

Specification

Outdoor Cable Pit Specification

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1 PURPOSE

The purpose of this specification is to specify the minimum requirements of outdoor cable pits, which are to be installed within the ground or in the vicinity of DC traction substations on the Yarra Trams network.

Where pits are installed within the track environment reference should be made to track construction standard, and associated drawings.

The configuration, ratings and any other project specific equipment details shall be provided by Yarra Trams in the accompanying *Scope of Works* document.

2 SCOPE

The scope of this specification encompasses the design and construction requirements for all new outdoor cable pits within grounds and adjacent to dc traction substation sites. This specification does not apply retrospectively to existing outdoor cable pits on the Yarra Trams network. However, this specification is applicable if an existing outdoor cable pit is being altered, modified or replaced.

This specification applies to any party who is involved in the design or construction of outdoor cable pits for Yarra Trams.

3 COMPLIANCE

Any party who is involved in the design or construction of outdoor cable pits for Yarra Trams shall fully comply with this specification. Deviation from this specification is only permitted when a deviation or waiver has been formally requested and approved by the Engineering Design Authority at Yarra Trams.

The Yarra Trams Engineering Change Management Procedure [CE-021-PR-0020] shall be followed in all circumstances where change is proposed to this specification.

The following definitions apply throughout the specification:

- 'Shall' statements are mandatory in the context of compliance with requirements stipulated in this specification.
- 'Should' statements are considerations in the context of compliance with requirements stipulated in this specification.
- 'Information' statements provide additional content for clarification purposes only and are not requirements in the context of compliance with this specification.
- 'So far as is reasonably practicable' statements must at a minimum result in the provision of a technical risk assessment including proposed list of design controls to demonstrate compliance to this specification.



4 REQUIREMENTS

4.1 Service conditions

4.1.1 Operating conditions

4.1.1.1 The operating conditions are defined in the Infrastructure - Network Power – Substation Design and Construction [CE-021-ST-0023].

4.1.2 Transport and storage conditions

4.1.2.1 The transport and storage conditions are defined in the Infrastructure - Network Power – Substation Design and Construction [CE-021-ST-0023].

4.1.2.2 The *Designer* shall detail the minimum storage requirements.

4.2 General requirements

4.2.1 General

4.2.1.1 HV AC and DC Traction cable pits shall be reinforced prefabricated concrete type, designed in accordance with AS 3600 and AS 5001.2. LV AC and VicTrack cable pits may be of plastic construction, typically P5 or P8 Plastic Pit Range depending on application.

4.2.1.2 The *Designer* shall check the IL and RL levels of the prefabricated pit prior to ordering the pit and is fully responsible for providing suitable ratings. The IL and RL levels shall be provided on the drawings.

4.2.1.3 The *Designer* shall conduct a geotechnical soil investigation and provide a report in accordance to AS 1726.

4.2.1.4 The cable pit shall be founded on suitable material based on the load rating class that will be applied to it. Suitable bedding material shall be used which is based on the allowable bearing results from the geotechnical soil investigation report.

4.2.1.5 HV AC cables, DC Traction cables and LV cables shall not occupy the same cable pit or conduit runs.

4.2.2 Locations

4.2.2.1 A cable pit shall be provided in the following locations including, but not limited to:

- Where a cable joint is required and can not be provided in adjacent pits within the scope of existing cable lengths;
- Where standard available cable lengths require the installation of a cable pit to avoid cable joints within conduits
- Where a hauling access point is required
- At each major transitions or junctions between underground conduit, structure mounted conduit, ground level troughing or trunking, as well as adjacent to each point of entry to the ground or to a building;



- Cable draw pits shall be installed where there is a change of direction of the conduit bank.

4.2.3 Confined space

- 4.2.3.1 So far as is reasonably practicable, pits shall be designed so that they are not considered confined spaces. Where this is not practicable, the cable pit shall comply with AS 2865.
- 4.2.3.2 Step irons shall be provided for pits greater than 1000 mm deep in accordance to VicRoads Standard Drawing - Step Irons (SD 1041, Revision C).

4.2.4 Dimensions

- 4.2.4.1 The dimensions of the cable pit shall:
 - Accommodate the largest cable bending radius; and
 - Allow sufficient access for installation and maintenance of the cables.

