Procedure

Road/Rail Vehicle Rail Guidance System Static Alignment

Version 1.0

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Standard governance

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Document history

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Preface

The Asset Standards Authority (ASA) is a key strategic branch of Transport for NSW (TfNSW). As the network design and standards authority for NSW Transport Assets, as specified in the ASA Charter, the ASA identifies, selects, develops, publishes, maintains and controls a suite of requirements documents on behalf of TfNSW, the asset owner.

The ASA deploys TfNSW requirements for asset and safety assurance by creating and managing TfNSW’s governance models, documents and processes. To achieve this, the ASA focuses on four primary tasks:

- publishing and managing TfNSW’s process and requirements documents including TfNSW plans, standards, manuals and guides
- deploying TfNSW's Authorised Engineering Organisation (AEO) framework
- continuously improving TfNSW’s Asset Management Framework
- collaborating with the Transport cluster and industry through open engagement

The AEO framework authorises engineering organisations to supply and provide asset related products and services to TfNSW. It works to assure the safety, quality and fitness for purpose of those products and services over the asset’s whole-of-life. AEOs are expected to demonstrate how they have applied the requirements of ASA documents, including TfNSW plans, standards and guides, when delivering assets and related services for TfNSW.

Compliance with ASA requirements by itself is not sufficient to ensure satisfactory outcomes for NSW Transport Assets. The ASA expects that professional judgement be used by competent personnel when using ASA requirements to produce those outcomes.

About this document

This procedure supersedes RailCorp procedure EPR 0022 Alignment and Adjustment of Rail Guidance Gear, version 1.1.

The changes to previous content include the following:

- replacement of RailCorp organisation roles and processes with those applicable to the current ASA organisational context
- conversion of the procedure to ASA format and style
- amendments and clarification to content

This procedure is a first issue.
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1. **Introduction**

Road/rail vehicles operating on the Transport for NSW (TfNSW) Metropolitan Heavy Rail Network (formerly known as the RailCorp network) are required to meet specified safety requirements, in particular those provided in T HR RS 00000 ST RSU 000 Series - Minimum Operating Standards for Rolling Stock – General Requirements.

As part of T HR RS 00000 ST, the alignment of the rail guidance system alignment is one of a number of vehicle compatibility requirements to ensure the vehicle can safely operate on the network.

This procedure details the requirements for road/rail vehicle rail guidance system static alignment tests vehicle certification and recertification.

This procedure has been adapted from the Fessl Manual Part Two – Alignment & Adjustment – Fessl Pty Ltd.

2. **Purpose**

The purpose of a rail guidance system static alignment test is to ensure rail wheels fitted to road/rail guidance systems are fitted and aligned correctly to minimise improper wheel-rail contact, which can lead to derailments.

This procedure serves as a reference procedure for all road/rail vehicle owners, maintainers or certifiers when carrying out alignments and adjustments on their vehicles and to provide evidence that the rail guide wheel is aligned correctly.

This procedure provides a method to perform a static alignment of a road/rail vehicle’s rail guidance system that is accepted by the Asset Standards Authority (ASA).

2.1. **Scope**

This document provides details of procedures to perform a static alignment of a road/rail vehicle’s rail guidance system that complies with the requirements of T HR RS 00700 ST RSU 700 Series – Minimum Operating Standards for Rolling Stock – Infrastructure Maintenance Vehicle Specific Interface Requirements.

This procedure provides details on the equipment required, vehicle configuration requirements, steps and processes associated with the test, and a recommended test result form.

This procedure is written primarily for road/rail vehicles operating on the TfNSW Metropolitan Heavy Rail Network. Refer to the TS TOC 1 Train Operating Conditions (TOC) Manual – General Instructions which defines the areas associated with the network. Road/rail trailers are also detailed in this procedure.
2.2. **Application**

This procedure is applicable to all new, modified and existing road/rail vehicles and road/rail trailers. The procedure may also be used on trolleys, support frames, trailers (rail bound) and quadricycle vehicles to align the rail wheels to the vehicle.

