



AUSTRALIAN RAIL TRACK CORPORATION LTD

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Supplementary Appendix to ARTC Track & Civil Code of Practice

Mixed Gauge Track ETF-00-01

Applicability

ARTC Network Wide		Western Jurisdiction	✓
New South Wales		Victoria	✓

Primary Source

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1.1	23 Oct 06	2.6.1, 2.8, App 1	Reference to timber sleepers updated Text and referenced drawings altered to cover ARTC dual gauge turnouts.
1.2	11 Apr 07	2.3, 2.9.3 App 1	New Guard Rails section added Additional description for Common Rail Change Over included ARTC list of reference drawings updated
1.3	19 Jun 08	4.2.2 App 1	Added reference to new maintenance manual ETN-03-01 Added Additional Victorian drawing details

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1 Scope

This document describes and specifies the requirements for mixed gauge track in the ARTC network.

2 General

2.1 Plain line

This section describes the configurations that shall apply in plain line mixed gauge (broad 1600mm gauge and standard 1435mm gauge) track in main line and loop tracks.

Mixed gauge track is essentially the same as single gauge track up to top of sleeper level and normally consists of 3 rails, one common rail and the others laid to 1435mm gauge and 1600mm gauge on the dual rail side.

2.2 Rail types

Mixed gauge track is preferably laid with AS 47 or 50kg rail or equivalent that affords adequate room to apply fastenings between the dual rails.

53 or 60 kg rail may be used subject to:

- Using spacer blocks between the dual rails and applying fastenings to the outsides of the rails.
- Creating enough room between the dual rails by planing material off the bottom flanges of the rails.
- On dogspiked track where discrimination insulation between the rails is required, this can be achieved by using specially planed dogspikes that can be driven between the dual rails.

2.3 Guard Rails

Guard rail configuration on dual gauge track should generally follow the recommendations as specified in clause 1.1.6 *Section 1 Rail* of the ARTC Code of Practice, except that the working face of the guard rail that comes into contact with derailed wheels, should be between 250mm and 360mm in from the gauge faces of the common and standard gauge rails.

This must be located to keep derailed wheels on sleeper ends and to avoid rolling stock impacts with structures.

2.4 Rail orientation

Plain line running rails are inclined at a nominal 1 in 20 towards the track centre, by the shape of the applied baseplate.

2.5 Rail lengths

Rail is to be continuously welded when rerailling and laying new track for main line or loops.

Long or short welded rail, joined by fishplates may be used in sidings.

2.6 Rail anchors

Rail anchors are to be used on CWR, LWR and SWR track fastened with dogspikes. They shall be fitted both sides and hard against the sleeper and applied from the outside of the dual rails. Anchoring patterns shall be adjusted to suit site specific conditions so that the anchors are effective.

2.7 Sleepers and Fastenings

2.7.1 Sleepers

Dual gauge prestressed concrete sleepers are to be of an approved design (eg AN6) using fastenings suitable for dual rails.

Timber sleepers for use in mixed gauge track shall conform to those specified in [ETA-02-01 Timber Sleeper, Turnout and Bridge Transom Specification](#).

2.7.2 Fastenings

Resilient fastenings are the preferred fastening to be used to secure the rails, when rerailling on timber sleepers and transoms.

Where resilient fastenings are to be used, pandrol or equivalent fastenings shall be used on concrete sleepers and Rex-lok or equivalent shall be used on timber sleepers.

The fastenings to be used on the dual rail side shall be as follows: -

- On concrete sleepers – On the outside flanges standard pandrol or equivalent fastenings are to be used. Between the dual rails hook in shoulders for pandrol or equivalent fastenings are cast in the sleeper and the clips are applied on alternate sleepers to each dual rail.
- On baseplated timber sleepers – Special dual rail baseplates to an ARTC approved design (preferably cast iron to AS1085.3) are to be used. On the outside flanges standard Rex-lok or equivalent fastenings are to be used. The fastening between the dual rails consists of a screw spike, spring washer and spacer assembly.

2.7.3 Inspection and Assessment (Timber Sleepers)

Note that the effectiveness of the fastening between the dual rails depends on:

- The condition of the fastening assembly.
- The condition of the timber under the dual rail baseplate, which may be difficult to inspect.

During patrol and general inspections on mixed gauge track, inspectors should look for (in addition to the tasks specified in [Section 2](#) of the ARTC Track & Civil Code of Practice clauses 2.4.2 and 2.4.3), particularly on curves of up to 800m radius:

- Abnormal degradation of sleepers in the dual rail area.
- Loose and ineffective fastenings on the dual rail side, particularly between the rails.

