HEAVY RAIL TRACTION DEVELOPMENTS IN NZ

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WELLINGTON ELECTRIFIED AREA POWER SUPPLIES

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Where it all started.

Otira Tunnel – opened 1923
• 8.5km long on a 1 in 33 grade
• New 1500v DC system between Otira and Arthurs Pass – approx 13.5 route km’s
• Coal fired power station at Otira, then in 1941 replaced by a new mercury arc rectifier sub at Otira Tunnel portal
• 5 Eo class locos – 680hp (1 hour rating) each capable of hauling 175 tons at 18mph on 1 in 33 grade
Otira - continued

• Original Eo locos replaced 1968 with 5 new Toshiba locos (1285hp 1 hour rating)
• Increasing coal traffic necessitated diesel operation plus electric bankers in 1990’s
• Tunnel ventilation system commissioned in 1997 which allowed full diesel operation and decommissioning of the electrification.
Christchurch – Lyttelton
1929 -1970

• 1500v DC system linking Christchurch and Lyttelton – distance of 10.5km
• Installed to eliminate smoke problems in Lyttelton tunnel (approx 3.5km long)
• One rotary converter substation at Woolston near middle of system
• 6 Ec class locos – 1188hp 1 hr rating
• System effectively displaced by diesel locos
Wellington Electrified Area (WEA)

- 1500v DC system – (standard practice for time)
- 1st line to Johnsonville opened 1938 (10.42km)
- Wellington – Paekakariki 1940 (39km)
- Wellington – Upper Hutt completed 1955 (32km)
- Extension Paekakariki to Paraparaumu 1983 (9km)
- Extension Paraparaumu – Waikanae planned for completion Jan 2011 (7km)
NIMT 25kV AC system

• Completed 1988
• 405 route km’s between Palmerston North and Hamilton over mainly hilly terrain
• 4 feeder substations directly connected to 220kV grid
• 22 (now 18?) 30 class locos 3KW (4021hp) continuous rating
Auckland 25kV AC System

- All lines Papakura – Swanson inclusive
- Under construction – due for completion by end 2013
- 2 feeder substations directly connected to 220kV power transmission grid
- EMU procurement in early stages.
- All main lines double track
- Bi – directional signals operation on double lines
AUCKLAND METRO 25kV AC ELECTRIFICATION,
PRELIMINARY SCHEMATIC.
DRAFT - 6 NOVEMBER, 2007
Wellington Electrified Area (WEA) Overhead

- 1100 new steel poles installed to date
- New overhead McKays to Waikanae (duplicated track) and other selected areas
- All new and full replacement work made balanced weight tension
- Addition of positive feeder wires on all lines
WEA Positive feeder wires

- Additional feeder wire run on overhead for each main line for additional voltage and current support
- Doubled wire in a few critical locations
- Special Aluminium alloy wire 307mm2
- Helps mitigate sag of catenary and contact wire due to heat and high current draw where fixed tension overhead installed.
REFERENCE No. ET71001/N'

MINIMUM TERMINATION HEIGHT FOR STYLES 1 TO 6 = 5200 mm.
MINIMUM TERMINATION HEIGHT FOR STYLE 7 = 6700 mm.

'X' IS DIFFERENCE IN mm BETWEEN CATENARY AND CONTACT ANCHOR HEIGHTS.
REFER TO CROSS-SECTION FOR THE FIGURE.

SUPPORT BRACKETS & GUY ARE NOT SUPPLIED WITH THIS DRAWING.

STYLES 1 TO 6, WHEEL SETUP FOR MAXIMUM HALF TENSION LENGTH OF 650 m WITH TEMPERATURE RANGE OF -20°C TO 50°C, MINIMUM TERMINATION HEIGHT 5.2 m FOR THIS CONFIGURATION.

STYLE 7, WHEEL SETUP FOR MAXIMUM HALF TENSION LENGTH OF 750 m WITH TEMPERATURE RANGE OF -20°C TO 60°C, MINIMUM TERMINATION HEIGHT 5.7 m FOR THIS CONFIGURATION.
WEA Power requirements

- 1500v DC systems need a lot more substations compared to 25kV AC
- 1500v DC in Auckland would have required about 22 feeder substations compared to 2 feeder substations for 25kV
- 8 new DC substations being provided for existing network and additional 2 for extension to Waikanae.
- New SCADA control system for substations
WEA Substations
See Wellington Power Upgrade by Craig Tooke.