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CRN CS 200

Standard

Track System

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1. Purpose scope and application

This Standard is the "head" standard for Track. It establishes functional and performance requirements for track. It establishes specific characteristics and, where necessary, limitations to be incorporated in any final design solution.

It is applicable to all new and existing Country Regional Network (CRN) track. It applies to the following elements and attributes of track infrastructure:

- Track system - including geometry, stability and transit space
- Rail - including rail joints and rail-to-- rail fastenings
- Sleepers and track support, including rail-to-sleeper fastenings, direct fixation systems, sleeper plates and pads
- Ballast
- Special trackwork - including turnouts, diamonds, catchpoints, slips and expansion switches
- Formation width and earthworks profile.

It includes the requirements for mainlines, sidings and yards.

The standard also contains definitions of standard terminology (see Appendix 2).

The standard applies for all new works, or where a significant alteration to the existing infrastructure occurs and incorporation of the requirements is strategically necessary to progress its general adoption. Small alterations or additions to existing infrastructure may employ the existing track configuration at that location.

2. References

2.1. Australian and International Standards

AS 4292 – Railway Safety Management

Unless otherwise specified, all references relate to the latest standard versions, including amendments and relevant superseding standards.

2.2. CRN documents

CRN RM 001 - Train Operating Conditions Manual (TOC Manual) Working Timetable

CRN CS 100 – Civil Technical Maintenance Plan CRN CS 210 - Track Geometry & Stability

CRN CS 215 – Transit Space CRN CS 220 – Rail and Rail Joints

CRN CS 230 – Sleepers and track support CRN CS 240 – Ballast

CRN CS 250 – Turnouts and Special Trackwork CRN CS 310 – Underbridges

CRN CS 410 – Formation and Earthworks CRN CP 204 – Product Approval

CRN CP 206 – Track Construction

CRN CM 001 – Civil Technical Competencies and Engineering Authority

CRN CM 101 – Civil Services Schedules

CRN CM 202 to CRN CM 251 – Track Engineering Manuals

CRN CM 203 – Track Inspection

2.3. Other References

Rail Safety National Law (NSW) 2012 and Rail Safety National Law National Regulations 2012

3. Engineering Authority for Track

UGLRL CRN's Principal Track and Civil Engineer exercises Engineering Authority for all track works undertaken on CRN infrastructure.

The Principal Track and Civil Engineer may delegate engineering authority for specified tasks.

4. Functional Requirements

4.1. General

The CRN Track System shall be designed, constructed and maintained to meet the following general criteria:

- Provide a safe and reliable corridor for the passage of all rail traffic
- Be capable of supporting the operation of rail traffic at the designated loads and speeds for each section of track
- Provide a path for signalling circuits (where required)
- Conform with transit space requirements
- Meet the specified Availability, Reliability and Maintainability requirements.

The Principal Track and Civil Engineer may approve permanent waivers to the requirements of the standards at specific locations. Where such waivers have been granted, they shall be listed in the relevant standards.

4.2. Operating Environment

This standard has been developed in consideration of the following operational and environmental variables:

- traffic types
- line function (e.g. mixed passenger / freight line, freight only line, siding)
- vehicle speeds, axle loads and gross annual tonnages
- longitudinal and lateral loads generated by rolling stock
- requirements for track signalling circuits
- Rail temperature range - Thermal expansion and contraction forces act on rail within a temperature range from –10°C to 75°C.
- Air temperature range - –10°C to 45°C
- The operating environment may also include potentially corrosive situations such as wet tunnels, salty atmospheres and locations subject to chemical contamination.

4.3. Operating Concept

Track systems shall be designed, constructed and maintained to a track class suitable for the axle loads and speeds specified in Table 1.

Table 1 - Train Speed and Axle Load-Main Line

Track Class	Max Axle Load (Tonnes)	Max Train Operating Speed – H.S Passenger (KM/hr)	Max Train Operating Speed – Passenger (KM/hr)	Max Train Operating Speed – Freight (KM/hr)	Nominal Maximum MGT/year
1	25	160	115	80	10
2	21	140	100	80	6
3/3G	19	100	100	70	5
5	19	-	-	40	1

Note: These figures indicate the governing design speed and axle load for the design of the track structure

Table 2 - Train Speed and Axle Load - Siding

Track Class	Max Axle Load (Tonnes)	Max Train Operating Speed – H.S Passenger (KM/hr)	Max Train Operating Speed – Passenger (KM/hr)	Max Train Operating Speed – Freight (KM/hr)	Nominal Maximum MGT/year
1	25	25	25	25	6
2	21	25	25	25	6
3	19	25	25	25	5
5	19	-	-	25	1

Note: These figures indicate the governing design speed and axle load for the design of the track structure

The maximum speeds and axle loads shown in Table 1 are for the purposes of design/ configuration. The definitive speed and axle load conditions for all rolling stock (which may be higher than the nominal maximum axle load or speed shown in Table 1& 2) are detailed in CRN RM 001 - Train Operating Conditions Manual (TOC Manual) Train Operating Conditions Manual (TOC Manual) or the Working Timetable.

4.4. Operating interfaces

Track infrastructure shall be compatible with and capable of operation with the infrastructure in adjoining sections. New works shall be designed to preserve physical and functional interfaces with adjoining sections and equipment.

4.5. Design Life

Track shall be designed to achieve its projected life operating at the capacity nominated in the relevant Track Class in Table 1. Where a design life is not specified, an indefinite operating life shall be assumed.

The design shall be such as to permit achievement of its projected life, operating at the loading levels specified in Table 1 by appropriate component replacement, repair or refurbishment.

Track configuration shall be selected to minimise the Whole of Life cost of the asset.

4.6. Transit Space Requirements

The design of the track system shall comply with the Transit Space requirements specified in CRN Engineering standard CRN CS 215 – Transit Space Transit Space.

4.7. Maximum speed

Track shall be designed to comply with maximum safe speed requirements defined in CRN Engineering standard CRN CS 210 - Track Geometry & Stability.

The design shall provide for the operation of trains at speeds nominated for the designated Track Class in Table 1.

4.8. Maximum train capacity

Maximum train lengths shall be specified where they may be limited by items such as

- lengths of refuges, loops or sidings etc.
- train handling requirements
- signalling requirements.

