

TRANSPORT FOR NSW (TfNSW)

QA SPECIFICATION R201

FENCING

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REVISION REGISTER

Ed/Rev Number	Clause Number	Description of Revision	Authorised By	Date
Ed 1/Rev 1		First issued as R70.	GM, CMS	Jan 91
Ed 2/Rev 0	3.2 4.1 4.3.2	Clause numbers and lists have been restructured to suit the new format. Concrete post strengths increased. New paragraph covering intersecting fences. Ambiguity in laps removed.	GM, CEC	02.05.95
Ed 2/Rev 1	1.2 2 4.6, 4.7 7 Annexure R161/1	Specification Number changed from R70 to R161. Converted to MS Word 6.0c. References to RTA Specifications changed. Test Method RTA T166 added. Removal of trees redefined, HOLD POINT added. New clauses for stock grids and manproof fencing. Pay items renumbered and new pay items added. New annexure - Hold Point.	GM, RNIC (W Ho)	05.03.97
Ed 2/Rev 2	7	Pay Item R161P9 - Separate rate required for each grid opening width.	GM, RNIC (J Woodward)	17.12.98
Ed 3/Rev 0		General revision.	GM, RNIC	14.06.02
Ed 3/Rev 1	6	Pay Item R161P12 – unit of measurement defined.	GM, RNIC	30.08.02
Ed 3/Rev 2	Various	Format changed. “Superintendent” changed to “Principal” Minor editorial changes	GM, RNIC	22.10.03

Ed/Rev Number	Clause Number	Description of Revision	Authorised By	Date
Ed 3/Rev 2 (cont'd)	1.2 2.4.1, 2.4.2, 3.3.1 2.7, 2.8 3.3.1 Pay Item R161P10	Transferred to Annexure R161/M with additional references. New text explaining format. Requirements for strainer and intermediate posts added Revised to accord with changes to Standards Backfill holes in rock with mortar or concrete Bracing for steel posts added Includes costs of backfill		
Ed 4/Rev 0	Notice Guide Notes Global 2 1.1 1.2.5 2.1 2.2.1 2.2.3 2.3.1 2.3.2 2.3.3 2.3.5	Specification Number changed from R161 to R201. RTA PO Box and Fax numbers updated. Notes rewritten. Specification reformatted. Text revised to direct imperative style. New terms used for some types of fences. "Contractor" replaced by "you". Some clauses renumbered or moved to Annexures. Previous clauses deleted: - CI 2.2 "Reinforced Concrete Posts"; - CI 2.10 "Pedestrian Fence Infill Panels"; - CI 2.15 "Miscellaneous Hardware". Scope exclusions for specification clarified. New clause on "Definitions and Abbreviations". Requirements for alternative materials included. Requirements for prestressed concrete strainer posts expanded. OHS requirements for prestressed concrete posts added. Title revised to cover bracing stays and rails. Requirements for steel posts expanded and extended to cover bracing stays and rails. Galvanized steel sheeting requirements added. Requirements for miscellaneous steel items added. New clause on "Steelwork". Star picket mass requirement revised. New clause on "Galvanized Steel Sheeting".	GM, IC (Bernie Ch' worth)	14.01.10

Ed/Rev Number	Clause Number	Description of Revision	Authorised By	Date
Ed 4/Rev 0 (cont'd)	2.3.6	New clause on "Miscellaneous Steel Items".		
	2.4.1	Timber requirements expanded to include timber bracing stays, timber pegs and timber items for flood gates.		
	2.4.2	OHS requirements for treated timber added.		
	2.5.1	Range of wire fencing products clarified. Wire fencing product requirements modified.		
	2.5.2	New clause on "Wire Strand".		
	2.5.3	New clause on "Wire Rope".		
	2.6	New clause on "Wire Rope Grips, Thimbles and Turnbuckles".		
	2.7	New clause on "Electric Fence Components".		
	2.8.1, 2.8.2	Requirements for gates for rural boundary fencing and security fencing expanded.		
	2.8.3	New clause on "Gates for Urban Residential and Commercial Properties".		
	2.9.1, 2.9.2	Requirements for flood gates for small water courses and gullies and creeks modified.		
	2.9.3	New clause on "Flood Gates for Fauna Exclusion Fence".		
	2.10	Requirements for stock grids modified.		
	2.11	Retitled to include mortar. Requirements for mortar added.		
	2.12	New clause on "Signposts".		
	2.13	New clause on "Delineators".		
	2.14	New clause on "Sheet Aluminium".		
	2.15	New clause on "Paint".		
	2.16	New clause on "Plastic Components".		
	2.17	Requirement for timber inspection reports added.		
	3	New clause on "Fabrication".		
	4.1	Scope of construction of fencing expanded to include setting out of fence lines. Requirement for alignment of rural boundary fencing removed. Requirements for work near high voltage transmission lines added.		
	4.2	New clause on "Set Out of Fence Lines".		
	4.3.1	Reference to RTA G71 added.		
	4.3.3	New clause on "Urban Fencing".		

Ed/Rev Number	Clause Number	Description of Revision	Authorised By	Date
Ed 4/Rev 0 (cont'd)	4.4	General requirements for erection of rural boundary fencing added.		
	4.4.1	Requirements for erection of concrete posts deleted. Requirements for erection of prestressed concrete posts added. Requirements for depth of embedment clarified.		
	4.4.2	Requirements for tension of wires expanded to cover temperatures at 10°C, 20°C and 30°C respectively.		
	4.4.3	Retitled to include erection of chain-link fencing fabric and prefabricated field fencing fabric.		
	4.4.3	Requirements for erection of netting extended to cover erection of chain-link fencing fabric and prefabricated field fencing fabric.		
	4.4.4	Requirements for erection of rabbit-proof fencing expanded.		
	4.4.5	Requirements for tension of wires expanded to cover temperatures at 10°C, 20°C and 30°C respectively.		
	4.4.6	New clause on “Electric Fencing”.		
	4.4.7	New clause on “Temporary Rural Fencing”.		
	4.5	New clause on “Urban Fencing”.		
	4.6	Requirements for erection of new security fencing to replace existing fence added.		
	4.7	Welding requirement for erection of pedestrian fencing deleted. Requirements for erection of miscellaneous hardware deleted.		
	4.8	New clause on “Rock Fall Fencing”.		
	4.9	New clause on “Urban Residential and Commercial Fencing”.		
	4.10.1	Requirements for gap width underneath and on each side of rabbit-proof fences added.		
	4.10.2	Dimensions of rural gates deleted.		
	4.10.3	Requirements for security gates simplified.		
	4.11.1	Meaning of term “watercourse” clarified.		
	4.11.2	Requirements for erection of flood gates for small watercourses simplified.		
	4.12	Signs requirements associated with the installation of stock grids added.		

Ed/Rev Number	Clause Number	Description of Revision	Authorised By	Date
Ed 4/Rev 0 (cont'd)	4.13 6 Annex A Annex B Annex L Annex M	New clause on "Stockraces". Requirement for waste to be handled in accordance with RTA G34M or G35 or G36 included. New Annexure added. Descriptions for Pay Items P1 to P6, P8, P14 to P16 revised. New Pay Items P10, P11, P20 and P21 added. Previous Annex R161/L deleted. References updated.		
Ed 4/Rev 1	4.2	Required locations of boundary fences amended to conform with new fencing policy.	GM, IC	28.05.10
Ed 4/Rev 2	4.2	Additional requirements regarding preservation and restoration of property survey marks included.	GM, IC	11.06.10
Ed 4/Rev 3	1.2.4	Previous Clause 1.3. Subsequent clauses renumbered.	GM, IC (W Stalder)	15.07.11
Ed 4/Rev 4	3.1	Requirement for rounding edges of exposed ends of balusters of Types 2, 4 and 6 pedestrian fencing added.	GM, IC	22.10.12
Ed 4/Rev 5	2.2.1, 2.2.2 4.4.2	Clauses merged together. Specified dimensions of post deleted. Exception to required concrete cover of 20 mm for post ends added. Post ends to be coated with epoxy added. Subsequent clauses renumbered. 5th para – clause amended to apply only to grooved posts.	GM, IC	24.04.13
Ed 5/Rev 0	Global Guide Notes 1.1 1.3.1 1.3.2 1.4	Clauses rearranged and reworded to improve clarity. Duplicate clauses deleted. Similar clauses consolidated. Guide notes amended to accord with changes in main body of spec. Scope clarified. Definition of "watercourse" moved here from previous clause 4.11.1. Definition of symbol " D_{ig} " added. Previously clause 2.1. Testing requirements for alternative pedestrian fencing designs updated, to accord with latest version of Aust Std.	DCS	04.07.18

