CARLTON TRAM SUBSTATION

Carlton tram substation front and west side

front and east side

1964 addition.JPG

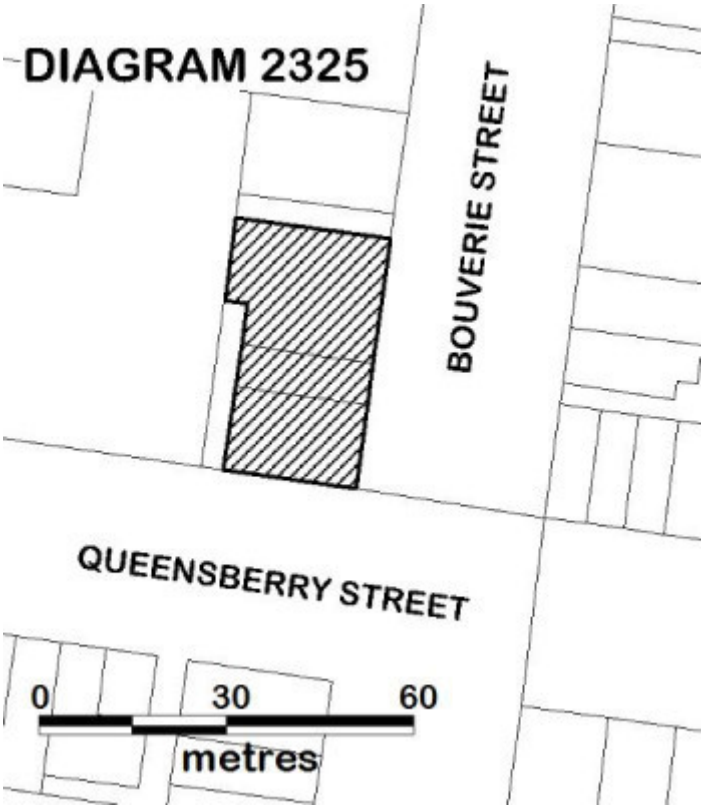

diagram 2325.jpg

Location

214-222 QUEENSBERRY STREET CARLTON, MELBOURNE CITY

Municipality

MELBOURNE CITY

Level of significance

Registered

Victorian Heritage Register (VHR) Number

H2325

Heritage Overlay Numbers

HO1091

VHR Registration

December 12, 2013

Heritage Listing

Victorian Heritage Register

Statement of Significance

Last updated on -

What is significant?

The Carlton Tram Substation at 214 Queensberry Street, built in 1925 and extended in 1964.

History Summary

The Melbourne and Metropolitan Tramways Board (M&MTB) was established by the Victorian Government in 1919 to amalgamate the existing cable and electric tram routes in Melbourne and to integrate and electrify the entire system. Following the formation of the State Electricity Commission (SEC) in 1920, electricity to power the electric tram lines was taken from the state power grid at substations. These converted the SEC's alternating current (AC) to direct current (DC) at a lower voltage and fed it to overhead wires to power the motors of the trams. Between 1925 and 1940 the M&MTB progressively electrified all of the old cable tram lines, extended existing tram lines and added new routes. The Carlton substation was probably designed by the M&MTB's architect Alan Monsborough and was built in 1925. To reduce labour costs, most of Melbourne's tram substations were unmanned, and were operated remotely from the Carlton substation. This was said to save £9000 a year in wages, and the automatic substations were said to be more reliable. The equipment at Carlton meant that staff could quickly identify and correct electrical faults in the other substations. In 1964 an air-conditioned extension containing a new control room, designed by the Board's then architect, H R Steains, was added at the rear of the 1925 substation. Melbourne's tram substations continue to be operated from this control room.

Description Summary

The 1925 Carlton Substation is a tall red brick building with rendered decoration in an Inter-war Stripped Classical style. It is a gabled structure with a high central section and lower aisles along the length of each side. The Queensberry Street elevation has a central pediment with a large central arched window above a wide entrance which has 'MMTB' inscribed in a rendered panel above. There is rendering on the base and parapets and around the steel-framed windows. Internally the 1925 part of the building has an elevated central section where the rectifiers and switching equipment are located. The transformers are located in the side aisle to the west. To the north of the main hall are office spaces, where the original supervisory equipment was located until 1964. The original control room is now a meeting room. The modern supervisory equipment is now located in the 1964 brick addition on the north side of the building, which is a modernist building with an asymmetrical composition of different colours and materials on the Bouverie Street facade.

