Clearances

Section 7

Applicability

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This ARTC CoP has drawn on the Rail Industry Safety and Standards Board (RISSB) National Code of Practice Volume 4, Track and Civil Infrastructure, but is not identical. The ARTC CoP has been subject to Risk Assessment as required by the Office of the National Rail Safety Regulator. The results of these risk assessments have made it necessary to deviate from the RISSB CoP in some areas. ARTC maintains traceability of the differences.
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7 Section 7: Clearances

7.1 General

This Section applies to clearances between—

a. rollingstock and structures; and

b. rollingstock on adjacent tracks.

Structure outlines are provided for the purpose of rollingstock operation and train passage only. In addition where required, owners are to make provision for access or egress (emergency or otherwise), rollingstock clearances to people, plant or equipment, projection of parts of the body from rollingstock, risks from derailed rollingstock, other health and safety reasons, service, maintenance and future clearance upgrades.

Where a guard rail has been fitted to provide protection to a structure in the event of a derailment the structure outline shall be widened to accommodate derailed rollingstock running against the guard rail.

The minimum clearance shall not be employed in a particular situation if more clearance can be provided.

7.1.1 Reference Documents

The following documents support this Standard:

- ETE-07-01 - Examination of Track and Structural Clearances
- RAP 5135 - Inspection of Track Clearances – Procedure
- ARTC RAS – Route Access Standard
- ARTC RAS Appendix A - Rolling Stock Outlines and Loading Requirements
- OPE-PR-029 - Application for Out of Gauge Train Notice
7.2 Design and Rating

7.2.1 Clearance Outlines

Clearance standards shall be determined and specified for each line section in conjunction with operators. These standards should specify the following:

a. Static rollingstock outline
   The cross-sectional outline of a maximum size vehicle at rest.

b. Maximum kinematic rollingstock outline
   Equivalent to the "permissible Rollingstock outline" defined in AS 4292.2 and includes the effects of vehicle centre and end throw, track tolerances and dynamic rollingstock limits described in the general procedure in Appendix A.

c. Base operating standard for structures
   The outline which may be infringed only in special circumstances and subject to there being no exceedance of the appropriate track tolerances for clearance (in ARTC this may be taken as the Kinematic Envelope plus 100mm).

d. Maintenance intervention standard for structures
   The outline that will first require maintenance actions to be taken to restore clearances to a standard such that no operating restrictions are required (in ARTC this may be taken as the Kinematic Envelope plus 200mm).

e. Structure outline
   The standard that determines what structures on the line section should be included in the clearance register, i.e. because they could become subject to maintenance intervention. (in ARTC the structure outline for the purpose of clearance measurements should be 2.5m in width plus, on curves, allowances for vehicle displacement and superelevation. These outlines are illustrated in Figure 7.1.

Note: The kinematic envelope, base operating standard and maintenance intervention standard are measured relative to the plane of the track, that is the relative alignment of the two rails.

The structure gauge is measured to the plane of gravity and is independent of the alignment of the two rails.
Figure 7.1 – Schematic of Clearance Outlines

- Structure Outline
- Static Rolling Stock Outline
- Kinematic Rolling Stock Outline
- Base Operating Standard for Clearances
- Kinematic Outline Plus 200mm
- Contingency Gap (Safety Margin)
7.2.2 Determination of clearance standards

Appendix A outlines a method that may be used to determine clearance standards. These procedures may be used for the specification of clearance standards listed in Clause 7.2.1 when considering both new and existing combinations of structures and rollingstock. The standards determined should represent the worst-case combination of structure and rollingstock for the track section under consideration.

Appendix A uses the static rollingstock outline as the starting point for determining the remaining clearance outlines listed in Clause 7.2.1.

When determining the clearance standards, the following clearance management practices shall be taken into consideration:

- a. Infringement of the maximum kinematic rollingstock outline shall not be permitted in normal operations and shall be treated as a track obstruction.
- b. Infringement of the base operating standard for structures shall result in action being taken prior to the passage of the next train.
- c. Infringement of the maintenance intervention standard for structures shall result in action being taken to restore clearances. Consideration should be given to increased monitoring for further deterioration until the clearances are restored.
- d. Permanent infringements of the maintenance intervention standard shall be subject to increased rates of scheduled inspection in accordance with Clause 7.3.1.
- e. Where a permanent infringement of the structure outline occurs, the structure shall be placed on a clearance register and subject to scheduled inspection in accordance with Clause 7.2.8.

7.2.3 Exceedances and infringements of adopted standards

Design and rating methods based on the guidelines given in Clause 7.2.2 may be used to determine whether to approve the following exceedances and infringements of the specified clearance standards:

- a. Exceedance of static rollingstock outline including out-of-gauge loads.
- b. Exceedance of dynamic rollingstock limits or track tolerances used to determine the maximum kinematic rollingstock outline.
- c. Infringement of structure outlines.
- d. Infringement of base operating standards for structures.
- e. Infringement of maintenance intervention standards for structures.

Approval by the owner may be subject to conditions such as speed restriction or tightened track tolerances.

7.2.4 Infringements of the base operating standard

No structure should be designed, or have a change in configuration, which will result in a safety margin less than 200mm.

The safety margin between the maximum kinematic rollingstock outlines on adjacent tracks shall not be less than 200mm.

For a limited period the clearance, other than at platforms or where the track position is fixed, the safety margin may be reduced down to the Base Operating Standard of 100mm without
restricting operating conditions. However, inspection and maintenance systems should be reviewed and modified where specified by ARTC, and in accordance with clause 7.2.2 (c).

The permanent infringement of the base operating standard for clearances should be subject to approval by the owner and only be permitted in special circumstances, such as at platforms.

Notes:

1. Normal practice is to locate platforms as close as possible to the train for passenger safety. This may be achieved by allowing the platform to be built to the kinematic envelope of the largest swept path envelope of rollingstock using the route. The track may need higher inspection or maintenance levels than for open track.

2. The Infrastructure owners (track and platform) should determine with the passenger train operators tolerances for the furthest position of the track from the platform.

7.2.5 New structures or new rollingstock - general

Where new structures or new types of rollingstock are being considered, the requirements to be specified should be determined in accordance with one or other of the following:

a. The dynamic rollingstock limits and track tolerances used should be appropriate to the actual rollingstock and infrastructure combination being considered.

b. Designs should include the dynamic rollingstock limits in Table 7.1 and track tolerances in Table 7.2 and should be appropriate to the actual rollingstock and infrastructure combination being considered.

c. Existing clearance standards where the maximum kinematic rollingstock outline should be appropriate to the dynamic rollingstock limits and track tolerances of the actual rollingstock and infrastructure combination being considered.