Ed/Rev Number	Clause Number	Description of Revision	Authorised By	Date
Ed 5/Rev 0 (cont'd)	2.1	Previously clause 2.11.		
	2.2.1	Previously sub-clause 2.3.2, now titled "General".		
	2.2.2	New sub-clause cross referencing clause 3.2.		
	2.2.3	Previously sub-clause 2.3.5.		
	2.3	Individual clauses rearranged. Heading added to form new sub-clause 2.4.2; previous sub-clause 2.4.2 now becomes sub-clause 2.3.3.		
	2.3.3	"NSW WorkCover" replaced by "Safe Work Australia" in relation to Code of Practice.		
	2.4	Previously clause 2.14.		
	2.5	Previously clause 2.15. Link to APAS specs moved here from Annex M.		
	2.6	Previously clause 2.16.		
	3	New clause titled "Components", incorporating parts of previous clause 2.		
	3.1	Previously clause 2.2. Previous sub-clause 2.2.1 divided to become sub-clauses 3.1.1 and 3.1.2. Previous sub-clause 2.2.2 becomes sub-clause 3.1.3.		
	3.2	Previously clause 2.3.1. Heading title changed. Headings added to form new sub-clauses 3.2.1 and 3.2.2.		
	3.2.1	Table 2 (previously Table 1) reformatted.		
	3.3	New clause incorporating parts of previous sub-clauses 2.3.1, 2.3.3, 2.3.4 and 2.3.6.		
	3.3.1	New sub-clause formed from parts of previous sub-clauses 2.3.1 and 2.3.6. Aust Std reference corrected.		
	3.3.2	Specified unit mass for star picket posts changed to equivalent "kg/m".		
	3.4	New clause incorporating part of previous sub-clause 2.4.1 including Table 3. Part of Table 3 moved to under clause 3.7.1 to become Table 5.		
	3.5	Previously clause 2.5. Heading title changed. Previous sub-clauses 2.5.1 to 2.5.3 renumbered accordingly.		
	3.5.2	Aust Std reference for galvanizing of wire strand corrected.		
	3.5.4	Previously clause 2.6.		
	3.6	Previously clause 2.8. Previous sub-clauses 2.8.1 and 2.8.2 renumbered accordingly.		

Ed/Rev Number	Clause Number	Description of Revision	Authorised By	Date
Ed 5/Rev 0 (cont'd)	3.7	Previously clause 2.9.		
	3.7.1	New sub-clause. Part of previous Table 3 moved here to become Table 5.		
	3.7.2	New sub-clause combining previous sub-clauses 2.9.1 to 2.9.3.		
	3.7.3	Previously clause 3.2.		
	3.8	Previously clause 2.10. Headings added to form sub-clauses 3.8.1 and 3.8.2. Individual clauses rearranged and reworded.		
	3.9	Previously clause 3.1. Heading title changed. Headings added to form sub-clauses 3.9.1 to 3.9.4.		
	3.10	Previously clause 2.7. Previous clauses 2.12 and 2.13 on signposts and delineators deleted.		
	3.11	Previously clause 2.17.		
	4.1	Statement on scope of fencing work deleted. Clause on connection of new fencing with existing fencing consolidated with near identical clause in previous clause 4.4.		
	4.2	New clause incorporating parts of previous clause 4.1. Headings added to form sub-clauses 4.2.1 and 4.2.2.		
	4.3	Previously clause 4.2. Statement on disturbance of existing permanent survey marks consolidated with that in clause 4.4.		
	4.4	Previously clause 4.3.		
	4.4.1	Clause on disturbance of permanent survey marks replaced by reference to spec G71.		
	4.4.2, Annex A	Area for clearing for rural fencing changed to either 1 m either side of fence line, or 1 m on one side and 3 m on the other. Actual project requirement to be specified in Annex A.		
	4.5	Previously clause 4.4. Heading added to form new sub-clause 4.5.1. Previous sub-clauses 4.4.1 divided into new sub-clauses 4.5.2 to 4.5.7.		
	4.5.1	New sub-clause incorporating parts of previous clause 4.4 and sub-clause 4.3.2. Duplicate clauses deleted.		
	4.5.2 to 4.5.7	Previously part of sub-clause 4.4.1.		
	4.5.3	Requirement added to repair any damage to epoxy coating over cut ends of tendons caused by driving.		

Ed/Rev Number	Clause Number	Description of Revision	Authorised By	Date
Ed 5/Rev 0 (cont'd)	4.5.8	Previously sub-clause 4.4.2. Individual clauses rearranged and edited.		
	4.5.9	Previously sub-clause 4.4.3.		
	4.6	Previously sub-clause 4.4.4.		
	4.7	Previously sub-clause 4.4.5. Required wire tensions placed in Table 8.		
	4.8	New clause incorporating previous sub-clauses 4.4.6 and 4.4.7 and clause 4.13.		
	4.9	Previously clause 4.6.		
	4.10	Previously clause 4.5.		
	4.11	Previously clause 3.3. Previous clause 4.9 deleted.		
	4.12	Previously clause 4.7. Installation requirements for fence posts with baseplates cross referred to RMS Standard Drawing.		
	4.13	Previously clause 4.8.		
	4.14	Previously clause 4.10.		
	4.14.1	Part of previous sub-clause 2.8.1 moved here and consolidated.		
	4.15	Previously clause 4.11.		
	4.16	Previously clause 4.12. Headings added to form new sub-clauses 4.16.1 to 4.16.4.		
	5	New clause combining previous clauses 5 and 6. Headings added to form new sub-clauses.		
	Annex A1	Guidance notes added, table reformatted. Coating types corrected.		
	Annex A2	Table added containing options for clearing for rural fencing, and associated guidance notes.		
	Annex A3	Added to provide for inclusion of other project specific requirements.		
Annex B	Pay Items description amended.			
Annex C	Schedules updated.			
Annex M	Reference updated.			
Ed 5/Rev 1	Global	References to “Roads and Maritime Services” or “RMS” changed to “Transport for NSW” or “TfNSW” respectively.	DCS	22.06.20

GUIDE NOTES

(Not Part of Contract Document)

Background

This specification for fencing was first issued as R70, and was renumbered R161 in 1997. At that time, the Standard Drawings for fencing retained the R70 numbering.

In Edition 4, the specification was renumbered R201. The Standard Drawings have already been renumbered to accord with the new Specification numbering and revised to better reflect current practice.

Changes in Terminology in Previous Edition 4

Some terms used in earlier versions of this Specification and the Standard Drawings have been changed, as follows:

Old Term	New Term	Comments
Controlled access fence	Boundary fence	See below under “controlled access road”
Manproof fence	Security fence	Term used in AS 1725.1
Plain wire	Single strand wire	Term used in AS 2423
Chain wire	Chain-link fencing fabric	
Ringlock netting	Prefabricated field fencing fabric	
Welded mesh	Welded mesh fabric	
Rolltop mesh	Heavyweight welded mesh panels	
Horse proof	Horse protector	

Controlled Access Road

Previous versions of this Specification and the Standard Drawings have used the term “controlled access rural (or urban) road fencing” or similar. In past practice, rural controlled access road boundary fences were erected 300 mm on the roadway side of the boundary line. This practice has been discontinued and, while a controlled access road remains a type of classified road included in the Roads Act, there is little purpose in continuing to use the term to describe a type of fence.

Clause 1.1 Scope (of Specification)

The scope of R201 excludes some types of fencing, such as noise walls (which sometimes function as fences) which are covered in Specification R271, and safety screens on bridges which are covered by Bridgeworks specifications.

Project specific requirements for fencing materials should be stated in Annexure R201/A. If required, additional fencing types may be inserted as project specific changes.

Clause 1.4 Alternative Materials and Systems

Provision for submission by the Contractor of alternative materials and systems for fencing is included in Clause 1.4. In considering alternative materials submitted by the Contractor, it should be noted that the fence is a system designed to carry out a specific function and the following considerations should be taken into account:

- (a) **Strength:** Strength is not always the most important factor in the choice of a fence component. As an example, the Standard Drawings shows alternatives for fence posts including steel, prestressed concrete and timber, with different strengths, although the end use of the fence is similar. As noted in item (c) below, a stronger post may be of no advantage if its performance under lateral load is limited by the properties of the soil in which it is embedded. A further consideration is the method of installation. For example, experience has shown that extra light tubes are easily damaged if they are driven into firm soils.
- (b) **Durability:** This should be considered in the light of the environment of the site, including soil properties.
- (c) **Ability to mobilise soil resistance:** This aspect is relevant to posts and the anchorages for bracing stays. Alternatives with smaller cross sections may be deficient if they cannot mobilise adequate soil resistance. It may be possible to overcome this deficiency by deeper embedment in the soil, adequate bracing or other means.
- (d) **Appearance:** The choice of the specified fence type and material may be made on aesthetic grounds. Even if this is not the case, the nominated alternative should be assessed for compatibility with roadscape intentions.
- (e) **Sustainability:** Alternatives utilising recycled materials may be favourably considered.
- (f) **Safety for vehicle occupants, pedestrians and animals**
Some issues are:
 - (i) Excessively strong posts may pose a road safety hazard to motorists.
 - (ii) Rails and bracing stays may constitute spearing hazards.
 - (iii) Fence components which could endanger stock or other animals should be avoided.
 - (iv) Do not use timber preservatives containing chromium or arsenic because of WHS and general human and animal safety concerns.
 - (v) For electric fence hazards, refer to AS/NZS 3014.

Clause 3 Components

Reinforced Concrete Posts

Requirements for reinforced concrete posts are no longer included because they are not readily available.

Prestressed Concrete Posts (refer Clause 3.1)

The requirement for testing in accordance with TfNSW T342 has been removed. Other fence components are not subject to this type of testing and it appears that the test is no longer enforced. The design and material certification requirements should be enforced to ensure quality.

Steel Tubular Posts, Stays and Rails (refer Clause 3.2)

Two types of tube may be used.

