Transport Asset Standards Authority

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Technical Note – TN 003: 2018

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Subject: Turnout speeds and crossing selection

This technical note is issued by the Asset Standards Authority (ASA) as an update to ESC 250 *Turnouts and Special Trackwork*, version 4.8 to restrict the design speed through higher speed turnouts and crossovers, provide restrictions on the use of certain crossing types and correct some typographical errors.

Higher speed turnouts, when used in a crossover or a reversing curve situation without transitions, can result in higher maintenance requirements and increased passenger discomfort.

Swing nose and spring wing crossings are permitted to be used with tangential turnouts, but due to whole-of-life costs considerations, restrictions on their use have been expanded.

The updates include amendments to Section 6.1.5 as follows:

1. Section 6.1.5 Crossings

Replace the contents of Section 6.1.5 with the following:

The selection of turnouts is dependent upon the criteria for crossing rates and crossing types. For crossing rate see Section 6.1.5.1 and for crossing type see Section 6.1.5.2.

1.1. Section 6.1.5.1 Selection of crossing rate

The selection of the crossing rate shall be based on the geometric design of the turnout and the associated limiting speeds of the mainline and turnout roads.

Turnout speeds shall be determined by applying design standards for track geometry detailed in ESC 210 *Track Geometry and Stability*.

Allowable published speeds for the diverging (turnout) road of turnouts located on straight mainline track shall be as shown in Table 3. The speeds indicated are for normal passenger trains and freight trains.

Table 3 – Standard turnout speeds

Turnout	Crossing rate (1 in _)	Crossing geometry	Switch length (mm) (nominal design)	Recommended turnout speed (km/h)
Standard conventional				
1 in 8.25	8.250	Curved	6100	15
1 in 9	9.000	Straight	6100	20
1 in 10.5	10.500	Straight	6100	25
1 in 10.5	10.500	Straight	9150	40
1 in 15	15.000	Straight	9150	50
Standard tangential				
160:6.6	7.433	Curved	N/A	30
160:8.25	8.250	Straight	N/A	30
190:7	8.106	Curved	N/A	35
190:9	9.000	Straight	N/A	35
250:8.25	9.306	Curved	N/A	40
250:10.5	10.500	Straight	N/A	40
300:9	10.200	Curved	N/A	45
300:12	12.000	Straight	N/A	45
500:12	13.180	Curved	N/A	60
500:15	15.000	Straight	N/A	60
800:15	16.681	Curved	N/A	75
800:18.5	18.500	Straight	N/A	75
1200:18.5	20.436	Curved	N/A	85
1200:24	24.000	Straight	N/A	85

While Table 3 provides speeds for individual turnouts, the design speeds for special turnouts, turnouts forming crossovers and adjacent trackwork shall be calculated from geometry component relationships as mentioned in ESC 210 using virtual transitions where required.

Where there is an intervening straight of 13 m or longer between turnouts of a crossover, and the speed is ≤ 40 km/h, the lower of the individual turnout speeds shall be applied.

Where there is an intervening straight of 13 m or longer between turnouts of a crossover, and the speed is > 40 km/h, the design speed shall result in the rate of change of deficiency (D_{roc}) being no greater than the Normal Limits for turnouts as specified in Table 1 of ESC 210 version 4.8.

The allowable speed through any crossover or reversing alignment where the intervening straight section of track is less than 13 m shall be calculated on an individual site specific basis in accordance with the requirements of ESC 210. The resulting D_{roc} in these instances shall be no greater than the Normal Limits for turnouts or plain track as is applicable. For crossovers, a short section of plain track may be regarded as part of the turnout.

Crossings in main lines, other than swing nose or spring wing crossings, introduce a design dip in the track. This is an impact point that leads to accelerated deterioration of components. The impact can be reduced by limiting the speed over the crossing. Whilst this is achieved for traffic

travelling on the turnout road because of the crossing alignment geometry (Table 3), the speed of mainline (through road) traffic should be limited by the dip angle. As a guide, the crossing angle should be selected to meet the design speed requirements in accordance with Table 4.

Table 4 – Maximum mainline speeds for crossings based on dip angle

Crossing rate (1 in _)	Crossing dip angle (mrad)	Normal Limit (km/h)	Maximum Limit (km/h)	Exceptional Limit (km/h)
2	140	16	25	29
4.5	62	37	55	65
7.5	37	62	92	108
8.25	34	68	102	120
9	31	74	111	130
10.5	27	86	130	130
12	23	99	130	130
15	19	125	130	130
18.5	15	130	130	130
21	13	130	130	130
24	11	130	130	130

Normal Limits shall be exceeded only with the approval of the RIM's delegated engineering representative who shall accept the increased maintenance impact.

Maximum Limits shall be exceeded only with the approval of the Lead Track Engineer, ASA.

The speeds are for significant passenger and freight traffic. Higher speeds may be permitted for uncommon operations, such as occasional XPT trains.

1.2. Section 6.1.5.2 Selection of crossing type

The selection of the crossing type shall be based on the requirements set out in Table 5.

Table 5 – Crossing types

Crossing type	New rail size (kg/m)	Replacement rail size (kg/m)	For use in turnout type
Fabricated	50, 60	50, 53, 60	Conventional
Rail bound manganese	60	53, 60	Conventional and tangential
Compound	60	53, 60	Conventional and tangential
Fully cast	60	60	Conventional and tangential
Swing nose	60	60	Tangential
Spring wing	60	60	Tangential

Conventional turnouts may be provided with fabricated or compound 'V' assemblies. Refer to Appendix B for diagrams of each type.

Tangential turnout designs are approved for both straight and curved crossings. Where the main line is not straight track the curved crossing type should be used. Elsewhere, the straight crossing type shall be used if no site constraints or adverse impacts on other rail infrastructure are present.

Tangential turnouts shall be provided with fixed nose compound crossings unless specified otherwise.

Swing nose crossings are available for the tangential turnouts detailed in Table 6.

Table 6 – Swing nose crossings

General description	Crossing	General layout drawing number
250:10.5	Straight	CV0479043
300:12	Straight	CV0479045
800:18.5	Straight	CV0479049
1200:24	Straight	CV0479051

Swing nose and spring wing crossings have the potential to reduce noise and vibration often associated with other crossing types by eliminating the design dip in the rail. While these crossings are permitted, due to whole-of-life costs considerations, their use will require the approval of the Lead Track Engineer in the form of a concession. For swing nose crossings, the requirements for additional point operating motor and associated signalling componentry shall be addressed. Guidelines for the use of swing nose and spring wing crossings include the following:

- to be used with tangential turnouts
- the turnout shall have a straight crossing and be installed on concrete bearers or directly fixed to track slab formation
- alternative bearer materials are permitted on track slab formation when fixed by an approved method

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Technical Note – TN 046: 2015

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Subject: Revised plans for tangential turnouts and in-bearer arrangements

This technical note is issued by the Asset Standards Authority as a temporary update to ESC 250 *Turnouts and Special Trackwork*, Version 4.8. This technical note supersedes TN 094: 2014, issued 20 November, 2014.

ESC 250 is presented as a legacy RailCorp document and shall be read in conjunction with the changes and clarification set out in this technical note, and interpreted according to the interpretation guidelines published:

Table 1 – Interpretation guides

Reference No.	Title	Version	Issue date
TS 10762	Legacy RailCorp Standards Interpretation - Management Overview	1.0	28/06/2013
TS 10760	Guide to interpretation of organisational role and process references in RailCorp standards	1.0	17/06/2013
TS 10760 - SMS	Interpretation guide RailCorp SMS References within RailCorp engineering standards	1.0	17/06/2013

Changes in the document's frontispieces, branding, formatting and governance are not included.

1. Additional information standard drawings for tangential turnouts

Table 18 and Table 19 of ESC 250 provide references to the geometry layouts for standard tangential turnouts and crossovers. The intention is to bring all of the design documentation to a consistent standard and include various improvements incorporating feedback from past installations.

The R160 turnout type is the first in the sets of drawings that have been amended. Revised plans are listed in Table 2 of this technical note. Changes made to these plans include:

- nominated use of in-plate switch rollers as per Table 4 of this technical note
- amendment to nominated closure lengths (to position rail joint mid-bay between bearers)
- amended notes and references

Amended drawings also include reference to the requirement for slotted holes in the elevated guard rail section nominated for tangential turnouts. This reflects changes to SPC 251 *Turnouts and Special Trackwork Components*, issued in April 2013.

Table 2 – Drawing numbers for R160 turnouts

Description	Plan number	Amendment
R160:6.6 – General Arrangement	CV0479038	D
R160:6.6 – Conc. T/O Bearer LO & Details	CV0237801	C
R160:6.6 – Timbering and Plating Details	CV0237802	C
R160:6.6 – Concrete Bearer Details	CV0237803	B
R160:6.6 – Turnout Bearer Pad Details	CV0237804	A
R160:6.6 – Curved End Infill – Conc. Bearer LO & Details	CV0237805	B
R160:6.6 – Straight End Infill – Conc. Bearer LO & Details	CV0237806	B
R160:8.25 - General Arrangement	CV0479039	C
R160:8.25 – Conc. T/O Bearer LO & Details	CV0237807	D
R160:8.25 – Timbering and Plating Details	CV0237808	D
R160:8.25 – Concrete Bearer Details	CV0237809	C
R160:8.25 – Turnout Bearer Pad Details	CV0237810	B
R160:8.25 – Curved End Infill – Conc. Bearer LO & Details	CV0237811	B
R160:8.25 – Straight End Infill – Conc. Bearer LO & Details	CV0237812	B
R160:6.6 & R160:8.25 – Switch and Stock rail Assemblies	CV0237814	C
R160 – In-bearers – Adjusted Turnout Bearer Layout	CV0237813	C

2. In-bearer arrangements

Updating of plans for ‘In-bearer Adjusted Turnout Bearer Arrangements’ for R160 to R800 tangential turnouts has also been completed. Revised plans are listed in Table 3. The bearer locations for the in-plate switch rollers are detailed in Table 4.

Table 3 – Drawing numbers for adjusted turnout bearer layouts

Description	Plan number	Amendment
R160 – In-bearers – Adjusted Turnout Bearer Layout	CV0237813	C
R190 - In-bearers – Adjusted Turnout Bearer Layout	CV0278550	C
R250 – In-bearers – Adjusted Turnout Bearer Layout	CV0278551	F
R300 – In-bearers – Adjusted Turnout Bearer Layout	CV0278552	F
R500 – In-bearers – Adjusted Turnout Bearer Layout	CV0278553	F
R800 - In-bearers – Adjusted Turnout Bearer Layout	CV0278554	E

Table 4 - Bearer location of in-plate switch rollers

In-plate switch roller requirements - tangential turnouts						
	1st roller (with in-bearers)	1st roller (no in-bearers)	2nd roller	3rd roller	4th roller	5th roller
R160	Bearer 4	Bearer 3	Bearer 7	Bearer 10	Not required	Not required
R190	Bearer 4	Bearer 3	Bearer 8	Bearer 11	Not required	Not required
R250	Bearer 4	Bearer 3	Bearer 8	Bearer 12	Not required	Not required
R300	Bearer 4	Bearer 3	Bearer 8	Bearer 12	Bearer 16	Not required
R500	Bearer 4	Bearer 3	Bearer 8	Bearer 13	Bearer 17	Not required
R800	Bearer 5	Bearer 4	Bearer 9	Bearer 14	Bearer 18	Bearer 22

3. Section 4.4.7 Catchpoint clearances

Replace Paragraph 3 of item 4 on page 14 of ESC 250 with the following:

"Failure to achieve any of the above criteria will require a formal concession application."

Replace item 1, bullet point 2 on page 16 of ESC 250 with the following:

"A detailed design is required on a case-by-case basis to provide an appropriate system to direct the derailed vehicle along the track. This may be achieved using a guard rail arrangement."

4. General

The plans are stored in the plan room. Staff involved in the design, manufacture, construction and maintenance of turnouts should familiarise themselves with the amendments.

The R190, R250, R300, R500 and R800 series of plans are also being updated similar to the R160 plans. These will be progressively lodged in the plan room.

A summary of currently available standard drawings for tangential turnout bearer layouts is provided in Table 5.

Table 5 - Standard tangential turnouts – standard plan drawing list

BASE TYPE		160:6.6	160:8.25	190:7	190:9	250:8.25	250:10.5	300:9	300:12	500:12	500:15	800:15	800:18.5	1200:18.5	1200:24
TURNOUTS	GENERAL ARRANGEMENT	CV0479038	CV0479039	CV0479040	CV0479041	CV0479042	CV0479043	CV0479044	CV0479045	CV0479046	CV0479047	CV 0479048	CV0479049	CV0479050	CV0479051
	CONCRETE BEARER LAYOUT	CV0237801	CV0237807	775-986 CV0225622	775-981 CV0225620	CV0212863	775-439 CV0170785	775-717 CV0170800	775-901 CV0065863	CV0442174	775-245 CV0170041	775-246 CV0170243	775-325 CV0170838	775-247 CV0170255	CV0450644
	CURVED END INFILL CONC. BEARER LAYOUT	CV0237805	CV0237811	CV0423626	CV0213387	CV0239298		CV0375955	N/A	CV0518997	CV0278397	785-119 CV0106694		775-248 CV0170256	
	STRAIGHT END INFILL CONC. BEARER LAYOUT	CV0237806	CV0237812	CV0423627	CV0213386	CV0239299	CV0260442	CV0375956	CV0375814	CV0518867	CV0518851	775-710 CV0170799	775-326 CV0170839		CV0450642
CROSSOVERS	R.H. CROSSOVER 3.660 Crs.				CV0163857		775-475 CV0170788		775-958 CV0170251		775-229 CV0042420		775-369 CV0170782		
	L.H. CROSSOVER 3.660 Crs.				CV0152970		CV0158591		CV0054920		775-230 CV0042421				
	R.H. CROSSOVER 3.700 Crs.				CV0158956		CV0026179								
	L.H. CROSSOVER 3.700 Crs.				CV0158959		CV0478740								
	R.H. CROSSOVER 3.720 Crs.										CV0212881				
	L.H. CROSSOVER 3.720 Crs.						CV0206200				CV0238913				
	R.H. CROSSOVER 3.730 Crs.				CV0518481										
	R.H. CROSSOVER 3.734 Crs.						CV0066899								
	L.H. CROSSOVER 3.740 Crs.										775-658 CV0170795				

BASE TYPE	160:6.6	160:8.25	190:7	190:9	250:8.25	250:10.5	300:9	300:12	500:12	500:15	800:15	800:18.5	1200:18.5	1200:24
R.H. CROSSOVER 3.800 Crs.				775-996 CV0170267										
L.H. CROSSOVER 3.800 Crs.				CV0279010		CV0281677								
R.H. CROSSOVER 3.820 Crs.						CV0428692								
L.H. CROSSOVER 3.820 Crs.														
R.H. CROSSOVER 3.900 Crs.						CV0125065								
L.H. CROSSOVER 3.900 Crs.										CV0479838 Vales Point				
R.H. CROSSOVER 3.930 Crs.				CV0111480										
L.H. CROSSOVER 3.930 Crs.														
L.H. CROSSOVER 3.960 Crs.				CV0282155										
R.H. CROSSOVER 3.962 Crs.												CV0168220		
L.H. CROSSOVER 3.962 Crs.														
R.H. CROSSOVER 4.000 Crs.				CV0152531		CV0042519				775-330 CV0170841				
L.H. CROSSOVER 4.000 Crs.				CV0152528		CV0163456			CV0279619 Unanderra			CV0439640		
R.H. CROSSOVER 4.150 Crs.				CV0158950										
L.H. CROSSOVER 4.150 Crs.				CV0158953										

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Engineering Standard
Track

ESC 250

TURNOUTS AND SPECIAL TRACKWORK

Version 4.8

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Engineering Standard

Owner:	Chief Engineer, Track		
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NSW Transport RailCorp

Document control

Version	Date	Summary of change
1	October 2006	First issue as a RailCorp document. Includes content from TS 3101, TS 3402, RTS.3430, CTN 04/09
2	April 2007	Minor corrections; inclusion of requirement to review electrical implications of new crossing materials; inclusion of requirement to provide switch protection pads on sharp radius conventional switches in sidings; limit on use of diamonds in sharp curves; additional table of definitions in component order.
3	October 2007	Changes include: alteration to limits for "front of points"; changes to reference drawings for tangential turnouts
4	May 2008	Section 3.2 – Additional references; Section 5.2 – Clarification of design requirements for diamond crossings; Section 5.4.7 – Clarification of the measurement of the landing zone for catchpoints and inclusion of reference to ESC 215 to determine rolling stock outline; Section 7.1.4.3 – Addition of In-bearer layouts; Section 7.1.5.1 – Addition of guidelines for selection of crossing rates based on main line speeds; Appendix 5 – Addition of approved In-bearer layouts and correction of heading in Table 25.
4.1	December 2008	Section 5.1.2 – Additional requirements for the checkrail opening; Appendix 2 – Changed requirements for Crossing Identification
4.2	May 2009	Format Change; Section 4.4.2 Figure 2 – wording change to clarify steepness of ballast ramp
4.3	December 2009	Changed Table captions to read "Table XX" rather than "Figure XX"
4.4	July 2010	Section 2.2 - Number of reference Rolling Stock standard changed; Sections 4.1.2, 4.2.2, 4.4.2, - Number of reference Rolling Stock standard changed
4.5	February 2011	Section 6.1.1.1 – Inclusion of reference to limits on transitions included in ESC 210; Appendix 6 - Inclusion of additional approved products
4.6	August 2011	New section 2.4 – Standard Plans – includes content from CTN 11/09; Section 2.2 - Deletion of signals reference drawing; Section 6.1.4.3 - Deletion of signals reference drawing; New section 6.1.7- Switch and stockrail drilling – includes content from CTN 11/13; Section 6.1.8 to 6.1.11 – Renumbered; Section 9.1 - Addition of acceptance limits for switch location and squareness Section 11 - Some damage limits included; Appendix E - Tables 18 and 19 - Updated approved tangential turnout designs; Appendix F - Updated approved products; Appendix G - Detailed listing of Standard Plans - – includes content from CTN 11/09
4.7	April 2012	Reformatted to new template; 2.2 - Signal drawing added; 4.2.1 - Addition of limits on crossing rates in diamonds and the use of raised checkrails; 4.2.2 - Correction of typographical error; 6.1.8 - New section – “securing of points” includes content from CTN 12/03; 6.1.9 to 6.1.12 – Renumbered; Appendix C - Change of naming convention in “K” crossing diagrams ; Appendix G - Table 23 – inclusion of Civil drawing number for spiking plate on concrete bearers
4.8	April 2013	Changes detailed in Summary table below

Summary of changes from previous version

Summary of change	Section
Control changes	Document Control
Correction of reference format errors Correction of incorrect title for ESC 230	Various
Added comment regarding containment catchpoints to Description	3
Changed requirements for diamond crossings and inclusion of explanatory notes	4.2.1
In-bearer signalling deleted from signalling interface for diamonds	4.2.6
Clarification of slope of catchpoint landing area; clarified descriptions in Figure 5	4.4.7
Changed requirements for bearer layout on tangential turnouts	6.1.4.2
Added freight trains to passenger for determination of crossing design speed; Added new turnouts to tables covering mainline and turnout speeds Updated speeds in Table 9.	6.1.5.1
Additional turnout with swingnose crossing included in Table 6	6.1.5.2
Clarification of application and location of switch protector pads	6.1.6.1
Table 17 – additional 60kg catchpoint drawings	6.4.1
Clarified definition of checkrail and wingrail Added guard rail to catchpoint definition	Appendix A
Clarification in Table 17 – Standard designs for conventional turnouts	Appendix D
Table 20 – VCA added as supplier of approved design, correction of turnout rate for 1200 tangential turnout.	Appendix E
New appendix – Crossing nose profiles Appendix G and H renumbered	Appendix F
Clarification of abbreviations for manufacturers Addition of note regarding use of standard carbon rail	Appendix G
Clarification of abbreviations for manufacturers	Appendix H

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1 Purpose, Scope and Application

This Standard establishes functional and design requirements, approved configurations, acceptance standards, damage limits and repair standards for the following elements of track infrastructure:

- turnouts,
- diamond crossings,
- catchpoints, and
- expansion switches.

It includes switch and crossing components.

It also includes manual points lever operation, but does not cover points operation where the points are connected to the signalling system.

It is applicable to all RailCorp main line and siding tracks.

The standard also contains definitions of standard terminology relevant to turnouts and special trackwork (See Appendix A).

2 References

2.1 Australian and International Standards

Nil

2.2 RailCorp Documents

ESR0001-200 - Minimum Operating Standards for Rolling Stock
ESC 200 - Track System
ESC 210 - Track Geometry & Stability
ESC 215 - Transit Space
ESC 220 - Rail and Rail Joints
ESC 230 - Sleepers and track support
ESC 240 – Ballast
TMC 222 – Rail Welding
SPC 201 – Measuring gauges
SPC 251 - Turnout Components
Signals drawings

M02-678 – Switch Installation for In-bearer points, not in operation
M10-508 Sheet 1– "In bearer A & B sleeper signal footprint details"
M10-508 Sheet 2 – "In bearer backdrive signal footprint details"

2.3 Other References

Nil

2.4 Standard Plans

Standard designs (also known as Standard Plans) are extensively referenced in this standard. A standard design normally comprises a set of plans, with significant reference made to other Standard Plans for component details etc.

Appendix B (Table 27 and Table 28) contains a listing of Standard Plans for conventional turnouts, diamonds, catchpoints and expansion switches referenced within the body of this standard, and further listing of second and third level Standard Plans referenced by the first level documents.

Some of the Standard Plans have been replaced. A further listing in Appendix (Table 29) provides a listing of superseded plans and their replacement. Superseded plans are not to be used.

3 Description

Turnouts allow rail tracks to converge or diverge. They are an assembly of rail components comprising:

- Switch and stockrail assemblies
- V Crossings
- Checkrail units (not required for swing nose crossings)
- Closure rails
- Bearers
- Plates, fasteners and rail joints
- Points operating equipment

(See Appendix B for turnout component descriptions)

Diamond crossings allow rail tracks to cross each other. They are an assembly of rail components comprising:

- V Crossings
- K Crossings
- Checkrail units (not required for swing nose crossings)
- Closure rails
- Bearers
- Plates, fasteners and rail joints

Catchpoints and derail devices provide a level of protection against train collisions at the junctions of sidings and main running lines. Catchpoints or derail devices are provided when required to conform to RailCorp Signalling Design Standards.

Catchpoints and derail devices may be interlocked with a signalling system or operate via a manual lever.

Catchpoints are an assembly of:

- Switch and stockrail assemblies
- Closure rails
- Throw off rails
- Bearers
- Ramp (or derail) blocks
- Plates, fasteners and rail joints
- Points operating equipment

Containment catchpoints - A guard rail is used in lieu of a throw off rail for some types of catchpoints.

Expansion switches provide a level of control for rail stresses when tracks are attached to sub-structures (e.g. steel underbridges) which are also subject to temperature related expansion and contraction.

Expansion switches are an assembly of:

- Switch and stockrail assemblies
- Closure rails
- Bearers
- Plates, fasteners and rail joints

4 Design Requirements

This standard has been developed in consideration of the following criteria:

- speed on each leg of the points and crossing structure (eg. on the through and diverging tracks in a turnout structure) including consideration of maximum superelevation (cant) deficiency;
- service loads (and dynamic response) including effects of impact loading at the points and crossing wheel transfer locations, track alignment, maintenance standards, and traffic task;
- component material types and maintenance requirements (eg. fabricated versus cast crossings, fixed nose versus swing nose and spring wing crossings, material hardness and hardening processes);
- servicing requirements (eg. lubrication and adjustment);
- component, layout geometry and assembly details include the following:
  - bearer dimensions, location and orientation;
  - rail fastening baseplate and chair dimensions, location and orientation;
  - track radius or alignment curvature;
  - crossing angle and wheel transfer area cross-sectional geometry;
  - switch geometry and cross-sectional geometry;
  - detailed component geometry;
  - flangeways and wheel opening dimensions;
  - checkrail length, location and effectiveness, profile and end flaring;
  - wheelset geometry (i.e. wheel cross-sectional profile and wheelset back to back);
- requirements for movable components where applicable, including the geometric fit for construction and maintenance in all switch and crossing positions;
- need for trailable points in yard operations;
- requirements for rails, bearers and fastenings.

4.1 Turnouts

Turnout general arrangements and components shall meet the requirements of Section 6.1 of this standard. Designs for turnouts comprising compatible individual components shall comply with standard configurations unless otherwise approved by the Chief Engineer Track.

The following criteria shall be used in the design of points and crossing configurations:

4.1.1 Turnout Geometry

1. Nominal gauge shall be 1435 mm.

2. All turnout components shall be designed so that the rail is vertical (ie zero cant). The 1:20 cant in open track shall be transitioned to zero cant over a minimum of 3 sleepers clear of the turnout bearers.

4.1.2 Rolling Stock Interface

1. Turnout components shall meet the requirements of RailCorp standard ESC 215 – Transit Space. This shall include clearances between crossovers where such moves are permitted by signalling.

2. The nominal dimension from the gauge face of the running rail of a crossing to the working face of the checkrail (i.e. checkrail effectiveness) shall be 1391 mm with a crossing flangeway width of 42mm and a checkrail gap of 44mm.

3. The design switch rail toe / stockrail open throw dimension shall be ≥ 100mm or otherwise to suit signalling equipment, if installed.

4. Switch rail throat opening shall be 60mm ± 5mm.

5. The checkrail end opening shall be flared, and provide an opening ≥ 80mm (≥ 85mm if the checkrail is adjustable) to the gauge face of the running rail at the flared end. The flare angle shall be as shown in Figure 1.

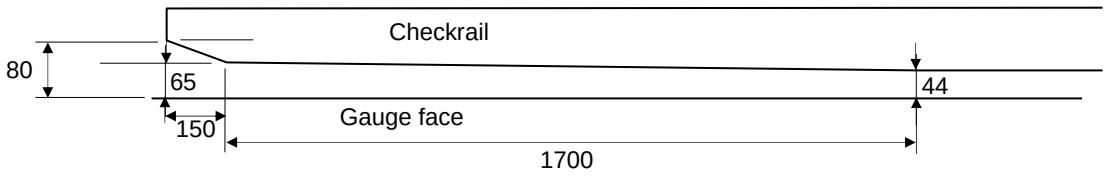


Figure 1 - Flare on checkrail end

6. Checkrail height shall be between 0mm and 25mm above the running rail and shall take into consideration rolling stock clearances.