7.2.6 Track Clearances for new construction and upgrade works

Unless otherwise formally approved by the appropriate ARTC Executive General Manager, all track clearances (including structures, main lines, passing tracks etc) shall be designed in accordance with below.

a. For all greenfield sites the design references profile shall be Plate F which will encompass all other current ARTC reference profiles.

b. For existing corridor works the objective will be to meet the clearance requirements for each rollingstock profile currently used on the corridor.
Section 7: Clearances

7.2.7 New Structures on the Defined Interstate Rail Network (DIRN) and the Inland Route

a. Unless otherwise formally approved by the appropriate ARTC Executive General Manager, all new structures over mainlines and passing loops/sidings shall be constructed to give full plate “F” (See B10, B11 and B12 below) i.e. this will give 7.1m clearance above rail.

b. Some of the conditions under which exceptions to the above may be approved include:
   - Some structures are specifically covered by provisions in ARTC’s NSW lease and this allows for the NSW State Railway to replace existing structures at existing heights.
   - Where an approved business case justifies approval of a structure that is designed to be lifted to give 7.1m in future.

7.2.8 New structures on other corridors

For any other Corridors, any variations to the above must be approved by the appropriate ARTC Executive General Manager.

7.2.9 Existing structures and existing rollingstock

Where existing structures and existing types of rollingstock, see Note 1, are being considered the permissible rollingstock outlines may be determined from clearance standards for the relevant line section.

Note [1] Refers to rollingstock that meets the ARTC Route Access Standard

7.2.10 Rollingstock and structure outline standards

For the static rollingstock outlines the corresponding structure outlines in B2 to B12 may be adopted. These structure outlines have been derived from the corresponding static rollingstock outlines by applying the following:

a. Dynamic rollingstock limits from Table 7.1.

b. Track tolerances from Table 7.2.

c. 150 mm and 0 mm cant elevation to provide for clearances on the inside and outside rail respectively of curved track.

d. For curves of 300 m radius or greater, centre and end throws based on 300 m radius.

e. For curves of radius 100 m and greater but less than 300 m radius, centre and end throws based on 100 m radius.

f. 200 mm air gap, see Note 1.
### Table 7.1 – Dynamic Rollingstock Limits

<table>
<thead>
<tr>
<th>FACTOR</th>
<th>ASSUMED LIMITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lateral translation, see Note 1</td>
<td>± 40 mm</td>
</tr>
<tr>
<td>Body roll, see Note 2:</td>
<td></td>
</tr>
<tr>
<td>Rollingstock outlines (not double stack containers)</td>
<td>±2° about a roll centre 610 mm above rail level</td>
</tr>
<tr>
<td>Rollingstock outlines (for double stack containers)</td>
<td>±2.5° about a roll centre 440 mm above rail level</td>
</tr>
<tr>
<td>Bounce, see Note 3</td>
<td></td>
</tr>
<tr>
<td>Wheel clearance (worn wheel to new rail), see Note 1</td>
<td>±20 mm (refer to B31)</td>
</tr>
</tbody>
</table>

**Notes:**

1. ± means linear displacement parallel to the plane of the top of the rails to each side of rollingstock centreline.

2. ± means angular displacement clockwise and anti-clockwise about the roll centre on the rollingstock centreline.

3. + means upward linear displacement normal to the plane of the top of the rails.

### Table 7.2 – Track Tolerances

<table>
<thead>
<tr>
<th>Factor</th>
<th>Assumed tolerances, see Note 1, (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Straight Track</td>
</tr>
<tr>
<td>Rail side wear, see Note 2</td>
<td>± 5</td>
</tr>
<tr>
<td>Gauge widening, see Note 2</td>
<td>± 0</td>
</tr>
<tr>
<td>Gauge (from 1435 mm), see Note 2</td>
<td>± 20</td>
</tr>
<tr>
<td>Track alignment (from design), see Note 3</td>
<td>± 50</td>
</tr>
<tr>
<td>Cross-level (from design), see Note 4</td>
<td>± 30</td>
</tr>
<tr>
<td>Rail Level, see Note 5</td>
<td>± 100</td>
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</table>

### Table 7.3 – Reduced Track Tolerances at Platforms

<table>
<thead>
<tr>
<th>Factor</th>
<th>Assumed tolerances, see Note 1, (mm)</th>
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</thead>
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<tr>
<td></td>
<td>Straight Track</td>
</tr>
<tr>
<td>Gauge (from 1435 mm), see Note 2</td>
<td>± 5</td>
</tr>
<tr>
<td>Track alignment (from design), see Note 3</td>
<td>± 20</td>
</tr>
<tr>
<td>Cross-level (from design), see Note 4</td>
<td>± 10</td>
</tr>
</tbody>
</table>

Reduced track tolerance at platforms shall only be used where there are good drainage and ballast conditions and where maintenance actions are linked to the reduced tolerances.

Factors may be reduced where reduced maintenance tolerances are used (such as Table 7.9). Where reduced factors are used these must be assessed against for the purposes of Cl. 7.3.3 (b).
Notes:

1. These geometry tolerances are intended for the purpose of calculating clearances only.
2. On straight track ± means linear displacement parallel to the plane of the top of the rails to each side of the design centreline of the track.
   On curved track, + means linear displacement to the outside of the curve and - means linear displacement to the inside of the curve parallel to the plane of the top of the rails.
3. On straight track ± means horizontal linear displacement each side of the design centreline of the track.
   On curved track, + means horizontal linear displacement to the outside of the curve and - means horizontal linear displacement to the inside of the curve.
4. ± means vertical displacement of the left and right rails respectively resulting in a clockwise and anti-clockwise rotation of the track in the vertical plane normal to the track.
5. ± means vertical linear displacement above (+) and below (-) design rail level.

7.2.11 Documentation

All clearance locations inside the adopted structure outline shall be entered into a register in the Enterprise Asset Management System. General inspections should be carried out with reference to this register.

Documentation should include clearance classification of each track section in terms of the standards adopted.

All locations on a track section where structures (or the maximum kinematic rollingstock outline on adjacent track) infringe on the adopted structure outline shall be registered in the Enterprise Asset Management System.

For a given line section the maximum kinematic rollingstock outline on an adjacent track may be treated in a similar way to a structure over or adjacent the line.

7.2.12 Normal Structure Gauge 1994 (NSW SINGLE STACK LINES ONLY)

Normal Structure Gauge 1994 applies to existing infrastructure.

Normal Structure Gauge 1994 is shown as Figure 7.2.

Permanent infringements to Structure Gauge 1994 are shown in Figure 7.3.

The maximum Transit Space to be derived from Figure 7.2 is shown in Figure 7.4.

Applicable to all ARTC NSW tracks where clearance is available. It provides for ease of use under most circumstances and includes appropriate infrastructure service requirements as detailed in Section 6. No restrictions are placed on rolling stock operation on corridors carrying any authorised rolling stock outline. It does not require determination of kinematic envelopes.

Infringement of the Nominal Structure Gauge 1994 will be permitted only in accordance with the provisions of Clauses 7.2.13 and 7.2.14.

