

METROLINK

TOPIC SHEET

Number 1 September 1990

Vehicles



The initial system will be operated with a fleet of 26 vehicles. Up to 23 vehicles will be in service in the peak periods with the remaining 3 on standby or under maintenance, whilst 14 vehicles will be required for the off-peak service. Phase I will be operated by single vehicles but they can be coupled in tandem to provide extra capacity and, in fact, four vehicles can be controlled by a single driver in an emergency.

The vehicles are articulated units carried on three bogies by means of an air suspension system. Each of the outer bogies is powered by two, separately-excited direct-current traction motors whilst the centre bogie is not powered and supports the articulation gangway. The weight balance is such that under full-loaded conditions, almost 70% of the weight is on the powered bogies, which assists the hill-climbing ability of the trains.

Each vehicle is 29m long and weighs 45 tonnes empty and 65 tonnes fully laden. The normal seating capacity is 82 and when crush-laden the vehicle can accommodate 270 (although in normal service the load is unlikely to exceed about 200).

Two areas (adjacent to the centre doors) have been specially set aside for wheelchairs and a further two areas are allocated for parcels/luggage. Fold down seats are provided at all four locations for use by other passengers if the areas are not immediately required for their prime purpose.

Four doorways are provided each side, each 1.22m wide, with externally-hung sliding door leaves. To facilitate access with prams, wheelchairs, etc the nominal platform gap is 75mm with the floor height maintained nominally constant relative to the platform by means of the air suspension system.

The areas allocated for wheelchairs, etc are adjacent to the two middle doors. Furthermore, the articulation gangway is wide enough to allow wheelchairs to move freely from one section to the other.

The vehicle bodies are of a welded steel construction employing steel sections and sheets. The floor consists of composite wood sheets mounted on stainless steel with an abrasion-resistant rubber covering.

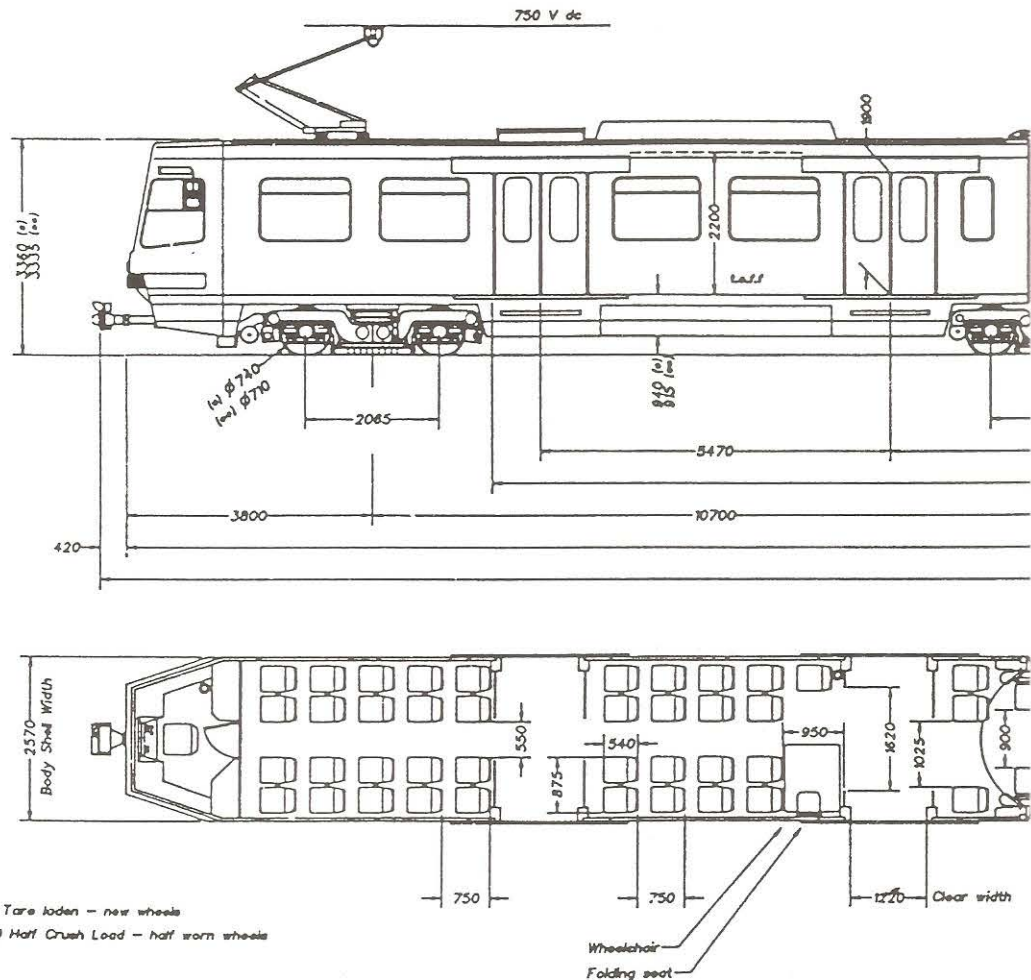
The saloon walls are lined with laminate materials which are moulded to form window recesses. The ceiling is lined with light alloy panels which are shaped to accept two rows of semi-recessed fluorescent light fittings and to provide central air distribution ducts.

Thermostatically-controlled heaters are provided at floor level along the side walls of the vehicles. The main saloon windows include a hopper-type opening section at the top of the window with sealed windows next to the articulation and in the doors.