This procedure is to be used by rolling stock manufacturers, testing personnel and road/rail vehicle certifiers when assessing the vehicles for the following:

- compliance with T HR RS 00000 ST
- annual recertification of vehicles as per T HR RS 30020 ST *Road/Rail Vehicle Certification and Recertification* or T HR RS 30030 ST *Trolley, Trailer and Quadricycle Certification and Recertification*
- alignment confirmation following derailment
- investigation purposes following vehicle incidents

As this procedure is based on the Fessl Manual the application is primarily for flexitor style rail guidance systems. Some guidance systems may not be able to be aligned to this procedure in full depending on their design, however in those instances the alignment should be aligned as per this procedure and the alignment figures as far as is reasonably practical.

3. **Reference documents**

The following documents are cited in the text. For dated references, only the cited edition applies. For undated references, the latest edition of the referenced document applies.

**Transport for NSW standards**

- T HR RS 00000 ST RSU 000 Series – Minimum Operating Standards for Rolling Stock – General Requirements
- T HR RS 00700 ST RSU 700 Series – Minimum Operating Standards for Rolling Stock – Infrastructure Maintenance Vehicle Specific Interface Requirements
- T HR RS 30020 ST Road/Rail Vehicle Certification and Recertification
- T HR RS 30030 ST Trolley, Trailer and Quadricycle Certification and Recertification
- TS TOC 1 Train Operating Conditions (TOC) Manual – General Instructions

4. **Terms and definitions**

The following terms and definitions apply in this document:

**TfNSW** Transport for NSW
5. **Road/rail vehicle rail guidance system static alignment requirement**

Prior to operation of any road/rail vehicle on the TfNSW Metropolitan Heavy Rail Network the vehicle shall comply with T HR RS 00000 ST.

The rail guidance system static alignment test is one of a number of vehicle compatibility tests that are required by T HR RS 00000 ST to ensure vehicles operate safely.

The requirement for rail guidance system static alignment test is detailed in T HR RS 00700 ST (RSU 721).

This requirement also applies to road/rail trailers.

The rail guidance system static alignment test is also a requirement in the annual recertification of road/rail vehicles, trailers and quadricycles as required in T HR RS 30020 ST and T HR RS 30030 ST.

⚠ **Cautionary:**

In the event of a derailment the vehicle and its rail wheels shall be realigned.

6. **Required equipment and test site conditions**

The following equipment and test site conditions are the minimum required to undertake rail system guidance static alignment test:

- straight level test site with standard gauge track (or simulated track) preferably with rails embedded in concrete where the top of the rails shall be level within ±1 mm along the length of the test vehicle
- tape measure
- steel rule
- string line (or appropriate alternative – such as lasers)
- U–frames (or appropriate wheel alignment boards or frames)
- suitable wedges or chocks

7. **Site safety evaluation**

A site safety evaluation shall be conducted to evaluate the risks and hazards that are and may be present in and around the test site. The evaluation of risks and hazards should take into account, but not be limited to, the planned testing, environment, other vehicles, personnel and equipment. If the risks and hazards are acceptable, or controls are in place to reduce the risk
and hazards to an acceptable level, the testing may proceed, otherwise an alternative test site shall be found.

8. Test vehicle configuration

The test vehicle shall be in full operational condition with any auxiliary equipment such as cranes, booms, tippers and elevating work platforms stowed in the on-rail travel position.

9. Test procedures

There are two separate procedures for road/rail vehicles and road/rail trailers which are detailed in Section 9.1 and Section 9.2.

9.1. Test procedure – road/rail vehicle

Conduct the following procedure when performing a rail guidance system static alignment test on a road/rail vehicle:

1. Position the vehicle on the test site ensuring any auxiliary equipment (moveable elements) such as cranes, booms, tippers and elevating work platforms are stowed in the on-rail travel position.

2. Confirm that the wheel assemblies, including wheels, wheel nuts, bearings, axles and axle nuts, are fitted and assembled correctly.

