Requirements for Track Machines Accessing and Operating on the Adelaide Tram Network

Engineering Standard

ENG-ENS-NIL-0027

Document Control

Table 1: Torrens Connect Document Control

V	Date	Description of Change	Review	Accountable	Endorse
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Term	Definitions
ATN	Adelaide Tram Network
DC	Direct Current
DIT	Department of Infrastructure and Transport
EMC	Electromagnetic Compatibility
MGTP	Modified Glenelg Tramline Profile
NDT	Non-Destructive Testing
OHW	Overhead Wiring
PM	Project Manager
PRW	Person Responsible for the Works
PRES	Person Responsible for Electrical Safety
RISSB	Rail Industry Safety Standards Board
SWMS	Safe Work Method Statement
Infrastructure Maintenance Rolling Stock[1]	Track Machines and Road-Rail vehicles. Also known as On Track Vehicles

Term	Definitions
Rolling Stock[1]	Any vehicle that operates on, or intends to operate on, or uses a railway track, including any loading on such a vehicle, but excluding a vehicle designed for both on- and off-track use when not operating on the track. Rolling stock is a collective term for a large range of rail vehicles of various types, including locomotives, freight wagons, passenger cars, track machines and road-rail vehicles.
Road-Rail Vehicle[1]	A “road-rail vehicle” is a road vehicle fitted with retractable rail wheels that enable it to be driven along the track. It can be moved on to or off of the track at level crossings or other suitable places and can also operate as a road vehicle.
RSNL	Rail Safety National Law
SFAIRP	So Far As Is Reasonably Practical
TC	Torrens Connect
Tram	The standard gauge tracks on the ATN.
Travel Mode	Where the track machine is travelling to and from the worksite.
Work Mode	Where the track machine is performing its work function within the worksite and under an authorised work possession / authority i.e. tamping, regulating, etc.

[1] RISSB National Guideline Glossary of Railway Terminology

1 Introduction

Torrens Connect (TC) operates and maintains the Adelaide Tram Network (ATN) on behalf of The Department for Infrastructure and Transport (DIT) under its Rail Accreditation. This standard is intended to ensure that the introduction of track machines onto the ATN does not create any risks not deemed to meet the So Far As Is Reasonably Practicable (SFAIRP) principles under Rail Safety National Law (RSNL).

The requirements are applicable to DIT owned and Contractor supplied track machines accessing and operating on the ATN under TC Rail Accreditation. Where an Access Agreement is in place, enabling a third party to undertake work on the ATN under their own rail accreditation, the third party is fully responsible for ensuring that any track machine used for the work complies with all applicable legislative requirements, TC Rail Access Procedures, and all relevant standards.

Track machines include, but are not limited to:

- Tampers
- Ballast Regulators
- Track Recording Vehicles
- Rail Grinding/Milling Machines (not road–rail)
- Track Laying Machines
- Ballast Cleaners

This standard provides the minimum requirements for track machines to access and operate on the ATN. It does not remove the need for a site-specific Safety Management Plan or Work Instruction to ensure that the track machine can undertake its work tasks safely at the worksite.

Track machines that do not meet the minimum requirements in this standard are not permitted to access and operate on the ATN. Approval may be granted by TC, under specified conditions, for a track machine to access the ATN for the purpose of track machine examination and testing.

2 Purpose

The purpose of this standard is to specify the minimum certification requirements for track machines to access and operate on the ATN.

3 Scope

This standard applies to all track machines, including those owned by DIT, accessing, and operating on the ATN standard gauge (1435mm) Tram, mainlines, depot, sidings, and worksites.

Refer to *ENG-ENS-NIL-0023 Requirements for Road-Rail Vehicles Accessing and Operating on the Adelaide Tram Network* for certification of road-rail vehicles on the ATN.

Refer to *ENG-ENS-NIL-0047 Requirements for Rail Trolleys and Trailers Accessing and Operating on the Adelaide Tram Network* for certification of rail trolleys and trailers on the ATN.

4 References

- Rail Safety National Law (SA) Act 2012
- Rail Safety National Law National Regulations 2012
- Work Health and Safety Regulations 2012 (South Australia)
- AS 7501 Railway Rolling Stock – Rolling Stock Compliance Certification
- AS 7503 Train Identification and Integrity Part 4: Infrastructure Maintenance Rolling Stock
- AS 7505 Signal Detection Interface
- AS 7508 Railway Rolling Stock – Track Forces & Stresses – Part 4: Infrastructure Maintenance Rolling Stock
- AS 7509 Railway Rolling Stock - Dynamic Behaviour - Part 4: Infrastructure Maintenance Rolling Stock
- AS 7510 Railway Rolling Stock - Braking Systems - Part 4: Infrastructure Maintenance Rolling Stock
- AS 7513 Interior Environment - Part 4: Infrastructure Maintenance Rolling Stock
- AS 7514 Railway Rolling Stock - Wheels - Part 4: Infrastructure Maintenance Rolling Stock
- AS 7515 Axles
- AS 7516 Axle Bearings
- AS 7517 Wheelsets
- AS 7518 Railway Rolling Stock - Suspension - Part 4: Infrastructure Maintenance Rolling Stock
- AS 7519 Railway Rolling Stock - Bogie Structures Requirements - Part 4: Infrastructure Maintenance Rolling Stock
- AS 7520 Body Structural Requirements - Part 4: Infrastructure Maintenance Rolling Stock
- AS 7522 Railway Rolling Stock - Access & Egress - Part 4: Infrastructure Maintenance Rolling Stock
- AS 7523 Railway Rolling Stock - Emergency Equipment - Part 4: Infrastructure Maintenance Rolling Stock
- AS 7524 Railway Rolling Stock - Drawgear - Part 4: Infrastructure Maintenance Rolling Stock
- AS 7527 Event Recorders
- AS 7529 Railway Rolling Stock - Fire Safety - Part 4: Track Machines
- AS 7531 Lighting & Rolling Stock Visibility
- AS 7532 Audible Warning Device (Draft)
- AS 7533 Railway Rolling Stock - Driving Cabs – Part 4 - Infrastructure Maintenance Rolling Stock
- AS 3978 Non-destructive Testing – Visual Inspection of Metal Products and Components
- EN 13309 Construction Machinery – Electromagnetic Compatibility of Machines with Internal Power Supply
- EN 50121-3-1 Railway Applications – Electromagnetic Compatibility – Part 3-1: Rolling Stock – Train and Complete Vehicle
- EN 50121-3-2 Railway Applications – Electromagnetic Compatibility – Part 3-2: Rolling Stock – Apparatus
- GM/RT 2304 Equipotential Bonding of Rail Vehicles to Running Rail Potential
- GM/RC 2514 Recommendations for Equipotential Bonding of Rail Vehicles to Running Rail Potential
- ISO 11451 Series Road Vehicles – Vehicle Test Methods for Electrical Disturbances from Narrowband Radiated Electromagnetic Energy
- ISO 11452 Series Road Vehicles – Component Test Methods for Electrical Disturbances From Narrowband Radiated Electromagnetic Energy
- ISO 9712 Non-destructive Testing – Qualification and Certification of NDT Personnel
- European Automotive EMC Directive 2004/104/EC
- ENG-ENS-NIL-0023 Requirements for Road-Rail Vehicles Accessing and Operating on the Adelaide Tram Network.

- ENG-ENS-NIL-0047 Requirements for Rail Trolleys and Trailers Accessing and Operating on the Adelaide Tram Network
- RS2-DRG-300000 MGTP wheel profile for Tramline
- ENG-ENS-NIL-0026 Tram Wheel Inspection and Defects Standard
- ENG-ENS-NIL-0007 Structural Clearances (Tram)
- ENG-PRO-NIL-0002 Static Twist Test for Rolling Stock

5 Roles and Responsibilities

5.1 General

There are, generally, two ways in which a track machine can be introduced onto the ATN:

- Through planned construction or maintenance works where an external contractor, who owns or hires a track machine, is engaged by TC for the works.
- Purchasing and maintaining of a new or modified DIT owned track machine by DIT Fleet Services for use by TC.

For construction and maintenance works it is the responsibility of the TC Project Manager (PM) or Person Responsible for the Works (PRW) to ensure that all track machines to be used for their works are certified before accessing and operating on the ATN.

It is not intended that external contractors apply directly to TC to have their track machines certified in anticipation of work on the ATN.

For DIT owned track machines, the TC Head of Assets is responsible for ensuring that all track machines are certified before accessing and operating on the ATN.