4.8.1. Loop and Siding lengths

The maximum loop or siding length shall be determined as the longest section of track free from:

- Controlling signal or related insulated joint(s)
- Clearance post
- Toe of catchpoints or derailer
- Buffer stop

Unless otherwise specified by the Principal Rolling Stock Engineer, the physical length for loops and sidings shall be governed by the Nominal Train Length with an additional placement allowance of 2% rounded up to the nearest metre plus any sighting requirement (as per CRN SD 022).

4.9. Safety

All works shall be designed to comply with the requirements of relevant Commonwealth and New South Wales Legislation for construction, operation and maintenance, in particular the Rail Safety National Law (NSW) 2012 and Rail Safety National Law National Regulations 2012 and AS 4292 Railway safety management.

4.10. Maintenance and maintainability

CRN's existing track assets are to be maintained in accordance with the Civil Technical Maintenance Plan (CRN Engineering standard CRN CS 100 – Civil Technical Maintenance Plan) and a suite of Service Schedules for Track (CRN Engineering manual CRN CM 101 –

Civil Services Schedules). Track assets are to be installed, inspected and maintained in accordance with the procedures documented in Engineering Manuals CRN CM 202 to CRN CM 251 – Track Engineering Manuals. Installation, inspection and maintenance tasks are to be undertaken by people with the competencies documented in CRN Engineering Manual CRN CM 001 – Civil Technical Competencies and Engineering Authority Civil Technical Competencies and Engineering Authority.

When undertaking new track designs, defect limits shall be set for relevant track components that have failure modes with significant impact. Where defect limits and responses are to be developed during the design stage. Defect Limits shall be where possible consistent with CRN Engineering Manual CRN CM 203 – Track Inspection. If they differ from those already specified, they shall be consistent with the response regime documented in CRN Engineering Manual CRN CM 203 – Track Inspection.

Technical Maintenance Plans (TMP) and Service Schedules (SS) shall be prepared and implemented for all track assets, specifying which items are to be maintained, what maintenance is to be carried out and when maintenance is required. Preventive Maintenance tasks already documented in CRN CS 100 – Civil Technical Maintenance Plan and CRN CM 101 – Civil Services Schedules shall be utilised where possible. The TMP and Service Schedules shall be documented in a format that can be readily incorporated into CRN CS 100 – Civil Technical Maintenance Plan and CRN CM 101 – Civil Services Schedules. Installation, inspection and maintenance procedures shall be documented in a format that can be readily incorporated in CRN CM 202 to CRN CM 251 – Track Engineering Manuals.

New designs shall consider and incorporate appropriate solutions for maintenance activities. This includes consideration of;

- access to the site during construction and maintenance
- safe places when undertaking maintenance activities
- distance (and hence time) to attend
- staff training requirements
- knowledge of the equipment

4.11. Construction

CRN has a model technical specification for construction of track (CRN Engineering specification CRN CP 206 – Track Construction).

The specification provides a suite of requirements for track construction that can be included wholly, or in part, in a project specification. Some requirements may not be applicable and some good practice guidelines may be able to be achieved by other means.

Specific CRN standards, manuals and specifications are referred to in this specification. They are mandatory where applicable.

Appropriate sections of the specification shall be incorporated in the design and construction documentation of track works.

4.12. Type Approval

New track components, specialised repair processes and tools are subject to type approval, which is a process that assesses the fitness for purpose of any item from a specified manufacturer for use on the network. Products, manufacturers and processes currently approved for use on CRN track infrastructure are detailed in appendices to CRN Engineering standards CRN CS 220 – Rail and Rail Joints, CRN CS 230 – Sleepers and track support, CRN CS 240 – Ballast and CRN CS 250 – Turnouts and Special Trackwork.

If the design incorporates products (whether new or from a non-approved manufacturer) or processes that are not currently approved for use on CRN track infrastructure, type approval shall be sought in accordance with the requirements of CRN Engineering Specification CRN CP 204 – Product Approval.

The type approval of an item from a specified manufacturer does not necessarily indicate that it is the preferred item for a specific site or operational requirement.

5. Minimum Design Standards for New Track

5.1. Track Geometry

The design of new track and the realignment of existing track shall meet the track geometry requirements established in CRN CS 210 - Track Geometry & Stability. The requirements include:

- Spatial control of track location
- Adoption of geometry, based on defined geometry components (curves and straights) in both horizontal and vertical alignment
- Limits for radius, superelevation, superelevation deficiency, length of horizontal alignment components, transition geometry and grades based on operation of trains at speeds nominated for the designated Track Class in Table 1 & 2.
- Design of track vertical alignment to withstand flooding in accordance with CRN CS 420 Track Drainage. This requirement shall be achieved in conjunction with appropriate hydrology and earthworks design documented in CRN Engineering Standard CRN CS 310 – Underbridges and CRN Engineering Standard CRN CS 410 – Formation and Earthworks Formation and Earthworks.

5.2. Track Stability

The design of new track geometry and structure, and the reconstruction and maintenance of existing track shall meet the track stability requirements established in CRN Engineering standard CRN CS 220 – Rail and Rail Joints. The requirements include:

- Rail neutral temperature of 35°C unless otherwise approved by the Principal Track and Civil Engineer.
- Track structure design capable of providing resistance to lateral movement in the rail temperature range established in Section 4.2.

5.3. Main line track structure – approved configurations

5.3.1. New or reconstructed mainline track

New or reconstructed mainline track shall conform to the minimum requirements shown in Table 2, unless approved by the Principal Track and Civil Engineer. The Track Structure Classification in Table 2 is a function of the Track Class nominated in Table 1. Alternate mainline configurations maybe approved as detailed in Section 5.5.

The default track structure detailed in Table 2 is a ballasted track structure. Track designs, in which the sleepers and/or ballast are replaced by direct fixation in accordance with the requirements of CRN Engineering standard CRN CS 230 – Sleepers and Track Support, are permitted.

