

Track Standard Clearances

Purpose

The purpose of this Standard is to describe the requirements in design, construction and maintenance of track clearances between rolling stock and the fixed track infrastructure in relation to the fixed structure gauge.

Document Control

Document No.	T-ST-DE-5212	Issue No.	Issue 2.0
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		Authorised for Release By	Professional Head of Track

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1. Revision Procedure and History

This is a 'living' document, that will be updated every five years or whenever KiwiRail determines that changes to it and processing requirements documented herein are appropriate.

If changes arise from the review this document will be reissued, however, if no changes arise from the review, the current version of this document will remain in force.

Refer to the **Briefing Note(s) for T-ST-DE-5212 Clearances**

(at the end of this document) for full document changes.

Issue No	Prepared (P) Reviewed (R) Amended (A)	Authorised for Release By	Date Effective
1.0	Mark Fleet (A)	Professional Head of Track	31/01/2018
2.0	Mark Fleet (A)	Professional Head of Track	31/08/2023

1.1 Changes in this issue

Issue No	Description	Page(s)
2.0	Section 3 - Acronyms updated	6
	Table 6.1 – section 9 updated	9
	Table 6.1 and 6.2 – section 1a added	9,10
	Section 6.5, 6.6, 6.11 – minor updates	10,12
	Section 6.13 – new section on temporary clearances	13
	Section 9 – Requirement for Risk Assessment and inclusion of hazard warning tape added	14

1.2 Withdrawn, closed and superseded

Old Reference	Title	Replaced by

2. Associated Documents

Level	Number	Title
3	T-ST-DE-5200	Track Design
3	T-ST-AM-5120	Track Geometry
3	C-ST-RW-4104	Retaining Walls

Level	Number	Title
3	C-ST-CD-4102	Corridor Drainage
3	C-ST-PL-4109	Passenger Platforms
2	E-PR-AE-0012	AEA Interface Principles - Traction and Electrical – Track –Civil-Structural
3	E-SP-AE-61317	AEA Infrastructure Interface
3	E-SP-AE-61319	AEA Traction Clearances
3	E-SP-AE-61210	AEA 25 kV 50 Hz Overhead Line Equipment
3	S-ST-CW-2140	Construction of Cable Duct Routes
3	CE 100795	Culvert Renewal Standard Details
3	CE 100862	Drainage and Formation Standard Details
3	CE 100892	Exclusion Zones for Cables and Ducting
3	CE 300196	Limited Clearance Warning Sign
3	(WEA) E/CST/205	1600 V DC Traction Overhead: Clearances: Electrical, Mechanical
3	(NIMT) E/CST/305	25 kV Traction Overhead: Clearances: Electrical, Mechanical
3	E-ST-AE-0161	AEA Traction Overhead: Clearances: Electrical and Mechanical
3	S20948-1/2/3	Standard Heights for Signalling Equipment

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3. Acronyms and Definitions

Acronyms	Definition
AEA	Auckland Electrification Area
Cant	The difference in cross level between the rails at any point at curvature
End throw	Additional side clearance need for the swept path of the end corners of the rolling stock body when travelling outside of the curve
Gauge	The distance between two gauge points (measured 16 mm below the top of rail) of the running edges of rails
LNI	Local Network Instructions
OLE	Overhead Line Equipment
PH	Professional Head of the relevant discipline
PSR	Permanent Speed Restriction
Points Levers	Line side device to move points mechanically
Rolling Stock	Any authorised rail mounted vehicle including locomotives, carriages, wagons, maintenance plant and hi-rail vehicles
RORP	Rail Operating Rules and Procedures
Signal	Line side device which displays the movement authority to proceed to the locomotive engineer
T200	Network Engineering Track Handbook
TSR	Temporary Speed Restriction
Versine (centre throw)	Additional side clearance required for the swept path of the midpoint of rolling stock body when travelling inside of the curve
UTX	Under track crossing

3.1 Notes, caution and warnings

Icon	Definition
	Note(s) to point out something of special importance
	Caution or warning – drawing special attention to anything of important reminder or a safety message

4. Scope

This standard describes the requirements in design to allow for the clearance between rolling stock and the fixed track infrastructure in relation to the fixed structure gauge.