2.8 Ballast Depths and Shoulders

As specified in [Section 4](#) in the ARTC Track and Civil Code of Practice.

2.9 Mixed Gauge Points and Crossings

On the ARTC network there are two main areas with mixed gauge track i.e:

- From Dry Creek to Outer Harbor and from Gillman Junction to Port Flat in SA.
- From 1.6km near Spencer Street to West Footscray Junction, from Tottenham to Newport and from North Geelong to Gheringhap in Victoria.

Mixed gauge assemblies shall conform to the reference drawings listed in appendix 1.

2.9.1 Turnouts and Gauge Separations

The SAR/AN turnout designs use pivot heel switches, which incorporate very flat angle K crossings to enable the broad gauge rail to carry it over the standard gauge rail where required in mixed gauge turnouts. The V crossing angle is 1 in 8 on the broad gauge, and where required double crossings are used. This type of mixed gauge turnout is also used in Victoria for some installations in 47 kg rail.

The Victorian turnout designs are not fully mixed and incorporated transfers or fixed points and are manufactured in 53 and 60kg rail. The fixed points require maintenance to tight tolerances. The fixed points are not preferred in main line and are being replaced with switch blades.

ARTC has developed more robust designs based on the SAR/AN design, both for turnouts and gauge separations, utilising 50kg head hardened rail and concrete bearers. These turnouts are used for new installations and will supersede the older types.

2.9.2 Diamonds

Mixed gauge diamonds where a dual gauge track crosses a single gauge track should be avoided wherever possible as they are costly to maintain and are only suitable for slow speeds. Because of the high impacts caused by the double vee and k crossings they should be laid on timber bearers.

Diamonds where a broad gauge track crosses a standard gauge track are satisfactory in service as long as they are assembled correctly. They are preferably laid on concrete bearers.

2.9.3 Common Rail Change Over

Common rail change overs either consist of:

- Two fixed points laid opposite each other. (This type shall only be used in exceptional circumstances)
- Two interlocked switch rails laid on nominally straight track approximately 9800mm apart.

3 Rail Wear Limits

As specified in [Section 1](#) of the ARTC Track and Civil Code of Practice and General Appendix to ARTC Track & Civil Code of Practice Rail [ETG-01-01](#).

4 Track Geometry

4.1 Design

As specified in [Section 5](#), clause 5.1 in the ARTC Track and Civil Code of Practice. The standard gauge alignment shall be the reference for design. The parameters and limits for plain line design shall be as for the typical limits in Table 5.2A, with the exception of common rail change overs.

4.2 Inspection and Assessment

4.2.1 Plain Line

Track geometry as specified in [Section 5](#) clause 5.4 in the ARTC Track and Civil Code of Practice. The tolerances for the broad gauge rail shall be as specified in clause 5.4.

4.2.2 Points and Crossings

Generally in line with [Section 3](#) clause 3.4 in the ARTC Track and Civil Code of Practice, except: -

- Where the designed dimensional limits differ from standard gauge assemblies.
- At fixed points (transfers).

Refer to ARTC maintenance manual [ETN-03-01](#) for maintenance details of the AN dual gauge turnouts and gauge separations.

5 Clearances

Clearances to structures and/or other tracks shall be measured or calculated relative to the track centres of the two gauges.

