Master Specification
Part RW-TC-D1

Track and Civil (Design and Construction)

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Contents

RW-TC-D1 Track and Civil (Design and Construction)

1 General

a) This Master Specification Part sets out the requirements for the design and construction of track and civil Rail Infrastructure including:

i) the documentation requirements, as set out in section 2;

ii) the general requirements, as set out in section 3;

iii) the operational signage requirements, as set out in section 4;

iv) the track geometry requirements, as set out in section 5;

v) the structural clearance requirements, as set out in section 6;

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ix) the track structure and support systems requirements, as set out in section 10;

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xii) the guard rails, check rail and derails requirements, as set out in section 13;

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xvi) the fire prevention and control requirements, as set out in section 17;

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xviii) the road level crossings requirements, as set out in section 19;

xix) the fencing and gates requirements, as set out in section 20; and

xx) the undertrack crossings requirements, as set out in section 21.

b) Where the Contractor proposes the design of track and civil Rail Infrastructure cannot meet a rail engineering standard specified by the Rail Commissioner, approval must be obtained for an engineering waiver in accordance with PC-RW30 “Design”.

c) The design of rail track and civil Rail Infrastructure must be undertaken in accordance with PC-EMD1 “Design Management” and PC-RW30 “Design”.

d) The design and construction of track and civil Rail Infrastructure must comply with the Reference Documents, as appropriate for the type of Rail Infrastructure comprised in the Contractor’s Activities, including:

i) 200-A3-82-1658 - Maximum Outline for Metropolitan Railway Rollingstock & Equipment 1600mm gauge;

ii) 301-A2-86-2239 - STA Allowable Infringements , Minimum Structures 1600 mm Gauge;

iii) 301-A3-85-1874 - Platform Clearance -1600 mm Gauge - Existing Platform;

iv) 301-A3-2010-2389 - Platform Clearance -1600 mm Gauge - New or Reconstructed Platform;

v) AS 1085.20 Railway track materials, Part 20: Welding of steel rail;

vi) AS 4799 Installation of Underground utility services and pipelines within railway boundaries;

vii) AS 5100 Bridge Design series;

viii) CP TS 974 Operational Signage Volume Three Tram System;

ix) CP TS 977 Structures Volume Three Tram System;

x) CP TS 980 Track Support Systems Volume Three Tram System;

xi) CP TS 981 Rails And Rail Joints Volume Three Tram System;

xii) CP TS 982 Guard Checkrails + Buffer Stops Volume Three Tram System;

xiii) CP TS 983 Points And Crossings Volume Three Tram System;

xiv) CP TS 984 Rail Stress Control Volume Three Tram System;

xv) CP TS 986 Fire Prevention + Control Volume Three Tram System;

xvi) CP-TS-954 - Operational Signage - Volume Two - Train System (CP2);

xvii) CP-TS-960 - Track Support Systems - Volume Two - Train System;

xviii) CP-TS-961 - Rail and Joints - Volume Two - Train System;

xix) CP-TS-962 - Guard Check Rails Buffer Stops and Derails - Volume Two - Train System;

xx) CP-TS-963 - Points and Crossings Volume Two Train System;

xxi) CP-TS-964 - Rail Stress Control - Volume Two - Train System;

xxii) CP-TS-966 - Fire Prevention and Control - Volume Two - Train System;

xxiii) CS1-DOC- 000454 Fencing and Gates Standard for Rail Corridors and Facilities;

xxiv) CS1-DOC-001218 Drainage - Train System;

xxv) CS1-DOC-001538 Formation and Earthworks - Train System;

xxvi) CS1-DOC-001639 Buffer Stops - Train System;

xxvii) CS2-DOC-0034468 - Track & civil infrastructure formation earthworks - Tram system;

xxviii) CS2-DOC-0034469 - Drainage - Tram system;

xxix) CS4-DOC-000446 Standard for Railway Pedestrian Crossings;

xxx) EN13481 Railway Applications - Track-Performance requirements for fastening systems - Part 5: Fastening systems for slab track with rail on the surface or rail embedded in a channel;

xxxi) ENG-ENS-RIM-0002 Speed board locations on the Adelaide Tram Network;

xxxii) PTS-AR-10-TK-SPE-00000035 In-bearer Point Machines Technical Specification;

xxxiii) PTS-MS-10-SG-STD-00000094 - Pit and conduit standard for signalling and communication cables;

xxxiv) PTS-MS-10-TR-STD-00000047 - Structural Clearances Design & Rating;

xxxv) TC1 DOC 003459 Track Geometry Tram System;

xxxvi) TC1-DOC-000386 - Engineering Decision - Change to Track and Civil Infrastructure Code Of Practice Volume 2 - Train System to Support Higher Track Speeds;

xxxvii) TC1-DOC-000445 Speed Board Locations on the Adelaide Metropolitan Public Transport Network;

xxxviii) TC1-DOC-000448 - Track Geometry - Train System;

xxxix) TC1-DOC-000456 Rail Profiling - Train System Engineering Specification;

xl) TC1-DOC-000954 Engineering Instruction - Excavation and Ground Penetration;

xli) TC1-DOC-001642 Structures -Train System;

xlii) TP1-DOC-000389 Electrical and Mechanical Clearances for the 25kV Electrified Train Network; and

xliii) Transport for NSW Asset Standards Authority - Standard - T HR CI 12072 ST Track Slabs.