This site is part of the traditional land of the Kulin Nation.

How is it significant?

The Carlton Tram Substation is of historical and architectural significance to the state of Victoria and satisfies the following criterion for inclusion in the Victorian Heritage Register:

Criterion A Importance to the course, or pattern, of Victoria's cultural history

Criterion D Importance in demonstrating the principal characteristics of a class of cultural places and objects

Why is it significant?

The Carlton Tram Substation is historically significant for its association with the electrification by the M&MTB from the 1920s of Melbourne's tram system, which involved the conversion and extension of Melbourne's old cable and electric tram networks into an integrated electric tramway system. As well as its role in supplying electricity to the electric trams in this northern part of the city, the Carlton substation also remotely operated and supervised the other substations in Melbourne's tram system, a role which it has performed continuously since 1925. The Carlton substation is one of four 1920s substations which survive relatively intact, and these, individually and as a group, help to demonstrate the scale of the electric tram network developed by the M&MTB in Melbourne and its suburbs and the infrastructure required for this work. (Criterion A)

The 1925 building at the Carlton Tram Substation is architecturally significant as an example of the application of the Inter-war Stripped Classical style to a utilitarian industrial building, and is a demonstration of the scale and quality of the works undertaken by the M&MTB. It was the largest of the 1920s tram substation buildings and demonstrates the form of the substations constructed by the M&MTB in the 1920s as part of the electrification and expansion of Melbourne's tram system. The large front entrance and high roofline of the building demonstrate the features required for the movement of the massive electrical equipment used at the time, as well as the need to prevent overheating, and the high windows demonstrate the need to maximise natural light. (Criterion D)

Permit Exemptions

General Exemptions:

General exemptions apply to all places and objects included in the Victorian Heritage Register (VHR). General exemptions have been designed to allow everyday activities, maintenance and changes to your property, which don’t harm its cultural heritage significance, to proceed without the need to obtain approvals under the Heritage Act 2017.

Places of worship: In some circumstances, you can alter a place of worship to accommodate religious practices without a permit, but you must notify the Executive Director of Heritage Victoria before you start the works or activities at least 20 business days before the works or activities are to commence.

Subdivision/consolidation: Permit exemptions exist for some subdivisions and consolidations. If the subdivision or consolidation is in accordance with a planning permit granted under Part 4 of the *Planning and Environment Act 1987* and the application for the planning permit was referred to the Executive Director of Heritage Victoria as a determining referral authority, a permit is not required.

Specific exemptions may also apply to your registered place or object. If applicable, these are listed below. Specific exemptions are tailored to the conservation and management needs of an individual registered place or object and set out works and activities that are exempt from the requirements of a permit. Specific exemptions prevail if they conflict with general exemptions.

Find out more about heritage permit exemptions here.

Specific Exemptions:

General Conditions: 1. All exempted alterations are to be planned and carried out in a manner which prevents damage to the fabric of the registered place or object. General Conditions: 2. Should it become apparent during further inspection or the carrying out of works that original or previously hidden or inaccessible details of the place or object are revealed which relate to the significance of the place or object, then the exemption covering such works shall cease and Heritage Victoria shall be notified as soon as possible. Note: All archaeological places have the potential to contain significant sub-surface artefacts and other remains. In most cases it will be necessary to obtain approval from the Executive Director, Heritage Victoria before the undertaking any works that have a significant sub-surface component. General Conditions: 3. If there is a conservation policy and plan, all works shall be in accordance with it. Note: A Conservation Management Plan provides guidance for the management of the heritage values associated with the site. It may not be necessary to obtain a heritage permit for certain works specified in the management plan. General Conditions: 4. Nothing in this determination prevents the Executive Director from amending or rescinding all or any of the permit exemptions. General Conditions: 5. Nothing in this determination exempts owners or their agents from the responsibility to seek relevant planning or building permits from the responsible authorities where applicable.