4.2.5 Drainage

- 4.2.5.1 Adequate drainage shall be provided to discharge water from the pit. The arrangement shall be coordinated and integrated with the drainage system in the area. Designer shall investigate the water table level and drainage levels across the site in the location of the cable pit.
- 4.2.5.2 Where it is impractical to provide drainage, the pit shall be provided with a sump suitable for the placement of a sump pump. The floor of the cable pit shall be suitably graded towards the sump.
- 4.2.5.3 Cable pits shall be installed to prevent water ingress of ground water seepage. All conduit entry and exit points into pit walls shall provide a watertight seal. All conduit entry points must be suitably concreted to ensure adequate strength of conduit systems during cable haulage

4.2.6 Access covers

- 4.2.6.1 Access covers shall comply with AS 3996.
- 4.2.6.2 In accordance with Table 3.1 of AS 3996, the access covers shall use the following applicable load classifications:
 - Class C (for medium duty applications); or
 - Class D (for heavy duty applications).
 - In consideration of design it must be recognized that Yarra Trams heavy maintenance vehicles for overhead maintenance will often be required to work in close proximity to poles. All pits in close proximity to poles must be class D application,
 - All other pits should be class D application. Lighter grade pits can be used for worker safety only in areas where it can be demonstrated that heavy vehicles cannot access or are unlikely to access.
- 4.2.6.3 The *Designer* shall consult with Yarra Trams when determining the load classification.



- 4.2.6.4 In accordance with Table 4.3 of AS 3996, the access covers in pedestrian areas shall have a slip-resistant surface and shall meet class P4 (wet pendulum test condition).
- 4.2.6.5 In areas subject to pedestrian or vehicular traffic, the following shall apply:
- Access covers shall be flush with the finished surface; and
 - The top of the cable pit walls shall be rebated to prevent inadvertent movement of the access cover.
- 4.2.6.6 In areas not subject to pedestrian or vehicular traffic, the following shall apply:
- The cable pit and access cover shall be above the surrounding ground level to prevent the ingress of water.
- 4.2.6.7 The access cover manufacturer and product item number shall be specified on the drawings.
- 4.2.6.8 Staka type pits are not allowed within substation yards unless the pit walls are fully protected by a concrete surrounding pour (refer to the latest track specification).

4.2.7 Testing

- 4.2.7.1 Access covers shall be tested in accordance with Section 4 of AS 3996.

4.3 Reliability, Availability, Maintainability and Safety (RAMS)

- 4.3.1.1 The RAMS requirements shall be those defined in the Infrastructure - Network Power – Substation Design and Construction [CE-021-ST-0023].

4.4 Documentation

- 4.4.1.1 Submitted documentation shall at least comprise the items outlined in Table 1. This documentation shall be provided for the outdoor cable pit throughout the procedure outlined in EMS Design Acceptance Standard [CE-023-ST-0020].

Table 1: Documentation

Documentation	Step 1: System Design Specifications (SDS)	Step 2: Acceptance Test Criteria	Step 3: Preliminary Design	Step 4: Detailed Design	Step 5: Production	Step 6: Installation/Site Assembly	Project completion
Statement of compliance			✓				
Technical specification			✓				
General layout			✓				



Documentation	Step 1: System Design Specifications (SDS)	Step 2: Acceptance Test Criteria	Step 3: Preliminary Design	Step 4: Detailed Design	Step 5: Production	Step 6: Installation/Site Assembly	Project completion
Detailed drawings of mechanical arrangement, including cable boxes, IL and RL levels,				✓	✓	✓	✓ ¹
Cable pit design calculations in accordance with AS 3600 and AS 5001.2 (see clause 4.2.1.1)				✓	✓	✓	✓
Test reports				✓	✓		
Access cover type test certificate					✓	✓	✓
Geotechnical soil investigation report				✓			
¹ Drawings shall be submitted into PTV's Drawing Management System Compliant library according to the requirements of clause 4.4.1.2. ² Only typical non-project specific documentation required.							

4.4.1.2 The documentation shall be compliant with the requirements defined in the Infrastructure - Network Power – Substation Design and Construction [CE-021-ST-0023].

5 DIAGRAMS AND GUIDANCE

Refer to Infrastructure - Network Power – Substation Design and Construction Standard [CE-021-ST-0023] for further guidance and diagrams.