It applies to existing, upgraded and new construction on mainlines, crossing loops and yards / sidings. It prescribes the minimum standards, provides guidance to managers, supervisors, site workers, designers and track inspectors for ensuring safe clearances of fixed assets and dictates standard cross sections.

4.1 Use in the field

This document has been designed to be used in the field. It is expected that this document will be opened in an iPad via 'Briefcase' and used as reference to complete the task. Note as written on the front cover the original version is held on KiwiRail EDMS, and controlled copies are available through SharePoint or Colligo. All other electronic copies and all printed versions are uncontrolled.

5. Purpose of the Track Clearance Standard

The purpose of this document is to define the clearances and cross sections to enable the:

- 1) checking of any structural clearance to any adjacent track layout to comply with the fixed structure gauge.
- 2) compatibility with the standard static gauge for rolling stock.
- 3) clearances applied to any new track construction or renewal work, showing all of the fixed structure clearances and positions adjacent to the track, not limited to but including:
 - lineside buildings and their components
 - signals and related equipment
 - OLE
 - stations, platforms, verandah's and loading docks
 - any other structures and their components

Excluded from this document is any third party construction including level crossings, lineside fencing, drainage, roads or pathways as these are required to be at least 5 m away from track centreline.

6. Standard Design

The designer will ensure that the clearances are acceptable for the safe operation of trains, including the introduction of new rolling stock to KiwiRail, and account for any risk of fluctuations of the site such as seasonal rail temperature changes.

The PH Track and any other discipline specific PH will verify that the horizontal and vertical clearances of the track to any structures, traction and electrical equipment, and signal devices shall comply with the fixed structure gauge limits applicable for any route.

6.1 Clearance data

Clearance measurements in the form of profiles, laser scans and data of composite and minimum actual clearances for each line, and sections of line between major stations, shall be maintained by Track Engineering. The diagrams are to identify the object which gives rise to the minimum clearance and, if not on straight track, the radius and applied cant at that location.

These records are to be updated less than or equal to every three years, or at the request of Regional Staff after any major track or structures clearance realignment or adjustment.

6.2 Standard clearance and cross sections

The standard clearance and cross section drawing CE 100862 shown in the Appendices shall be grouped into two different situations, for the :

- 1) main line corridor, which is further grouped into:
 - Multiple Tracks, or
 - Single Track
- 2) sidings or yards, either for single track or multiple tracks

The designer should ensure all track assemblies or components have sufficient clearances for rail traffic between the track alignment and any line side structure or OLE. If the track assembly design covers works adjacent to other running tracks, then the design shall provide suitable passing clearances between trains.

Track centre spacing is defined by the distance between centre lines of tracks running adjacent to each other, measured horizontally and at right angles to the track. For more details on new and existing track centres refer to document T-ST-DE-5200 Track Design, this gives details of desirable and absolute minimum values.

All clearances shown in this document and drawings are applied on a straight track section and shall be increased by allowances for centre throw (Versine), end throw, and any cant effect on curves. Refer to document T-ST-DE-5200 Track Design for design details.

6.3 Track clearances in the mainline corridor

Refer to Appendix 1 Fixed Structure Gauge – Standard Drawing 300157.

Table 6.1 Mainline clearance notes

Line	Index to Lines on Standard Drawing in Appendix 1
1	Minimum fixed structure gauge except for the items listed below or specially approved by the PH Track and relevant discipline PH. Refer to Line 9(c) below.
1a	Minimum height of over bridge soffit (+0.5m for desirable height of bridge soffit) on electrified lines.
2	Minimum vertical clearance where specially approved by the PH Track; used for temporary work and scaffolding in non-electrified areas.
3	Station verandas.
4	Signals also veranda's where there is no alternative unrestricted track available for high over-gauge loads.
5	Isolated obstruction (eg poles, bridge columns, traction masts, buttresses, pedestrian mazes, hand rails on bridge footways). Note non-railway power structures are regulated by statute.
6	Bridge truss or girder inside flange, bridge handrails with limited clearance, signals, temporary work and scaffolding, track signage.
7	Bridge bracing, other hand rails with limited clearance.
8	Passenger platforms not referred to in Line 9; point's motor and ground equipment (including two position ground signals).
9	Passenger platforms at major stations, suburban stations and terminals, except Auckland Metro. <ul style="list-style-type: none"> a) Dimensions (shown in mm) are the minimum for new construction on straight track on main lines and crossing loops. They apply also to modifications to existing structures. b) The clearances shown apply to straight track only. If the track is curved, adjustment for cant and curvature must be made. c) Also consult PH Structures and PH Traction: about any structure proposed to be constructed over any electrified railway, or when any structure less than 5.5 m above railway level is proposed over any line likely to be electrified d) Half-through rail bridge girders are also included and will apply the same restrictions below within the Auckland Metro area.