Where structures are located on a transition or a straight within 22 metres of a tangent point and the lateral clearance is less than 3.0 metres the 'M' allowance must include the allowance specified in Appendix C.
Normal Structure Gauge, 1994

Coordinates

<table>
<thead>
<tr>
<th>Point</th>
<th>Lateral</th>
<th>Vertical</th>
</tr>
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<tbody>
<tr>
<td>a</td>
<td>673</td>
<td>38</td>
</tr>
<tr>
<td>b</td>
<td>673</td>
<td>-32</td>
</tr>
<tr>
<td>c</td>
<td>718</td>
<td>-32</td>
</tr>
<tr>
<td>d</td>
<td>718</td>
<td>0</td>
</tr>
<tr>
<td>e</td>
<td>921</td>
<td>0</td>
</tr>
<tr>
<td>f</td>
<td>921</td>
<td>38</td>
</tr>
<tr>
<td>g</td>
<td>See Diag.</td>
<td>38</td>
</tr>
<tr>
<td>h</td>
<td>See Diag.</td>
<td>3800</td>
</tr>
<tr>
<td>i</td>
<td>See Diag.</td>
<td>B</td>
</tr>
</tbody>
</table>

Superelevated Track Example

Where:
* “Ea” is the Applied Superelevation (right rail in diagram is the low rail).
* “B” is the vertical clearance required.
* “Z” is the vertical height above the design low rail level.
* “M” is the Centre Throw and End Throw component in curves.

For dimensions “B” & “M”, see text.

Detail

For Dimensions, see Detail.

Physical Interface for trip arm in trip position only.
Figure 7.3 – Permanent Infringements

Note: Removeable copings are an approved infringement where only narrow or non-electric vehicles operate.

Legend

M = maximum displacement of centre line of vehicle from the design centreline of curved track (i.e. the centre or end throw of a vehicle).

Ea = Superelevation of track in mm.

Z = height above graded rail level in mm.
Figure 7.4 – Maximum Transit Space Envelope
Section 7: Clearances

a. Horizontal Clearance

The minimum clearance of 2060mm from track centre provides safe clearance for the passage of all rolling stock on straight track. This dimension should be altered to cater for curve effects as follows:

Outside (high leg) of curve = 2060 + M - \( \frac{E_u Z}{1435} \) mm

Inside (low leg) of curve = 2060 + M + \( \frac{E_u Z}{1435} \) mm

The altered horizontal dimensions should be rounded up to the nearest 20mm.

Where:

\( M \) = the allowance for centre and end throws = \( \frac{42000}{R} \) mm

\( Z \) = height above rail level mm

Where structures are located in transitions or straights (including turnouts) within 22m of tangent point the altered dimension (based on the full radius of the curve) must extend 20m beyond the tangent point along the straight (see Appendix C).

To provide for main line crossing loop service requirements as listed below, the 2060 mm dimension from track centre may be varied to the values in Table 7.4. An allowance for track curvature and super elevation has been included in these clearances.

<table>
<thead>
<tr>
<th>Structure</th>
<th>Dimension mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Signal bridge masts; temporary construction works adjacent to a track.</td>
<td>3000</td>
</tr>
<tr>
<td>Vertical piers, columns, deflection walls between tracks</td>
<td>3500</td>
</tr>
<tr>
<td>Bridge substructures and deflection walls (except between tracks); cuttings without road access; station buildings; columns, footbridges, and signal bridge supporting structures on platforms; other structures located adjacent to non-electrified tracks and where road access is not required.</td>
<td>4300</td>
</tr>
<tr>
<td>Other structures and cuttings where road access are required.</td>
<td>6000</td>
</tr>
</tbody>
</table>

For structures adjacent to sidings the dimension from the track centre shall be as shown in Table 7.5 to allow for worksite access and operating safety requirements. These clearances shall be increased to allow for track curvature effects when structures are located at, or within 22 metres of curves or turnouts.

<table>
<thead>
<tr>
<th>Structure</th>
<th>Dimension mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-continuous structures e.g. isolated columns, doorways and gateways.</td>
<td>2500</td>
</tr>
<tr>
<td>Continuous structures, e.g. walls, material stacks and unbroken fencing.</td>
<td>3000</td>
</tr>
<tr>
<td>Where vehicle doors may open opposite a structure.</td>
<td>3700</td>
</tr>
</tbody>
</table>
b. Vertical Clearances

In non-electrified areas, Dimension 'B' is the vertical distance from the underside of a structure to the design height of the low rail.

The minimum design value of Dimension 'B' for specified rolling stock outlines in non-electrified areas shall be as detailed in Table 7.6.

*Table 7.6 – Vertical Clearance at Dimension B*

<table>
<thead>
<tr>
<th>Dimension B</th>
<th>Rollingstock Outline</th>
</tr>
</thead>
<tbody>
<tr>
<td>4670 + 1.2Eₐ</td>
<td>Narrow Non-Electric</td>
</tr>
<tr>
<td></td>
<td>Narrow Square</td>
</tr>
<tr>
<td></td>
<td>Narrow Container</td>
</tr>
<tr>
<td></td>
<td>Intersystem</td>
</tr>
<tr>
<td></td>
<td>Narrow Hopper</td>
</tr>
<tr>
<td></td>
<td>NZZA Wagon</td>
</tr>
<tr>
<td>6250 + 1.5Eₐ</td>
<td>Double Stack</td>
</tr>
</tbody>
</table>

This provides for the safe passage of approved Rolling Stock and loading outlines and includes a minimum vertical clearance of 400mm above the approved outline. The 400mm margin includes a design allowance of 150mm for track resurfacing.

c. Track Centres

*Table 7.7 Minimum design track centres for new works*

<table>
<thead>
<tr>
<th>Configuration</th>
<th>Required Track Centres</th>
</tr>
</thead>
<tbody>
<tr>
<td>Main line to Main line, Main line to Crossing Loop</td>
<td>4500mm (5500mm where signals/lighting posts are located between tracks).</td>
</tr>
<tr>
<td>Main line to Refuge Loop Siding or Siding (non-examination)</td>
<td>4500mm (5500mm where signals/lighting posts are located between tracks).</td>
</tr>
<tr>
<td>Main line to Siding, Crossing Loop to Siding or Examination Siding</td>
<td>5500mm for straight and curved tracks.</td>
</tr>
</tbody>
</table>
7.2.13 Clearances at Platforms (NSW ONLY)

a. General

A platform wall adjacent to a track is a critical clearance location and is to be specially managed under the provisions of ETE-07-01.

The clearances between platforms and rolling stock are designed to provide the minimum gap when allowance is made for vehicle dynamics and acceptable maintenance tolerances for track and vehicle.

ARTC is responsible for the maintenance of the clearance between the track and the platform. Others are responsible for maintaining the structural integrity of the platform surface, face and coping.

