



Government of South Australia

Department of Planning,
Transport and Infrastructure

PUBLIC TRANSPORT SERVICES

NON-RAIL SERVICE INSTALLATIONS WITHIN THE RAIL CORRIDOR

TC4-DOC-000357



and THINK

Zero Harm



Document Control

DOCUMENT STATUS

Document Owner: Director, Asset Management			
Action	Name and Position	Signature	Date
Prepared By:	Name: Keyvan Pourhassan Title: Project Engineer - Electrification Project		26/06/13
Reviewed By:	Name: Philip Degenhardt Title: Track and Civil Engineering Manager		26/6/13.
Reviewed By:	Name: Keith Charlton Title: Rail Engineering Manager		26.6.13
Approved By:	Name: Brian Green Title: Director, Engineering and Maintenance		26/6/2013
Risk Category: Low			
Document Review Schedule: This document is due for review as required			

DOCUMENT AMENDMENT RECORD

Rev	Change Description	Date	Prepared	Reviewed	Authorised
0	Initial Issue	June 2013	Keyvan Pourhassan	Philip Degenhardt Keith Charlton	Brian Green



Contents

1.0	PURPOSE, SCOPE AND APPLICATION	4
2.0	ACRONYMS AND REFERENCE DOCUMENTS.....	4
2.1	ACRONYMS	4
2.2	REFERENCES.....	4
3.0	GENERAL REQUIREMENTS	5
3.1	APPLICATIONS BY NON-RAIL PARTIES	5
3.2	SERVICES SEARCH.....	5
3.3	METHODS FOR LOCATING EXISTING SERVICES.....	6
3.4	MARKING OF SERVICES	6
3.5	INSTALLATION PLANNING	6
4.0	BELOW GROUND (UNDERGROUND) SERVICES.....	7
4.1	TYPES OF SERVICES	7
4.2	PERMITTED INSTALLATIONS – NON-RAIL PARTIES	7
4.3	DESIGN REQUIREMENTS	7
4.3.1	General	7
4.3.2	Location.....	7
4.3.3	Geotechnical assessment.....	8
4.3.4	Design traffic load	9
4.3.5	Depth of cover.....	9
4.3.6	Direction of services.....	9
4.3.7	Carrier and encasing pipes	9
4.3.8	Separation of services	9
4.3.9	Service pits / Accessible Parts	9
4.3.10	Electro Magnetic Compatibility.....	10
4.4	INSTALLATION	10
4.4.1	General	10
4.4.2	Installation methods.....	10
4.4.3	Protection of rail infrastructure	11
4.4.4	Width of trenches.....	11
4.4.5	Backfilling and compaction	11
4.4.6	Disposal of excavated materials	12
4.4.7	Ponding of water in open trenches.....	12
4.5	MARKERS	12
5.0	ABOVE GROUND (AERIAL) SERVICES.....	12
5.1	TYPES OF SERVICES	12
5.2	PERMITTED INSTALLATIONS – NON-RAIL PARTIES	12
5.2.1	Aerial Services Waiver Process.....	12
6.0	DOCUMENTATION.....	13
6.1	DESIGN STAGE	13
6.2	WORK-AS-EXECUTED (AS-BUILT) PLANS	13



1.0 PURPOSE, SCOPE AND APPLICATION

This standard specifies the technical requirements for the design, installation and maintenance of electrical, communications and utility services, cables and pipelines on the PTS rail corridor. The requirements are applicable to services owned by non-rail parties. The requirements are applicable to both above ground and below ground services. For the sections of the railway corridor where ARTC share the corridor with PTS, ARTC shall also be consulted and their requirements shall also be met.

Services covered in this document include:

- Electrical
- Telecommunications
- Water and sewerage
- Stormwater drainage
- Combustible liquids
- Flammable fluids
- Cathodic Protection

2.0 ACRONYMS AND REFERENCE DOCUMENTS

2.1 ACRONYMS

Terms used in this standard are defined as follows

ACRONYM	Full Name
AMPRN	Adelaide Metropolitan Passenger Rail Network
ARTC	Australian Rail Track Corporation
PTS	Public Transport Services
PTSOM	PTS Operations and Maintenance
UTX	Under Track Crossing: a service crossing beneath a rail line.
URX	Under Road Crossing: a service crossing beneath a roadway (e.g. access road).
WHS	Work Health and Safety
Non-Rail Party	Organisation external to PTS, e.g. Telstra, Optus, Local Government Authorities, electrical, water, sewerage and gas utilities. Also known as "Third Party".