7. The design wheelset back to back dimension shall be 1357mm – 1360mm as documented in RailCorp standard ESR0001-200.

8. Flangeways shall be designed to accommodate a wheel flange height of ≤ 45mm.

9. The turnout components shall be designed to suit the following new and worn wheel profiles for the traffic involved:

   - ANZR1
   - WPR 2000
   - Passenger only lines use WPR2000 with full flange (new) and 7/8 flange all turned for 130mm wide wheels.
   - Other lines have passenger trains, as above, freight traffic, a majority of which have WPR2000 wheel profiles, some freight wagons and all locomotives with ANZR1, and some odd interstate and historic passenger vehicles with ANZR1.
   - Worn wheel shapes should be considered.

4.1.3 Crossing nose profile

The profile shape applied to the nose and wingrail area of crossings is a complex arrangement considering the technology being offered, track maintenance requirements, the requirements of operators and the interface with rolling stock.

Both transverse and longitudinal profiles are involved and there is a relationship between the two giving rise to a three-dimensional shape.

The design of crossing nose profiles shall consider the rolling stock and other issues as detailed above.

Guidelines covering design issues in general and recommended profiles for some common crossing design variations are provided in Appendix F. The default profile recommend for manufacturing is the T1 longitudinal profile. This may be adjusted in service to suit actual operation as part of maintenance grinding.

Ideal transverse profiles are provided though simplified shapes may be needed to suit manufacture.

In some cases fabricated crossings have been designed with 42mm flangeways and modified wings using a similar arrangement to a composite crossing. The longitudinal profiles adopted in this case may be the same as for composite crossings.

4.1.4 Track Geometry

1. The maximum superelevation (cant) deficiency allowable through the diverging track of a turnout shall be as detailed in RailCorp standard ESC 210.

2. Design requirements for general track geometry including vertical/horizontal track alignment and superelevation are detailed in RailCorp standard ESC 210.

3. Maximum design superelevation in turnouts shall be 50mm.

4.1.5 Components

The design shall be based on relevant RailCorp standards for the components used within the turnout.

4.1.6 Rail Adjustment

Turnouts shall be designed as “fixed anchor points”. Designs are to include suitable rail anchoring arrangements as specified in Section 6.1.12.

4.1.7 Signalling Interfaces

Turnouts shall be designed to meet the signalling requirements specified by the Chief Engineer, Signals. This includes requirements for

- the placement of insulated joints,
- limiting conditions for the placement and operation of switch motors on power operated points, crossings, switches and drives, including limitations on the drilling of switches (hole size and location),
- in-bearer signalling,
- conductive rails for signalling and traction return,
- positive security of points that will be installed and over which rail traffic will operate before the signal interlocking is connected, or where the signal interlocking equipment will be removed from a set of points pending removal.

Where non standard carbon steels are proposed for use in switches or crossings a review of electrical properties shall be undertaken and signalling and electrical implications determined.

4.2 Diamond Crossings

Diamond crossings are not a preferred configuration on RailCorp main line track infrastructure. Where practical new diamond crossing should not be installed and existing special trackwork utilising diamond crossings should be redesigned when renewal is proposed.

Diamond crossing general arrangements and components shall meet the requirements of Section 6.2 of this standard. Designs for diamond crossings comprising compatible individual components shall comply with standard configurations unless otherwise approved by the Chief Engineer Track.

The following criteria shall be used in the design of diamond crossing configurations:

4.2.1 Crossing Geometry

1. Nominal gauge shall be 1435 mm.

2. All crossing components shall be designed so that the rail is vertical (ie zero cant). The 1:20 cant in open track shall be transitioned to zero cant over a minimum of 3 sleepers clear of the crossing bearers.

3. For straight track and curves of greater than 600m radius the sharpest crossing rate that can be designed for a “K” crossing is 1:8.25. “K” crossings with rates sharper than 1:6 shall be fitted with checkrails raised above rail level by at least 20mm but no more than 25mm. This may be achieved by a crossing design with a special checkrail section or by welding a 20-25mm steel section to the checkrail. Raised checkrail design arrangements shall be approved by the Chief Engineer Track.

4. For curved track of tighter than 600m radius or for crossing rates flatter than 1 in 8.25, additional protection of the “un-checked” area is required . These shall be approved by the Chief Engineer Track. For further explanation of the issues involved see explanatory notes below:

   - At diamonds there is an area where K crossings are directly opposite and no checking is provided (this is different to V crossings where checking is provided by the checkrail opposite the crossing). At K crossings indirect checking is provided to the forward projecting section of the wheel flange by the back section of the wheel flange which is still in contact with the approaching wingrail checking face.
   - A raised checking section on the K crossing wingrail will increase the lateral support and reduces the effective unchecked area. There is a limit on the amount of raising that can be provided without compromising clearances to rollingstock. The maximum permitted in-service (including wear and tear) is 38mm above rail level. The maximum design that is permitted must allow for future wear of the running rails in service.
   - For any arrangements alternative to the standard arrangements the un-checked area must be considered. The base case is the unchecked area for a 1 in 8.25 diamond on straight tracks, or curved up to a 600m radius on one track. Any alternative design arrangements should not result in an unchecked area worse than this. Detailed designs must also consider the implications of the crossing positions on opposite rails, track curvature and the implications for rollingstock.
   - In addition the implications of the wheel angle of attack must be considered in relation to the potential impact on facing noses of the “V” assemblies at the K crossing. The angle of attack arises from the rollingstock characteristics (e.g. bogie, spacing, wheel diameter, bogie lozenging limits) and the track curvature.

4.2.2 Rolling Stock Interface

1. Diamond crossing components shall meet the requirements of RailCorp standard ESC 215.

2. The nominal dimension from the gauge face of the running rail of a K crossing to the working face of the checkrail (i.e. checkrail effectiveness) shall be 1391 mm with a flangeway width of 44mm.

3. The nominal dimension from the gauge face of the running rail of a V crossing to the working face of the checkrail (i.e. checkrail effectiveness) shall be 1391 mm with a crossing flangeway width of 42mm and checkrail gap of 44mm.

4. The checkrail end opening shall be flared, and provide an opening ≥ 80mm to the gauge face of the running rail at the flared end. The flare angle shall be as shown in Figure 1.

5. Checkrail height shall be between 0 mm and 25 mm above the running rail and shall take into consideration rolling stock clearances.

6. The design wheelset back to back dimension shall be 1357mm – 1360mm as documented in RailCorp standard ESR0001-200.

7. Flangeways shall be designed to accommodate a wheel flange height of ≤ 45mm.

8. The turnout components shall be designed to suit the new and worn wheel profiles detailed in Section 4.1.2 (9) for the traffic involved.

4.2.3 Track Geometry

1. Design requirements for general track geometry including vertical/horizontal track alignment and superelevation are detailed in RailCorp standard ESC 210.

2. Maximum cant deficiency shall be 25mm

4.2.4 Components

The design shall be based on relevant RailCorp Standards for the components used within the crossing.

4.2.5 Rail Adjustment

Diamond crossings shall be designed as “fixed anchor points”. Designs shall include suitable rail anchoring arrangements as specified in Section 6.2.2.

4.2.6 Signalling Interfaces

Diamond crossings shall be designed to meet the signalling requirements specified by the Chief Engineer, Signals. This includes requirements for

- the placement of insulated joints
- Conductive rails for signalling and traction return

Where non standard carbon steels are proposed for use in crossings a review of electrical properties shall be undertaken and signalling and electrical implications determined.

4.3 Slips

Slips are not approved for standard application in RailCorp. Existing slip configurations shall be replaced with standard turnout and diamond crossing designs where practicable. The Chief Engineer Track shall provide design requirements where any installation of slip configurations is proposed.

4.4 Catchpoints

Catchpoint general arrangements and components shall meet the requirements of Section 6.4 of this standard. Designs for catchpoints comprising compatible individual components shall comply with standard configurations unless otherwise approved by the Chief Engineer Track.

The following criteria shall be used in the design of catchpoint configurations:

4.4.1 Turnout Geometry

1. Nominal gauge shall be 1435 mm

2. All catchpoint components shall be designed so that the rail is vertical (ie zero cant). The 1:20 cant in open track shall be transitioned to zero cant over a minimum of 3 sleepers clear of the bearers.

4.4.2 Rolling Stock Interface

1. Catchpoint components shall meet the requirements of RailCorp standard ESC 215.

2. The design switch rail toe / stockrail open throw dimension shall be ≥ 100mm or otherwise to suit signalling equipment, if installed.

3. Switch rail throat opening shall be 60mm ± 5mm.

4. The design wheelset back to back dimension shall be 1357mm – 1360mm as documented in RailCorp standard ESR0001-200.

5. The turnout components shall be designed to suit the new and worn wheel profiles detailed in Section 4.1.2 (9) for the traffic involved:

4.4.3 Track Geometry

Design requirements for general track geometry including vertical/horizontal track alignment and superelevation are detailed in RailCorp standard ESC 210.

4.4.4 Components

- The design shall be based on relevant RailCorp Standards for the components used within the catchpoint.
- Catchpoints shall be of the same rail weight as the turnout they protect.

4.4.5 Rail Adjustment

Catchpoints shall be designed as “fixed anchor points”. Designs shall include suitable rail anchoring arrangements as specified in Section 6.4.2.

4.4.6 Signalling Interfaces

Catchpoints shall be designed to meet the signalling requirements specified by the Chief Engineer, Signals. This includes requirements for:

- the need for catchpoints at a particular location,
- the functional requirements for the catchpoints,
- the placement of catchpoints to suit placement of signals,
- the placement of insulated joints,
- limiting conditions for the placement and operation of switch motors on power operated switches and drives, including limitations on the drilling of switches (hole size and location),
- in-bearer signalling,
- conductive rails for signalling and traction return,
- positive security of points that will be installed and over which rail traffic will operate before the signal interlocking is connected, or where the signal interlocking equipment will be removed from a set of points pending removal.

4.4.7 Clearances

1. Catchpoints and derail devices shall be located to provide a minimum of 450mm clearance between the side of a vehicle on the running line and the derailed vehicle at the clearance point.

2. Throw-off rails shall be located so as to ensure the wheels of the derailing vehicle travel a path that ensures that the vehicle does not foul the running line. The throw off rail shall be either parallel to the running line or at such an angle to it that a derailed vehicle will be deflected away from the main line.

3. Derail blocks shall be located so that the derailed wheel tracking in the “four-foot” will mount the derail block before striking the rail.

4. The location of catchpoints, derailers or other similar devices shall be selected to ensure that a vehicle derailed at such a device has a clear, even throw-off area, level in the transverse direction, to minimise subsequent damage and to help the vehicle remain upright. Derailed vehicles shall not be directed into a building or onto any structure, particularly overbridges, overhead wiring masts or transmission line poles, earthworks or over any embankment or directly into any cutting or retaining wall. The clear, even area required is dependent on the potential size and speed of any vehicle or train to be derailed and the nature of any retarding equipment or infrastructure (such as a sand drag) and will have to be determined for each site.

   The normal minimum requirement at locations where the normal operating speed of vehicles (or controlled speed if signalling controls such as train stops are installed) is ≤ 25km/hr shall be 2 vehicle lengths (40m) beyond the point of derailment (the end of the stockrail).

   Approval of the Chief Engineer Track is required for strategies proposed at locations where trains operate at higher speeds or where alternative retardation devices are proposed.

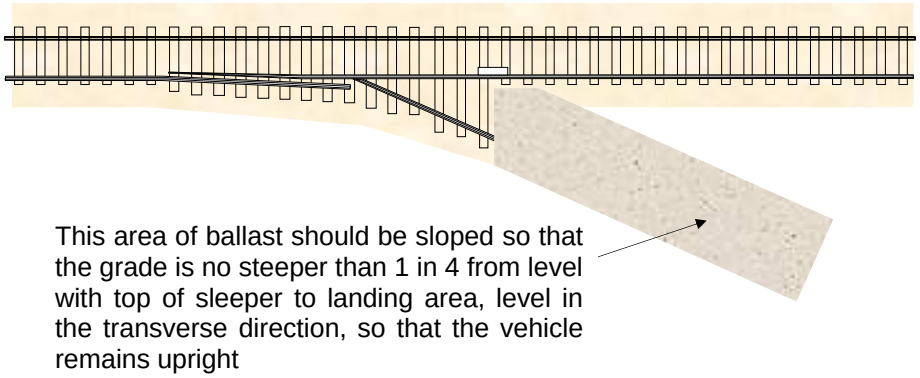


Figure 2 - Ramp to landing zone

The establishment of a clear landing area shall include consideration of the train descent down the ballast shoulder. A standard ballast shoulder creates a twist (tending to tip a train over) as well as a severe dip (See Figure 3).

A square even, transversely level, descent can be achieved using ballast (See Figure 2 and Figure 4).

Figure 3 - Example of catchpoint with poor landing zone

Figure 4 - Example of catchpoint with good landing zone

Special consideration shall be given if there is any possibility of an occupied building being in the path of a derailed vehicle. This will include land outside the rail boundary where there is, or is the potential for, building development.

Bridge columns in the vicinity may need to be protected by deflection walls as specified in relevant standards.

1. For locations where throw off and derail block configuration would not provide an adequate clear even run-off area, the following alternative arrangement is permitted.

    - Retain the vehicle on the track from which it is derailed. In this case, the throw-off rail and derail block are not required.
    - A detailed design is required on a case by case basis to provide an appropriate system to direct the derailed vehicle along the track. This can be achieved using a guard rail arrangement. The Chief Engineer Track shall approve designs.

2. Catchpoints and derails at the ends of loops will normally be located in accordance with the guidelines specified in Table 1.

Track Centres	Catchpoint location
Main line straight with parallel loop	
4 - 5m	Catchpoint or de-rail located on the parallel loop road with throw-off located at the tangent point
6.4m	Catchpoint or de-rail located on the parallel loop road between the turnout and the loop road preferably on straight track
Main line curved with concentric loop	
4 - 5m	Catchpoint or de-rail located on the concentric loop road with throw-off located at the compound tangent point
6.4m	Catchpoint or de-rail located on the concentric loop road to provide specified minimum safety clearance as defined below.

Table 1 - Catchpoint location at loop ends

Minimum safety clearances shall be met. These shall be calculated on the basis of track geometry and traffic type as follows:

$$C_L = W + 0.450 + \frac{B_C{}^2}{4R}$$

Where C_L = Safety Clearance (metres)
W = Width of maximum vehicle operating in the track section (metres). (Refer to RailCorp Engineering Standard ESC 215 to determine rolling stock outlines operating on all routes).
B_C = Bogie Centres (metres)
R = Radius of mainline or loop, whichever is less (metres).

The distance from the throw off rail to the clearance point shall be at least $\frac{L - B_C}{2}$ metres i.e. equal to the distance from the end of the standard vehicle to the bogie centre (see Figure 5).

The distance from the switch to the throw off rail shall be as short as practicable so that directional guidance is provided to the derailed wheel as soon as possible.

The maximum design rolling stock gauges for vehicles are detailed in RailCorp standard ESC 215:

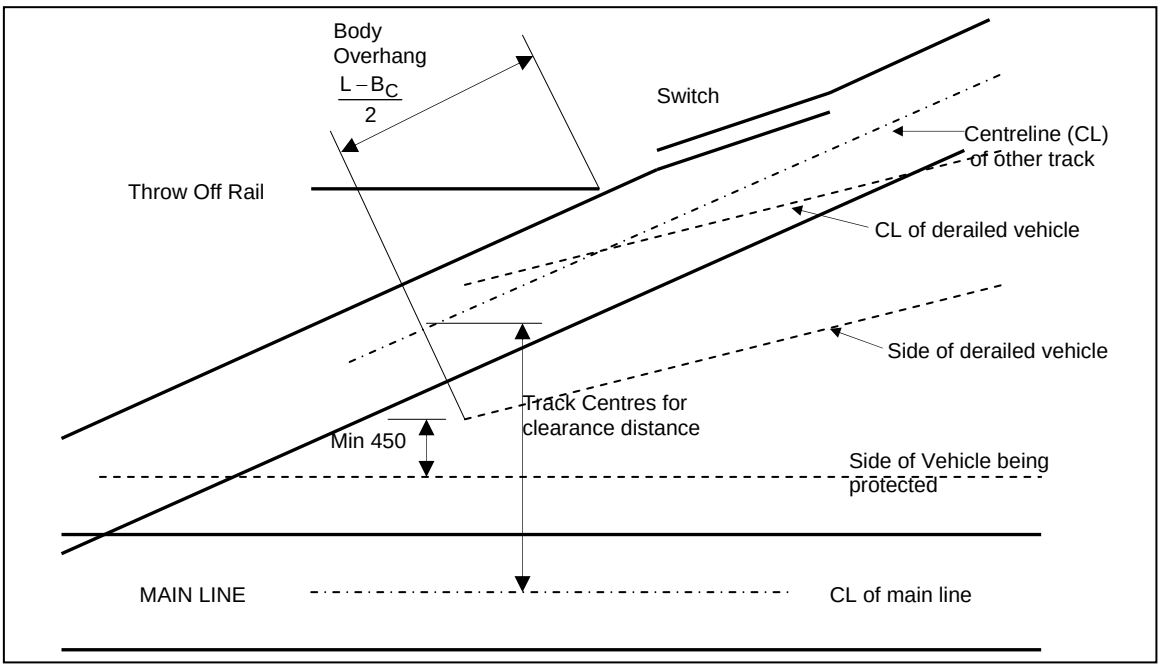


Figure 5 - Clearances at Catchpoints

4.5 Expansion Switches

Expansion switch general arrangements and components shall meet the requirements of Section 6.5 of this standard. Designs for expansion switches comprising compatible individual components shall comply with standard configurations unless otherwise approved by the Chief Engineer Track.

The following criteria shall be used in the design of expansion switch configurations:

1. Nominal gauge shall be 1435mm.
2. All expansion switch components shall be designed so that the rail is canted 1:20 to the vertical (the same as open track).
3. Expansion switches shall be designed and constructed to allow a maximum opening of no greater than 1.5mm and tight gauge of no more than 6mm within the operating range of the switch movement.
4. Expansion switches wherever possible shall only to be designed in the trailing direction for normal traffic.
5. Blunt switches with joggled stockrails are not permitted on curves sharper than 1000m radius.
6. The operating range of movement shall be designed to allow the full range of anticipated substructure movement, the thermal expansion of the rails and a rail creep allowance of 30mm.

4.6 Manual Point Levers

Point lever general arrangements and components shall meet the requirements of Section 6.6 of this standard. Designs for point levers shall comply with standard configurations unless otherwise approved by the Chief Engineer Track.

The following criteria shall be used in the design of Point lever configurations:

1. Manual point levers shall be designed to hold a closed switch against its matching stockrail with security, for safe vehicle movements.

2. Levers, or the points they control, may be locked or clipped to prevent unauthorised traffic movements.

3. Levers are operated manually and independently of an interlocked signalling system

4. Usage is restricted to shunting operations where operational personnel directly control traffic movements.

5. Manual point levers are not permitted on main lines.

6. Levers designed for trailable movements are permitted subject to operational requirements.

7. Manual point lever configurations shall be selected to meet the requirements of users.

5 Documentation Requirements

5.1 Turnouts

Turnout designs shall include drawings detailing:

- turnout length,
- switch length,
- point arrangements including rail brace, slide chair and heel details and provisions for connecting rodding,
- crossing and checkrail details,
- rail weight,
- bearer details,
- plating details,
- rail fastening and anchoring details, and
- setting out detail including curve radii.

Detailed component manufacturing drawings shall be provided

Designs relating to a specific layout shall include the following details:

- turnout framepoint co-ordinates,
- location of points and crossing,
- where there is no straight route in the turnout (ie the turnout is curved) offset dimensions shall be provided from a straight line,
- crossing rate and catalogue No.,
- track centres,
- track identification,
- all proposed track alterations,
- signalling requirements (supplied by signalling designer), and
- location of insulated joints.

5.2 Diamond Crossings

Diamond crossing designs shall include drawings detailing:

- diamond length,
- crossing and checkrail details,

- rail weight,
- bearer details,
- plating details,
- rail fastening and anchoring details, and
- setting out detail including curve radii.

Detailed component manufacturing drawings shall be provided.

Designs relating to a specific layout shall include the following details:

- framepoint co-ordinates,
- location of V and K crossings,
- where there is no straight route in the diamond crossing offset dimensions shall to be provided from a straight line,
- crossing rate and Catalogue No.,
- track centres,
- track identification,
- all proposed track alterations,
- signalling requirements for swing nose or swing wing crossings (supplied by signalling designer), and
- location of insulated joints.

5.3 Slips

Designs for slips shall include drawings detailing the information required for turnouts in Section 5.1 and diamond crossings in Section 5.2.

Detailed component manufacturing drawings shall be provided.

Designs relating to a specific layout shall include the following details:

- framepoint co-ordinates,
- location of points and crossings,
- where there is no straight route in the slip, offsets dimensions shall to be provided from a straight line,
- crossing rate and catalogue Nos,
- track centres,
- track identification,
- all proposed track alterations,
- signalling requirements for swing nose or swing wing crossings (supplied by signalling designer), and
- location of insulated joints.

5.4 Catchpoints

Catchpoint and derail designs shall include drawings detailing:

- point arrangements including rail brace, slide chair and heel details and provisions for connecting rodding,
- throw-off rail details,
- ramp (or derail) block details,
- rail weight,
- bearer details,
- plating details,
- rail fastening details, and
- setting out detail

Detailed component manufacturing drawings shall be provided.

Designs relating to a specific layout shall include the following details:

- framepoint co-ordinates,
- location of points and throw-off rail,
- location of clearance point,
- where the catchpoint is designed for installation in a curve, offset dimensions shall to be provided from a straight line,
- details of clear area required beyond the point of derailment including identification and assessment of any obstruction or other hazards in the area,
- track centres,
- track identification,
- all proposed track alterations,
- signalling requirements for swing nose or swing wing crossings (supplied by signalling designer), and
- location of insulated joints

5.5 Expansion Switches

Expansion switch designs shall include drawings detailing:

- switch length,
- point arrangements ,
- rail weight,
- bearer details,
- plating details, and
- rail fastening and anchoring details

Design drawings shall show the design limits of expansion and contraction measured relative to a reference punch mark which shall be located on the back of the head of the fixed rail.

Detailed component manufacturing drawings shall be provided as required.

Designs relating to a specific layout shall include the following details:

- framepoint co-ordinates,
- location of point,
- where the expansion switch is designed for installation in a curve, offset dimensions shall to be provided from a straight line,
- track identification, and
- all proposed track alterations

6 Allowable Configurations

6.1 Turnouts

Turnout configurations shall be selected in accordance with the existing or proposed track structure class detailed in RailCorp standard ESC 200.

Turnout configurations adopted for a specific site or application shall conform to the design requirements detailed in this standard unless otherwise approved by the Chief Engineer Track.

All new turnouts and replacement components shall be manufactured to meet the requirements of RailCorp specification SPC 251 - Turnout Components.

There are two types of turnout used in the RailCorp,

1. Conventional, and
2. Tangential turnouts.

The distinction between the two types is based on geometry and component technology.

Both conventional and tangential turnouts may be either:

- standard, where one route is straight, or
- non-standard (or special) where the mainline route is curved.

Conventional turnouts

Standard conventional turnouts are defined by a combination of the switch length and heel angle, and the crossing rate. (See Appendix D for a description of conventional turnouts). Conventional turnouts may be left or right hand.

Standard conventional turnouts are designed with the main line track straight.

There are three standard design options for conventional turnouts:

A fully straight crossing – available for all turnouts with crossing angles ≥ 1 in 9. (See Appendix D Figure 8).

A partially curved crossing (short leg curved to turnout radius - long leg straight) available for turnouts with crossing angles ≤ 1 in 10.5. (See Appendix D Figure 9).

A fully curved crossing (short and long legs curved to turnout radius) available for turnouts with crossing angles ≤ 1 in 10.5.

The standard conventional turnout configurations adopted in RailCorp for new installations are detailed in Appendix D - Table 17.

Only approved designs shall be used. The approved designs are the standard conventional turnout configurations detailed in Appendix D - Table 17.

Tangential turnouts

Tangential turnouts are defined by the radius of the turnout. (See Appendix E for a description of a tangential turnout.)

Tangential turnout designs have a standard configuration (footprint). The standard configurations adopted in RailCorp are detailed in Appendix E Table 18.

All tangential turnout designs shall be based on an approved configuration. Each of these configurations has the through road straight and the turnout track, including the switches, continuously curved with a tangent point located near the toe of the points.

There are two standard configuration options for curvature through the crossing - either a straight crossing or fully curved crossing. (See Appendix E Figure 10 and Figure 11).

Only approved designs shall be used. Approved designs are detailed in Appendix E - Table 20 and Table 21.

6.1.1 Location of Turnouts

6.1.1.1 Horizontal Alignment

Installation of turnouts in curves is NOT desirable. Where a new or replacement turnout is proposed in a horizontally curved section of the main line the following requirements apply:

1. Configuration approval is required if any turnout (new or replacement) is proposed to be located on a curved section of track.

2. Approval is required from the Chief Engineer Track to locate any turnout on curves <600 metres radius.

3. Main lines shall be graded coplanar where crossover renewals are proposed in curved track and long bearers extend under both main lines.

4. Turnouts should NOT, normally, be placed in transitions. If this cannot be avoided, the twist created through the switch and crossing segments of the turnout shall meet the maximum limits for special trackwork detailed in RailCorp standard ESC 210 - Track Geometry & Stability.

5. When Double Turnouts, Diamonds and Slips require renewal, they shall be replaced with standard turnouts, where practicable. These track components may only be used where approved by the Chief Engineer Track.

6.1.1.2 Vertical Alignment

Where a turnout is to be renewed or placed in a vertically curved section of the main line the following requirements apply:

1. Configuration approval is required if the turnout (new or replacement) is not located on a constantly graded section of track.

2. Switches should NOT be placed in vertical curves. If this cannot be avoided, special consideration shall be given to vertical displacement of the switch to determine that it falls within tolerances for installation and maintenance. The minimum radius of vertical curvature shall be 3000m.

6.1.1.3 Proximity to Other Special Trackwork

Special trackwork geometry shall be designed using standard units that can each be replaced as single units, with the exception that standard crossover designs shall make provision for use of long bearers crossing both tracks.

6.1.2 Selection of Turnout Type

Turnout type shall be selected to meet, at least, the minimum requirements specified in Table 2. Tangential turnouts are the preferable configuration and may be used where conventional turnouts are specified as the minimum.

Operating Class	New or replacement Turnouts				
	Turnout type	**Rail size**	**Bearer type**	**Switch type**	**Crossing type**
Main line					
Passenger Main Line	Tangential	60HH	Concrete	Tangential	Compound
Mixed Passenger Freight Main Line	Tangential	60HH	Concrete	Tangential	Compound
Light Passenger or Mixed Freight Line	Conventional	53SC	Timber	Flexible	Fabricated
Heavy Freight Option	Tangential	60HH	Concrete	Tangential	Compound
Yard/Siding (speed limited to 25km/hr)					
General Yard	Conventional	60HH	Timber	Flexible	Fabricated
Passenger operations/ or maintenance	Conventional	60HH	Timber	Flexible	Fabricated
Passenger Siding	Conventional	53SC	Timber	Flexible	Fabricated
Engineering Maintenance Siding	Conventional	53SC	Timber	Flexible	Fabricated

Table 2 - Selection of Turnout type – Minimum requirements

1. If it is proposed to install new or replacement turnouts that do not meet the minimum configurations detailed in Table 2, configuration approval is required.