5.2 TC Project Manager/Person Responsible for the Works

It is the responsibility of the TC PM/PRW to obtain all documentation and information for certification from the Applicant/Owner, follow the process described in Appendix 8 and:

- Ensure that completed *ENG-FRM-RSG-0004 Track Machine Certification Application Form* (Appendix 1) is obtained and forwarded to the Rolling Stock Engineer;
- Ensure all required supporting documentation in accordance with *ENG-FRM-RSG-0009 Track Machine Documents Review Checklist* (Appendix 2) is obtained and forwarded to the Approving Engineer for review;
- Ensure that completed *ENG-FRM-RSG-0009 Track Machine Documents Review Checklist* (Appendix 2) and all supporting documentation are obtained and forwarded to the Rolling Stock Engineer;
- Ensure that completed *ENG-FRM-RSG-0003 Assessment for On Track Plant in 600V OHW Areas* (Appendix 5) is obtained and forwarded to the Infrastructure Engineer for review;
- Ensure that the track machine undergoes the general condition examination by an approved Rolling Stock Examiner and ensure *ENG-FRM-RSG-0008 Track Machine General Condition Examination Checklist* (Appendix 3) is completed and forwarded to the Rolling Stock Engineer;
- Ensure that completed *ENG-FRM-RSG-0002 Infrastructure Maintenance Rolling Stock Annual Confirmation* (Appendix 7) is obtained and forwarded to the Rolling Stock Engineer; and
- Ensure that any issues arising from the document review and general condition examination are addressed.

5.3 Applicant/Owner

For planned construction and maintenance works the application form *ENG-FRM-RSG-0004 Track Machine Certification Application Form* (Appendix 1) and *ENG-FRM-RSG-0002 Infrastructure Maintenance Rolling Stock Annual Confirmation* (Appendix 7) is to be completed by the external contractor engaged for the works and forwarded to the PM/PRW. The form has provision for supply of the track machine owner details where the contractor is hiring the machine.

For DIT owned track machine, both the application form and annual confirmation are to be completed by the TC Head of Assets

5.4 TC Head of Assets

It is the responsibility of the TC Head of Assets to obtain all documentation and information required for certification and:

- Ensure that *ENG-FRM-RSG-0004 Track Machine Certification Application Form* (Appendix 1) is completed and forwarded to the Rolling Stock Engineer;
- Ensure all required supporting documentation in accordance with *ENG-FRM-RSG-0009 Track Machine Documents Review Checklist* (Appendix 2) is obtained and forwarded to the Approving Engineer for review;
- Ensure that completed *ENG-FRM-RSG-0009 Track Machine Documents Review Checklist* (Appendix 2) and all supporting documentation are obtained and forwarded to the Rolling Stock Engineer;
- Ensure that completed *ENG-FRM-RSG-0003 Assessment for On Track Plant in 600V OHW Areas* (Appendix 5) is obtained and forwarded to the Infrastructure Engineer for review;
- Ensure that track machine to undergo the general condition examination by an approved Rolling Stock Examiner and ensure *ENG-FRM-RSG-0008 Track Machine General Condition Examination Checklist* (Appendix 3) is completed and forwarded to the Rolling Stock Engineer;
- Ensure that *ENG-FRM-RSG-0002 Infrastructure Maintenance Rolling Stock Annual Confirmation* (Appendix 7) is completed and forwarded to the Rolling Stock Engineer; and
- Ensure that any issues arising from the document review and general condition examination are addressed.

5.5 Approving Engineer

An Approving Engineer shall be appointed jointly by the Rolling Stock Engineer and the Infrastructure Engineer. The Approving Engineer is responsible for carrying out the assessment of documentation in accordance with *ENG-FRM-RSG-0009 Track Machine Document Review Checklist* (Appendix 2). The Approving Engineer shall have:

- Experience in assessing rolling stock against standards;
- Demonstrated knowledge and experience of the RISSB (AS 7500 series) rolling stock standards;
- Demonstrated knowledge and experience of the Rail Safety National Law (SA) Act 2012;
- No undeclared conflicts of interest;
- Knowledge of risk management.

It is the responsibility of the Approving Engineer to review the documentation provided by the PM/PRW or TC Head of Assets against the requirements of this standard and complete *ENG-FRM-RSG-0009*

Track Machine Documents Review Checklist (Appendix 2). For documentation relating to track engineering the Approving Engineer shall consult with the Infrastructure Engineer.

If the Approving Engineer determines that the documentation provided is not satisfactory the PM/PRW or TC Head of Assets is to be advised and requested to update and resubmit. If the documentation is satisfactory the completed checklist is to be forwarded to the Rolling Stock Engineer. The Approving Engineer shall provide recommendations on restrictions or limitations for the operation of track machine on the ATN.

5.6 Rolling Stock Engineer / Infrastructure Engineer

It is the responsibility of the Rolling Stock Engineer and the Infrastructure Engineer to:

- Jointly ensure all applications for certification of track machines are assessed in accordance with this standard;
- Jointly appoint an Approving Engineer;
- Jointly sign all of the approval certificates with any restrictions or limitations;

The Rolling Stock Engineer or delegate shall:

- Receive the application pack for the certification or re-certification of track machines via rolling stock engineering mailbox: RS_Eng@torrensconnect.com.au
- Approve the appointment of the Rolling Stock Examiners undertaking the general condition examination;
- Select an Approving Engineer from the Register;
- Determine the expiry date and inserting expiry date on the certificate;
- Ensure that the certificate is prepared, and arrangements made for the certificate and labels to be displayed on the track machine; a copy of certificate is to be forwarded to the PM/PRW or TC Head of Assets;
- Maintain a register of all Infrastructure Maintenance Rolling Stock, this register shall contain details of rolling stock type, owner, certification/recertification dates;
- Ensure that the Infrastructure Maintenance Rolling Stock Register is updated at every new certification or re-certification; and
- Maintain a register of all Rolling Stock Examiners and Approving Engineers.

5.7 Infrastructure Engineer

It is the responsibility of the Infrastructure Engineer to:

- Ensure that all applications for certification of track machines are assessed for operation under 600V electrified Tram lines in accordance with Sections 10.1 and 10.2 of this standard;
- Review and sign the assessment form *ENG-FRM-RSG-0003 Assessment for On Track Plant in 600V OHW Areas* (Appendix 5) and provide the conditions under which the track machine may access and operate under live 600V Tram lines;
- Ensure that the signed form is forwarded to the Rolling Stock Engineer for preparation and issuing of the certificate; and
- Arrange for issuing and displaying, in prominent positions on the track machine, of the appropriate labels that detail the conditions for operating on 600V electrified Tram lines.

5.8 Head of HSQE

The Head of HSQE shall:

- Maintain this standard and all associated forms and checklists;
- Update this standard or associated form or checklist when required;
- Ensure that the current standard and all associated forms and checklists are available via intranet and internet to internal staff and external contractors; and
- Advise internal staff and external contractors on interpretation of the standard and requirements for track machines to access and operate on the ATN under this standard

5.9 Rolling Stock Examiner

The Rolling Stock Examiner is responsible for carrying out the general condition examination in accordance with *ENG-FRM-RSG-0008 Track Machine General Condition Examination Checklist* (Appendix 3) and assessment in accordance with *ENG-FRM-RSG-0003 Assessment for On Track Plant in 600V OHW Areas*.

Only Rolling Stock Examiners approved by TC are permitted to undertake the general condition examination.

The roles of Rolling Stock Examiner and the Approving Engineer cannot be performed by the same person.

6 General

The Rail Industry Safety Standards Board (RISSB) has developed and issued the AS 7500 series of rolling stock standards for the design, construction, and maintenance of rolling stock, including infrastructure maintenance rolling stock. The RISSB AS 7500 series standards were progressively approved and published from 2009 to 2014.

Retrospective application of the AS7500 series to track machines designed and constructed prior to 2014 requires balancing the need for safety against the potentially grossly disproportionate cost of retrofitting track machines to achieve full compliance.

TC has determined that all track machines designed and constructed after 2014 shall be required to be fully compliant with the sections of the RISSB AS 7500 series standards applicable to infrastructure maintenance rolling stock. A completed standards compliance register in accordance with Appendix C of *RISSB AS7501 Railway Rolling Stock – Rolling Stock Compliance Certification* will be required to obtain certification for a post 2014 track machine. In addition to the RISSB requirements TC has some conditions specific to the ATN and hence applicants with post 2014 track machines will still be required to comply with the requirements of this standard and complete the checklists shown as appendices.

Track machines designed and constructed prior to 2014 shall comply with all requirements detailed in this standard and its associated checklists to obtain certification.