Definitions of other standard terms used in this standard are provided in AS 4799: *Installation of underground utility services and pipelines within railway boundaries*.

2.2 REFERENCES

Document Number	Title
AS 1100 – 1984	Technical drawing - Part 401: Engineering survey and engineering survey design drawing



Document Number	Title
AS 1289 – 2000	Methods of Testing Soils for Engineering Purposes
AS 3000 – 2007	Electrical Installations (known as the Australian/New Zealand Wiring Rules)
AS 4799 – 2000	Installation of Underground Utility Services and Pipelines within Railway Boundaries
AS/NZS 2566.1 – 1998	Buried Flexible Pipelines – Part 1: Structural Design
AS 5100 – 2004	Bridge Design
AS/ACIF S009: 2006	Installation Requirements for Customer Cabling (Wiring Rules)
PTS-MS-10-EG-PRC-00000032	Approval of Technical Standards and Waivers Procedure
PTS-MS-10-SG-STD-00000094	Pit and Conduit Standard For Signalling and Communication Cables
PTS-MS-05-AM-PRC-00000091	Asset Management Technical Data Requirements for Projects

Note: Where there is a conflict between this document and any Australian or International Standards, a determination is at the discretion of the relevant PTS functional group manager.

3.0 GENERAL REQUIREMENTS

3.1 APPLICATIONS BY NON-RAIL PARTIES

All service crossings installed by a non-rail party are to be covered by an appropriate agreement (Easement, Licence etc). Applications by non-rail parties for the installation of services on the rail corridor shall be made through the Rail Network Access Manager who will forward to the Manager Track & Civil for approval and then to DPTI Transport Property Group for easement arrangements..

In addition to the mentioned agreement, details of works, including detailed design, geotechnical reports, Safe Work Method Statement, etc as explained in this document under section 3.5 "Installation Planning" shall be provided to the Rail Network Access Manager as part of the application for the Rail Corridor Access.

Notes:

- PTS Rail Corridor Access Application form should be obtained from the Rail Network Access Manager.)
- PTS Track and Civil Engineering will review the design. Approval from PTS Manager Track and Civil is required for the grant of access to the railway corridor.
- Preliminary advice regarding engineering considerations can be sought from PTS Manager Track and Civil prior to application.

3.2 SERVICES SEARCH

A services search shall be undertaken by the Applicant to identify any existing services that may be affected by the proposed new installation.



Service searches for non-rail (external) services are to be undertaken with the relevant authorities in accordance with industry-standard procedures including Dial-Before You-Dig. A services search is required where footings in the ground are proposed for service installations.

Service searches for PTS services are to be undertaken in accordance with PTS requirements and in consultation with PTS. Where PTS employees are required to assist in locating services, i.e. signalling infrastructure, a fee, payable by the 3rd party applicant may apply.

3.3 METHODS FOR LOCATING EXISTING SERVICES

There are various non-destructive methods available for validating the location of existing underground services on site. These include:

- Use of electronic cable locating equipment;
- Use of ground penetrating radar (GPR) equipment;
- Potholing by vacuum excavation, using compressed air or water to break up the ground and vacuum to remove the loosened material.

Electronic cable locating equipment may interfere with the operation of the signalling system. The use of electronic cable locating equipment shall be in accordance with PTS requirements and in consultation with PTS.

Potholing to expose a service provides a greater guarantee of the precise location of a service than the electronic or GPR methods.

3.4 MARKING OF SERVICES

Once identified, the ground marking of underground services shall be carried out using the following colour scheme:

Type of Service	Colour
Signalling / Communication	Pink
LV &HV Power Internal & External	Orange
External Telecommunications	White
Gas	Yellow
Water / Sewerage / Drainage	Light Blue
Compressed Air	Green
Fuel, Combustible and Flammable Liquids	Red

3.5 INSTALLATION PLANNING

The installation of services within the rail corridor shall be thoroughly planned in order to ensure that people, the environment and property remain safe.