Notes: Depending on the location of existing or proposed OLE structures, the proposed length or degree of skew of the new structure, a minimum clearance may be fixed at some points between line 1 and line 1(a) with approval of the PH Traction.

Auckland Metro Platforms are 1520 mm (+10 / -0 mm) from centre line and 750 mm (+0 / -20 mm) high for straight sections with allowances for Versine and End Throw, and Cant on curves.

All other Platforms at major, suburban or terminus stations including Wellington Metro are 1450 mm (+10 / -0 mm) from centre line and 680 mm (+0 / -20 mm) high for straight section with allowances for Versine and End Throw, and Cant on curves.

6.4 Track clearances in sidings and yards

Refer to Appendix 1 Fixed Structure Gauge – Standard Drawing 300157

Table 6.2 Siding / yard clearance notes

Line	Index to Lines on Standard Drawing in Appendix 1
1	Minimum fixed structure gauge except for the items listed below or specially approved by the PH Track and relevant discipline PH. Also refer to Table 6.1 Line 9(c)
1a	Minimum height of over bridge soffit (+0.5m for desirable height of bridge soffit) on electrified lines.
2	Minimum vertical clearance in non-electrified areas where road vehicles operate. Applies also to bridges, gantries, scaffolding, etc.
3	Minimum fixed overhead structure gauge in non-electrified areas where motor vehicles do not operate. Applies to doorways, floor beams inside buildings, roof trusses, bracing, scaffolding etc.
4	Isolated obstructions (bridge column, posts, etc) where a clear way is required for operating staff (also refer to Line 10) Note: non railway power structures are regulated by statute.
5	Inside walls of buildings (one side of track only). Hand rails with limited clearance.
6	Columns inside buildings (including door posts) on one side of track only, with loading doors closed.
7	High level loading banks.
8	Points levers, ground equipment.
9	Loading platform and banks, and ground equipment (including ground signals).
10	Signals, gantries, temporary works, scaffolding, doorways (also refer to Line 6) Other structures, on one side of the track only and where staff can safely work on the other side. <ul style="list-style-type: none"> a) Dimensions (shown in mm) are the minimum for new construction. They apply also to changes to existing structures. b) The clearances shown apply to straight track only. If the track is curved, adjustment for cant and curvature must be made.

6.5 Vortok temporary fencing

Installation of Vortok barriers is permitted 1900 mm from the track centreline on mainlines and yards due to its rigid design, fastened to the nearest running rail and the designed safety feature of the railings. Additional Track Safety Rules must be applied when this equipment is planned to be used, see RORP for further details.

6.6 Below railhead clearance

Below railhead clearances such as any exclusion zone for cables, ducting and UTX's are in the following standard drawings:

- CE 100862 – Drainage and Formation Standard Details
- CE 100795 – Culvert Renewals Standard Details
- CE 100892 – Exclusion Zone for Cable and Ducting

The area extending 1200 mm below the design rail level and extending 2100 mm from track centreline should be kept clear of structures and structural footings, there are exceptions where 700 mm depth clearance is permitted.

6.7 Drainage structures and retaining walls

Any requirement for trackside drainage structures should also be considered, especially for retaining walls directly upslope of the rail line, refer to drawings in document C-ST-RW-4104 Retaining Walls.

Where drainage is required, additional clearances for side drains should be allowed refer to the drawings in document C-ST-CD-4102 Corridor Drainage and in particular drawing CE 100862 – Drainage and Formation Standard Details.

