



Standard

Security Fences and Gates Standard

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Authorisations

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Review cycle	30 months	

Responsibilities

This document is the responsibility of the Asset Strategy Team, Tasmanian Networks Pty Ltd, ABN 24 167 357 299 (hereafter referred to as "TasNetworks").

Please contact the Asset Strategy Leader with any queries or suggestions.

- Implementation All TasNetworks staff and contractors.
- Compliance All group managers.

Minimum Requirements

The requirements set out in TasNetworks' documents are minimum requirements that must be complied with by all TasNetworks team members, contractors, and other consultants.

The end user is expected to implement any practices which may not be stated but which can be reasonably regarded as good practices relevant to the objective of this document.

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Record of revisions

Section number	Details
Entire doc	Copied over verbatim from superseded Transend (<i>D10/32913 Issue 7.0 May 2013</i>) to TasNetworks template. Updated Transend to TasNetworks document reference numbers where known including Australian Standards.
2	Detail added when weld mesh or chain wire to be used.

Table of contents

Authorisations.....	2
Responsibilities.....	2
Minimum Requirements.....	2
1.....	General 8
1.1.....	Purpose 8
1.2.....	Scope 8
1.3.....	Objective 8
1.4.....	Precedence 8
1.5.....	References 9
1.5.1.....	TasNetworks standards 9
1.5.2.....	Drawing references 9
1.5.3.....	Other standards 9
1.6.....	Definitions 10
2.....	Installation requirements 12
3.....	Design requirements 13
4.....	Adjoining property fences 14
5.....	Construction requirements 14
5.1.....	Pre-construction set-out 14
5.2.....	Excavations 14
5.3.....	Post footings 15
5.3.1.....	Footing materials 15

5.3.2.....	Footing installation	16
5.4.....	Fence plinth	16
5.4.1.....	Plinth materials	16
5.4.2.....	Plinth installation	16
5.5.....	Posts	17
5.5.1.....	Post materials	17
5.5.2.....	Post installation	17
5.6.....	Rails	17
5.6.1.....	Rail materials	17
5.6.2.....	Rail installation	17
5.7.....	Wire	17
5.7.1.....	Wire materials	17
5.7.2.....	Wire installation	18
5.8.....	Chainmesh fence panels	18
5.8.1.....	Chainmesh materials	18
5.8.2.....	Chainmesh installation	18
5.9.....	Weldmesh fence panels	19
5.9.1.....	Weldmesh materials	19
5.9.2.....	Weldmesh installation	19
5.10.....	Pedestrian gates	19
5.10.1.....	Pedestrian gate materials	19
5.10.2.....	Pedestrian gate installation	19

5.11.....	Vehicle gates	19
5.11.1.....	Vehicle gate materials	19
5.11.2.....	Vehicle gate installation	20
5.12.....	Insulated panels	21
5.12.1.....	Insulated fence panel materials	21
5.12.2.....	Insulated fence panel installation	21
5.13.....	Earth break fence panels	21
5.14.....	Bracing	22
5.14.1.....	Bracing materials	22
5.14.2.....	Bracing installation	22
5.15.....	Possum guard	22
5.15.1.....	Possum guard materials	22
5.15.2.....	Possum guard installation	22
5.15.3.....	Insulated panel sections installation	23
5.16.....	Warning signs	23
5.17.....	Galvanised finish and repairs	23
5.18.....	Perimeter fence line conduits and pits	23
5.18.1.....	Conduits and pit materials	23
5.18.2.....	Conduit and pit installation	23
6.....	Earthing	24
6.1.....	Earthing of fence posts	24
6.2.....	Earthing of weldmesh or chainmesh	24

7.....	Internal fenced enclosures	25
7.1.....	Internal fence possum guard	25
7.2.....	Internal fence warning signs	25
7.3.....	Clearance of fence from equipment	25
8.....	Security of substations	26
9.....	Safety clearances	26
10.....	Hold points	26

1 General

1.1 Purpose

To define the requirements for security fences and gates for transmission substations, switching and transition stations under the responsibility of Tasmanian Networks Pty Ltd (hereafter referred to as 'TasNetworks'). Substations, switching and transition stations are referred to as 'substations' for the remainder of this document.

1.2 Scope

This standard applies to all security fences and gates under the responsibility of TasNetworks.

This standard contains requirements for design, supply, transportation, delivery to site, construction and installation with complete documentation of security fences and gates and is to be applied to new installations as well as redevelopment of part or all of an existing installation.

1.3 Objective

TasNetworks requires that design, construction and installation of security fences and gates as covered in this standard are to ensure:

- (a) that relevant Australian legal requirements are met;
- (b) that the requirements of the Tasmanian Electricity Code and National Electricity Rules are met;
- (c) personnel and public safety and environmental hazards are identified, analysed and eliminated or control measures adopted;
- (d) risk to TasNetworks' assets is minimised;
- (e) ease of operation and maintenance, including access and egress;
- (f) reliability of the electricity transmission system;
- (g) minimum disruption to the electricity transmission system following a fault;
- (h) that the requirements of TasNetworks' business plan are met;
- (i) that the exposure of TasNetworks' business to loss is minimised; and
- (j) that TasNetworks' responsibilities under connection agreements are met.

1.1 Precedence

Any apparent conflict between the requirements of this standard and the law, mandatory requirements, industry standards, project specifications, non-statutory standards or guidelines, and any other associated documents should be brought to the immediate attention of TasNetworks for resolution and no action must be taken that might result in a breach of law or mandatory standard.