e) Where Reference Documents are not publicly available, the Contractor must contact the applicable rail operator or the Principal (as applicable) to obtain these documents.

2 Documentation

2.1 Design Documentation

In addition to the requirements of PC-EDM1 “Design Management” and PC-RW30 “Design”, the Design Documentation must include:

a) where relevant, details of reinstatement locations for existing operational signage salvaged as part of the Works, as required by section 4b);

b) where relevant, the Design Drawing for new operational signage, as required by section 4d);

c) details of the location where the AS50kg or Ri57A plain carbon rail will be used, as required by section 12d);

d) concrete sleeper capacity assessment, as required by section 13b);

e) details of points and crossing configuration, as required by section 15g);

f) details of the road crossing sleepers, as required by section 19b); and

g) monitoring proposal for newly constructed UTXs, as required by section 21d).

2.2 Design Report

In addition to the requirements of PC-EDM1 “Design Management” and PC-RW30 “Design”, the Design Report must include details of all design speeds as required by section 3d).

2.3 Construction Documentation

In addition to the requirements of PC-CN3 “Construction Management”, the Construction Documentation must include:

a) ballastless track construction methodology, as required by section 11g);

b) the proposed radius for points and crossings for the tram network, as required by section 15c);

c) rail stress management plan, as required by section 16b); and

d) UTX construction methodology, as required by section 21e).

2.4 Quality Management Records

In addition to the requirements of PC-QA1 “Quality Management Requirements” or PC-QA2 “Quality Management Requirements for Major Projects” (as applicable), the Quality Management Records must include:

a) new weld test certificates as required by section 12g);

b) records of all rail stressing as required by section 16c); and

c) Australian level crossing assessment model field and rating survey as required in section 18c).

3 General

a) The design of the track and civil Rail Infrastructure must accommodate the operating regime in Table RW-TC-D1 3-1 (subject to section 3c)).

b) The design of the track and civil Rail Infrastructure must allow all passenger rolling stock to achieve the maximum operating speed while maintaining passenger comfort.

c) The design of the track and civil Rail Infrastructure must accommodate location specific operational speeds, which in instances may be less than the maximum operating speed, set out in Table RW-TC-D1 3-1, in accordance with:

i) TC1-DOC-000445 Speed Board Locations on the Adelaide Metropolitan Public Transport Network; and

ii) ENG-ENS-RIM-0002 Speed board locations on the Adelaide Tram Network.

d) The Contractor must detail all design speeds in the Design Report.

Table RW-TC-D1 3-1 Operating regime

Designation	Maximum axle load	Maximum operating speed
Passenger diesel or diesel electric multiple units	21 tonnes	110 km/hr
Locomotives	22 tonnes	65 km/hr
Freight rolling stock	21 tonnes	65 km/hr
Tram	12 tonnes	75 km/hr

4 Operational signage

a) The Contractor must ensure all operational signage for railways complies with:

i) CP-TS-954 - Operational Signage - Volume Two - Train System (CP2); or

ii) CP TS 974 Operational Signage Volume Three Tram System,

as applicable.

b) Where required in the Contract Documents, existing operational signs must be salvaged, stored and reinstated in their existing location or as otherwise specified in the Design Documentation.

c) The Contractor must design, manufacture and install operational signs for railways in accordance with current approved Department Standard Drawings.

d) Where new operational signage is required for which there is no current approved Department Standard Drawing, a Design Drawing must be provided in the Design Documentation.

e) The Contractor must design and install the rail operational signage to avoid any adverse affect on any critical sighting distances for train or tram drivers, maintenance staff, pedestrians or members of the public.

5 Track geometry

The Contractor must design and construct track geometry in accordance with:

a) TC1-DOC-000448 - Track Geometry - Train System; or

b) TC1 DOC 003459 Track Geometry Tram System,

as applicable.