Special Load Gauge vehicles overhang standard platforms and cannot pass Level Access (see clause 7.2.12b) platforms.

Special Load Gauge vehicle vertical clearance to standard access platforms is critical and tolerances must be maintained as specified below.

Some corridors have paths that are designated “Special Load Gauge paths” through the corridor. It is not permitted to construct Level Access platforms adjacent to tracks on these paths.

During track upgrading or construction works, changes in the approved design configurations may exceed acceptable tolerances and as a result special management procedures may need to be prescribed by the authorised ARTC representative.

b. Standard and Level Access Platforms

Platforms may be designated as Standard Access or Level Access.

Standard Access platforms provide a step down of approximately 150mm from car floor to platform coping.

Level Access platforms are at approximately the same level as the car floor. There are no Level Access platforms on the ARTC Network.
c. **Standard Access Platform**

The height $V_s$ to a platform coping above Graded Rail Level on straight track is shown in Table 7.8.

The height to a platform coping above Graded Rail Level (low rail) on curved, track is to be:

$$V_c = V_s + 1.7E_d$$

for a concave platform

$$V_c = V_s - 0.7E_d$$

for a convex platform

The horizontal and vertical clearance between a straight Standard Access platform coping edge and the nearest running face of rail ($H_s$) of the adjacent track is shown in Table 7.8 and Figure 7.5. The horizontal clearance shall be the widest kinematic envelope using the route.

<table>
<thead>
<tr>
<th>Rolling Stock Type</th>
<th>Sleeper Type</th>
<th>$H_s$ (mm)</th>
<th>$K$</th>
<th>$k$</th>
<th>$V_s$ (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Narrow/Non-Electric</td>
<td>All</td>
<td>1575</td>
<td>32600</td>
<td>0.67</td>
<td>1065</td>
</tr>
<tr>
<td>Other</td>
<td>All</td>
<td>1700</td>
<td>42000</td>
<td>0.75</td>
<td>1065</td>
</tr>
<tr>
<td>Hunter Valley</td>
<td>All</td>
<td>1580</td>
<td>32600</td>
<td>0.67</td>
<td>1060</td>
</tr>
</tbody>
</table>

**Notes:**

1: $K$ is the co-efficient for determining horizontal displacement due to centre throw calculated as $K = \frac{Bc^2}{8}$ where $Bc$ represents vehicle bogie centres

2: $k$ is the co-efficient for determining horizontal displacement due to superelevation calculated as $k = \frac{V}{1435}$ where $V$ represents platform height

**Figure 7.5 – Standard Access Platform Coping Clearances**
d. Curved Track

The horizontal clearance to concave and convex Standard Access platforms is shown in Figure 7.6 by $H_c$ and $H_v$ respectively as follows:

**Figure 7.6 - Standard Access Platform Coping Clearances for Concave and Convex Platforms**

For concave platform

$$H_c = H_s + \frac{K}{R} - kE_{ae}$$

For convex platform

$$H_v = H_s + \frac{K}{R} - kE_{ae}$$

---

e. Transitioned Track

The clearances to platforms adjacent to transition curves, or within a vehicle length of a transition curve, are determined from modified forms of the above formulae. The radius used is the effective radius at the point in the track being analysed, and the super-elevation used is the effective super-elevation at the point in the track being analysed.

For concave platform

$$H_c = H_s + \frac{K}{R_e} - kE_{ae}$$

for convex platform

$$H_v = H_s + \frac{K}{R_e} + kE_{ae}$$

The effective super-elevation ($E_{ae}$) for a *concave* platform is the average super-elevation of two points on the track, which are a distance of $\frac{L + R_c}{2}$ and $\frac{L - R_c}{2}$, in the direction of increasing super-elevation, from the point in the track being analysed.

The effective super-elevation ($E_{ae}$) for a *convex* platform is the average super-elevation of two points on the track, which are a distance of $\frac{R_c}{2}$ in each direction, from the point in the track being analysed.

The effective radius ($R_e$) for a *concave* platform is the average radius of two points on the track, which are a distance of $\frac{L + R_c}{2}$ and $\frac{L - R_c}{2}$, in the direction of tightening radius, from the point in the track being analysed.
The effective radius ($R_e$) for a **convex** platform is the average radius of two points on the track, which are a distance of $\frac{R_1}{2}$, in each direction, from the point in the track being analysed.

The average radius of two points can be determined using the following formula:

$$R_e = \frac{2}{\frac{1}{R_1} + \frac{1}{R_2}}$$

Where $R_1$ and $R_2$ are the radii at each of the two points.

$E_x$ and $R$ at any point in a transition can be determined from formulae provided in ARTC Specification ETD-00-03.

**f. Determining Alignment**

Alignment shall be determined from the point of coping closest to the nearest running face of rail, taking into consideration coping may not be straight.

*Figure 7.7 - Alignment Point on Platform Coping*

<table>
<thead>
<tr>
<th>Height Tolerance</th>
<th>Standard Relative to Platform (Vs)</th>
<th>Hunter Valley Relative to Design Rail Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Platform Construction</td>
<td>+25mm / -0mm</td>
<td>+0mm / +15mm</td>
</tr>
<tr>
<td>Track Construction</td>
<td>+50mm / -0mm</td>
<td>+0mm / +20mm</td>
</tr>
<tr>
<td>Track Maintenance</td>
<td>+50mm / -0mm</td>
<td>+0mm / +70mm</td>
</tr>
</tbody>
</table>

**g. Tolerances at Platforms**

*Table 7.9 Tolerances at Platforms*

<table>
<thead>
<tr>
<th>Lateral Clearance Tolerance</th>
<th>Standard</th>
<th>Hunter Valley</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction</td>
<td>+5mm / -0mm</td>
<td>+4mm / -4mm</td>
</tr>
<tr>
<td>Maintenance</td>
<td>+15mm / -15mm</td>
<td>+15mm / -15mm</td>
</tr>
</tbody>
</table>

Through platforms, super-elevation is to be maintained within 10mm of design.
h. Documentation

The following details any new platform design must be provided to ARTC:

i. Line and track;
ii. Kilometrage;
iii. Station name and platform number
iv. Design details consisting of track width class, rolling stock outlines considered, height category (standard or level access);
v. Standard followed.

7.2.14 Minimum Standards for Clearances (NSW ONLY)

a. Reduced Clearances

The required transit space can be infringed by rolling stock, loads, structures, track centrelines and the exceedance of track and vehicle tolerances.

Normal Structure Gauge 1994 provides for a safety margin of 200mm between the kinematic envelope and an adjacent structure (excluding a platform) or a vehicle on an adjacent track.

Where the clearance is reduced below the Base Operating Standard for clearances of 100mm, action is to be taken to restore clearances.

At platform copings the usual design safety margin of 200mm is not achieved and special lateral and vertical clearances are authorised in clause 7.2.12.