TC has followed the RISSB AS7500 series format and layout in the development of this standard and where a RISSB requirement is applicable to existing track machines those clauses in the AS7500 series have been adopted as mandatory.

7 Track Machine Outline & Structure

7.1 Clearances

The static profile of the track machine shall not exceed the limits shown in the below mentioned diagram under any condition of loading or wear:

- A TC Tram Rolling Stock Outline drawing is still to be developed for the Tram system (the Flexity vehicle outline shall be used in the interim).

The above profiles do not take account of the dynamic and kinematic effects associated with the movement of the track machine and reference should be made to *ENG-ENS-NIL-0007 Structural Clearances for the Tramline*. The kinematic envelope of the track machine can be determined using the one of the following methods:

- Full application of the above standards.
- A combination of the application of the above standards and, where available, actual performance and measurements of the dynamic behaviour of the track machine

Details of the track machine kinematic envelope shall be provided.

The track machine componentry, when in work mode within a controlled worksite, may exceed the permissible outline, but must be retracted and securely locked within the maximum rolling stock outline when in travel mode. A diagram or illustration shall be supplied clearly defining the retracted positions of the components in travel mode.

7.2 Crack Testing

For track machines that have been in service for more than 10 years, or have logged in excess of 30,000 km, a visual examination of the main body structural elements including critical welds and members of the main frame shall be conducted in accordance with the requirements of *AS 3978 Non-destructive Testing – Visual Inspection of Metal Products and Components* by an inspector certified to *ISO 9712 Non-destructive Testing – Qualification and Certification of NDT Personnel* Level 3 or equivalent at certification. The Level 3 inspector shall then prepare a procedure for NDT of all welds and critical structural elements of main body and frame. This NDT procedure shall be implemented by an inspector certified to *ISO 9712* Level 1 or higher for the applicable method (s). The crack testing shall be carried out at certification and every two years subsequently or at recertification if the track machine does not access or operate on the ATN for an extended period. Evidence of the crack testing in the form of a certificate along with relevant photographs and the procedure used shall be provided.

8 Identification and Integrity (RISSB: AS 7503.4)

All track machines shall have a unique numeric or alphanumeric identifier.

The identifier shall be displayed on each side, and where practicable, on the front and rear of the track machine body.

The identifier characters displayed on the track machine body sides shall not be less than 125 mm high.

The markings applied for the identifier shall have a minimum of 30% luminance contrast to the background.

Track machines shall also permanently display, in a prominent position, the following information:

- Fully provisioned/gross mass (tonnes),
- Tare mass (tonnes),
- Length over couplers (metres) - if fitted with or able to be coupled with automatic knuckle couplers,
- Maximum allowable speed.

For identification purposes TC shall be provided with photographs of the front, rear and sides of the track machine to confirm that the markings comply with the requirements above.

9 Signal Detection Interface (RISSB: AS 7505)

Track machines are generally either insulated or non-insulated or have the ability to switch between the two modes as required.

Where track machines are insulated, evidence shall be provided that the direct current (DC) electrical resistance between the rail contact surfaces of wheels on the same axle is greater than 20,000 ohm in accordance with *AS 7505 Signalling Detection Interface*.

Where track machines are non-insulated evidence shall be provided that the direct current (DC) electrical resistance between the rail contact surfaces of wheels on the same axle is less than 1 milliohm (0.001 ohm) measured with a voltage source with an open circuit voltage no greater than 1 volt in accordance with *AS 7505 Signalling Detection Interface*.

10 Operation on Electrified Lines

10.1 Operation on Live 600V Electrified Tram Lines

Track machines are only permitted to access and operate on 600V electrified Tramline if:

1. The 600V electrified Tram lines are isolated and earthed for the area in which the track machine is travelling or working and is accompanied by a PRES who holds a Certificate of Isolation for the OHW.

OR

2. The track machine fully complies with Section 10.1 of this document and a machine specific Safe Work Method Statement (SWMS) is available that details how that machine will safely travel and work under live 600V OHW equipment.

11 Track Forces & Stresses (RISSB: AS 7508.4)

The maximum axle load for all rolling stock on the Tram network is 11 tonne.

11.1 P2 Forces

P2 force is the total vertical force (static plus 'low frequency' dynamic forces) per wheel when the rolling stock operates over a defined angular discontinuity (ramp) in the rail vertical profile, representing an idealised dipped rail joint. The dynamic component of P2 force is directly proportional to speed.

The P2 forces exerted by the track machine shall be assessed in accordance with *AS 7508 Railway Rolling Stock – Track Forces and Stresses – Part 4 - Infrastructure Maintenance Rolling Stock*.

The P2 force shall not exceed 200kN for a 0.010 radian dip.

11.2 Rail Stress During Track Work

If the track machine, during track work, is capable of inducing stresses in the rail that exceed 90% of the rail yield stress an instruction shall be clearly displayed in the Work Plan and near the appropriate controls indicating the correct operating procedure to minimise damage to the rail.

12 Dynamic Behaviour (RISSB: AS 7509.4)

12.1 Twist Test

A twist test shall be carried out that assesses the wheel unloading performance and underframe behaviour of the track machine under track conditions that replicate the track geometry on the ATN.

The twist test shall be carried out in accordance with Engineering Instruction *ENG-PRO-NIL-0002 Static Twist Test for Rolling Stock*.

The maximum wheel unloading permitted is 60%.

A value for wheel unloading exceeding 60% will mean the track machine has failed the twist test and is not permitted to access or operate on the ATN.

12.2 Speed and Performance

The maximum speed for track machines on the ATN is 40 km/hr or reduced speed under special conditions. This speed shall be clearly displayed in the cab and be visible to the operator.

At level crossings, facing switches, V and K crossings the speed shall be reduced to 10 km/hr.

The maximum reversing speed is 20 km/hr.

Notwithstanding the above, all posted track speeds shall be strictly observed.

12.3 Track Curves

Minimum horizontal and vertical curves able to be negotiated by the track machine shall be provided as applicable.

13 Braking Systems (RISSB: AS 7510.4)

Track machines shall be equipped with a failsafe braking system.

Track machines shall have at least two separate brake systems:

- Stopping or service brake
- Parking brake

There shall be a visual indication showing the parking brake status (applied or released) which is clearly visible to the operator from any driving/operating position.

Where track machines are used to tow other vehicles the track machine and the towed vehicle shall be treated as one consist for testing of the brake system. Where the track machine is attached to a different towed vehicle a separate full brake test shall be conducted for the new towing arrangement.

Details of the braking system shall be provided.

13.1 Brake Performance

The track machine, on dry level rail, stopping from 40km/hr under full braking from an emergency application of the stopping brake shall have average decelerations of 0.9m/s^2 without wheel slide.

The parking brake shall be capable of holding the track machine on a gradient of 1 in 30 indefinitely. The parking brake should not be reliant on the coefficient of adhesion exceeding 0.085 between the wheel and the rail.

The track machine braking system shall comply with all requirements relevant to existing infrastructure maintenance rolling stock in *AS7510 Railway Rolling stock – Braking systems – Part 4 – Infrastructure Maintenance Rolling Stock*.

14 Interior Environments (RISSB: AS 7513.4)

TC requires that all track machines have interior environment control measures in place to ensure crew safety. Evidence is required to demonstrate that control measures have been implemented to address the following:

- Noise
- Vibration
- Air quality
- Temperature

The track machine shall comply with all requirements relevant to existing infrastructure maintenance rolling stock in *AS 7513 Interior Environment – Part 4 – Infrastructure Maintenance Rolling Stock*.

15 Wheels, Axles, Wheelsets & Suspension (RISSB: AS 7514.4, AS 7515, AS 7516 & AS 7517.4, AS 7518.4)

The wheels, axles, bearings, wheelsets and suspension of the track machine shall comply with all of the requirements relevant to existing infrastructure maintenance rolling stock in the following standards:

- AS 7514 Railway Rolling Stock – Wheels – Part 4 – Infrastructure Maintenance Rolling Stock
- AS 7515 Axles
- AS 7516 Axle Bearings
- AS 7517 Wheelsets
- AS 7518 Railway Rolling Stock - Suspension - Part 4: Infrastructure Maintenance Rolling Stock

The following rail wheel profiles are used on the ATN:

- Tram – Modified Glenelg Tramline Profile (MGTP – Flexity/Citadis)

The use of wheel profiles other than the above may be permitted under special conditions. Details of the alternative profile shall be provided for assessment by TC.

The back-to-back measurement for each wheelset shall be measured at three different locations around the wheel (120 degrees apart). For standard gauge track the back-to-back measurement shall be within the range of 1387 -1389mm.

