staff was 11% higher in 1968/69 than in 1967/68. Productive use increased by 12% and developmental use increased by 9%.

Two-shift operation has been necessary throughout the year, the computer being in use for an average of 13 hours per day. The highest average daily usage, in June, 1969, was 15½ hours per day.

A review of the adequacy of the 1620 for present computing needs, and an investigation of the Board's future requirements for computer use is now being made in conjunction with representatives of the Secretary's and Accountant's Branches.

Computer Programming

The Section continued to provide advice and assistance in the use of computers to other members of the Board's staff.

During the year the Section developed new computer programmes to check and summarize information obtained in the Road Needs Survey, and programmes to produce summaries of Materials Research Division test reports. Improvements and additions were made to computer programmes for road design calculations, production of bridge specifications, mechanical plant records and bituminous surfacing statistics.

New Equipment

A Fischer and Porter Translator was attached to one of the card punches in May, 1969. This unit reads traffic count information from tapes produced on automatic recorders, and punches it into cards which are subsequently processed on the computer.

SAFETY

There was a slight reduction in the number of lost time injuries in 1968/69 in comparison with the previous year, continuing the trend from 1966/67 to 1967/68. Details of the injuries are set out in Table 10.

TABLE 10—INJURIES TO BOARD'S EMPLOYEES

Type of Injury	1968/69	1967/68	Changes from 1967/68	
			Decrease	Increase
Back strains	50	64	14	—
Burns and scalds	20	16	—	4
Burns to eyes	11	5	—	6
Foreign body in eyes	51	75	24	—
Fatal injuries	3	2	—	1
Fractures	34	32	—	2
Head injuries	15	10	—	5
Lacerations and wounds	40	47	7	—
Miscellaneous	49	32	—	17
Multiple injuries	1	2	1	—
Occupational diseases	51	48	—	3
Sprains and strains	50	52	2	—
Totals	375	385	Nett decrease = 10	

The table "Injuries to Board's Employees" in the 1967/68 Annual Report showed a large proportion of the injuries reported in 1967/68 in the category "Miscellaneous". Some of the injuries shown in this and several other categories have been reclassified more appropriately for more accurate comparison with the 1968/69 information. Table 10 contains the reclassified information.

For the second consecutive year there has been a decrease in the number of back strains, reflecting the value of follow-up training sessions on kinetic lifting methods which were introduced in 1967.

Eye injuries have further decreased following more widespread use of safety glasses and other eye protection equipment.

The relative frequency and severity of accidents for 1968/69 and 1967/68 are as set out below:—

	1968/69	*1967/68*
Total manhours worked	8,423,000	8,420,000
Lost time accidents	375	385
Accident frequency rate per million manhours	44.5	46.0
Days lost	22,113	14,328
Days lost per million manhours	2,563	1,714

"Days Lost" are based on Australian Standard CZ6-1966, "Recording and Measuring Work Injury Experience". Under this code a fatal accident is assessed as being equivalent to 6,000 days lost.

Inspections and Investigations

Regular visits of 3 to 5 days' duration were made to country Divisions and frequent visits were made to the Central Workshops at Syndal and to jobs in the metropolitan area. During these visits general safety inspections were carried out at depots, workshops, precasting yards and in the field. The inspections were to identify existing and potential unsafe practices and conditions, and following the inspections desirable safety measures were discussed with the engineers concerned.

MANUALS

Four manuals for use by the Board's engineering staff were published during the year. These were:—

Road Drafting Manual
Engineering Survey Manual
Title Survey Manual
Standard System for Estimating and Costing of Direct Labour Roadworks.

A number of new and revised standard specifications for roadworks were issued in two amendment lists to the manual "Notes on the Standard Specifications for Roadworks".

A booklet entitled "Proper and Economical use of Plant in the Field" was issued for the information and guidance of engineers responsible for field operations.

STAFF TRAINING

Selected members of the Chief Engineer's Branch attended the following training courses and conferences during 1968/69:—

External Courses

Fourth Conference of the Australian Road Research Board—Melbourne.

Jubilee Annual Engineering Conference—Institution of Engineers, Australia—Sydney.

Tenth Congress, Australian Planning Institute—Perth.

Twelfth Annual Congress, Institute of Surveyors, Australia—Melbourne.

Eighth Civil Engineering Construction Management Course—University of New South Wales.

Traffic Planning and Control Course—University of New South Wales.

Seminar: Traffic Engineering—University of Melbourne.

Special Lectures in Transport—University of Melbourne.

Seminar: Urban Transport in the Years Ahead—Transport Regulation Board.

Symposium: City Development: The Future of the Central Business District—Melbourne Chamber of Commerce.