Table 3 - Minimum configuration for new or reconstructed mainlines

Track Class	Rail Size (Kg/m)	Rail Adjustment	Ballast Depth	Ballast Grade	Sleepers ≥450m radius	Sleepers <450m radius	Sleepers Fastening
1	60	CWR	270	Standard	Medium Duty Concrete	Heavy Duty Concrete	Elastic (1)
1	53	CWR	270	Standard	Medium Duty Concrete	Heavy Duty Concrete	Elastic (1)
2	50	CWR	270	Standard	Medium Duty Concrete	Heavy Duty Concrete	Elastic (1)
3	53	CWR	150	Standard	Steel	Steel	Elastic
3G	41	CWR	200	Standard	Steel	Steel	Elastic
5	30	Loose Rail	150	Fine	Steel (4)	Steel(4)	Non-Elastic (4)

Note (1) - Where concrete sleepers are utilised, mixed elastic configurations are not permitted. Elastic fastener selection shall be consistent with the adjacent sections of track. Approval from the Track and Civil Manager or delegate is required to install elastic fastener other than e-clip type.

Note (2) - Heavy duty sleepers are to be installed on curves <450m radius. For isolated curved track with ≥ 350m radius, medium duty sleepers may be installed for consistency with adjacent infrastructure.

Note (3) - Alternate rail sizes as per CRN CS 220 Rail and Rail Joints may also be used.

Note (4) - Timber sleepers or equivalent shall be installed at joints

5.3.2. Existing mainline track

Existing track shall conform to the minimum requirements shown in Table 4.

Where approved in individual component standards referenced in Section 8, the following variations are permitted:

- rail size, hardness and welded length
- minimum ballast depth and grade
- sleeper type
- fastening type
- reclaimed components (rail, joint components, sleepers, sleeper fastenings and ballast).

The Track Class for each line section of CRN's current track network is detailed in Appendix 1. Where major track construction is being planned, the Track Class shall be reviewed to establish if it meets CRN's future operating requirements.

Table 4 - Approved Minimum configurations for mainlines

Track Class	Rail Size (Kg/m)	Rail Adjustment	Ballast Depth	Ballast Grade	Sleepers Type	Sleepers Fastening
1	53	CWR	270	Standard	Steel(1)	Elastic
2	47	CWR	270	Standard	Steel	Elastic
3G	53	CWR	150	Standard	Steel	Elastic
3	40	CWR	200	Standard	Steel	Elastic
5	30	Loose Rail	150	Fine	Timber	Non-Elastic

5.4. Siding track structure – approved configurations

Sidings include all tracks not specified in Section 5.3. The classification of sidings also applies to private sidings and yards.

The classification of a siding shall be equivalent to the adjacent mainline unless otherwise specified.

5.4.1. New or reconstructed sidings

New or reconstructed sidings shall conform to the minimum requirements shown in Table 5. Where there is a proposal to not apply minimum requirements, alternate siding configurations may be approved as detailed in section 5.5.

Where approved in individual component standards referenced in Section 8, the following variations are permitted:

- rail size, hardness and welded length
- minimum ballast depth and grade
- sleeper type
- fastening type.

Reclaimed components (rail, joint components, sleepers, sleeper fastenings and ballast) may be used in new sidings in accordance with the requirements of the track elements (see Section 8).

Table 5 - Approved Minimum configurations for sidings

Siding Class	Rail Size (Kg/m)(1)	Rail Adjustment	Ballast Depth	Ballast Grade	Sleepers Type	Sleepers Fastening
1	53	LWR	250	Standard	Timber	Non-Elastic
2	50	LWR	200	Fine	Timber	Non-Elastic
3	41	LWR	150	Fine	Timber	Non-Elastic
5	30	Loose Rail	150	Fine	Timber	Non-Elastic

5.4.2. Existing sidings

Existing sidings may not meet the minimum requirements for new or reconstructed sidings in Table 5.

5.5. Alternate track structure configurations

Value Engineering may be utilised to determine a suitable alternate track structure configuration for new or reconstructed track. In the case of mainline approval from the Principal Track and Civil Engineer must be sought prior to the commencement of design. For sidings, approval is not required prior to commencement of design.

Detailed design of alternative track structure configurations should utilise a combination of empirical and theoretical methods. Suggested methods and applicable limits are provided in CRN CM 005 Track Structure Assessment.

When undertaking design of alternate track structure;

- as a minimum the following factors need to be considered:
    - rail stresses (contact stress and bending stress)
    - rail deflection
    - ballast pressure
    - formation pressures
    - long term plastic deformation of the formation
    - construction and maintenance costs
- the following shall comply with requirements as detailed in the respective standard;
    - rail as per CRN CS 220
    - rail fasteners as per CRN CS 230
    - sleepers as per CRN CS 230
    - ballast as per CRN CS240
    - formation & earthworks as per CRN CS 410

6. Prohibited Configurations

The following configurations are not permitted for permanent works on CRN track work:

- Non-elastic fastening systems with 60kg/m rail
- Non-elastic fastening systems with concrete sleepers
- Non-elastic fastening systems with steel sleepers
- Joints in 60kg rail
- Joints on concrete sleepered track

- Joints may be permitted on concrete sleepered track as a part of temporary works in conjunction with track renewal, restoration or in an emergency. In such cases the design shall include maintenance controls (e.g. speed restriction, increased monitoring).

- Elastic fastenings must not be installed on LWR where this would result in them being more frequent than 1 in 3 unless a management strategy has been approved by the Principal Track and Civil Engineer in accordance with the requirements detailed in CRN CS 230 – Sleepers and track support.

7. Mixed Configurations

There are some limitations and special requirements when configurations are mixed. They are applicable to existing track ONLY. Such as:

- Concrete sleepers may be interspersed with timber sleepers only in accordance with the requirements detailed in CRN CS 230 – Sleepers and track support.
- Steel sleepers may be interspersed with timber sleepers only in accordance with the requirements detailed in CRN CS 230 – Sleepers and track support.
- Elastic fastenings on timber or steel sleepers may be installed as PRS on CWR provided a consistent tie pattern is maintained.

8. Track Elements

Elements of the track structure shall be designed, installed and maintained in accordance with the requirements of Table 6.