Where there may be a conflict between the requirements of this standard and any:

- (a) law, mandatory requirement or industry standard, then that law or statutory requirements will prevail over this standard;
- (b) non-mandatory standard, or guideline, then this standard will prevail over that standard or guideline; and
- (c) project specification, then the contract documentation will prevail over this standard.

Approval for a deviation to this standard may only be accorded if it does not reduce the quality of workmanship, pose a safety risk to person or equipment and does not deviate from the intent of this standard. Deviations if any must be specifically requested, and approved in writing by TasNetworks' Leader Asset Strategy and Performance.

1.1 References

As a component of the complete specification for a security fence and gate system, this standard is to read in conjunction with other relevant standards as applicable. Unless otherwise specified in the project specification, the equipment shall be in accordance with the latest edition and amendments of the standards listed below. The following documents, without reservation, contain provisions that, through reference in the text, constitute the requirements of this standard:

1.1.1 TasNetworks standards

Security Fences and Gates Condition Audit form (D05/27313)	TNM-CA-806-0171-001
Substation Civil Design and Construction Standard	R590634
General Substation Requirements Standard	R522687
Excavation work Standard (ex. D11/12740)	R192947
Excavation Procedure	R793081
Security Fences and Gates Quality Control form (D01/7223)	TNM-DS-806-0838-004
Substation Lightning Protection and Earthing Standard	R522692
Certificate of Conformance Proforma (D05/4398)	TNM-GS-809-0101-005
Substation Signage Standard	R527891
Substation Intruder Detection and Deterrence Standard	R579295

1.1.2 Drawing references

Standard Switchyard Earthing & Connections, Assembly and Details	TSD-SD-809-0002-001
Standard Switchyard Earthing of Fences & Gates, Assembly and Details	TSD-SD-809-0002-002
Standard security fences title and index sheet	TSD-SD-809-0003-000

1.1.3 Other standards

Structural steel hollow sections	AS/NZS 1163
Specification and supply of concrete	AS 1379
Chain-link fabric security fencing and gates	AS 1725
Switchgear assemblies and ancillary equipment for alternating voltages above 1 kV	AS 2067
Coated steel wire fencing products for terrestrial, aquatic and general use	AS 2423
Access covers and grates	AS 3996
Zinc and zinc/aluminium-alloy coatings on steel wire	AS/NZS 4534
Hot-dip galvanized (zinc) coatings on fabricated ferrous articles	AS/NZS 4680
Hot-dip galvanized (zinc) coatings on ferrous hollow sections, applied by a continuous or a specialized process	AS/NZS 4792

1.2 Definitions

In addition to terms and definitions detailed in AS 1725 the following specific definitions apply to this standard:

AC	Alternating current.
BCA	Building Code of Australia.
Back stay	A diagonal tubular galvanised steel member supporting a post laterally and set into the ground.
Barbed wire	The twisted longitudinal wires to which are attached four-point barbs and normally installed at the top of the fence line.
Bracing cable	The wire and turnbuckle used in braced panel or strainer assemblies as a tension member.
Braced panel	Two adjacent vertical posts in a chainmesh or weldmesh fence with one horizontal connecting bracing rail and two diagonal bracing cables.
Bracing rail	The horizontal galvanised tubular steel compression member installed between posts in a bracing panel.
Bracing post	A diagonal tubular galvanised steel member fixed to end posts, strainer posts, intermediate posts, corner posts or gateposts, installed in the line of the fence and set into the ground.
Chainmesh	A wound and interwoven galvanised wire 50 mm mesh comprising 3.15 mm diameter wire, with a twisted and barbed top selvedge and knuckled bottom selvedge, used to infill fence panels.
Construction hold point	A point in the construction of the substation security fence where inspection and approval of the site works completed is required by TasNetworks before further construction works proceed on site.
Corner fence post	A fence post positioned at the corners and changes of direction in the alignment of a fence.
Crank	The top section of the fence post that is angled from the vertical.
DC	Direct current.
Earth break fence panel	A non-conductive section of fencing used to isolate the earth grid and substation fence from an adjoining property fence line.
EGL	The external ground level, normally outside the substation security fence, prior to installation works.
End fence post	The fence post at the end of a line of fencing.
Extra high voltage (EHV)	Voltages normally associated with the transmission of electricity nominally within the range of 88 kV to 220 kV. This includes transmission line voltages, substation switching voltages and voltages on the line side of supply transformers within TasNetworks substations.
Extra low voltages (ELV)	Voltages normally associated with the control of electricity at other levels, normally not exceeding 50 V ac or 120 V dc (ripple free).
Fence panel	A section of fence between two adjacent vertical posts.
Fence post	