The first type of tube, manufactured to AS 1074, are used for steel pipes and have a minimum yield stress of 195 MPa. The sizes are designated by the letters DN followed by the nominal internal diameter in mm. Wall thicknesses for pipes are categorised as light, medium or heavy and are specified in the Standard.

The second type of tube is a structural steel hollow section manufactured to AS 1163. These tubes have a minimum yield stress of 250 MPa but 350 MPa and 450 MPa hollow sections are available.

Circular hollow section (CHS) sizes are usually designated by outside diameter and wall thickness, both in mm. CHS are used for security fences and some rock fall fences. Square hollow sections (SHS) are used in some rock fall fences.

Clause 3.2.2 specifies the galvanized coating class for steel tubes as HDG300 to AS 4792. This relates to coating on both surfaces of the tube. Other coating classes may be nominated in Annexure R201/A.

Where finishes such as varnish on star pickets or powder coating of various items are required, these may be nominated in Annexure R201/A.

Heavyweight Welded Mesh Panels (refer Clause 3.5.1)

It is important that these panels be fully specified. Various configurations and wire sizes are available from manufacturers. Panels with stiffening rolls at top and bottom are available and some products include a horizontal stiffening crease at mid height. Various uniform and variable horizontal wire spacings are available.

Steel Wire Strand And Rope (refer Clauses 3.5.2 and 3.5.3)

Where the strand or rope structure is important, project specific requirements should be included in the Drawings, Clause 3.5.2, Clause 3.5.3 or Annexure R201/A.

Clause 4.2.2 Fences Near Electricity Transmission Lines

Clause 4.2.2 requires the Contractor to contact the relevant power supply authority for fencing work near high voltage electricity transmission lines to ascertain any special requirements. This is because dangerous level of electricity can be induced in fences in the vicinity of such transmission lines. The measures to be taken will vary according to site conditions and therefore no standard requirements are specified.

In addition, it is recommended that the Project Manager obtain advice from the relevant power supply authority, show the requirements on the Drawings and makes project specific changes to Clause 4.2.2.

Clause 4.4.2 Clearing – Rural Fencing

The area for clearing is now changed to either 1 m on either side of the fence line, or 1 m on one side and 3 m on the other side of the fence line, and which of these two options is the one required is stated in Annexure R201/A.

Annexure R201/A Project Specific Requirements

A1 - Materials and Components

A very important aspect to be specified in Annexure R201/A1 is the quality of galvanizing to be applied to steel items. Different types and thicknesses of corrosion protection galvanizing are available on fencing products. The type and thickness of galvanized coating should be selected after considering the environment in which the product is to be used. Thicker protective coatings will increase the life span of the coating and hence the product.

AS 2423 includes an appendix which provides useful information on corrosion prevention for steel fencing products. A zinc/aluminium coating has a life span up to triple that of a zinc coating. PVC coatings may be used to provide an additional layer of corrosion protection.

Highly corrosive environments exist in coastal areas. It is not recommended that galvanized steel fence posts be used in coastal environments. Prestressed concrete posts or timber posts are considered to be more suitable. When wires are used in coastal environments, careful consideration should be

given to the type and thickness of the coating. Alternatively, consider accepting a reduced life span for the fence. Under some circumstances, plastic fencing products may be accepted.

A2 – Clearing for Rural Fencing

To select one of the two options for clearing, the TfNSW Project Manager must consult with the Property Acquisition and the Environmental personnel for the project, as there may be conflicting requirements between the two groups.



FENCING

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CONTENTS

CLAUSE	PAGE
FOREWORD	III
TfNSW Copyright and Use of this Document	iii
Revisions to Previous Version	iii
Project Specific Changes	iii
1 GENERAL	1
1.1 Scope	1
1.2 Structure of the Specification	1
1.3 Definitions and Abbreviations	2
1.4 Alternative Materials and Systems	2
2 MATERIALS	3
2.1 Concrete and Mortar	3
2.2 Steel	3
2.3 Timber	3
2.4 Aluminium Sheet	4
2.5 Paint	4
2.6 Plastic	4
3 COMPONENTS	5
3.1 Prestressed Concrete Posts	5
3.2 Steel Tubular Posts, Stays and Rails	5
3.3 Other Steel Components	6
3.4 Timber Posts and Stays	7
3.5 Wire and Related Components	7
3.6 Fence Gates	8
3.7 Flood Gates	9
3.8 Stock Grids	10
3.9 Pedestrian Fences	10
3.10 Electric Fence Components	11
3.11 Certificate of Compliance	11
4 CONSTRUCTION OF FENCING	11
4.1 General	11
4.2 Work Health and Safety Issues	12
4.3 Set Out of Fence Lines	12
4.4 Clearing	12
4.5 Rural Boundary Fencing	13
4.6 Rabbit-proof Fencing	16
4.7 Horse Protector Fencing	17
4.8 Other Rural Fencing	17
4.9 Security Fencing	17
4.10 Urban Fencing	18
4.11 Urban Residential and Commercial Properties Fencing	18
4.12 Pedestrian Fencing	18
4.13 Rock Fall Fencing	18
4.14 Fence Gates	18
4.15 Flood Gates	19
4.16 Stock Grids	20
5 REMOVAL OF EXISTING FENCING AND DISPOSAL OF MATERIAL	20

5.1	Removal of Existing Fencing	20
5.2	Removal and Disposal of Surplus Material and Rubbish	21
ANNEXURE R201/A – PROJECT SPECIFIC REQUIREMENTS		22
A1	Materials and Components	22
A2	Clearing for Rural Fencing	24
A3	Other Requirements	24
ANNEXURE R201/B – MEASUREMENT AND PAYMENT		25
ANNEXURE R201/C – SCHEDULES OF HOLD POINTS AND IDENTIFIED RECORDS		28
C1	Schedule of Hold Points	28
C2	Schedule of Identified Records.....	28
ANNEXURES R201/D TO R201/L – (NOT USED).....		28
ANNEXURE R201/M – REFERENCED DOCUMENTS.....		29
LAST PAGE OF THIS DOCUMENT IS		30

FOREWORD

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REVISIONS TO PREVIOUS VERSION

This document has been revised from Specification TfNSW R201 Edition 5 Revision 0.

All revisions to the previous version (other than minor editorial and project specific changes) are indicated by a vertical line in the margin as shown here, except when it is a new edition and the text has been extensively rewritten.

PROJECT SPECIFIC CHANGES

Any project specific changes are indicated in the following manner:

- (a) Text which is additional to the base document and which is included in the Specification is shown in bold italics e.g. ***Additional Text***.
- (b) Text which has been deleted from the base document and which is not included in the Specification is shown struck out e.g. ~~Deleted Text~~.

TfNSW QA SPECIFICATION R201

FENCING

1 GENERAL

1.1 SCOPE

This Specification sets out the requirements for construction of fencing, both rural and urban.

It also includes the requirements for pedestrian fencing, rock fall fencing, flood gates and stock grids, but does not include the requirements for noise walls or safety screens for bridges.

1.2 STRUCTURE OF THE SPECIFICATION

This Specification includes a series of annexures that detail additional requirements.

1.2.1 Project Specific Requirements

Project specific details of work are shown in Annexure R201/A.

1.2.2 Measurement and Payment

The method of measurement and payment is detailed in Annexure R201/B.

1.2.3 Schedules of HOLD POINTS and Identified Records

The schedules in Annexure R201/C list the **HOLD POINTS** that must be observed. Refer to Specification TfNSW Q for the definition of **HOLD POINTS**.

The records listed in Annexure R201/C are **Identified Records** for the purposes of TfNSW Q Annexure Q/E.

1.2.4 (Not Used)

1.2.5 (Not Used)

1.2.6 Referenced Documents

Unless specified otherwise, the applicable issue of a referenced document, other than a TfNSW Specification, is the issue current at the date one week before the closing date for tenders, or where no issue is current at that date, the most recent issue.

Standards, specifications and test methods are referred to in abbreviated form (e.g. AS 1234). For convenience, the full titles are given in Annexure R201/M.

1.3 DEFINITIONS AND ABBREVIATIONS

1.3.1 Definitions

The terms “you” and “your” mean “the Contractor” and “the Contractor’s” respectively.

The term “watercourse” includes ephemeral watercourses and shallow depressions upstream and downstream of culverts.

The names of wire fencing products are those used in AS 2423. Other terms are defined as follows:

- Strand** A number of wires in one or more layers laid helically around a central wire or fibre core with a uniform length of lay in each layer. Refer to AS 2759 for further information. Not to be confused with the term “single strand wire” used in AS 2423 to describe a single wire.
- Wire rope** A group of strands laid helically and symmetrically, with uniform pitch and direction, around a central core of natural or synthetic fibre, or wire. Refer to AS 2759 for further information.
- Stockrace** A pair of fences along a rural road at a transverse stock fence. “Scare” devices are provided at each end. Stockraces are an alternative to gates and stock grids on rural roads without longitudinal fences.

1.3.2 Abbreviations and Symbols

H.T. High Tensile

L.T. Low Tensile

D_{ig} Natural durability class of heartwood for in-ground contact, in accordance with AS 5604

1.4 ALTERNATIVE MATERIALS AND SYSTEMS

You may propose alternative materials or systems for fastening wires and other components for approval by the Principal. The submission must include full details of the alternative materials or systems, and demonstrate that the alternatives are at least equivalent to that specified in terms of:

- (a) strength;
- (b) durability;
- (c) ability to mobilise soil resistance;
- (d) appearance;
- (e) sustainability; and
- (f) safety for vehicle occupants, pedestrians and animals.