Course on Ultrasonic Testing—Non-Destructive Testing Association of Australia, in conjunction with the Royal Melbourne Institute of Technology.

Design of Heavy Weldments—Royal Melbourne Institute of Technology.

Limit State Design in Bridges—University of New South Wales.

Second Tewkesbury Symposium on Fracture—University of Melbourne.

Lecture Course: Aspects of Present Day Corrosion Science and Technology—Australian Corrosion Association.

Sixteenth Annual Conference—The Australian Welding Institute—Hobart.

Symposium: Analytical Flame Spectroscopy: Royal Australian Chemical Institute, Victorian Branch.

Forum on Australian Standard CA 1—1968—Australian Institute of Steel Construction.

School in Rock Mechanics—University College of Townsville.

Symposium on Piled Foundations—Institution of Engineers, Australia—Melbourne Division.

Symposium on Flood Hydrology—Institution of Engineers, Australia—Sydney Division.

Symposium on Steel Structures—Institution of Engineers, Australia—Melbourne Division.

Lecture Series on Scaffolding—Royal Melbourne Institute of Technology.

Topics in Machine Design—Royal Melbourne Institute of Technology.

Earth Moving Equipment: Lecture Series—Society of Automotive Engineers, Australasia.

Rotary Engines: Lecture Series—Society of Automotive Engineers, Australasia.

Vehicle Safety Testing School—Victoria Police Force.

Instructor Drivers' Training Course—Victoria Police Force.

Conference on Vibration and Machines—Institution of Engineers, Australia—Melbourne Division.

Training course on Case Model 1150 Crawler Front End Loader—J. I. Case (Australia) Pty. Ltd.

Instruction School on Champion Industrial Mark 3 Tractor—Chamberlain Industries Pty. Ltd.

Course for First Year Apprentices—William Adams Tractors Pty. Ltd.

Inspection of Timken Bearing Factory, Ballarat—arranged by Ball Bearings Pty. Ltd.

Training Course on Bedford Vehicles—General Motors-Holden.

Seminar: A Day with the Industry—The Aluminium Development Council.

Study Courses for Training of Colombo Plan Fellows: Intermediate Level Engineers' Course—Department of Main Roads, New South Wales.

Road Foremen and Works Superintendents' Course—Royal Melbourne Institute of Technology.

Discussion Course: Extractive Industries General Operating Regulations—Institute of Quarrying—Victorian Group.

Symposium: Programme Budgeting—Commonwealth Bureau of Roads.

First Victorian Weeds Conference—The Weed Society of Victoria.

Industrial Engineering Appreciation Course—Australian Post Office.

Advanced Course—Australian Administrative Staff College.

Seminar for Senior Staff—State Rivers and Water Supply Commission.

Seminar: Effective Top Management—Dr. H. Koontz, Beckingsale & Company.

Methods of Instruction Course—Department of Labour and National Service.

Scientific Handling Course—Department of Labour and National Service.

Counselling Course—Australian Institute of Management.

Conference: The Supervisor's Role—Australian Institute of Management.

Symposium—Safety Engineering Society of Australasia—Victorian Division.

Municipal Superintendents of Works Conference—Local Government Engineers' Association of Victoria.

Explosives Course—State Electricity Commission of Victoria.

CPO1 Fortran Coding Course—IBM Australia Ltd.

Fortran Programming Course—IBM Australia Ltd.

Linear Programming Course—IBM Australia Ltd.

Data Base Organization and Management—W. D. Scott & Co. Pty. Ltd.

Scott-Brandon E.D.P. Seminar—W. D. Scott & Co. Pty. Ltd.

Internal Courses

Roadside Development Course.

Road Design Course.

Training Conference—Materials Research Division.

Training Course in Materials Research Division Methods.

Bituminous Surfacing (Sprayed Work) Course.

Engineers' Training Conferences on Contract Administration, Standard Specifications and Right of Way Procedures.

Supervising Engineers' Conference.

Overseers' Training Conference.

Training Within Industry Instruction.

Course in Industrial Relations.

Engineering Survey Course.

Course in Use of Computer Methods.

Course in Procedures of the Board's Traffic and Location Section.

Training in Various Specified Matters—Bridge Sub-branch.

Conference for Roadmasters and Patrolmen—Geelong Division.

Training of Board's Young Engineers.

Communication Courses.