Table 6 - Reference Standards for track elements

Element	Reference Standards
Rail and Rail Joints	CRN CS 220 – Rail and Rail Joints
Sleepers and Track Support	CRN CS 230 – Sleepers and track support
Ballast	CRN CS 240 – Ballast
Turnouts and Special Trackwork	CRN CS 250 – Turnouts and Special Trackwork
Formation and Earthworks	CRN CS 410 – Formation and Earthworks

Appendix A System Map

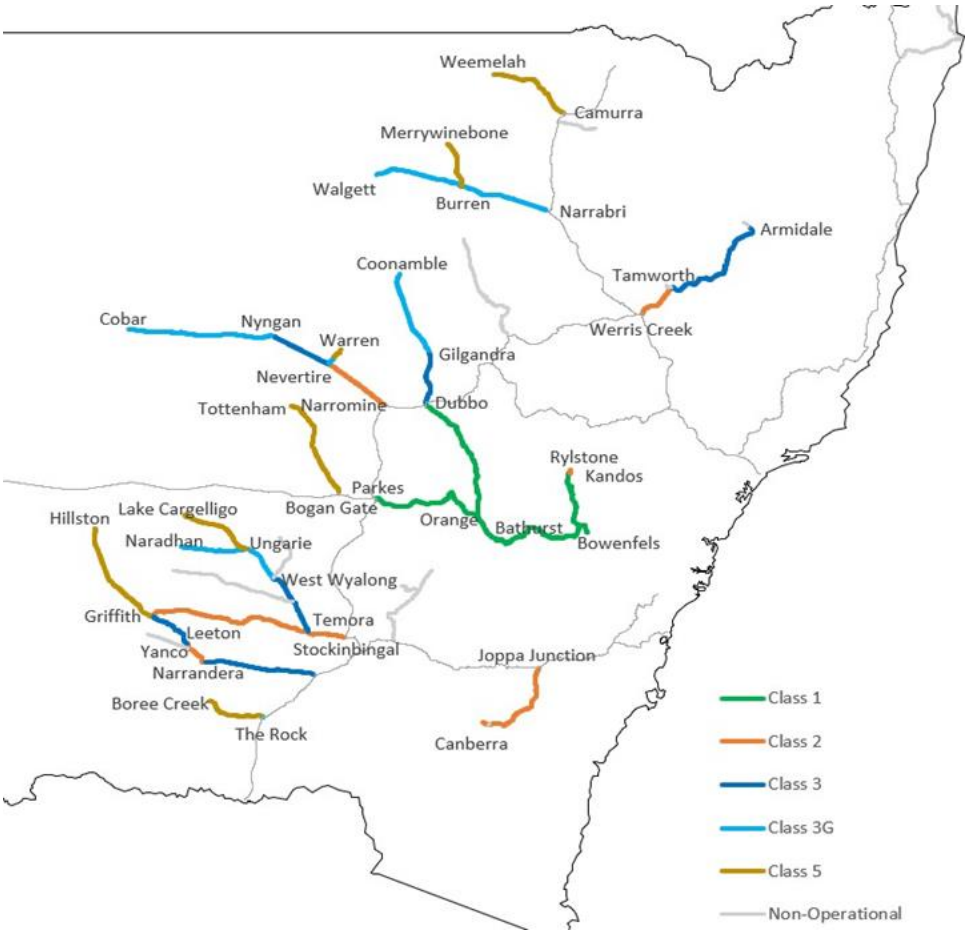

Figure 1 - CRN Network Map with Track Class

Corridor No.	Corridor Location	Start (km)	Finish (km)	Track Class
N00	Werris Creek to West Tamworth	411.201	454.900	Class 2
N00	West Tamworth to Armidale	454.900	579.500	Class 3
N23	Camorra to Weemelah	679.040	762.746	Class 5
N80	Narrabri to Walgett	564.799	733.130	Class 3G
N82	Burren Junction	648.480	649.420	Class 3G
N82	Burren Junction to Merrywinebone	649.420	716.737	Class 5
S45	The Rock	551.075	554.000	Class 3G
S45	The Rock to Boree Creek	554.00	607.763	Class 5
S50	Joppa Junction to Queanbeyan	230.610	322.500	Class 2
S54	Queanbeyan to Canberra	321.665	329.663	Class 2

S70	Stockingbingal to Temora	454.906	489.433	Class 2
S70	Temora to West Wyalong	489.433	553.900	Class 3
S70	West Wyalong to Ungarie	553.900	597.811	Class 3G
S70	Ungarie to Lake Cargelligo	597.811	669.175	Class 5
S78	Ungarie to Naradhan	597.803	658.251	Class 3G
S80	Junee to Narandera	486.021	584.032	Class 3
S80	Narandra to Yanco	584.032	605.812	Class 2
S85	Yanco to Leeton	605.812	614.273	Class 2
S85	Leeton to Griffith	614.273	660.478	Class 3
S86	Temora to Griffith	489.433	640.689	Class 2
S86	Griffith to Hillston	605.812	748.045	Class 5
W00	Bowenfels to Orange	158.800	379.000	Class 1
W00	Orange to Dubbo	379.000	460.890	Class 1
W00	Narromine to Nevertire	497.809	564.000	Class 2
W00	Nevertire to Nyngan	564.000	622.462	Class 3
W20	Orange to Parkes	320.813	446.950	Class 1
W32	Bogan Gate to Tottenham	486.050	598.446	Class 5
W34	Orange to Parkes	627.491	628.744	Class 1
W43	Nevertire to Ascott	563.930	580.300	Class 3G
W43	Ascott to Warren	580.300	584.089	Class 5
W44	Nyngan to Cobar	627.000	754.700	Class 3G
W50	Wallerawang to Kandos	171.920	249.368	Class 1
W50	Kandos to Rylstone	249.368	257.330	Class 2
W61	Troy Junction to Gilgandra	466.231	526.000	Class 3
W61	Gilgandra to Coonamble	526.000	616.175	Class 3G