1964 building:

Internal alterations to the 1964 building are permit exempt.

Theme

3. Connecting Victorians by transport and communications 6. Building towns cities and the garden state

Construction dates	1925, 1964,
Architect/Designer	Monsborough, Alan G,
Heritage Act Categories	Registered place,
Other Names	SUB STATION,
Hermes Number	13964
Property Number	

History

CONTEXTUAL HISTORY

The first trams operating in Melbourne were horse-drawn. The first of Melbourne's cable trams opened in 1885 on the Richmond line, and in the following six years the councils of Melbourne and the ten surrounding municipalities built a system of cable-hauled tramways. The 46 miles [74 km] of double track serving seventeen routes radiating from the centre of the city to neighbouring suburbs was probably the world's largest cable tram network. By 1900 it was recognised that other countries had established electric tramways that were less expensive to install, and an electric tram had already begun operating in Sydney.

The first electric tram to run in Australia was demonstrated during the Centennial International Exhibition in Melbourne in 1888. From 1889 until 1896 this pioneer vehicle and a second car ran a regular tramway service between Box Hill Station and Doncaster, mainly as a means of attracting potential land purchasers, but it did demonstrate the viability of electric traction.

The first two regular electric tram service in Melbourne opened in 1906, with the opening of a line from the cable tram terminus at Flemington Bridge to Essendon and the Victorian Railways line from St Kilda to Brighton. In the early 1900s, several municipalities formed trusts and built electric tramways in their areas. In 1909 Municipal authorities in Prahran and Malvern combined to form a Trust to operate electric tramways within their boundaries

and opened lines in 1910, which by 1919 had grown to a network of thirty-five route miles [56 km]. During World War I other suburban electric networks developed, including municipal trust undertakings in the areas of Hawthorn, Brunswick, Coburg, Fitzroy, Kew, Preston and Footscray. Until the State Electricity Commission of Victoria was formed in 1920, electricity for the trams was provided by various private and municipal power generators.

The Victorian Government in 1910 set up a Royal Commission to enquire into the 'present condition of the Railway and Tramway systems of Melbourne'. Their 1911 report recommended electrification of the suburban railway network, and also recommended that all the metropolitan tramways, cable and electric, municipal and private, be vested in a Municipal Tramways Trust, and that the cable tramways be converted to electricity. The advantages of electric tramways were considered to be lower capital costs, greater speed and flexibility, adaptability to extension and simplification of terminal shunting.

Implementation of these recommendations was delayed by World War I, but in 1918 legislation was passed setting up the Melbourne & Metropolitan Tramways Board (M&MTB). In 1919 it took over authority for the cable trams, and in 1920 for the Northcote line and all the electric networks operated by municipal trusts. The M&MTB formulated a comprehensive plan for integration and development of the system as a whole, with considerable extension of the electric lines and gradual conversion of the cable lines.

The first cable tram line electrified was the St Kilda line in 1925, and in less than a month electric trams were serving the whole length of Swanston Street. Within the first year a considerable part of the southern section had been electrified. The last cable tram line (Northcote) closed in 1940. During this time the cable trams were converted to electric traction, new depots and substations were built, lines extended and new routes added. Hundreds of new, large, electric trams were built to replace the fleets of small cars previously operated by the municipal tramway trusts.

Tram Substations

With the establishment of the M&MTB new substations had to be built to electrify the converted cable tram lines and for new routes, and to systematise the distribution of power from the Latrobe Valley generator of the State Electricity Commission (SEC, formed in 1920). Electricity to power Melbourne's tram lines was taken from the state grid system at the substations, where the SEC's alternating current (AC) at 6600 volts was transformed (or rectified) to direct current (DC) at a lower voltage to operate the trams. Substations housed the equipment required to transform the high voltage AC power down to the low voltage DC traction power.

Since the 1880s electric trams have been powered by direct current (DC) at a relatively low voltage - initially at 500 volts, but in later years more commonly between 600 and 700 volts. DC motors were well-suited to use on trams as they were compact and light and could easily be incorporated into the restricted space on the trams. However direct current has a major drawback: voltage drops quickly with distance and tram performance therefore falls off rapidly if the tram is much more than 4 km from the power source. So substations were usually built near the middle of tram routes.