The planning process shall identify hazards associated with the proposed installation and shall develop work methods to mitigate the hazards.

The planning of work shall incorporate the following processes:

- Preparation of engineering designs for the installation of services within the corridor in accordance with the relevant PTS, Australian and International standards;



- Preparation of Excavation Work Plan and Safe Work Methods Statements (SWMS). The SWMS shall address specific site factors for each proposal;
- Geotechnical investigations and assessment of effect when installing under track crossings (UTX) on ground movement and the safe passage of trains, and determination of safe working methods; The need to monitor any movement of the track or other adjacent infrastructure by survey, during and after installation, and preparation of a track and structures monitoring plan;
- Obtaining of applicable permits and approvals from the relevant authorities;
- Obtaining licence/agreement from DPTI Transport Property Group;
- Obtaining permission from the Rail Network Access Manager to access the rail corridor.

4.0 BELOW GROUND (UNDERGROUND) SERVICES

4.1 TYPES OF SERVICES

Below ground (underground) services may include low or high voltage electrical and telecommunication cables and pipelines conveying, water, sewerage, combustible liquids (e.g. petroleum) and flammable fluids (e.g. gas).

The services may run along or across the rail corridor and pass beneath a rail line (UTX) or roadway (URX).

4.2 PERMITTED INSTALLATIONS – NON-RAIL PARTIES

Installation of new service crossings directly across the rail corridor will be considered and may be approved by PTS, subject to all engineering requirements being met and a satisfactory agreement being reached between PTS and the Applicant.

Although there are many existing non-rail services that have been installed longitudinally along the rail corridor, further installations shall not be permitted unless approved by PTS Chief Engineer.

Valves, compressor stations and flare points for combustible liquids or flammable fluids are not permitted on the rail corridor.

4.3 DESIGN REQUIREMENTS

4.3.1 General

Underground cables and pipelines shall be designed and installed in accordance with Australian Standard AS 4799: *Installation of Underground Utility Services and Pipelines within Railway Boundaries* and the requirements of this standard.

PTS shall be consulted and their requirements shall be met prior to the installation of power cables.

4.3.2 Location

For non-rail party installations, underground services shall be located in natural ground.

Minimum clearances to adjacent structures and vulnerable areas such as drains, toes of embankments, shoulders of embankments and tops of cuttings shall be in accordance with AS 4799: *Installation of Underground Utility Services and Pipelines within Railway Boundaries* Section 3 or as determined by PTS Manager Track and Civil..



No services are to be attached to bridges and structures.

When approval is given to place a pipe under a bridge, the trench shall be excavated no closer than 3 metres to the footings of any abutment or pier. The excavation shall not undermine the bridge footing or lead to instability or sliding of the abutment or pier. The stability of the abutment or pier shall be checked for the temporary open trench condition and it shall be demonstrated that the requirements of AS 5100 have been met.

When approval is given to install a pipe through a concrete culvert, the pipe shall be located close to the culvert wall and as close to the soffit as possible. The pipe is to be located by grouting under and over the pipe to present a smooth surface to the water passing through the culvert. The pipe is to return underground at each end of the culvert as quickly as practical.

No services are to be installed in an open channel drainage system.

No under boring can be carried out at any location under, or within 10 metres of turnouts or special track work (catch points, expansion switches, diamonds, slips etc).

4.3.3 Geotechnical assessment

Minor excavations or boreholes are necessary for geotechnical assessment as per instructions from the PTS Manager Track and Civil. The geotechnical conditions may dictate the most suitable installation method.

The geotechnical assessment shall consider the effect of the proposed installation on the track, overhead wiring structures and other infrastructure, including any effects from changes in the water table.

Any application by a non-rail party to install an undertrack crossing shall be accompanied by a geotechnical investigation/ report prepared by a qualified geotechnical engineer.

The geotechnical investigation for the proposed undertrack crossing shall include (but not be restricted to) the following:

- Boreholes or test pits at entry and exit points to a minimum depth of 5000mm below the base of the proposed excavation entry/ exit points;
- Boreholes or test pits at the toe of the ballast on either side of the line to a minimum depth of 5000mm below the base of the proposed UTX invert. For multiple track lines, additional boreholes or test pits shall be carried out as required by PTS.
- For boreholes in the railway corridor, location of the bores/pits shall be approved by PTS discipline managers as part of the Rail Corridor Access Application.