The rail wheels on the track machine shall comply with all requirements of *ENG-ENS-NIL-0026 Tram Wheel Inspection and Defects Standard*.

Note: Track machines with MP2 or similar train wheels may not be able to travel through the switches on the ballasted sections of the Tramline; access the in-street track sections; or be able to stable in Glengowrie Depot.

16 Access & Egress (RISSB: AS 7522.4)

The track machine shall provide for safe and efficient access and egress for crew and workers.

The track machine shall comply with all the requirements relevant to existing infrastructure maintenance rolling stock in *AS 7522 Access and Egress – Part 4 – Infrastructure Maintenance Rolling Stock*.

17 Emergency and Safety Equipment (RISSB: AS 7523.4)

The track machine shall be fitted with the following safety/emergency equipment:

- First aid kit
- Fire extinguisher compliant with AS/NZS 1841 Portable Fire Extinguishers
- Torch

- At least two (2) red and one (1) white signalling flags
- A signal lamp.

18 Emergency Stop

If the track machine is designed to be operated or attended by more than 1 person and more than 1 emergency stop control is fitted, it must ensure that the multiple emergency stop controls are of the "stop and lock-off" type so that the track machine cannot be restarted after an emergency stop control has been used unless that emergency stop control is reset.

19 Couplers & Drawgear (RISSB AS 7524.4)

The type of coupler fitted to track machines will dictate the type of vehicles to which they can be coupled. Each configuration may require different couplers for compatibility.

Track machine couplers and drawgear shall comply with all of the requirements relevant to existing infrastructure maintenance rolling stock in A*S 7524 Rolling stock – Drawgear – Part 4 – Infrastructure Maintenance Rolling Stock*.

Where track machines are used to tow other vehicles the track machine and the towed vehicle shall be treated as a unique coupled set for testing of the coupler system.

Coupling of the track machine to a different vehicle will require a separate coupler test for that towed set.

20 Event Recorder (RISSB: AS 7527)

The track machine shall be fitted with an event recorder that records, as a minimum, the following:

- Speed
- Direction (forward or reverse)
- Distance on track (in kilometres)
- Date/time
- GPS location
- Stopping/Service brake application
- Park brake application
- Horn activation
- Vigilance time & acknowledgement

Details of the type, operation and configuration of the event recorder shall be provided.

21 Lighting & Visibility (RISSB: AS 7531)

Track machines that do not have the ability to fully rotate to face in the opposite direction shall be fitted with headlights, stop lights, tail lights and marker lights at both ends.

The track machine lighting shall comply with all requirements relevant to existing infrastructure maintenance Rolling Stock in *AS 7531 Rolling stock – Lighting & Visibility – Part 4 – Infrastructure Maintenance Rolling Stock*.

22 Audible Warning Device (RISSB: AS 7532)

The Track machine shall have an Audible Warning Device. The Audible Warning Device shall be reviewed and assessed for compliance, where practicable, with all requirements relevant to existing infrastructure maintenance rolling stock in *AS 7532 Audible Warning Devices*.

23 Driving Cabs (RISSB: AS 7533.4)

The driving cab of the track machine shall be reviewed and assessed for compliance, where practicable, with the following sections of *AS 7533 Railway Rolling Stock - Driving Cabs – Part 4 - Infrastructure Maintenance Rolling Stock*:

- Crew positions
- Seating
- Consoles/workstations
- Exterior Vision
- Signal sighting
- Visibility of Persons on Track
- Rear Vision
- Interior Vision
- Glare
- Controls
- Speed Indicating Device

24 Vigilance System

A vigilance system shall be installed on the track machine.

The vigilance system shall periodically alert the driver with a flashing light and auditory alarm which requires acknowledgement to prevent an emergency brake application and loss of traction power/engine cut-out.

The time from reset to the first vigilance system alarm shall not be less than 25 seconds nor more than 90 seconds. The time from reset to the emergency brakes application shall not be less than 30 seconds nor more than 110 seconds. The total time from reset to the emergency brakes application, including the first vigilance system alarm, shall not be more than 110 seconds.

The over speed function shall prevent the track machine from over speeding by applying the emergency brakes. The maximum allowable speed on the ATN shall be in accordance with Section 12.2. The threshold speed limits at which the emergency brakes apply shall be on greater than +5km/hr above the maximum allowable speed for both the forward and reverse directions.

The track machine shall have provision for isolation of the vigilance system should the vigilance unit become inoperable due to a malfunction. The isolation switch/mechanism shall have a permanent seal that is required to be broken to affect the isolation. The vigilance isolation shall only be used to enable removal of the track machine from operating tracks to travel to depot for repair of the vigilance malfunction. Under these circumstances driver only operation is not permitted – a second person must be present on the track machine as it travels to the depot. Where the vigilance system is isolated a visual indication shall be provided to the driver. Track machines with a broken vigilance seal are not permitted to access or operate on the ATN.

Track machines have two modes of operation:

- Travel mode; where the machine is travelling to and from the worksite
- Work mode; where the machine is performing its work function within the worksite under an authorised work possession i.e. tamping, regulating, etc.

The track machine shall be configured to ensure that the vigilance system can automatically distinguish between the travel and work modes. When in travel mode the vigilance system shall be fully operational. When in work mode the track machine shall be configured to enable the vigilance system to be suppressed – the sealed isolation switch is not permitted to be used for this purpose. Suppression of the vigilance system is required to enable the track machine driver to concentrate on work activities. The configuration shall ensure that the suppression of the vigilance is automatically cancelled when work mode is terminated. Where the vigilance system is suppressed a visual indication shall be provided to the driver.

Details of the type, operation and configuration of the vigilance system shall be provided.

25 Communications

The track machine shall have a communication system that is fully compatible with the ATN communication system.

26 Certification and Recertification

26.1 Certification

In order to be certified all track machines shall comply with all of the requirements of this standard. The Track Machine Certification Application Form, *ENG-FRM-RSG-0004 Track Machine Certification Application Form* (Appendix 1), must be completed by the applicant/owner to enable the track machine to be assessed.

The process to be followed for certification of track machines is shown in the flow chart in Appendix 8. This flow chart is intended to specify the action to be taken by the person responsible at each stage of the process toward certification.

The *Application form (See Appendix 1), Document Review Checklist (See Appendix 2), General Condition Examination (See Appendix 3), 600V Assessment (See Appendix 5)* and all associated test documentation shall be provided by the PM/PRW or TC Head of Assets. For identification purposes photographs of the front, back and sides of the track machine shall be provided.

A maintenance schedule and service history of a track machine shall be provided for any certification or re-certification application for access and operation on the ATN.

If elements of the required evidence are missing the PM/PRW or TC Head of Assets will be requested to supply the missing information for further review.

Once certified the track machine shall be issued with a certificate in accordance with *ENG-FRM-RSG-0001 Infrastructure Maintenance Rolling Stock Certificate Template* (Appendix 4) and a certification label as shown in Appendix 6. The expiry date on a certificate shall be inserted by the Rolling Stock Engineer. Any restrictions or limitation on the certificate are applied by Rolling Stock Engineer and/or Infrastructure Engineer following the recommendations provided by an Approving Engineer.

TC Infrastructure Maintenance Rolling Stock Register shall be updated at every new certification or re-certification. Track machines may be certified for a maximum 1 year period or period determined by the Rolling Stock Engineer. Following the first year of certification an annual automatic renewal for a maximum of 2 further years (i.e. total 3 years including first certification year) may be granted in accordance with the Section 26.3. Both the certificate and the label must be retained on the track machine at all times when accessing and operating on the ATN. The track machine driver must follow all restrictions or conditions as shown in the certificate and/or label. TC reserves the right to request the certificate for audit purposes at any time. The label must be attached to the track machine in a prominent position.

26.1.1 Certification of Gauge Convertible Track Machines

The general condition examination in accordance with *ENG-FRM-RSG-0008 Track Machine General Condition Examination Checklist* (See Appendix 3) shall be required for standard gauge configuration for the application of a gauge convertible track machine to access and operate on the ATN.

For any subsequent gauge conversion on the ATN during the certificate validity period, a detailed inspection by an approved Rolling Stock Examiner is required to ensure that the gauge conversion has been carried out correctly. A record of this inspection may be requested by TC at any stage during the operation on the ATN for auditing purposes.

26.2 General Condition Examination

The general condition examination, *ENG-FRM-RSG-0008 Track Machine General Condition Examination Checklist* (Appendix 3), is not intended to be an exhaustive assessment of all of the operating systems, components and sub-components of the track machine. The examination enables TC to assess the track machine to determine if its general condition is consistent with the level of compliance attributed by PM/PRW or TC Head of Assets in the document review. The examination is primarily visual in nature, with some checking, measuring, and testing of critical functions and structural elements.