Definition

Term	Description
A	
Actual Measured Rail Temperature	The temperature measured on shaded rail web by an approved measuring device.
Alignment	The horizontal position of a track measured in relation to survey marks. The measurement of alignment is from survey marks to the line rail.
Alignment Index	The ratio of Curve Radius (m) to length of the Curve (m). Used in the calculation of track stability.
Aluminothermic Welding	Field welding by any process using an Aluminothermic type reaction.
Aluminothermic Welding Gap	The gap required between the rail ends to be welded together by aluminothermic welding.
Anchor Point	A section of track in which the rails are anchored to sleepers or bearers to prevent any longitudinal rail movement. The securely-anchored track section provides a stable platform for managing rail-stress adjustment.
Approved track components	Products approved for use on CRN track infrastructure.
B	
Back Canting	Rails are normally inclined 1:20 towards the track centreline. Back canting is where rails are tilted towards the field side of this normal position (typically due to timber sleeper wear).
Ballast	Free draining coarse aggregate or metallurgical slag used to support railway tracks.
Ballast Cleaning	Process for removing fines from in-track ballast by removing the ballast from the track, sieving it and returning graded ballast to the track in a continuous operation. Often includes addition of new ballast.
Ballast Depth	Distance from the formation level to the base of the sleeper below the lowest rail seat.
Ballast Shoulder Height	Height of the shoulder ballast above the sleeper base as measured at the end of the sleeper.
Ballast Shoulder Width	Width of the shoulder ballast as measured from the sleeper end to the edge of the shoulder.
Base Operating Limits	The limits of track conditions outside which, operating restrictions will apply.
Bearer	A type of sleeper used under points and crossing track structures. Bearers are generally larger in dimension than standard sleepers to provide support for both tracks, as well as the increased loading experienced under such track structures.

Beater Packing	Process for tightly packing ballast under sleepers using manual methods (includes hand tools and small motor-driven machinery).
Bend	The point of intersection of two straights.
Bonded Insulated Joint	A pre-assembled rail joint consisting of rail sections connected by high-strength, purpose- designed fishplates and connecting bolts reinforced by a high-strength, insulating bonding material. The joint provides electrical insulation between the connected rail ends via the insulating resin.
Box anchor	Application of four (4) rail anchors to a sleeper, that is, two (2) to each rail with one on each side of the sleeper.
Boxing Up	Process for establishing correct ballast profile by laying ballast in sleeper cribs and on shoulders.
Buckle	See Misalignment.
C	
Cant - Rail	The inclination of the base of the rail relative to the sleeper base.
Cant - Track	See "Superelevation"
Cast in shoulder	A component in concrete sleepers and bearers that prevents lateral movement of the rail foot and provides anchorage for the resilient fastening system.
Cast - in synthetic Insert	A component in concrete bearers that allows a screwspike to provide lateral restraint for turnout switch plates.
Catch points	A single switch assembly and a throw-off rail. The catch point 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 mainline.
Centre Binding	Where there is greater bearing pressure below the centre of the sleeper compared to the ends of the sleeper. Steel sleepers can become deformed and timber and concrete sleepers can break when centre-bound.
Chair Plates	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. The types of chairs are identified by a mark on the end of the plate.
Check Rail	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.
Checkrail Effectiveness	Distance from the guard face of check rail to the gauge face of the nose of crossing, measured square to the running rail at the nose of the crossing.

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 check rails and crossings to support rail components at a fixed distance apart. Raised lettering and numbers on the chock identify its application.
Circular Curve	Component of horizontal or vertical track alignment, defined by end points and radius.
Clearance	The space margin between the kinematic envelope of rolling stock and a structure, or between rolling stock on adjacent tracks.
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	A short length of rail used to replace a piece of rail in track. A closure is not generally less than 2.2m long except in turnouts where special requirements may apply.
Closure Rails	Rails making up a turnout apart from those in the points, crossings and checkrail units.
Combined Rail wear	Rail wear that includes both curve (side) and tangent (top wear).
Compound Manganese Crossing	Comprises a 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 which replaces the point/housed rails in a fabricated crossing.
Compound Transition	The component that joins two circular curves of different radii.
Compression	When rail temperature is increased, the rail expands and there are no available gaps to allow the rail to freely expand. The force generated will place the rail in compression.
Continuous Welded Rail (CWR)	Rails which are in excess of 220 metres in length.
Cracking or spalling of the rail head	Surface damage in the form of visual cracks or breakouts of small shallow sections of the rail surface typically 3mm to 6mm in depth.
Creep control point	A reference marker recording the position of a rail at the time of stress adjustment and subsequent longitudinal movement.
Crib Ballast	The track ballast located between adjacent sleepers.
Cross Level	The difference in level of the two rails in a track.

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.
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 a connecting plain trackwork.
Curve Creep	Expressed in terms of equivalent tangent creep, curve creep expresses the increase or decrease in the length set at the time of establishment due to the radial movement of curves. Curve creep is measured relative to track alignment marks.
Cutting	Excavation of the natural ground to a determined cross section and longitudinal profile to accommodate the railway and any associated infrastructure.
D	
Defect	A variation from maintenance or operating standards which exceeds the nominated limit.
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.
Detailed Walking	A thorough examination, conducted by walking, of the components of the track structure and the right of way, to ensure that the components are satisfactory and contribute to a safe railway.
Diamond Crossing	The component of a track system where lines intersect. Diamond Crossings comprise V and K crossings.
Dogspike	A round spike that is driven into a pre-drilled hole in a sleeper to hold the rail foot against vertical and lateral movement.
Drainage	The surface flow of water away from the track structure and cess. It includes: Top and side drains along the railway reserve to direct water away from the rail track formation to recognised water courses. Pipes installed expressly to collect water from between or beside tracks and direct it away to a recognised side drain or water course. Waterways constructed under the track, whether pipes, culverts, or similar.
E	
Effective sleeper	When the sleeper and fastenings combine to effectively support the rails vertically and provides lateral restraint. Restraint must allow no lateral movement of the fastenings relative to the timber. The sleeper must provide gauge restraint and must be one piece that will not separate along its length or transversely.

