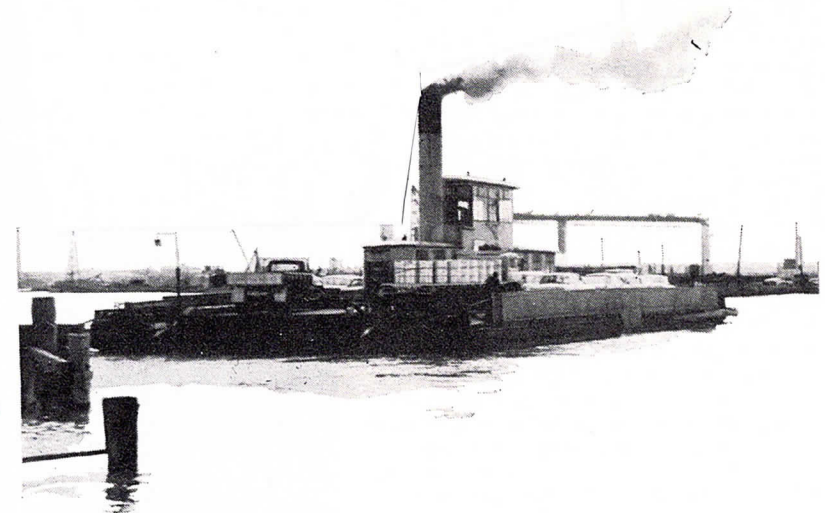


THE WEST GATE

PROJECT

by Robert Morgan



One could say fairly accurately that everyone knows that a span of the West Gate Bridge collapsed last year, but how many people know much more about the project?

The bridge is just one part of a whole co-ordinated group of projects which stretch eight miles from Ferrars Street in South Melbourne to the Princes By-pass Road (Geelong Road) at the Western Suburbs Memorial Park, Brooklyn.

This article deals with the whole project — not only the bridge. There is no discussion of the collapse as it would be highly improper at this stage.

BACKGROUND

The construction of the West Gate Bridge is a direct result of pressure by the Western Industries Association to have the State Government replace the Williamstown Ferry with a modern fixed crossing.

Ferries of one kind or another have been running between Williamstown and Port Melbourne since the 1830s. The present ferry has been in service since 1931.

Proposals for a tunnel near the present ferry site began as early as 1912 when a tunnel of 25 feet diameter was

contemplated. Further plans for a tunnel or bridge of two or four lanes were made up to 1955, but none got further than the investigation stage.

In 1957 the Western Industries Association was formed, to improve facilities west of the Yarra. Due to the activities of this Association, plans for a bridge or tunnel were actively investigated. In 1964 a government committee recommended a high-level, six lane bridge.

In 1965 the Lower Yarra Crossing Authority (L.Y.C.A.), a public company set up by an Act of Parliament, was registered and, with the increased data then available, it was decided to build an eight-lane bridge. This has since been modified to eight traffic lanes and two break-down lanes on the same pavement width. At a later stage it can be changed to ten traffic lanes of slightly reduced width with no break-down lanes.

The effects of the West Gate Bridge will be much more far-reaching than earlier bridge and tunnel proposals which simply sought to replace the Williamstown Ferry. The bridge together with the Lower Yarra Freeway will provide, along with current improvements to Geelong Road, freeway conditions between Port Melbourne and Corio (near Geelong).

Traffic from the south and east of Melbourne will no longer have to pass through the City to reach the west of Melbourne and beyond. The saving to the community from reduced accidents in the area is estimated to be over \$1 million in the first year of operation.

With eight traffic lanes, the bridge will be capable of carrying a peak volume of 15,500 vehicles per hour. The L.Y.C.A. expects that upon opening, the bridge will be used by 35,000-40,000 vehicles per day on an average weekday, with weekend traffic expected to be as high as 50,000 v.p.d., particularly on summer Sundays. The L.Y.C.A. traffic studies were carried out by P.G. Pak Poy and Associates, who used the predicted volumes in a toll revenue study.

The C.R.B. also made studies which indicated a typical weekday volume of 33,000 v.p.d. One Pak Poy assumption which the C.R.B. did not use was that motorists will always take the route of shortest distance. This assumption has been found incorrect in previous studies of Melbourne traffic.

EASTERN APPROACHES

In anticipation of the increased traffic volumes the C.R.B. has made considerable improvements to roads in South Melbourne and Port Melbourne.

The C.R.B. expects traffic to enter and leave the bridge along three main routes. With their expected percentages of the total bridge traffic, these routes are:

- (i) Graham Street, 36%.
- (ii) Ingles Street-Dorcas Street, 26%.
- (iii) Rogers, Boundary, Brady and Montague Streets, 28%.
- (iv) Others, 10%.

This highlights the main purpose of the bridge — not as a city link, but as a city by-pass, relieving arteries such as Kingsway and Spencer Street Bridge.