3. Arrange the vehicle on the track (or on simulated track) and engage the vehicle into rail mode ensuring that the front and rear rail guidance system is fully deployed with the guidance equipment locked in place.

4. Confirm that the rail guidance system at the front and rear has the correct wheel back to back dimensions (to be set between 1357 mm to 1360 mm).

5. Position U-frames across rail wheels and secure in place. The inside face of the frames should be positioned against the machined back face of the rail wheels and locked into position.

6. Fit a string line to the outside of the U-frames. Refer to Figure 1.

7. For each road wheel, measure the distance from wheel rim to string line and record measurement at each wheel. Where the difference is less than or equal to 5 mm on the one axle no further adjustment is necessary. Where the difference is greater than 5 mm, adjust equipment to reduce the difference to less than or equal to 5 mm.

8. After completion of step 7 the toe-in of the rail wheels should be set.

   a. Rear rail wheels are usually set to 0° or 0 mm toe-in.

   b. Front rail wheels are nominally set to 0.5 – 1.0 degrees or 2 mm – 5 mm toe-in (for a 250 mm rail wheel or U-frame).
c. Adjustment is usually achieved by loosening the flexitor mounting bolts and tapping the flexitor adjusting plates until the desired dimension is reached. The dimension should be measured from the end of the U-frame to the stringline as depicted in Figure 1. This may require jacking the rail wheel clear of the rail.

d. After checking that the dimension is correct, sequentially tighten the mounting bolts in each flexitor assembly.

e. The rail guidance system should be raised and lowered and the alignment remeasured to take into account any movement of the rubber elastic elements.

9. Before finalising the alignment, check that all previous settings have remained as set (for example, back to back). Should these settings have varied, reset using the procedures described previously.
Figure 1 - Measuring alignment of road/rail vehicles

ADJUST GUIDANCE EQUIPMENT SO THAT A1 = A2 AND B1 = B2 (MAXIMUM OF 5MM DIFFERENCE PERMITTED)

U-FRAMES ARE PURPOSE BUILT TO VEHICLE TYPE AND CONFIGURATION

LOCATE U-FRAME ON BACK FACE OF RAIL WHEEL

STRINGLINE TO JUST TOUCH THIS END OF U-FRAME

BACK TO BACK
9.2. Test procedure - road/rail trailers

Conduct the following procedure when performing a rail guidance system static alignment test on a road/rail trailer:

1. Position the vehicle on the test site ensuring any special equipment (moveable elements) such as cranes, booms, tippers and elevating work platforms are stowed in the on-rail travel position.

2. Confirm the wheel assemblies (including wheels, wheel nuts, bearings, axles and axle nuts) are fitted and assembled correctly.

3. Arrange the vehicle on the track (or on a simulated track) and engage the vehicle into rail mode ensuring that the rail guidance system is fully deployed with the guidance equipment locked in place.

4. Confirm the rail guidance system has the correct wheel back to back dimensions (to be set between 1357 mm to 1360 mm).

5. Position U-frames across rail wheels and secure in place. The inside face of the frames should be positioned against the machined back face of the rail wheels and locked into position.

6. Fit a string line to outside of U-frames. Refer to Figure 2.

7. Measure the distance from the string line to the drawbar coupling point. The difference between the two sides shall not exceed 10 mm. Where the difference is greater than 10 mm, adjust equipment to reduce the difference to less than or equal to 10 mm.

8. Measure the distance from the string line to the drawbar coupling point. The difference between the two sides shall not exceed 10 mm. Where the difference is greater than 10 mm, adjust equipment to reduce the difference to less than or equal to 10 mm.

9. After completion of step 7 the toe-in of the rail wheels should be set to 0° or 0 mm.

10. Before finalising the alignment, check that all previous settings have remained as set (for example, back-to-back). Should these settings have varied, reset using the procedures described previously.
10. Recording alignment

A specific alignment record form is not provided as the recertification checklist, both for road/rail vehicles and for road/rail trailers details alignment and prompts for results to be recorded. Refer to T HR RS 30020 ST or T HR RS 30030 ST and the applicable recertification checklist forms for recording of alignment details.