The absolute limit on platform height is -100mm (i.e. 1165mm for standard access platforms on straight track) except in the Hunter Valley. In the Hunter Valley the absolute limit for platform height is +145mm. The base operating tolerance on platform lateral clearance is 20mm of the design value.

Permanent reduction in the clearances detailed above may be permitted only under special operating conditions and registered in accordance with clause 7.2.13d.

To determine the safety margin at a structure or between adjacent trains, the kinematic envelope should be derived.

No structure should be designed, or have a change in configuration, which will result in a safety margin less than 200mm.

b. Approval of Reduced Clearance

Reduction in safety margins to those listed in Clause 7.2.13a may be approved by the authorised ARTC representative.

Management of temporary infringements should include:

i. Action plan to correct infringement;
ii. Appropriate alterations to maintenance procedures and operating restrictions;
iii. Consultation with the authorised ARTC representative;
iv. Appropriate records of the infringements.
v. Reduction in a service clearance may be approved by the authorised ARTC representative.
vi. Reduction of designated safety margins to structures and between rolling stock should be temporary only and managed by the authorised ARTC representative.

c. Track and Structures Design Infringements

When existing tracks or structures are scheduled for renewal or major upgrading and for new structures, the design must include clearances not less than those specified in the Normal Structure Gauge 1994. Where this is unattainable, reduced clearances may be approved in accordance with clause 7.2.13a.

Prior to approval, evidence of the inability to comply will need to be submitted to the authorised ARTC representative together with appropriate technical and financial supportive documentation. Where approval is given, the appropriate infringement approval form will need to be completed, specifying any special conditions.

d. Infringement Notification and Records

Structure Gauge Infringement Approval Forms are to be held by authorised ARTC representative. See Appendix D.

A register is to be maintained for each Corridor with a current copy of the register issued to the authorised ARTC representative and relevant Maintenance Staff.

Note: These requirements are in addition to those specified in Clause 7.3.4

7.2.15 Transit of Special and Out-of-Gauge Loads (NSW ONLY)

a. General

The authorisation of various vehicle loads and speeds is published in the appropriate working timetable. Authority for the running of heavy loads is to be established by ARTC Operations.

The objective is to initiate consultation where clearances cannot be maintained within the specified tolerances. In particular, platform heights are identified as critical to the operation of special and out-of-gauge loads.

The authorised ARTC representative is to regularly monitor and fully document all locations where special and out-of-gauge loads will infringe existing structures. Any intended variation, or variations from previous monitoring should also be nominated.

Any infringements of structure gauge standards adopted for various lines at any time are to be regarded as temporary only and are to be corrected as a priority.

The ARTC Operations will use the information from the authorised ARTC representatives to determine what out-of-gauge loads can run and will liaise directly with ARTC Operations Standards Manager to arrange any special corrective measures required for the safe transit of these loads.

Operators will liaise directly with the ARTC Operations Standards Manager to determine whether particular trains can run and arrange for the running of these trains.

b. Platform Clearances

For the running of special and out-of-gauge loads, the platform height needs to be maintained within tolerance, particularly on curves. Lateral clearances to platforms are at an absolute minimum for passenger services when vehicle allowances of 2° roll and 75mm bogie displacement are included.
The standards for platform clearances are detailed in the Section 7. Any reduction in these clearances is to be treated as potential infringement and reported accordingly.

7.2.16 Track Centre Clearance Warning Signs for Yards (NSW ONLY)

c. Purpose

Warning signs are to be provided where track centres within yard limits are less than 4000 mm. This applies to ARTC tracks or between an ARTC track and an adjacent track.

The purpose of the sign is to warn train operations personnel of the existence of track centres narrower than 4000 mm. The required response to the signs by operators is specified in the Safe Working regulations.

d. Warning Signs

Warning Signs should contain the words “Danger Narrow Track Clearances” and be laid out as shown in Figure 7.8. All signs shall be reflectorised and of metal construction.

*Figure 7.8 – Danger Narrow Track Clearances Sign*

Where signs are provided at entry points to yards/sidings, they are to be 600 x 400mm. The minimum height of the centre of the sign is to be 2.2m above rail level. Where signs are provided at point levers or main frame levers, they are to be 400 x 300mm.

e. Position of Signs

The number and location of signs within a yard is to be determined during a joint risk assessment with the operator/s. The minimum requirement is 2 signs, one at each end of the yard. The position of all Warning Signs is to be documented on the applicable track layout diagram. Signs are to be positioned:

i. Clear of structure gauge and clearly visible to train operations personnel;

ii. So as not to be associated with any signals;

iii. So as not to restrict the operator’s normal field of vision or operation of levers;

iv. So they will not present a tripping hazard, or a head or body collision hazard to personnel.

v. The position of all signs should be documented on the applicable track layout diagram.
7.3 Inspection and Assessment

7.3.1 Scheduled clearances inspection (see section 7.2.1 for definitions)

All clearance inspections should consider the kinematic envelope applied to the plane of track as per the design superelevation. If the kinematic envelope is applied to the actual superelevation, then a new clearance check shall be undertaken for any adjustment in super exceeding the values used to determine the kinematic envelope as per Cl 7.2.10.

a. Patrol inspection

The purpose of a patrol inspection for clearances is to identify visible clearance infringements and to report any structure or adjacent track that is damaged, unsound or of changed geometry.

The interval between patrol inspections of structure-to-track and track-to-track clearances shall not exceed the timeframe specified in the approved Technical Maintenance Plan. Track patrol inspections should keep a lookout for clearance infringements and conditions (i.e. indicators of infringements) that may affect train operations including the following:

i. track obstructions;
ii. changes in track or structure location since previous inspection;
iii. visible markings or damage to structures, including platform edges;
iv. horizontal and vertical alignment past or through structures;
v. evidence of recent or current movement;
vi. fouling point markers are not visible, conspicuous or performing the function intended;
vii. other obvious defects that may affect clearances.

The speed at which the inspection is carried out should be consistent with the local conditions and the full scope of the inspection being carried out (e.g. the type and number of other infrastructure elements being inspected).

b. General inspections—Compliance

General inspections at locations on the clearance register should confirm compliance with the clearance standards and shall be able to detect the following:

i. structures infringing the maintenance intervention standard;
ii. structures infringing the base operating standard;
iii. adjacent tracks infringing the maintenance intervention standard;
iv. adjacent tracks infringing the base operating standard.

These inspections should identify locations of clearance degradation requiring action and determine the need for further specialist inspection.

c. General inspections - Frequency and tasks

General inspections of clearances shall be carried out in a manner and at an interval appropriate to the location, rates of deterioration and other local factors (e.g. track type), and in any case at intervals not greater than those specified below or as otherwise specified by ARTC e.g. in an approved Technical Maintenance Plan. At locations of restricted clearance such as platforms the frequency of general inspection should be increased.
A general inspection including determination of the available clearances should also be carried out when there are suspected defects following work affecting the location of the track(s) or structure or defects are identified from patrol inspections.