For information relating to culverts/cross drain pipes under the track refer to the drawings contained within document C-ST-CU-4103 Culverts and in particular drawing CE 100795 – Culvert Renewals Standard Details.

6.8 Structures

Bridge and viaduct horizontal clearances are referencing the nearest edge of the truss, girder or beam to the track centreline. Handrails should be ≥ 2600 mm from track centreline, but may be fitted within the range 2100 mm – 2599 mm with limited clearance signs in place.

6.9 Tunnels

Unrestricted tunnel clearances require a minimum of 1700 mm measured horizontally from track centreline for above 860 mm from top of rail to a vertical height of 4360 mm. Below 810 mm is to maintain a 100 mm clearance. The correct rolling stock loading gauge for the route must be applied. Extra allowance for any OHL, additional equipment and cable troughing must also be provided.

Refer to Appendix 2 Tunnel Clearance Diagram – Standard Drawing.

Tunnels complying with these clearances will be prohibited for staff to enter with no appropriate track protection in place, see RORP - Track Safety Rules for details.

6.10 Platforms

Platforms may be considered as a retaining wall with limited clearances. For specific information refer to document C-ST-PL-4109 Passenger Platforms.

Table 6.3 Platform clearances

Location	Vertical Offset from top of rail to top of platform lip	Horizontal offset from centre line of rail track to edge of platform
Auckland Metro	750 mm	1520 mm
Wellington Metro and any major, suburban or terminus platform	680 mm	1450 mm
All other platforms	530 mm	1450 mm

Installation/maintenance tolerances for platform faces are:

Vertically = +0 mm -20 mm

Horizontally = +10 mm -0 mm

6.11 Overhead line equipment

OLE along the route that support the contact wire or rigid overhead conductor beam are governed by their clearances to the track geometry, and included in these are clearances for offset, throws and cant on curves.

See documents for further details of this relationship:

- E-PR-AE-0012 – AEA Interface Principles – Traction and Electrical – Track-Civil-Structural
- E-ST-AE-0161 - AEA Traction Overhead: Clearances: Electrical and Mechanical
- (WEA) E/CST/205 – 1600V DC Traction Overhead: Clearances: Electrical, Mechanical
- (NIMT) E/CST/305 – 25kV Traction Overhead: Clearances: Electrical, Mechanical
- E-SP-AE-61317 AEA Infrastructure Interface
- E-SP-AE-61319 AEA Traction Clearances
- E-SP-AE-61210 25 kV 50 Hz Overhead Line Equipment

6.12 Signals equipment

Signals equipment shall not encroach in to the fixed structure gauge 2300 mm horizontally from any track centre, and vertically above the 2750 mm vertical limit line, except for ground signals where a closer distance horizontally is permitted up to 1450 mm from track centre with the maximum height of 530 mm above the top of rail.

Trackside ducting routes shall be installed according to document S-ST-CW-2140 Construction of Cable Duct Routes – Depth and Clearance from Track.

Refer to Standard Signal Drawings:

- S20948-1 Standard Height for Searchlight Signals
- S20948-2 Standard Height for Three Position Colour Light Signals
- S20948-3 for typical details of each signal type and dimensions

Train stops are excluded from these requirements.

6.13 Temporary works

These are defined as any temporary structure in place for a period of no more than three months. Moveable lineside equipment such as piling rigs may go as close as that described in section 6.9, if a detailed Risk Assessment and proposed mitigations are approved by the PH Track.

7. Line Side Materials

Stacked material within the rail corridor should be at least 3 m away from track centre line including loops, and 2.3 m away from track centre line in sidings / yards (with permission of Officer / Person In Charge of the siding / yard).

Welded rail shall be placed beside the track below the running rail level. Where this is not possible, it should be placed at least 1.5 m from track centre line.

All vertical distances are measured from nearest edge of material to track centreline.

8. Managed Track

Both OLE and any other structure within 2600 mm of the track centreline are considered as managed track as per document T-ST-AM-5120 Track Geometry. These areas require close supervision of any track work that may alter clearances and will require monumenting.