Submissions for alternative designs of pedestrian fencing (refer Clause 4.12) must conform to the testing requirements of AS/NZS 3845.2.

2 MATERIALS

2.1 CONCRETE AND MORTAR

Unless specified or shown otherwise elsewhere in this Specification or on the Drawings, all concrete must comply with Specification TfNSW R53 and the 28 day compressive strength of concrete must not be less than 20 MPa.

Mortar must comply with TfNSW R53, except that the mixture must consist of 2 parts sand to 1 part cement.

2.2 STEEL

2.2.1 General

Materials for fabricated steel items must comply with Table R201.1.

Table R201.1 – Materials for Fabricated Steel Items

Component	Standard	Requirements
Steel plate	AS/NZS 3678	Grade 250/300 unless shown otherwise on the Drawings or specified otherwise in Annexure R201/A.
Steel bars and sections	AS/NZS 3679.1	Grade 250 unless shown otherwise on the Drawings or specified otherwise in Annexure R201/A.
Steel hollow sections	AS/NZS 1163	Minimum grade C250. Hollow sections used in fabricated steel items must be Grade C350 unless shown otherwise on the Drawings or specified otherwise in Annexure R201/A.
Bolts, nuts and washers	AS 1111.1, AS/NZS 1390, AS 1112.3 and AS 1237.1	Hot-dip galvanized in accordance with AS/NZS 1214.

2.2.2 Steel Posts, Stays and Rails

Steel posts, stays and rails must comply with Clause 3.2.

2.2.3 Galvanized Steel Sheeting

Galvanizing for steel sheeting must be zinc coating class Z600 complying with AS 1397, unless specified otherwise in Annexure R201/A.

2.3 TIMBER

2.3.1 General

Use only the species of timber that are listed in Appendix A of AS 5604. Hardwood must have a natural durability class of heartwood for in-ground contact (D_{ig}) of 1, 2 or 3. Softwood of any durability class is acceptable.

Season all timber used.

2.3.2 Timber Types Requiring Preservative Treatment

Where the species of timber has a D_{ig} of 1 or 2 and less than 20% of the cross-sectional area comprises sapwood, no preservative treatment is required. If 20% or more of the cross-sectional area is sapwood, carry out preservative treatment to the timber in accordance with AS 1604.1 to hazard class H4 except that, for timber rails, palings and other above ground items, carry out the treatment to hazard class H3.

Where the species of timber has a D_{ig} of 3 for hardwood or D_{ig} of 3 or 4 for softwood, carry out preservative treatment to the timber in accordance with AS 1604.1 to hazard class H4 except that, for timber rails, palings and other above ground items, carry out the treatment to hazard class H3.

2.3.3 Preservative Treatment

Carry out preservative treatment of the timber using a vacuum/pressure autoclave process in a State Forests of NSW approved facility. The preservative used must not contain any chromium or arsenic.

Address the hazards associated with timber preservatives and treated timber to comply with the Work Health and Safety legislation. Be guided by AS 5605 and Safe Work Australia Code of Practice for the Safe Handling of Timber Preservatives and Treated Timber.

After treatment, do not resaw, dress, plane or otherwise alter the original dimensions of the timber.

2.4 ALUMINIUM SHEET

Aluminium sheet for stock scare devices at stockraces must be made of aluminium alloy with designation 1150 complying with AS/NZS 1734.

The aluminium sheet must be anodised in black colour in accordance with AS 1231 to thickness grade of AA15.

2.5 PAINT

All paints and associated materials must comply with the relevant Australian and APAS Specifications. APAS specifications are available at:
<http://www.apas.gov.au/SpecList.asp>

Unless specified or shown otherwise on the Drawings, use waterborne latex paint.

2.6 PLASTIC

All components made from plastic must be sufficiently strong and durable to serve the required purpose for at least 10 years.

3 COMPONENTS

3.1 PRESTRESSED CONCRETE POSTS

3.1.1 Design

Design the prestressed concrete strainer and intermediate posts in accordance with AS 3600 to carry a respective ultimate load of 3.5 kN and 7.5 kN at the centre of a 1.5 m span. The direction of the load is taken to be perpendicular to the long axis of the post and parallel to the longer faces. The design must be certified by a Structural Engineer eligible for Membership of Engineers Australia.

3.1.2 Manufacture

Supply, placing and curing of concrete, and dimensional tolerances of the finished posts, must comply with TfNSW R53 and the following:

- (a) Minimum concrete strength at 28 days must be 32 MPa.
- (b) Prestressing tendons must comply with AS/NZS 4672.1.
- (c) There must be no jointing of tendons.
- (d) At least two high tensile steel tendons must be provided.
- (e) Unless shown otherwise on the Drawings, the tendons must have 20 mm minimum cover except at the post end faces. Cut ends of tendons must not protrude from the post end faces. Protect the cut ends of tendons with a coating of high impact resistant epoxy.

3.1.3 Work Health and Safety

Address the hazards associated with prestressed concrete items in order to comply with the requirements of Specification TfNSW G22.

3.2 STEEL TUBULAR POSTS, STAYS AND RAILS

3.2.1 General

Steel tubular posts, bracing stays and rails must be of either galvanized seamless tube complying with AS 1074, or galvanized structural steel circular hollow sections complying with AS/NZS 1163, and of the properties shown in Table R201.2 and on the Drawings.

Table R201.2 – Steel Post and Stay Requirements

Fence Type	Component Type	Standard	Thickness/ Grade	Size
Rural boundary	Strainer post	AS 1074	Medium	DN 150
	Intermediate post			DN 100
	Bracing stay			DN 50
Urban boundary	Corner and angle post	AS 1074	Medium	DN 50
	Intermediate post			DN 40
	Bracing stay			DN 40
Marsupial-proof	Strainer, end, corner, cross fence or gate post	AS 1074	Medium	DN 50
	Intermediate post			DN 32
	Bracing stay			DN 40
Fauna exclusion	Strainer, end, corner, cross fence or gate post	AS/NZS 1163	C350	48.3 x 4 mm
	Intermediate post			42.4 x 4 mm
	Bracing stay			42.4 x 4 mm
Security	Refer to Annexure R201/A and Drawings			
Rock fall	Refer to Drawings			

Provide each post with a set of 12 mm holes to suit the spacing of the wires shown on the Drawings for the particular type of fencing to be erected.

3.2.2 Protective Treatment

Galvanizing must be to coating class HDG300 in accordance with AS/NZS 4792, unless specified otherwise in Annexure R201/A or on the Drawings.

Where so specified in Annexure R201/A or the Drawings, provide a powder coating over the galvanizing in accordance with AS 4506.

At pipe connections that are not welded and are subject to movement, protect the galvanized coating from scratching caused by movement of the connecting members.

Fit each post with a galvanized steel cap to prevent the ingress of water.

3.3 OTHER STEEL COMPONENTS

3.3.1 Brackets and Other Items

All brackets, hinges, catches, clamps and similar steel items must be standard proprietary manufactured items fabricated from grade 250/300 structural steel complying with AS/NZS 3678 and AS/NZS 3679.1 as applicable and then hot-dip galvanized in accordance with AS/NZS 4680.

Chain must comply with AS 2321 and be galvanized.

Nails and staples must comply with AS 2334 and be galvanized.

3.3.2 Star Pickets

Steel star pickets must be of “Y” bar section (“STAR” pattern), drilled to suit the spacing of the wires and the post length shown on the Drawings, and hot-dip galvanized in accordance with AS/NZS 4680, unless specified otherwise on the Drawings or in Annexure R201/A.

The unit mass of posts must be not less than 1.9 kg/m.

3.3.3 Fence Droppers

Fence droppers must be of proprietary galvanized high tensile steel “V” sections with turned edges and pre-formed fixing holes, of minimum steel thickness 0.9 mm.

Fix the droppers to the wires using tie wire or proprietary galvanized fastening clips.

3.4 TIMBER POSTS AND STAYS

Timber posts and stays must comply with Table R201.3.

Table R201.3 – Timber Post and Stay Requirements

Component	Standard	Requirement
Rural fence	AS/NZS 2878	Strength group SD6 minimum
Strainer posts		Round, nominal diameter 250 mm
Intermediate posts		Round, nominal diameter 150 mm, or sawn hardwood 150 mm by 100 mm, or split hardwood, four sided, with - no average cross sectional dimension less than 100 mm, - no outside dimension less than 65 mm, and - cross sectional area not less than 18,000 mm ² .
Bracing stays		Sawn hardwood 200 mm by 150 mm
Timber pegs		Round, nominal diameter 150 mm

3.5 WIRE AND RELATED COMPONENTS

3.5.1 Coated Wire Fencing Products

Coated wire fencing products, including the following, must comply with AS 2423:

- (a) single strand wire (including electric fence wire, horse protector wire and tie wire);
- (b) barbed wire;
- (c) wire netting;
- (d) chain-link fencing fabric;
- (e) prefabricated field fencing fabric;
- (f) welded mesh fabric; and
- (vii) heavyweight welded mesh panels.

Diameters and other dimensions, tensile strengths, metallic coating designation and any coating applied over the metallic coating must be as specified below, as shown on the Drawings or as specified in Annexure R201/A.