	Sleepers should not be excessively backcanted more than 1 in 30. Timber sleepers with rot, or holes through which ballast can be seen are not satisfactory. At least 300mm is required between rail foot and sleeper ends for effective tamping.
Elastic fastenings	See Resilient Fastenings.
Embankment	Stabilised fill formation, above the natural ground, to a determined cross section and longitudinal profile to accommodate the railway and any associated infrastructure.
Expansion switch:	An assembly comprising of 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 (e.g. steel underbridges) which are also subject to temperature-related expansion and contraction.
F	
Fabricated Crossing	Comprises a Vee 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.
Face work	Where sleepers are replaced systematically one after another.
Field Assembled Glued Joint	A rail joint consisting of bored rail ends, high-strength purpose designed fishplates and connecting bolts reinforced by an insulating epoxy resin mixed and applied in the field. The joint provides electrical insulation between the connected rail ends via the insulating resin.
Field Welding	Welding of rails together in the track by any process.
Fishbolts	Bolts shaped to fit through fishplates to provide a mechanical rail joint.
Fishplates	Mechanical joint components shaped to fit against the head, web and foot of a rail and by means of 6 fish bolts provide a structural support to give a continuous running rail section.
Fishscaling	Is the flow of steel at the gauge corner of the rail that resembles a series of fishscales.
Fixed crossings	These crossings have a wheel flange gap in both rails. Wheel transfer of fixed crossings depend on matching wheel and rail profiles. Fixed crossings are used in conjunction with check (guide) rails to provide lateral guidance in the crossing area.

Fixed point	A point or location in the track where the rail is fixed and cannot move longitudinally relative to the sleepers and ballast. This may include such locations as turnouts, level crossings and transition points from dog spiked timber sleepered track to resilient fastened concrete sleepered track.
Flame Cut Rail	A rail closure fastened at a mechanical joint where the rail end(s) have been cut or bolt holes have been blown by a gas cutting process.
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 check rail 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 check rails and in 'V' and 'K' crossings.
Flexible Switch	A switch machined from longer rails and fixed towards the end of this rail with blocks 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 towards the fixed end.
Flare	The tapered widening at the ends of flangeways to gradually engage wheel flanges and position them to pass through flangeways
Foul Ballast	Ballast that has been contaminated by degraded ballast fines, fines from failed formation and/or deposited material. Free drainage has been blocked.
Free Welding	Welding without correcting rail adjustment.
French Rail	Rail branded "Longwy" or "Micheville", installed in the 1950's and exhibiting severe internal defects.
Front of Train Examination	A non-specific examination which assists in the assessment of track by enabling the reaction of trains to the track structure to be observed (preferably at maximum allowable speed)
Frozen Rail Joint	A joint that is not free to open and close with changes in rail temperature.
G	
Gauge	The distance between the inside running (or gauge) faces of the two rails measured between points 16mm below the top of the rail heads.
Gauge corner fatigue	Damage to the gauge corner of the rail in the form of longitudinal cracks and dark spots irregularly spaced in the gauge corner. It may also take the form of fishscaling or lamination.
Gauge face angle	The angle of the gauge face to the vertical.

Grade Rail	The rail that defines the vertical position of the track. On curves, the low rail is the grade rail. On tangent track either rail is the grade rail.
Graded Rail Level	The designed rail level for the track.
Guard Rail	A rail (inside or outside the running rail) used to restrain lateral movement of a derailed wheelset. Used to protect structures or control the lateral movement of the wheelset on bridges or in other higher risk situations.
H	
Heel	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.
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.
Horizontal Alignment	The designed horizontal location of track as measured to survey marks.
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.
Insulated Plate Joint	An assembled joint consisting of bored rail ends, joined with purpose-designed joint plates that are electrically insulated at all external surfaces and connected to the rail by high tensile bolts or swage fastenings.
Insulated Rail Joint	A rail joint designed to prevent the flow of signalling circuit currents across the rail ends. Generally, this is achieved by using insulating materials to separate the steel components of the mechanical joints.
Interlocking	Interaction of equipment-controlling switches and/or signals to prevent conflicting movements, and to make sure that routes are set correctly.
J	
Jointed Welded Rail (JWR)	Rails which are, individually, longer than 27.4m and less than or equal to 220m.

Junction Rail	A rail with differing rail profiles at each end in order to match with rails of dissimilar section.
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.
Kinematic Envelope	A two-dimensional cross-sectional representation of the swept path of a rail vehicle.
Kinematic Outline	A two-dimensional cross-sectional representation of the swept path of all the vehicles authorised at a particular location.
L	
Lamination	The formation of thin layers of metallurgically altered steel near the rail surface that typically interfere with ultrasonic signals used for rail examination.
Level Crossing	A structure provided at track grade to enable vehicular and/or pedestrian traffic to cross rail lines.
Line	The smoothness of the horizontal location of the track. The method of measurement is by stringlining methods. (Note the comparison with alignment.) Track can have good line (i.e. be straight or have a smooth curve) but have poor alignment (offset from design position). Conversely, track can have good alignment (on design position at the survey marks) but poor line (not smooth line in between the marks).
Line Rail	The Rail, from which, line is measured. This should be the outer rail of curves. On a tangent track either rail can be used but the same rail shall be used throughout the tangent.
Lockspike	Spring fastening spikes used to secure sleeper plates to timber sleepers. They are driven through holes in the sleeper plate into the timber sleeper. As the spike penetrates the timber, the points of the spike separate and anchor the spike into the sleeper.
Long Welded Track (LWR)	See Jointed Welded Rail
Loose rail	Rails which are 27.4 metres or less in length.
M	
Main lines	The running line normally used for the running rail traffic through and between locations. Main lines also include crossing loops, refuge loops and sidings adjacent to a running line with a maximum permissible speed greater than 25km/hr.
Major Cyclic Maintenance	Major maintenance activity which is generally performed on a cycle greater than 12 months e.g. partial