The geotechnical report for the proposed undertrack crossing shall include (but not be restricted to) the following:

- Site description and results of investigation;
- An accurately surveyed cross section along the UTX alignment showing current ground surface, rail levels/ positions, position of proposed UTX, existing underground services, borehole or test pit information and correlation lines of subsurface layers between boreholes or test pits, and any other relevant information;
- Prediction of possible ground subsidence during the UTX installation, especially if non-cohesive soils are present;
- Recommendation for the most suitable installation method;
- An assessment as to whether a geotechnical engineer should be in attendance during construction to monitor any suspect ground conditions and ground movement.
-



4.3.4 Design traffic load

Pipelines carrying underground services crossing under the tracks shall be designed for train loads as specified in AS 4799: *Installation of Underground Utility Services and Pipelines within Railway Boundaries*.

Pipelines carrying underground services within the rail corridor shall be designed to accommodate a road vehicle load of 10 tonnes per axle.

The dynamic load allowance (DLA) shall vary linearly from 1.5 at 0.3 m depth to 1.0 at 3.5 m depth or greater, where the depth is measured from the top of rail. This load shall be applied to the length of pipe as specified in AS 4799: *Installation of Underground Utility Services and Pipelines within Railway Boundaries*.

4.3.5 Depth of cover

For UTX installations, the minimum cover shall be as prescribed in AS4799: *Installation of Underground Utility Services and Pipelines within Railway Boundaries*. A minimum cover of 2000mm is preferred **but shall be** no less than 1600mm from top of the rail.

For services installed parallel to the tracks, the minimum depth shall be as prescribed in AS4799: *Installation of Underground Utility Services and Pipelines within Railway Boundaries* **and** no less than 800mm below ground level.

4.3.6 Direction of services

For non-rail party installations, UTX crossings shall cross at $90 \pm 5^\circ$ to the tracks. Service crossings shall not have bends within the rail corridor.

4.3.7 Carrier and encasing pipes

In general, the need for an encasing pipe for UTX's is to be assessed on a case by case basis.

Encasing pipes shall be provided for all UTX's conveying high voltage cables, pressure pipelines and pipelines carrying combustible liquids and flammable fluids.

Steel encasing pipes are not permitted on the AMPRN.

4.3.8 Separation of services

Trenches may be shared by high voltage cables, signalling and communications cables and other services.

Different services are to be separated as prescribed in Clause 3.2.6 of AS 4799: *Installation of Underground Utility Services and Pipelines within Railway Boundaries*, and AS 3000: *Electrical Installations (known as the Australian/New Zealand Wiring Rules)*.

Installation of services in a shared trench is allowed only upon approval from PTS Manager Signalling & Communications and Manager Electrical Engineering.

4.3.9 Service pits / Accessible Parts

Pits and access chambers for non-rail services shall be located outside the rail corridor.



4.3.10 Electro Magnetic Compatibility

Non-rail service installation shall comply with Industry Standards and PTS requirements for Electro Magnetic Compatibility.

4.4 INSTALLATION

4.4.1 General

Installation by non-rail parties is to be undertaken in accordance with the approval granted by PTS and as advised by the Rail Network Access Manager. Construction is to be carried out in accordance with Work Health and Safety (WHS) legislation and relevant Safe Work SA regulations.

For excavation work, the requirements of Safe Work SA are to be observed in their entirety. The SafeWorkSA Code gives specific direction on legal requirements for shoring of excavations, periodic inspections, safety fencing, excavations adjacent to buildings and structures, flooding risks, stacking of materials, protection from falling objects, work adjacent to or under overhead power lines, manual handling, lighting, ladders and scaffolding, mechanised plant and heavy machinery, working in confined spaces, use of personal protective equipment and environmental protection.

