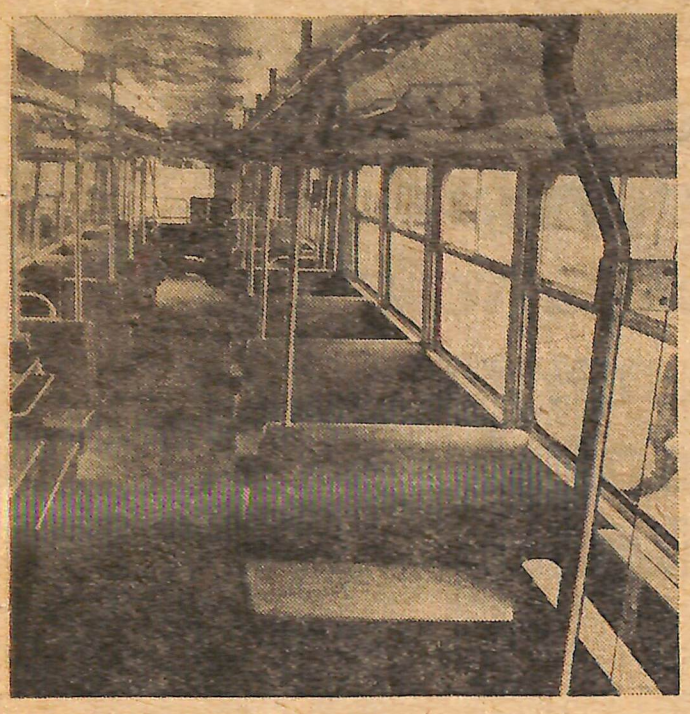
ELECTRICAL EXPERTISE

...including new transit trams for Melbourne



Inside one of Melbourne's new trams . . . mechanical and electrical components were designed by ASEA in Sweden.

ASEA Electric (Aust) Pty Ltd is a member of the worldwide ASEA group of companies, which ranks among the largest in the field of heavy electrical engineering, with headquarters in Vasteras, Sweden.

ASEA's activities include equipment for heavy industry, power distribution and transmission, AC and DC machines, transport, materials handling, semi-conductors and electronic components, computer systems and process control, relays, and high and law voltage switchgear.

Since the Australian operation began in the 1920s, ASEA equipment has been installed in virtually every type of industrial undertaking, building a solid reputation for quality of design, manufacture and materials, efficiency and reliability.

In addition, the company has provided engineering design and supervision services for complete installations and turnkey projects throughout Australia.

ASEA electric motors are perhaps the company's most familiar product, but ASEA also designs and installs such major capital equipment as hydro-electric generators (including 22 to the Snowy Mountains Scheme) mine winders, steel furnaces, heavy materials handling plant, hoists and conveyors, container cranes, shipboard cranes, cargo handling winches, control equipment, steam and gas turbines, uninterruptable power supplies, plus their installations and other equally major projects.

ASEA is well known in the mining industry, where a number of firsts have been achieved in the field of mine winders, skip cage winders and automatic man elevators as well as the supply of sophisticated ore carrying systems.

ASEA's activities in the paper industry are also well known in Australia, where where complete turnkey projects involving electrical equipment from low voltage switchgear, paper machine drives, control equipment, right through to power generation, have been supplied.

The electronics division is fully equipped to design the most complex process control systems, variable speed drives and electronics weighing equipment. ASEA Australia has engineering experts for digital and analogue solutions.

Power authorities thoughout Australia use ASEA high voltage circuit breakers, low voltage switchgear, relay controls, transformers, synchronous condensers and power generation equipment.

In the sugar industry, one third of all centrifugals in Australian mills have been supplied by ASEA and in recent years all of them with modern Thyristor Control.

ASEA is also a major supplier of transportation equipment and rolling stock, a notable example being the design and supply of electrical and mechanical components for Melbourne's new trams.

The company, which employs more than 500 people throughout Australia, has its headquarters at Lilydale, Victoria, where a modern factory and administration block was built in 1968.

Here both high voltage and low voltage switchgear is manufactured and major projects involving imported equipment are engineered. All of these projects have the backing of the parent company's facilities in Sweden.

As well as the Lilydale plant, ASEA has a large manufacturing plant in Tottenham, Victoria, where a full range of electric motors and hoists, distribution transformers, lightning arresters and high and low voltage capacitors are produced.

ASEA regional offices are located at Sydney, Newcastle, Brisbane, Adelaide, Perth and Launceston, which also provide availability of local stock, spare parts and service facilities.

The contract for the supply of 100 trams was let to Commonwealth Engineering (Vic) Pty Ltd, who designed the body and auxiliary equipment and are building and equipping the bodies at Dandenong. The main electrical and mechanical equipment was designed by ASEA in Sweden.