	resleepering, rerailing, resurfacing, ballast cleaning, rail grinding. Also called Major Periodic Maintenance (MPM).
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.
Manual Resleepering	Replacement of sleepers using hand-held tools and equipment and small on or off-track plants.
Mechanical Insulated Joint	A conventional joint assembly where the components and insulation material are fitted to a modified mechanical rail joint. They can be dissembled to their component parts. They may include Standard Mechanical Insulated Joints or Insulated Plate Joints.
Mechanical Joint	A conventional joint assembly comprising fishplates, fishbolts and washers, that can be, dissembled to its component parts. [Mechanical joints allow for some limited movement of the rail ends.]
Mechanised Resleepering	Replacement of sleepers using dedicated teams and large production plant.
Misalignment	A sharp horizontal displacement of track (includes rails and sleepers). A misalignment occurs when the compression generated in the rails exceeds the ability of the structure to hold itself in place and the track is displaced laterally. Irrespective of the resulting horizontal displacement a misalignment has occurred when there is visible evidence that the sleepers have moved laterally in the ballast.
Monoblock sleeper	Prestressed concrete sleeper cast in a single piece.
N	
Neutral Rail Temperature	See Neutral Temperature
Neutral Temperature:	The temperature at which a rail will be neither in compression nor in tension (also called the Stress-Free Temperature SFT). Rail is to be adjusted so that this will occur at 35°C (Tolerance +2 - 0 °C).
Nominal Size	The designation of an aggregate which gives an indication of the largest size particle present.
Nominal Train Length	Sum of the individual registered vehicles lengths. The Nominal Train Length should be specified by Network Operations.
Non-elastic fastenings	Fastenings which do not rely on spring steel properties to retain a positive force on sleepers (as do lockspikes) or rails (as do resilient fasteners). For example, dogspikes are nonelastic fasteners which rely on friction with a bored hole in timber sleepers for effectiveness and lose that effectiveness over time.
O	

Open Ballasted Track	Track comprising of rails, fastenings, sleepers and ballast. It does not include track comprising of slab or embedded systems, or track on transom deck bridges.
Operating Limit	The limit or condition which triggers a mandatory response. The response depends on the asset and its condition and may require restricting operations or reviewing whether operational restrictions are required.
Operating Restriction	A restriction on the operation of rolling stock (such as speed, axle load, type of rolling stock, time of operation) to provide an appropriate level of risk in response to a specific infrastructure condition.
P	
Permanent rail joint	Non-welded rail joints intended for use in track in the long term. They include fishplated joints, glued insulated joints and expansion joints.
Pod	The space under a steel sleeper below the sleeper deck and between the side walls of the sleeper.
Points and crossings	In track structures 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 catch 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.
Prestressed concrete bearer	Concrete bearer where the deformed reinforcing bars (tendons) are stressed before casting the concrete.
Prestressed concrete sleeper	Concrete sleeper where the deformed reinforcing bars (tendons) are stressed before casting the concrete.
Partial Resleepering (PRS)	Replacement of sleepers in a pattern or at random to maintain a general sleeper condition in a track section.
Q	
R	
Rail Adjustment	Rail adjustment is the procedure used to ensure a welded track is in a stress free state at the defined neutral rail temperature.
Rail Anchors	Devices (other than resilient fastenings) interfacing between a rail and the supporting sleepers or bearers designed to prevent longitudinal movement of the rail relative to the sleepers.
Rail Anchoring	Use of Fair type anchors with timber sleepers and resilient rail fastenings with steel and/or timber sleepers to restrain

	(anchor) the rails from moving longitudinally through the sleepers.
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 contacts the underside of the head and the top of the foot of the stockrail and is used for stockrail support to maintain the gauge.
Rail Brace Plates	Attach the Rail Brace to the bearer. The plates are distinguishable by a number at the end.
Rail Bunching	Rail Creep towards a fixed point, resulting in increased compressive stress.
Rail corrugations:	Cyclic wave defects that form on the surface of the rail. There are two types viz. Short pitched - about 30mm to 90mm wave-length with a characteristic regular sequence of bright peaks with darker hollows on the running surface and long wave length - around 300mm pitch with depressions in the running surface. There is no difference in appearance between peaks and hollows for this category.
Rail Creep	The longitudinal movement of rail through the fastening system.
Rail Defects	Rail discontinuities greater than the minimum size, and for which there is a defined repair response.
Rail End Batter	A permanent plastic deformation of a rail end at a joint resulting from wheel impacts.
Rail Gap Dial Calculator	Rail Gap Dial Calculator is a round slide rule type calculator using rail temperature and rail length to give appropriate rail gap for a neutral temperature of 35°C, for use with CWR work only.
Rail Gaps	Space between rail ends in jointed track.
Rail Level	The rail level when measured on the head of the rail. The down rail on straight tracks. The low rail on curves.
Rail Lubricator	A device attached to a running rail designed to apply a controlled volume of lubricant to passing wheel flanges, which transport and deposit the lubricant on the high rail of curves to reduce friction and rail/wheel wear.
Rail or Running Rail	A rolled steel section conforming to the requirements of AS 1085 installed in the track and fastened to gauge for the purpose of carrying railway traffic.
Rail side (curve) wear	Rail wear that normally occurs in the high leg of curved track and has only a minimal amount of top wear. Side wear can be measured either by determining the width of the rail 16 mm below the running surface in mm, or the loss of head area as a percentage of the original head area.
Rail Temperature	See Actual measured rail temperature

Rail Temperature Error	An expression of rail adjustment in °C indicating the extent of rail adjustment deviation in relation to the standard neutral temperature (35°C). It is calculated by subtracting the Theoretical Measured Temperature from the Actual Measured Temperature.
Rail top (tangent) wear	Rail wear that normally occurs on the top running surface of the rail in tangent track or the low legs of curves. Usually has a minimal side wear component. Rail tangent wear or top wear shall be measured 16mm in from the running face of the rail.
Rail Wear	Abrasion of rail due to contact between rail and rolling wheels. It occurs as top (tangent) wear or side (curve) wear.
Resilient Baseplates	A device for securing rails to sleepers, transoms, tunnel inverts or track slabs. The fasteners are required to moderate noise and vibration. The baseplates typically consist of a resilient material bonded to a lower frame and rail base.
Resilient Fastenings:	Elastic steel clips attached to sleepers or bearers and designed to engage rail flanges with a degree of elasticity between the sleeper and rail with the aim of avoiding the loosening of the fastening due to vibration. These clips fasten rails to the sleepers or bearers providing lateral support. Standard resilient fastenings also generate toe load at the rail flange providing resistance to longitudinal movement. For special applications where longitudinal rail anchoring is not desirable, resilient fastenings may be designed for zero-toe load.
Right of Way	The area of land extending to the railway boundaries.
Rolling contact fatigue:	Deep-seated cracking that occurs on the rail head due to high contact stresses between wheel and rail.
Rolling Stock	Any vehicle which operates on or uses a railway track, including any loading on such a vehicle, but excluding a vehicle designed for both on and off-track use when not operating on the track.
Rolling stock Outline	The combination of rolling stock cross-section, bogie centres (or wheelbase for non-bogie rolling stock) and body overhang, as well as rolling stock tolerances, which define the swept path of the rolling stock.
Rolling stock Tolerances	The possible/allowable displacements of the rolling stock from the design rolling stock outline centred on the guiding wheels. These are described in terms of translations and rotations of rigid bodies relative to infrastructure.
Running Line	A line (other than a siding) that is used for the through movement of rail traffic.
S	
Safety Clearance Margin	The defined clearance beyond the kinematic envelope necessary for safe operation using specified track and rolling stock tolerances.