26.2.1 External Contractor Supplied Track Machines

All external Contractor supplied track machines are required to undergo the general condition examination. Any issues arising from the examination will need to be corrected before the track machine can be certified.

26.2.2 TC Owned Track Machines

TC has contracted out the maintenance of its track machines and it is an expectation that the contractual arrangement will include a maintenance regime that ensures that the requirement for a general condition assessment is satisfied by regular assessments and examinations. The Rolling Stock Engineer and the Infrastructure Engineer shall determine the requirement for a general condition assessment.

26.2.3 Rolling Stock Examiner

Only companies approved by TC are permitted to carry out the general condition examination. The companies must demonstrate the following competencies:

- Qualified in a relevant trade with knowledge of the purpose and safety requirements applicable to track machines.
- Competent in assessing and identifying rail wheel damage and profile condition.
- Familiarity with all operating controls and safety functions installed on the track machine.
- Familiarity with all interface requirements related to TC's overhead wiring system.
- Familiarity with RISSB AS 7500 Series of rolling stock standards.
- Competent in carrying out the testing requirements necessary to establish compliance with the specified acceptance criteria.

26.3 Recertification and Decertification

Where the certification is required to be extended past the initial 1 year period the Applicant/Owner may use form *ENG-FRM-RSG-0002 Infrastructure Maintenance Rolling Stock Annual Confirmation* (Appendix 7), to confirm annually (on the initial certification anniversary) the following:

1. That servicing is up to date and being carried out in accordance with the regime provided at the initial certification.
2. No modifications have been undertaken to the track machine since initial certification.
3. The vehicle has not been involved in any accidents or incidents since the initial certification.
4. A twist test has been carried out annually since the initial certification.
5. Crack testing of the stub axle has been carried out annually since initial certification. (Only for road-rail vehicles)
6. Equipotential bonding testing has been carried out annually since the initial certification.
7. All records are available for audit.
8. The vehicle is fit for purpose.

On receipt of the completed form the certification of the track machine will be carried over for a further 1 year period or period determined by the Rolling Stock Engineer and the track machine applicant/owner advised accordingly. A 4 week grace period may be granted for the submission of the annual confirmation following the initial expiry date. During this period the track machine shall not be allowed to access and operate on the ATN. Unless directed otherwise by the Rolling Stock Engineer there is no requirement for a new Application form, Documents Review Checklist or General Condition Examination Checklist to be submitted with the Annual Confirmation Form.

A full recertification will be required at the end of the 2 automatic renewals period. Full recertification will require submission of a new Application Form, Documents Review Checklist and General Condition Examination Checklist in accordance with Section 26.1.

The track machine may be decertified at any time at the discretion of TC. Typical circumstances where this may occur include, but are not limited to:

- Failure to provide the annual confirmation at the end of full certification period.
- A safety incident e.g. runaway, collision etc.
- Evidence of lack of maintenance.
- Substantial modification without notification to TC.

In the event of decertification the certificate and certification label shall be removed from the track machine and it will not be permitted to access and operate on the ATN.

Following a safety incident (e.g. runaway, collision, derailment) a track machine shall be removed from the ATN until an inspection has been carried out. Any identified issues shall be addressed before the track machine is allowed to resume access and operation on the ATN.

26.4 Pre-work Inspection

Evidence must be provided that there is a pre–work start checklist for the track machine. It is a requirement that the pre-work inspection be carried out daily or before the track machine commences any operation on the ATN. All defects noted must be recorded, reported and rectified before work commences.

TC reserves the right to audit the pre–work inspection records and log books at any time the track machine is operating on the ATN.

26.5 Modifications

Where substantial modifications are made to a track machine it will require recertification. A modification is considered substantial if it impacts in any way on the ability of the track machine to operate safely on the ATN. Where there is doubt as to the whether the modifications are substantial clarification shall be sought from the Rolling Stock Engineer.

All modifications made to the track machine that have the potential to affect its ability to be fit for purpose shall be notified to TC for assessment.

It is a requirement that any modification to a track machine shall meet all of the relevant requirements of the RISSB AS 7500 series of standards. Compliance will be limited to the component or subcomponent being modified.

26.6 Submission Time Frame

All submissions related to certification or recertification of track machines are to be emailed to the following email address:

RS_Eng@torrensconnect.com.au

Submission of all documentation in a single emailed pack at least 10 working days prior to any planned work on the ATN is essential for an efficient and smooth certification process.

27 Associated Documents

Table 3: Associated Documents

Document ID	Title
ENG-FRM-RSG-0004	Track Machine Certification Application Form
ENG-FRM-RSG-0009	Track Machine Documents Review Checklist
ENG-FRM-RSG-0001	Infrastructure Maintenance Rolling Stock Certificate Template
ENG-FRM-RSG-0008	Track Machine General Condition Examination Checklist
ENG-FRM-RSG-0003	Assessment for On Track Plant in 600V OHW Areas

Document ID	Title
ENG-REG-NIL-0002	Infrastructure Maintenance Rolling Stock Register
	Rolling Stock Examiners Register (Internal Use Only)
	Approving Engineers Register (Internal Use Only)
ENG-FRM-RSG-0002	Infrastructure Maintenance Rolling Stock Annual Confirmation

I. Appendix A

Track Machine Certification Application Form

Track Machine Certification Application Form

Applicant Name			
Applicant Contact Details			
Track Machine Name and Type			
Track Machine Unique Identifier		**Track Machine Serial Number**	
Track Machine Details	Make: Year: Number of Bogies/Axles: Bogie/Axle Spacing (mm): ☐ Insulated ☐ Non-Insulated ☐ Both (Adjustable) Other additional details:		
Track Machine Dimensions (mm)	Height: Width: Length:		
Track Machine Maximum Speed (km/hr)		**Mass (tonnes)**	Tare: GVM:
Track Machine Owner (If different to Applicant)			
Track Machine Owner Contact Details			
Reason for Accessing Adelaide Tram Network	☐ Electrified Network ☐ Non-Electrified Network ☐ Both		
Track Machine Gauge	☐ Standard (1435 mm) ☐ Gauge Convertible		
Certification Type	☐ New Certification ☐ Recertification		
Declaration I declare that the information submitted is correct to the best of my knowledge and complies with TC document *ENG-ENS-NIL-0041 Requirements for Track Machines Accessing and Operating on the Adelaide Tram Network.*			
Name			
Signature		**Date**	
Contact Details			
Acknowledged by TC Project Manager / Person Responsible for the Works	Name: Title: Signature: Date:		

II. Appendix B

Track Machine Documents Review Checklist

Track Machine Documents Review Checklist

Review Date		**Track Machine Unique Identifier**	
Track Machine Make		**Track Machine Year**	
Track Machine Type	☐ Tamper ☐ Ballast Regulator ☐ Track Recorder		
	☐ Rail Grinding/Milling Machine Other:		
Serial No		**Odometer/Hour Reading**	
Applicant / Owner			
Reviewed By	**Name:**	**Title:**	

		Pass	Fail	N/A	Details of Supporting Evidence	Non-Compliance Details & Control
Item No.	**General**	✓	x	✓		
1	If the track machine was manufactured after 2014 has a standards compliance register been provided in accordance with Appendix C of *RISSB AS7501 Railway Rolling stock – Rolling Stock Compliance Certification*	☐	☐	☐		
2	Does the track machine have a current engineering report confirming its structural integrity?	☐	☐	☐		
3	Is there evidence that issues that resulted in the failure of a previous application for certification have been addressed?	☐	☐	☐		
4	Is there evidence that the track machine has current certification with other Australian railways?	☐	☐	☐		
5	Has the track machine been subject to modification since it was last certified for access and operation on the Adelaide Tram Network?	☐	☐	☐		
6	Is there evidence that the modification has been the subject of an engineering report?	☐	☐	☐		
7	Does the modification meet all of the requirements of the RISSB AS7500 series standards and relevant TC standards?	☐	☐	☐		
Item No.	**Maintenance Records**	✓	x	✓		
8	Is there evidence of a valid maintenance regime for the track machine?	☐	☐	☐		
9	Are there records provided that demonstrate that the track machine is being maintained to that regime?	☐	☐	☐		
10	Are the maintenance records up to date?	☐	☐	☐		
11	Is there any deferred work that may affect the operation of the track machine on the Adelaide Tram Network?	☐	☐	☐		
12	Is there evidence of a pre-work inspection regime?	☐	☐	☐		
Item No.	**Track Machine Outline & Structure**	✓	x	✓		
13	Is there evidence provided that the static track machine outline complies with Adelaide Tram Network Rolling Stock Outline?	☐	☐	☐		
14	Is there evidence provided that the kinematic track machine outline complies with Adelaide Tram Network standards?	☐	☐	☐		
15	Is there evidence that the locking system for retractable components will ensure that the track machine will not infringe the Adelaide Tram Network Rolling Stock Outline or Structural Clearance standards in travelling mode?	☐	☐	☐		
16	If the track machine has been in service for more than 10 years or has logged more than 30,000km has NDT crack evaluation of the critical welds and members of the main frame been conducted?	☐	☐	☐		
17	If the track machine has been in service for more than 10 years or has logged more than 30,000km has NDT crack evaluation been carried out every 2 years?	☐	☐	☐		
Item No.	**Identification & Integrity**	✓	x	✓		
18	Does the track machine have identification markings in accordance with Section 8 of *ENG-ENS-NIL-0041 Requirements for Track Machines Accessing & Operating on the* Adelaide Tram Network?	☐	☐	☐		
19	Have photographs of the track machine been provided in accordance with Section 8 of *ENG-ENS-NIL-0041*	☐	☐	☐		

