



SYDNEY MONORAIL TECHNICAL FACT SHEET

TECHNICAL INFORMATION

Operations

Opened 21 July 1988

Closed 30 June 2013

Services operated 364 days a year (Closed Christmas Day), every 5 minutes

7am – 10pm Mon to Fri

8am – 10pm Sat and Sun

Network

Circuit loop length 3.6km

Circuit time duration 15 mins

Maximum circuits per hour 4

Maximum circuits per day 60

Stations

City Centre

Darling Park

Harbourside

Convention

Paddy's Markets

Chinatown (closed)

World Square

Galleries Victoria

Rolling stock

Vehicle type Von Roll MR111

Number of vehicles 6

Number of cars per vehicle 7

Vehicle length 32.12 metres

Vehicle width 2.06 metres

Vehicle height 2.6 metres

Number of drive units 6 (located between carriages) Maximum speed 9.2 metres per second

Maximum capacity 170

Maximum seated capacity 56

Track

Rail type Box girder fabricated sheet

Rail size 832mm (h) x 700mm (w) 940mm top flange

Spans 30m on straights

Support columns 690x125

UB (typical) rolled steel (i.e. 690mm flange to flange, 250mm wide, Universal Beam section weighing 125kg/m)

Minimum radius of curves 20m (reduce speed 5m/sec)

Maximum gradients 4.5% up 6.5% down

Power

Power supply 525 V AC 3 wire/50 Hertz

Number of feeding units 8

Number of conductor rails

2 + 1 earth using up-thrust collectors

Maintenance

Facilities include vehicle storage washing and cleaning, full maintenance facilities (including pit) and control room

Number of traversers 1 with 2 beams to install and remove monorails from service



SYSTEM OF OPERATIONS

The trains were designed with automatic and semi-automatic functionality, where the decisions regulating the normal safe operation of each train are carried out by micro-processor based control system in the front car of each train.

Unlike remote controlled craft, which are directly instructed by an operator, the monorail trains receive system and status data which permits them to proceed as automatically programmed if safe operating conditions exist.

Under semi automatic control, the fail safe needs of the Monorail system require that every level of information, processing and communication is either duplicated or simultaneously checked by separate systems to ensure that safety is never compromised.

Until recently all vehicles were operated in semi-automatic mode. However due to the age of the controlling autopilot components, the autopilot components were replaced with Anti Collision Controllers (ACC). All trains are now run in manual mode which allows the driver to control the speed of the vehicle while still being under the supervision of the ACC.

At the central control room, two main computers are linked in a master/standby relationship. Either machine may be started as master and while operating, the standby stays in a back-up mode, its data base being regularly replenished by the master to ensure that it remains conversant with the system conditions and is able to assume full command within seconds, should any failure occur in the master computer.

Each Monorail unit is able to carry out its own automatic control of speed, acceleration and deceleration and can also monitor and control its safety systems.

The equipment fitted consists of a series of PLCs (programmable logic controller) and an ACC. The two systems work together providing checks on each other. The main computer system works together with the ACC providing checks on the trains position, speed and distance to the train in front.

The computer system comprises of a main unit built into the nose cone which determines the Monorail position by means of pulse counters. The system resets to zero at every station and is supplied with power from onboard batteries.

Information on position is relayed to the central control room, which in turn relays information to other units on the loop so that each Monorail is aware of its relative position. As the vehicles are now driven in manual mode, this information is no longer processed, however in full automatic mode the position of relative trains governed the departure of vehicles from stations around the loop ensuring that separation distance between vehicles was kept.



Further control computers are fitted to each carriage in the Monorail unit to monitor and control drive motors, doors, lights and other systems. The main computer is pre programmed with complete information on the position/distance/speed relationship of the loop.

The ACC uses a control rail (or busbar) cut at intervals and joined by diodes to determine the Monorail position by measuring the number of diode voltage drops between it and the Monorail in front. The ACC can then regulate speed accordingly. Diode failure can be detected by the ACC and in the event of a short circuit diode failures are detected by a station-to-station check circuit.

Speed is monitored from a pulse generator fitted on the non-drive bogies at the front of the Monorail. Information is relayed back to the central control room and provided as information on the control rooms SCADA system. When driven in auto and semi automatic mode the autopilot would override the computer speed control if reference signals from the non drive bogies indicate speed beyond tolerance of the systems predetermined speed profile.

MAINTENANCE AND SUPPLY

The facility is situated in Pyrmont between Convention and Haymarket monorail stations.

A traverser system is fitted to move monorails in and out of the main circuit, the traverser being able to align with five storage tracks, a monorail washing track, and tracks for maintenance and inspection.

Full workshops and the central control room are located in this complex.

The maintenance track is specially designed to allow the monorail to be run up and supported on the upthrust rollers, so allowing access to the drive bogies for maintenance purposes.

The traverser is in fact, a double traverser; the working traverser described above delivers and retrieves the monorails from storage, and the through traverser maintains the main track allowing uninterrupted service.

Interlocking is provided to prevent a second monorail from entering the section incorporating the traverser until the traverser sequence is complete and all safety checks satisfied.