2. Where a conventional turnout design is selected for a main line application, only standard conventional turnout designs shall be used. (See Appendix D Table 17).

3. Where the through track in main lines is installed on a curve <800m radius, and the turnout track is also curved some degree of curvature is required. If conventional turnouts are proposed “Special” designs, which are non standard, are required. In such cases tangential turnout designs shall be used. (See Appendix E Table 18)

4. Non standard conventional turnouts may only be installed in mainline track with the approval of the Chief Engineer Track. The design requirements for non standard tangential turnouts are detailed in Section 6.1.9

5. Configuration approval is required if non standard special designs are proposed for siding applications.

6. Where an increase in turnout speed is desirable, the use of tangential turnouts is recommended. A tangential turnout replacing a conventional turnout will, normally, allow a higher speed.

7. Where there is more than 2 MGT traffic on the turnout road the use of tangential turnouts is recommended.

8. Conventional turnouts should, generally, be restricted to sidings and slow speed, low traffic, standard turnouts on the main line.

6.1.3 Rail

Rail used in the manufacture of turnouts shall meet the requirements of RailCorp standard ESC 220.

Rail size and type (standard carbon or head hardened) shall be selected for a turnout in accordance with the requirements of Table 2.

6.1.4 Bearers

6.1.4.1 Selection of Bearer Type

Concrete and timber bearers shall meet the requirements of RailCorp standard ESC 230.

Concrete or timber bearers will, normally, be selected for a turnout in accordance with the requirements of Table 2. Timber bearers shall only be used as an alternative to concrete bearers (where specified in Table 2) at locations where it is impractical to design for concrete. The designer shall verify the alternative use.

Otherwise, concrete bearers shall be used where indicated in Table 2 unless installation of timber bearers is approved by the General Manager Infrastructure.

Notwithstanding the requirements detailed in Table 2, where concrete sleepers exist on the adjoining track, concrete bearers will, normally, be used.

6.1.4.2 Bearer Layout

The layout for turnout bearers or ties, as well as interface requirements for fixing components, (crossings, checkrails, switch/stockrails and closure rails) shall be included in the design.

Turnout bearers in **conventional turnouts** are laid square to the main line alignment. This includes crossovers and any infill between turnouts

The turnout bearers in **tangential turnouts** are laid in a fan shape, with each bearer forming a half angle with both the main line and turnout road. This allows a single set of turnout bearers and plates for both a right-hand and left-hand turnout of similar radius.

The first sleeper installed beyond the end infill bearers (mainline and turnout roads) shall be angled to return the sleeper skew to square to the track (angle ½ difference between bearer skew and normal to the track).

For crossovers designed with tangential turnouts, the long bearers shall be laid on the half angle of the turnout and will need to be right hand or left hand. Long bearers shall be installed where clearance is not available for standard sleepers on adjoining tracks.

The bearer design for a nominated tangential turnout configuration is standard and can be used independently of the manufacturer of the steel componentry.

6.1.4.3 Use of In-Bearers

The use of approved in-bearers (where the signalling equipment is contained within the bearer) is encouraged.

The layouts are only for use in tangential turnouts with concrete bearers. Standard concrete beams are used except for the bearers that are replaced by in-bearer units.

In the points area there is some re-spacing of bearers to suit the in-bearer A and B ties and the back-drive. The A and B in-bearer units are the same for all turnouts.

The back-drive units are of two types: Type 1 which suits 250m and 300m radius designs and Type 2 which suits 500m and 800m radius designs. Standard drawings are available for each of the track designs. These are detailed in Appendix E Table 19.

Signal Requirements

A standard interface has been developed for both the points and back-drive. The standard signalling interface is defined in Signal Drawings M02-678, M10-508 Sheet 1 and M10-508 Sheet 2.

6.1.5 Crossings

6.1.5.1 Selection of Crossing Rate

The selection of the crossing rate shall be based on the geometric design of the turnout and the associated limiting speed of the main line and turnout road.

Turnout speeds shall be determined by applying design standards for track geometry detailed in RailCorp standard ESC 210.

Allowable published speeds for the diverging (turnout) road of turnouts shall be as shown in Table 3. The speeds indicated are for normal passenger and freight trains.

Turnout Rate	Crossing Straight/ Curved	Switch length (nominal design)	Recommended Turnout Speed (kph)
Standard Conventional			
1 in 8.25	Curved	6100 switch	15
1 in 9	Straight	6100 switch	20
1 in 10.5	Straight	6100 switch	25
		9150 switch	40
1 in 15	Straight	9150 switch	50
Standard Tangential			
Turnout radius: Crossing rate			
160:6	Curved		30
160:8.25	Straight		30
190:7	Curved		35
190:9	Straight		35
250:8.25	Curved		40
250:10.5	Straight		40
300:9	Curved		45
300:12	Straight		45
500:12	Curved		60
500:15	Straight		60
800:15	Curved		75
800:18.5	Straight		75
1200:18.5	Curved		85
1200:24	Straight		85

Table 3 - Turnout Speeds

Note: 1. Where there is a straight of 13m or longer between turnouts of a crossover, the speeds applicable to the individual turnouts shall be applied.
2. The allowable speed through a crossover or reversing movement where the intervening straight section of track is < 13m shall be calculated on an individual site specific basis in accordance with the requirements of RailCorp standard ESC 210.
3. Speeds for non-standard turnout designs shall be calculated from geometries in RailCorp standard ESC 210 using Virtual transitions where required.

Crossings in main lines (other than swingnose crossings) introduce a design dip in the track. This is an impact point that leads to accelerated deterioration of components. The impact can be reduced by limiting the speed over the crossing. Whilst this is achieved for

traffic travelling on the turnout road because of the crossing alignment geometry in Table 3 above, the speed of mainline (through road) traffic should be limited by the dip angle. As a guide the crossing angle should be selected to meet the design speed requirements in accordance with Table 4.

Crossing Rate (1 in)	Crossing Angle (mrad)	Mainline Speed over Turnout(kph)		
		Normal	Maximum Note 1	Exceptional Note 2
2	140	16	25	29
4.5	62	37	55	65
7.5	37	62	92	108
8.25	34	68	102	120
9	31	74	111	130
10.5	27	86	130	130
12	23	99	130	130
15	19	125	130	130
18.5	15	130	130	130
21	13	130	130	130
24	11	130	130	130

Table 4 - Maximum mainline speeds for crossings based on dip angle

Note: 1. Maximum speeds shall only be introduced with the approval of the Civil Maintenance Engineer who must accept the increased maintenance impact.
2. Exceptional speeds shall only be approved by the Chief Engineer Track.
3. The speeds are for significant passenger and freight traffic. Higher speeds may be permitted for uncommon operations (such as occasional XPT trains).

6.1.5.2 Selection of Crossing Type

The selection of crossing type shall be based on the requirements of Table 5.

Crossing type	Rail size		For use in turnout type
	New	Replacement	
Fabricated	50, 60	50, 53, 60	Conventional
Rail Bound Manganese	60	53, 60	Conventional & Tangential
Compound	60	53, 60	Conventional & Tangential
Fully cast	60	60	Conventional & Tangential
Swing Nose	60	60	Tangential
Spring Wing	60	60	Tangential

Table 5 - Crossing types

1. Standard conventional turnouts can be provided with Fabricated or Compound “V” assemblies. See Appendix B for diagrams of each.

2. Standard tangential turnout designs are approved for both straight and curved crossings. Where there are no site constraints or adverse impacts on other rail infrastructure the straight crossing type shall be used.

3. Standard tangential turnouts shall be provided with fixed nose compound crossings unless specified otherwise.

4. Swing nose crossings are available for the standard tangential turnouts detailed in Table 6.

General Description	Crossing	General Layout Design Drawing Reference No.
20:10.5	Straight	CV0479043
300:12	Straight	CV0479045
800:18.5	Straight	CV0479049
1200:24	Straight	CV0479051

Table 6 - Swing nose crossings

5. The following criteria influences the selection of a turnout with a swing nose crossing:

   - The turnout shall have a straight crossing and be installed on concrete bearers.
   - Any requirement for noise and vibration reduction with continuous wheel/rail contact through the crossing throat.
   - Requirements for additional point operating motor and associated signalling componentry.

6.1.6 Switches

6.1.6.1 Selection of Switch Type

The selection of switch type shall be based on the requirements of Table 7.

Switch Type	Rail size		For use in turnout type
	New	Replacement of existing	
Heeled	50, 60	50, 53, 60	Conventional
Flexible	50, 60	50, 53, 60	Conventional
Tangential	60	60	Tangential

Table 7 - Switch types

See Appendix B for diagrams of standard switch types

1. Where conventional turnouts are approved for use in main line applications, all new switches shall be the flexible type. There are however, limitations on the capacity of points operating equipment to operate flexible switches at remote distances. Where required by the Signals designer, heeled switches may be used.

2. Switches used with Manual Levers (Thornley or Throwover) shall be, preferably, the flexible type

3. Switch protection pads shall be installed to protect conventional switches in siding turnouts where the crossing rate is ≤ 1 in 8.25. Apply the switch pad protector on one rail only 50mm in front of the appropriate switch (See Figure 6). Only approved bolt-on switch pad protectors may be used. Approved pad protectors are detailed in Appendix .

4. Switch protector pads are for the protection of conventional arrangements. They are not required and are not to be used on undercut stockrails.

5. Where signal equipment is fitted to switches some adjustment may be required to the position of the switch protector pad to avoid conflict.

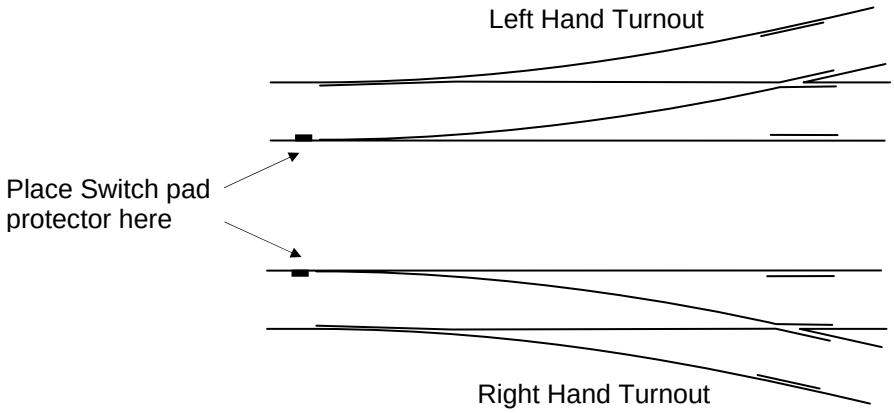


Figure 6 - Location of switch pad protectors

1. The operation of all new or renewed switches shall be determined by the Chief Engineer Signals. The switch operation shall be included in the turnout design.

2. The undercut switch design incorporated in the 50 and 60kg types eliminates the requirements for Heavy Duty and Housed Switches.

3. Switches for tangential turnouts are manufactured from a shallow depth asymmetric rail.

4. The distance from the point of the switch to the nearest end of the stockrail is called the “front” of a turnout. The “front” is a standard length as shown in Table 8 and Appendix B.

   The front length shall normally be retained for all new turnouts.

Switch Type		Rail size	Front length (mm)	For use in turnout type
Heeled		53	4877	Conventional
Flexible		53	4877	Conventional
Flexible		50, 60	2000	Conventional
Asymmetric	160 - 500	50, 60	2890	Tangential
	800		3490	
	1200		2290	

Table 8 - Front lengths of turnouts

5. Where switches in an existing 53kg turnout require renewal, and there is no 53kg material available, the points may be renewed in 60kg material. Junction rails or welds shall be fitted between the switches and the crossing and associated checkrails and appropriate plating shall be adopted.

6.1.7 Switch and Stockrail Drilling

The standard design for Switch and Stockrail Drilling for AS60HH rail tangential turnouts is documented in Plan No. CV0190133. This is the basic arrangement for all 60kg/m tangential turnouts. The prescribed drilling will accommodate timber and concrete bearers and all types of approved signalling arrangements including in-bearer back-drives. It supersedes other standard design switch and stockrail drilling and machining.

All new tangential 60kg/m turnout design and manufacture shall use the standard drilling. Variation to the approved design shall only be made with approval of those with appropriate Engineering Authority.

6.1.8 Security of points

Where points will be installed and over which rail traffic will operate before the signal interlocking is connected, or where the signal interlocking equipment will be removed from a set of points pending removal, the points shall be secured against potential movement.

Traditionally with timber turnouts the points have been secured by spiking a fishplate to the timber bearer.

For concrete bearers and in-bearer turnouts spiking plates have been designed and approved for use as follows:

- For in-bearer turnouts - Signals drawing M02-678.
- For concrete turnouts without in-bearer - Plan No. CV0365884

6.1.9 Design Requirements for Non Standard Tangential Turnouts

For turnouts in which both roads are to be curved, the basic design shall be varied to achieve the required geometry. In this case:

- the bearer design will be the same as for the standard turnout design but will need re-spacing to suit the altered track geometry,
- the closure rails will be slightly shorter or longer depending on the extent of curvature applied in the design,
- switch and stockrail design will be the same as for the standard turnout design but with altered curvature to suit the main line radius,
- checkrail design will be the same as for the standard turnout design but with altered curvature to suit the main line radius,
- crossings will need to be specially curved to suit the applicable geometry, and
- turnouts may be left or right handed.

6.1.10 Other Special Track Components

In addition to the major components specified in this standard, all other special track components completing a standard turnout configuration such as fastenings, plating and closure rails shall be as specified on the General Arrangement drawings for each turnout type. Approval of a turnout design shall include approval of all special components included in the design.

6.1.11 Standard Track Components

Where standard plain track components are used in turnouts then the rail, rail joining methods, fastenings, sleepers/bearers, ballast, and track geometry used shall be designed in accordance with the relevant RailCorp standards detailed in Table 9.

Standard No	Component
ESC 210	Track Geometry & Stability
ESC 220	Rail and Rail Joints
ESC 230	Sleepers and track support
ESC 240	Ballast

Table 9 - Standards for components

6.1.12 Rail Adjustment

The following rail anchoring requirements apply to turnouts constructed with timber sleepers and non-resilient fastenings. Bearers (timber or concrete) with resilient fastenings do not require anchoring.

Only approved configurations shall be installed.

6.1.12.1 For Main Line Turnouts and Interlocked Turnouts:

Double anchor every second sleeper for 32 sleepers (i.e. a total of 16 anchored sleepers) in front of the switch, commencing from the first sleeper from the switch.

Double anchor every second sleeper/timber for 32 sleepers/timbers (i.e. a total of 16 anchored sleepers/timbers) behind the crossing, commencing from the first timber after the crossing that has plain track fastenings.

Double anchor every second timber on the through rails and turnout rails between the heel of the switch and the front legs of the crossing.

6.1.12.2 For Non Interlocked Siding Turnouts:

Double anchor every second sleeper for 32 sleepers (i.e. a total of 16 anchored sleepers) in front of the switch, commencing from the second sleeper from the switch.

Double anchor every second sleeper for 32 sleepers (i.e. a total of 16 anchored sleepers) behind the crossing, commencing from the first timber after the crossing leg that has plain track fastenings.

Double anchor every second timber on the through rails and turnout rails between the heel of the switch and the front legs of the crossing.

6.2 Diamond Crossings

6.2.1 General

Diamond crossing configurations shall be selected in accordance with the existing or proposed track structure class detailed in RailCorp standard ESC 200.

Diamond crossing configurations adopted for a specific site or application shall conform to the design requirements detailed in Section 4.2 unless otherwise approved by the Chief Engineer Track.

Installation of diamonds in curves is NOT desirable. Where a new or replacement diamond is proposed in a horizontally curved section of the main line the following requirements apply:

1. Configuration approval is required if any diamond (new or replacement) is proposed to be located on a curved section of track.

2. Approval is required from the Chief Engineer Track to locate any diamond on curves <600 metres radius.

All new diamond crossings and replacement components shall be manufactured to meet the requirements of RailCorp specification SPC 251 - Turnout Components

Table 10 details approved configurations for diamond crossings used in main lines and in sidings.

Track components comprising standard diamond crossing configurations such as 'V' and 'K' crossings, fastenings, plating and closure rails shall be as specified on the General Arrangement drawings for each approved configuration. See Appendix C for diagrams of diamond arrangements and ‘K’ crossings.

Operating Class	New or replacement diamond crossings		
	Rail size (kg/m)	Crossing rate	RailCorp Drawing Reference
Main lines			
Passenger only and Mixed Passenger & Freight	60	1:7.5	184-858
	60	1:8.25	925-827
	53	1:8.25	425-976

Table 10 - Approved diamond crossing configurations

6.2.2 Rail Adjustment

The following rail anchoring requirements apply to diamond crossings constructed with timber sleepers and non-resilient fastenings.

Only approved configurations shall be installed.

Double anchor every second sleeper/timber for 32 sleepers/timbers (ie a total of 16 anchored sleepers/timbers) behind the crossing, commencing from the first timber after the crossing that has plain track fastenings.

Double anchor every second timber between the "V" and "K" crossings.

6.3 Slips

6.3.1 General

Slip configurations adopted for a specific site or application shall conform to the design requirements detailed in Section 4.3. All slip configurations shall be approved by the Chief Engineer Track.

All slip components shall be manufactured to meet the requirements of RailCorp Specification SPC 251 - Turnout Components. See Appendix C for diagrams of single and double slip arrangements.

There are no approved standard configurations for slips.

6.4 Catchpoints

6.4.1 General

Catchpoint configurations shall be selected in accordance with the existing or proposed track structure class detailed in RailCorp standard ESC 200.

Catchpoint or derail configurations adopted for a specific site or application shall conform to the design requirements detailed in Section 4.4 unless otherwise approved by the Chief Engineer Track.

All new catchpoints and replacement components shall be manufactured to meet the requirements of RailCorp specification SPC 251 - Turnout Components

Table 11 details approved configurations for catchpoints used in main lines/crossing loops and in siding class tracks. See Appendix C for a diagram of a catchpoint arrangement.

Track components comprising standard catchpoint configurations such as fastenings, plating and closure rails shall be as specified on the General Arrangement drawings for each catchpoint type.

Operating Class	New or replacement catchpoints	
	Rail size (kg/m)	Drawing Reference
All Main lines crossing loops and sidings	60	580 – 715 CV0455620 CV0190657 CV0214014
	53	153- 891

Table 11 - Approved catchpoint configurations

6.4.2 Rail Adjustment

The following rail anchoring requirements apply to catchpoints constructed with timber sleepers and non-resilient fastenings.

Only approved configurations are to be installed.

Double anchor the catchpoint rail every second sleeper for 32 sleepers (i.e. a total of 16 anchored sleepers) in front of the switch, commencing from the first sleeper from the switch.

Double anchor the catchpoint rail every second sleeper/timber for 32 sleepers/timbers (i.e. a total of 16 anchored sleepers/timbers) behind the heel commencing from the first timber after the heel that has plain track fastenings.

Anchor the plain track rail as for plain track (see ESC 220).

6.5 Expansion Switches

Expansion switches configurations shall be selected in accordance with the existing or proposed track structure class detailed in RailCorp standard ESC 200.

Expansion switches may only be installed at locations and on structures approved by the Chief Engineer Track. Generally approved usage will be restricted to the expansion end of transom top or ballast top span(s) > 80m long.

All new expansion switches and replacement components shall be manufactured to meet the requirements of RailCorp specification SPC 251 - Turnout Components

Expansion switches should be installed in the trailing direction for normal traffic movements where possible.

Expansion switches shall only to be installed on tangent track.

Table 12 details approved configurations for expansion switches. See Appendix C for a diagram of an expansion switch arrangement.

Track components comprising standard expansion switches configurations such as fastenings, plating and closure rails shall be as specified on the General Arrangement drawings for each approved expansion switch design.

Operating Class	New or replacement expansion switches	
	Rail size (kg/m)	Drawing Reference
All (1:20 cant)	60	250-1201 250-1202 CV0234453
All (vertical design for locations where rail cant is provided in design of track support)	60	CV0234454

Table 12 - Approved Expansion switch configurations

6.6 Manual Points Levers

Manual point lever configurations include:

- throw over levers
- sprung levers

Approved manual point levers, including proprietary designs, are detailed in Appendix - Approved Products.

7 Configuration Requirements for Existing Special Trackwork

Existing configurations of turnouts, diamonds, slips, catchpoints or expansion switches in each Route Class may not meet the requirements for new and replacement configurations (see Table 2 to Table 12). Speeds in Table 3 may not be achieved for these configurations.

All replacement components for existing turnouts shall be manufactured to meet the requirements of RailCorp Specification SPC 251 - Turnout Components.

8 Prohibited Configurations

The following configurations are considered undesirable for installation in main lines. They should be considered for strategic upgrading.

1. Heeled switches
2. Short switches (< 6100mm)
3. Turnouts on sharp curves, especially if they are similar flexure.
4. Diamond on sharp curves
5. Slips
6. "Entangled" trackwork, where different special trackwork units overlap.
7. Catchpoints without a clear landing area. Where such cases exist a risk analysis shall be undertaken to establish potential corrective or protective actions.

9 Acceptance Standards

9.1 Turnouts

1. Turnout geometry for new installations shall meet the requirements of RailCorp standard ESC 210 Track Geometry. In addition:

   - gauge dimensions at the switch tip shall conform to the design ± 2mm,
   - gauge at crossings shall conform to the design ± 2 mm,
   - flangeways at V crossings shall conform to the design ± 1 mm,
   - checkrail effectiveness at V crossings shall conform to the design +3 −1mm,
   - switches shall bear on all plates + 1 − 0 mm in closed position.
   - Switch points and crossing intersections shall not vary more than 10mm from the design location and switches shall be square to within 6mm.

2. Other fabrication and installation tolerances shall be in accordance with the design specification or manufacturer's instructions.

3. When turnouts are placed within 30m of a bridge end (where spans are < 18m) OR when turnouts are placed within 60m of a bridge end (where one or more spans are ≥ 18m but < 80m), the turnout shall be aluminothermic welded throughout and a flexible switch used if possible.

4. Where tangential turnouts are used, the turnouts, and the track for 50 metres either side, shall be fully welded. The use of joints is only permitted for a short period during the initial construction and installation phase. Civil Maintenance Engineers may, however, approve the installation of crossing units with fixed, swage fastened joints.

5. For turnouts fitted with dry slide chairs, no oil or grease shall be applied to these chairs.

6. Plain track components shall meet the acceptance standards detailed in the component standards in Table 9.

9.2 Diamond Crossings

1. Diamond geometry for new installations shall meet the requirements of RailCorp standard ESC 210 Track Geometry. In addition:

   - gauge at V and K crossings shall conform to the design ± 2 mm,
   - flangeways at V and K crossings shall conform to the design ± 1 mm,
   - checkrail effectiveness at V crossings shall conform to the design +3 −1mm,
   - The relative locations of the four crossings in a diamond shall be within 10mm of the designed distances.

2. The crossing intersection points (Theoretical Point) shall be within 10mm of the position defined by reference pegs or survey monuments.

3. Other fabrication and installation tolerances shall be in accordance with the design specification or manufacturer's instructions.

4. Plain track components shall meet the acceptance standards detailed in the component standards in Table 9.

9.3 Slips

Geometry and condition of new installations shall meet the acceptance standards for turnouts in Section 9.1 and diamond crossings in Section 9.2.

9.4 Catchpoints

1. Catchpoint geometry shall meet the requirements of RailCorp standard ESC 210 Track Geometry. In addition gauge generally in catchpoints shall conform to the design ± 3 mm.

2. Other fabrication and installation tolerances shall be in accordance with the design specification or manufacturer's instructions.

3. Plain track components shall meet the acceptance standards detailed in the component standards in Table 9.

9.5 Expansion Switches

1. Expansion switches shall be installed to the adjustment suitable for the substructure position and temperature and the rail temperature.

2. The switch opening and gauge shall not exceed the design requirements at the limits of expansion and contraction of both the rail and the structure.

3. The gap between the switch and the stockrail at installation shall not exceed 0.5mm.

4. The switch heel and stock rail may be welded to adjoining rails.

5. Other fabrication and installation tolerances shall be in accordance with the design specification or manufacturer's instructions.

6. Plain track components shall meet the acceptance standards detailed in the component standards in Table 9.

9.6 Manual Point Levers

Manual point levers shall be installed to meet the tolerances established by the manufacturer.

10 Repair Standards

10.1 Geometry

10.1.1 Turnouts

The following maintenance limits shall be applied to manual regauging of turnouts or component renewal.

1. Turnouts shall meet the requirements of RailCorp standard ESC 210 Track Geometry.

2. For non-interlocked points the clearance between the back of an open switch point and the gauge of the running stock rail shall conform to the design ± 2mm.

3. Housed switches shall conform to the design ± 1mm of the specified parameters.

4. If the maintenance activity includes longitudinal movement of any crossing, of resulting position of the crossing intersection point (Theoretical Point) shall be within 15mm of the position defined by reference pegs or survey monuments.

5. After maintenance, crossing and checkrail measurements on all tracks shall be within the limits in Table 13.

	Flangeway Depth(min) (mm)	Crossing Flangeway Width (mm)	Checkrail Flangeway Width (mm)	Gauge (mm)	Checkrail Effectiveness (mm)
V Crossing	38 min	44 ± 2	44 ± 2	1435 ±2	1389 - <1396
K Crossing	38 min	44 ± 2	NA	1435 ±2	1389 - <1395

Table 13 - Turnout geometry maintenance limits

10.1.2 Diamond Crossings

The following maintenance limits shall be applied to manual regauging or component renewal in diamond crossings.

1. Geometry shall meet the requirements of RailCorp standard ESC 210 Track Geometry.

2. If the maintenance activity includes longitudinal movement of any crossing, of resulting position of the crossing intersection point (Theoretical Point) shall be within 15mm of the position defined by reference pegs or survey monuments.

3. After maintenance, crossing and checkrail measurements on all tracks shall be within the limits in Table 13.

10.1.3 Slips

The following maintenance limits shall be applied to manual regauging or component renewal in slips.

1. Geometry shall meet the requirements of RailCorp standard ESC 210 Track Geometry.

2. For non-interlocked points the clearance between the back of an open switch point and the gauge of the running stock rail shall conform to the design ± 2mm.