Specifically, the improvements consist of (referring to the map):

- A. (i) Reconstruction of Graham Street — a short section of which was previously unconstructed — between Lorimer Street and Foote Street to provide four through traffic lanes. Involved with this are an overpass over the freeway (part of the Graham Street interchange — see later) and one over the Port Melbourne railway line at Graham Station.
- (ii) Minor construction in Foote Street and a right-turn lane in Beaconsfield Parade. This work is being done by South Melbourne Council at C.R.B. expense.
- B. Reconstruction of Rogers Street

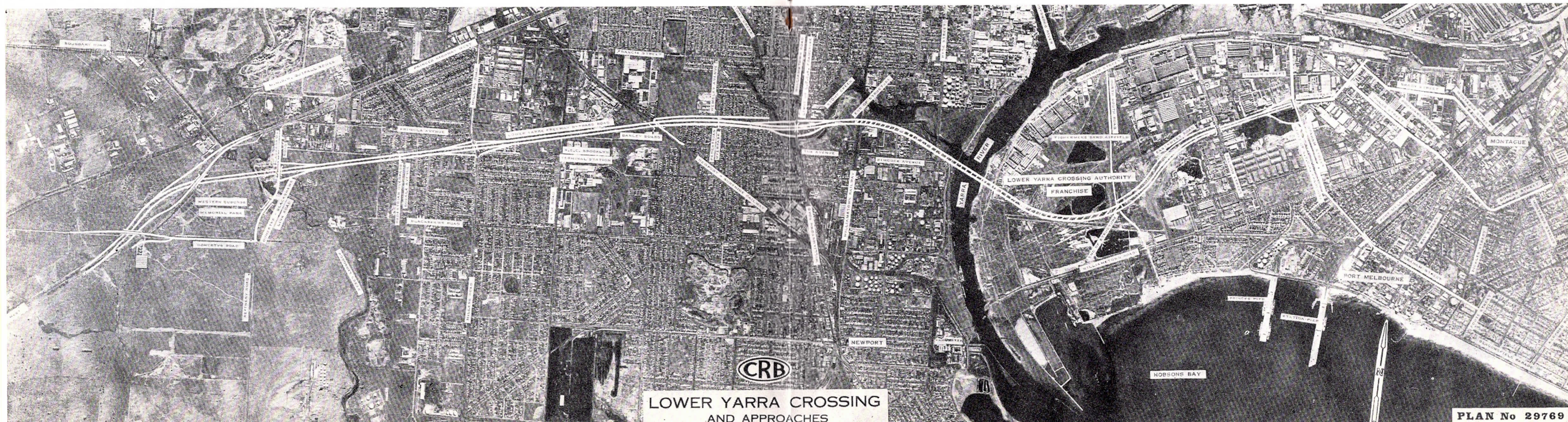
through to Lorimer Street to expressway standard and reconstruction, to 46 feet width, of a continuous section of Boundary, Brady and Montague Streets.