Records of these inspections are be recorded in the Enterprise Asset Management System. The scheduled inspections should include the tasks of the patrol inspection in addition to the measurement of the following:

i. clearance from datum points to specified locations;
ii. distance between track centrelines (including fouling clearances at turnouts);
iii. track superelevation if specified on the datum;
iv. track curvature if specified on the datum.

A general inspection frequency regime should be specified. The inspection frequency regime should take into account the associated level of risk at the clearance location.

If the clearance standards adopted are based on the design guidelines prescribed in Clause 7.2.7 (or a total air gap of 200 mm or greater is provided) the following rates of scheduled general inspection shall apply:

A. If the structure is outside the adopted structure outline, scheduled general inspections are not necessary.

B. If the structure is inside the adopted structure outline inspections shall be carried out as follows:
   a. Annually on passenger lines and lines carrying more than 10 million gross tonnes;
   b. Every 2 years on all other lines.

7.3.2 Electronic Survey Equipment

Gauging surveys shall be carried out using approved equipment.

Survey equipment (including software used to process survey data collected by that equipment) used to check clearances in track or structure designs shall be approved by the General Manager, Asset Management, or their delegate, where applicable.

Gauging survey equipment shall relate measurements to the rail running edge of the surveyed track, ideally by touching the rail running surface and edge at the gauge point of both rails. The gauge point and working instruction is defined in RAP5135.

Non-contact methods of measuring to rail and interpolating the gauge point shall be able to capture both rail gauge corners in all typical Australian railway scenarios (i.e. switches and crossings (S&C), check rails, level crossings, foot crossings, cant/curvature combinations, and on new and worn rails, including heavily lipped rails) accurate to 1 mm.

**NOTE** The reference to the rail may be via the wheels of a vehicle or trolley on which the measuring equipment is mounted or by direct contact with the measuring equipment. Measuring to the rail directly using laser equipment, such as Theodolite, Lasersweep or Routescan is not acceptable, unless a trolley mounted prism is used.

Gauging survey equipment shall be calibrated annually and validated at a suitable frequency to ensure reliable information.
Where possible, gauging survey equipment shall provide swept profiles representing the worst clearance over five metres of track. Accuracy of survey equipment shall be calculated to consider the effect of point measurement, cant and curvature accuracies and surface roughness. See Appendices A and B.

NOTE: Due to variations in surface roughness, discrete survey systems are not suitable for use at structures of rock and rough masonry construction.

Gauging survey equipment shall be classified as a Survey Method within the enterprise asset management system. Details of survey methods, the gauging survey equipment they encompass, and the accuracy of the method shall be maintained.

Changes or additions to the list of survey methods, the associated gauging survey equipment, accuracies and their suitability for use at platforms shall be agreed in writing by the General Manager, [Technical Standards]

All surveys shall include:

a. co-ordinates of points on the structure, with the Y axis points related to a line in the plane of the both rail top surfaces and the X axis points related to the track centreline. Co-ordinates are positive above and to the field rail;

b. co-ordinates of the rails for the track being surveyed;

c. Actual or design curvature of the surveyed track;

d. Actual or design cross level of the surveyed track;

e. All relevant track and location information;

f. Structure Number/Identifier.

Where a structure spans multiple Track Line references or Base Codes, separate records for each section of the structure shall be created.

Longitudinal positioning of a profile or swept profile shall be provided in terms of kilometres and metres, to within a metre. The position of adjacent profile or swept profiles shall be provided within 200 mm.

Any manual amendment of captured structure profiles shall be undertaken by competent staff, with reference to visual representations of the structure.

Any manual editing of discrete manual survey data undertaken shall be completed prior to any decimation process.

All structure and platform surveys shall contain a set of 2D co-ordinates which, when plotted, provide a reasonable correlation to the visual representation of the structure or platform the survey captured.

Any decimation undertaken shall be pure decimation, retaining those captured points closest to a radial point and not be undertaken to a Standard Deviation.

All surveys shall include:

a. co-ordinates of points on the structure, with the Y axis points related to a line in the plane of the both rail top surfaces and the X axis points related to the gauge point on the left-hand rail in increasing kilometrage;

b. co-ordinates of the rails for the track being surveyed;

c. five-metre composite profile (when measured with a continuous system).
Manual measurement may be undertaken to verify findings of an electronic survey, where a discrepancy exists the electronic measurement should be used except where it is apparent that the measurement is erroneous.

7.3.3 Assessment and actions

a. General

Clearances shall be assessed against the clearance standards adopted for each line section.

The results of inspections shall be assessed to determine whether the structure (or the maximum kinematic rollingstock outline on adjacent tracks) infringes the maintenance intervention or base operating standard for clearances, and action taken as set out in Item (b) and (c).

Appendix E details the requirements of base operating and maintenance intervention standards for various rollingstock profiles.

b. Movement relative to datum point or last known position

Where a datum point exists (e.g monument, plaques etc) or last position is known, any measured track movement outside the allowable tolerance should be rectified;

i. prior to the passage of the next train where the base operating standard is infringed (e.g at platforms)

ii. within seven days at all other locations

Note: The allowable tolerances for track movement are those used in the determination of the kinematic envelope. Table 7.2 lists the default track tolerances, however in some locations tighter tolerances do apply (e.g locations with infringement waivers)

c. Infringement of the maintenance intervention standard

Where the maintenance intervention standard is infringed either—

i. action should be taken to restore the clearances such that the maintenance intervention standard is not infringed, with clearances monitored until this action is completed; or

ii. approval shall be sought as per Clause 7.3.4

Note: The increased rate of general inspection guidelines in Clause 7.3.1. (c) should be met.

d. Infringement of the base operating standard

Where the base operating standard is infringed either—

i. action should be taken, prior to the passage of the next train, to restore the clearances such that the base operating standard is not infringed, see Note 1; or

ii. restrictions should be applied to operations, prior to the passage of the next train, until action can be taken to restore clearances, see Note 2.

Track clearances measured to be less than required in Appendix E shall be treated as an infringement to the base operating standard.

Permanent infringement to the base operating standard may only be approved by the Manager Standards through a formal waiver.
Notes:

1. *If this action does not restore clearances such that the maintenance intervention standard is not infringed, Item (b) should then be implemented for infringement of the maintenance intervention standard.*

2. *Assessment of an appropriate restriction may be carried out using the general procedures defined in Clause 7.2.*

e. Permanent infringements of the base operating standard

Where permanent infringement of the base operating standard for clearances has been permitted the results of inspections should be assessed to determine whether the track tolerances used to specify the clearance standards (see Clause 7.2.10) have been exceeded, see Note 1.