3. If the maintenance activity includes longitudinal movement of any crossing, the resulting position of the crossing intersection point (Theoretical Point) shall be within 15mm of the position defined by reference pegs or survey monuments.

4. After maintenance, crossing and checkrail measurements on all tracks shall be within the limits in Table 13.

5. After maintenance switch tip measurements shall be within the limits in Table 14.

10.1.4 Catchpoints

The following maintenance limits shall be applied to manual regauging or component renewal in catchpoints.

1. Geometry shall meet the requirements of RailCorp standard ESC 210 Track Geometry.

2. For non-interlocked points the clearance between the back of an open switch point and the gauge of the running stock rail shall conform to the design ± 2mm.

3. After maintenance switch tip measurements shall be within the limits in Table 14.

10.2 Component Repair

10.2.1 Switches

1. Repair of switches by wirefeed welding is prohibited. Switch profile and condition may only be repaired by grinding.

2. After maintenance switch tip measurements shall be within the limits in Table 14.

<table>
<tr><th></th><th>Standard</th><th>Heavy duty</th><th>Undercut</th><th>Asymmetric</th></tr>
<tr><td>Switch tip radius</td><td>≥ 13mm</td><td>≥ 13mm</td><td>NA</td><td>NA</td></tr>
<tr><td>Switch angle (to vertical)</td><td>≤ 180 (3:1)</td><td>180 (3:1)</td><td colspan="2" rowspan="3">The top of the switch tip shall sit within the face of the stockrail</td></tr>
<tr><td>Switch tip height
(below top of rail)</td><td>≥ 13mm</td><td>≥ 13mm</td></tr>
<tr><td rowspan="2">Switch tip width
(at top of switch)</td><td>≤ 4mm</td><td>The whole of the switch tip shall sit within the gauge line of the joggled stockrail</td></tr>
<tr><td></td><td></td><td colspan="2">No part of the running surface of the switch blade, between 17mm and 30mm from the head of the rail, shall form a plane at an angle of less than 400 to the horizontal (see Figure 7)</td></tr>
</table>

Table 14 - Switch tip maintenance limits

3. There shall be no damage in the first 2m from the tip of the switch blade, deeper than 17mm from the running surface and which extends more than 100mm along the blade, or consecutive areas of damage less than 100mm apart forming a length more than 100mm.

4. There shall be no damage in the first 2m from the tip of the switch blade, deeper than 19mm from the running surface.

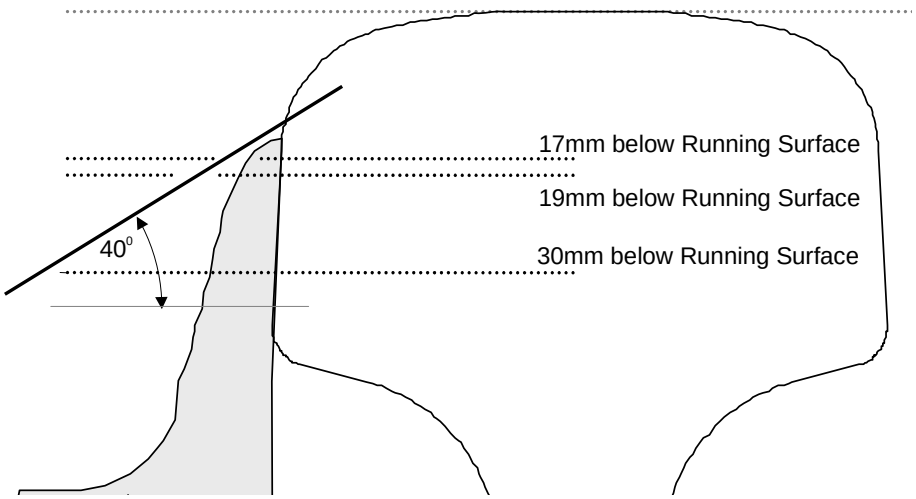


Figure 7 - Switch tip acceptance limits

10.2.2 Crossings and Wingrails

1. Repair of crossings and wingrails by wirefeed welding is an approved repair method.

2. Repaired components shall meet the design profile and tolerances of the component being repaired.

3. All repairs shall be ultrasonically tested. ALL ultrasonic indicators shall be below reportable limits as detailed in RailCorp standard ESC 220 - Rail and Rail Joints.

11 Damage Limits

Normal (Note 1)	Track Speed (Normal / Passenger) km/hr					
	20/20	40/40	60/60	80/90	100/115	115/160
Switches						
Switch rail throat opening (mm) Back of Switch Rail to Stock Rail	41	41	45	45	50	50
Switch Rail Open Throw (mm) Switch Rail Toe to Stock Rail Conventional ONLY	86	86	90	90	95	95
Crossings						
Check Rail Effectiveness (mm) V Crossing	1396	1396	1396	1396	1396	1396
	1386	1386	1386	1386	1389	1389
Check Rail Effectiveness (mm) K Crossing	1396	1396	1396	1396	1396	1396
	1387	1387	1387	1387	1389	1389

Note: 1. The limit at or below which no response is required.

Table 15 - Normal limits for turnout geometry

Maximum Limits (Note 2)		Track Speed (Normal / Passenger) km/hr					
		20/20	40/40	60/60	80/90	100/115	115/160
Switches							
Switch rail throat opening (mm) Back of Switch Rail to Stock Rail		<35	<35	<37	<37	<40	<40
Switch Rail Open Throw (mm) Switch Rail Toe to Stock Rail Conventional ONLY		<80	80	80	82	82	<86
Crossings							
Check Rail Effectiveness (mm) V Crossing	Wide	1400	1400	1400	1400	1398	1398
	Tight	<1382	<1382	<1382	<1382	1384	1384
Check Rail Effectiveness (mm) K Crossing	Wide	1397	1397	1397	1397	1395	1395
	Tight	<1382	<1382	<1382	<1382	1385	1385

Note: 2. The limit beyond which an emergency level response is required.

Table 16 - Damage limits for turnout geometry

Appendix A Definitions

Term	Description
A, B	*No Entries*
C	
Catchpoints:	A single switch assembly and a throw-off rail. The Catchpoint switch is normally set in the open position, thus breaking the continuity of the siding track causing unauthorised train movements to derail at a point clear of the main line. A guard rail is also used in lieu of a throw off rail for some types of catchpoints
Chair Plates	A chair is a flat plate with a pressed up section that is attached with a bolt through the web of either stockrail, in the case of a switch assembly, or the checkrail carrier, in the case of a checkrail assembly.
Checkrail	A rail placed inside the running rail which comes into contact with the back of the wheel flange and is used in points and crossing work to provide steering of the wheelset such that the crossing nose is not contacted by the opposite wheel. Note the difference between a checkrail and a wingrail – a checkrail checks wheels against lateral movement; a wingrail bears load from wheels.
Checkrail Unit	The unit consists of a length of rail (called the checkrail) with a flared bevel machined on each end, hardened on the checking face, bolted through chocks to a closure rail (called the carrier) to attain a flangeway clearance. The centre of the checkrail is usually opposite the theoretical point of the crossing.
Chocks	An iron casting used mainly with checkrails and crossings to support rail components at a fixed distance apart. Raised lettering and numbers on the chock identify its application.
Clearance Point	A point on converging or diverging tracks where the track centres or separation between the tracks allows clear passage for passing trains and beyond which vehicles must not stand.
Closure Rails	Rails making up a turnout apart from those in the points, crossings and checkrail units.
Compound Crossing	Comprises a crossing V point that is manufactured from a single cast nose which is welded to head hardened rails to complete the V which replaces the point/housed rails in a fabricated crossing. They may be manufactured from manganese steel, chrome vanadium alloys or other materials.
Compound Manganese Crossing	A Compound crossing V point that is manufactured from a cast manganese nose which is explosively hardened and flashbutt welded to head hardened rails to complete the V. It replaces the point/housed rails in a fabricated crossing.
Crossing Assembly	The component of a track system where lines branch out or intersect. Crossings assist in the passage of track wheels where two track rails intersect. Crossings may be fixed or switchable. In diamond crossings there are K and V crossings and in turnouts V crossings.
Crossover	The means by which trains pass from one track to an adjacent parallel track. A Crossover is constructed from two turnouts (one on each track facing opposite directions) and connecting plain trackwork.
D	
Derail	A vehicle derailing device that, when operating to protect the main running line, causes wheels to climb the siding rail and derail clear of the protected line.
Diamond Crossing	The component of a track system where lines intersect. Diamond Crossings comprise V and K crossings.

Term	Description
E	
Expansion switch	An assembly comprising two rails appropriately matched and fastened at the longitudinal interface to provide virtual continuity of the running rail and gauge faces while allowing controlled longitudinal slip. Expansion switches provide a level of control for rail stresses when tracks are attached to sub-structures (eg steel underbridges) which are also subject to temperature related expansion and contraction.
F	
Fabricated Crossing	Comprises a V and two (2) wing rails fabricated from sections of rail, set, machined and fitted together with chocks. The hand of the crossing is determined by the location of the point rail and may be right or left. The point rail is always the rail carrying the maximum tonnages, or higher speed. A right hand crossing has the point rail in the rail that connects to the right hand switch.
Fixed crossings.	These crossings have a wheel flange gap in both rails. Wheel transfer at fixed crossings depends on matching wheel and rail profiles. Fixed crossings are used in conjunction with checkrails to provide lateral guidance in the crossing area.
Flangeway	The space adjacent to the gauge face of a running rail to allow for the passage of wheel flanges.
Flangeway Clearance	The distance between the gauge side of a running rail and the guard face of a checkrail or the guard face of a wing rail.
Flangeway Depth	Flange way depth is the height of the running surface of the rail above the top of the blocks at checkrails and in 'V' and 'K' crossings.
Flare	The tapered widening at the ends of flangeways to gradually engage wheel flanges and position them to pass through flangeways.
Flexible Switch	A switch machined from longer rails and fixed towards the end of this rail with blocks or other device to the adjacent stockrail. The switch movement is provided by the flexibility of the longer switch rail and a section machined from the rail foot (foot relief) towards the fixed end.
Fully cast crossing	A one piece solid cast steel crossing with the four legs joined to standard rail sections through a welding process or by bolts and plates.
G	*No Entries*
H	
Heel	The end of a switch at which the switch pivots
Heel Block	Single or multiple blocks, depending on switch type, that rigidly fix the switch rail to the adjacent rail in the correct geometric configuration. The adjacent rail is the stockrail and can include a closure rail for some switch types.
Heeled Switch	A switch that pivots about a gapped joint between the switch rail and adjoining closure rail. The switch is bolted to the stockrail and closure rail using a heel block and fishplate designed to allow this movement.
Housed Switch	A heavy duty switch and joggled stockrail equipped with a "Housing". The housing is a specially machined component with a hardened checking face fitting above the switch to act as a checkrail for the opposite switch and joggle. Where both switches are required to be heavy duty a housing is required on one of the switches.
I	
In - Bearer	A bearer fabricated into a hollow channel shape that is used at a set of points to house the switch operating rodding. This eliminates the rodding being located in a bay between bearers.
Interlocking	Interaction of equipment controlling switches and/or signals to prevent conflicting movements, and to make sure that routes are set correctly.
J	*No Entries*

Term	Description
K	
K Crossing	The principal special component of a diamond crossing. It is the intersecting component between two rails. The intersection creates an unchecked area in the centre of the K, thus limiting the angles that can be designed for K crossings
L	*No Entries*
M	
Manual Point Lever	An apparatus consisting of a manually actuated lever and connecting rodding to operate points in turnouts and catchpoints or to operate a derail device. Manual point levers do not include ground frame or signal box levers that are generally connected to an interlocked signalling system.
N, O	*No Entries*
P	
Points and crossings	A combination of rail and track components that provide for one track to join or cross another whilst maintaining continuous support and direction to the rolling stock wheels. The points are the location where one track separates into two tracks (or vice-versa) and generally includes moving rail components called switches or switch blades. The crossing allows rolling stock wheels to cross over a rail. Combinations of points and crossings may be used to construct various track structures including slips, diamond crossings, turnouts and Catchpoints.
Points Assembly	The location where one track separates into two tracks (or vice-versa) and generally includes moving rail components called switches or switch blades that are attached to stockrails.
Q	*No Entries*
R	
Rail Brace	Component used in points assemblies to fasten the stockrail in position where fastenings on the gauge side of the rail cannot be used. The Rail Brace is bolted through the web of the stockrail.
Rail Brace Plates	Attach the Rail Brace to the bearer.
S	
Single/Double Slip	A special track layout that combines turnouts and diamond crossings. They allow train movements both across and onto and out of a track.
Spring Wing crossing	A switchable V crossing with both a fixed and spring wing leg. The spring wing effectively eliminates the flange way gap when using the main line thus reducing the wheel generated impact in the crossing. The wheel flange forces the spring wing open when taking the siding road.
Stockrails	Provide support for the closed switch and become the running rail when the switch is open. They are curved, set and /or joggled.
Swing Nose Crossing	A switchable V crossing with a nose assembly that moves from the main line rail to the turnout rail, depending on the train movement, allowing a continuous surface for the wheel to run through the crossing. They are provided with straight crossings only. No checkrails are required with this crossing type.
Switch	A machined tapered rail that allows the direction of a train to be altered to another line. A switch consists of a section of rail set and machined to a design shape, drilled to detail to accommodate switch operating rodding and heel blocks or chocks to allow attachment to a stockrail.
Switch Rollers	Rollers that support the switch during the opening and closing operation. Theycan be located in the bay between bearers, usually bolted to the stockrail, or be fabricated as a part of the plate assembly under the switch. They eliminate the need to lubricate the switch plate/switch interface.

Term	Description
Switch Stops	Switch Stops are bolted to the web of the stockrail and make contact with the web of the switch when the switch is in the closed position, providing lateral support. They can be manufactured from castings, rolled angle section or extended bolts.
Switchable crossings.	These crossings close the gap in one track that is being made active for traffic allowing a continuous surface for the wheel to run through the crossing. Wheel transfer in switchable crossings is without any impact for any wheel profile. Switchable crossings have no flange gap in the active track and thus do not require checkrails. They can have either Swing Nose or Spring Wing
T	
Tangential Switch	A switch with a continuous curve through the full length of the switch. The curved gauge line of the switch is tangent to the gauge line of the attached stockrail at a distance in front of the switch tip.
Theoretical Point	Located on the crossing nose at the intersection of the gauge lines of the two running rails forming the crossing.
Trailable Point Lever	A manual point lever that is designed to allow for vehicle wheels trailing through points set the wrong way to re-set the points for the trailing movement without the need to operate the lever.
Turnout	Special trackwork that allows trains to pass from one track on a diverging path. It consists of switch and stockrail assemblies, a 'V' crossing and checkrails, linked together by straight and curved infill rails (closure rails).
Turnout Length	The distance from the toe of the switch to the theoretical point measured along the main line running rail containing the crossing.
Turnout Radius	The radius of the centreline of the curved turnout track and not the turnout rail radius. It is tangential to the switch at the heel (real or imaginary) and to the appropriate leg of a straight crossing. The radius is carried through a curved crossing
Turnout Rail	This is a closure rail that joins the turnout switch to the crossing, as part of the secondary track. It may consist of more than one rail length.
U	*No Entries*
V	
V crossing	A unit that allows a train travelling on the turnout direction rail to cross the mainline rail. The crossing rate is a measure of the angle made by the main line and turnout rail gauge faces that intersect at the theoretical point. The crossing rate is the cotangent of the angle made. All crossings are identified by markings on the wing rail which are provided during manufacture. See Appendix B Crossing Identification The catalogue number allows the geometry of the particular crossing to be identified. Each catalogue number defines a crossing with a unique geometry. See Appendix B for diagrams of standard crossing types
W	
Wing Rail	The rails of a crossing (on the end closest to the switch in a turnout) that are flared to allow the passage of the wheel to transfer to or from the crossing nose. Named for their resemblance to a wing in shape. Note the difference between a wingrail and a checkrail – a wingrail bears load from wheels; a checkrail checks wheels against lateral movement. Note also that wingrails in K crossings perform both functions (they bear and check)
X, Y, Z	*No entries*

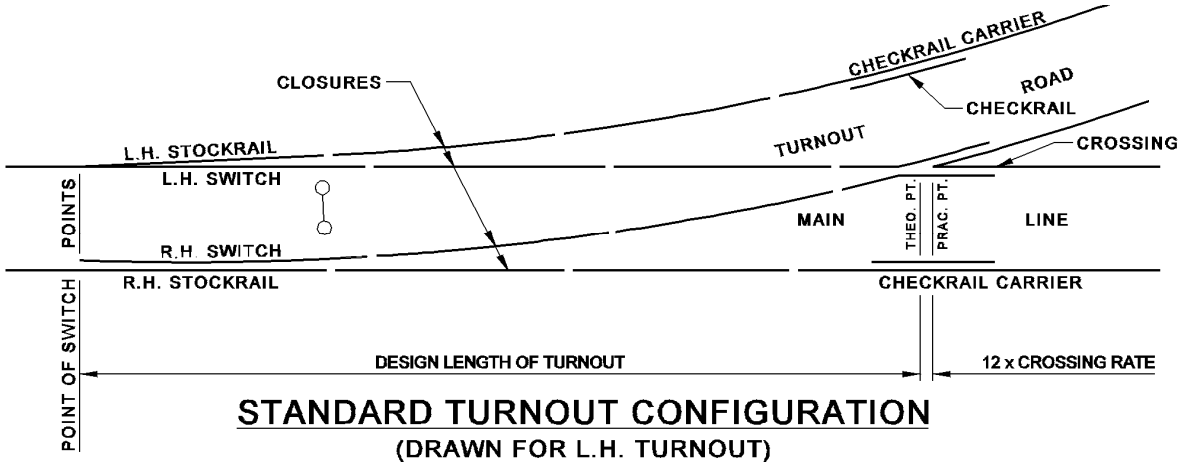
Grouped by component	
Term	**Description**
General	
Points and crossings	A combination of rail and track components that provide for one track to join or cross another whilst maintaining continuous support and direction to the rolling stock wheels. The points are the location where one track separates into two tracks (or vice-versa) and generally includes moving rail components called switches or switch blades. The crossing allows rolling stock wheels to cross over a rail. Combinations of points and crossings may be used to construct various track structures including slips, diamond crossings, turnouts and Catchpoints.
Turnout	Special trackwork that allows trains to pass from one track on a diverging path. It consists of switch and stockrail assemblies, a 'V' crossing and checkrails, linked together by straight and curved infill rails (closure rails).
Turnout Length	The distance from the toe of the switch to the theoretical point measured along the main line running rail containing the crossing.
Turnout Radius	The radius of the centreline of the curved turnout track and not the turnout rail radius. It is tangential to the switch at the heel (real or imaginary) and to the appropriate leg of a straight crossing. The radius is carried through a curved crossing
Turnout Rail	This is a closure rail that joins the turnout switch to the crossing, as part of the secondary track. It may consist of more than one rail length.
Stockrails	Provide support for the closed switch and become the running rail when the switch is open. They are curved, set and /or joggled.
Crossover	The means by which trains pass from one track to an adjacent parallel track. A Crossover is constructed from two turnouts (one on each track facing opposite directions) and connecting plain trackwork.
Diamond Crossing	The component of a track system where lines intersect. Diamond Crossings comprise V and K crossings.
Catchpoints:	A single switch assembly and a throw-off rail. The Catchpoint switch is normally set in the open position, thus breaking the continuity of the siding track causing unauthorised train movements to derail at a point clear of the main line. A guard rail is also used in lieu of a throw off rail for some types of catchpoints.
Clearance Point	A point on converging or diverging tracks where the track centres or separation between the tracks allows clear passage for passing trains and beyond which vehicles must not stand.
Derail	A vehicle derailing device that, when operating to protect the main running line, causes wheels to climb the siding rail and derail clear of the protected line.
Expansion switch	An assembly comprising two rails appropriately matched and fastened at the longitudinal interface to provide virtual continuity of the running rail and gauge faces while allowing controlled longitudinal slip. Expansion switches provide a level of control for rail stresses when tracks are attached to sub-structures (eg steel underbridges) which are also subject to temperature related expansion and contraction.
Single/Double Slip	A special track layout that combines turnouts and diamond crossings. They allow train movements both across and onto and out of a track.
Points	
Points Assembly	The location where one track separates into two tracks (or vice-versa) and generally includes moving rail components called switches or switch blades that are attached to stockrails.
Switch	A machined tapered rail that allows the direction of a train to be altered to another line. A switch consists of a section of rail set and machined to a design shape, drilled to detail to accommodate switch operating rodding and

Grouped by component	
Term	**Description**
	heel blocks or chocks to allow attachment to a stockrail.
Heeled Switch	A switch that pivots about a gapped joint between the switch rail and adjoining closure rail. The switch is bolted to the stockrail and closure rail using a heel block and fishplate designed to allow this movement.
Heel	The end of a switch at which the switch pivots
Heel Block	Single or multiple blocks, depending on switch type, that rigidly fix the switch rail to the adjacent rail in the correct geometric configuration. The adjacent rail is the stockrail and can include a closure rail for some switch types.
Flexible Switch	A switch machined from longer rails and fixed towards the end of this rail with blocks or other device to the adjacent stockrail. The switch movement is provided by the flexibility of the longer switch rail and a section machined from the rail foot (foot relief) towards the fixed end.
Tangential Switch	A switch with a continuous curve through the full length of the switch. The curved gauge line of the switch is tangent to the gauge line of the attached stockrail at a distance in front of the switch tip.
Housed Switch	A heavy duty switch and joggled stockrail equipped with a “Housing”. The housing is a specially machined component with a hardened checking face fitting above the switch to act as a checkrail for the opposite switch and joggle. Where both switches are required to be heavy duty a housing is required on one of the switches.
In - Bearer	A bearer fabricated into a hollow channel shape that is used at a set of points to house the switch operating rodding. This eliminates the rodding being located in a bay between bearers.
Interlocking	Interaction of equipment controlling switches and/or signals to prevent conflicting movements, and to make sure that routes are set correctly.
Chair Plates	A chair is a flat plate with a pressed up section that is attached with a bolt through the web of either stockrail, in the case of a switch assembly, or the checkrail carrier, in the case of a checkrail assembly.
Rail Brace	Component used in points assemblies to fasten the stockrail in position where fastenings on the gauge side of the rail cannot be used. The Rail Brace is bolted through the web of the stockrail.
Rail Brace Plates	Attach the Rail Brace to the bearer.
Switch Rollers	Rollers that support the switch during the opening and closing operation. Theycan be located in the bay between bearers, usually bolted to the stockrail, or be fabricated as a part of the plate assembly under the switch. They eliminate the need to lubricate the switch plate/switch interface.
Switch Stops	Switch Stops are bolted to the web of the stockrail and make contact with the web of the switch when the switch is in the closed position, providing lateral support. They can be manufactured from castings, rolled angle section or extended bolts.
Manual Point Lever	An apparatus consisting of a manually actuated lever and connecting rodding to operate points in turnouts and catchpoints or to operate a derail device. Manual point levers do not include ground frame or signal box levers that are generally connected to an interlocked signalling system.
Trailable Point Lever	A manual point lever that is designed to allow for vehicle wheels trailing through points set the wrong way to re-set the points for the trailing movement without the need to operate the lever.
Crossings	
Crossing Assembly	The component of a track system where lines branch out or intersect. Crossings assist in the passage of track wheels where two track rails intersect. Crossings may be fixed or switchable. In diamond crossings there are K and V crossings and in turnouts V crossings.

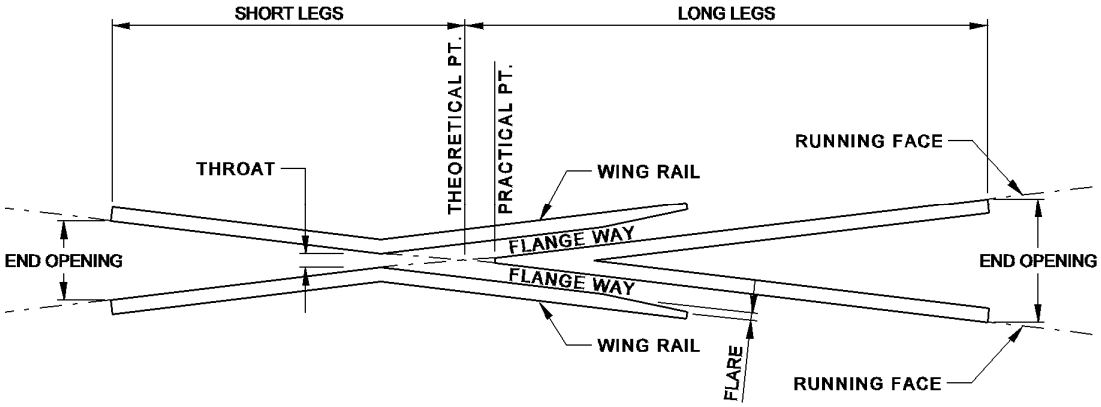
Grouped by component	
Term	**Description**
V crossing	A unit that allows a train travelling on the turnout direction rail to cross the mainline rail. The crossing rate is a measure of the angle made by the main line and turnout rail gauge faces that intersect at the theoretical point. The crossing rate is the cotangent of the angle made. All crossings are identified by markings on the wing rail which are provided during manufacture. See Appendix B Crossing Identification The catalogue number allows the geometry of the particular crossing to be identified. Each catalogue number defines a crossing with a unique geometry. See Appendix B for diagrams of standard crossing types
K Crossing	The principal special component of a diamond crossing. It is the intersecting component between two rails. The intersection creates an unchecked area in the centre of the K, thus limiting the angles that can be designed for K crossings
Fabricated Crossing	Comprises a V and two (2) wing rails fabricated from sections of rail, set, machined and fitted together with chocks. The hand of the crossing is determined by the location of the point rail and may be right or left. The point rail is always the rail carrying the maximum tonnages, or higher speed. A right hand crossing has the point rail in the rail that connects to the right hand switch.
Compound Crossing	Comprises a crossing V point that is manufactured from a single cast nose which is welded to head hardened rails to complete the V which replaces the point/housed rails in a fabricated crossing. They may be manufactured from manganese steel, chrome vanadium alloys or other materials.
Compound Manganese Crossing	A Compound crossing V point that is manufactured from a cast manganese nose which is explosively hardened and flashbutt welded to head hardened rails to complete the V. It replaces the point/housed rails in a fabricated crossing.
Fully cast crossing	A one piece solid cast steel crossing with the four legs joined to standard rail sections through a welding process or by bolts and plates.
Fixed crossings.	These crossings have a wheel flange gap in both rails. Wheel transfer at fixed crossings depends on matching wheel and rail profiles. Fixed crossings are used in conjunction with checkrails to provide lateral guidance in the crossing area.
Switchable crossings.	These crossings close the gap in one track that is being made active for traffic allowing a continuous surface for the wheel to run through the crossing. Wheel transfer in switchable crossings is without any impact for any wheel profile. Switchable crossings have no flange gap in the active track and thus do not require checkrails. They can have either Swing Nose or Spring Wing
Swing Nose Crossing	A switchable V crossing with a nose assembly that moves from the main line rail to the turnout rail, depending on the train movement, allowing a continuous surface for the wheel to run through the crossing. They are provided with straight crossings only. No checkrails are required with this crossing type.
Spring Wing crossing	A switchable V crossing with both a fixed and spring wing leg. The spring wing effectively eliminates the flange way gap when using the main line thus reducing the wheel generated impact in the crossing. The wheel flange forces the spring wing open when taking the siding road.