The earliest rectifier systems used mechanical rotary converters with electric motors to drive generators. The initial installations by the tramway trusts were often co-located within the tram depots, as at Malvern, Kew, Elsternwick, Hawthorn and Coburg depots, which all used massive rotary converters. In the 1930s new technology was introduced, which used mercury arc converters, which employed a process involving ionising mercury vapour. These were smaller and were initially housed in glass bulbs and later in steel tanks. From the 1960s the system progressed to solid state silicon diode rectifiers. These are what is currently used, together with the extensive use of electronics, to control switching, and they require much less space than the old systems. Melbourne had to re-equip its substations in the 1990s due to the higher electric current required to air-condition trams.

In order to reduce supervisory labour costs, the M&MTB constructed remote control equipment of its own design for its substations. The main central control room was in Queensberry Street at Carlton, which was able to operate all the other substations remotely. By 1933 there were 19 substations, 15 of them fully automatic unattended stations, and by 2013 there were 55, with more planned.

Many of the early tram substations were free-standing buildings, the oldest being the Elsternwick substation built by the Prahran & Malvern Tramways Trust in 1914. The early substations housed rotary converters and required deep foundations to prevent damage to the building fabric. They also had large doorways and high roofs, to permit easy handling of the electrical plant, and large high windows to provide natural light. A series of similar

large impressive brick substations were built between 1924 and 1929 by the M&MTB in Camberwell, South Yarra, Ascot Vale, South Melbourne and Carlton, all designed to house rotary converters. All were similar in materials and form but varied in their size, floor plans, and the degree of rendering and decoration.

In 2005 a number of Melbourne's substations and their equipment became redundant. The old substations were cleared of hazardous materials and new substations were built adjacent to the old buildings.

Alan G Monsborough

Alan G Monsborough was the M&MTB's architect and was responsible for the design of all tramway buildings during the formative years of the electric tramway system, until he left in 1938. His prodigious output ranged from electric sub-stations and tram depots to the large scale heavy industrial buildings at the Preston tramway workshops, the board's multi-storey head office building in Little Collins Street, Melbourne, the elevated signal cabin and waiting shelter in Swanston Street (1928, VHR H686) and the rustic chalet and passenger shelters at Wattle Park in Burwood (1920s, VHR H904).

HISTORY OF THE PLACE

The M&MTB substation in Queensberry Street Carlton was built in 1925. It is probable that it was designed by the M&MTB's architect Alan G Monsborough.

The Carlton substation has always had a supervisory role, controlling remotely the activities of the other substations. Power failures of even short duration result in severe disruptions to timetables, and it was necessary to keep a close eye on substation equipment. By 1930 however there were 14 unattended substations, all of which were automatically controlled from the central control room in Carlton. The supervisors at Carlton could get a picture of the electrical conditions in the system under their care and staff could promptly identify and carry out any required correcting operations. A method was evolved in which a semi-circular 12-panel desk was used to house the complete supervisory installation for the system. This resulted in great economic benefits: the 1929 MMTB Annual Report noted the savings in labour costs amounted to £9000 a year, and also noted that automatic substations were more reliable than manual substations.

In 1964 a brick extension with a new control room was built at the rear of the 1925 substation (the original control room was converted to a meeting room), designed by the Board's then architect, H R Steains. It was announced in the *MMTB News* (Nov-Dec 1964, p 5) that "a large, air-conditioned building, full of modern electronic equipment - a complex and highly sophisticated arrangement of relays (12,000 of them) wires, signals, telephones, switches and control panels, has just taken over complete control of the Tramways electrical system in Melbourne". It provided for central remote control of the M&MTB's 26 suburban substations at the time. The same article noted that the old supervisory control equipment at Carlton had born the brunt of the electrical supervision and control of Melbourne's tram power supply system for over thirty years. It noted that "to step into the control room is almost to enter another age - a science fiction dream of the future". A feature of the new control room was the control diagram, a 30ft long 9½ft high pale green panel set in a continuous arc of 45ft radius. The main control desk

perfectly complements the control diagram. It is curved in an arc, concentric with the diagram panel, and is inset with pale green control panels, matching the colour of the control diagram. These desk panels are fitted with an orderly maze of levers, buttons, and white semaphore switches. White, blue and red lights, some set in the switches themselves, are studded here and these in neat groups.