Horse protector wire must consist of a low tensile core wire with a nominal diameter of 4 mm. The core wire metallic coating designation must be W02Z and a white PVC coating must be provided.

Tie wire must be low tensile wire with a minimum nominal diameter of 2 mm. Tie wire must be hot-dip metallic coated to the same designation as that of the fence product to be tied.

3.5.2 Wire Strand

Wire strand must comply with AS 2841. Diameter and wire grade must be as shown on the Drawings or as specified in Annexure R201/A.

Galvanizing must be Class A in accordance with AS 2841.

3.5.3 Wire Rope

Wire rope must comply with AS 3569. Diameter and wire grade must be as shown on the Drawings or as specified in Annexure R201/A.

Galvanizing must be Class W10Z in accordance with AS/NZS 4534.

3.5.4 Wire Rope Grips, Thimbles and Turnbuckles

Accessories for securing wire strand and rope must be galvanized and comply with the Standards listed in Table R201.4.

Table R201.4 – Accessories for Wire Strand and Rope

Item	Standard	Requirement
Wire rope grips	AS 2076	
Thimbles	AS 1138	
Turnbuckles	AS 2319	Quality Grade L

3.6 FENCE GATES

3.6.1 Gates for Rural Boundary Fences

Unless shown otherwise on the Drawings, gates for rural boundary fences must be standard proprietary manufactured items of galvanized tubular steel frame construction, with galvanized tubular steel internal bracing in an “N” shaped configuration and galvanized welded mesh fabric infill.

Tubes must comply with AS 1074 (refer also Clause 3.2.1) and welded mesh fabric must comply with AS 2423 (refer also Clause 3.5.1).

Hinges and other fittings must comply with Clause 3.3.1.

Welded mesh fabric infill for gates in rabbit-proof fences must have a mesh size not exceeding 25 mm.

Unless shown otherwise on the Drawings, gates for vehicular access must be 3.6 m wide and 1.2 m high and pedestrian access gates must provide a 900 mm clear opening.

Hinges, gudgeons and latch support brackets must be either fabricated from grade 250/300 structural steel to the details shown on the Drawings and the requirements of Clause 3.9, and hot-dip galvanized in accordance with AS/NZS 4680, or proprietary manufactured items of equal strength and durability.

3.6.2 Gates for Security Fencing

Components of security gates must comply with AS 1725.1 for the type of fence nominated on the Drawings or in Annexure R201/A. Galvanizing must be as specified in Annexure R201/A or shown on the Drawings.

Unless shown otherwise on the Drawings, vehicle access gates must comprise double gates, each nominally 2.75 m wide, and incorporate a dropbolt, a handhole and a locking chain. Weld the locking chain to the gate.

Pedestrian access gates must be 1.2 m wide and incorporate a handhole and a shoot bolt.

3.7 FLOOD GATES

3.7.1 General

Timber for flood gates must comply with Table R201.5.

Table R201.5 – Timber for Flood Gates

Component	Standard	Requirement
Flood gates:	AS 2082	
Small watercourses		Minimum stress grade of F14 for strength group and structure
Large crossings (gullies and creeks)		Minimum diameter of 150 mm for ballast and other timber items for flood gates at large creek crossings

3.7.2 Small Watercourses, Large Crossings and Fauna Exclusion Fence

Flood gates for small watercourses, requiring an opening width not exceeding 2.4 m in fences with netting or fabric, must consist of a hardwood and galvanized steel sheet flap gate and a hardwood support frame to the details shown on the Drawings.

Flood gates for gullies and creeks, requiring an opening width exceeding 2.4 m, must consist of a suspended wire netting structure to the details shown on the Drawings.

Flood gates for fauna exclusion fences must consist of a galvanized sheet metal flap and a concrete drain to the details shown on the Drawings.

3.7.3 Fabrication

Fabricate flood gates to the details shown on the Drawings.

Frame timber work firmly, with close fitting joints. Do not fabricate using open joints or packing of shimming of joints.

3.8 STOCK GRIDS

3.8.1 Design

Stock grids must be standard steel proprietary units, with reinforced concrete base and side supports.

Stock grids must be designed to withstand A160 axle load and corresponding load factors as defined in AS 5100.2, and designed in accordance with AS 4100 and AS 3600.

The spacing of the grillage members must not exceed 200 mm centres.

Designs must be certified by a Structural Engineer eligible for Membership of Engineers Australia.

3.8.2 Manufacture

Materials must comply with Clause 2.2, and fabrication must comply with the requirements specified for pedestrian fences in Clause 3.9 where applicable.

3.9 PEDESTRIAN FENCES

3.9.1 General

Fabricate steel pedestrian fences to the details shown on the Drawings, using materials complying with the Standards listed in Clause 2.2.1.

Do not splice members unless shown on the Drawings or approved by the Principal.

3.9.2 Cutting and Drilling

Cut steel by sawing, shearing or thermal cutting. Do not cut by nibbling action. Finish any cut surfaces square or to the angle shown on the Drawings. Round exposed corners in the finished item to a radius of 1 mm to 2 mm.

For Types 2, 4 and 6 pedestrian fencing, round the edges of the exposed ends of balusters to a radius of 3 mm to 4 mm.

Cut surfaces which are to be welded must comply with AS/NZS 1554.1.

Form round holes by drilling. Slotted holes and the diameters of holes for bolts must comply with AS/NZS 5131.

3.9.3 Welding

Welding must comply with the requirements of AS/NZS 1554.1 for weld category GP.

3.9.4 Protective Treatment

Hot-dip galvanize all components in accordance with AS/NZS 4680 after fabrication, with a minimum average coating mass of 500 g/m².

If shown on the Drawings or specified in Annexure R201/A, apply powder coating in accordance with AS 4506 after galvanizing.

Where specified or shown on the Drawings, fit pedestrian fence posts with a steel cap. Fabricate the cap to the details shown on the Drawings and hot-dip galvanize the cap in accordance with AS/NZS 4680.

3.10 ELECTRIC FENCE COMPONENTS

Insulators and other components for electric fences must comply with AS/NZS 3014.

3.11 CERTIFICATE OF COMPLIANCE

Before constructing fence, gates, flood gates and stock grids, provide the Principal with a signed Certificate of Compliance, verifying that the materials and components to be used comply with the requirements of this Specification.

The Certificate must identify the item and record the product certification, inspection or test records that verify conformity. Timber inspection reports must identify the timber species.

HOLD POINT

Process Held:	Incorporation into the Works of fencing, gates, flood gates and/or stock grids.
Submission Details:	Certificates of Compliance, at least seven days prior to incorporation in the Works.
Release of Hold Point:	The Principal will consider the submitted documents and may request further information prior to authorising the release of the Hold Point.

4 CONSTRUCTION OF FENCING

4.1 GENERAL

Construct fencing in accordance with the requirements of this Specification and the Drawings. When completed, the fencing must be sound, strong, of neat appearance and correctly aligned.

Where minor irregularities occur in the ground, the vertical profile of the fence must not follow these irregularities, but must be aligned to a uniform grade between definite changes in the natural slope of the ground.

Where new fencing intersects existing fencing that is not to be removed, submit your proposed connection details to the Principal for consideration. The proposal must show details of strainer posts, strainer post bracing and restraining of wire and reconnection of fencing fabric/wire netting.

Construct the fencing in accordance with the approved details and in coordination with the relevant land owner(s).

HOLD POINT

Process Held:	Connection of new fencing to existing fencing.
Submission Details:	A proposal detailing the connection between new and existing fencing.
Release of Hold Point:	The Principal will consider the submitted documents prior to authorising the release of the Hold Point.

4.2 WORK HEALTH AND SAFETY ISSUES

4.2.1 Stacking of Fencing Material

On a road open to traffic, ensure that any temporary stacks of new or surplus materials or components are:

- (a) safely and neatly stacked;
- (b) located clear of traffic flow close to the boundary fence line or at least 2 metres behind the face of a safety barrier;
- (c) located at positions where the stacks do not interfere with the working of the adjacent property or the use of the roadside by the public.

If materials are stacked behind a safety barrier, the stacked material must not be within 25 m of the commencement of the leading terminal.

4.2.2 Fences Near Electricity Transmission Lines

For fences installed near high voltage electricity transmission lines, ascertain any special requirements by contacting the owner of the transmission line before commencing the erection of the fence.

4.3 SET OUT OF FENCE LINES

Set out all permanent fence lines in accordance with Specification TfNSW G71. Notwithstanding the provisions of AS 1725.1, you are responsible for carrying out any boundary set out.

Locate boundary fences on the boundary line between the road reserve and the private property. Use the services of a Registered Land Surveyor to establish the property boundaries.

4.4 CLEARING

4.4.1 General

Comply with the requirements for Preservation of Survey Infrastructure contained in TfNSW G71, and ensure that no permanent survey marks are disturbed without authorisation.

Where a new fence replaces an existing fence on the same line, remove all existing fencing material in accordance with the requirements of Clause 5.

4.4.2 Rural Fencing

Remove all logs, boulders, stumps, roots, undergrowth and rubbish, along the full length of the fence line,

either

(a) within 1 m on either side of the fence line;

or

(b) within 1 m on one side and 3 m on the other side of the fence line.

Annexure R201/A will state which of the above options, whether option (a) or (b), is required.