	An upright tubular galvanised steel or treated pine member for supporting fencing materials.
Gate fence post	Two fence posts forming a gateway in a fence line.
Helicoil wire	Specially formed wire positioned at the top, middle and bottom of the fence, used to limit the movement of the chain wire.
High voltage (HV)	Voltages normally associated with the distribution of electricity, normally within the range of 1 kV to below 88 kV. This includes voltages on the load side of supply transformers, distribution switching voltages and distribution line voltages.
Hinged vehicular gate	A round tubular galvanised steel frame covered with weldmesh or chainmesh, hinged on a gate post or posts and used to close a vehicular gateway and normally rectangular in shape.
Insulated fence panel	A section of substation fence constructed from non-conductive materials, usually timber.
Intermediate fence posts	Fence posts positioned at a regular spacing between corner and/or end posts to provide support for fencing materials.
ID	The inside diameter of the cross section of steel tubing.
Lacing and tie wires	The wire that is used to lace and or tie chainwire or other fencing materials to supporting Helicoils, fence posts and gate frames.
Low Voltage (LV)	Voltages normally associated with the control or consumption of electricity, normally within the range of 50 V ac to 1 kV ac or 120 V dc to 1500 V dc.
OD	The outside diameter of the cross section of steel tubing.
Pedestrian gate	A tubular galvanised steel frame covered with chainmesh or weldmesh, hinged on a gatepost and used to close a pedestrian gateway, normally rectangular in shape.
Pipe strap	A stainless steel strap requiring a proprietary hand operated tool to fix into position and secure the strap.
Plinth	A concrete foundation section cast in-situ at the base of the fence.
Possum guard	'Colorbond' sheeting attached to the top of weldmesh or chainmesh fence panels on the outside to prevent possums from climbing the fence fabric. Covers SS fixing straps.
Post extensions	An extension of the fence post above the normal height of chainwire or weldmesh that may be angled or vertical in alignment and to which barbed wire may be attached.
PPR	Principal's Project Requirements document (refer comment in Section 3).
RHS	Rectangular hollow section of steel tubing.
Selvedge	Top and bottom edges of the chainmesh.
SGL	The switchyard ground level, normally inside the substation security fence, prior to installation works. Synonymous with Sw/Yard Level.
SHS	Square hollow section of steel tubing.
Sliding vehicular gate	A rectangular RHS galvanised steel frame, in-filled with galvanised vertical SHS members, sliding on a track between gateposts and used to close a vehicular gateway.

Strainer assembly	A strainer post with bracing helicoil and turnbuckle or bracing stays, or alternatively a braced panel with crossed diagonal bracing cables and turnbuckle.
Strainer fence posts	Fence posts positioned at significant variations in ground levels and at intervals when specified with either bracing stays or bracing cables to enable required tension of support helicoils and chainwire to be obtained.
Weldmesh panel	A sheet of mesh constructed from welded and galvanised vertical and horizontal lengths of wire, normally in sheet sizes of 2500 mm high by 2400 mm long, eg 'Smorgon WG 312 general purpose', or of equivalent quality.

2 Installation requirements

This standard details two types of fence fabric:

1. Weldmesh.
2. Chainmesh.

And two types of gates:

1. Hinged.
2. Sliding.

The selection of the fence fabric and gate type is dependent on the vulnerability assessment for the site. TasNetworks will undertake the vulnerability assessment and detail the type of fence fabric and gates required within the project specifications to meet the level of security required for the site. Typically weldmesh will be used for security fencing on the external boundary of substations and chain mesh within a substation to provide separation protection, eg. around a capacitor bank installation. Alternative fence fabric, such as block masonry with a barbed wire cranked section or pre-fabricated concrete panels, may be utilised if deemed necessary and detailed in the project specifications.

All materials, fittings and/or work must be supplied and installed in accordance with the maker's instructions to provide an effective and functional security fence and gate.

In performing the works, the Contractor is responsible for the following and any other activities required to achieve the project goals and requirements:

- (a) dismantling of existing fence and gates if applicable;
- (b) detailed design and documentation;
- (c) setting out;
- (d) procurement;
- (e) transportation;
- (f) delivery to site;
- (g) unloading at site;
- (h) storage and handling at site;
- (i) removal and disposal of spoil and waste;
- (j) construction;
- (k) installation;
- (l) on-site testing;
- (m) reinstatement;

- (n) site clean-up and final handover of works;
- (o) certification;
- (p) accessories; and
- (q) consumables.

3 Design requirements

- (a) The Contractor must arrange for a site survey to include the property boundary, existing perimeter fence and the location of the new fence and gate.
- (b) A new fence plan drawing must be prepared in accordance with this standard and the project specifications and submitted to TasNetworks for approval. The fence plan drawing must include notes addressing construction detail, sequence of work, risk management and the location of all adjoining buildings and property fences.
- (c) A security fence and gate is normally located with a minimum 'external' horizontal clearance zone of three metres from the property boundary, together with a minimum 'internal' horizontal clearance zone of six metres from EHV or HV equipment and a minimum three metre 'internal' clearance from other infrastructure. All operational buildings are to be internal to the security fence.
- (d) Minimum electrical safety clearance from overhead EHV or HV conductors must be maintained as per AS 2067.
- (e) The location of any adjacent underground and overhead electrical infrastructure must be marked on the fence plan drawing.
- (f) All new substation security fence and gates must be designed for a minimum service life of 50 years.
- (g) All ferrous materials must be hot dipped galvanised to comply with the relevant standards as per Section 1.5 - References.
- (h) The new substation fence must be a minimum of 3250 mm high from the outside EGL to the top run of the barbed wire constituting the fence.
- (i) The fence must be constructed of either weldmesh or chainmesh panels or other approved material as specified in the PPR.
- (j) Where the type of fence fabric is not specified, then galvanised weldmesh shall be installed for the entire section of the new fence.
- (k) A concrete plinth must be provided at the base of the substation security fence and any internal security fence. All concrete plinths must follow the existing substation yard level, removing excessive rise and fall in the ground levels outside the substation.
- (l) Each vehicle gate must be constructed of:
 - (i) a single sliding gate, with a sliding gate runway on a concrete foundation; automated, or arranged for future automation; or
 - (ii) two hinged gates, with a concrete foundation between supporting gate posts.
- (m) Where the type of vehicle gate is not specified in the PPR, then a sliding gate must be provided.
- (n) New substation or switchyard perimeter fence sections must be constructed outside the existing perimeter fence, with the new fence centre line within 200 mm of the existing fence centre line, unless otherwise detailed in the project specifications.
- (o) The contractor must mark concrete laid over new and existing buried services to indicate the location of the service.