6 Appendix 1 – Reference Drawings

Drawing No	Title
AN type Assemblies	
W110	Gauge separators & mixed gauge diamonds (shows configurations)
W111	1600 & 1435 gauge mixed gauge leads (shows configurations)
W33021	M G lead assembly 1600 & 1435 gauges straight, common rail on right, 1600g LH turnout, 4571mm switch, 47kg
W33022	M G lead assembly 1600 & 1435 gauges straight, common rail on left, 1600g RH turnout, 4571mm switch, 47kg
W33023	M G lead assembly 1600 & 1435 gauges straight, common rail on right, 1435g RH turnout, 4571mm switch, 47kg
W33024	M G lead assembly 1600 & 1435 gauges straight, common rail on left, 1435g LH turnout, 4571mm switch, 47kg
W33025	M G lead assembly 1600 & 1435 gauges straight, common rail on right, 1435g LH turnout, 4571mm switch, 47kg
W33026	M G lead assembly 1600 & 1435 gauges straight, common rail on left, 1435g RH turnout, 4571mm switch, 47kg
W33027	M G lead assembly 1600 & 1435 gauges straight, common rail on right, 1600g RH turnout, 4571mm switch, 47kg
W33028	M G lead assembly 1600 & 1435 gauges straight, common rail on left, 1600g LH turnout, 4571mm switch, 47kg
W33029	M G lead assembly 1600 & 1435 gauges, common rail on right, LH turnout, 4571mm switch, 47kg 1 in 8
W33030	M G lead assembly 1600 & 1435 gauges, common rail on left, RH turnout, 4571mm switch, 47kg 1 in 8
W33031	M G lead assembly 1600 gauge straight, common rail on right, 1435 & 1600gauges, RH turnout, 4571mm switch, 47kg
W33032	M G lead assembly 1600 gauge straight, common rail on left, 1435 & 1600gauges, LH turnout, 4571mm switch, 47kg
W33033	M G lead assembly 1435 gauge straight, common rail on right, 1435 & 1600gauges, LH turnout, 4571mm switch, 47kg
W33034	M G lead assembly 1435 gauge straight, common rail on left, 1435 & 1600gauges, RH turnout, 4571mm switch, 47kg
W33035	M G lead assembly 1435 gauge straight, common rail on right, 1435 & 1600gauges, RH turnout, 4571mm switch, 47kg
W33036	M G lead assembly 1435 gauge straight, common rail on left, 1435 & 1600gauges, LH turnout, 4571mm switch, 47kg
W33037	M G lead assembly 1600 gauge straight, common rail on right, 1435 & 1600gauges, LH turnout, 4571mm switch, 47kg
W33038	M G lead assembly 1600 gauge straight, common rail on left, 1435 & 1600gauges, RH turnout, 4571mm switch, 47kg
W33039	M G lead assembly 1600 & 1435 gauges, common rail on right, RH turnout, 4571mm switch, 47kg 1 in 8
W33040	M G lead assembly 1600 & 1435 gauges, common rail on left, LH turnout, 4571mm switch, 47kg 1 in 8
W33062	M G lead assembly 1600 gauge straight, common rail on right, 1435g RH turnout, 4571mm switch, 47kg 1 in 8.466
W33064	M G lead assembly 1435 gauge straight, common rail on right, 1600g LH turnout, 4571mm switch, 47kg 1 in 8.466

Drawing No	Title
W33082	Gauge separator 1435 gauge straight, common rail on left, 1600g RH turnout, 47kg 1 in 8
W33084	Gauge separator 1600 gauge straight, common rail on right, 1435g LH turnout, 47kg 1 in 8
W33086	Gauge separator 1600 gauge straight, common rail on left, 1435g RH turnout, 47kg 1 in 8
W33087	Gauge separator 1435 gauge straight, common rail on right, 1600g RH turnout, 47kg 1 in 8
W33088	Gauge separator 1435 gauge straight, common rail on left, 1600g LH turnout, 47kg 1 in 8
W33089	Gauge separator 1600 gauge straight, common rail on right, 1435g RH turnout, 47kg 1 in 8
W35503	1 in 8 mixed gauge diamond 1435g over 1600g, 53kg, rbm crossings, (Type D1)
W35503	1 in 8 mixed gauge diamond 1435g over 1600g, 53kg, rbm crossings, (Type D3, opposite hand to type D1)
W35504	1 in 8 mixed gauge diamond 1600 & 1435gauges over 1600g, 53kg, (Type D4)
W35506	1 in 8 mixed gauge diamond 1435g over 1600 & 1435gauges, 53kg,
W35507	1 in 6 mixed gauge diamond 1600g over 1600 & 1435gauges, 53kg, (Type D6)
W35508	1 in 4 mixed gauge diamond 1600g over 1600 & 1435gauges, 53kg, (Type D9)
W35509	1 in 6 mixed gauge diamond 1435g over 1600 & 1435gauges, 53kg, (Type D7)
W35510	1 in 8 mixed gauge diamond 1600g over 1600 & 1435gauges, 53kg, (Type D10)
W35511	1 in 4 mixed gauge diamond 1600g over 1435g, 53kg, (Type D5)
W35516	1 in 8 mixed gauge diamond 1435g over 1600g, 60kg
W39104	LH & RH fixed point common rail change over assembly, 1600/1435 gauges, 1600g straight, 47kg
W39105	LH & RH fixed point common rail change over assembly, 1600/1435 gauges, 1435g straight, 47kg
ARTCS0060075	Mixed gauge lead assembly modified type 33, 1435mm gauge, common rail on right 1435 and 1600mm gauge LH turnout, 6095 fh switches, 47 kg rail
Victorian Types	
760-41	Third rail fixed point turnout rail bound assembly RH
110-42	4'-8 ½" turnouts, transfers & 5'-3" turnout off mixed gauge
228-42	5'-3" turnout off mixed gauge TR2 LH 94 AS
445-43	Mixed gauge diamond layouts Nos 7.52 B & 7.52 C
420-49	Mixed gauge diamond No 7.52 D installation plan
1017-60	Third rail, fixed points, 5'-3" turning out, 107 AS
1089-60	Third rail, fixed points, 4'-8 ½" turning out, 107 AS
1090-60	Third rail, 4'-8 ½" transfer, 94AS
1122-60	5'-3" turnout off mixed gauge TR2 RH 94 AS
1123-60	4'-8 ½" turnout off mixed gauge TR2 LH 94 AS
1133-60	Third rail turnouts off mixed gauge TR2 & TR3, 94AS
430-61	Third rail fixed point turnouts, gauge & offset diagrams
518-61	Third rail fixed point turnouts TR1 & TR4 No 7.52 107AS
605-63	Third rail special points, 4'-8 ½" turning out TR12 LH 107AS
743-63	Third rail, 4'-8 ½" turnout off mixed gauge, TR12 LH 94 & 107AS