Grouped by component	
Term	**Description**
Wing Rail	The rails of a crossing (on the end closest to the switch in a turnout) that are flared to allow the passage of the wheel to transfer to or from the crossing nose. Named for their resemblance to a wing in shape. Note the difference between a wingrail and a checkrail – a wingrail bears load from wheels; a checkrail checks wheels against lateral movement. Note also that wingrails in K crossings perform both functions (they bear and check)
Flangeway	The space adjacent to the gauge face of a running rail to allow for the passage of wheel flanges.
Flangeway Clearance	The distance between the gauge side of a running rail and the guard face of a checkrail or the guard face of a wing rail.
Flangeway depth	Flange way depth is the height of the running surface of the rail above the top of the blocks at checkrails and in 'V' and 'K' crossings.
Theoretical Point	Located on the crossing nose at the intersection of the gauge lines of the two running rails forming the crossing.
Checkrail unit	
Checkrail Unit	The unit consists of a length of rail (called the checkrail) with a flared bevel machined on each end, hardened on the checking face, bolted through chocks to a closure rail (called the carrier) to attain a flangeway clearance. The centre of the checkrail is usually opposite the theoretical point of the crossing.
Checkrail	A rail placed inside the running rail which comes into contact with the back of the wheel flange and is used in points and crossing work to provide steering of the wheelset such that the crossing nose is not contacted by the opposite wheel. Note the difference between a checkrail and a wingrail – a checkrail checks wheels against lateral movement; a wingrail bears load from wheels.
Chocks	An iron casting used mainly with checkrails and crossings to support rail components at a fixed distance apart. Raised lettering and numbers on the chock identify its application.
Flare	The tapered widening at the ends of flangeways to gradually engage wheel flanges and position them to pass through flangeways.

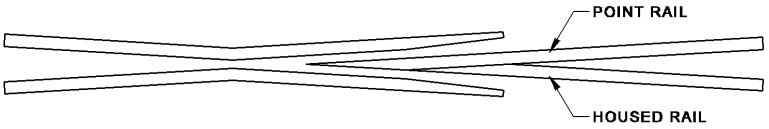
Appendix B General Turnout Data



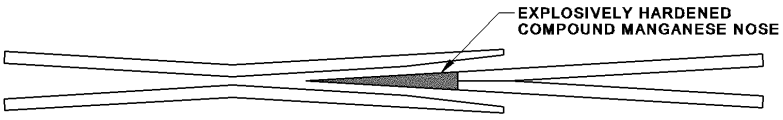
STANDARD TURNOUT CONFIGURATION
(DRAWN FOR L.H. TURNOUT)



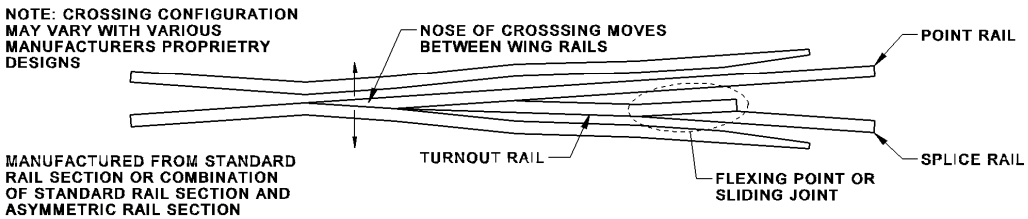
'V' CROSSING



FABRICATED CROSSING
DRAWN FOR R.H. POINT RAIL



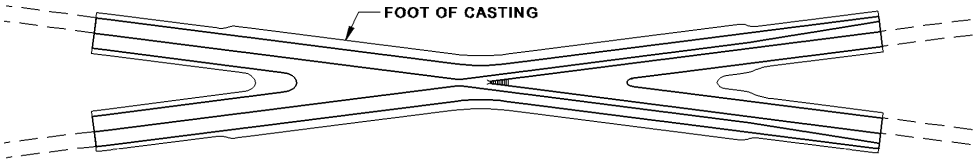
COMPOUND MANGANESE NOSE CROSSING



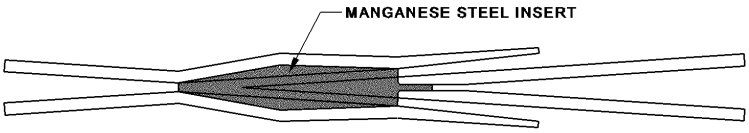
FABRICATED SWING NOSE CROSSING

'V' CROSSING TYPES

NOTE:
ONLY RAIL HEAD SHOWN IN DIAGRAMS (UNLESS NOTED OTHERWISE)



SOLID CAST MANGANESE CROSSING

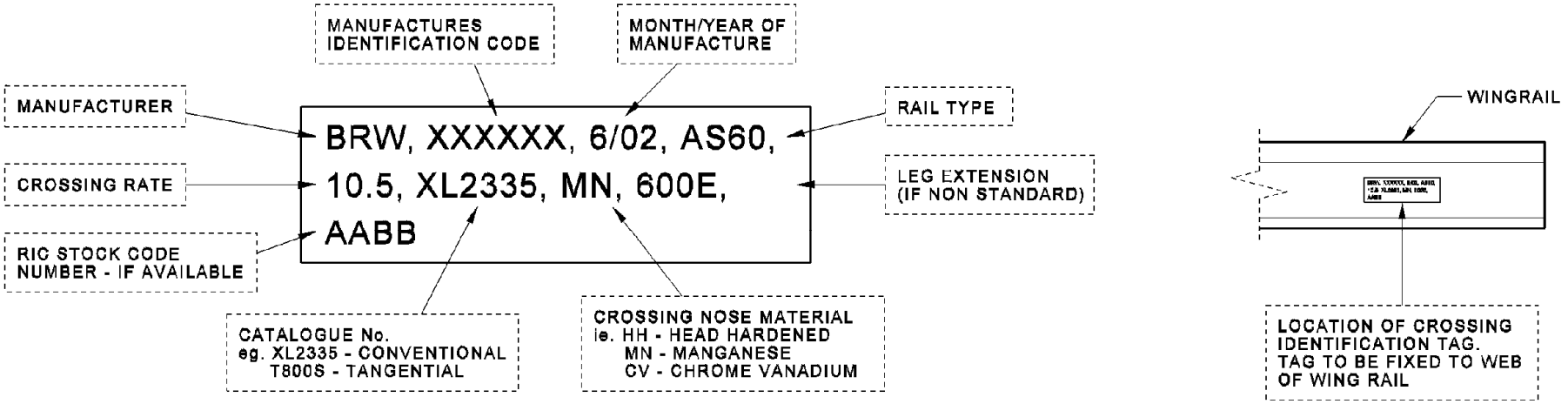


RAIL BOUND MANGANESE CROSSING

SPRING WING CROSSING

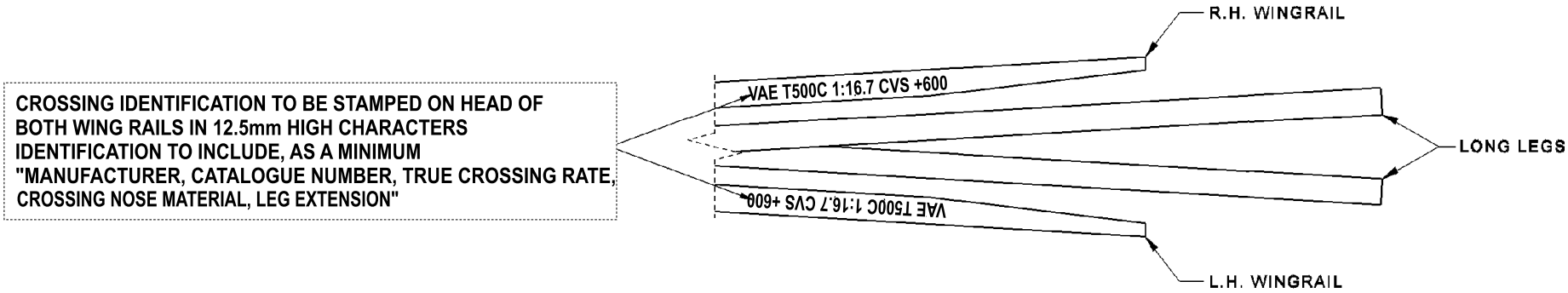
'V' CROSSING TYPES

NOTE:
ONLY RAIL HEAD SHOWN IN DIAGRAMS (UNLESS NOTED OTHERWISE)



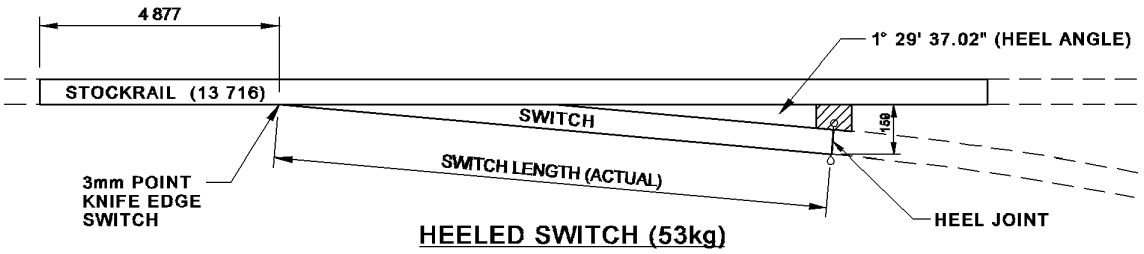
IDENTIFICATION TAG

(CONTAINS A MINIMUM OF " MANUFACTURER, DATE OF MANUFACTURE, RAIL TYPE, CROSSING RATE, CATALOGUE NUMBER")

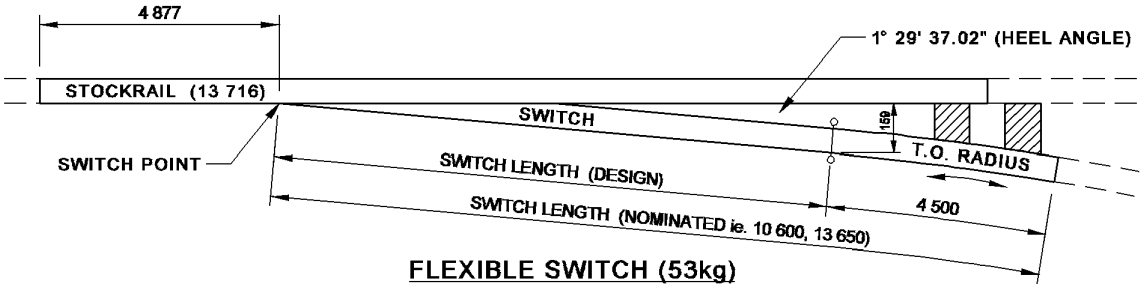


WING RAIL MARKING

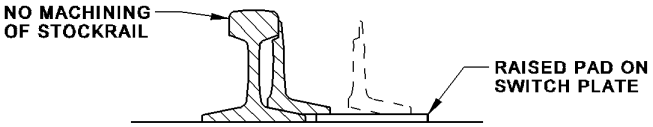
CROSSING IDENTIFICATION



HEELED SWITCH (53kg)

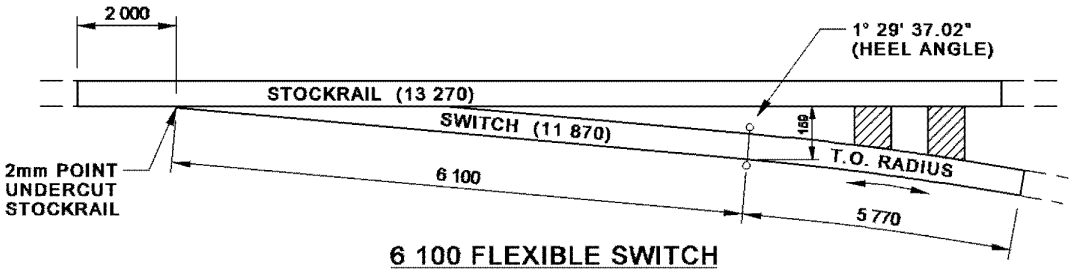


FLEXIBLE SWITCH (53kg)

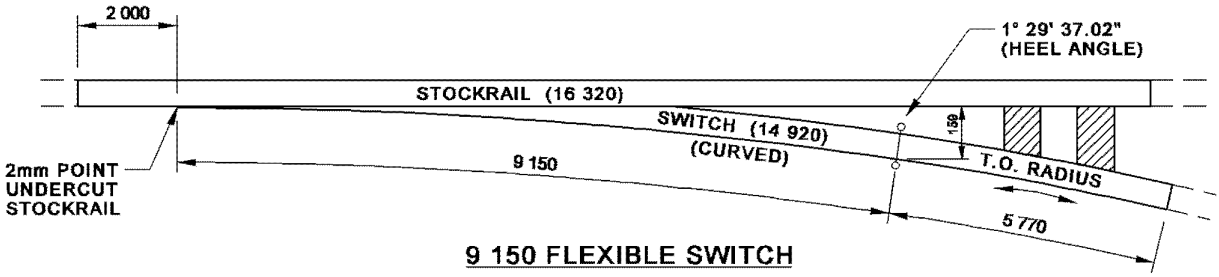


SECTION AT SWITCH TIP

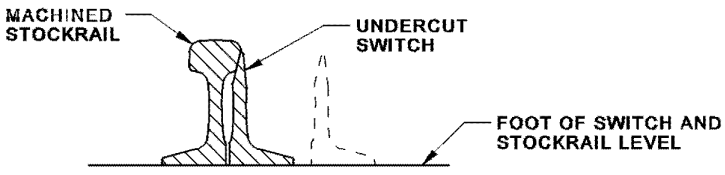
53kg HEELED & FLEXIBLE SWITCHES



6 100 FLEXIBLE SWITCH



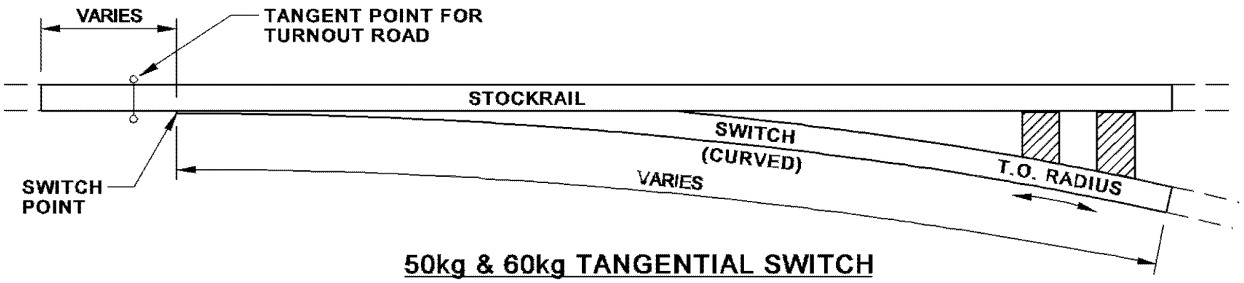
9 150 FLEXIBLE SWITCH



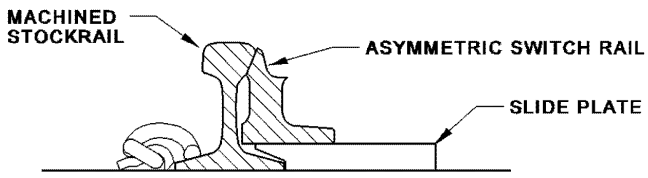
SECTION AT SWITCH TIP

50kg & 60kg FLEXIBLE SWITCHES

NOTE: RIGHT HAND TURNOUT AND LEFT HAND SWITCH ONLY DRAWN.



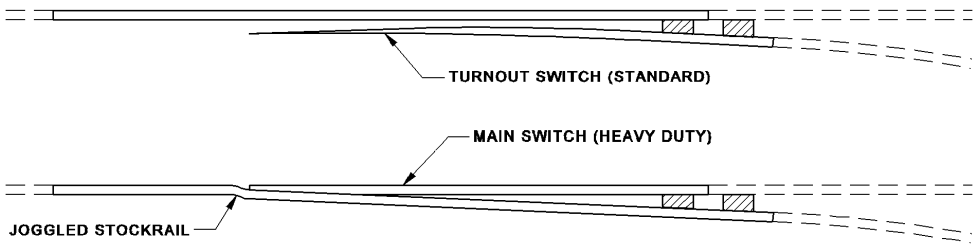
50kg & 60kg TANGENTIAL SWITCH



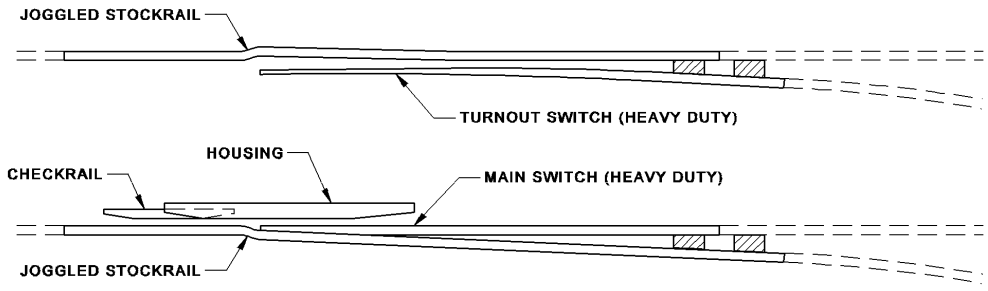
SECTION AT SWITCH TIP

TANGENTIAL SWITCHES

NOTE: RIGHT HAND TURNOUT AND LEFT HAND SWITCH ONLY DRAWN.



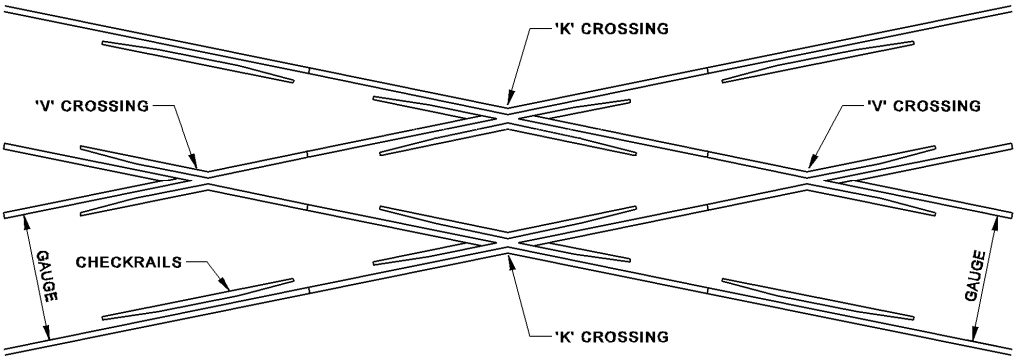
HEAVY DUTY SWITCHES



HOUSED SWITCHES

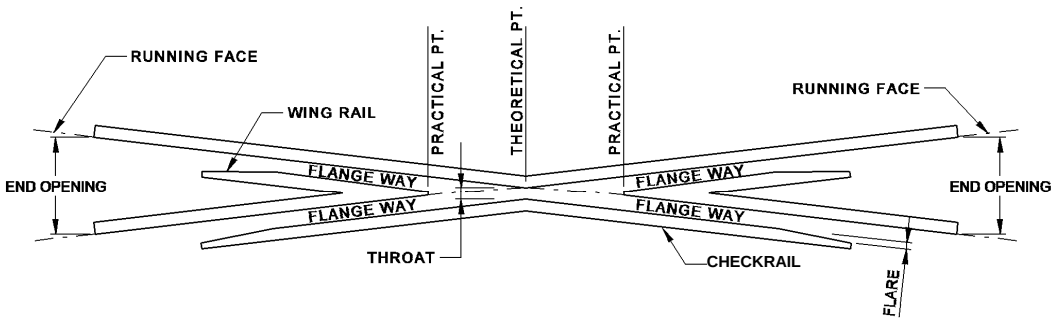
Appendix C Other Special Trackwork Data

Diamond crossings

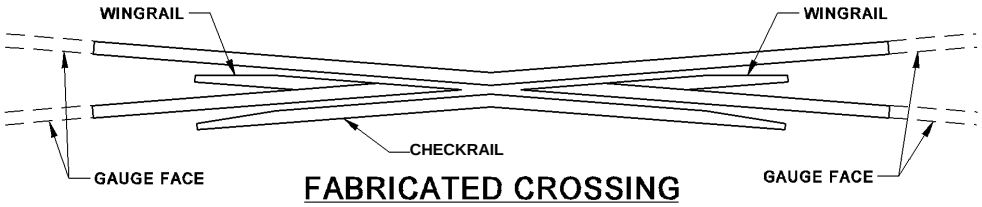


DIAMOND CONFIGURATION

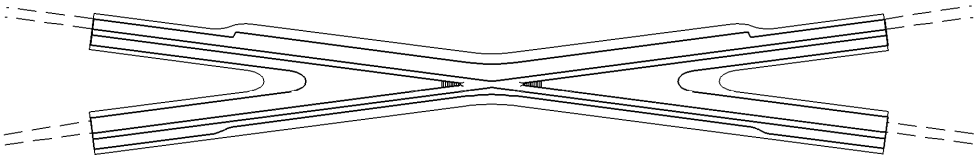
NOTE:
CONFIGURATION OF CHECKRAILS AND WINGRAILS VARIES DEPENDING ON CROSSING ANGLE



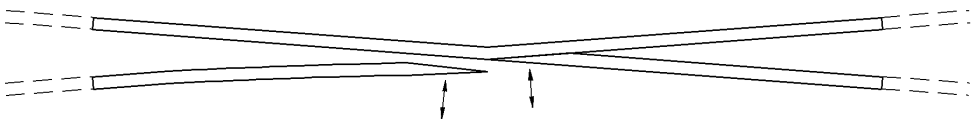
'K' CROSSING



FABRICATED CROSSING



SOLID CAST MANGANESE CROSSING

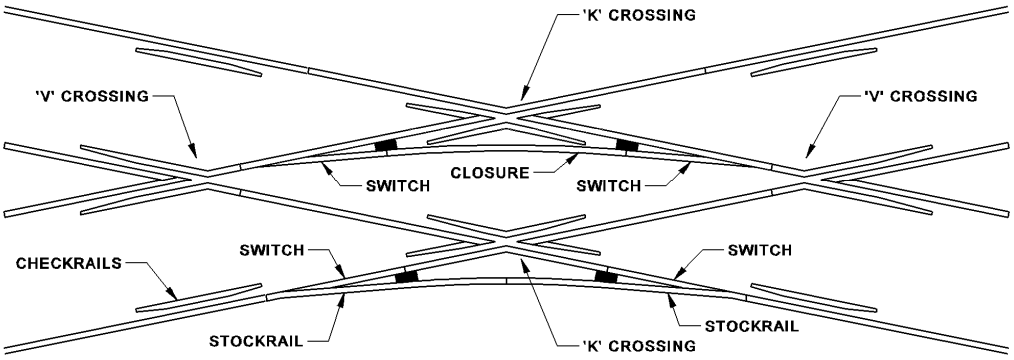


SWITCHABLE CROSSING

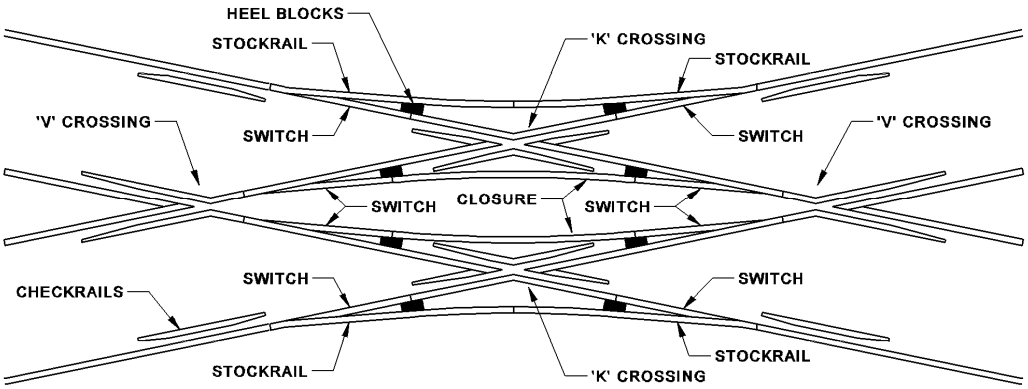
'K' CROSSING TYPES

NOTE:
ONLY RAIL HEAD SHOWN IN DIAGRAMS (UNLESS NOTED OTHERWISE)

Slips

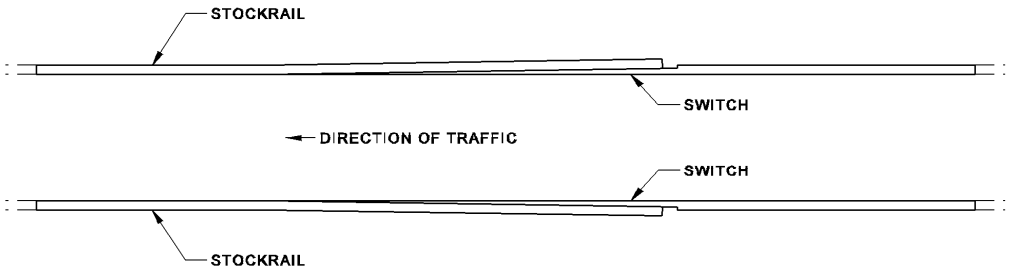


SINGLE SLIP CONFIGURATION



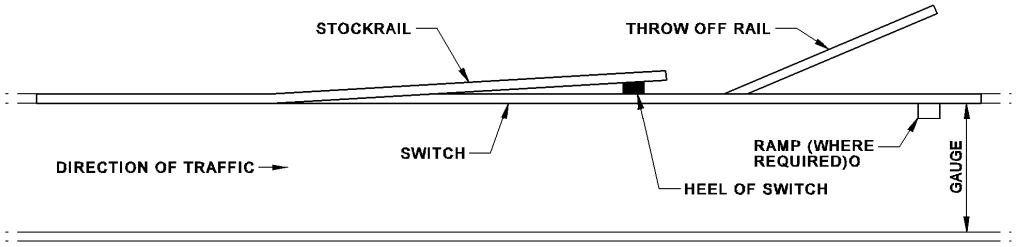
DOUBLE SLIP CONFIGURATION

Expansion switches



EXPANSION SWITCHES

Catchpoints



CATCHPOINT CONFIGURATION

NOTE:
SWITCH TYPE MAY BE HEELED OR FLEXIBLE

Appendix D Standard Designs for Conventional Turnouts

Standard Conventional Turnouts							
Rail (kg)	Crossing		Switch Description	General Arrangement			
	Rate	Type		Length	Bearers	Plating	Design Reference
50	8.25	Curved	5030 x 159 H	21.770	Timber	Resilient	720-420
			6100 x 159 F	23.470	Timber	Standard	320-1197
	9	Straight	6100 x 159 F	23.510	Timber	Standard	320-1305
		Curved	6100 x 159 H	24.740	Timber	Standard	320-1520
	10.5	Straight	6100 x 159 F	25.730	Timber	Standard	320-1309
		Curved	6100 x 159 F	27.170	Timber	Standard	320-1310
53	8.25	Curved	5030 x 159 H	21.770	Timber	Resilient	246-466
			10600 F	23.470	Timber	Resilient	246-403
	9	Straight	10600 F	23.510	Timber	Resilient	246-920
	10.5	Straight	10600 F	25.730	Timber	Resilient	720-497
	15	Straight	10600F / 13650F	32.270/35.320	Timber	Resilient	248-1180
60	8.25	Curved	6100 x 159 H	23.470	Timber	Resilient	320-1215
			6100 x 159 F	23.470	Concrete	Resilient	690-418(RH) 690-419(LH)
					Timber	Resilient	425-462
	9	Straight	6100 x 159 F	23.510	Timber	Resilient	250-1258
			9150 x 159 F	26.560	Timber	Resilient	250-1258
	10.5	Straight	6100 x 159 F	25.730	Timber	Resilient	720-615
					Concrete	Resilient	320-1282(RH), 720-436(LH)
			9150 x 159 F	28.780	Timber	Resilient	720-615
	15	Straight	6100 x 159 F	32.270	Timber	Resilient	425-725, 320-1219
			9150 x 159 F	35.320	Timber	Resilient	425-725, 320-1219 (RBM)
			9150 x 159 F	35.320	Concrete	Resilient	720-538(RH), 720-539(LH)

Table 17 - Standard Conventional Turnouts

Note:
1. H - Heeled Switches.
2. F - Flexible switches
3. For 53kg rail the flexible switch is defined as the total length of switch rail from which the switch is made. For 50kg and 60kg rail the flexible switch is defined as the length from the point to the theoretical head point (for design purposes only), and can be identified by the machining on the stockrail. (i.e. 53kg 10600 and 13650 switches have the same design geometry as the 6100x159 and 9150x159 (respectively) indicated for 50 and 60kg rail.
4. Standard plating is a non-resilient type i.e. dogspikes, lockspikes, and/or screwspikes.
5. Resilient plating refers to an elastic type of fastener securing the rail foot to the baseplate.
6. The layout for turnout bearers or ties forms part of the configuration. References to drawings detailing interface requirements for fixing components on standard turnouts, that is, crossings, checkrails, switch/stockrails and closure rails are indicated under design references.