Remove all trees within this area with a trunk diameter of less than 100 mm, measured 500 mm above the ground, unless otherwise directed by the Principal. Mark any trees within this area with a trunk diameter exceeding 100 mm, measured 500 mm above the ground, with coloured tape, but do not remove these trees unless approval is given by the Principal to do so.

HOLD POINT

Process Held: Removal of trees with trunk diameter exceeding 100 mm.

Submission Details: Locations of marked trees.

Release of Hold Point: The Principal will carry out a site inspection to determine the trees to be removed prior to authorising the release of the Hold Point.

Do not undertake clearing or otherwise cause damage to trees and native vegetation outside the limits of clearing specified.

4.4.3 Urban Fencing

Clear the least possible area required to erect the fence. Take care to avoid disturbing existing utilities, landscaping and structures and make good any damage caused by you.

4.5 RURAL BOUNDARY FENCING

4.5.1 General

Where new rural boundary fencing is replacing existing fencing, ensure that fencing is in place at all times to prevent the ingress or egress of stock or vermin as specified in Clause 5.1.2.

If trees located along the fence line are to be retained (refer Clause 4.4.2), do not strain wires around or against any tree. Provide strainer posts adjacent to and on both sides of the tree.

Wherever concave grade change exceeds 7.5%, provide a strainer post with star picket and twisted wire hold-downs as shown on the Drawings.

4.5.2 Installation of Posts - General

Install all posts in a vertical position, except at unusually steep locations where the Principal may direct you to erect the posts perpendicular to the surface of the ground.

Install posts either by driving, or by inserting in pre-excavated holes. Do not install posts into rock by driving.

Where posts are installed in excavated holes in earth, the holes must be sufficiently large to permit compaction of the earth backfill. Place the earth backfill around posts in layers of maximum thickness

150 mm for the full depth of the hole, and compact the backfill to the same relative compaction as that of the original undisturbed ground.

Where posts are installed in excavated holes in rock, the holes must be sufficiently large to permit backfilling with concrete or cement mortar. Fill the space around the posts completely with cement mortar or with concrete.

Install the posts to the minimum depths shown in Table R201.6

Table R201.6 – Post Hole Depth

Type of Post	Depth (mm)	
	Earth	Rock
Strainer posts	900	600
Intermediate posts	600	450

Notes:

- (1) Where rock is encountered below earth, the depth of embedment in rock must be as shown in Table R201.6 except that the total depth of embedment needs not exceed that for earth. For example, a strainer post must be sunk in a hole at least 700 mm deep where 100 mm of earth covers the rock.
- (2) Do not cut prestressed concrete posts on site. Adopt the reduced length in rock only if posts of the correct length are supplied by the manufacturer. Otherwise, the depth of sinking must be the same as that for earth.
- (3) In soft or loose earth, deeper embedment may be necessary.

4.5.3 Prestressed Concrete Posts

If installed by driving into earth, use a suitable post driver to hold the post vertically in position and a steel cap with a plywood cushion of not less than 12 mm thick to protect the top of the post during driving. Repair any damage to the epoxy coating over the cut ends of the tendons caused by the driving.

If installed by placing in pre-excavated holes in earth or rock, neatly excavate the holes, and after placing the strainer posts in position, backfill the full depth of the hole with concrete in accordance with Clause 2.1.

After placing intermediate posts in position, backfill the full depth of the hole with earth, if the hole is formed in earth, and with concrete or cement mortar complying with Clause 2.1, if the hole is formed in rock.

4.5.4 Steel Posts

If installed by driving into earth, use suitable driving equipment to drive the steel posts. Take care not to damage the tops of the posts during driving. Repair any damage to the protective coating of posts caused by driving using an organic zinc-rich primer complying with AS 3750.9.

If installed by placing in pre-excavated holes in rock, neatly excavate the holes, place the posts in position and backfill the full depth of the hole with concrete or cement mortar complying with Clause 2.1.

4.5.5 Timber Posts

If installed by driving into earth, use a suitable post driver.

Timber posts may be driven directly into soft earth provided the driving does not damage the post. In stiff earth, drive the posts into pre-drilled holes with a diameter 50 mm less than the nominal maximum post diameter. Drive strainer posts with small diameter end down. Erect other posts with butt end down.

4.5.6 Damage and Other Nonconformities

Remove any posts which cannot be driven to the required depth, have been significantly damaged or have deviated from the vertical position during driving.

For prestressed concrete posts, undamaged posts may be reused.

All damaged posts must be removed (if installed) and replaced with new posts, and the damaged post disposed of.

4.5.7 Strainer Posts

Install strainer posts at:

- (a) ends of fencing;
- (b) angles along the fence line;
- (c) locations of abrupt change in grade;
- (d) intersections of the fencing with other fencing and gates;
- (e) intermediate points along a straight fence line.

Brace in one direction the strainer posts located at the ends of fencing and at gates. Brace the strainer posts in two directions at angles along the fence line, locations of abrupt changes of grade and intermediate points. For other strainer post arrangements and for bracing stays, install them in accordance with the details shown on the Drawings.

The spacing between intermediate strainer posts must not exceed 120 m, except for fencing erected for the retention of cattle, which must have spacings between intermediate point strainer posts not exceeding 90 m.

4.5.8 Installation of Wires

Storage and handling of steel wire strand and wire rope must comply with AS 2759.

Fix all wires shown on the Drawings.

Fix the wires such that they are located on the private property side of the posts.

Using a wire strainer and gauge, fasten and strain wires securely between strainer posts to the nominal tension shown in Table R201.7.

Table R201.7 – Nominal Wire Tension

Wire Diameter (mm)	Type	Tension (kN) at		
		10°C	20°C	30°C
4.0	Single strand wire	2.1	1.8	1.5
2.5	H.T. single strand wire	1.4	1.3	1.2
2.5	L.T. barbed wire	1.5	1.3	1.1
1.6	H.T. barbed wire	1.4	1.3	1.2

Fix single strand and barbed wire at end strainer posts by wrapping the securing end of the wire at least four times around the tension side of the line as shown on the Drawings.

Fix the top strand of barbed wire in position at the top of prestressed concrete and steel intermediate posts, as shown on the Drawings. Where the prestressed concrete intermediate posts are grooved, seat the wires firmly in the grooves provided on the side of the posts.

Where the plain and the barbed wires are secured either to the tops or sides of the posts by tie wire, stretch the tie wire tight and fit it snugly against the sides of the posts to prevent movement of the wire. Wrap the ends of the tie wire at least twice around the line wire and neatly cut off the ends.

Alternatively, use proprietary galvanized fastening clips, and galvanized staples of minimum length 40 mm, to fix the wires to steel and timber posts respectively.

All joints in wires must be in the form of “figure of eight” knots as shown on the Drawings.

Attach wires to star pickets to the details shown on the Drawings.

4.5.9 Installation of Netting and Fabric

Install wire netting, chain-link fencing fabric or prefabricated field fencing fabric on the same side of the fence as the line wire.

Erect the netting, chain-link fencing fabric or prefabricated field fencing fabric for the type of fence to be erected as shown on the Drawings. Attach netting to the fence wire with tie wire or fixing clips.

Tie the netting, chain-link fencing fabric or prefabricated field fencing fabric loosely to the fence wires, then carefully strain the netting/fabric without distorting or breaking the mesh and tie or clip the netting/fabric to the wires immediately on each side of every post and at intervals not exceeding 1 m. Twist each tie wire twice around the fence wire and cut off the ends neatly.

4.6 RABBIT-PROOF FENCING

In addition to the requirements for rural fencing under Clause 4.5, comply also with the following additional requirements for rabbit-proof fencing.

Install the netting with its bottom section either buried or laid flat on the ground as shown on the Drawings. Where the bottom section of the netting is to be buried, excavate the trench required before the netting is run out.

Where existing rabbit-proof fencing with buried netting is to be replaced with similar fencing on the same alignment, remove all traces of the old netting.

Excavate the new trench and dispose of the excavated material as spoil in accordance with Specification TfNSW R44. Supply, place and compact with backfill material of similar quality to the surrounding material.

At each strainer post bracing stay, attach additional netting to the fence adjacent to the strainer post to the level of the top wire and for a width of 450 mm from the post as shown on the Drawings.

4.7 HORSE PROTECTOR FENCING

In addition to the requirements for rural fencing under Clause 4.5, comply with the following additional requirements for horse protector fencing.

Use horse protector wires for the top two fence wires in the horse protector fencing. All other wires will remain as 4 mm diameter single strand wires.

Strain the horse protector wires to the nominal tension shown in Table R201.8.

Table R201.8 – Nominal Wire Tension – Horse Protector Fencing

Ambient Temperature	Nominal Tension (kN)
10°C	2.1
20°C	1.8
30°C	1.5

4.8 OTHER RURAL FENCING

4.8.1 Electric Fencing

Comply with the requirements of AS/NZS 3014 for electric fence wires attached to a fence which includes barbed wires.

4.8.2 Temporary Rural Fencing

Erect temporary fencing associated with the construction of rural fencing generally in accordance with the requirements of Clauses 4.5.2 to 4.5.9, and 4.6 to 4.8 and the details shown on the Drawings.

4.8.3 Stockraces

Construct stockraces in accordance with the Drawings.

4.9 SECURITY FENCING

Construct security fencing in accordance with the requirements of AS 1725.1.