	Requirements for Track Machines Accessing & Operating on the Adelaide Tram Network?					
Item No.	**Signal Detection Interface**	✓	x	✓		
20	For an insulated track machine, is there evidence that the vehicle has effective electrical isolation in accordance with Section 9 of *ENG-ENS-NIL-0041 Requirements for Track Machines Accessing & Operating on the* Adelaide Tram Network?	☐	☐	☐		
21	For a non-insulated track machine, is there evidence that the vehicle meets the resistance requirements of Section 9 of *ENG-ENS-NIL-0041 Requirements for Track Machines Accessing & Operating on the* Adelaide Tram Network?	☐	☐	☐		
Item No.	**Operation on Live Electrified Lines**	✓	x	✓		
22	Is there evidence the track machine has been equipotentially bonded and tested in accordance with Section 13 of *ENG-ENS-NIL-0041 Requirements for Track Machines Accessing & Operating on the* Adelaide Tram Network?	☐	☐	☐		
23	Has the track machine been assessed to ensure it is not affected by electromagnetic interference and does not generate electromagnetic interference that could affect railway signalling and communication equipment in accordance with Section 13 of *ENG-ENS-NIL-0041 Requirements for Track Machines Accessing & Operating on the* Adelaide Tram Network?	☐	☐	☐		
24	Have the component and sub-component parts of the track machine been assessed for susceptibility and immunity to electromagnetic induced current in accordance with Section 13 of *ENG-ENS-NIL-0041 Requirements for Track Machines Accessing & Operating on the* Adelaide Tram Network?	☐	☐	☐		
Item No.	**Track Forces & Stresses**	✓	x	✓		
25	Is there evidence of a static weigh test carried out in accordance with AS7508 *Railway Rolling Stock – Track Forces & Stresses – Part 4: Infrastructure Maintenance Rolling Stock*?	☐	☐	☐		
26	Is there evidence that the axle load for the track machine does not exceed the Adelaide Tram Network operating regime of 11 tonnes for Tram?	☐	☐	☐		
27	Is there evidence that the P2 force of the track machine will not exceed 200kN for a 0.010 radian dip?	☐	☐	☐		
28	Is there evidence that, during track work, the track machine is not capable of inducing stresses in the rail that exceed 90% of the rail yield stress?	☐	☐	☐		
29	Have details of the minimum horizontal and vertical curves able to be negotiated by the track machine been provided?	☐	☐	☐		
Item No.	**Braking Systems**	✓	x	✓		
30	Is there evidence that the track machine has a failsafe braking system that incorporates a stopping/service brake and a parking brake?	☐	☐	☐		
31	Have details of the braking system been provided?					
32	Is there evidence that the track machine braking system complies with the sections of AS7510 *Railway Rolling Stock – Braking systems – Part 4 – Infrastructure Maintenance Rolling Stock* relevant to existing infrastructure maintenance rolling stock?	☐	☐	☐		
Item No.	**Interior Environment**	✓	x	✓		
33	Is there evidence that control measures are in place that address the risk to crew and workers from noise exposure, vibration, air quality and temperature?	☐	☐	☐		
34	Is there evidence that the track machine complies with the sections of AS7513 *Interior Environment – Part 4 – Infrastructure Maintenance Rolling Stock* relevant to existing infrastructure maintenance rolling stock?	☐	☐	☐		

Item No.	Wheels, Axles, Wheelsets & Suspension	✓	x	✓		
35	Is there evidence that the wheels of the track machine comply with the sections of AS7514 *Railway Rolling Stock - Wheels - Part 4 – Infrastructure Maintenance Rolling Stock* relevant to existing infrastructure maintenance rolling stock?	☐	☐	☐		
36	Is there evidence that the wheelsets of the track machine comply with the sections of AS7517 *Railway Rolling Stock – Wheelsets* relevant to existing infrastructure maintenance rolling stock?	☐	☐	☐		
37	Is there evidence that the wheel diameter complies with Adelaide Tram Network rolling stock standard: *ENG-ENS-NIL-0026 Tram wheel inspection and defects standard*?	☐	☐	☐		
38	Is there evidence that the wheel profile is compatible with the Adelaide Tram Network infrastructure?	☐	☐	☐		
39	Is there evidence that the axles of the track machine comply with the sections of AS7515 *Axles* relevant to existing infrastructure maintenance rolling stock?	☐	☐	☐		
40	Is there evidence that the axle bearings comply with the sections of AS7516 *Axle Bearings* relevant to existing infrastructure maintenance rolling stock?	☐	☐	☐		
41	Is there evidence that the suspension complies with the sections of AS7518 *Railway Rolling Stock - Suspension - Part 4: Infrastructure Maintenance Rolling Stock* relevant to existing infrastructure maintenance rolling stock?	☐	☐	☐		
Item No.	Access & Egress	✓	x			
42	Is there evidence that the track machine has safe and efficient access and egress for crew and workers and complies with Section 16 of *ENG-ENS-NIL-0041 Requirements for Track Machines Accessing & Operating on the* Adelaide Tram Network and with the sections of AS7522 *Access and Egress - Part 4 - Infrastructure Maintenance* relevant to existing infrastructure maintenance rolling stock?	☐	☐	☐		
Item No.	Emergency and Safety Systems	✓	x	✓		
43	Is there evidence that the track machine is fitted with the emergency equipment detailed in Section 17 of *ENG-ENS-NIL-0041 Requirements for Track Machines Accessing & Operating on the* Adelaide Tram Network?	☐	☐	☐		
Item No.	Drawgear	✓	x	✓		
44	Is there evidence that the track machine has been fitted with drawgear in accordance with the sections of AS7524 *Drawgear - Part 4 - Infrastructure Maintenance Rolling Stock* relevant to existing infrastructure maintenance rolling stock?	☐	☐	☐		
Item No.	Event Recorder	✓	x	✓		
45	Is there evidence that the track machine is fitted with an event recorder as specified in Section 20 of *ENG-ENS-NIL-0041 Requirements for Track Machines Accessing & Operating on the* Adelaide Tram Network?	☐	☐	☐		
46	Have details of the event recorder been provided?	☐	☐	☐		
Item No.	Lighting and Visibility	✓	x	✓		
47	Is there evidence that the track machine lighting complies with the sections of AS7531 *Rolling Stock – Lighting & Visibility – Part 4 – Infrastructure Maintenance Rolling Stock* relevant to existing infrastructure maintenance rolling stock?	☐	☐	☐		
48	Does the machine have the ability to fully rotate to face in the opposite direction?	☐	☐	☐		

49	If answer to question 47 is 'No' - Is the machine fitted with headlights, stop lights, taillights and marker lights at both ends?	☐	☐	☐		
Item No.	**Audible Warning Device**	✓	x	✓		
50	Is there evidence that the track machine is fitted with an Audible Warning Device that complies, where practicable, with the requirements of AS7532 *Audible Warning Devices*?	☐	☐	☐		
Item No.	**Driving Cabs**	✓	x	✓		
51	Is there evidence that the driving cab of the track machine complies with Section 23 of *ENG-ENS-NIL-0041 Requirements for Track Machines Accessing & Operating on the* Adelaide Tram Network?	☐	☐	☐		
Item No.	**Vigilance System**	✓	x	✓		
52	Is there evidence that the vigilance system complies with Section 24 of *ENG-ENS-NIL-0041 Requirements for Track Machines Accessing & Operating on the* Adelaide Tram Network?					
53	Have the details of vigilance system been provided?	☐	☐			
Item No.	**Communications System**			✓		
54	Is there evidence that the communications system is fully compatible with the Adelaide Tram Network system?	☐	☐	☐		