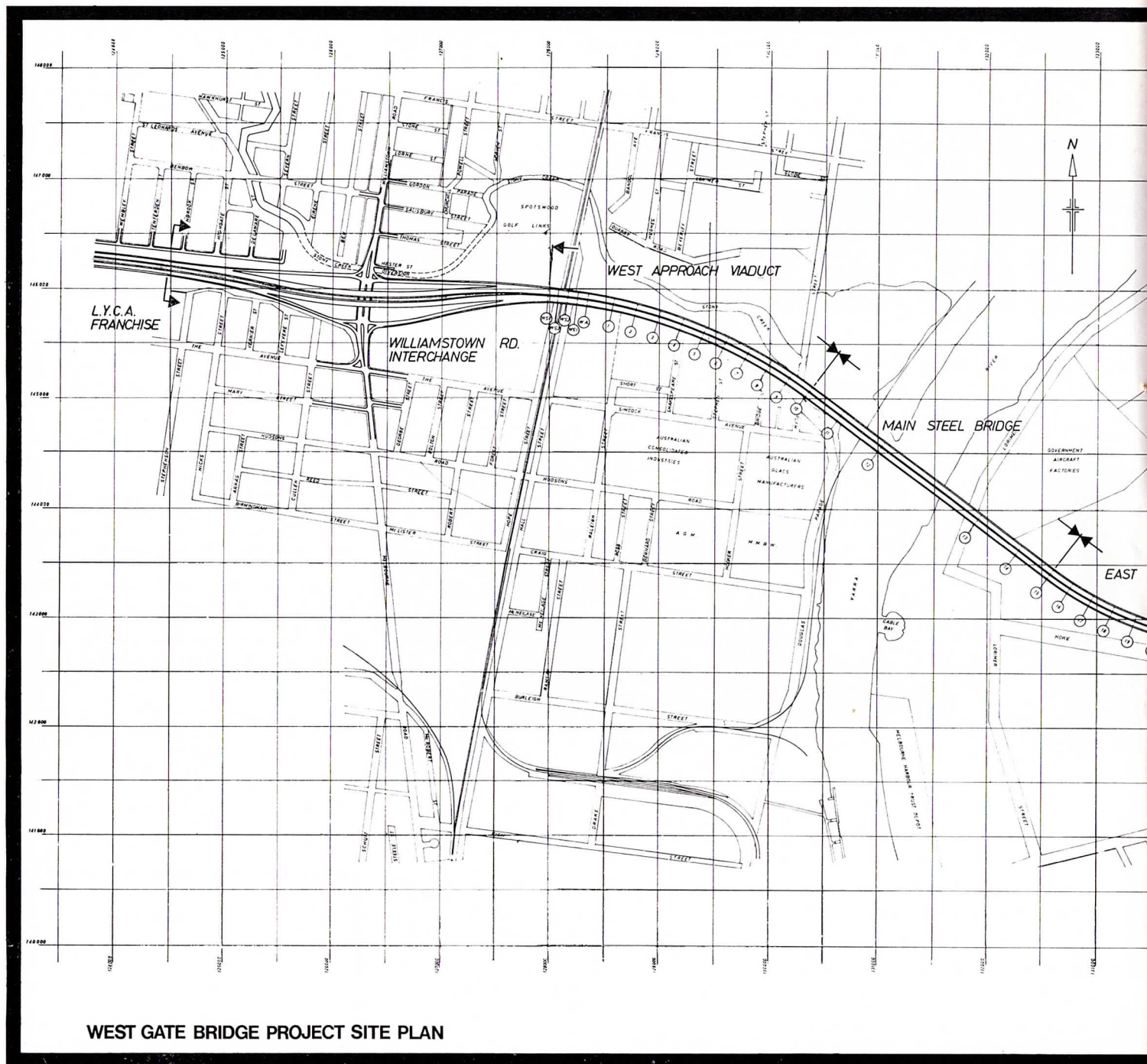
- C. (i) Reconstruction of Ingles and Dorcas Streets to provide four through traffic lanes.
- (ii) Improvement of the Ingles Street railway crossing by the installation of duplicated boom gates.
- D. Installation of new traffic control signals at nine locations along these feeder routes. Three other sets will be upgraded or rephased to meet the changed traffic demands.
- E. As the freeway extension, east of Graham Street, uses the old alignment of Cook Street, alternative access had to be found for properties facing this street. This was done by constructing Turner Street and constructing Bridge Street from Fennell Street to the A.M.I. property. Except for Turner Street, where Port Melbourne Council paid about one-third of the cost and the Graham Street interchange overpass (see later), these improvements were wholly paid for by the C.R.B. as a direct charge against the project. Two other works have also been undertaken in the area which will aid access to the bridge, while not being a direct

- charge against the project. These are:
- F. Reconstruction and duplication of Canterbury Road and Ferrars Street, from Fitzroy Street to Dorcas Street, by St. Kilda and South Melbourne Councils, with financial assistance from the C.R.B. This will provide an extended dual carriageway for traffic using Dorcas Street to reach St. Kilda.
- G. The M.M.B.W. is constructing a link between City Road and Alexandra Avenue underpassing St. Kilda Road. This will ease congestion which is already a problem where north-south and east-west traffic meets. Without the underpass congestion could be expected to increase once the bridge opens.

The improvements are considerable and extend up to three miles from the bridge complex. It is expected that these feeder routes will extend far enough for traffic to diffuse into the existing main traffic arteries easily after leaving the bridge. The C.R.B. expects the improvements to provide a high level of service for approximately five years, after which time the level of service will decline and eventually further improvements will be required.

The Metropolitan Planning Scheme (1954) incorporates a limited access road extending eastward from the Lower Yarra





WEST GATE BRIDGE PROJECT SITE PLAN

cables. Erection was by means of a launching truss which travelled on rails along the previously completed sections of the spine, hoisting units into place and holding them in position while tensioning took place.

Spine sections were cast in yards on both sides of the river while cantilevers were made only on the east side. Those required for the western viaduct were road-hauled to the site.

Spine units were cast in single pours standing on their ends and cantilevers cast on their sides. Steam curing enabled the units to be handled 24 hours after pouring. Standard formwork was made of steel and only variable sections were made of plywood.

MAIN STEEL BRIDGE

Span 10-11 which collapsed was the first steel span on the west side of the Yarra. Therefore, discussion here must be limited to items such as facts on

dimensions and to the nature of the design investigations.

The main steel bridge was designed as a cable stayed steel girder, 2,782 feet long, with the supporting cables resting on towers above columns 12 and 13. The steel box superstructure is of a trapezoidal section 13'2" deep, 62'6" wide at the bottom and 83'6" wide at the top. Cantilever brackets extend on each side at the top to provide a maximum deck width of 122'6" over the main span, where a nine foot median is required for the supporting towers. Away from the towers the median reduces to three feet and the cantilevers are subsequently shorter.

Each supporting tower is made up of six welded boxes, eight feet square and 23'4" long with shorter sections forming the lower bearing base and top saddle for the cables.

The deck was to be covered by a continuous concrete slab, joined to the

steel top flange by field welded stud shear connectors. The concrete deck meant a bridge of simplified structural form compared with an all-steel deck. The larger supporting cables required meant that deflection under live load would be less and that the natural frequency of the structure would be less.