4 Adjoining property fences

Should an adjoining metallic property fence be connected to the substation perimeter fence, and the initial section of the adjoining property fence is not insulated as specified in drawing TSD-SD-809-0003-001 then the first 4800 mm of the adjoining property fence must be replaced with earth break fence panels, including barbed wire topping (refer Section 5.13). The contractor must obtain consent from the property owner/s of the adjoining fence/s prior to work commencing. In this case the earth break panel must have palings and possum guard on both sides of the fence. A perimeter concrete plinth is not required for this type of earth break panel.

5 Construction requirements

5.1 Pre-construction set-out

- (a) After being granted possession of each substation site by TasNetworks, and prior to commencing site works, the Contractor must survey and 'mark out' the proposed fencing construction in accordance with the fence plan drawing.
- (b) The Contractor must 'mark-out' the location of underground infrastructure near the old and new fence line, including all underground EHV or HV cables, or LV control cables, earth grid grading ring, water supply and drainage systems.
- (c) The 'mark-out' must also include the location of all:
 - (i) new fence posts,
 - (ii) new gate posts,
 - (iii) bracing sections,
 - (iv) plinths,
 - (v) raised plinth sections,
 - (vi) fence foundations,
 - (vii) sliding gate foundations,
 - (viii) warning sign locations; and
 - (ix) other site specific construction details.
- (d) The fence plan drawing must be updated to include any modified construction detail resulting from the pre-construction set-out.
- (e) Existing concrete kerbing may be used to form the inside of the new plinth.

5.1 Excavations

- (a) All excavations are to be performed in conjunction with TasNetworks Excavation work Standard D09/114713.
- (b) Waste spoil from excavations must be removed from site unless permission to retain on site is granted by TasNetworks; permission is to be requested in writing prior to starting excavation.
- (c) Post holes, plinths and foundations must be excavated with vertical sides and a firm base, as specified in Standard Security Fence drawing series TSD-SD-809-0003-000.
- (d) All excavated, filled or disturbed ground surfaces must be remediated to match the surrounding surfaces.

5.1 Post footings

5.1.1 Footing materials

The concrete used for footings and gate foundations must comply with AS 1379, Grade N25.

5.1.2 Footing installation

All concrete finishes must comply with the following:

- (a) Footing – mass concrete placed around post; where a plinth is not installed, finish with a weathered top falling 25 mm from the post to SGL.
- (b) Plinth – finish with a weathered top falling 25 mm to the outside of the substation.
- (c) Sliding vehicle gate foundation – finish level with the existing roadway level along the length of the sliding gate foundation.
- (d) Pedestrian gate foundation – finish level with the SGL along the length of the pedestrian gate plinth.
- (e) All concrete must be vibrated to remove voids.

5.1 Fence plinth

- (a) Two Y12 reinforcing bars must be installed in each 7200 mm section of plinth.
- (b) Each bar must be continuous.
- (c) Install the reinforcing bars centrally within the plinth ensuring a minimum concrete cover of 75 mm.
- (d) Weld the reinforcing bars to each fence post, with one bar on the inside of the fence posts and one bar on the outside of the fence posts, for each section of plinth.
- (e) Where a pedestrian gate is installed in the fence line, the reinforcing bars must run through the gateway plinth.

5.1.1 Plinth materials

The concrete used for fence plinths must comply with AS 1379, Grade N25.

5.1.2 Plinth installation

- (a) A concrete plinth must be supplied and installed in situ under all:
 - (i) chainmesh or weldmesh perimeter fence sections,
 - (ii) back stays,
 - (iii) bracing posts and
 - (iv) insulated panels fence sections.
- (b) Concrete plinths must be supplied and installed from the fence plinth to each existing and proposed fence bracing post. Plinth width and height above SGL to be equal to fence plinth.
- (c) Plinth expansion and control joints must be installed centrally between posts at centres not exceeding 7200 mm. This allows for the installation of three fence posts to each section of plinth bordered by expansion and control joints.
- (d) Where a plinth is stepped, the concrete plinth should be stepped on the uphill side of the post as specified in drawings TSD-SD-809-0003-000.
- (e) To provide for future installation of electric security fence posts the following must be applied for each change in plinth direction:
 - (i) 600 mm each side of a change in direction of the inside face of the plinth must be plumb and smooth.
 - (ii) Cable pits must not be located within 600 mm of each change in direction.

- (f) Conduits must be installed in plinths.
- (g) Where the plinth finishes above EGL, install 20 mm PVC pipe as ground water weep holes, at 1000 mm centres along the length of the raised section to vent level with the EGL. The inside of the weep holes to be covered with 25 mm blue metal aggregate.

5.1 Posts

5.1.1 Post materials

Post materials are specified in Standard Security Fence drawing series TSD-SD-809-0003-000.

- (a) Holes must be pre-drilled in the cranked section of the fence post prior to galvanising for the installation of the barbed wire.
- (b) With the exception of the welded gate frame, all joints between posts and rails must be galvanised fence and gate fittings.

5.1.1 Post installation

- (a) Posts must be installed vertically at heights that follow the contour of the SGL.
- (b) All vehicle gateposts must be one piece, not cranked and extend to the same height as the gate barbed wire section.
- (c) The post crank forming part of the posts, for supporting the eight strands of barbed wire, must extend outwards from the substation fence line.
- (d) The length of corner posts cranked section must be increased as appropriate to ensure the horizontal outreach matches the intermediate posts.