Where the track tolerances have been exceeded either—

i. action should be taken prior to the passage of the next train, to restore the track position such that the track tolerances are not exceeded; or

ii. restrictions should be applied to operations, prior to the passage of the next train, until action can be taken to restore the track position, see Note 2.

Notes:

1. *This may be achieved using datum markers on structures, however where this is not the case the relative position of track and structure (or track and adjacent track) should be checked against the clearance standard at the location.*

2. *Assessment of an appropriate restriction may be carried out using the general procedures defined in Clause 7.2.*

f. Track inspectors shall log infringement defects in Ellipse, managed via the existing defect management process.

### 7.3.4 Infringement Waivers

a. General

All infringement waivers must be approved by the Corridor Manager.

If the infringement is to the base operating standard it must also be approved by the Manager Standards.

The final approver should specify a timeframe to review the waiver, if applicable.

Infringement waivers shall be via form SECTION7F1 and entered into the Enterprise Asset Management System as a feature with the following information as a minimum;

- Location
- Required clearance(s)
- Actual clearance(s)
- Controls
- Duration of waiver

The process owner shall maintain these records and waiver register master documents for the duration of the waiver.
Appendix A – Clearance Design Procedures

A1 Static Rollingstock Outline

The static rollingstock outline for the rollingstock operating on a track section should be determined in conjunction with operators.

The static rollingstock outline should be met by the rollingstock under all maintenance and loading conditions (e.g. at all wheel diameters in the range for new and condemnable worn wheels).

A2 Vehicle Swept Path

The centre throw \( C \) (in mm) and end throw \( E \) (in mm) of rollingstock on circular curved track may be calculated as follows:

\[
C = \frac{B^2}{8R} \quad \ldots \text{(Eq. A1)}
\]

and

\[
E = \frac{(L^2 - B^2)}{8R} \quad \ldots \text{(Eq. A1)}
\]

where:

\[
B = \text{length between pivot centres of bogies (mm)}
\]

\[
L = \text{overall length of vehicle (mm)}
\]

\[
R = \text{radius of curve (mm)}
\]

The swept path should be based on the static rollingstock outlines operating on the section of track under consideration as follows:

a. On straight (tangent) track the swept path should not be less than the static outlines of the rollingstock.

b. On circular curved track down to 100 m radius the swept path should not be less than the static outlines of the rollingstock plus allowance made for centre and end throw.

A3 Track Tolerances

Track tolerances should be determined for the line section being considered for the following:

a. Rail side wear.

b. Gauge widening on curved track.

c. Gauge from 1435 mm.

d. Track alignment from design.

e. Cross level from design.

f. Rail level from design.

Note: The design track position should be known as well as these tolerances.
A4 Dynamic Rollingstock Limits

The dynamic rollingstock limits should be determined in conjunction with operators for the following displacements:

a. Linear, to each side of the vehicle centreline and parallel to the plane of the top of the rails for lateral translation and for wheel clearance (worn wheel to new rail).

b. Angular, clockwise and anti-clockwise about the roll centre, for body roll.

c. Upward linear displacement normal to the plane of the top of the rails, for bounce.

A5 Maximum Kinematic Rollingstock Outline

The kinematic envelope for an item of rollingstock should represent the largest possible profile it can assume under the most adverse conditions.

It should be determined for the particular track section using the following procedures:

a. Determine the static rollingstock outline (on straight, uncanted track) for the rollingstock operating on the line section.

b. For each point on the static rollingstock outline, apply horizontal displacements to widen the outline on each side of its vertical centreline for—
   i. rollingstock lateral translation;
   ii. wheel clearance (worn wheel to new rail);
   iii. rail side wear;
   iv. gauge widening of the track;
   v. gauge tolerance of the track; and
   vi. centre and end throw of the rollingstock on curved track.

c. From Step (b), apply vertical displacements to extend the outline vertically for rollingstock bounce.

d. From Step (c), apply angular displacements about the point of cant rotation for cant.

e. From Step (d), apply angular displacements about the left hand rail for cross level tolerance.

f. From Step (d), apply angular displacements about the right hand rail for cross level tolerance.

g. From Steps (e) and (f), apply angular displacements about the roll centre of the vehicle for body roll. (In the case of tilt trains, apply additional angular displacements about the tilt centre for body tilt.)

h. From Steps (e), (f) and (g), apply horizontal displacements for track alignment tolerances, and vertical displacements for rail level tolerances.

i. The maximum envelope from steps (e), (f), (g) and (h) defines the maximum kinematic rollingstock outline.
A6 Air Gap Provision

The provision of an air gap between the maximum kinematic rollingstock outline and structures (or maximum kinematic rollingstock outlines on adjacent tracks, see Note) should take into account the following:

a. Base operating standards, maintenance intervention standards, and structure outlines.
b. Inspection intervals.
c. Variations in and rates of change of the parameters used to determine the maximum kinematic rollingstock outline.
d. Potential for movement of the structure.

Note: For a given line section the maximum kinematic rollingstock outline on an adjacent line may be treated in a similar way to a structure over the line.

A7 Base Operating Standard

An air gap should be added to the maximum kinematic rollingstock outline to define the base operating standard for clearances to structures or to the maximum kinematic rollingstock outline on adjacent tracks.

This air gap should provide a safety margin against infringement of the maximum kinematic rollingstock outline.

A8 Maintenance Intervention Standard

An air gap should be added to the base operating standard to define the maintenance intervention standard for clearances to structures or to the maximum kinematic rollingstock outline on adjacent tracks.

This air gap should provide for maintenance action to be taken before infringement of the base operating standard.

A9 Structure Outline

An air gap should be added to the maintenance intervention standard to define the structure outline for clearances to structures or to the maximum kinematic rollingstock outline on adjacent tracks.

This air gap should provide an additional safety margin such that scheduled inspections are not considered necessary for structures (or maximum kinematic rollingstock outlines on adjacent tracks) which fall outside this outline.
Appendix B – Clearance Diagrams

Rolling stock profile diagrams can be found of the ARTC Route Access Standard, except for outline F.
Rollingstock outline F is included in this Appendix.

B1 Rollingstock Outline F

Notes:

1. The dimensions between bogie pivots and from bogie pivot to end of body should not be increased unless allowance is made by a reduction in width to compensate for increased centre and end throw on a curve of 100 m radius.