A considerable amount of study was put into the effects of wind on the structure — into excitation and methods of damping. These studies showed that a girder consisting of twin box girders joined by a thin deck slab became very unstable with moderate inclined winds. This precluded the use of such a design.

WILLIAMSTOWN ROAD INTERCHANGE

West of the bridge, the first major structure is the Williamstown Road Interchange. It is a full diamond interchange which provides for the transfer of traffic between Williamstown Road and either the bridge to the east or the freeway

to the west. A relatively large volume of bridge traffic is expected to use this interchange and its east side is provided with two-lane on and off ramps. Provision has also been made in the interchange for the future connection of freeway F3 along Stoney Creek.

Under an agreement between the C.R.B. and the L.Y.C.A., the L.Y.C.A. became the constructing authority for the whole of the interchange west to Cranbrook Street. Once again the C.R.B. and the L.Y.C.A. each paid half the cost.

The interchange site was almost completely encircled by Stoney Creek. Diversion of the creek into a concrete channel to the north of the site cost over \$500,000. However, this avoided extensive bridgeworks within the interchange.

At its present stage of development, the interchange consists of four ramps plus twin bridges to carry the freeway over Williamstown Road. Each bridge

consists of two simply supported spans fixed to the central support, with longitudinal movements occurring at the abutments. The deck is made up of hollow, post-tensioned box-beams with a four inch insitu reinforced concrete deck.

S.E.C. INVOLVEMENT

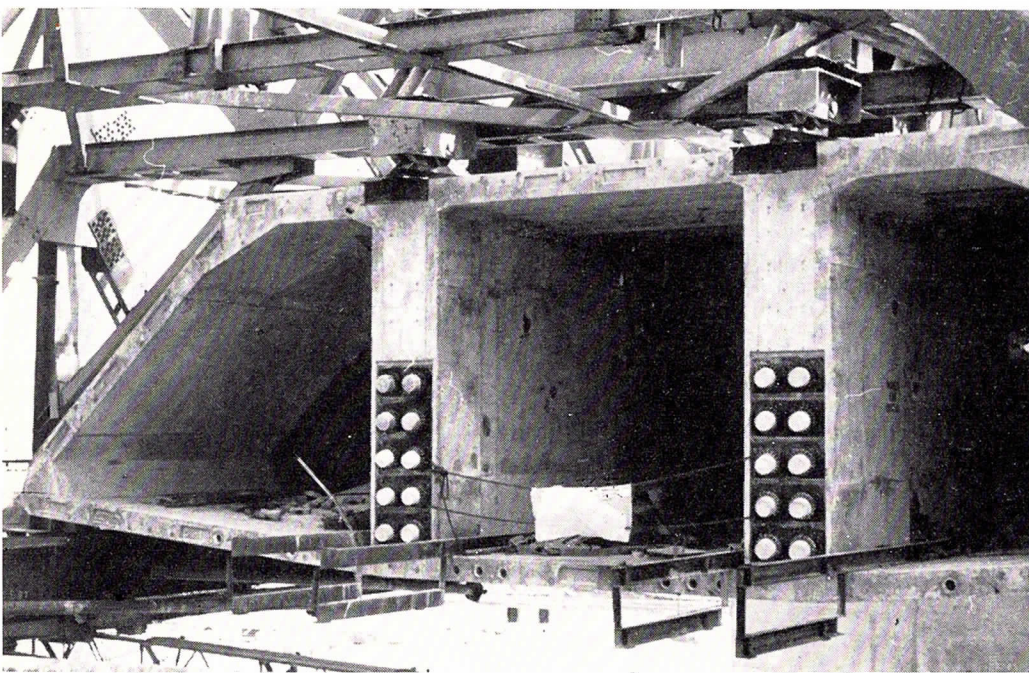
The Lower Yarra Freeway, as well as the bridge structure west of the Yarra, follows the general alignment of a State Electricity Commission (S.E.C.) transmission line easement. The Hyde Street-Stoney Creek area contained overhead lines up to 66kV. The easement between Yarraville and Geelong Road contained one tower line and three pole lines. Although provision had been made in the Metropolitan Planning Scheme (1954) for a roadway immediately to the south of the S.E.C. easement, it was far too narrow for the freeway required to cope with the estimated traffic. Property acquisition was therefore inevitable, but

it was kept to a minimum by using the southern side of the S.E.C. easement for part of the freeway and then acquiring an additional strip of land on the southern side of the roadway reserve.

This meant that a major re-arrangement of S.E.C. lines was necessary. The tower line was shifted to the north side of the easement and the pole lines incorporated in the new tower line. While re-aligning the towers, the S.E.C. upgraded the Yarraville to Brooklyn section from 132kV to 220kV. In all, 24 new towers were erected. Other major works involved were the simultaneous enlargement of the Brooklyn Terminal Station and the undergrounding of a section of the Newport-Yarraville line between columns 6 and 7 of the western approach viaduct. The re-arrangement and relocation of all these assets required detailed programming to enable the work to be completed without a shutdown in the area. While some circuits were out of service during



Eastern Approach with T beams over the east abutment in foreground.