Drawing No	Title
93-88	Mixed gauge double Junction, 60kg relay West Footscray
201-89	Third rail 1435mm transfer /TR6 & 7 /53kg
317-89	Twin guard Rail Assembly for mixed gauge crossing work /TR11 /53kg
238-90	Third rail transfer /TR2 points /53kg
239-90	Third rail transfer /Spreaders for TR2 points /53kg
2085-93	Turnout /TR4 /No8.7 /53kg
2092-93	Third rail fixed points 1435 turning out TR15-53kg
10-94	Turnout /TR15 /No15A /53kg
22-94	Turnout /TR4 /No7.52 /53kg
334-94	Third rail fixed points 1435 turning out TR1-53kg
335-94	Turnout /TR1 /No8.7 /53kg
122-95	Turnout /TR1 /No7.52 /53kg
340-95	Unplated Turnout /TR1 /No8.7 /53kg
398-95	Unplated Turnout /TR4 /No8.7 /53kg
337-99	General layout – Mixed Gauge Diamonds 7.52A & 7.52B /RBM / 60kg Concrete bearers
Additional Victorian Types	
A1B14715D	1 in 7.52 Dual Gauge Switch Assembly Type 82 configuration, Broad gauge RH turnout 1435mm Gauge straight common rail on left, 1600mm & 1435 mm Gauge 53kg
A1B14716D	1 in 7.52 Dual Gauge Switch Assembly Type 82A configuration, Broad Gauge LH turnout, 1435 Gauge straight common rail on right , 1600mm & 1435mm Gauge
A1B14717D	1 in 7.52 Dual Gauge Switch Assembly Type 84 configuration, Broad Gauge straight, 1435 Gauge LH turnout common rail on left, 1600mm & 1435mm Gauge
ARTC Types	
ARTCS107008000	Standard 50kg dual gauge turnouts and gauge separation (shows configurations)
Turnouts	
ARTCS1060001000	1 in 8 Dual Gauge Lead Assembly Type 29 1600mm & 1435mm Gauge, 50kg
ARTCS1060007000	1 in 8 Dual Gauge Lead Assembly Type 30 1600mm & 1435mm Gauge, 50kg
ARTCS1060019000	1 in 8 Dual Gauge Lead Assembly Type 40 1600mm & 1435mm Gauge, 50kg
ARTCS1060013000	1 in 8 Dual Gauge Lead Assembly Type 39 1600mm & 1435mm Gauge, 50kg
Gauge Separators	
ARTCS1060154000	1 in 8 Dual Gauge Lead Assembly Type 24 1600mm & 1435mm Gauge, 50kg
ARTCS1060159000	1 in 8 Dual Gauge Lead Assembly Type 27 1600mm & 1435mm Gauge, 50kg
ARTCS1060164000	1 in 8 Dual Gauge Lead Assembly Type 28 1600mm & 1435mm Gauge, 50kg
ARTCS1060169000	1 in 8 Dual Gauge Lead Assembly Type 34 1600mm & 1435mm Gauge, 50kg
ARTCS1060174000	1 in 8 Dual Gauge Lead Assembly Type 82 1600mm & 1435mm Gauge, 50kg
ARTCS1060179000	1 in 8 Dual Gauge Lead Assembly Type 82A 1600mm & 1435mm Gauge, 50kg
VAE12531	Gauge separator 1435 g straight, common rail on right, 1600g RH turnout, 250m radius, 60kg 1 in 9 (Type 87)