9. Substandard Clearances

Where construction, maintenance, any emergency or trackside temporary works require the clearances to be substandard, an appropriate TSR must be applied to the affected section. A detailed Risk Assessment will also be required to determine any other mitigation requirements.

Table 9.1 Static clearance and allowable speed

For Height Above the Vehicle Floor (905 mm)	
Lateral Static Clearance (mm)	Maximum Speed (km/h)
Greater than 200	Line Speed applicable
150 to 200	55
75 to 149 structural component	25
Exclude frangible components from the analysis for 75 mm clearance and above	
50 to 74	15
less than 50	Not to run unless piloted
For Height At or Below the Vehicle Floor (905 mm)	
Nearest Static Clearance (mm)	Maximum Speed (km/h)
Greater than 50	Line Speed applicable
30 to 50	25
Less than 30	Not to run unless piloted

Frangible components are defined as items attached to rolling stock that are designed such that if they strike a fixed structure, the structure is not damaged. Examples of the sort of components to which it is intended this requirement applies includes car step extensions and locomotive rear view mirrors.

Frangible components must remain within the rolling stock static gauge, or the approved vehicle gauge for the route concerned and electrical clearances must be maintained.

Where reduced clearances are below the minimum fixed structure gauge's allowance for temporary work, a departure from standard to the minimum fixed structure gauge may be granted by the PH Track who will arrange notification by a Bulletin and impose mitigations where necessary. Reduced clearances may not be approved which are less than 400 mm outside the rolling stock static gauge defined in the NRSS/6. If such clearances are authorised for temporary work, details must be noted on the clearance diagrams and in the database until compliant clearances are restored.

The Asset Engineer must investigate all reported sub-standard clearances and arrange corrective action or mitigation where necessary. Details of sub-standard clearances which cannot be corrected are to be advised to the PH Track who will

arrange for their inclusion and any PSR or TSR in to the LNI of the Rail Operating Rules and Procedures, by Bulletin and on clearance diagrams or any database held by Track Engineering.

Any fixed structure <2600 mm away from the track centreline on both sides of the track and/or more than 20 m long with no refuges or safe place provided shall have Limited Clearance signs as per standard drawing CE 300196 erected on both cesses and at both ends of the structure to demarcate areas that have no safe place when the line is open for normal operation.



Figure 9.1 Example of limited clearance sign

Permanent reflective hazard warning tape (with alternate yellow and black diagonal stripes) may be installed 1.3m above rail level in between the limits of the obstruction where identified as part of the Risk Assessment.

Any spacing or sizing of refuges or a safe place is to be determined by Risk Assessment. The minimum permitted size is:

Height = 2000 mm

Width = 1500 mm

Depth = 700 mm

With the floor at top of sleeper level or a single step of no more than 200 mm.