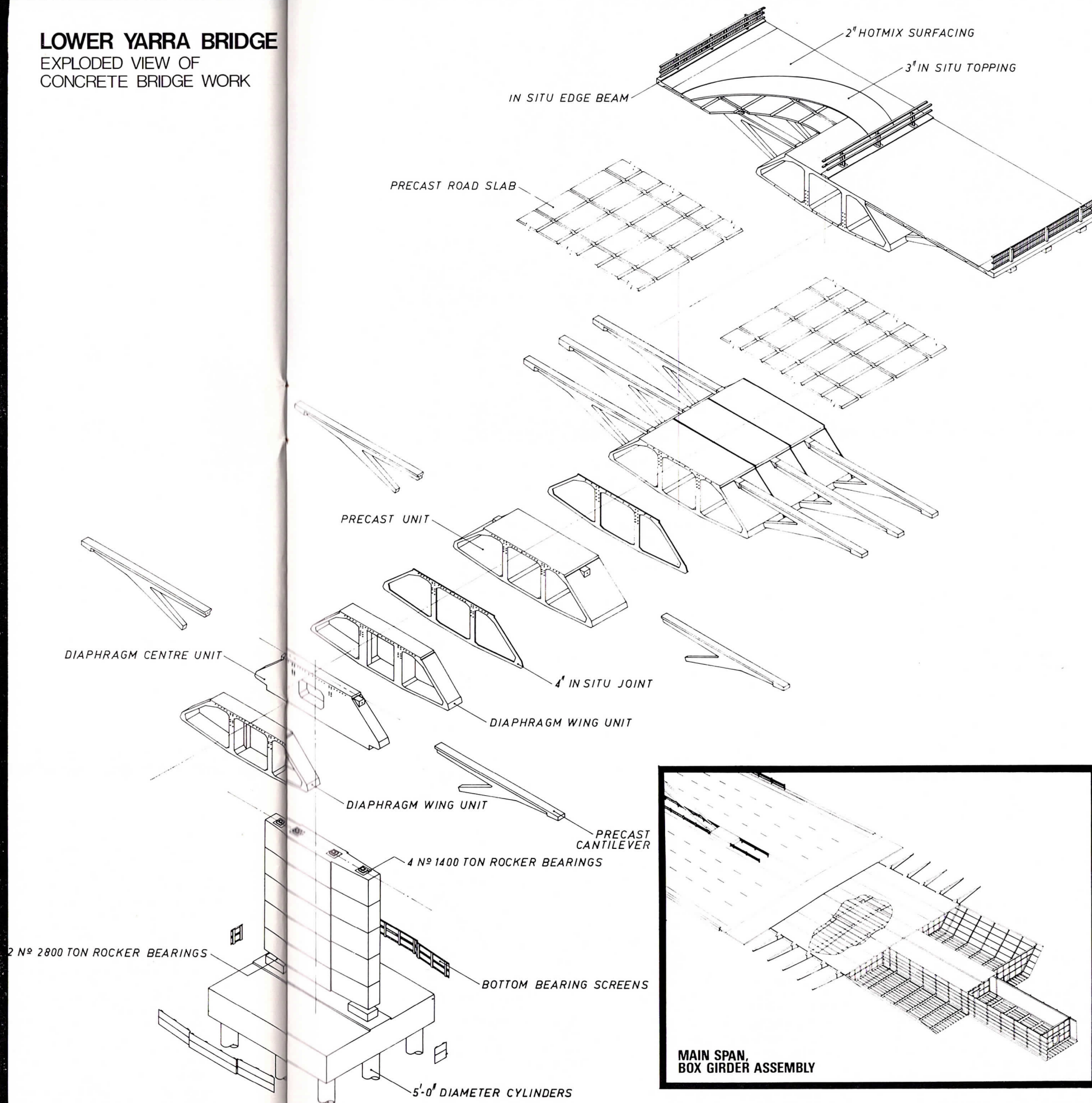


Concrete spine in the Erection Truss.