6 Structural clearances

a) The Contractor must ensure structural clearances for rail tracks comply with:

   i) PTS-MS-10-TR-STD-00000047 - Structural Clearances Design & Rating;

   ii) 200-A3-82-1658 - Maximum Outline for Metropolitan Railway Rollingstock & Equipment 1600mm gauge;

   iii) 301-A2-86-2239 - STA Allowable Infringements, Minimum Structures 1600 mm Gauge;

   iv) 301-A3-85-1874 - Platform Clearance -1600 mm Gauge - Existing Platform;

   v) 301-A3-2010-2389 - Platform Clearance -1600 mm Gauge - New or Reconstructed Platform; and

   vi) TP1-DOC-000389 Electrical and Mechanical Clearances for the 25kV Electrified Train Network.

b) The Contractor must design fouling points on siding tracks entering a main line in a position that ensures no two trains can come closer to each other than 4.0 metres.

7 Structures

The Contractor must design and construct rail track structures in compliance with:

a) RW-ST-D1 “Structures”; and

b) TC1-DOC-001642 Structures -Train System; or

c) CP TS 977 Structures Volume Three Tram System,

as applicable.

8 Drainage

a) The Contractor must design and construct stormwater and drainage for Rail Infrastructure in compliance with:

   i) CS1-DOC-001218 Drainage - Train System; and

   ii) CS2-DOC-0034469 - Drainage - Tram system,

   as applicable.

b) Open access rail track drainage must not be obstructed by overhead wiring poles or signal masts, cables or associated equipment.

9 Formation and earthworks

The design and construction of formation and earthworks infrastructure for rail tracks must comply with:

a) CS1-DOC-001538 Formation and Earthworks - Train System; and

b) CS2-DOC-0034468 - Track & civil infrastructure formation earthworks - Tram system,

as applicable.

10 Track structure and support systems

a) The Contractor must design and construct track structure and support systems in accordance with:

i) CP-TS-960 - Track Support Systems - Volume Two - Train System; or

ii) CP TS 980 Track Support Systems Volume Three Tram System,

as applicable.

b) For the train network, the concrete sleepers for track structures and support systems must comply with Department Standard Drawing 225-22D-F2 Gauge Convertible Concrete Sleeper (Broad / Standard).

c) For the Tram network, the concrete sleepers for track structures and support systems must comply with Department Standard Drawing 170-14S-e-C.

d) The Contractor must use galvanized rail fasteners in locations where the fasteners are covered or not safely accessible for inspection.

11 Ballastless track

a) The Contractor must design a concrete slab where the track gradient is greater than 1 in 45.

b) The track must be directly fixed to the concrete slab.

c) Embedded systems are not permitted.

d) The Contractor must design ballastless tracks in accordance with:

i) EN13481 Railway Applications - Track-Performance requirements for fastening systems - Part 5: Fastening systems for slab track with rail on the surface or rail embedded in a channel;

ii) Transport for NSW Asset Standards Authority - Standard - T HR CI 12072 ST Track Slabs;

iii) AS 5100 Bridge Design series; and

iv) TC1-DOC-001642 Structures -Train System or CP TS 977 Structures Volume Three Tram System (as applicable).

e) The design of rail track and civil Rail Infrastructure must include a track support transition between the track slab and the concrete sleepered ballasted track to:

i) provide a progressive change in track stiffness;

ii) provide an easily maintained track form transition which will not be prone to differential settlement;

iii) provide accurate matching of track alignment under all loading conditions in order to avoid stress concentrations in components or uneven ride characteristics; and

iv) achieve the nominated levels of vibration and regenerated noise attenuation.

f) The Contractor must design the ballastless tracks and transitions to mitigate noise and vibration impacts in accordance with all Laws, Approvals and the Contractor’s Environmental Management Plan.

g) The ballastless track construction methodology must be provided in the Construction Documentation.

12 Rails and rail joints

a) The Contractor must design and construct rails and rail joints in accordance with:

i) CP-TS-961 - Rail and Joints - Volume Two - Train System; or

ii) CP TS 981 Rails and Rail Joints Volume Three Tram System,

as applicable.

b) The design of rail track and civil Rail Infrastructure design must provide for continuously welded rail.

c) The Contractor must use AS50kg standard plain carbon rail for plain line track on the train system.

d) The Contractor must use AS50kg or Ri57A plain carbon rail for plain line track on the tram system. The Contractor must provide details of the location where the AS50kg or Ri57A plain carbon rail will be used in the Design Documentation.

e) The Contractor must not use head hardened rail for the train system or the tram system.

f) Welds must be “flash butt” in accordance with AS 1085.20 Railway track materials, Part 20: Welding of steel rail.

g) The Contractor must ensure all new welds are ultrasonically tested and certified by an independent accredited authority as defect free before handover for rail traffic operations, including test trains. The test certificates must be provided as part of the Quality Management Records.