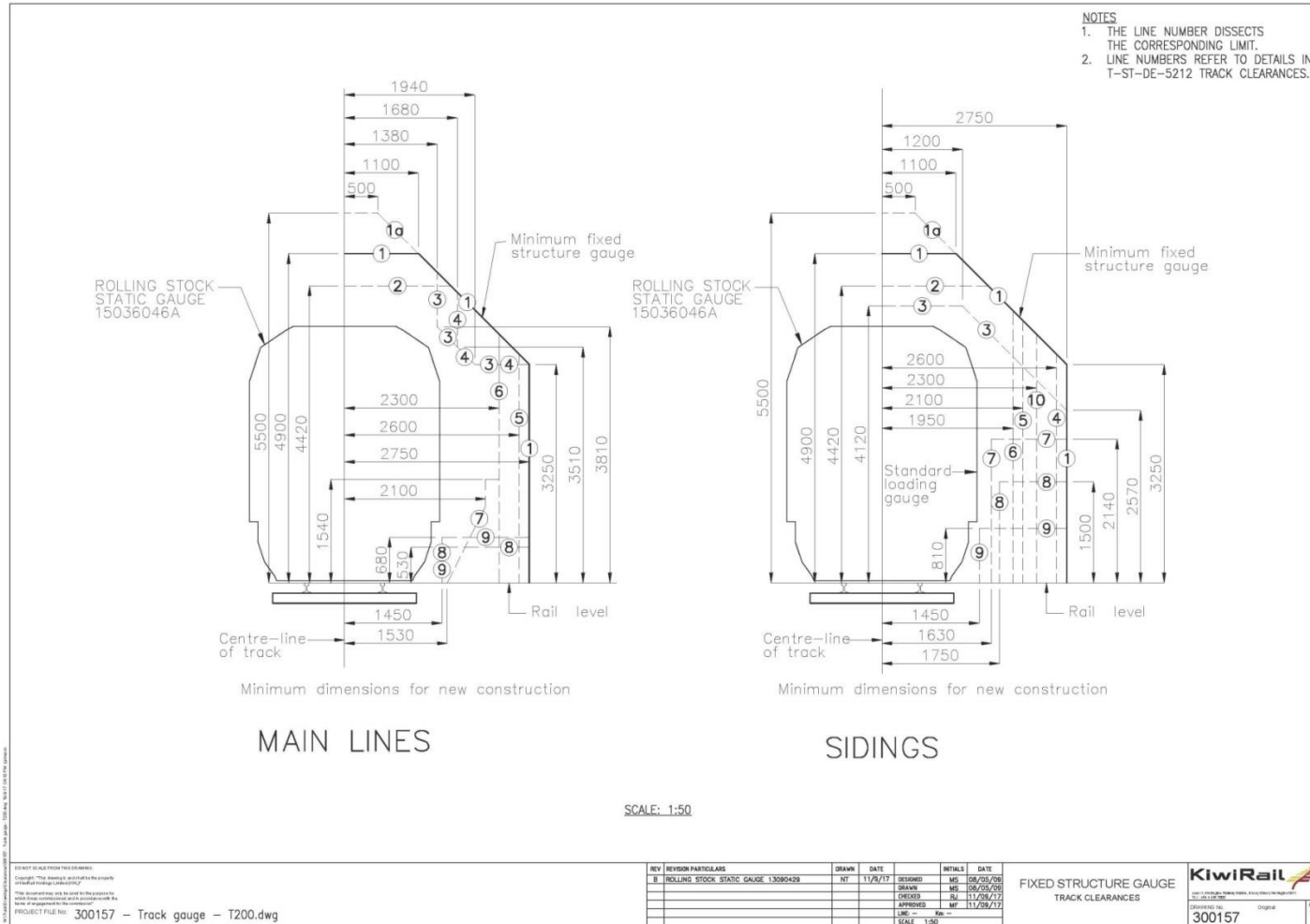
10. Operating Clearances

Where a clearance from a fixed structure or a track centre-to-centre distance is less than shown in the Appendices, it shall be notified in the LNI of the Rail Operating Rules and Procedures. Staff shall promptly report to the Asset Engineer every instance found of sub-standard clearances not already identified. When measuring to determine whether a clearance is sub-standard, due allowance must be made for the effects of cant and curvature and the procedure detailed for limited clearances followed.