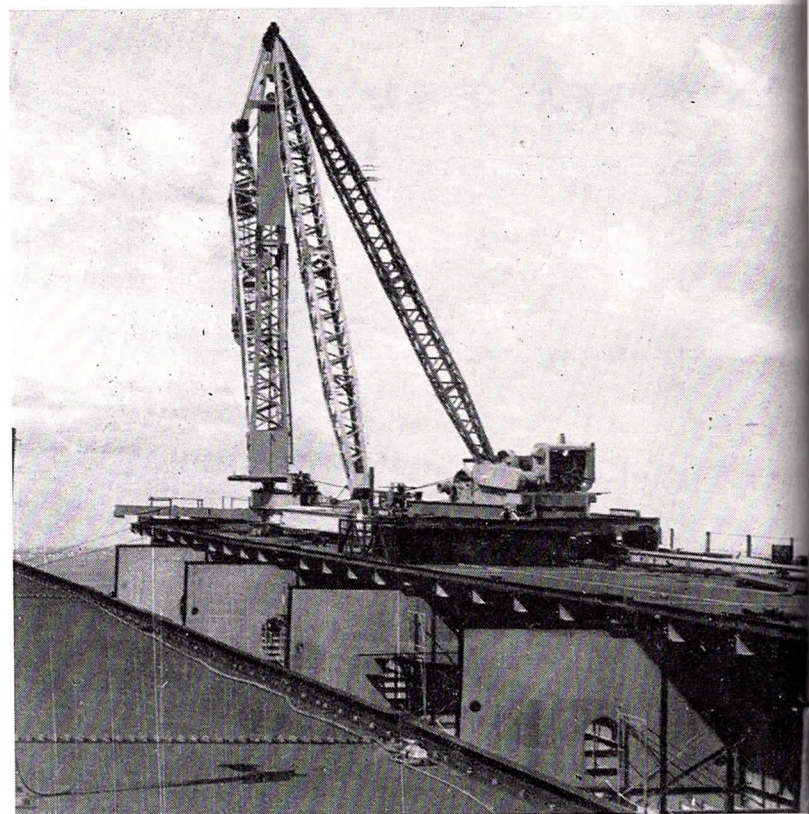
Concrete cantilevers arriving on site.

LOWER YARRA BRIDGE EXPLODED VIEW OF CONCRETE BRIDGE WORK





Work prior to final tensioning of cables in Western Concrete Approach Viaduct.



Span 10-11 before two half widths were joined together.

changeover work, there was no interruption to major transmission or to local power supplies.

The relocation work took place between August 1967 and August 1969 and, including work near the main bridge structure, cost approximately \$2,332,000. The work was done by the S.E.C. at the expense of the C.R.B. and L.Y.C.A.

The use of part of the S.E.C. easement showed economical land use and also minimized disruption to the community as both road and power services were placed together.

Property acquisition was necessary between Williamstown Road and the Newport-Sunshine railway and between the Brooklyn Terminal Station and Freemans Road, Altona where altogether 150 properties with 120 houses were affected. These were sold by auction for demolition or removal, most being moved to other locations.

West of Freemans Road about 100 acres of unimproved industrial land was acquired.

THE LOWER YARRA FREEWAY

The freeway has dual carriageways and extends for four miles west of Williamstown Road. Connections to the freeway are made at Millers Road, Grieve Parade (formerly part of Blackshaws Road) and at Geelong Road.

The number of lanes and the expected initial traffic volumes for the different sections are:

- Bridge to Williamstown Road — 8 lanes, 33,000 v.p.d.
- Williamstown Road to Millers Road — 6 lanes, 29,000 v.p.d.
- Millers Road to Geelong Road — 4 lanes, 17,500 v.p.d.

Equal volumes of traffic are expected in both directions. All the lanes are 12 feet wide and where each carriageway has three or more lanes, sealed shoulders are provided on each side of the carriageway. These shoulders are fully constructed, as well as being used in emergencies, they can take through traffic if maintenance requires the temporary closure of a through lane. Allowance has been made for widening the whole freeway west of Williamstown Road to 8 lanes by future reduction of the median width.

Because of the generally shallow occurrence of rock (basalt) along the route, construction of a depressed freeway would have been uneconomical. The freeway therefore passes over most obstacles along its route by means of bridges and embankments.

The embankment material was obtained from the few cuttings made for the freeway as well as from stripping the overburden from the Footscray City Council quarry and by importing from other local quarries. The material is generally a black basaltic clay.

The project has involved the construction of fourteen bridges west of the Yarra. They are located at Williamstown Road (2), Wembley Avenue (pedestrian), Sunshine-Newport railway line (2), Millers Road (2), Rosala Avenue (pedestrian), Grieve Parade (1), Kororoit Creek (freeway 2, and Grieve Parade 1), Geelong Road (1), and Doherty's Road (1).

When a freeway is constructed, it not only limits access between surface roads and the freeway, but also limits cross-movement to places where grade separation is available. The construction of the Lower Yarra Freeway severed frequent local access across the freeway alignment

and the partial restoration of such access was required. Plans were drawn up and approved by the Councils concerned. As these streets will come under Council control for maintenance, it was agreed that the Councils concerned should construct them, at C.R.B. expense. The major work was the construction of Fogarty Avenue in Footscray. Many streets which were cut by the freeway were also given vehicular or pedestrian access to adjacent parallel streets. Further access is also provided by the pedestrian bridges at Wembley Avenue and Rosala Avenue which cater for school children whose previous access to school was closed.

At the Western Interchange (Geelong Road) local access was restored by the construction of Grieve Parade and Doherty's Road along the southern boundary of the Memorial Park.