6 RELATED LEGISLATION & DOCUMENTS

- 6.1.1.1 The design and construction of outdoor cable pits shall be consistent with the best engineering practices and shall comply with all of the referenced documents listed in this section. These referenced documents shall be read in conjunction with this specification.
- 6.1.1.2 All referenced documents shall refer to the most recent published versions of them at the time of invitation to tender.
- 6.1.1.3 Wherever a conflict exists in the requirements of these documents, the order of precedence shall be observed as defined in the Infrastructure - Network Power – Substation Design and Construction [CE-021-ST-0023].

Table 2: Referenced documents

Name	Document number
Yarra Trams	
EMS Design Acceptance Standard	CE-023-ST-0020
Infrastructure - Network Power – Substation Design and Construction	CE-021-ST-0023
Public Transport of Victoria	
PTV Infrastructure Drafting Standards	
Regulations & other legislative documents	
As defined in the Infrastructure - Network Power – Substation Design and Construction [CE-021-ST-0023]	
Industry codes of practice, guidelines, policies, and rules	
As defined in the Infrastructure - Network Power – Substation Design and Construction [CE-021-ST-0023]	
VicRoads Specifications	
Vic Roads Standard Drawing - Step Irons	SD 1041
Australian Standards	
Geotechnical site investigations	AS 1726
Confined spaces	AS 2865
Concrete structures	AS 3600
Access covers and grates	AS 3996
Bridge design - Part 2: Design loads	AS 5100.2



DOCUMENT VERSION CONTROL

Table 3: Document version control

Version History	Date	Detail
1.0	30/07/2021	Original approved issue
1.01	2/09/2021	Minor typing errors corrected
1.08	12/05/2025	Periodic review. No change
1.09	10/03/2026	Periodic review. No change
1.10	30/06/2026	Changed from a Standard to a Specification. Document number changed from CE-019-ST-0046 to CE-019-SP-0046. Logo updated to YJM.

DEFINITIONS & ABBREVIATIONS

Table 4: Glossary - Words

Word	Definition
Designer	The party who is fully responsible for the suitability and compliance of the design of the DC traction substation and all its equipment and subsystems.
Prefabricated	A construction product that is manufactured and constructed using prefabrication. It consists of factory-made components or units that are transported and assembled on-site to form the complete product.
Scope of Works	The Scope of Works is a key document that defines the specific project-related requirements such as the configuration and rating of equipment to be installed. It prevails over all the specifications.

Table 5: Glossary - Abbreviations

Abbreviation	Definition
AC	Alternating Current
DC	Direct Current
EMC	Electromagnetic Compatibility
EMS	Engineering Management System (internal Yarra Trams abbreviation)
FAT	Factory Acceptance Test
HV	“High Voltage” means a nominal voltage exceeding 1000 V AC or exceeding 1500 V DC
IL	Invert Level
LV	“Low Voltage” means nominal voltage exceeding 50 V AC / 120 V DC but not exceeding 1000 V AC / 1500 V DC
PTV	Public Transport of Victoria



Abbreviation	Definition
RAMS	Reliability, Availability, Maintainability and Safety
RMS	Root Mean Square
RL	Relative Level
SCADA	<i>Supervisory Control and Data Acquisition</i>



APPENDIX B – TENDER REQUIREMENTS

Table 6 summarises the information which shall be defined by Yarra Trams in the *Scope of Works* at the time of tender.

Table 6: Summary of information to be defined in the *Scope of Works*

Description	Requirement

Statement of compliance

The *Designer* shall return a statement of compliance to this specification. The Yarra Trams statement of compliance template and deviation procedure for specifications is provided within the Infrastructure - Network Power – Substation Design and Construction [CE-021-ST-0023].

Equipment selection principles

The equipment selection principles are defined in the Infrastructure - Network Power – Substation Design and Construction [CE-021-ST-0023].



APPENDIX C – DESIGN CONSIDERATIONS

The cable pit design should include, but is not limited to, the following considerations:

- Gradient and depth of the duct line;
- Changes in route direction;
- Maximum allowable pulling tension of the cable;
- Minimum bending radii of cables;
- Maximum length of cable on a drum;
- Joints in cable;
- De-rating of cables;
- Protection of all cables in the same pit;
- Construction and maintenance of the cable installation;
- Provision for future cable installations;
- Requirements of the Occupational Health and Safety Act and Regulation;
- Water table levels;
- Drainage arrangements;
- Presence of other services in the vicinity;
- Vehicular and pedestrian traffic at the cable pit location; and
- Proximity to tracks.