All underbores shall be backfilled with grout or sleeved appropriately to comply with the requirements of AS4799: *Installation of Underground Utility Services and Pipelines within Railway Boundaries* and AS/NZS2566.1: *Buried Flexible Pipelines – Part 1: Structural Design*. The minimum acceptable grout strength is 60kPa. The method shall be approved by PTS Manager Track and Civil prior to construction.

4.4.2 Installation methods

A detailed methodology shall be prepared by the non-rail party and submitted with the application for service installation. Depending on the particular site conditions, alternative methods for installing underground services under tracks or access roads within the rail corridor include but are not limited to:

- Cased auger boring (refer to Clause 3.6 of AS 4799: *Installation of Underground Utility Services and Pipelines within Railway Boundaries*): this method is suitable where precise accuracy is not crucial;
- Laser-guided micro-tunnelling: this method uses a laser-guided vacuum borer head with articulated positive steering;
- Pipe jacking (refer to Clause 3.6 of AS 4799: *Installation of Underground Utility Services and Pipelines within Railway Boundaries*): pipe jacking methods are generally suitable for larger pipe diameters and can be employed up to a distance of 100 metres. Accuracy in alignment is achieved by using a laser beam. In addition to Clause 3.6.2.2 of AS 4799: *Installation of Underground Utility Services and Pipelines within Railway Boundaries*, for jacking through non-cohesive soil where the pipe can be advanced ahead of excavation, removal of soil in the pipe shall only proceed to within one pipe diameter behind the leading edge of the pipe. Generally, excavation shall proceed not more than 50mm ahead of the leading end of the pipe before the pipe is jacked forward;
- Directional boring: this process is surface launched and can be tracked down to a depth of over 100 metres below the surface. Services can typically be laid up to a distance of 1000 metres in a single bore. Advantages include elimination of trenching and associated excavation and shoring costs, greater safety and less delays owing to unfavourable weather conditions. Disadvantages include potential impact on the track from heaving or frackout.
- Tunnel boring: this method typically employs a steel cylinder equipped with a hydraulic excavator in the front. Extracted material is removed with an auger or conveyor and a liner plate is installed in the rear section as the borer progresses forward. Using this method, tunnels up to 2400mm in diameter can be installed in granular soil;



- Trenching: trenching with rail baulks or temporary tunnelling under tracks is permitted in exceptional circumstances only. This method may necessitate a complete closedown of the track. Technical aspects of trenching are addressed in Clause 3.7 of AS 4799: *Installation of Underground Utility Services and Pipelines within Railway Boundaries*.
- Trenching is also permitted for services running along the rail corridor and not crossing under a track or access road, subject to the technical requirements and procedures being followed as laid down in AS4799: *Installation of Underground Utility Services and Pipelines within Railway Boundaries*.

4.4.3 Protection of rail infrastructure

Care shall be exercised when excavating within 5 metres of rail infrastructure as there is a risk that the rail infrastructure may be disturbed or damaged. This could include for example:

- Track subsidence;
- Excavation at the base of railway embankments, that might lead to destabilisation and failure of the embankment;
- Excavation in the vicinity of overhead wiring structure footings;
- Disturbance to drainage systems over railway cuttings that might lead to failure of the cutting slopes or fouling of the tracks below;
- Undercutting of the base of railway cuttings;
- Damage to railway cess drains and disturbance to the flow of stormwater runoff;
- Damage to train examination or staff walkway areas;
- Excavation adjacent to building, bridges or other structures that might undermine or destabilise the foundations;
- Damage to above ground railway equipment, e.g. signalling infrastructure;
- Damage to other existing underground services.

When excavating adjacent to structures, there is a risk that the footings may be undermined or the structure destabilized, resulting in structural failure and potential collapse.

Excavations in the vicinity of structure footings are therefore not permitted unless documented engineering advice and approval are obtained.

No excavation should be made within this 5m distance without prior analysis of structure stability with respect to the effects of the excavation.

The approval will be in the form of a certification by a competent geotechnical/structural engineer with relevant engineering authority, based on the results of an appropriate geotechnical and/or structural investigation.

4.4.4 Width of trenches

The width of trenches shall only be wide enough for installation and compaction. The minimum requirement is pipe diameter plus 150 mm minimum each side (300mm minimum trench width).