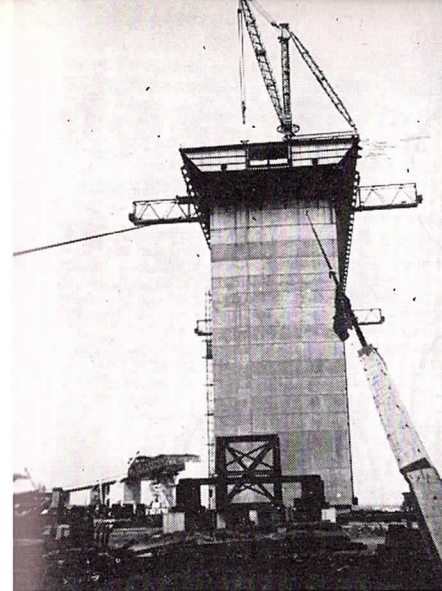
PROJECT COST

Total cost of the project has been estimated at \$60.5 million consisting of L.Y.C.A. works \$42 million (likely to be at least \$43 million since the collapse of span 10-11) and C.R.B. works \$18.5 million (services relocation \$2.5, land acquisition \$3, construction \$13).

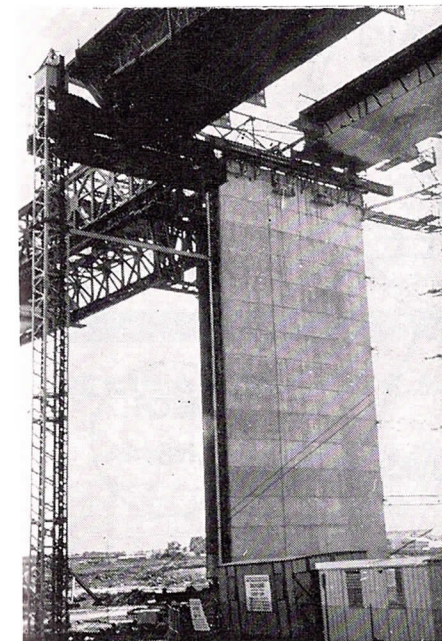
FINALLY

There is little doubt that the project will be completed once the Royal Commission makes its findings. Then the West Gate Project will certainly be an impressive gateway into Melbourne. Some may better enjoy its value for getting out of Melbourne.

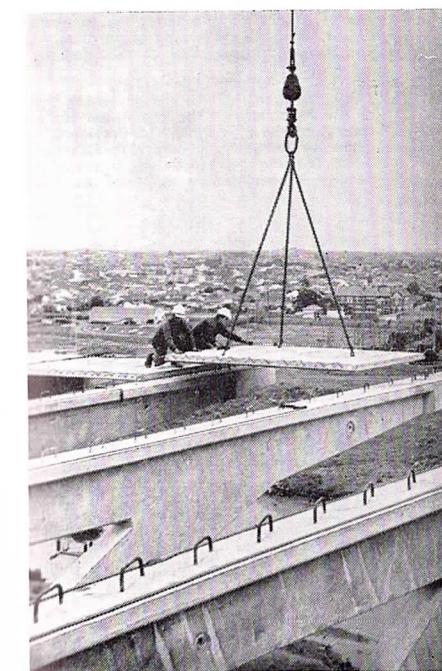
Photographs by Robert Morgan.



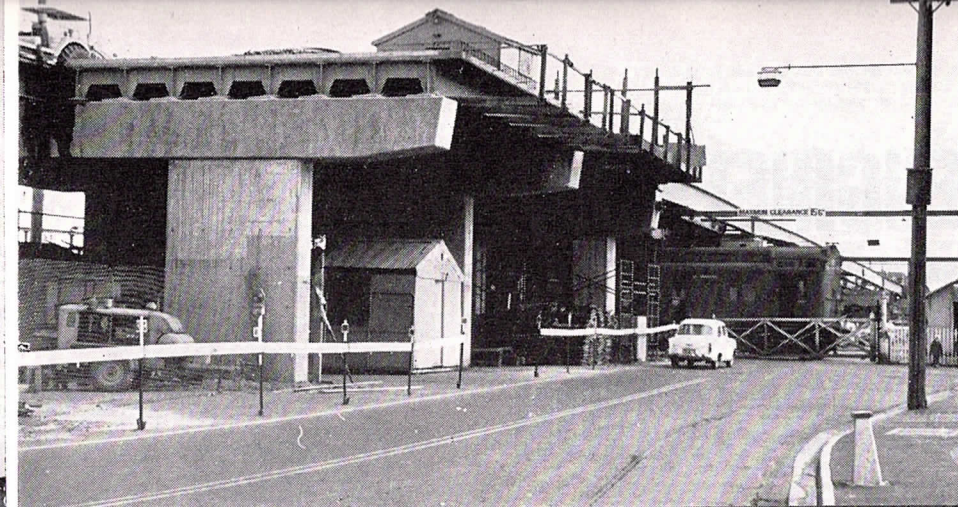
Span 14-15 and column 14.