2. The clearances above rail should be preserved under all conditions of operation, loading and maintenance of a vehicle on level track.
**B2 Structure Outline**

Straight Track

Used for Rollingstock Outlines A and B

---

**Notes:**

1. *Uses dynamic rollingstock limits from Table 7.1 and track tolerances from Table 7.2.*
B2 **Structure Outline**
Curved Track ≥300m radius
Used for Rollingstock Outlines A and B

Notes:
1. Uses dynamic rollingstock limits from Table 7.1 and track tolerances from Table 7.2
B3 **Structure Outline**  
Curved Track ≥100 M and <300 M Radius  
Used for Rollingstock Outlines A and B

![Diagram of Structure Outline](image)

**Design Centreline of Track**

**Design Rail Level**

**Notes:**

1. *Uses dynamic rollingstock limits from Table 7.1 and track tolerances from Table 7.2.*
### Structure Outline

Straight Track

Used for Rollingstock Outlines C and D

---

**Notes:**

1. *Uses dynamic rollingstock limits from Table 7.1 and track tolerances from Table 7.2.*
Structure Outline
Curved Track ≥300m radius
Used for Rollingstock Outlines C and D

Notes:
1. Uses dynamic rollingstock limits from Table 7.1 and track tolerances from Table 7.2.
B6  Structure Outline
Curved Track ≥100 M and <300 M Radius
Used for Rollingstock Outlines C and D

Notes:
1. Uses dynamic rollingstock limits from Table 7.1 and track tolerances from Table 7.2.
**B7 Structure Outline**

Straight Track
Used for Rollingstock Outline E

---

**Notes:**

1. *Uses dynamic rollingstock limits from Table 7.1 and track tolerances from Table 7.2.*
B8 Structure Outline
Curved Track ≥300m radius
Used for Rollingstock Outline E

Notes:
1. Uses dynamic rollingstock limits from Table 7.1 and track tolerances from Table 7.2.
B9  **Structure Outline**  
Curved Track ≥100 M and <300 M Radius  
Used for Rollingstock Outline E

Notes:
1. *Uses dynamic rollingstock limits from Table 7.1 and track tolerances from Table 7.2.*
B10 **Structure Outline**
Straight Track
Used for Rollingstock Outline F

**Notes:**

1. *Uses dynamic rollingstock limits from Table 7.1 and track tolerances from Table 7.2.*
B11  **Structure Outline**  
Curved Track ≥300m radius  
Used for Rollingstock Outline F

**Notes:**

1. Uses dynamic rollingstock limits from Table 7.1 and track tolerances from Table 7.2.
B12 Structure Outline
Curved Track ≥100 M and <300 M Radius
Used for Rollingstock Outline F

Notes:
1. Uses dynamic rollingstock limits from Table 7.1 and track tolerances from Table 7.2.
B13  Wheel Clearance (Worn Wheel to New Rail)

New Wheel Flange
(Worn Wheel Flange shown hatched)

New Rail
Appendix C – Centre and End Throw at Transitions (NSW ONLY)

C1 Clearance required on outside of non-transitioned curve (ANZR)
C2 Clearance required on inside of non-transitioned curve (ANZR)
C3 Clearance required from through track at turnout (ANZR)
C4 Clearance required on outside of non-transitioned curve (NE / NNE)
C5 Clearance required on inside of non-transitioned curve (NE / NNE)
C6  Clearance required from through track at turnout (NE / NNE)

[Diagram showing clearance requirements for different vehicle types and additional clearances at various distances from point (m).]
# Appendix D – Forms (Examples Only)

## D1 ETM0701F-01 Trans Space Operational Infringement Approval

### TRANSIT SPACE OPERATIONAL INFRINGEMENT APPROVAL

<table>
<thead>
<tr>
<th>Location Details</th>
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<tbody>
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</tr>
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<td>Track:</td>
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<td>Km from:</td>
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</tr>
<tr>
<td>Km to:</td>
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<tr>
<td>Nearest station:</td>
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### Infringement Details

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<td>Height: From</td>
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<td>Height: To</td>
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</tr>
<tr>
<td>Max Infringement to Structure Gauge</td>
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<tr>
<td>Min Clearance to Kinematic Envelope</td>
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<thead>
<tr>
<th>Lateral</th>
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<tbody>
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</tr>
<tr>
<td>Height: To</td>
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<td></td>
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<tr>
<td>Max Infringement to Structure Gauge</td>
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<tr>
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### Vertical

* Down side of profile line is positive

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<tr>
<td>Min Clearance to Kinematic Envelope</td>
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### Track Centres

Max Infringement to Structure Gauge

Min Clearance to Kinematic Envelope

### Approval Details

Infringement Structure

Requesting Authority

Reason for Infringement

Condition Approval

Structure Gauge Reference

Structure Gauge Drawing

Recommended

Approved

Title:  
Date:  

Note: Form layout may change to suit a particular infringement
<table>
<thead>
<tr>
<th>Line</th>
<th>Sector Code</th>
<th>Track/s</th>
<th>Kilometrage</th>
<th>Brief Details of Approval</th>
<th>Special Conditions</th>
<th>Approval Date</th>
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D2 ETM0701F-02 Trans Space Operational Approval Register
Clearance Infringement Waiver

### Location Details

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<td>Line</td>
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<td>Section From</td>
<td>KM To</td>
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### Infringement Details

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<tr>
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<th>RIGHT SIDE</th>
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<tr>
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<td></td>
</tr>
<tr>
<td>Height To</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Min Infringement Distance from Centreline</td>
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<tr>
<td>Required Structure Gauge from Centreline</td>
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<td>Min Clearance To Kinematic Envelope</td>
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<th>VERTICAL CLEARANCE</th>
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<td></td>
</tr>
<tr>
<td>Horizontal To *</td>
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<td></td>
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<tr>
<td>Min Infringement Distance from Top of Rail</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Max Infringement To Structure Gauge</td>
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<th>TRACK CENTRES</th>
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<tr>
<td>Min Track Centres Measured</td>
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### Reference Details

Infringement structure

Requesting Authority

Reason For Infringement

Condition of Approval

Structure Gauge Reference

Structure Gauge Drawing

### Approval Details

<table>
<thead>
<tr>
<th>Sign</th>
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<td></td>
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<td>Corridor Manager</td>
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Approved*

Manager Standards

*Note: Approval only required for infringement to base operating standard
Appendix E – Clearance Limits

The base operating, maintenance and kinematic values in this appendix refer to the values furthest from centreline, this is typically toward the top of the rollingstock envelope. Lesser values may be required at heights closer to top of rail.

Refer to ARTC RAS for list of rollingstock profiles on each corridor.

**E1 Clearance Limits Measured from Track Centreline**

These values apply to straight track only, additional allowances are required for curves.

Refer to Section 7.3.3 for required actions.

<table>
<thead>
<tr>
<th>Profile</th>
<th>Kinematic</th>
<th>Base Operating</th>
<th>Maintenance</th>
<th>Structure Gauge</th>
<th>Track Centres</th>
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<tbody>
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<td>A</td>
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**E2 Clearance Limits Measured from Rail Gauge Point**

These values apply to straight track only, additional allowances are required for curves.

These values are measured from the gauge point of the closest rail.

Refer to Section 7.3.3 for required actions.

<table>
<thead>
<tr>
<th>Profile</th>
<th>Kinematic</th>
<th>Base Operating</th>
<th>Maintenance</th>
<th>Structure Gauge</th>
<th>Track Centres</th>
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