Concrete for footings must comply with Clause 2.1. Shape the top surface of the concrete footing such that there is a crown at the fence line, to shed water away from the fence post.

Where new security fencing is replacing existing fencing, ensure that fencing is in place at all times to prevent the movement of people.

4.10 URBAN FENCING

Construct and erect urban fencing in accordance with the requirements and details shown on the Drawings.

Concrete for footings and base strips must comply with Clause 2.1. Shape the top surface of the concrete strip such that there is a crown at the fence line, to shed water away from the fence post.

4.11 URBAN RESIDENTIAL AND COMMERCIAL PROPERTIES FENCING

Construct gates for urban residential and commercial premises to the details shown on the Drawings.

Frame timber work firmly, with close fitting joints. Do not fabricate using open joints or packing or shimming of joints.

Fabricate steel gates to the details shown on the Drawings and in accordance with Clause 2.2.

Painting must be of the colour and finish shown on the Drawings. Prepare surfaces and apply the required primer, undercoat and finishing coats as recommended by the manufacturer.

4.12 PEDESTRIAN FENCING

Fabricate and install pedestrian fencing to the details shown on the Drawings.

Where posts are required to be erected on a concrete footing, construct the footing to the minimum dimensions for the type of ground conditions encountered as shown on the Drawings.

Concrete for footings must comply with Clause 2.1.

For fence posts with baseplates, install the posts in accordance with the detail shown on TfNSW Standard Drawing R0800-12.

4.13 ROCK FALL FENCING

Install rock fall fences as shown on the Drawings.

4.14 FENCE GATES

4.14.1 General

Where gates are specified or shown on the Drawings, erect them so that they swing away from the road.

At the locations of gates, level the ground or finished surface material over the full area of the arc of the gate opening.

Hang the gates and provide connections and fittings for the type of fencing to be constructed, in accordance with the Drawings.

Gates for fences other than rabbit-proof fences must be installed with a 50 mm gap underneath. Gates for rabbit-proof fences must be installed with a maximum gap of 25 mm underneath and at the sides.

4.14.2 Rural Fencing Gates

Install rural fencing gates suitable for the adjoining fence type. Ensure that they are stock-proof or rabbit-proof to the maximum extent possible.

Gates that form part of a rabbit-proof fence must have securely supported wire netting installed to a height of at least 900 mm above ground level.

4.14.3 Security Fencing Gates

Install security fencing gates in accordance with the requirements of AS 1725.1.

4.15 FLOOD GATES

4.15.1 General

Provide flood gates at the locations and of the types shown on the Drawings.

Make suitable provision at all watercourses to allow for the passage of surface water through the fence.

Flood gates must allow sufficient movement of the suspended part of the gate under the flow of flood waters to prevent damage to the fence and the accumulation of debris against it.

4.15.2 Small Watercourses

At small watercourses, provide flood gates in rural fencing which incorporates netting or fabric. For flood gates in rabbit-proof fencing, ensure that no gaps exceed 25 mm width.

4.15.3 Gullies and Creeks

Construct gully and creek flood gates as shown on the Drawings.

Suspend a 9 mm galvanized steel wire rope over the gully in one span, threaded through a strainer post located on each edge of the gully and tied back to an anchor set in the footing of each adjacent intermediate post.

Incorporate a thimble and wire rope grips to the end connections. Provide turnbuckles at each end to tension the wire rope so that it hangs horizontally.

Suspend wire netting from the wire rope. Fix the netting to the wire rope with tie wire at 200 mm intervals. Overlap adjacent widths of netting at joints and tie them together securely. The netting must be of sufficient length to lie on the ground for a distance of not less than 1 m at the downstream side of the crossing.

Provide ballast, consisting of 150 mm diameter timber and securely fixed to the netting with 40 mm galvanized staples, at the downstream end of the netting.

Stay each strainer post in three directions as shown on the Drawings.

Trim the sides of the gully, as necessary, to ensure that the flood gate is stock-proof, fauna-proof or rabbit-proof, as required.

4.16 STOCK GRIDS

4.16.1 General

Install stock grids at the locations shown on the Drawings. Install warning signs and make any necessary adjustments to the associated fencing.

Where possible, install grids on raised abutments with approach ramps. Construct the abutments and ramps in accordance with the requirements of TfNSW R44. Alternatively, a grid may be placed over an excavated pit. In such case, provide adequate drainage. Dispose of all excavated material.

4.16.2 Bedding

Bed the grid base evenly on a continuous layer of 50 mm thick compacted sand or granular material with a maximum particle size of 5 mm. Compact the bedding material to achieve a relative compaction of not less than 95% as determined by Test Method TfNSW T166.

4.16.3 Crossfall

There must be no crossfall on the grillage for single lane grids. For two lane grids, each half of the grillage must have a crossfall identical to that of the approach road.

4.16.4 Signs

Install sign Type W5-15, W5-16 or W5-32 as appropriate at the approach to a stock grid across a public road in accordance with Specification TfNSW R143.

5 REMOVAL OF EXISTING FENCING AND DISPOSAL OF MATERIAL

5.1 REMOVAL OF EXISTING FENCING

5.1.1 General

Remove existing fencing where shown on the Drawings. Where existing posts are installed in rock, the Principal may approve their removal by neatly cutting off the post at ground level. Remove all traces of netting above and below ground.

5.1.2 Maintain Barrier

Do not remove existing fencing if there is a risk of egress or ingress of stock or vermin.

If the existing fence is a rabbit-proof fence or a fauna exclusion fence, ensure that during the times when work is not being carried out, the whole of the fence remains rabbit-proof or fauna-proof. If necessary and where approved by the Principal, erect temporary fencing to maintain this condition.

You are responsible for any loss, damage or injury to crops, livestock, property or persons caused by non-compliance with this requirement.

5.1.3 Backfill Holes and Trenches

Backfill all holes and trenches left after removal of existing fencing by compacting in layers of 150 mm deep maximum to the relative compaction of the surrounding ground material. Fully reinstate any constructed surface layer material and associated foundation removed or damaged during the removal of existing fencing.

5.2 REMOVAL AND DISPOSAL OF SURPLUS MATERIAL AND RUBBISH

5.2.1 General

In accordance with Clause 4.2.1, neatly stack all materials generated from the removal of existing fencing prior to disposal of the materials off site.

5.2.2 Disposal

Recycle, reuse or otherwise dispose of all surplus material, including offcuts, timber logs, boulders, stumps, roots, undergrowth, rubbish and other debris resulting from the clearing and fencing work, in accordance with the requirements of Specification TfNSW G36.

5.2.3 Preservative-treated Timber

Do not burn preservative-treated timber. Dispose of preservative-treated timber in accordance with the treatment applicator's recommendations.

ANNEXURE R201/A – PROJECT SPECIFIC REQUIREMENTS**A1 MATERIALS AND COMPONENTS**

NOTES TO TENDER DOCUMENTER: (Delete this boxed text after customising Annexure R201/A1)

Complete the tables below by filling in the required details. Refer to the front Guide Notes on Annexure R201/A1 for additional guidance on the details required.

Where “H.T. / L.T.” option (refer Clause 1.3.2 for definition) is shown below, delete whichever is not applicable.

Clause	Description	Standard	Requirement
2.2.1	Steel plate grade	AS/NZS 3678	
	Steel bars and sections grade	AS/NZS 3679.1	
	Steel hollow sections grade	AS 1163	
2.2.3	Galvanised steel sheeting - zinc coating class	AS 1397	
3.2	Steel posts and bracing stays for boundary fencing:		
	Galvanized coating class	AS/NZS 4792	
	Powder coating - Atmospheric classification	AS 4506	
	- Colour		
	- Gloss level		
3.2.1	Security fencing:		
	Fabric height	AS 1725.1 Appendix A2	
	Wire coating		
	Service duty		
	Pipe Class		
	Type and option		
	Powder coating - Atmospheric classification	AS 4506	
	- Colour		
- Gloss level			
3.3.2	Star pickets: coating		
3.5.1	Single strand fencing wire:		
	Tensile strength	AS 2423	H.T. / L.T.
	Diameter		
	Metallic coating		
	Plastic coating - Type		
- Colour			

Clause	Description	Standard	Requirement
3.5.1	Barbed wire:		
	Tensile strength	AS 2423	H.T. / L.T.
	Diameter		
	Metallic coating		
	Plastic coating - Type		
- Colour			
3.5.1	Electric fencing wire:		
	Diameter	AS 2423	
	Metallic coating		
3.5.1	Fencing tie wire:		
	Diameter	AS 2423	
	Metallic coating		
3.5.1	Wire netting:		
	Product designation	AS 2423	
	Metallic coating		
	Plastic coating - Type		
- Colour			
3.5.1	Chain-link fencing fabric:		
	Product designation	AS 2423	
	Metallic coating		
	Plastic coating - Type		
- Colour			
3.5.1	Prefabricated field fencing fabric:		
	Product designation	AS 2423	
	Metallic coating		
3.5.1	Welded mesh fabric:		
	Product designation	AS 2423	
	Metallic coating		
	Plastic coating - Type		
- Colour			

Clause	Description	Standard	Requirement
3.5.1	Heavyweight welded mesh panels:		
	Product designation	AS 2423	
	Metallic coating		
	Powder coating - Atmospheric classification	AS 4506	
	- Colour		
- Gloss level			
3.5.2	Wire strand:		
	Diameter	AS 2841	
	Wire grade		
3.5.3	Wire rope:		
	Diameter	AS 3569	
	Wire grade		

A2 CLEARING FOR RURAL FENCING

NOTES TO TENDER DOCUMENTER: (Delete this boxed text after customising Annexure R201/A2)

Complete the table below by deleting whichever option is not applicable. Refer to the front Guide Notes for guidance on selecting the appropriate option.