The documentation supplied by the Applicant has been reviewed against the requirements detailed in this checklist.			☐ Satisfactory ☐ Unsatisfactory
Approving Engineer			
Name		**Signature**	**Date**
Phone			
Comments - List all special operational conditions or restrictions			

III. Appendix C

Track Machine General Condition Examination Checklist

Track Machine General Condition Examination Checklist

Review Date		**Track Machine Unique Identifier**	
Track Machine Make		**Track Machine Year**	
Track Machine Type	☐ Tamper ☐ Ballast Regulator ☐ Track Recorder		
	☐ Rail Grinding / Milling Machine Other:		
Serial No		**Odometer/Hour Reading**	
Applicant / Owner			
Examined by	**Name:**	**Title:**	
Company Details			
TC Review by	**Name:**	**Title:**	

Item No.			1st Inspection Pass	1st Inspection Fail	2nd Inspection Pass	2nd Inspection Fail	N/A
	Track Machine Outline & Structure		✓	x	✓	x	✓
1	Check that the overall height and width of the track machine does not exceed the limits for the Adelaide Tram Network Rolling Stock static outlines.		☐	☐	☐	☐	☐
2	Check frame areas, welds, mounting points for looseness, excessive corrosion, and cracks.		☐	☐	☐	☐	☐
3	Check for wear, cracks, structural damage, excessive corrosion, and lack of lubrication.		☐	☐	☐	☐	☐
4	For componentry that exceeds the Adelaide Tram Network Static Rolling stock outlines in work mode check the retracting and locking mechanisms for correct function/damage.		☐	☐	☐	☐	☐
	Identification		✓	x	✓	x	✓
5	Does the track machine have compliant identification markings displayed on each side and, where practicable, on front and rear?		☐	☐	☐	☐	☐
6	Does the track machine have the information required in Section 8 *ENG-ENS-NIL-0041 Requirements for Track Machines Accessing & Operating on the* Adelaide Tram Network on prominent display?		☐	☐	☐	☐	☐
	Signal Detection Interface		✓	x	✓	x	✓
7	Where the track machine has facility to interchange from insulated to non-insulated check for correct function/damage.		☐	☐	☐	☐	☐
	Dynamic Behaviour		✓	x	✓	x	✓
8	Conduct twist test to satisfy maximum wheel unloading requirement.						
	Vehicle Side	Maximum % wheel unloading					
		Front rail wheel / Rear rail wheel					
	Left		☐	☐	☐	☐	☐
	Right		☐	☐	☐	☐	☐
9	Check the speed indicating device for correct function/damage.		☐	☐	☐	☐	☐
	Brakes		✓	x	✓	x	✓
10	Check all brakes for correct function/damage/defects.		☐	☐	☐	☐	☐

11	Conduct full emergency application of stopping brake test to satisfy minimum requirements.						
	Parameter	Measurements					
	Initial Speed	km/hr	☐	☐	☐	☐	☐
	Deceleration	m/s^2	☐	☐	☐	☐	☐
	Stopping Distance	metres	☐	☐	☐	☐	☐
12	Test parking brake holding ability on 1 in 30 grade for a minimum of 20 minutes.		☐	☐	☐	☐	☐
13	Check the visual indication showing the status of parking brake for correct function / damage.		☐	☐	☐	☐	☐
14	Check the emergency stop for correct function / damage (track machine cannot be restarted after an emergency stop control has been used unless that control is reset).		☐	☐	☐	☐	☐
	Interior Environment		✓	x	✓	x	✓
15	Check HVAC system for correct function/damage.		☐	☐	☐	☐	☐
16	Check noise and temperature insulation for damage / defects.		☐	☐	☐	☐	☐
17	Check driving cab for seating comfort, condition, and damage.		☐	☐	☐	☐	☐
18	Check that the machine is fitted with rear vision devices and that they are functioning correctly.		☐	☐	☐	☐	☐
19	Check all controls and actuators for correct marking, illumination, and function/damage.		☐	☐	☐	☐	☐
20	Check all interior lighting for correct level and function/damage.		☐	☐	☐	☐	☐
	Rail Wheels, Axles, Wheelsets & Suspension		✓	x	✓	x	✓
21	Check rail wheels for condition, cracks, wear & damage.		☐	☐	☐	☐	☐
22	Check wheel studs and nuts for security/damage.		☐	☐	☐	☐	☐
23	Check web, flange and tread for cracks, wear, spalling, and profile condition.		☐	☐	☐	☐	☐
24	Check wheel bearings for wear & damage.		☐	☐	☐	☐	☐
25	Check axles for condition, cracks & damage.		☐	☐	☐	☐	☐
26	Check suspension for condition, wear, and damage		☐	☐	☐	☐	☐
27	Check back-to-back gauge of front and rear guide wheels. (Back-to-back 1387-1389mm for Tram Network)		☐	☐	☐	☐	☐
	Back-to-back gauge – Front	Back-to-back gauge – Rear					
	mm	mm	☐	☐	☐	☐	☐
	Access & Egress		✓	x	✓	x	✓
28	Check floors and other walked on areas for slip resistance/defects.		☐	☐	☐	☐	☐
29	Check ladders and access ways for correct function/defects.		☐	☐	☐	☐	☐
	Emergency & Safety Equipment		✓	x	✓	x	✓
30	Check all emergency & safety equipment are fitted and check for correct function/damage.		☐	☐	☐	☐	☐
	Couplers & Drawgear		✓	x	✓	x	✓
31	Check couplers & drawgear for correct function/damage.		☐	☐	☐	☐	☐
	Event Recorder		✓	x	✓	x	✓
32	Check event recorder for correct function /damage.		☐	☐	☐	☐	☐
	Lighting & Visibility		✓	x	✓	x	✓
33	Check all lighting for correct function/damage.		☐	☐	☐	☐	☐

41	Check the automatic configuration of vigilance system, which distinguishes between work & travel mode, for correct function/damage.	☐	☐	☐	☐	☐
	Communications System	✓	x	✓	x	✓
42	Check communications system for correct function/damage.	☐	☐	☐	☐	☐
This Track Machine has been examined for general condition against the above checklist		☐ Satisfactory ☐ Unsatisfactory				
Comments:						

IV. Appendix D

Track Machine Certificate Template

Infrastructure Maintenance Rolling Stock Certificate

Criteria	Details
Applicant Name	
Applicant Contact Details	
Vehicle Name / Type	
Vehicle Registration Number	
Vehicle Owner (if different to applicant)	
Vehicle Owner Details	
Access Track Gauge	☐ Standard (1435 mm)
Allowed to access track under live overhead	☐ Yes (See Electrical labels for conditions) ☐ No
Insulation Status	☐ Insulated ☐ Non-Insulated ☐ Switchable

Any Restrictions / Constraints

Infrastructure Manager		
Name:	Signature:	Date:
Rolling Stock Reliability Engineer		
Name:	Signature:	Date:

EXPIRY DATE:

The above vehicle is approved to access and operate on the Adelaide Tram Network with above restrictions and compliance with this certificate. This certification is valid **until the date specified above**.