4.4.5 Backfilling and compaction

Backfilling and compaction of excavations under tracks shall be carried out in accordance with PTS-MS-10-SG-STD-00000094: *Pit and Conduit Standard for Signalling and Communication Cables*.

The ground surface above and around backfilled excavations is to be graded so as not to restrict the flow of surface water and to prevent ponding.



4.4.6 Disposal of excavated materials

The provisions of Clause 3.8 of AS 4799: *Installation of Underground Utility Services and Pipelines within Railway Boundaries* and EPA guidelines shall be applied to the disposal of excavated material.

4.4.7 Ponding of water in open trenches

At no time shall water be allowed to pond in open trenches. If rain is occurring or forecast, or if active seepage into the open trench is encountered, the trench shall be filled on the same day as the excavation.

4.5 MARKERS

Marker signs shall generally be installed in accordance with the technical requirements and procedures laid down in Clause 3.10 and Sections 4 to 6 of AS 4799: *Installation of Underground Utility Services and Pipelines within Railway Boundaries* and PTS-MS-10-SG-STD-00000094: *Pit and Conduit Standard for Signalling and Communication Cables*.

In addition to above ground markers, plastic warning tape is to be laid in every trench 100 mm above telecommunications cables, to act as a warning during subsequent excavation, fire break grading or access road maintenance.

Tracer Wires (to be detected by electronic detection methods) are to be installed if materials used within under bore or trench is unable to be detected.

5.0 ABOVE GROUND (AERIAL) SERVICES

5.1 TYPES OF SERVICES

Above ground services include aerial lines such as electrical and communication services, free-standing structures carrying pipelines and services attached to bridges.

The services may run along or across the rail corridor.

5.2 PERMITTED INSTALLATIONS – NON-RAIL PARTIES

The installation of new above ground services by non-rail parties including high and low voltage power, telecommunications, water, sewerage and gas are **not permitted**.

Except in extenuating circumstances when underground services installation is not possible an Aerial Services Waiver may be sought from the PTS Chief Engineer.

5.2.1 Aerial Services Waiver Process

In order for a Waiver to be considered, the Non-Rail Party must detail the basis of the request in accordance with the PTS-MS-10-EG-PRC-00000032: *Approval of Technical Standards and Waivers Procedure* including how they are complying with:

- All Statutory and Legislative Requirements
- All Standards, Codes of Practice and Guidelines
- Why an Underground approach is not feasible
- Protective Provisions Related to Electrical Earthing and Bonding (AR-EL-STD-0102)



- Electrical Safe Working Rules for the AMPRN
- Electro Magnetic Compatibility Requirements

Referenced documentation prepared by the Non-Rail Party and attached to the Waiver shall include as a minimum:

- Asset Management Technical data in accordance with PTS-MS-05-AM-PRC-00000091: *Asset Management Technical Data Requirements for Projects* to be provided including as-built information
- Non-Rail Parties proposed upper limiting cost for removal of that service from the corridor and extinguishment of the easement at such time as the PTS Chief Engineer may require.

6.0 DOCUMENTATION

6.1 DESIGN STAGE

Documentation complying with AS 1100: *Technical drawing - Part 401: Engineering survey and engineering survey design drawing* and AS 4799: *Installation of Underground Utility Services and Pipelines within Railway Boundaries* is to be provided by the Applicant as part of the planning and design process.

General requirements include a site survey and scaled plans and cross-sections detailing:

- Proposed location in plan view and rail kilometrage of the crossing, relative to the railway boundary, tracks and other adjacent railway infrastructure;
- Proposed reduced levels of the crossing, relative to the ground, track and other infrastructure;
- Angle of the crossing;
- Details of the proposed type and construction of the crossing;
- Location of proposed valves, pits, masts/poles and other fixtures and fittings;
- Details of markers or other protection devices to be installed;
- Details of other adjacent services as determined from the services search.

6.2 WORK-AS-EXECUTED (AS-BUILT) PLANS

Work-as-executed plans shall be prepared and submitted by the Applicant on the completion of all new service installations and changes to existing services. Any variations to the approved plans must be clearly marked, particularly with respect to any change in location, changes in depth of services below ground or direction of services.

Measurements are to be sufficient to enable the update or replacement of existing relevant PTS plans and the associated CAD files.