Service Requirement	The clearance beyond the Safety Clearance Margin that enables defined service tasks to be undertaken (e.g. walkways between tracks, access roads etc.).
Shielding	When ultrasonic testing of the rail for defects is inhibited by physical or metallurgical alteration to the rail on the surface of the rail head.
Short Rail	See Loose rail
Shoulder Ballast	Ballast placed outside the end of sleepers.
Sidings	All operating lines which are not mainlines.
Single/Double Slip	A special track layout that combines turnouts and diamond crossings. They allow train movements both across, onto and out of a track.
Sleeper Plates	Steel plates that are fastened on the top of a timber sleeper and onto which rails are placed. In open track they are sloped to provide the rail base with a 1 in 20 cant.
Sleeper Spacing	The spacing is defined as the distance between the centrelines of the sleepers.
Sleepers	Timber, steel or concrete planks of defined dimensions that are spaced at intervals on the ballast and on which rails are laid and fastened. They provide the method of fixing track gauge and transferring vertical, lateral and longitudinal loads to the ballast.
Special Loads/Profiles	Vehicle/loading envelopes that infringe approved rolling stock outlines.
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 mainline thus reducing the wheel-generated impact in the crossing. The wheel flange forces the spring wing open when taking the siding road.
Stockrails	These provide support for the closed switch and become the running rail when the switch is open.
Stress free	The rail will neither be in tension or compression.
Stress free temperature	See Neutral Temperature
Structure Gauge	The transit space outline setting out the space parameters necessary for the construction and maintenance of structures adjacent to a rail track.
Summer Period	For hot weather instructions, this is defined as 1 November to 31 March.
Superelevation	The vertical distance that the outer rail is raised above the inner or grade rail. See Cant.
Surface	The relationship of opposite rails to each other in cross level and profile.
Swaged Fastener	High tensile, high-clamping strength bolts and fastenings that may be used as replacements for conventional fishbolts and crossing bolts for specified applications.

Swept Path	The maximum three-dimensional volume taken up by a specified rolling stock Outline (including rolling stock tolerances) as it moves along a track at specified track tolerances, through design curves, transitions etc.
Swing Nose Crossing	See Switchable crossings
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.
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
Switch Rollers	Rollers that support the switch during the opening and closing operation. They can 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.
T	
Tangent Creep	The longitudinal movement of rail in a track section in CWR track. It is generally measured as the net movement into or out of a defined section.
Tangential Switch	A switch manufactured from an asymmetric rail section that is flash butt welded to a normal rail section towards the fixed end of the switch.
Temporary rail joint	Non-welded rail joints intended for temporary joining of rails only, and generally requiring special measures to be implemented with their use. These measures permit the short-term passage of trains and may include special inspections or speed restrictions.
Tension	At low rail temperature the rail contracts and joint gaps are fully opened placing the rail in tension.
Theoretical Measured Temperature	The anticipated rail temperature predicted by a given set of rail gaps for known rail lengths if that rail is to be in correct adjustment.
Theoretical Point	Located on the crossing nose at the intersection of the gauge lines of the two running rails forming the crossing.
Tie	A sleeper installed as a partial replacement of sleepers.

Tie and Surfacing	The process by which sleepers are installed in PRS and the ballast packed under and around the sleepers to the required track geometry and ballast profile tolerances.
Top	Vertical alignment of the rails.
Track Clearance	The space margin between the kinematic envelope of approved rolling stock and a structure, or between rolling stock on adjacent tracks.
Track Condition Index	A numerical evaluation of track-geometry condition used to establish and compare standards of track.
Track Examination System	A group of examinations of the track and right of way which are carried out on a scheduled basis.
Track geometry	The horizontal and vertical alignment, cross-level and superelevation of the track.
Track Stability Loss	Estimate of the vulnerability of a track section to misalignment (or curve pull in) due to variance in rail adjustment and loss of resistance to lateral movement. It is calculated by assigning % values to a set of negative factors (rail adjustment, ballast profile, disturbance, condition etc.).
Track Geometry Tolerances	The threshold displacements of the track from its design track position and gauge.
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.
Transit Space	A clearance envelope that provides for the safe passage of defined rolling stock and for infrastructure service requirements. The envelope is defined by a Transit Space outline referred to as Structure Gauge.
Transition	A track component which joins a straight to a circular curve or connects circular curves of different radii. The transition is based on a cubic parabola.
Transom	Transverse members of track-supporting structures generally made from timber, to which the running and guard rails are fastened. These members are designed specifically as structural members of the track-supporting structure and should not be treated as sleepers.
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 mainline 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.
Twist	The variation in actual track cross-level between two locations separated by a nominated distance (along the track).
U	
Underbridge	Supports the track and pass-over waterways, roadways, pathways etc.
Underground Services:	Pipes, cables and other service facilities located underground which may include signalling cables, electric power cables, communications cables, water pipes, drainage pipes, sewerage pipes, gas and other fuel supply lines.
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 mainline and turnout rail gauge faces that intersect at the theoretical point. The crossing rate is the cotangent of the angle made.
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.
Wheel burns	Damage to the surface of the rail in the form of sharp dips or head flow caused by continuous slip of locomotive or multiple unit traction wheels. Damage can be from abrasion or from heat generation.
WOLO Speed Restriction	Temporary reduction in the speed of trains, for one day only, when the AIR temperatures is forecast to be high.
X, Y, Z	**No entries**