5.1 Rails

5.1.1 Rail materials

Rail materials are specified in Standard Security Fence drawing series TSD-SD-809-0003-000.

5.1.2 Rail installation

- (a) All joints between fence posts or gateposts and rails must be galvanised fence and gate fittings.
- (b) Top, middle and bottom rails must be installed for a weldmesh fence panel.
- (c) Top and bottom rails must be installed for a chainmesh fence panel. The centre of the bottom rail for chainmesh fences must be installed one full diamond from the bottom-knuckled selvedge.
- (d) Bolts used to fasten joints between posts and rails must be installed with the tamper proof mushroom head bolt on the outside of the substation fence.

5.1 Wire

5.1.1 Wire materials

Wire materials are specified in Standard Security Fence drawing series TSD-SD-809-0003-000.

5.1.2 Wire installation

- (a) Helicoil Wire for Chainmesh Fencing
 - (i) Helicoil wire must be installed on the outside face of the fence posts. Position the top run of helicoil wire one half diamond from the top barbed selvedge. Position the bottom and middle run of helicoil wire.
 - (ii) Each strand of helicoil wire must be wrapped twice around corner, gate or end posts, finally secured back upon itself with at least four turns and laced with tie wire.
 - (iii) All helicoil wire runs must be tensioned to have maximum sag of 10 mm between all fence posts.
- (b) Lacing and Tie Wire
 - (i) With the exception of the tie wire for the barbed wire all twisted ends of the tie wire must be on the inside of the substation fence.
 - (ii) Must be two strands of tie wire doubled around the member being tied, the ends twisted and neatly cut off. This applies to all tie and lacing requirements except the fixing of the chainmesh to the helicoil wire where only one turn is required.
 - (iii) When tying or lacing chainmesh to corner, gate or end posts, use lengths of tie wire no longer than 1000 mm.
- (c) Barbed Wire
 - (i) Must be secured to the outside face of the cranked section of the fence post using two strands of tie wire threaded through a hole in the crank and around the post, twisted and neatly cut off.
 - (ii) Must be tensioned to have maximum sag of 10 mm between all fence posts with all joins in the barbed wire being made at fence posts.
 - (iii) Must be secured in a manner that prohibits axial movement of the wire on the fence post or gate frame member.
 - (iv) Where the barbed wire section of a cranked post is adjacent to another structure, a barbed wire in-fill must be provided to secure the gap.
 - (v) Must be spaced as specified in Standard Security Fence drawing series TSD-SD-809-0003-000.

5.1 Chainmesh fence panels

5.1.1 Chainmesh materials

Refer to definition for chainmesh. The minimum height of the chainmesh must be 2500 mm.

5.1.2 Chainmesh installation

- (a) The chainmesh must be installed on the outside of the fence posts against the supporting helicoil wires and tensioned to have maximum sag of 10 mm between all fence posts.
- (b) The chainmesh must be tied off to the bottom fence rail and supporting helicoil wires on the inside of the substation using tie wire.
- (c) The chainmesh must be tied off to all fence posts in equally spaced positions.
- (d) The chainmesh must be laced to all corner, end and gate posts from top to bottom of each fence panel.
- (e) The gap between any part of the chainmesh fence and the concrete plinth must not exceed 25 mm.

5.1 Weldmesh fence panels

5.1.1 Weldmesh materials

Refer to definitions for weldmesh panels. All ferrous materials must be hot dipped galvanised to comply with the relevant standard.

5.1.2 Weldmesh installation

- (a) Weldmesh must be installed on the outside of the fence posts and supporting fence rails.
- (b) The vertical wire of the weldmesh must be on the outside of the fence to reduce the ability to obtain a foothold on the external side of the fence.

5.1 Pedestrian gates

Refer to Standard Security Fence drawing series TSD-SD-809-0003-000 for assembly details.

5.1.1 Pedestrian gate materials

- (a) All pedestrian gate frames must be supplied complete with two hinges that resist lifting when the gate is in the closed position.
- (b) Hinges may be used for self-closing if sufficient.
- (c) They must also be supplied complete with TasNetworks keyed single cylinder deadlatch. Lockwood 002-3K1SCMK is approved by TasNetworks for this application.

5.1.1 Pedestrian gate installation

- (a) The small fence panel above the gate must be filled with chainmesh or weldmesh that matches the adjacent fence panels.
- (b) Pedestrian gates must only open 'inwards' into the substation and be self-closing.
- (c) The locking mechanism must be mounted on a galvanised mild steel plate that extends across the gate post so as to provide a mechanical means of preventing movement of the gate outwards and removes the ability to force the lock open from the outside.
- (d) The concrete plinth must continue under all pedestrian gates.