11. Kinematic Envelope

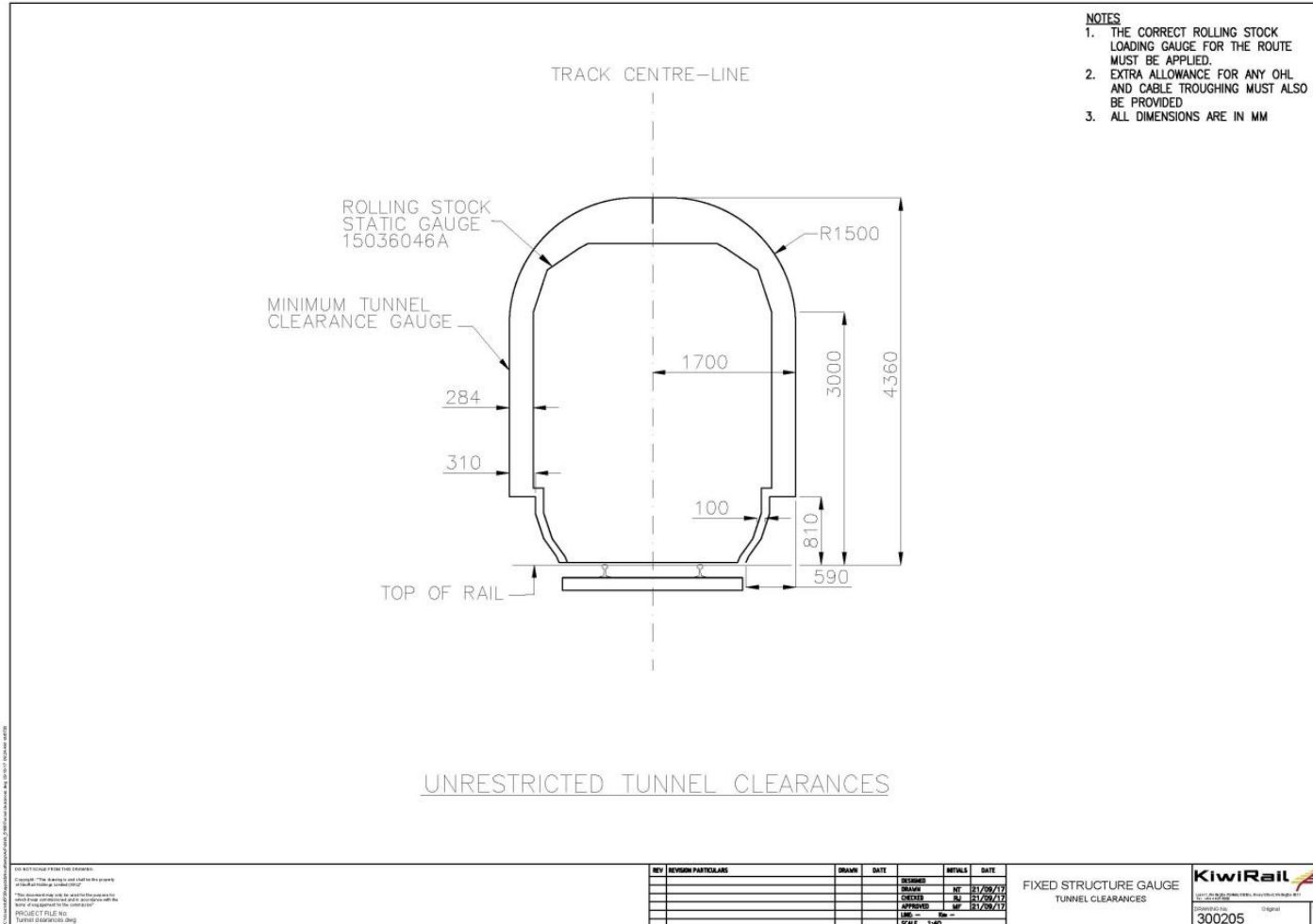
This may be calculated for all permitted rolling stock to give clearance values lower than specified in this document on a site by site basis. All such approvals may be given by the PH Track on submission of a detailed report specifying methodology in determining any lower clearance values.

Appendix 1 Fixed Structure Gauge – Standard Drawing 300157



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Appendix 2 Tunnel Clearance Diagram – Standard Drawing 300205



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Briefing Note(s) for T-ST-DE-5212 Clearances

Date Effective 31/08/2023 **Issue No.** Issue 2.0

Background

Minor updates to document.

Key changes / compliance

Refer to section 1.1 Changes in this issue.

Implementation

This document should be cascaded down to all staff impacted by this Standard in the field.

Applicability (Select relevant boxes)	General	Civil	Signals	Structures	Track	Traction and Electrical	Control Systems	Interoperability
Zero Harm	<input type="checkbox"/>							
Learning and Development	<input type="checkbox"/>							
Project Management Office	<input checked="" type="checkbox"/>							
Manager Property Revenue and Grants	<input type="checkbox"/>							
National Train Control Centre	<input type="checkbox"/>							
Engineering Services Manager	<input type="checkbox"/>							
National Supply Chain and Distribution Manager	<input type="checkbox"/>							
Professional Head		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Network Services Managers		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Region Operations Managers		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
STTE Managers		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Production Managers		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Asset Engineers		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
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Document History

Note page numbers relate to the document at the time of amendment and may not match page numbers in current document.

Issue No.	Section	Description	Page(s)