That company is providing all of the motors and traction control equipment, manufacturing the majority of the motors in Australia and assembling the imported control equipment. Bogie frames are being manufactured by Commonwealth Engineering and the bogies are being assembled by the board.

The tram is 16.46 metres long, 2.67 metres wide and weighs approximately 19 tonnes. The body is fabricated from pressed and roll formed steel sections with an interior stressed skin.

The two bogies have a stress relieved electrically welded tubular frame. The roller bearing axle boxes support chevron rubber primary suspension units and rubber is also used for the suspension of the bogie bolster.

Tractive effort is provided by four 300 volt forced air ventilated high-speed DC motors each rated at 52 kW. They have Class F insulation in both rotor and stator.

The motors are mounted on the bogie frame parallel to the axle and are coupled to the gearbox through a short rubber-bushed cardan shaft. The double reduction gearbox has a ratio of 7.27 to 1.

The acceleration and braking of the tram is controlled by the driver through three pedals. The left foot is used to operate a safety pedal.

The vehicle cannot be started until pressure is applied to this pedal and braking is automatically applied if the pedal is depressed beyond a set position or released while the vehicle is in motion.

The accelerator and brake pedals are operated by the right foot and the position of these pedals determines the value of inputs to an electronic control unit (tramiac).

The tramiac also receives information from tachometers attached to each motor shaft and from shunts in the motor circuits. It uses this information to determine the appropriate rate for contactor switching of the resistor in the motor circuits. If wheel slip or skid is detected the rate of acceleration or deceleration is adjusted to eliminate the condition.

Braking is normally electrodynamic down to approximately 2kph when the spring applied, hydraulically removed disc brake is applied to bring the tram to rest, but the disc brake is capable of stopping the tram from the maximum speed of 72 kph should dynamic braking fail.

Emergency braking is provided by electromagnetic track brakes.

The control system is designed to provide a smooth comfortable ride for passengers under all conditions and to provide all possible assistance to the driver in obtaining maximum performance.

The vehicle is totally enclosed and doors are interlocked so that the vehicle cannot start until the doors are closed and the doors cannot be opened until the speed falls below 2 kph.

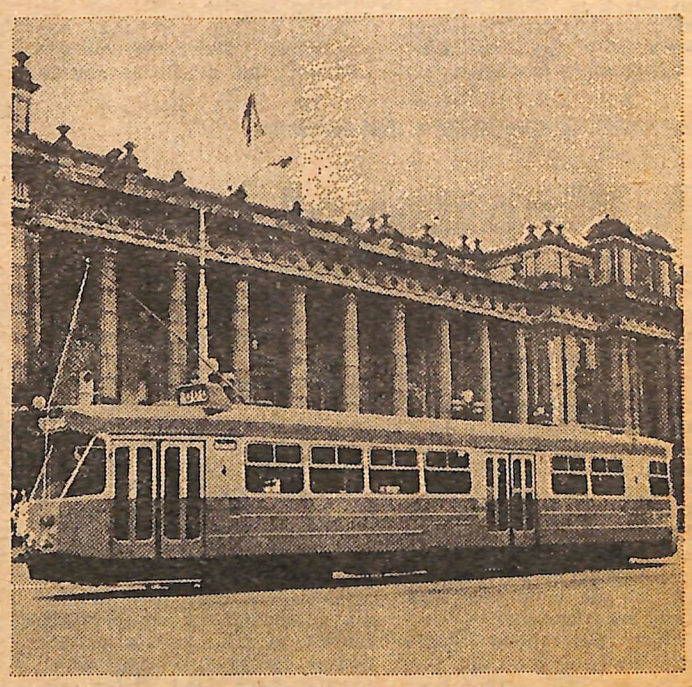
Because the doors are normally closed, forced ventilation of the tram interior is provided through 6 AC motor driven fans in the ceiling. Supply for the fans is provided by an alternator driven by a 4.7 kW 600 volt DC motor.

The three phase alternator has an output of 2kVA of 20 volts, 50 to 60 HZ and its main function is to provide a 24 volt supply to the tram control circuits via a bank of 165 ampere-hour (five hour rate) lead acid batteries.

Two fans are mounted, one at each end of the motor alternator shaft. One fan is used to provide forced ventilation for the traction motors and the other fan is used to cool the starting and braking resistor bank.

Air for this fan is drawn from within the tram and the air leaving the resistor cubicle is either recirculated for interior heating or dumped to atmosphere as required.

Trams have survived in Melbourne for a number of reasons. The wide streets — particularly in the area surveyed by Hoddle, who had more faith in the development of Melbourne as a major city than many of his successors — have received much credit but a high standard of track construction and maintenance has also contributed.



Production model of the new Melbourne tram.