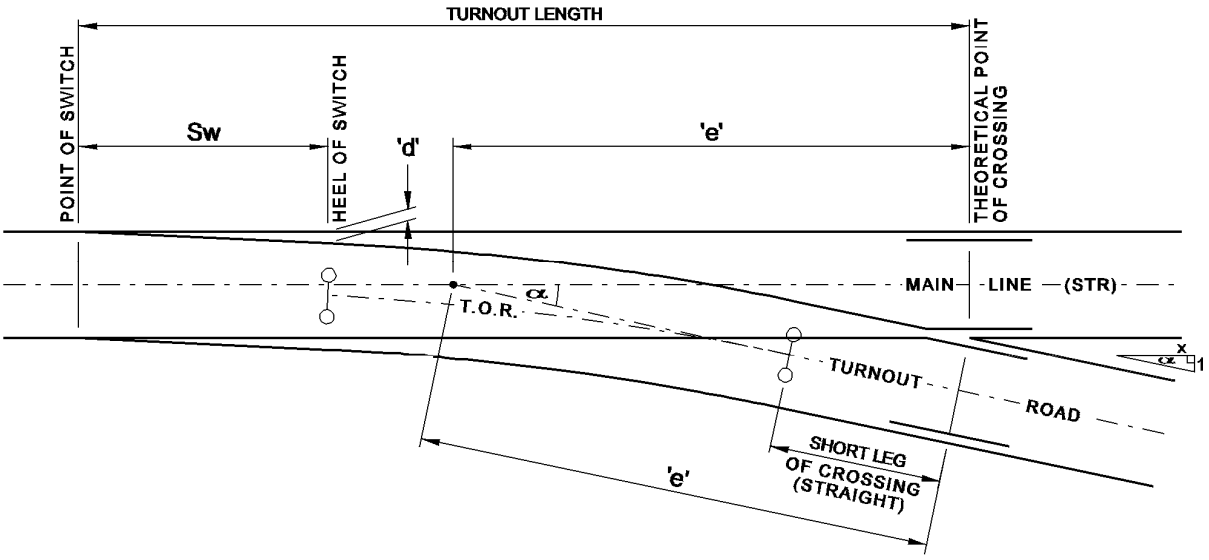


Figure 8 - Straight Crossing Conventional Turnout (drawn for RH turnout)

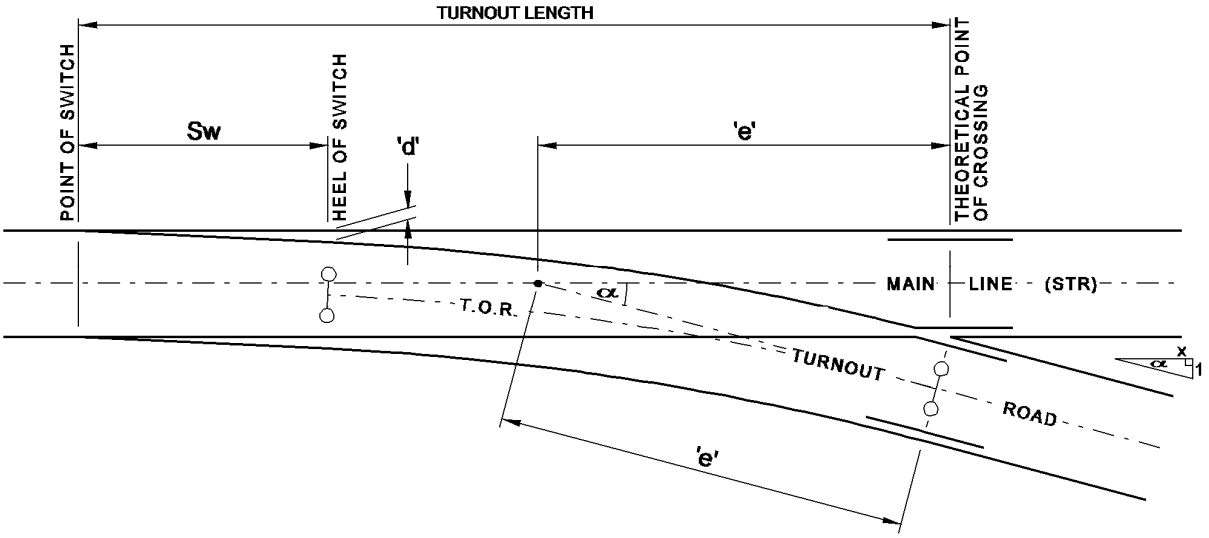


Figure 9 - Curved Crossing Conventional Turnout – short leg curved (drawn for RH turnout)

Crossing Rate	'e'
8.25	11.882
9	12.955
10.5	15.102
15	21.549

Sw	=	Switch length
d	=	Heel Centres (159mm)
g	=	Gauge (1435mm)
α	=	Crossing angle
x	=	Crossing rate

Switch length and heel centres are measured at heel joint for heeled switches and for flexible switches they are adopted for design purposes

Appendix E Standard Designs for Tangential Turnouts

Tangential Turnouts – Design Parameters							
Type	Crossing	Turnout Angle (^{0})	Length (T) (m)	Turnout Length (Pts to Theo Pt) (m)	Total Length (TOTP to TOEP) (m)	Distance (TOTP to Pts) (m)	General Layout Design Drawing Ref No.
160:6.6	Curved	8.615648	12.052	20.939	24.105	0.490	CV0479038
160:8.25	Straight	6.911227	9.622	21.058	24.644	0.490	CV0479039
190:7	Curved	8.130102	13.503	22.862	27.006	0.490	CV0479040
190:9	Straight	6.340192	10.523	22.988	26.298	0.490	CV0479041
250:8.25	Curved	6.911227	15.096	26.296	30.193	0.490	CV0479042
250:10.5	Straight	5.440332	11.878	26.489	30.309	0.490	CV0479043
300:9	Curved	6.340192	16.616	28.853	33.231	0.490	CV0479044
300:12	Straight	4.763642	12.478	29.238	33.630	0.490	CV0479045
500:12	Curved	4.763642	20.797	37.391	41.595	0.490	CV0479046
500:15	Straight	3.814075	16.648	37.707	43.532	0.490	CV0479047
800:15	Curved	3.814075	26.637	46.827	53.274	1.090	CV0479048
800:18.5	Straight	3.094058	21.606	47.083	54.660	1.090	CV0479049
1200:18.5	Curved	3.094058	32.409	56.996	64.818	1.690	CV0479050
1200:24	Straight	2.385944	24.989	57.754	67.026	1.690	CV0479051

Table 18 - Standard Tangential Turnouts

Tangential Turnouts – In-bearer design		
Type	Comment	General Layout Design Drawing Ref No.
160	no back-drive required	CV0237813
190	no back-drive required	CV0278550
250	with backdrive	CV0278551
300	with backdrive	CV0278552
500	with backdrive	CV0278553
800	With double backdrive	CV0278554

Table 19 - Standard In bearer layouts for tangential turnouts

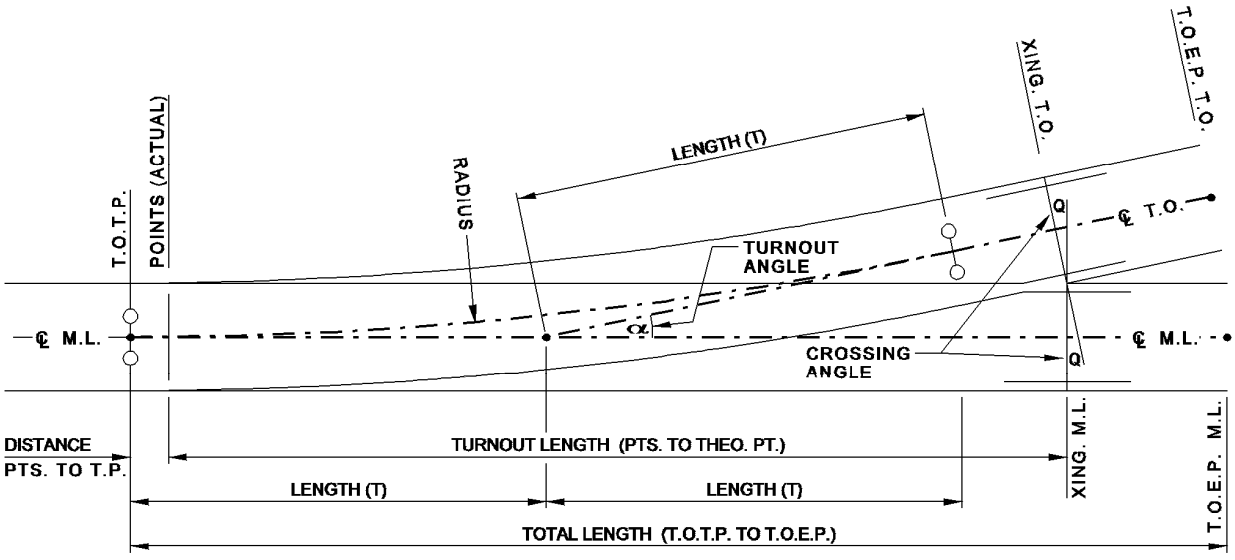


Figure 10 - Straight Crossing Turnout (drawn for LH turnout)

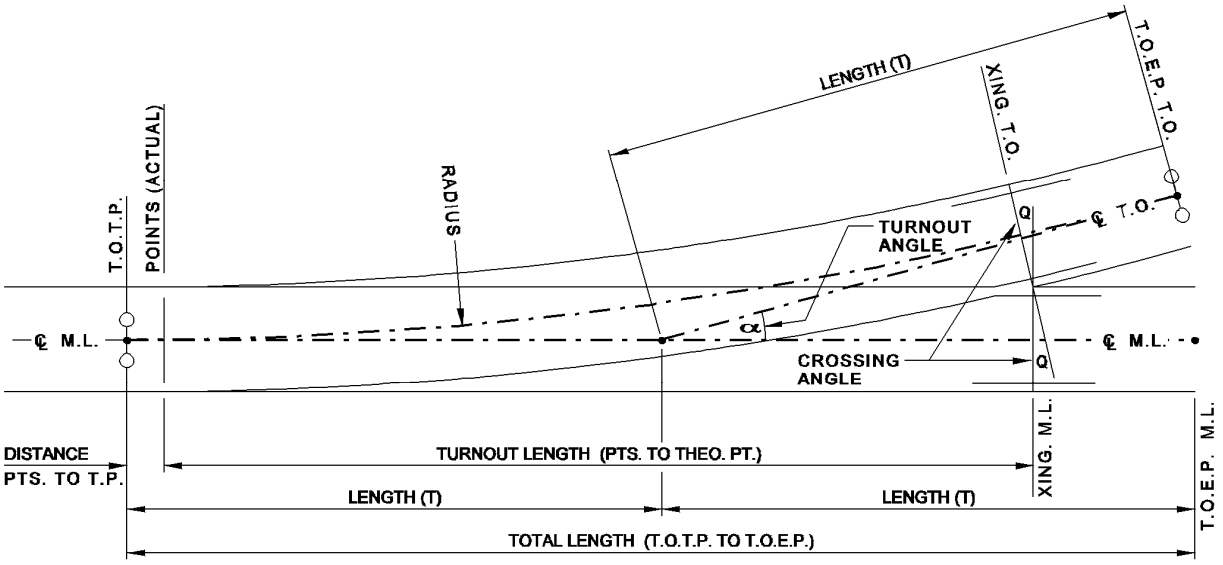


Figure 11 - Curved Crossing Turnout (drawn for LH turnout)

Tangential Turnouts – Approved designs			
Radius (m)	**Turnout Rate**	**Bearers**	**Designs Approved From**
190	1 in 7	Concrete	VAE, PRE, BRFC
	1 in 9	Concrete	VAE, PRE, BRFC
250	1 in 8.25	Concrete	VAE, PRE, BRFC
	1 in 10.5	Concrete	VAE, PRE, BRFC
300	1 in 9	Concrete	PRE, VAE
300	1 in 12	Concrete	VAE, PRE
500	1 in 12	Concrete	VAE, PRE
500	1 in 15	Concrete	VAE, PRE
800	1 in 15	Concrete	VAE, PRE
800	1 in 18.5	Concrete	VAE, PRE
1200	1 in 18.5	Concrete	VAE, PRE, VCA(Note 1)
1200	1 in ~~21~~ 24	Concrete	VAE
VAE = VAE Railway Systems Pty Ltd PRE = Pacific Rail Engineering Pty Ltd BRFC = Bathurst Rail Fabrication Centre (RailCorp) VCA = Vossloh Cogifer Australia Pty Ltd			

Table 20 - Tangential Turnouts - Approved designs

Note 1: Interim approval to supply turnouts. Each use requires approval by the Chief Engineer Track. Full approval is dependent on successful completion of a period of inspection and monitoring.

Tangential Turnouts – Approved designs				
Radius (m)	**Xing Rate**	**Bearers**	**Designer**	**Drawing Reference**
250	1 in 10.5	Slab	VAE	Special
300	1 in 12	Concrete	PRE	PRE01-GA-0036
		Concrete	VAE	VAM 11439B
800	1 in 18.5	Concrete	PRE	PRE01-GA-0045
		Concrete	VAE	VAM 12713A

Table 21 - Tangential Turnouts with Swing nose crossings- Approved designs

Appendix F Crossing nose profiles

Longitudinal crossing nose profile

Different profiles apply depending on the direction of traffic over the crossing, the type of traffic (freight or passenger), the design flangeway width and the profile of the wingrail.

The longitudinal profiles detailed in Table 22 are mainly for use with fabricated crossings. They may, however, be used for other crossings.

The design profile is defined by the nose depths at the 16mm point and the 32mm point. A straight is formed by these two locations shown as A and B in Figure 12.

Longitudinal Profile			
Nose Width		**32mm**	**16mm**
Nose Depth		**A**	**B**
Facing Profiles	**F1**	A= 1mm	B= 8mm
	F2	A= 2mm	
	F3	A= 3mm	
	F4	A= 4mm	
Trailing Profiles	**T1**	A= 1mm	B= 6mm
	T2	A= 2mm	
	T3	A= 3mm	

Table 22 - Longitudinal Profiles

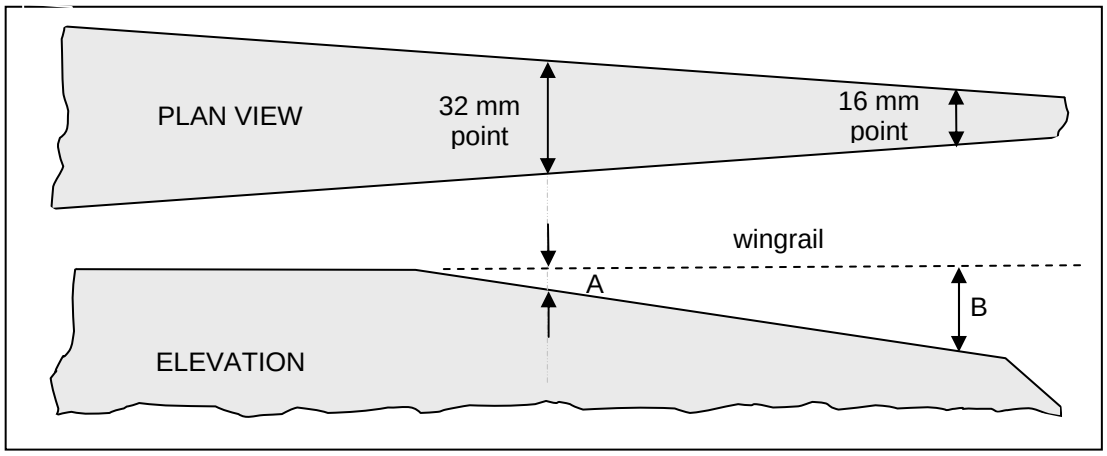


Figure 12 – Crossing nose design slope for F1 profile

The nose width is measured 16mm below the wingrail (similar to measuring gauge) as shown in Figure 13.

The 16mm point is where the nose is 16mm wide at the gauge point. Likewise the 32mm point is where the nose is 32mm wide at the gauge point.

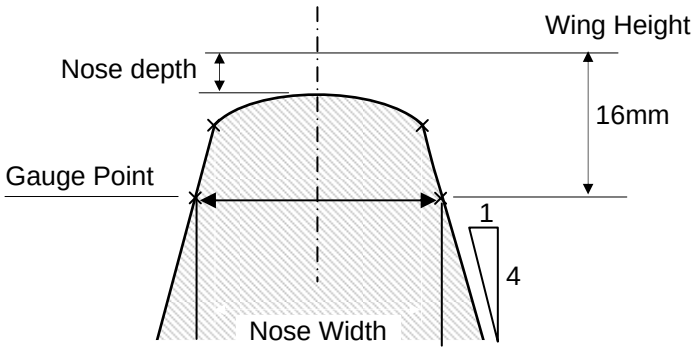


Figure 13 – Cross-Section of crossing nose

Note that the slope on the side of the nose is approximately 4:1.

Longitudinal crossing nose profiles have been established for a range of crossing designs. These are specified in Table 23. Select the profile based on the flangeway width at the crossing, wingrail profile, traffic task and whether the crossing is facing, trailing or both.

Profile Selection				
Traffic direction	**Facing or Both**			
Traffic Type	**Freight or Mixed**		**Passenger Only**	
Wing	**44 Flangeway**	**42 Flangeway**	**44 Flangeway**	**42 Flangeway**
Standard wing rail rounded shape	F1	F2	F2	F3
Square Wing	F2	F3	F3	F4
Traffic direction	**Trailing Only**			
Traffic Type	**Freight or Mixed**		**Passenger Only**	
Wing	**44 Flangeway**	**42 Flangeway**	**44 Flangeway**	**42 Flangeway**
Standard wing rail rounded shape	T1	T2	T2	T3
Square Wing	T2	T3	T3	T3

Table 23 - Longitudinal Crossing Profile Selection

Square wingrails (see Figure 14) provide greater support for the wheel and allow a longer nose ramp. Monoblock and RBM crossings are designed with a square wing.

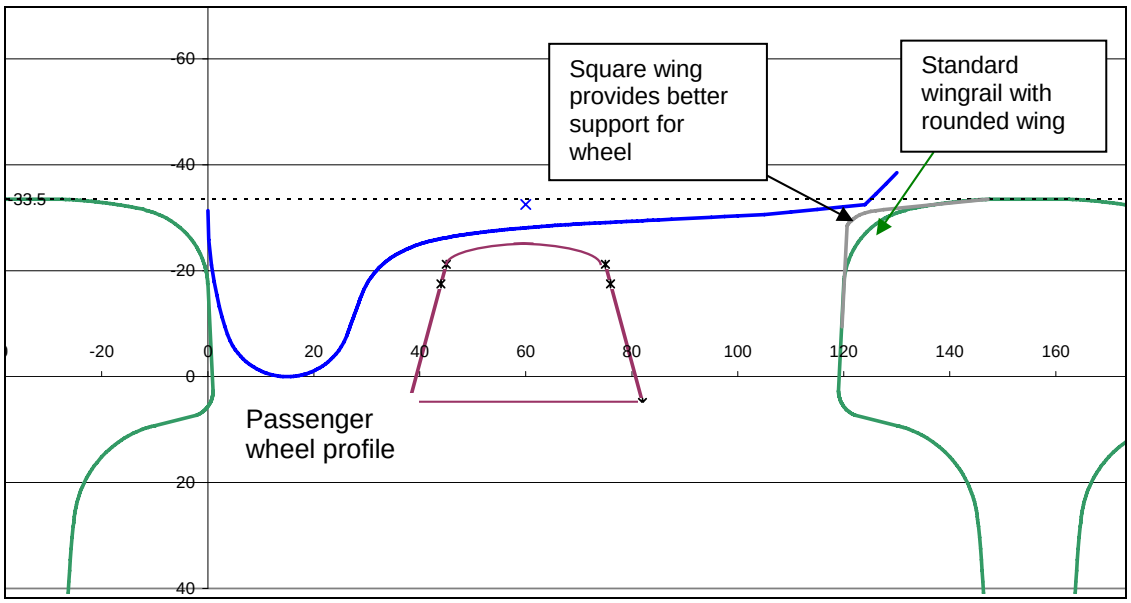


Figure 14 – Cross-Section showing square vs rounded wing

Applying the crossing profile

At the 16mm point the longitudinal crossing nose profile shall be 8mm below the wingrail (or 6mm below if the crossing is trailing ONLY). The nose then slopes upwards in a straight line to the 32mm point. The nose depth at the 32mm point will vary depending on selected profile.

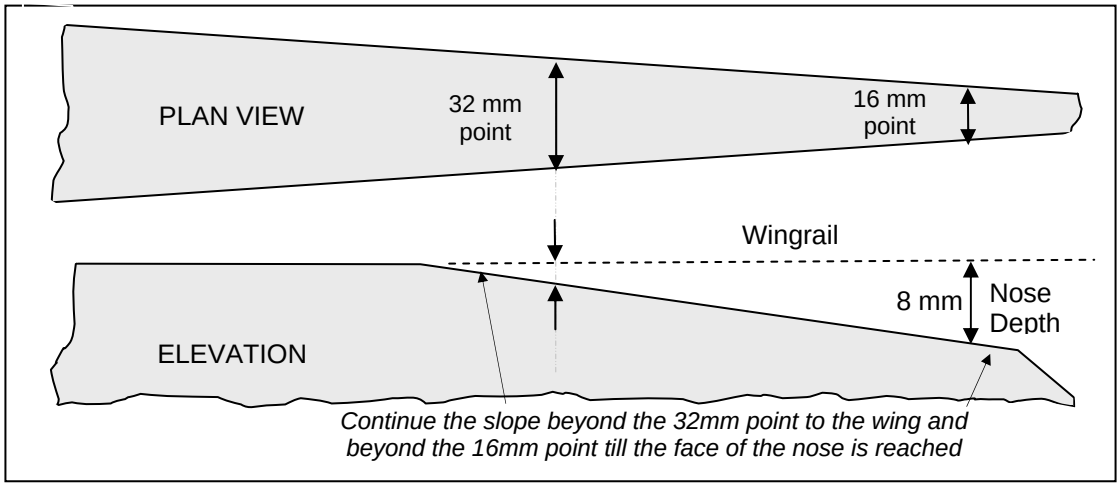


Figure 15 – Crossing nose design slope for F1 profile

The nose depth below the wing is a straight line between the 16mm point and the 32mm point. This straight is extended until it reaches the same height as the wingrail in one direction and the end of the nose in the other direction. See Figure 15.

Table 24 provides distances from the theoretical point to the different crossing nose widths for various crossing rates.

Distances from theoretical point to nose width (mm)						
Standard Crossings (Conventional & Tangential)						
Nose Width (mm)	**Crossing Rate 1 in**					
	8.25	**9**	**10.5**	**15**	**18.5**	**21**
16	132	144	168	240	296	336
32	264	288	336	480	592	672
Curved Tangential Crossings						
Crossing Description	**160 – 1 in 6.6**	**190. – 1 in 7**	**250 - 1 in 8.25**	**300 - 1 in 9**	**500 - 1 in 12**	**800 - 1in 15**	**1200 - 1 in 18.5**
Nose Width (mm)	**True Crossing Rate 1 in :**						
	7.433	**8.106**	**9.3**	**10.2**	**13.3**	**16.7**	**20.4**
16	119	130	149	163	213	267	326
32	238	259	298	326	426	534	653

Table 24 - Distances from theoretical point to nose width

Transverse crossing nose profile

The following transverse crossing nose profile may be applied to the crossing nose as shown in Figure 16.