5.1 Vehicle gates

5.1.1 Vehicle gate materials

- (a) Hinged vehicle gates must:
 - (i) match the height of the adjacent fence line;
 - (ii) be fitted with barbed extensions that match height of the adjacent fence line;
 - (iii) comprise two leaf gates;
 - (iv) be fitted with hinges that resist lifting or jacking when in the closed position;
 - (v) have the gate foundation fitted with a ground mounted 25 mm diameter x 150 mm long galvanised steel tube gatekeeper for both leaf gates for both open and closed positions;

- (vi) have a gatekeeper positioned 10 mm in height clear of the surrounding concrete;
 - (vii) be supplied complete with a deadlock for locking;
 - (viii) be supplied with a 16 mm diameter galvanised steel drop-bolt, suitable for padlocking, fitted on the inside of both leaf gates to hold the gates in both open and closed positions;
 - (ix) have a designated earthing palm welded to the lower portion of each gate adjacent to the gate frame earthing palm; and
 - (x) be in-filled with weldmesh that complies with the fencing weldmesh profile. The weldmesh must be secured to a top, middle and bottom horizontal gate rail.
- (b) Sliding vehicle gates must:
- (i) include a track of Omega profile suitable for sliding gate wheels;
 - (ii) no horizontal members that create potential climbing points, other than the top and bottom rails, are to be fabricated into the sliding gate;
 - (iii) be provided with a procedure to follow in the event of a gate malfunction, such as a jam. Procedure to be displayed on outside of motor enclosure, facing inside of substation;
 - (iv) be fitted with opening and closing back block cushions;
 - (v) all welding will be completed with a MIG welding machine; and
 - (vi) steel surface finish is to be Hot Dip Galvanising.
- (c) Electric sliding vehicle gates must include: (The following are all approved for use by TasNetworks Networks.)
- (i) high speed gate slider, Model – Liftmaster LPK5;
 - (ii) magnetic gate lock, Model - ML12G;
 - (iii) key switches for exit and entry. Model - C4 with momentary contact spring return (low voltage); and
 - (iv) preventing inadvertent closing by means of electronic eye.
- (d) Concrete vehicle gate foundations must have a vehicle loading capacity of 80 tonnes and be installed under all vehicle access gates, including the gateposts.
- (i) The foundation must run the full length of the hinged gate opening or sliding gate runway. Y20 structural steel complete with supporting frames must be supplied and installed as detailed in Section 5.4.2.
 - (ii) Where the finished height of the foundation or sill is above the existing roadway level, taper the concrete to form ramps on both sides.

5.1.1 Vehicle gate installation

- (a) Hinged vehicle gates must only open 'inwards' into the substation. Mechanical interlocks must be installed on the gate hinge or across the gate opening to restrict movement of the gates outwards.
- (b) The opening width between supporting gateposts of vehicle gates must be as specified in the Standard Security Fence drawing series TSD-SD-809-0003-000 unless detailed otherwise in the PPR.
- (c) When in the closed position, the gap between the top of the concrete gate foundation and the bottom of the hinged gate frames must not exceed 25 mm. When in the closed position, the gap between the two gates must not exceed 25 mm.
- (d) The gap between the top of the sliding gate runway and the bottom of the sliding gate frame when in the closed position must not exceed 25 mm. This may require the track wheels being set into the gate

frame to comply with the maximum clearances. The gap between the sliding gateposts and the gate frame when in the closed position must not exceed 25 mm.

- (e) Loose gravel is to be reduced on the approach to a sliding gate by forming hardstand hot-mix bitumen or concrete apron areas at least 5000 mm either side of the gate across the width of the existing roadway.
- (f) Sliding gates are to be automated, or arranged for future automation, complete with conduits and a cable pit. Automated sliding gates must have external and internal key switches mounted as required by the project specifications. Motor drives must be installed in weatherproof enclosures and is to incorporate a 240VAC weatherproof GPO inside each automatic gate motor enclosure to be supplied from 415 VAC substation distribution board.

5.1 Insulated panels

5.1.1 Insulated fence panel materials

- (a) Insulated fence panels must be composed entirely of non-conductive materials, except for minor fastenings such as screws or bolts that do not provide an earth fault potential or current path.
- (b) Insulated fence panel sections must be constructed in accordance with Security Fence drawing series TSD-SD-809-0003-000.

5.1.1 Insulated fence panel installation

Insulated fence panels are used where required to isolate from the security fence metallic items, located either inside or outside the substation.

- (a) Fence palings must be installed on the outside of the fence rails, minimising the gap between palings.
- (b) 'Screw-in' type fasteners for affixing the palings must be of a type not easily removed, and must be inserted at least two-thirds depth into the railing.
- (c) Nails may be used in conjunction with screw fasteners but each fence paling must be secured with at least one screw fastener to each rail.
- (d) All fastenings must be corrosion resistant and not stand proud of the paling surface.
- (e) The barbed wire extension mounted on the treated pine posts must be cranked outwards.
- (f) The perimeter concrete plinth must extend beneath the insulated panel section.
- (g) The Y12 reinforcing bar installed within the plinth must not be physically bonded or have contact with any steel support post within the plinth.

5.1 Earth break fence panels

Earth break panels are used where it is necessary to isolate an earthed security fence from unearthed metallic fences. They provide an isolating section between the metallic security fence and an external fence. For the latter case palings and possum guards should be fitted to both sides of the panel to ensure it does not create an entry point into the substation.

- (a) The minimum length of the panels must be 4800 mm.
- (b) Climbing points are to be removed from where the earth break fence panel abuts an adjoining property fence, eg wooden stock fence posts not to be located within 2000 mm of the earth break fence panels.

5.1 Bracing

5.1.1 Bracing materials

- (a) Corner posts, end posts, mid-fence line braces and gateposts must be braced in the line of the fence with either horizontal galvanised tubes or diagonal bracing wires, or diagonal stays clamped to the posts and buried into concrete footings.
- (b) Bracing stays, at 60 degrees, must be a minimum of 3500 mm long.