The control room was described as having floors of honey coloured cork tiles, and a ceiling with a close-patterned off-white plastic screen covering fluorescent lighting tubes. This 1960s system has since been replaced.

In the 1980s there were 28 substations on the tramway electrical system, all controlled from the Carlton substation. By 2013 there are more than 50, with another 15 planned. Each substation powers about 3 km of line, though some power as much as 5 km, and the system is interconnected so that each section of line can draw power from more than one substation.

KEY REFERENCES USED TO PREPARE ASSESSMENT

Biosis Research (Gary Vines), 'Melbourne Metropolitan Tramway Heritage Study', Report for Heritage Victoria, 2011

HV file PL-HE/03/0424 (Maribyrnong Tram Substation)

M&MTB Annual Report 1929, p 13.

MMTB News November-December 1963, pp 5-7, 11.

Public Transport Victoria website: http://corp.ptv.vic.gov.au/managing-victoria-s-public-transport-network/history-and-heritage/early-history-of-public-transport/#trams]

Russell Jones for Friends of the Hawthorn Tram Depot, 'Fares please! An economic history of the Melbourne & Metropolitan Tramways Board', 2008, online at http://www.hawthorntramdepot.org.au/papers/ecohist/ecohist0.htm

John Keating, *Mind the Curve! A history of the Cable Trams*, Sydney 2001.

Russell Jones for Friends of Hawthorn Tram Depot, 'From Rotary Converters to solid-state: tramway substation architecture in Melbourne', 2013; online at http://www.hawthorntramdepot.org.au/papers/substations.htm.

Plaque Citation

Built in 1925, this is one of five impressive electrical substations built in the 1920s by the Melbourne & Metropolitan Tramway Board as part of the electrification of Melbourne's tram system. This one controls remotely all of Melbourne's other substations.

Assessment Against Criteria

Criterion
The Carlton Tram Substation is of historical and architectural significance to the state of Victoria and satisfies the following criterion for inclusion in the Victorian Heritage Register:

Criterion A Importance to the course, or pattern, of Victoria's cultural history Criterion D Importance in demonstrating the principal characteristics of a class of cultural places and objects
The Carlton Tram Substation is historically significant for its association with the electrification by the M&MTB from the 1920s of Melbourne's tram system, which involved the conversion and extension of Melbourne's old cable and electric tram networks into an integrated electric tramway system. As well as its role in supplying electricity to the electric trams in this northern part of the city, the Carlton substation also remotely operated and supervised the other substations in Melbourne's tram system, a role which it has performed continuously since 1925. The Carlton substation is one of four 1920s substations which survive relatively intact, and these, individually and as a group, help to demonstrate the scale of the electric tram network developed by the M&MTB in Melbourne and its suburbs and the infrastructure required for this work. (

Criterion A)
The 1925 building at the Carlton Tram Substation is architecturally significant as an example of the application of the Inter-war Stripped Classical style to a utilitarian industrial building, and is a demonstration of the scale and quality of the works undertaken by the M&MTB. It was the largest of the 1920s tram substation buildings and demonstrates the form of the substations constructed by the M&MTB in the 1920s as part of the electrification and expansion of Melbourne's tram system. The large front entrance and high roofline of the building demonstrate the features required for the movement of the massive electrical equipment used at the time, as well as the need to prevent overheating, and the high windows demonstrate the need to maximise natural light. (Criterion D)

Extent of Registration

All of the place shown hatched on Diagram 2325 encompassing all of Lot 1 on Title Plan 901189 and Lot 1 on Title Plan 703295.

This place/object may be included in the Victorian Heritage Register pursuant to the Heritage Act 2017. Check the Victorian Heritage Database, selecting 'Heritage Victoria' as the place source.

For further details about Heritage Overlay places, contact the relevant local council or go to Planning Schemes Online http://planningschemes.dpcd.vic.gov.au/