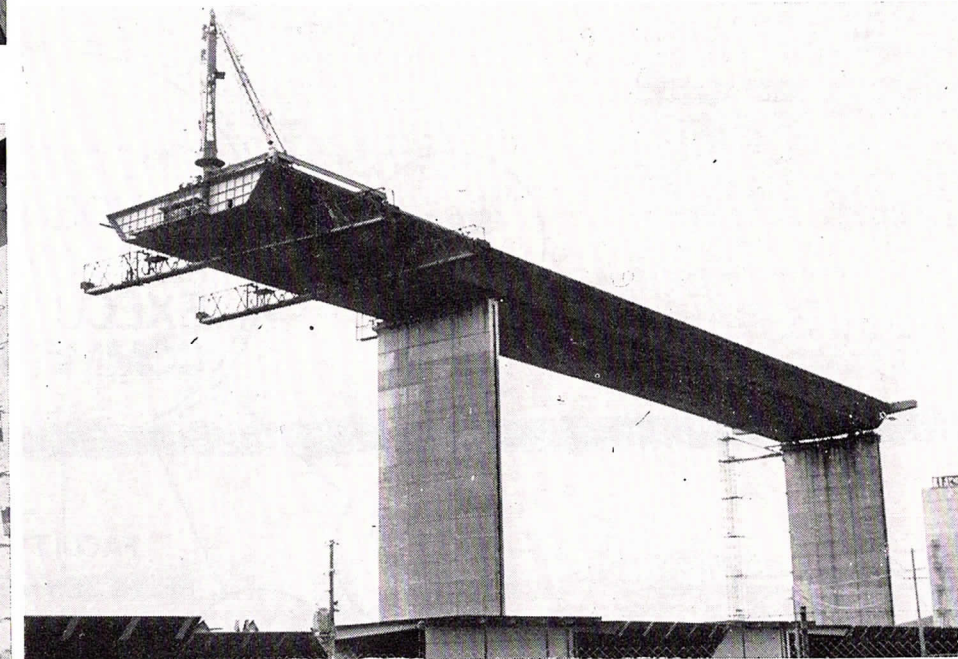
Column 10 where the concrete approach viaduct connects with the steel spans.



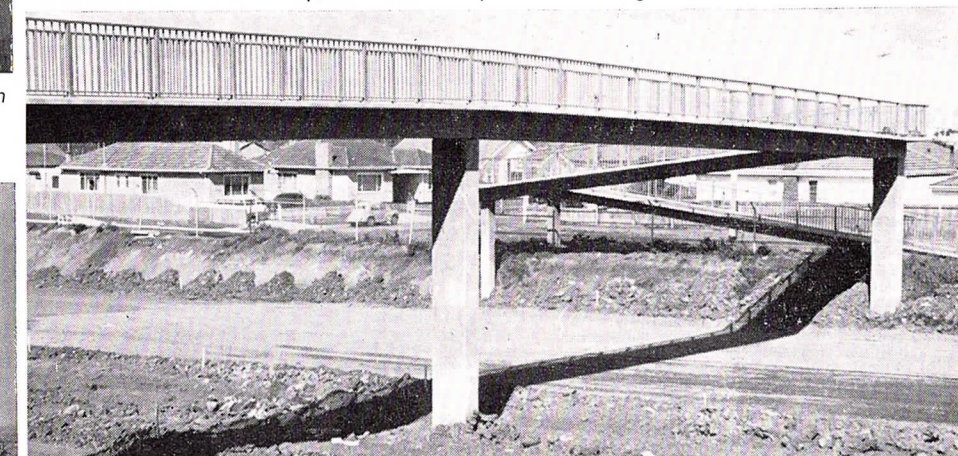
Placing slabs between concrete cantilevers.



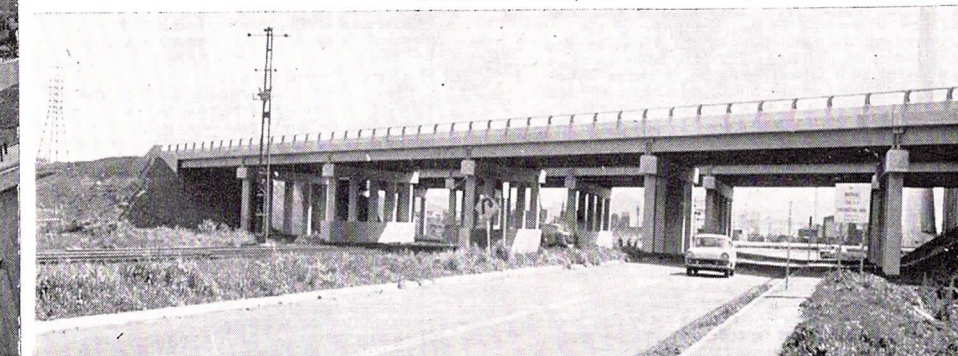
Graham Street Overpass, Graham Station.



Span 14-15 with span 13-14 being cantilevered out to column 13.



Pedestrian Overpass at Wembley Avenue, Spotswood.



Freeway over Newport-Sunshine railway line.

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