5.1.1 Bracing installation

- (a) Additional fence bracing posts must be provided at least at every third post, with the placement determined by counting from each corner post of every fence line section. No more than three consecutive fence panels are to be without a bracing post.
- (b) A brace must be provided for every post that is flange mounted.
- (c) The location of fence post braces are not to interfere with the safe operation of sliding gates.
- (d) Where room does not allow for a bracing stay at 65 NB post can be installed.
- (e) A concrete plinth must be installed around bracing stay to 100 mm above SGL.

5.1 Possum guard

All substation fences, earth break fence panels and vehicle and pedestrian gates must have possum guard fitted.

5.1.1 Possum guard materials

Possum guard sheeting for chainmesh and weldmesh sections of fencing must be installed as specified in the Standard Security Fence drawing series TSD-SD-809-0003-000

- (a) Possum guard sheeting for insulated and earth break timber fence panels must be:
 - (i) Polycarbonate, corrugated, ultraviolet (UV) compatible material;
 - (ii) 400 mm high with a gauge of 3.5 mm; and
 - (iii) 'Rivergum Green' in colour for the external face.

5.1.1 Possum guard installation

- (a) The possum guard must be installed on the outside of the fence with the top of the sheeting either level with the top run of chain wire on chainmesh fence panels, or level with the top of the weldmesh on weldmesh fence panels.
- (b) The 'Rivergum Green' side must face outwards from the substation.
- (c) Where the fence panels are stepped then the top edge of the possum guard must be positioned such that it nominally follows the contour of the ground and aligns with only the high points of the fence panels.
- (d) No part of the panel should be exposed above the possum guard.
- (e) Fixing points for the possum guard to fence panels must be at least every 600 mm using 25 mm x M6 galvanised gutter bolts complete with M6 galvanised mudguard washer, M6 Nylock nut and two 100 mm long x 40 mm wide x 3 mm gauge back plates.

- (f) One fixing point for possum guard must be at least 400 mm either side of each fence post.
- (g) The back plate is to be fitted top and bottom of the possum guard and on the inside of the fence.
- (h) The possum guard must be positioned to fully cover the SS fixing straps to the top or bottom rail.
- (i) Where the possum guard is not a continuous run or where the possum guard stops at corner posts, gate posts and gate edges, the end of the possum guard must be laced with galvanised tie wire.
- (j) Possum guard must not be fixed to fence posts and all section joins must overlap by at least 50 mm.

5.1.1 Insulated panel sections installation

Install the top of the polycarbonate sheeting on an insulated fence panel or earth break fence panel level with the top of the fence palings, using flat head non-corrosive screws to secure the PVC sheeting to the treated pine palings at least every 600 mm.

5.2 Warning signs

Warning sign materials and installation procedures are detailed in standard R527891. The warning signs must be used for new security fence installations, unless detailed otherwise in the project specifications. The Contractor must ensure the installation of the warning signs occurs concurrently with the fence installation.

5.3 Galvanised finish and repairs

- (a) Galvanised finishes must be repaired in accordance with the manufacturer's instructions.
- (b) Galmet cold galvanising paint and Galmet Duragal silver paint must be used unless prior approval in writing is obtained from TasNetworks to vary the repair method.
- (c) Spray can paints must not be used for repairs to galvanised surfaces.

5.1 Perimeter fence line conduits and pits

For future security cabling, conduits must be installed in the plinth along the perimeter fence line and associated cable pits must be installed within the substation.

5.1.1 Conduits and pit materials

- (a) All electrical conduits must satisfy AS/NZS 2053.2.
- (b) Electrical conduits must be three off, 32 mm, heavy duty type, complete with draw wires. The draw wire may comprise suitable 5 mm diameter poly cord conduit draw wire.
- (c) Electrical conduits must be of heavy duty type where the conduits enter the switchyard.
- (d) Sweep bends must only be used for any change of direction.
- (e) Cable pits standard must be to AS 3996 Type A complete with polycrcrete lid marked 'Electrical Services' or similar.

5.1.1 Conduit and pit installation

- (a) Install three conduits at the bottom portion of the plinth concrete.
- (b) Where the fence line length exceeds 40 metres or 10 lengths of conduit, bring the conduits out into the switchyard and terminate into cable pits.

- (c) The cable pits must be installed at a minimum distance of 200 mm from the plinth to a finish level with SGL, min 50 mm concrete cover.
- (d) The cable pits are to be installed adjacent all vehicle sliding gates to align with conduits.
- (e) Cable pits are not to be installed between a sliding gate in the open position and the adjacent fence.

6 Earthing

For relevant details refer to the Substation Lightning Protection and Earthing Standard R522692 and drawings TSD-SD-809-0002-001 and TSD-SD-809-0002-002.

6.1 Earthing of fence posts

- (a) Connect corner posts, gateposts and every sixth intermediate fence post, approximately every 15 metres, to the earth grid grading ring.
- (b) Looping of earthing conductor is not permitted.
- (c) Supply and install a galvanised steel earth palm welded to corner posts, gateposts and every sixth intermediate fence post along a run of perimeter fencing.
- (d) All nuts, bolts and washers must be galvanised.
- (e) Apply two brushed coats of Galmet cold galvanising paint to the fence post termination point after connection ensuring a complete painted cover of the earth palm, the cable crimp lug and connection bolt.
- (f) Connect the fence post earthing cable to the earth grid grading ring as per detail on Drawing TSD-SD-809-0002-001.
- (g) Supply the fence posts to site with the earth palm already mounted in position.

6.1 Earthing of weldmesh or chainmesh

Earthing of weldmesh fence panels must be as per Drawing TSD-SD-809-0002-001.