PUBLICATIONS

The following papers were presented during 1968/69, in connection with the Board's engineering work:

Paper	Author
Sampling and In Situ Testing Equipment used by the Country Roads Board of Victoria for Evaluating the Foundations of Bridges and Embankments	A. H. Bartlett, B.Sc., A.M.Aust.I.M.M.
Presented at the Fourth Conference of the Australian Road Research Board, Melbourne, August, 1968.	J. C. Holden, Dip.C.E., B.E. (Civil), M.Eng.Sc., Ph.D., M.I.E.Aust., A.M.A.S.C.E.
Pavement Evaluation using the Plate Bearing Test	B.R. Cochrane, B.C.E., M.I.E.Aust.
Presented at the Fourth Conference of the Australian Road Research Board, Melbourne, August, 1968.	J. R. Styles, B.E. (Civil)
A Recording Mechanism for a Road Roughness Indicator	A. F. Griffiths, B.E., A.R.M.T.C.
Presented at the Fourth Conference of the Australian Road Research Board, Melbourne, August, 1968.	D. L. Veith, F.R.M.I.T., Grad.I.R.E.E.
Strathmore By-pass Road—A Case Study of Urban Freeway Location	N. S. Guerin, B.C.E., C.E., Cert. H.T. (Yale), M.I.E.Aust., A.M.I.T.E.
Presented to the Highways and Traffic Engineering Branch of the Victoria Division, The Institution of Engineers, Australia, June, 1969.	
Field Measurements to Evaluate the Performance of Sand Drains at Dynon Road Overpass, Melbourne	J. C. Holden, Dip.C.E., B.E. (Civil), M.Eng.Sc., Ph.D., M.I.E.Aust., A.M.A.S.C.E.
Presented at the Fourth Conference of the Australian Road Research Board, Melbourne, August, 1968.	
An Urban Intersection Accident Study	W. I. Leslie, B.E., C.E., M.I.E.Aust. (Commonwealth Bureau of Roads)
Presented to the Highway and Traffic Engineering Branch of the Victoria Division, The Institution of Engineers, Australia, May, 1969.	A. T. Fry, B.E., M.Eng.Sc., M.I.E.Aust.
Computer Techniques in Highway Design	D. Pritchard, Dip.C.E., C.E., M.I.E.Aust.
Presented to the Highway and Traffic Engineering Branch of the Victoria Division, The Institution of Engineers, Australia, October, 1968.	
Acceleration Noise and Traffic Congestion	R. T. Underwood, M.E., B.C.E., Dip.T.&R.P., C.H.T. (Yale), C.E., M.I.E.Aust., M.A.P.I., A.M.I.T.E.
Published in the Journal "Traffic Engineering and Control", Vol. 10, No. 3, July, 1968.	

Experience in the Design of Urban Divided Road — R. T. Underwood, M.E., B.C.E., Dip.T.&R.P., C.H.T. (Yale), C.E., M.I.E.Aust., M.A.P.I., A.M.I.T.E.

Presented at the Fourth Conference of the Australian Road Research Board, August, 1968.

The Economic Evaluation of Urban Transport Networks — B. B. Wentworth, B.Com. (Hons.), L.I.B.A.

Presented to the Monash University Department of Economics, July, 1968.

Mention of the following papers was inadvertently omitted from previous Annual Reports:

Experience with a Nuclear Moisture-Density Measuring Device — J. N. Hanks, B.Sc.

Published in the Journal "Australian Road Research", Vol. 3, No. 3, September, 1967.

An Evaluation of the Performance of Certain Pavements in Northern Victoria, Australia — A. Ratnarajah, B.Sc.

Presented at the South-East Asia Regional Conference on Soil Engineering, Bangkok, April, 1967.

The Effectiveness of the Drill Lime Process — H. D. Taskis, B.Sc., Dip.Ed.

Published in the Journal "Australian Road Research", Vol. 3, No. 5, March, 1968.

The following issues of "Engineering Notes" were published in 1968/69:

89. Safety Batter Harness
90. Conditions Governing Erection of Service Stations Abutting C.R.B. Roads
91. Establishment of Non-overtaking Zones

One issue of "Construction News" was published, containing eight items on various topics.

STAFF

Total staff of the Chief Engineer's Branch was 969 at 30th June, 1969.

Mr. C. C. Perrin retired as Deputy Chief Engineer—Works, after 48 years' service with the Board, and Mr. B. R. Abery retired as Deputy Chief Engineer—Bridges, after nearly 40 years' service. Both Mr. Perrin and Mr. Abery made very valuable contributions to the Board's activities during their long service.

Mr. F. F. O'Brien, Divisional Engineer, Ballarat, died on 14th April, 1969. His period of service was about 42 years and was also a most valuable one.

The total cost of work performed in 1968/69 by the Board on its own direct works and for other authorities, and by municipalities with funds made available by the Board, was $70,747,000.

The Board's engineering activities continue to grow in magnitude, and to become more involved. I wish to thank the staff for their able and dedicated contribution to these activities.

H. S. Gibbs, B.C.E. (Hons.), M.C.E., C.E., F.I.E.Aust., A.A.S.A.,
Chief Engineer.

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