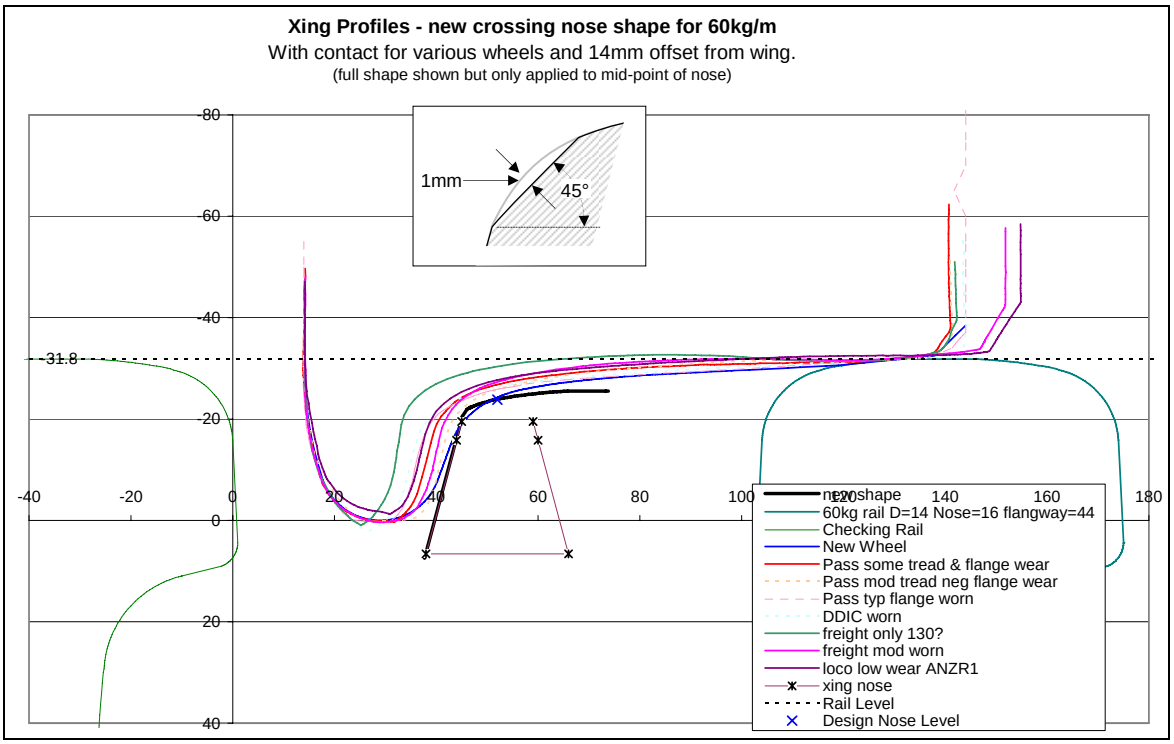


Figure 16 – Crossing nose transverse profile

The profile is detailed in Figure 17 and Table 25.

The template shown in Figure 17 is detailed in RailCorp Engineering Specification SPC 201 – "Measurement Gauges".

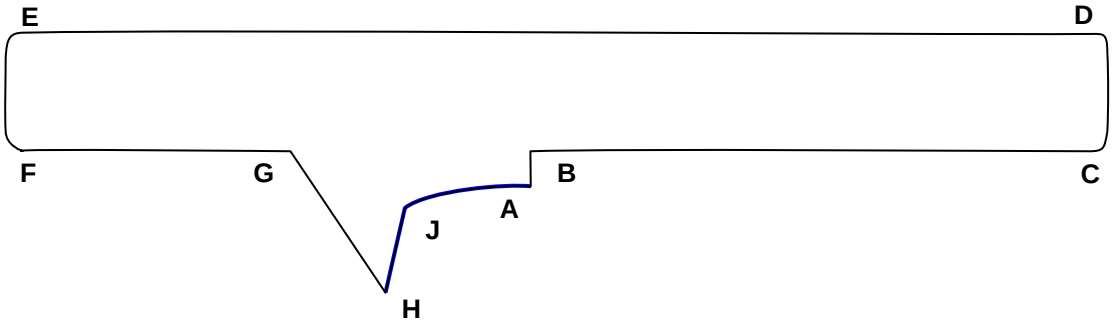


Figure 17 – Crossing nose transverse profile template

Pt	X	Y	X	Y	X	Y	Pt	X	Y
A	118.93	18.94	93.7444	16.44653	103.2670	18.29405		113.7168	18.94
B	118.93	25.32	94.16866	16.57849	103.9637	18.37715		113.93	18.94
C	250	25.32	94.59292	16.69686	104.6603	18.45529		114.43	18.94
D	250	45.32	95.01719	16.80195	105.3570	18.52849		114.93	18.94
E	0	45.32	95.60377	17.04913	106.0536	18.59676		115.43	18.94
F	0	25.32	96.30042	17.18769	106.7503	18.66011		115.93	18.94
G	65	25.32	96.99708	17.32111	107.4469	18.71856		116.43	18.94
H	86.54538	0	97.69374	17.44942	108.1436	18.77210		116.93	18.94
J	90.24538	13.99	98.3904	17.57263	108.8402	18.82075		117.43	18.94
	91.14538	15.24349	99.08705	17.69078	109.5369	18.86452		117.93	18.94
	91.62307	15.5671	99.78371	17.80387	110.2336	18.90341		118.43	18.94
	92.04734	15.77408	100.4804	17.91192	110.9302	18.93742	A	118.93	18.94
	92.47160	15.96489	101.1770	18.01494	111.6269	18.94			
	92.89587	16.14019	101.8737	18.11297	112.3235	18.94			
	93.32013	16.30057	102.5703	18.2060	113.0202	18.94			

Table 25 – Crossing nose profile co-ordinates

Figure 16 shows the profile applied from one side using the profile gauge. The gauge can be reversed to give the profile for the other side of the crossing nose.

The gauge can be applied along the crossing nose until the normal rail shape is reached. The gauge corner at the nose tip needs to be manually chamfered off at about 45 degrees to about one mm depth at the 16mm point running back to zero at the 19mm point.

The crossing nose profile in Table 25 only gives the shape. The vertical position needs to be set with reference to the defined longitudinal profile. Application of the profile gauge is detailed in RailCorp Engineering Manual TMC 222 “Rail Welding”.

Transverse wing rail profile

The following transverse wing rail profile may be applied to the wing rail.

The profile is detailed in Figure 18 and Table 26.

The template shown in Figure 18 is detailed in RailCorp Engineering Specification SPC 201 – "Measurement Gauges".

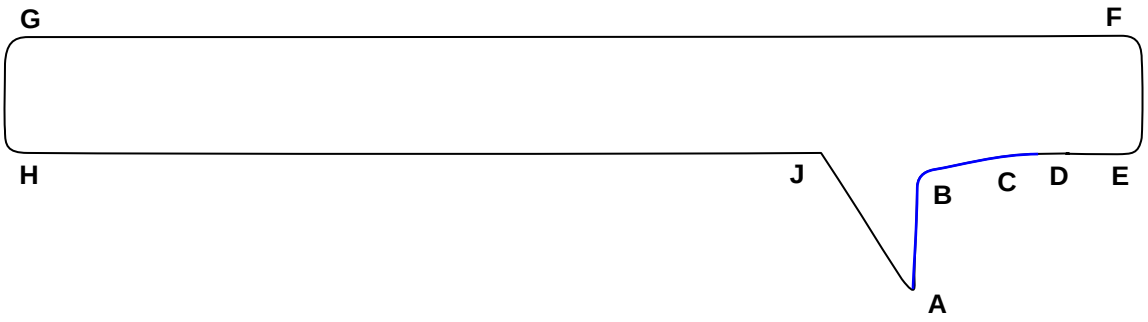


Figure 18 – Wingrail profile template

Pt	X	Y
A	199.65	0.00
B	200.61	19.10
	200.76	19.33
	200.92	19.61
	200.97	19.62

X	Y
201.34	19.95
201.88	20.45
202.34	20.78
203.05	21.14
203.97	21.50

Pt	X	Y
	205.08	21.79
	206.05	21.93
C	207.50	22.13
D	227.20	24.10
E	250.00	24.10

Pt	X	Y
F	250.00	44.10
G	0.00	44.10
H	0.00	24.10
J	180.00	24.10
A	199.65	0.00

Table 26 - Wing rail profile co-ordinates

This profile provides for the square wing design. It would normally be applied along the zone of wheel transfer. It is the same in all longitudinal positions and gives the vertical position as well as the shape. The square wing profile should be transitioned to a normal rail shape at either end of the transfer zone. It must not be applied more than 75mm past the crossing nose.

Appendix G Approved Products

The approved product list for turnouts and special trackwork contains only those products that may be used independently of any manufacturer's proprietary designs.

Common Item Name	Description	Standard/ Drawing	Manufacturer/ Supplier
Manual levers			
Thornley levers	Type 45		VCA (formerly TKL)
Switch equipment			
Switch pad protectors	Mack Reversible Switch Protector		VCA
Chair Bolt Cat. No 3	M24 x 75 Square Head Chair Bolt Cat. No3	91-187C	Greg Sewell Forgings
Special Thinner head Rail Brace Bolt	Special Thinner Hex Head M24 Brace Bolt Hex head 13.5mm high; marked 8.8, M24; 125mm long; 59mm thread c/w nut to AS 1252-1996 & 10mm thick spring washer to AS 1085.7 S/C 2085090 for “A” timber	NA	RailCorp Rail Fabrication Centre
Crossings			
Compound manganese	Compound crossing with manganese nose	ESC 250	VAE
Rail Bound Manganese	RBM V-Crossings	1:10.5,dwg CVO143533 1:15,dwg CVO235217	VCA
60kg HSH Rails (Note 1)	Use of 60kg 350HT AS60 HSH Deep Head Hardened Rails for Turnout components	Profile to AS 1085.1	VAE BRFC
53kg HH Rails (Note 1)	Use of 53kg Head Hardened Rails for crossings	AS 1085.1	OneSteel BRFC
Stock Rails			
53kg HH Rails	Use of 53kg Head Hardened Rails for stock rails	AS 1085.1	OneSteel BRFC
Note 1: Standard Carbon rails may be used where directed by the Chief Engineer Track			

Appendix H Standard Plans

Table 27 lists the Standard Plans for conventional turnouts, diamonds, catchpoints and expansion switches referenced in Engineering Standard ESC 250 Turnouts and Special Trackwork.

Table 28 lists the second level Standard Plans referenced in the plans listed in Table 27 and also the third level plans referenced in the second level

The table contents in Table 27 and Table 28 are not listed in number order. The contents are listed by category: e.g. turnout, catchpoint, switch, crossing, crossing rate, rail weight, switch length etc.

Table 29 lists any superseded plans referenced in level 1 or 2. This listing is for reference only. Superseded plans are not to be used. The plans that replaced the superseded plans are also listed in Table 28.

Table 27 - Level 1 Standard Plans

Xing rate	Rail	Curved/ Straight	Old Plan No.	EDMS No.	Title
Turnouts					
8.25	50	C	720-420	CV0065189	1 in 8.25 PANDROL SPLIT PLATED 50kg SIDING TURNOUT, CVD CROSSING; TIMBERING AND PLATING DETAILS.
		S	320-1197	CV0235386	1 IN 8.25 STANDARD PLATED TURNOUT 50KG - 1981 RAIL FLEXIBLE SWITCH CURVED CROSSING XL. 282, 284, 287, 289. TIMBER AND PLATING DETAILS
	53	C	246-403	CV0123711	1 IN 8.25 "PANDROL" PLATED; 53kg LEADS - CURVED CROSSING ; TIMBERING AND PLATING DETAILS
		C	246-466	CV0254666	1 IN 8.25 PANDROL PLATED 53 KG. SIDING LEAD CURVED CROSSING TIMBERING & PLATING DETAILS
	60	C	320-1215	CV0171437	1 IN 8.25 PANDROL SPLIT - PLATED TURNOUTS 60KG - 1986 RAIL 6100 HEELED SWITCH - CURVED CROSSING TIMBERING AND PLATING DETAILS
		C	425-462	CV0147401	1 IN 8.25 PANDROL SPLIT- PLATED; 60kg TURNOUTS - CURVED CROSSINGS; TIMBERING AND PLATING DETAILS
		C	690-418	CV0401438	STD. 1 IN 8.25 R.H. TURNOUT CURVED CROSSING 60KG. RAIL CONCRETE TIE & PLATING DETAILS
		C	690-419	CV0401439	STD. 1 IN 8.25 L.H. TURNOUT CURVED CROSSING 60KG. RAIL CONCRETE TIE & PLATING DETAILS
9	50	S	320-1305	CV0171461	STD. 1 IN 9 STANDARD PLATED TURNOUT 50 KG -1981 RAIL STRAIGHT CROSSING - FLEXIBLE SWITCH. TIMBERING AND PLATING DETAILS
			320-1520	CV0171469	1 IN 9 STANDARD PLATED TURNOUT 50 KG - 1981 RAIL - 6100 FLEXIBLE SWITCH CROSSING CAT. XL 292,294,297,299. TIMBERING AND PLATING DETAILS
	53	S	246-920	CV0254637	1 IN 9 PANDROL PLATED 53 KG LEADS - STRAIGHT CROSSINGS TIMBERING & PLATING DETAILS
	60	S	250-1258	CV0024151	STD. 1 IN 9 PANDROL SPLIT - PLATED TURNOUT; 60kg. 1981; STRAIGHT CROSSING - CAT. XL290, 291; TIMBERING AND PLATING DETAILS
10.5	50	S	320-1309	CV0171463	STD. 1 IN 10.5 STANDARD PLATED TURNOUT 50 KG. 1981 RAIL - 6100 FLEXIBLE SWITCHES STRAIGHT CROSSING CAT. XL 300, 301 TIMBERING AND PLATING DETAILS
		C	320-1310	CV0171464	1 IN 10.5 STANDARD PLATED TURNOUT 50KG 1981 RAIL CURVED CROSSING - 6100 FLEXIBLE SWITCH TIMBERING AND PLATING DETAILS
	53	S	720-497	CV0065202	1 IN 10.5 PANDROL PLATED 53KG LEADS - STRAIGHT CROSSING TIMBERING & PLATING DETAILS
	60	S	320-1282	CV0171459	STANDARD 1 IN 10.5 R.H. TURNOUT 60KG - 1981 RAIL R.B.M. STRAIGHT CROSSING CONCRETE TIES AND PLATING DETAILS
		S	720-436	CV0065960	STANDARD 1 IN 10.5 L.H TURNOUT 60KG - 1981 RAIL - R.B.M STRAIGHT CROSSING; CONCRETE TIES AND PLATING DETAILS.
		S	720-615	CV0147417	STANDARD 1 IN 10.5 PANDROL SPLIT-PLATED TURNOUT; 60kg - 1981 RAIL; STRAIGHT CROSSING CAT

Table 27 - Level 1 Standard Plans

Xing rate	Rail	Curved/ Straight	Old Plan No.	EDMS No.	Title
					XL300,301; TIMBERING AND PLATING DETAILS.
15	53	S	248-1180	CV0104748	1 in 15 PANDROL PLATED TURNOUT 53kg 1981 RAIL TIMBERERING AND PLATING DETAILS - STR CROSSING
	60	S	720-538	CV0065207	STANDARD 1 in 15 R.H.TURNOUT 60KG - 1981 - RAIL R.B.M. STRAIGHT CROSSING; CONCRETE TIES AND PLATING DETAILS
		S	720-539	CV0065959	STANDARD 1 IN 15 L.H TURNOUT; 60kg - 1981 RAIL - R.B.M STRAIGHT CROSSING; CONCRETE TIES AND PLATING DETAILS
		S	320-1219	CV0065967	STANDARD 1 IN 15 PANDROL SPLIT-PLATED TURNOUT; 60KG 1981 RAIL STRAIGHT R.B.M. CROSSING; TIMBERING AND PLATING DETAILS.
		S	425-725	CV0170525	STD. 1 IN 15 PANDROL SPLIT - PLATED TURNOUT; 60 kg 1981 RAIL; STRAIGHT CROSSING - CAT. XL 350, 351; TIMBERING AND PLATING DETAILS
Catchpoints					
			153-891	CV0068418	CATCHPOINT - 53kg; 10.600 HEEL LESS - SWITCH; PANDROL PLATES; GENERAL ARRANGEMENT
	60		580-715	CV169477	CATCHPOINT - 60kg; 6100 FLEXIBLE SWITCH ON CONCRETE TIES; GENERAL ARRANGEMENT - STEELWORK
Diamonds					
7.5	60		184-858	CV0065555	STANDARD 1 IN 7.5 DIAMOND CROSSING 60KG. - 1981 RAIL TIMBERING AND PLATING DETAILS
8.25	53		425-976	CV0170405	STANDARD 1 IN 8.25 DIAMOND CROSSING 53 KG - 1981 RAIL - PANDROL PLATED TIMBERING AND PLATING DETAILS
	60		925-827	CV0169034	STD. 1 IN 8.25 DIAMOND 60KG.-1981 RAIL-PANDROL PLATED TIMBERING AND PLATING DETAILS
Expansion Switches					
	60		250-1201	CV0239998	STANDARD EXPANSION SWITCH FOR 300MM MAX. MOVEMENT 60KG/M RAIL GENERAL ASSEMBLY FOR TIMBER SLEEPERS
			250-1202	CV0240038	STANDARD EXPANSION SWITCH FOR 300MM MAX. MOVEMENT 60KG/M RAIL GENERAL ASSEMBLY FOR CONCRETE SLEEPERS.A
				CV0234453	EXPANSION SWITCHES TO SUIT UP TO 300mm MOVEMENT RAIL - AS60/ZUI-60, 1:20 CANT TIMBERING AND PLATING DETAILS
				CV0234454	EXPANSION SWITCHES TO SUIT UP TO 300mm MOVEMENT RAIL - AS60/ZUI-60, ZERO CANT TIMBERING AND PLATING DETAILS

Table 28 - Level 2 Standard Plans

Switch Length	Rail	Old Plan No.	EDMS No.	Title
Switches				
5030	50	320-1220	CV0171439	STANDARD 5030 HEEL SWITCH; L.H. & R.H. TURNOUT; 50KG - 1981 RAIL; GENERAL ASSEMBLY
	53	201-184	CV0246922	STD. 16FEET - 6INCHES X 6¼INCHES SWITCHES 107 A.S. 1936 RAIL.
6100	50	320-1237	CV0171440	STANDARD 6100 FLEXIBLE SWITCH 50KG. - 1981 RAIL L.H. & R.H. TURNOUT GENERAL ASSEMBLY
		320-1243	CV0171446	STANDARD 6100 HEELED SWITCH 50 KG. - 1981 RAIL L.H. & R.H. TURNOUT GENERAL ASSEMBLY
	60	258-208	CV0068459	STANDARD 6100 FLEXIBLE SWITCH; 60kg - 1981 RAIL; L.H. & R.H. TURNOUT; GENERAL ASSEMBLY
		258-687	CV0047887	STANDARD 6100 FLEXIBLE SWITCH; 60 KG 1981 RAIL L.H. & R.H. TURNOUT; GENERAL ASSEMBLY FOR CONCRETE TIES
		250-1080	CV0255794	STANDARD 6100 HEELED SWITCH 60KG. 1981 RAIL L.H. & R.H. TURNOUT GENERAL ASSEMBLY.
9150	60	720-498	CV0065203	STANDARD 9150 FLEXIBLE SWITCH 60KG - 1981 RAIL L.H. & R.H. TURNOUT GENERAL ASSEMBLY FOR CONCRETE TIES
		258-040	CV0068458	STANDARD 9 150 FLEXIBLE SWITCH; 60kg - 1981 RAIL; L.H. & R.H. TURNOUT; GENERAL ARRANGEMENT
10600	53	246-404	CV0068449	10 600 HEEL-LESS SWITCH; 53kg 1977 RAIL; GENERAL ARRANGEMENT; L.H. TURNOUT
		246-405	CV0254654	10 600 HEEL LESS SWITCH 53 KG. 1977 RAILS GENERAL ARRANGEMENT R.H. TURNOUT
		246-540	CV0068453	10600 HEEL-LESS HEAVY DUTY SWITCH; 53kg 1977 RAIL; GENERAL ARRANGEMENT R.H. TURNOUT
		246-541	CV0068454	10600 HEEL-LESS HEAVY DUTY SWITCH; 53kg 1977 RAIL; GENERAL ARRANGEMENT L.H. TURNOUT
13650	53	246-314	CV0172350	STANDARD 13650 HEEL-LESS HOUSED SWITCH; 53kg RAIL 1977; LH TURNOUT; GENERAL ASSEMBLY
		246-315	CV0172351	STANDARD 13 650 HEEL-LESS HOUSED SWITCH; 53kg RAIL 1977; RH TURNOUT; GENERAL ASSEMBLY
Switch Details				
5030	47	184-484	CV0065526	STANDARD HEEL JOINT 5030 AND 6100 SWITCHES 47KG A.S. 1977 RAIL
5030	50	480-947	CV0169724	STANDARD 5030 HEELED SWITCH 50KG-1981 RAIL R.H. & L.H. TURNOUT DRILLING OF SWITCH & STOCKRAIL
6100	50	320-1238	CV0171441	STANDARD 6100 FLEXIBLE SWITCH 50KG - 1981 RAIL R.H. TURNOUT - L.H. SWITCH AND STOCKRAIL SETTING AND MACHINING DETAILS
6100	50	320-1239	CV0171442	STANDARD 6100 FLEXIBLE SWITCH 50KG - 1981 RAIL R.H. TURNOUT - R.H. SWITCH AND STOCKRAIL SETTING AND MACHINING DETAILS
6100	50	320-1240	CV0171443	STANDARD 6100 FLEXIBLE SWITCH 50KG - 1981 RAIL L.H. TURNOUT - L.H. SWITCH AND STOCKRAIL SETTING AND MACHINING DETAILS

Table 28 - Level 2 Standard Plans				
Switch Length	**Rail**	**Old Plan No.**	**EDMS No.**	**Title**
6100	50	320-1241	CV0171444	STANDARD 6100 FLEXIBLE SWITCH 50KG. - 1981 RAIL L.H. TURNOUT - R.H. SWITCH AND STOCKRAIL SETTING AND MACHINING DETAILS
6100	50	320-1242	CV0171445	STANDARD 6100 FLEXIBLE SWITCH 50 KG. - 1981 RAIL R.H. & L.H. TURNOUT DRILLING OF SWITCH & STOCKRAILS
5030	50	480-948	CV0169725	STANDARD 5030 HEELED SWITCH; 50KG - 1981 RAIL; L.H. TURNOUT - R.H. SWITCH & STOCKRAIL; SETTING AND MACHINING DETAILS
5030	50	480-949	CV0169726	STANDARD 5030 HEELED SWITCH 50KG-1981 RAIL L.H. TURNOUT - L.H. SWITCH AND STOCKRAIL SETTING AND MACHINING DETAILS
5030	50	480-950	CV0169727	STANDARD 5030 HEELED SWITCH 50KG-1981 RAIL R.H. TURNOUT - R.H. SWITCH AND STOCKRAIL SETTING AND MACHINING DETAILS
5030	50	480-951	CV0169728	STANDARD 5030 HEELED SWITCH 50KG-1981 RAIL R.H. TURNOUT - L.H. SWITCH AND STOCKRAIL SETTING AND MACHINING DETAILS
5030	53	201-668	CV0234691	STD 16-6X6¼ SWITCHES 107 A.S. 1936 RAIL FOOT MACHINING
5030	53	184-483	CV0065525	STANDARD HEEL JOINT; 5.030 AND 6.100 SWITCHES; 53kg A.S. 1977 RAIL.
		205A-334	CV0068426	STANDARD HEEL JONIT; HEEL BASEPLATES CAT.Nº.6 FOR 47kg. 50kg. 53kg. AND 60kg - 1981 RAIL
10600	53	246-419	CV0068451	STANDARD 10 600 HEEL-LESS SWITCH 53kg RAIL 1977; L.H. SWITCH DETAILS; SETTING & MACHINING
10600	53	246-420	CV0068452	STANDARD 10 600 HEEL-LESS SWITCH 53kg RAIL 1977; R.H. SWITCH DETAILS; SETTING & MACHINING
	47,53	91-197	CV0068495	HEEL-LESS SWITCH CHOCKS; 47kg & 53kg 1977 RAILS
13650	53	246-318	CV0172354	STANDARD 13 650 HEEL-LESS HOUSED SWITCH; 53kg RAIL 1977; R.H TURNOUT; L.H. SWITCH & STOCK RAILS; MANUFACTURING DETAILS
13650	53	246-319	CV0172355	STANDARD 13 650 HEEL-LESS; HOUSED SWITCH 53kg RAIL 1977; R.H TURNOUT; R.H. SWITCH & STOCK RAILS; MANUFACTURING DETAILS
13650	53	246-320	CV0172356	STANDARD 13650 HEEL-LESS HOUSED SWITCH; 53kg RAIL 1977; R.H & L.H TURNOUT; SWITCH & STOCK RAILS; DRILLING DETAILS.
13650	53	246-322	CV0172357	STANDARD 13650 HEEL-LESS HOUSED SWITCH; 53kg RAIL 1977; R.H & L.H TURNOUT; COMPONENT DETAILS
6100	60	250-1081	CV0255795	STANDARD 6100 HEELED SWITCH 60KG - 1981 RAIL L.H. TURNOUT - L.H. SWITCH AND STOCKRAIL SETTING AND MACHINING DETAILS
6100	60	250-1082	CV0255796	STANDARD 6100 HEELED SWITCH 60KG - 1981 RAIL L.H. TURNOUT - R.H. SWITCH AND STOCKRAIL SETTING AND MACHINING DETAILS
6100	60	250-1083	CV0255797	STANDARD 6100 HEELED SWITCH 60KG - 1981 RAIL R.H. TURNOUT - R.H. SWITCH AND STOCKRAIL SETTING AND MACHINING DETAILS