- (a) For chainmesh, re-connect all existing fence line earth grid tails to the chainmesh using 70 mm² insulated copper cable fitted with one high compression crimp lug for connections to the chainmesh plates. Where required, use one high compression crimp link for connections to the existing earth grid grading ring tail.
- (b) Existing and new connection points to the chainmesh fence must comply with the following:
 - (i) All nuts, bolts and washers must be stainless steel G316. Install the bolts with the head facing the outside of the fence line.
 - (ii) Terminate the earth grid grading ring tail via the compression lug onto one of the stainless steel bolts. Nuts and bolts should be of different grades to prevent binding. (Bolts '304/A2 70' and nuts 316/A4 70). The earth grid conductor must be brought up on the inside of the fence line; the termination point must be inside the substation fence line.
 - (iii) Electrolytic corrosion must be prevented from occurring between bare copper conductors and metal structures, use only tinned copper where contact between copper earthing cables or busbar and steel structures may occur.
 - (iv) The earth connection point must be free of corrosion; oxidisation or paint before and after the earth connection is made.

- (c) Where the new fence line intersects the existing earth grid, connect the earth grid to the fence line in the manner stated above. The contractor must install earth termination points as specified where no existing earth grid connection is apparent. This can be referenced from the Earth grid drawing in the appropriate site-specific schedules.
- (d) Gates must be connected to the substation earth grid grading ring using insulated flexible copper cables. Use 70 mm² insulated flexible copper cable fitted with a high compression crimp lug to both ends. Terminate the cable lug to both the adjacent gate post-earth palm and the designated earthing palm welded to the lower portion of the gate adjacent to the gate frame.
- (e) A cable with a minimum length of 300 mm is an approved method for earthing pedestrian gates.
- (f) A cable with a minimum length of 500 mm is an approved method for earthing hinged vehicular gates.
- (g) A 95 mm² insulated cable with a minimum length of 12 m attached at multiple points to a catenary wire runner is an approved method for earthing sliding vehicular gates.
- (h) Care must be exercised when excavating the concrete plinth and the post footings to ensure no earth grid or earth grid grading ring conductors are severed.
- (i) The contractor must undertake immediate temporary repairs, such as bridging, to any damage inflicted to the earth grid. This includes repairing broken individual strands of earth conductor, physical damage to the earth conductor from excavator damage and physically severing the earth conductor.
- (j) The Contractor must also document and record the nature of the earth grid damage and repair utilising photographs.
- (k) All electrical and earthing termination works on site must be in accordance with AS 3000 and AS 2067 and undertaken and completed by an electrical contractor currently licensed within Tasmania. On completion of the earth grid and fence earthing works and prior to ground reinstatement, the Contractor must perform electrical continuity testing of the new earth grid and fence line.

7 Internal fenced enclosures

All substation equipment enclosures or substation internal fences, unless detailed otherwise within the project specifications, are to be constructed as per perimeter security fences and gates, subject to the following exceptions.

7.1 Internal fence possum guard

Possum guard or skirting is not required unless stated in the site-specific schedule.

7.2 Internal fence warning signs

Warning signs are required for substation EHV or HV ground-mounted equipment enclosures as specified in standard R527891. However they are not required for other substation internal fences unless specified in the PPR.

7.3 Clearance of fence from equipment

Internal fences shall be located such that:

- (a) a minimum internal horizontal clearance of 1 metre exists for all equipment; and
- (b) at least the minimum electrical safety clearance is maintained from live equipment.

8 Security of substations

- (a) During the construction of any new security fencing, unauthorised access must be prevented by either the erection of temporary fencing or the direct presence of the work party at the worksite.
- (b) Access gates must not be left open or unlocked. A method of safe access and egress must also be maintained.
- (c) If required, removal of the existing perimeter security fence must only occur in manageable sections.
- (d) Where the area bounded by the perimeter security fence is to be extended to include a new area, the existing perimeter fence sections must remain in place until the new fence line is completed.
- (e) Temporary fencing must utilise chainmesh fence fabric, however, a plinth is not required. In addition, the bottom rail may be substituted for an additional helicoil wire installed at a maximum of 100 mm from EGL. The height and strength of any temporary fencing must maintain the existing perimeter security levels throughout the construction period.
- (f) During the construction of any new vehicle gate, temporary arrangements must be made to maintain a secure light vehicle access route to the substation.
- (g) All gates must be provided with TasNetworks keyed locks, dead-bolts, drop-bolts and gate-keepers.
- (h) TasNetworks will provide locks, padlocks or locksmith services to the Contractor on request by the Contractor.

9 Safety clearances

AS 2067 provides details of design clearances in air to earth of switchgear assemblies and clearances in air for safety purposes.

10 Hold points

The hold points for security fence installation are as follows:

- (a) Contractor's preliminary design site inspection.
- (b) Site specific survey and fence plan drawing.
- (c) Approval from adjoining property owners.
- (d) Site mark-out, with any updated fence plan drawings.
- (e) Completion of plinth and post-hole excavation works and prior to pouring concrete.
- (f) Completion of fence post installation and plinth concrete works.
- (g) Delivery docket for concrete delivered to site.
- (h) Delivery docket for tubing delivered to site.
- (i) Completion of fence earthing and earth grid works prior to reburial, including detailed photographs of any repairs.
- (j) Completion of a Security Fences and Gates Quality Control Form D01/7223 for each straight line section of the fence and gates. D05/27313 Security Fences and Gates Condition Audit Form to be utilised for chainmesh fences.