

MELBOURNE AND METROPOLITAN TRAMWAYS BOARD

Z3 CLASS TRAM - MELBOURNE, AUSTRALIA

CONTRACTOR:

Commonwealth Engineering (Vic.) Pty. Ltd.
Frankston Road,
Dandenong, Victoria, Australia.

In conjunction with -

A.E.G.-Telefunken (Berlin)
DUWAG (Dusseldorf)

DESCRIPTION:

A tram designed for use in Melbourne. The tram is double-ended non-articulated with four axles in two trucks. The trams can be operated as single units only and are not equipped to be coupled. They are fitted with thyristor (Chopper) control electrical equipment which provides smooth, jerk free acceleration and regenerative braking.

These trams are being built to continue the replacement of W2 class trams. The body is an improved form of Z1 and Z2 Class previously supplied by Comeng.

DEVELOPMENT STATUS:

Order placed 3 April, 1978
First tram into service on 25 September, 1979.
100 trams on order to be delivery at approx. rate of 25 trams per year.

PERFORMANCE - SEATED LOAD:

Speed (Max.)	70 km/hr
Grade (Max.)	9%
Acceleration (max.)	1.6m/sec ²
Retardation (service max. cont.)	1.6m/sec
Retardation (emergency)	3.0m/sec ²
Jerk (max.)	1.3m/sec
Horizontal curve radius (min.)	16.3m
Vertical curve radius (min.)	138m

CAPACITY:

42 seats
83 standees (Area per standee based on 6 per metre²)
125 total

DIMENSIONS:

Length	16,740 mm
Width (outside)	2,670
Height - rail to roof	3,410
Floor height above rail	850
Width (inside)	2,540
Headroom at centre line	2,140
Aisle width	690
Doorway width - clear opening between handrails	1,260
Doorway height	2,264
Step heights -	
Ground to first step at tare (new wheels)	334
Other 2 steps	258

MASS:

Tare	21,800 Kg
Laden (crush load)	30,130 Kg

TRUCKS:

Type	In-board bearing, monomotor
Design	DUWAG, Dusseldorf, West Germany
Construction of frames and bolsters	Welded steel by Comeng (Vic.)
Assembly	M.M.T.B. at Preston Workshops
Gauge	1,435 mm
Axle centres	1,800 mm
Wheel	Bochum 54, resilient
Wheel diameter	660 mm
Motors	Monomotors (1 per truck)
	A.E.G. - type ABS 3322 self ventilated designed for thyristor control, laminated stator. Continuous rating 195 kW at 600 volts.
Gears	Thyssen Henschel - Hypoid, right angle drive, hollow shaft with spider type flexible rubber coupling. Ratio 1:5:666.
Service Brakes	Electro-dynamic, regenerative operation down to 8km/hr.
Low speed, parking and stand-by brake	Spring applied caliper pads, to ventilated brake disc (knorr-Bremse), one per each axle. Pads hydraulically released.
Hydraulic system	Hydraulic pump and actuator mounted on truck (Hanning and Kahl).

TRUCKS (cont)

Emergency brakes	Electro dynamic plus electro-magnetic track brakes
Suspension	Primary - Chevron Rubber Secondary - Clouth rubber rolling ring type plus rubber plate springs.
Axle bearings	SKF twin spherical roller races.
Dampers	2 vertical, 1 transverse
Couple to body	Large diameter roller race incorporating angular movement stops.
Mudguards	Fibreglass.

ELECTRICAL CONTROL SYSTEM:

Line voltage	600 volts, D.C.
Line current (max)	550 Amps
Power collection	Trolley pole with MMTB carbon block collector head
Power control system	A.E.G. Thyristor "Chopper" using independent chopper systems to each truck. This power system also provides the regenerative braking capability.
Control system	Siemens electronic control.
Emergency control	In addition to the duplicity of the chopper system, a switch is provided to by-pass most of the electronic control system and thereby provide "get home" capability at reduced performance.
Overspeed control	Automatic power shut-off and brake application held down to 7 km/hr.
Wheel spin and slip	Detection and correction provided with automatic sanding.
Controls	Foot operated, 3 pedals (accelerator, brake and safety pedals).
Indications	Hand operated sand, gong, disc brake, points, turn indicators, and doors, speedometer, battery voltmeter and indicator lights.
Motor alternator	3 phase claw pole generator without slip rings. Outputs at 220V and 22V at 100 Hertz. Coupled to 600V D.C. motor. Rating 3.3KVA.
Battery	Lead acid, 171 Amp.hr.

BODY:

Numbers	116 to 215.
Frame	Steel - all welded
Truck centres	8500 mm
Exterior walls	Aluminium
Roof	Fibreglass
Interior walls	Stressed steel covered with teak finish laminate.
Lining, ceiling & coves	Fibreglass
Insulation	50mm glass fibre
Floor	Plywood over corrugated steel surfaced with "Treadmaster" (cork and neoprene rubber).
Windows	7 per side Beclawat "Tempest", half drop (anti-sun) glass
Doors	Aluminium framed, Beclawat, 2 four leaf folding doors per side.
Door operators Door system	Electric (Vapor Corporation U.S.A.) Safety interlocked with tram motion. Uses step treadle mats and pressure pulse sensitive door edges.
Ventilation	Four exhausting fans mounted in pods above ceiling, each 50 cubic metres per minute operating on thermostatic control above 25°C ambient at half speed and at full speed above 30°C ambient.
Heating	8 electric heaters, individually thermostatically controlled located under passenger seats and conductor's stations. Fans operated on 220V system and heater elements on 600V, 1kW each. Driver's heater-demister 2 kW each.
Seating	Upholstered over high resilience fire retarded polyurethane foam, (Hendiform)
Destination equipment	"Brose", polyester blind type, back lit, lower case letters.

WORK EXECUTED AT PRESTON TRAM WORKSHOPS

Truck assembly

Manufacture - fibreglass dash and canopy
Manufacture and installation of -
 all passenger seat frames and upholstery
 conductor's consoles (45° type)
 fibreglass seat surrounds
Installation of staunchions and rails
Manufacture and installation of current collection equipment.