Table 28 - Level 2 Standard Plans

Switch Length	Rail	Old Plan No.	EDMS No.	Title
6100	60	250-1084	CV0255798	STANDARD 6100 HEELED SWITCH 60KG - 1981 RAIL R.H. TURNOUT - L.H. SWITCH AND STOCKRAIL SETTING AND MACHINING DETAILS
6100	60	250-1085	CV0255799	STANDARD 6100 HEELED SWITCH 60KG - 1981 RAIL R.H. & L.H. TURNOUT DRILLING OF SWITCH & STOCKRAILS
		207-619	CV0068439	SPECIAL HEELBLOCKS; 60kg - 1981 RAIL; 6100 & 9150 FLEXIBLE SWITCHES
9150	60	258-045	CV0235126	STANDARD 9 150 FLEXIBLE SWITCH 60KG - 1981 RAIL R.H. & L.H. TURNOUT DRILLING OF SWITCH & STOCKRAILS
6100	60	258-209	CV0068460	STANDARD 6100 FLEXIBLE SWITCH 60kg-1981 RAIL; R.H. TURNOUT- L.H. SWITCH AND STOCKRAIL; SETTING AND MACHINING DETAILS
6100	60	258-210	CV0068461	STANDARD 6100 FLEXIBLE SWITCH 60kg-1981 RAIL; R.H. TURNOUT- R.H. SWITCH AND STOCKRAIL; SETTING AND MACHINING DETAILS
6100	60	258-211	CV0068462	STANDARD 6100 FLEXIBLE SWITCH 60kg-1981 RAIL; L.H. TURNOUT- L.H. SWITCH AND STOCKRAIL; SETTING AND MACHINING DETAILS
6100	60	258-212	CV0068463	STANDARD 6100 FLEXIBLE SWITCH 60kg-1981 RAIL; L.H. TURNOUT- R.H. SWITCH AND STOCKRAIL; SETTING AND MACHINING DETAILS
6100	60	258-213	CV0068464	STANDARD 6100 FLEXIBLE SWITCH 60kg-1981 RAIL; R.H. & L.H. TURNOUT; DRILLING OF SWITCHES & STOCKRAIL
		207-1095	CV0255670	60 KG EXPANSION SWITCH CURVING DIAGRAMS
Xing rate	**Rail**	**Old Plan No.**	**EDMS No.**	**Title**
V Crossings				
8.25	50	480-956	CV0169729	SPECIAL 1 in 8.25 'V' CROSSING; 50KG - 1981 RAILS; GENERAL LAYOUT FOR CAT.XL282 & 287
	50	480-957	CV0169732	STANDARD 1 in 8.25 'V' CROSSING; 50kg - 1981 RAIL; DRILLING, SETTING & MACHINING OF WINGRAILS FOR CAT.XL280-289
	53	157-584	CV0246824	STRAIGHT 1 IN 8.25 V CROSSING 53 KG - 1977 RAILS GENERAL LAYOUT FOR CAT XL 280 & CAT XL 281
	53	157-594	CV0246829	CURVED 1 IN 8.25 V CROSSING 53 KG - 1977 RAILS GENERAL LAYOUT FOR CAT XL 282 & XL 284
	53	157-712	CV0119496	CURVED 1 IN 8.25 "V" CROSSING; 53kg - 1977 RAILS; GENERAL LAYOUT FOR CAT. XL 287 & XL 289
	60	425-366	CV0065952	STANDARD 1 IN 8.25 'V' CROSSING; 60kg - 1981 RAILS; GENERAL LAYOUT FOR CAT XL 280

Table 28 - Level 2 Standard Plans

Xing rate	Rail	Old Plan No.	EDMS No.	Title
9	50	480-1095	CV0169736	STD 1 IN 9 V CROSSING 50KG 1981 RAILS GENERAL LAYOUTS FOR CAT. XL 290 & 291
	53	153-303	CV0254483	STRAIGHT 1 IN 9 V CROSSING 53KG 1977 RAILS GENERAL LAYOUT FOR CAT XL290 & CAT XL291
	60	425-374	CV0170490	STANDARD 1 IN 9 'V' CROSSING; 60kg - 1981 RAILS; GENERAL LAYOUT FOR CAT XL 290
	60	425-379	CV0170495	STANDARD 1 IN 9 'V' CROSSING; 60kg 1981 RAILS; GENERAL LAYOUT FOR CAT. XL 291
10.5	50	480-1101	CV0169741	STD 1 IN 10.5 V CROSSING 50KG 1981 RAILS GENERAL LAYOUTS FOR CAT. XL 300/301
	53	157-571	CV0106047	STRAIGHT 1 IN 10.5 "V" CROSSING; 53kg 1977 RAILS; GENERAL LAYOUT FOR CAT XL300 & CAT XL 301
	60	425-382	CV0170498	STANDARD 1 IN 10.5 'V' CROSSING; 60kg - 1981 RAILS; GENERAL LAYOUT FOR CAT. XL 300
	60	425-387	CV0170503	STANDARD 1 IN 10.5 'V' CROSSING; 60kg 1981 RAILS; GENERAL LAYOUT FOR CAT. XL 301
	60	258-224	CV142533	STANDARD 1 in 10.5 V CROSSING; RAIL BOUND MANGANESE STEEL 60kg RAIL; GENERAL ARRANGEMENT FOR CAT XL300/1
15	60	425-398	CV0170514	STANDARD 1 IN 15 'V' CROSSING; 60kg - 1981 RAILS; GENERAL LAYOUT FOR CAT XL 350
	60	425-403	CV0170519	STANDARD 1 IN 15 'V' CROSSING; 60kg 1981 RAILS; GENERAL LAYOUT FOR CAT XL 351
	60	1664-50558	CV0235217	STANDARD 1IN 15 V CROSSING RAIL BOUND MANGANESE STEEL 60 KG. RAIL GENERAL ARRANGEMENT FOR CAT 350/1
	60	258-389	CV0235178	STANDARD 1 IN 15 V CROSSING RAIL BOUND MANGANESE STEEL 60KG - 1981 RAIL MANGANESE STEEL INSERT DETAILS
K Crossings				
8.25	53	258-942	CV0235193	STANDARD 1 IN 8.25 K CROSSING FOR STANDARD PANDROL PLATED DIAMOND 53KG 1981 RAIL GENERAL LAYOUT

Table 28 - Level 2 Standard Plans

Xing rate	Rail	Old Plan No.	EDMS No.	Title
V Crossing Details				
7.5	60	PW-204	CV0420944	STANDARD 1 IN 7.5 V CROSSING 60KG - 1981 RAIL DETAILS FOR CAT. NO. XL270
8.25	50	PW-063	CV0421060	CURVED 1 IN 8.25 V X`ING. 50KG. - 1981 RAIL DETAILS FOR XL 284
		PW-067	CV0421057	CURVED 1 IN 8.25 V XING. 50KG - 1981 RAIL DETAILS FOR XL 289
	60	PW-016	CV0421106	CURVED 1 IN 8.25 V XING 60KG - 1981 RAIL DETAILS FOR CAT XL282
		PW-017	CV0421105	CURVED 1 IN 8.25 V XING 60KG - 1981 RAIL DETAILS FOR CAT. XL289
		PW-030	CV0421092	CURVED 1 IN 8.25 V CROSSING 60KG 1981 RAIL DETAILS FOR CAT. XL 287
		PW-031	CV0421091	CURVED 1 IN 8.25 V CROSSING 60KG 1981 RAIL DETAILS FOR CAT. XL 284
10.5	50	PW-081	CV0421056	CURVED 1 IN 10.5 V CROSSING 50KG - 1981 RAIL DETAILS FOR XL 307
K Crossing Details				
7.5	60	PW-205	CV0420943	STANDARD 1 IN 7.5 K CROSSING 60KG - 1981 RAIL DETAILS FOR CAT. NO. XL2603
8.25	50	480-1105	CV0169753	1 IN 8.25 V CROSSING 50KG 1981 RAIL DETAILS OF CHOCKS A, B, B1, C, D, D1, E, F.
	53	157-911	CV0246894	SPECIAL 1 IN 8¼ K CROSSING FOR STANDARD PANDROL PLATED DOUBLE SLIP 53 KG 1977 RAIL GENERAL LAYOUT FOR INSULATED JOINTS - CAT. XL 2285, 2286.
		157-914	CV0246897	SPECIAL 1 IN 8.25 K CROSSING FOR STD. PANDROL PLATED SLIPS. 53KG 1977 RAILS C,D,D1,E & F CAT XL 2285 & 2286.
	60	PW-169	CV0420976	SPECIAL 1 IN 8.25 K CROSSING 60KG - 1981 RAIL DETAIL FOR XL 2576
		425-370	CV0170486	STANDARD 1 IN 8.25 V CROSSING 60 KG - 1981 RAIL DETAILS OF CHOCKS A,B,B1,C,D,D1,E,F
		425-371	CV0170487	STANDARD 1 IN 8.25 'V' CROSSING; 60kg 1981 RAILS; GENERAL LAYOUT FOR CAT XL 281
		425-372	CV0170488	STANDARD 1 IN 8.25 V CROSSING 60 KG - 1981 RAIL DRILLING, SETTING AND MACHINING OF POINT & HOUSED RAILS FOR CAT. XL 281
		425-373	CV0170489	STANDARD 1 IN 8.25 V CROSSING 60 KG - 1981 RAIL MACHINING OF V POINT ASSEMBLY FOR CAT. XL 281
9	60	425-377	CV0170493	STANDARD 1 IN 9 V CROSSING 60 KG - 1981 RAIL MACHINING OF V POINT ASSEMBLY FOR CAT. XL 290

Table 28 - Level 2 Standard Plans				
Xing rate	**Rail**	**Old Plan No.**	**EDMS No.**	**Title**
10.5	50	480-1102	CV0169742	STANDARD 1 IN 10.5 V CROSSING 50KG 1981 RAIL DRILLING, SETTING AND MACHINING OF WINGRAILS FOR CAT. XL 300 - 309
		480-1103	CV0169743	STANDARD 1 IN 10.5 V CROSSING 50KG/M - 1981 RAILS DRILLING, SETTING & MACHINING OF POINT RAIL AND HOUSED RAIL FOR CAT. XL 300, 302 & 306
		480-1104	CV0169744	STANDARD 1 IN 10.5 V CROSSING 50KG/M - 1981 RAILS DRILLING, SETTING & MACHINING OF POINT RAIL AND HOUSED RAIL FOR CAT. XL 301, 303 & 307.
		480-1244	CV0169755	1 IN 10.5 V CROSSING 50KG 1981 RAIL DETAILS OF CHOCKS A, B, B1, C, D, D1, E, F.
	60	258-225	CV142534	STANDARD 1 in 10.5 V CROSSING; RAIL BOUND MANGANESE STEEL 60kg RAIL; MANGANESE STEEL INSERT DETAILS
		258-226	CV142535	STANDARD 1 in 10.5 V CROSSING; RAIL BOUND MANGANESE STEEL 60kg RAIL; WING RAIL AND HEEL; RAIL DETAILS
		207-182	CV0255161	HEAT TREATMENT OF CROSSINGS MINIMUM REQUIREMENTS
	47,53	207-561	CV0215632	H.T.S. BOLT NUT & C.S. WASHERS; FOR 'V' & 'K' CROSSINGS; 47 & 53kg/m 1981 RAILS
Checkrail Details				
	41,50	480-785	CV0169716	STANDARD CHECKRAIL; 41KG & 50KG RAIL
	53,60	310-1019	CV0068469	STANDARD CHECKRAILS; 53kg & 60kg RAIL
8.25		201-696	CV0368846	STANDARD CHECKRAIL UNITS 1 IN 8.25 XINGS. SETTING OUT DETAILS
10.5		201-695	CV0068424	STANDARD CHECKRAIL UNITS; 1 in 10.5 XINGS; SETTING OUT DETAIL
Old Plan No.	**EDMS No.**	**Title**		
Catchpoint Details				
180-618	CV0068422	CATCH POINT - 6100x60kg; PANDROL PLATED RAMP BLOCK DETAILS		
207-70	CV0068442	CATCH POINT - 5030x53kg; PANDROL PLATED RAMP BLOCK DETAILS		
580-716	CV169478	CATCHPOINT 6100 FLEXIBLE SWITCH, CONCRETE TIES STEELWORK DETAILS FOR R.H. SWITCH		
Joint Details				
207-1232	CV0255683	STANDARD FISHPLATE 50KG - 1981 RAIL MANUFACTURING DETAILS		
207-1218	CV0255680	INSULATED JOINT PLATE TYPE SI J-R FOR USE IN 60KG TURNOUTS		
ST-23	CV0465262	FISHBOLTS DETAILS OF MANUFACTURE		
Plates				
F-3501	CV0448878	SLEEPER PLATES DOUBLE SHOULDERED 94 LB. RAILS FOR USE WITH DOG SPIKES & ANCHOR SPIKES.		
F-3940	CV0240445	FLAT SLEEPER PLATE DOUBLE SHOULDERED FOR USE IN 107 LB LEADS		

Table 28 - Level 2 Standard Plans		
Old Plan No.	**EDMS No.**	**Title**
SP-498	CV0465440	SPECIAL DOUBLE SHOULDERED SLEEPER PLATE FOR USE IN LEADS. 107LB CAT. NO 424
205A-635	CV0239359	CANT REDUCING PLATES TYPE 431A,432A,433A FOR USE WITH A.S. 47K.G. & 50K.G. RAIL
205A-628	CV0239326	D.S. SLEEPER PLATE TYPE 434A FOR USE WITH A.S. 47K.G. & 50K.G. RAIL
205A-629	CV0239353	D.S. SLEEPER PLATE TYPE 435A FOR USE WITH A.S. 47K.G. & 50K.G. RAIL
205A-633	CV0239357	D.S. SLEEPER PLATE TYPE 470A-475A FOR USE WITH A.S. 47K.G. & 50K.G. RAIL
207-1279	CV0068437	CANT REDUCING PLATES TYPE 489C, 488C, 487C FOR USE ON CONCRETE TIES
SP-509	CV0465452	STANDARD TRACK PLATES 107LB AND 94LB.
91-42	CV0364507	SWITCH POINT LAYOUT 94 A.S. 1937 & 107A.S. 1936 RAILS PLATING DETAILS FOR RAIL BRACE PLATS NºS. 160 TO 180
207-1093	CV0068431	DOUBLE PANDROL CLIP PLATE; FOR USE IN 60kg TURNOUTS
207-1244	CV0068433	'PCR 50' BASEPLATE
207-1253	CV0068434	REFORMED FLAT 50kg D.S. SLEEPER PLATE - TO TAKE TYPE e2003 PANDROL CLIP. CAT.650
207-1255	CV0068435	SINGLE PANDROL CLIP PLATE FOR USE IN 50kg TURNOUTS
207-1256	CV0068436	DOUBLE PANDROL CLIP PLATE FOR USE IN 50kg TURNOUTS
207-903	CV0068447	SINGLE PANDROL CLIP PLATE; FOR USE IN 60kg TURNOUTS
207-941	CV0068448	PCR BASEPLATE
91-172	CV0068480	TYPE 'I' BASEPLATE
91-173	CV0065407	TYPE 'U' BASEPLATE Nºs PU-490 TO PU-553; SHEET 1 of 3
91-174	CV0068481	TYPE 'V' BASEPLATE
91-176	CV0068483	TYPE 'X' BASEPLATE
91-177	CV0068484	TYPE 'Y' BASEPLATE; Nºs. PY-260 TO PY-349; SHEET 1 of 3
91-178	CV0068485	TYPE 'Z' BASEPLATE
91-193	CV0068491	TYPE 'U' BASEPLATE; Nºs. PU-554 TO PU-617; SHEET 2 OF 3
91-194	CV0068492	TYPE 'U' BASEPLATE; Nºs. PU-618 TO PU-681; SHEET 3 OF 3
91-195	CV0068493	TYPE 'Y' BASEPLATE; Nºs. PY-350 TO PY-439; SHEET 2 OF 3
91-196	CV0068494	TYPE 'Y' BASEPLATE; Nºs. PY-440 TO PY-560; SHEET 3 OF 3
Fastenings		
205A-374	CV0024139	27mm SCREWSPIKE; FOR USE WITH 60kg SWITCHES
205A-381	CV0255599	24 MM SCREWSPIKE FOR USE ON CONCRETE TIES
205A-613	CV0239322	`60C` HEX. HEAD SCREWSPIKE 24MM DIA. FOR CONCRETE TIES

Table 28 - Level 2 Standard Plans		
Old Plan No.	**EDMS No.**	**Title**
	CV0046205	DOGSPIKE
205A-375	CV0024140	60kg TYPE; 27mm SCREW SPIKE GAUGE
205A-382	CV0255600	24 MM SCREWSPIKE GAUGE
849-577	CV0169248	DOUBLE CLIP WASHER FOR USE ON 1 IN 10.5 - 60KG L.H. TURNOUT WITH CONCRETE TIES
849-824	CV0255230	DOUBLE CLIP WASHER FOR USE ON 1 IN 15 - 60 KG R.H. TURNOUT WITH CONCRETE TIES
849-825	CV0255231	DOUBLE CLIP WASHER FOR USE ON 1 IN 15 - 60 KG L.H. TURNOUT WITH CONCRETE TIES
205A-571	CV0239320	DOUBLE CLIP WASHER FOR USE ON 1 IN 10.5 - 60 K.G. TURNOUTS WITH CONCRETE TIES
207-1217	CV0255679	STANDARD INSULATING FERRULE AND WASHER FOR CONCRETE TIES.
385-497	CV0058567	PADULLA RESILIENT PADS, WASHERS AND FERRULES FOR USE WITH CONCRETE TIES
645-353	CV0170812	STANDARD 1 IN 15 R.H. TURNOUT 60KG-1981 RAIL - R.B.M. STRAIGHT CROSSING RESILIENT PAD DETAILS
645-372	CV0237034	STANDARD 1 IN 15 L.H. TURNOUT 60KG-1981 RAIL-R.B.M. STRAIGHT CROSSING RESILIENT PAD DETAILS
849-576	CV0169247	STANDARD 1 IN 10.5 L.H. TURNOUT 60KG - 1981 RAIL - R.B.M. STRAIGHT CROSSING RESILIENT PAD DETAILS
189-1284	CV0255017	STANDARD 1 IN 10.5 R.H. TURNOUT 60KG - 1981 RAIL R.B.M. STRAIGHT CROSSING RESILIENT PAD DETAILS
850-747	CV0011324	STANDARD 1 IN 8.25 R.H. & L.H. TURNOUT 60KG . RAIL - XING CAT. XL282 & XL287 DETAILS OF RESILIENT PADS
580-719	CV0169481	CATCHPOINT - 60KG 6100 FLEXIBLE SWITCH, CONCRETE TIES CONCRETE TIE PAD DETAILS
	CV0365884	TANGENTIAL TURNOUTS - SPIKING PLATE FOR SPIKING OF TANG. SWITCHES ON CONCRETE BEARERS
Tie details		
205A-344	CV0255595	SRA CONCRETE SLEEPER OUTLINE
207-811	CV0105995	WHITTINGHAM STANDARD FLAT BED CONCRETE TIE
785-573	CV0170201	FLAT CONCRETE TIE FOR USE WITH FLAT OR CANT REDUCING PLATES CONCRETE SLEEPER DETAILS
91-179	CV0068486	PANDROL SHOULDER DETAILS
385-483	CV0170662	STANDARD 6 100 FLEXIBLE SWITCH 60KG/M - 1981 RAIL DETAILS OF CONCRETE TIES
645-447	CV0170820	STANDARD 9150 FLEXIBLE SWITCH 60KG/M - 1981 RAIL DETAILS OF CONCRETE TIES
580-717	CV0169479	CATCHPOINT - 60kg; 6100 FLEXIBLE SWITCH, CONCRETE TIES; GENERAL ARRANGEMENT - CONCRETE TIES
580-718	CV0169480	CATCHPOINT - 60KG 6100 FLEXIBLE SWITCH, CONCRETE TIES CONCRETE TIE DETAILS
575-336	CV0011322	STANDARD 1 IN 8.25 R. H. TURNOUT 60KG. RAIL - XING CAT. XL 282 DETAILS OF CONCRETE TIES FOR SECTION A & B
575-337	CV0011323	STANDARD 1 IN 8.25 L. H. TURNOUT 60KG. RAIL - XING CAT. XL 287 DETAILS OF CONCRETE TIES FOR SECTION A & B
320-1283	CV0171460	STANDARD 1 IN 10.5 R.H. TURNOUT 60KG - 1981 RAIL R.B.M. STRAIGHT CROSSING DETAILS OF CONCRETE TIES FOR I IN 10.5 T.O. SECTION A & B.

Table 28 - Level 2 Standard Plans		
Old Plan No.	**EDMS No.**	**Title**
720-437	CV0065195	STANDARD 1 IN 10.5 L.H. TURNOUT 60KG - 1981 RAIL - R.B.M. STRAIGHT CROSSING DETAILS OF CONCRETE TIES FOR SECTIONS A & B
720-209	CV0065152	STANDARD 1 IN 15 R.H. TURNOUT 60 KG - 1981 RAIL - R.M.B STRAIGHT CROSSING DETAILS OF CONCRETE TIES FOR SECTIONS A AND B
720-210	CV0065153	STANDARD 1 IN 15 L.H. TURNOUT 60KG - 1981 RAIL - R.B.M. STRAIGHT CROSSING DETAILS OF CONCRETE TIES FOR SECTIONS A AND B
Braces and chairs		
205A-370	CV0024138	SPECIAL BOLTS; TO BE USED WITH 60kg SWITCHES; AND CONCRETE TIES SWITCHES
91-170	CV0365141	RAIL BRACE BOLT
91-171	CV0365142	RAIL BRACE HOLDING DOWN BOLTS AND HEAD LOCK WASHER
91-187	CV0215547	CHAIR BOLT; CAT. NO. 3
91-188	CV0365143	SPECIAL CHAIR BOLT CAT. Nº5 TO 25 INCLUSIVE
91-191	CV0365145	HOUSING BOLT
91-150 to 91-167		RAIL BRACE PLATE Nº161 - 178
91-157	CV0068477	RAIL BRACE PLATE Nº.168
91-158	CV0068478	RAIL BRACE PLATE Nº.169
91-159	CV0076212	RAIL BRACE PLATE Nº.170
205A-354	CV0068427	RAIL BRACE PLATE; Nº. 179
205A-355	CV0068428	RAIL BRACE PLATE; Nº. 180
207-683	CV0068440	RAIL BRACE PLATE Nº.293(FOR USE ON CONCRETE TIES)
207-685	CV0068441	RAIL BRACE PLATE Nº.294(FOR USE ON CONCRETE TIES)
205A-760	CV0068429	RAIL BRACE PLATE; Nº.295(FOR USE ON CONCRETE TIES)
207-1089	CV0255665	RAIL BRACE PLATE TYPE ET (FOR USE ON EXPANSION SWITCH ON TIMBER TIES)
207-1090	CV0255666	RAIL BRACE PLATE TYPE EC (FOR USE ON EXPANSION SWITCH ON CONCRETE TIES)
207-1091	CV0255667	RAIL BRACE PLATE Nº EX (FOR USE ON EXPANSION SWITCH ON CONCRETE TIES)
91-169	CV0365140	MALLEABLE IRON RAIL BRACE TYPE 4: 47KG A.S. 1977 RAILS
91-168	CV0068479	MALLEABLE IRON RAIL BRACE TYPE 3; 53kg A.S. 1977 RAIL
207-599	CV0068438	CAST RAIL BRACE; TYPE 5; 60kg A.S.1981 RAILS
91-181	CV0215545	STANDARD M.S. 'B' CHAIR

Table 28 - Level 2 Standard Plans		
Old Plan No.	**EDMS No.**	**Title**
91-182	CV0068487	STANDARD M.S. 'C' CHAIR
91-184	CV0068489	M.S. LONG D CHAIR
91-183	CV0068488	STANDARD M.S. 'D' CHAIR
197-311	CV0023888	STANDARD M.S.'D' CHAIR; FOR ; 60kG - 1981 RAIL
197-312	CV0023889	M.S. LONG D60 CHAIR FOR; 60kg. - 1981 RAIL
91-185	CV0068490	STANDARD M.S. 'S.R.' CHAIR
91-186	CV0215546	STANDARD M.S. 'C.R.' CHAIR
91-190	CV0365144	HOUSING CHAIR TYPE 3

Table 29 Deleted Standard Plans

FOR REFERENCE ONLY - DO NOT USE

Old Plan No.	EDMS No.	Title	Replaced by
157-566	CV0068419	STANDARD CHECK RAILS; 47kg AND 53kg RAIL	310-1019
205A-211	CV0255570	C.S. TAPERED & HEADLOCK WASHERS FOR DIA. 30 V CROSSING BOLTS. 47 & 53 KG/M 1977 RAILS.	207-561
205A-323	CV0023890	FISHBOLTS; A INCLUDED IN SCHEDULE 89 ONLY	AS 1085.4
207-333	CV0255182	M30 BOLT & NUT AND SPRING WASHER	Bolt requirements deleted. Washer requirements replaced by AS 1085.7 Type 1 single coil
207-627	CV0255767	STANDARD FISHPLATE 60KG.-1981 RAIL MANUFACTURING DETAILS	AS 1085.2 Type A
91-14	CV0365158	CAST STEEL RAIL BRACE 107 A.S. 1936 RAIL	91-44
91-22	CV0364493	STANDARD V. CROSSINGS 107 A.S. 1936 RAIL LAYOUT OF TRACK PLATES 1 IN 12 TO 1 IN 16	REDUNDANT
91-39	CV0364504	HOUSING CHAIR TYPE 3 AMENDED DESIGN	91-190
91-41	CV0364506	RAIL BRACE PLATES FOR 107 A.S 1936 & 94 A.S 1937 RAILS DETAILS OF PLATES	91-152 to 91-167 and 91-170
91-44	CV0448761	MALLEABLE IRON RAIL BRACE TYPE 3: 107 A.S. 1936 RAILS TYPE 4: 94 A.S. 1937 RAILS	91-168
91-189	CV0263347	LOCKSPIKE TYPE L1	AS 1085.13 Type 1
91-203	CV0215548	TAPERED PANDROL; PLATE; CAT. NO.486	AS 1085.2
91-204	CV0024161	CANT. REDUCING PANDROL PLATE CAT Nº 487, 488, 489.	AS 1085.2
91-205	CV0024162	FLAT PANDROL PLATE CAT Nº 485	AS 1085.2
F-1851	CV0242974	HOUSING BOLT TYPE 2	
F-3787	CV0240403	STANDARD 7/8 INCH DIA. DOG SPIKE	CV0046205
SP-402	CV0465356	FLAT SLEEPER PLATES AT INSULATED JOINTS	REDUNDANT
SP-440	CV0465391	SLEEPER PLATES CANT REDUCING	SP-508
SP-508	CV0465451	DOUBLE SHOULDERED SLEEPER PLATES CANT REDUCING	205A-635
SP-516	CV0465458	`LOCKSPIKE` - TYPE L6	AS 1085.13 Type 6
SP-517	CV0465459	`GAUGE LOCKSPIKE` - TYPE LG 19	Redundant
SP-520		DOUBLE SHOULDERED SLEEPER PLATE 485	91-205

Table 29 Deleted Standard Plans

FOR REFERENCE ONLY - DO NOT USE

Old Plan No.	EDMS No.	Title	Replaced by
ST-204	CV0465221	STANDARD TRACK PLATES 107 LB. AND 94 LB.	SP-509
ST-217	CV0465228	B.C. RAIL ANCHORS DETAILS FOR ORDERING ASSEMBLING AND FIXING TO RAIL	Redundant
ST-223	CV0465235	ANCHORING OF LEADS AND DIAMONDS	ESC 220