Certificate Number:

V. Appendix E

Assessment for On Track Plant in /600V OHW Areas

Assessment for On-Track Plant in 600V OHW Areas

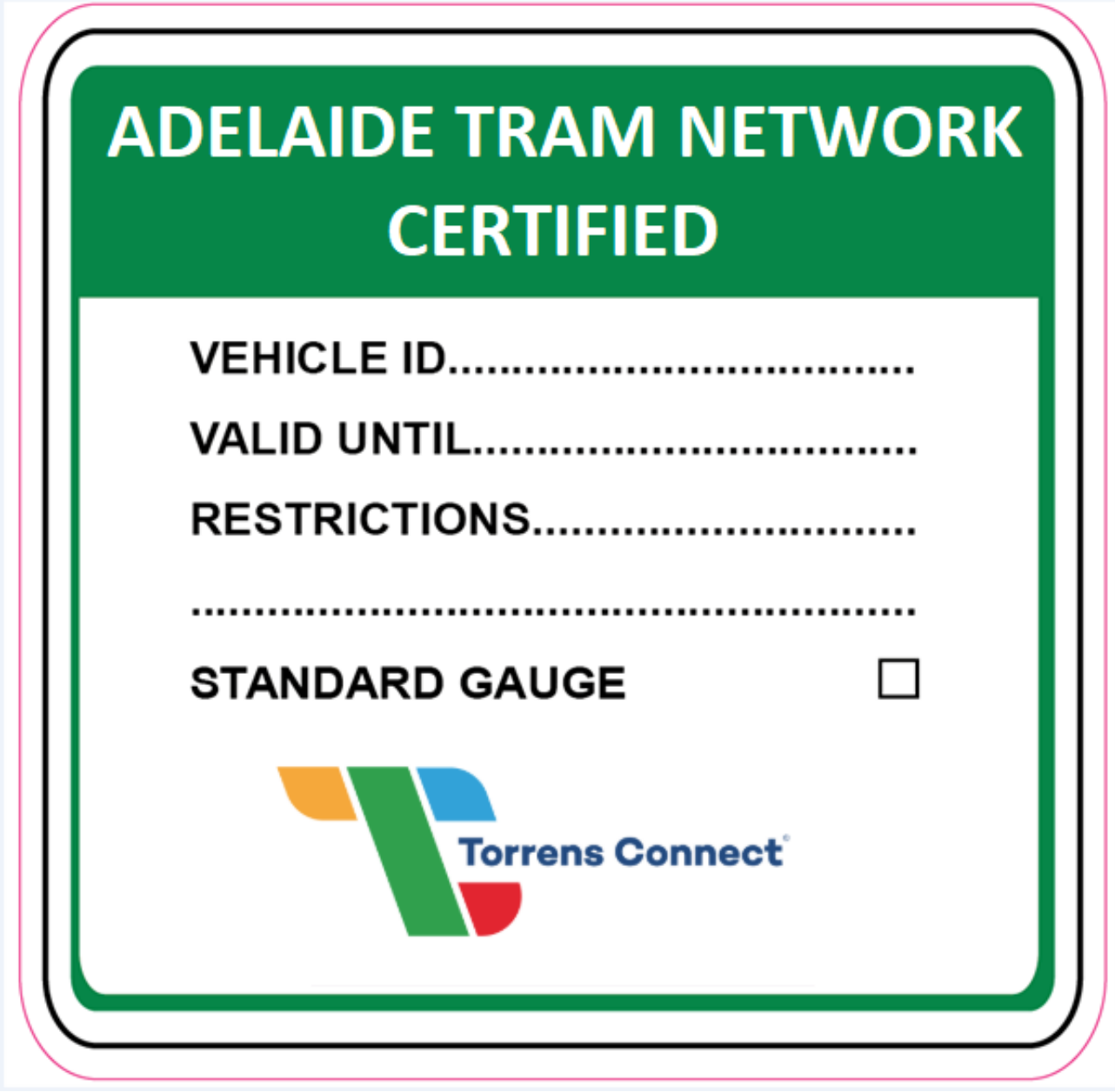
Plant / Vehicle Details					
Vehicle Make:		Vehicle Year:		Vehicle Rego:	

Assessment Criteria – by Examining Company				
Reference	Compliance Yes	Compliance No	Evidence	Comments
Equipotential Bonding	☐	☐		
Electromagnetic Compatibility	☐	☐		
Protection from Overhead Line Equipment	☐	☐		
Working and Travelling under Live Overhead Equipment	☐	☐		
On and Off Tracking Vehicles	☐	☐		
Sign Off				
Name:			Title:	
Company Details:				
Signature:			Date:	

Approval Conditions – by TC Infrastructure Engineer				
Conditions / Limitations	Yes	No	N/A	Comments
Prohibited from 600V OHW areas unless Isolated, Earthed and Certificate of Isolation issued to PRES	☐	☐	☐	
Permitted to Travel in live 600V OHW areas with Restrictions	☐	☐	☐	
Permitted to Travel in live 600V OHW areas without Restrictions	☐	☐	☐	
Permitted to Work in live 600V OHW areas	☐	☐	☐	
Permitted to On/Off Tracking in live 600V OHW areas	☐	☐	☐	
Sign Off				
Name:			Title:	
Signature:			Date:	
Valid Until:				

VI. Appendix F

Track Machine Certification Label



VII. Appendix G

Annual Certificate Confirmation Form

Infrastructure Maintenance Rolling Stock Annual Certificate

Criteria	Details
Vehicle Name / Type	
Vehicle Registration Number / Unique Identifier	
Date of Initial Certificate	

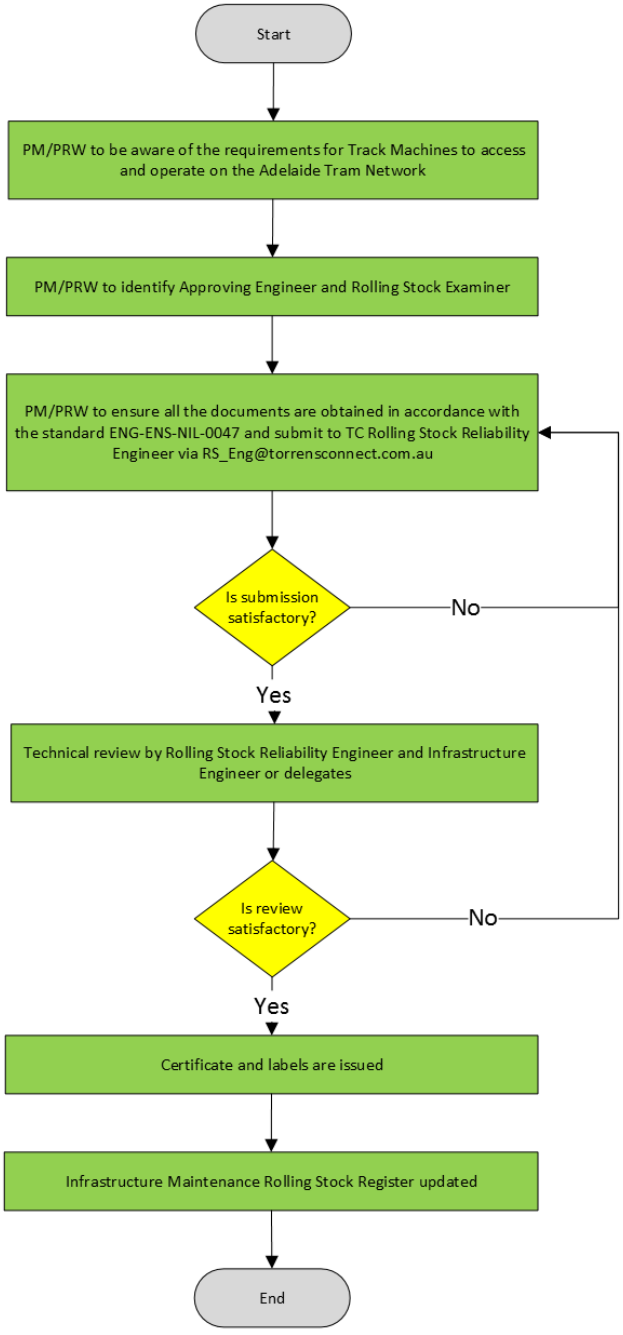
I / We confirm the following:

Item No.		Pass ✓	Fail x
1	That regular servicing has been carried out and includes all of the check items detailed in the *General Condition Examination form* used at the initial certification.	☐	☐
2	No modifications have been undertaken to the vehicle since the initial certification.	☐	☐
3	The vehicle has not been involved in any accidents or incidents since the initial certification.	☐	☐
4	Twist test has been carried out annually since the initial certification.	☐	☐
5	Crack testing of the stub axle has been carried out annually since the initial certification. (Only for road-going vehicles)	☐	☐
6	Equipotential bonding testing has been carried out annually since the initial certification.	☐	☐
7	All records are available for audit.	☐	☐
8	The vehicle is fit for purpose.	☐	☐

Name:	Signature:	Date:
Company Details:		
Acknowledged by TC Project Manager / Person Responsible for the Works		
Name:	Signature:	Date:
Title:		

VIII. Appendix H

Certification and Approval Process Flow Chart



ENG-FRM-RSG-0004 Certification and Application Form - **Applicant/Owner**
ENG-FRM-RSG-0009 Documents Review Checklist - **Approving Engineer (appointed by TC)**
ENG-FRM-RSG-0008 General Condition Examination - **Rolling Stock Examiner (approved by TC)**
ENG-FRM-RSG-0003 Assessment for 600V OHW Areas - **Rolling Stock Examiner (approved by TC)**
ENG-FRM-RSG-0002 Annual Confirmation - **Applicant/Owner**
ENG-FRM-RSG-0001 Certificate - **Rolling Stock Reliability Engineer**