13 Guard rails, check rail and derails

a) The Contractor must design and construct rail track guard rails to comply with:

i) CP-TS-962 - Guard Check Rails Buffer Stops and Derails - Volume Two - Train System; and

ii) CP TS 982 Guard Checkrails + Buffer Stops Volume Three Tram System,

as applicable.

b) Where the Contractor proposes the attachment of check rails, guard rails or signalling equipment to concrete sleepers, the Contractor must demonstrate in the Design Documentation that the concrete sleeper can accommodate the attachment of equipment without impairing the concrete sleeper function.

c) The Contractor must design check blocks and bolts to secure the check rail to the running rail.

d) Derailers must not be used.

14 End of track protection / buffers

a) The Contractor must design and construct end of track protection in accordance with CS1-DOC-001639 Buffer Stops - Train System.

b) The Contractor must design friction type buffers for all main line end of track protection.

15 Points and crossings

a) The Contractor must design and construct rail points and rail crossings in accordance with:

i) CP-TS-963 - Points and Crossings Volume Two Train System; or

ii) CP TS 983 Points and Crossings Volume Three Tram System,

as applicable.

b) New points and crossings for the train network must be 1 in 9, 250mR, utilising the 1600 mm gauge.

c) New points and crossings for the tram network must be 1 in 8 and the proposed radius must provided in the Construction Documentation.

d) The Contractor must design and construct points and crossings for:

i) an operational speed of 35 km/h for the diverging route; and

ii) location specific line speed for the straight routes as required in section 3c).

e) Contraflexure and similar flexure turnouts must not be used.

f) The Contractor must design and construct new points and crossings:

i) using AS60 kg rail;

ii) which are not gauge convertible; and

iii) for point machine operation.

g) The Contractor must provide details of the points and crossings configuration in the Design Documentation.

16 Rail stress control

a) The Contractor must control rail stress in accordance with:

i) rail stress management plan required by section 16b); and

ii) CP-TS-964 Rail Stress Control -Volume Two - Train System; or

iii) CP TS 984 Rail Stress Control Volume Three Tram System,

as applicable.

b) The Contractor must provide a rail stress management plan as part of the Construction Documentation which must detail the methodology and order of stressing.

c) The Contractor must provide full records of all rail stressing as part of the Quality Management Records including:

i) date and location;

ii) rail temperature / initial temperature;

iii) total rail length / initial rail length;

iv) rail extension;

v) rail movement;

vi) cut rail gap;

vii) weld gap;

viii) rail adjustment calculation;

ix) use of rail tensor, or artificial heating or cooling / stressing method;

x) direction of traffic;

xi) statement of completion of track-geometry marking and ballasting;

xii) type of welding method;

xiii) name of person responsible during the work;

xiv) name of supervisor; and

xv) type of fastener used.

17 Fire prevention and control

The Contractor must design and construct fire protection and control on rail tracks in accordance with:

a) CP-TS-966 - Fire Prevention and Control - Volume Two - Train System; or

b) CP TS 986 Fire Prevention + Control Volume Three Tram System,

as applicable.

18 Pedestrian level crossings

a) New pedestrian level crossings are not permitted unless specified otherwise in the Contract Documents.

b) The Contractor must design and construct the upgraded pedestrian crossings in accordance with CS4-DOC-000446 Standard for Railway Pedestrian Crossings.

c) Where specified in the Contract Documents, or as directed by the Principal, the Contractor must complete an Australian level crossing assessment model field and rating survey and provide as part of the Quality Management Records.

d) All upgraded pedestrian crossings must have a single constant grade across all tracks, preferably flat, but no steeper than 1 in 20.

19 Road level crossings

a) New road level crossings are not permitted.

b) Where the Contract Documents require an existing road level crossing track structure to be replaced, the Contractor must design and construct the road crossing sleepers in full depth concrete and provide details in the Design Documentation.

c) New AS50 kg rail must be used where the road level crossing track structure is being replaced.

d) A 65mm flange gap must be installed where the road level crossing track structure is being replaced.

e) Where existing road level crossings are resurfaced, the rail fastenings must be replaced with new galvanised fasteners.

20 Fencing and gates

The Contractor must design and construct rail track fencing and gates in accordance with CS1-DOC-000454 Fencing and Gates Standard for Rail Corridors and Facilities.

21 Undertrack crossings

a) The Contractor must minimise the use of UTX.

b) Where UTX are required, under track bores are preferred.

c) The design of rail track and civil Rail Infrastructure and construction of new or upgraded UTX must comply with:

   i) PTS-MS-10-SG-STD-00000094 - Pit and Conduit Standard for Signalling and Communication Cables - Engineering Standard;

   ii) TC4-DOC-000357 Non-Rail Service Installations within the Rail Corridor; and

   iii) AS4799 Installation of Underground utility services and pipelines within railway boundaries.

d) The Contractor must submit a monitoring proposal for newly constructed UTX's as part of the Design Documentation.

e) A UTX construction methodology must be submitted as part of the Construction Documentation.