Clause	Description	Requirement
4.4.2	Area of clearing required	within 1 m on either side of the fence line / within 1 m on one side and 3 m on the other side of the fence line

A3 OTHER REQUIREMENTS

NOTES TO TENDER DOCUMENTER: (Delete this boxed text after customising Annexure R201/A3)

Insert here any other project specific requirements; otherwise delete the entire clause including the heading title.

ANNEXURE R201/B – MEASUREMENT AND PAYMENT

Payment will be made for all costs associated with completing the work detailed in this Specification in accordance with the following Pay Items.

Where no specific pay items are provided for a particular item of work, the costs associated with that item of work are deemed to be included in the rates and prices generally for the Work Under the Contract.

Unless otherwise specified, a lump sum price for any of these items will not be accepted.

Pay Item R201P1 - Rural Boundary Fencing – Wire Fence

Pay Item.R201P2 - Rural Boundary Fencing – Cattle-proof Fence

Pay Item R201P3 - Rural Boundary Fencing – Rabbit-proof Fence – Netting on Ground

Pay Item R201P4 - Rural Boundary Fencing – Rabbit-proof Fence – Buried Netting

Pay Item R201P5 - Rural Boundary Fencing – Horse Protector Fence

Pay Item R201P6 - Temporary Rural Fencing

Pay Item R201P7 - Urban Boundary Fencing

Pay Item R201P8 - Security Fencing

Pay Item R201P9 - Pedestrian Fencing

Pay Item R201P10 - Rock Fall Fencing

The unit of measurement for Pay Items R201P1 to R201P10 inclusive is the linear metre of fencing erected.

The rate includes all costs associated with:

- (a) supply of all fencing materials required;
- (b) clearing of fence line;
- (c) installation of fence posts either by:
 - (i) excavation and backfilling; or
 - (ii) driving; and
- (d) erection of fencing.

to the details shown on the Drawings

Provide separate rates for each type and size of fence.

Pay Item R201P11 - Electric Fencing Wires

The unit of measurement is the linear metre of electric fencing wire installed on a fence.

The rate includes all costs associated with:

- (a) supply of all materials including insulators and other electric fence components;
- (b) attachment to the fence; and
- (c) commissioning the installation.

Pay Item R201P12 - Excavation and Backfill for Fence Posts in Rock

The unit of measurement is the cubic metre for all types of rock material excavated. Measurement must exclude over-excavation.

The breadth and width or diameter for payment is the lesser of that specified or shown on the Drawings or 0.3 m plus the breadth and width or diameter of the post. The sides of the hole is taken as vertical.

The depth for payment is that specified or shown on the Drawings.

The rate includes all costs associated with the excavation and disposal of rock and supply and placement of mortar or concrete backfill.

Pay Item R201P13 - Removal of Existing Fencing

The unit of measurement is the linear metre of fencing removed.

The rate includes all costs associated with the removal and disposal of existing fencing and supply, placement and compaction of backfill material for the reinstatement of post holes.

Pay Item R201P14 - Rural Fencing Gates

Pay Item R201P15 - Security Fencing Gates

Pay Item R201P16 - Urban Fencing Gates

The unit of measurement for Pay Items R201P14 to R201P16 is “each”.

The rate includes all costs associated with the supply, surface protection and installation of each gate and the associated hinge and latch hardware.

Provide separate rates for each type and size of gate.

Pay Item R201P17 - Flood Gates – Small Watercourse

The unit of measurement is “each”.

The rate includes all costs associated with the supply, surface protection, assembly, excavation, backfilling and compaction of support post holes and installation of each flood gate.

Provide separate rates for each size of flood gate.

Pay Item R201P18 - Flood Gates – Gully and Creek

The unit of measurement is “each”.

The rate includes all costs associated with the supply, surface protection, excavation and backfilling of holes for bracing stays, trimming of the sides of the gully and installation and erection of each flood gate.

Provide separate rates for each size of flood gate.

Pay Item R 201P19 - Stock Grids

The unit of measurement is “each”.

The rate includes all costs associated with:

- (a) supply, surface protection and installation of the stock grid and the supply of associated materials;
- (b) fencing alterations;
- (c) pit excavation, drainage works, the disposal of excavated material and the supply, placement and compaction of fill material for abutment and approach works;
- (d) supply, placement and compaction of bedding material; and
- (e) provision and installation of warning signs.

Provide a separate rate for each nominal opening width of stock grid.

Pay Item R 201P20 - Stockraces

The unit of measurement is “each”.

The rate includes all costs associated with:

- (a) supply, surface protection and installation of the stockrace;
- (b) fencing alterations; and
- (c) provision and installation of scare devices and warning signs.

ANNEXURE R201/C – SCHEDULES OF HOLD POINTS AND IDENTIFIED RECORDS

Refer to Clause 1.2.3.

C1 SCHEDULE OF HOLD POINTS

Clause	Description
3.11	Submission of Certificate of Compliance for materials and components
4.1	Submission of proposed connection arrangement of new fencing to existing fencing
4.4.2	Removal of trees with trunk diameter exceeding 100 mm

C2 SCHEDULE OF IDENTIFIED RECORDS

The records listed below are Identified Records for the purposes of TfNSW Q Annexure Q/E.

Clause	Description of Identified Record
3.11	Certificate of Compliance for materials and components
4.1	Connection arrangement of new fencing to existing fencing

ANNEXURES R201/D TO R201/L – (NOT USED)

ANNEXURE R201/M – REFERENCED DOCUMENTS

Refer to Clause 1.2.6.

TfNSW Specifications

TfNSW G22	Work Health and Safety (Construction Work)
TfNSW G36	Environmental Protection
TfNSW G71	Construction Surveys
TfNSW Q	Quality Management System
TfNSW R44	Earthworks
TfNSW R53	Concrete for General Works
TfNSW R143	Signposting

TfNSW Test Methods

TfNSW T166	Determination of Relative Compaction
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Australian Standards

AS 1074	Steel tubes and tubulars for ordinary service
AS 1111.1	ISO Metric hexagon bolts and screws – Product grade C – Bolts
AS 1112.3	ISO Metric hexagon nuts – Product grade C
AS 1138	Thimbles for wire rope
AS/NZS 1163	Cold-formed structural steel hollow sections
AS/NZS 1214	Hot-dip galvanized coatings on threaded fasteners (ISO metric coarse thread series) (ISO 10684:2004, MOD)
AS 1231	Aluminium and aluminium alloys – Anodic oxidation coatings
AS 1237.1	Plain washers for metric bolts, screws and nuts for general purposes – General plan
AS/NZS 1390	Cup head bolts with ISO metric coarse pitch threads
AS 1397	Continuous hot-dip metallic coated steel sheet and strip – Coatings of zinc and zinc alloyed with aluminium and magnesium
AS/NZS 1554.1	Structural steel welding – Welding of steel structures
AS 1604.1	Specification for preservative treatment – Sawn and round timber
AS 1725.1	Chain link fabric security fencing – Security fences and gates – General requirements
AS/NZS 1734	Aluminium and aluminium alloys – Flat sheet, coiled sheet and plate
AS 2076	Wire rope grips for non-lifting applications
AS 2082	Timber – Hardwood – Visually stress-graded for structural purposes
AS 2319	Rigging screws and turnbuckles
AS 2321	Short-link chain for lifting purposes

AS 2334	Steel nails – metric series
AS 2423	Coated steel wire fencing products for terrestrial, aquatic and general use
AS 2759	Steel wire rope – Use, operation and maintenance
AS 2841	Galvanized steel wire strand
AS/NZS 2878	Timber – Classification into strength groups
AS/NZS 3014	Electrical installations – Electric fences
AS 3569	Steel wire ropes – Product specification
AS 3600	Concrete structures
AS/NZS 3678	Structural steel – Hot-rolled plates, floorplates and slabs
AS/NZS 3679.1	Structural steel – Hot-rolled bars and sections
AS/NZS 3750.9	Paints for steel structures – Organic zinc-rich primer
AS/NZS 3845.2	Road safety barrier systems and devices – Road safety devices
AS 4100	Steel structures
AS 4506	Metal finishing – Thermoset powder coatings
AS/NZS 4534	Zinc and zinc/aluminium alloy coatings on steel wire
AS/NZS 4672.1	Steel prestressing materials – General requirements
AS/NZS 4680	Hot-dip galvanized (zinc) coatings on fabricated ferrous articles
AS/NZS 4792	Hot-dip galvanized (zinc) coatings on ferrous hollow sections, applied by a continuous or a specialized process
AS 5100.2	Bridge design – Design loads
AS/NZS 5131	Structural steelwork – Fabrication and erection
AS 5604	Timber – Natural durability ratings
AS 5605	Guide to the safe use of preservative-treated timber

Safe Work Australia

Code of Practice for the Safe Handling of Timber Preservatives and Treated Timber