Although release and closing of the doors is under the

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driver's control, the opening of individual doors is initiated by passenger-operated push buttons mounted at each doorway. At low level platforms a sliding step operates in conjunction with the doors; the step being automatically activated when a passenger-operated pushbutton is pressed.

The vehicles are bi-directional with a full-width cab at each end. The cab has a deep windscreen and long side windows to give the driver excellent vision all around. In addition there are self-retracting mirrors on each side of the vehicle allowing the driver to see the length of the train when it is in a station. These mirrors are heated and adjustable from the cab.

The driver is positioned on the centre line of the cab with a wrap-around console carrying the various controls (radio, public-address, heating, ventilation, lighting etc). Control of brake and acceleration is by means of a joystick-type controller with integral emergency brake and horn controls.

To provide the necessary clearance between vehicles passing on 25m curves the ends of the vehicles are tapered for almost the length of the cab.

Propulsion equipment

The power for the two driven bogies is provided by four separately-excited dc motors, a pair for each bogie. Each motor group is fed from independently controlled choppers utilising gate turn off (GTO) thyristors.

The separate field control is also provided on a per bogie basis, and this is achieved using 4 quadrant inverters with insulated gate bipolar transistor (IGBT) technology reducing the overall component count and weight.

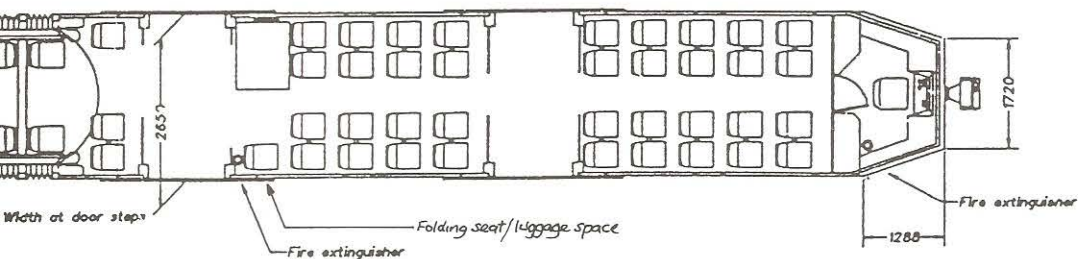
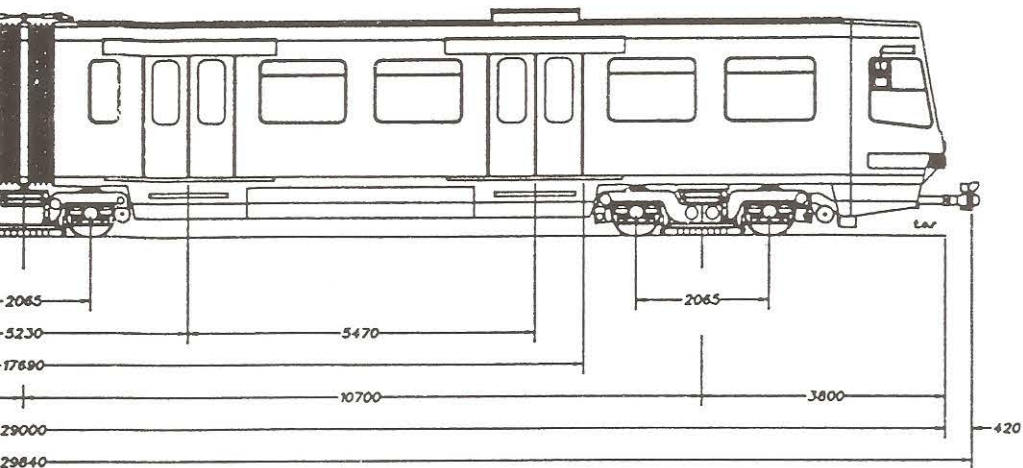
Electric braking is regenerative/rheostatic, with the energy being dissipated from naturally-cooled resistors mounted on the roof of the vehicle.



The line filter performs three functions: it presents a low impedance source to the chopper; it presents a high impedance to the ac voltage component in the overhead 750V supply and it filters out chopper-generated ripple.

The choppers are controlled by a microprocessor and operate at an interlaced chopping frequency of 600 Hz. A frequency monitoring circuit ensures that the chopper frequency does not deviate into signalling frequencies.

A third, 4-quadrant IGBT inverter provides an ac source to a reduction transformer for rectification into the 110V



Data

Maximum speed (off-highway)	80km/h
Maximum speed (street running)	48km/h
Acceleration rate	1.3m/s ²
Braking (normal)	1.3m/s ²
Braking (emergency)	2.6m/s ²
Jerk rate	0.8m/s ³
Maximum gradient	6.5%
Minimum curve radius	25m
Voltage	750V · dc

dc supply used for charging the battery and providing control and auxiliary supplies.

A programmable logic controller (PLC) is used to reduce the number of control relays, thus providing space savings and giving greater flexibility of operation.

The LRVs are braked using a fully-blended braking system, which employs regenerative/rheostatic electric and pneumatic brakes on the motored bogies and pneumatic brakes on the articulation bogie. Also fitted to all bogies are electric track-brakes, which provide a significant additional braking force, allowing the LRV to operate safely with normal road traffic.

The LRVs can be driven from either end, or coupled together in multiple. The driver has full control of all vehicles connected via the autocoupler from one cab, while the PLC provides such facilities as automatic door closing during the winter months.

