

1. PURPOSE

This specification sets out recommended minimum standards for materials and processes used to manufacture powder coated tubular steel security fencing. The specification has been developed to ensure purchasers of this type of fencing receive a product that is fit for purpose, has an extended service life and is aesthetically pleasing. Compliance with this specification will ensure products provided comply with relevant Australian Standards and established industry best practice.

There is no Australian Standard for powder coating tubular steel fencing. As a consequence suppliers in the market can offer fencing materials that vary greatly in terms of the steel tube profile size, the wall thickness (gauge) of the tube, the strength, the design and method of fabrication, the corrosion resistance, the metal pretreatment process used to clean the product and the powder coating regime. These aspects dramatically impact the cost of the fencing materials but also the whole of life cost of the product, including the safety of the product in service. In the absence of an Australian Standard we have developed this pro-forma specification to assist specifiers and to lift and make more uniform the product in the market for various applications.

There are Australian Standards for steel tube, and for powder coating and these are incorporated below.

This specification may be used in conjunction with a separate installation specification which sets the requirement for issues like post footings and clearances of the fence from climbing aids.

The italic paragraphs and notes throughout this document serve to highlight the functional or performance requirement of the product that that particular section of the specification sets out. They may also give the reader some background to the reason for a particular requirement. Purchasers using this specification may wish to delete the italic sections from the document before providing it to potential suppliers.

2. FENCE COMPONENTS

2.1. FENCE PANELS

Panel Length: Maximum 2400mm.

Panel Height: 1800mm or 2100mm.

Pickets: 25mm x 25mm x 1.2mm SHS Crushed Spear with sharp spear profile.

Rails: 40mm x 40mm x 1.6mm SHS.

Picket Spacing: Maximum 140mm Centre to Centre.

Panel Configuration: Vertical pickets are to be inserted through punched rails with each picket welded at the top and bottom, of both the top and bottom rails. The distance between the top side of the top rail and the top of the fence panel, and the bottom side of the bottom rail and the bottom of the fence panel, shall be 150mm.

This 'through rail' configuration provides an inherently stronger configuration because the picket is located neatly within the rail and can better withstand attack. This 140mm picket spacing maximises material usage efficiency while maintaining security characteristics. The length to which the picket

extends beyond the rail is 150mm to avoid the picket ends being prone to attack and minimise foothold height.

2.2. FENCE POSTS

Post: 65mm x 65mm x 1.6mm SHS x 2660mm

Post length: Post shall be sized to suit the height of the fence, expected loads, soil conditions and the footing design of the proposed fence installation. Typically the post shall be no shorter than 2660mm for installations in natural ground.

Posts may be fixed to a hard surface with a 130x130x6mm (min.) base plate welded to the base of the post. Base plate shall be hot dip galvanised after fabrication and then welded to the post.

This post has sufficient strength and rigidity to support standard fence panels. However, for heavier duty applications we would recommend a larger profile section that is stronger.

Post: 65mm x 65mm x 2.5mm SHS x 3000mm long.

2.3. PANEL BRACKETS

A zinc plated steel shroud shall be used to fix the panel to the post. The bracket shall be configured so that it can be fixed in 3 places. One point to fix the bracket to the rail of the panel and two points to fix the bracket to the post.

For heavier duty applications we would recommend a security bracket that will be a lot more vandal resistant and stronger.

A one-piece security bracket shall be used to attach the panel to the post. The bracket shall be manufactured from 3mm thick steel and hot dip galvanised after fabrication. The bracket shall be configured so that it is fixed to the inside of the post wherever possible to increase tamper resistance. The bracket shall also be configured so that it can be fixed in 3 places. One point to fix the bracket to the rail of the panel and two points to fix the bracket to the post.

2.4. GATES

Both Single and Double Gates shall be manufactured to the following specifications noting latch and drop bolt configurations for single and double gates may vary slightly.

Gate Leaf: Maximum 2400mm.

Gate Height: 2100mm.

Picket: 25mm x 25mm x 1.2mm SHS Crushed Spear with rounded top.

Rails: 40mm x 40mm x 1.6mm SHS.

Stiles: 40mm x 40mm x 2mm SHS.

Picket Spacing: Maximum 140mm Centre to Centre

Rail Configuration: Manufactured with a twin bottom rail configuration (3 rails total) with the top rail to be 150mm from top of vertical pickets and the top of the mid rail to be 190mm from the bottom of the gate.

Pickets are welded into punched bottom rail but not protrude through bottom of that rail. Each picket to be welded on both sides of the picket at top and underside of top of all rails. This makes a total of 12 welds per picket.

The two rails of 65mm x 65mm at the bottom of the gate and the welding regime significantly enhance the strength of the gate.

Gate Hinges: Supply and fit gates with two suitably sized ball bearing hinges per leaf (Goliath or equivalent) that can be lubricated. Hinges to be orientated so that the female piece cannot collect water. Hinge to be screwed and/ or bolted to the gate post and gate hinge stile with at least one M8 bolt through the stile and finished with a security (shear nut).

Self closing Hinges: Where a gate is to be self closing it shall be supplied and fitted with a heavy duty hydraulic self closing hinge with adjustable tension (D&D SureClose Readifit or equivalent). The gate shall also be fitted with a gate stop to prevent the gate leaf over-swinging resulting in damage to the hinge. A keeper post shall also be installed perpendicular to the gate opening to prevent the gate leaf being over opened causing damage to the hinge.

There are plastic self closing hinges available in the market that are designed for domestic pool applications. In our experience these are unsuitable for school and playground security fencing applications. The reason being, they are not able to handle the loads applied to the gates in service. Refer to the material risks reference document for examples of these hinges failing. For heavier duty applications we would recommend the following self-closing hinge. The large profile stiles are stronger and allow a heavy duty hinge to be used.

Rails: 65mm x 65mm x 1.6mm SHS.

Stiles: 65mm x 65mm x 2.5mm SHS.

Gate Hinges: Supplied and fitted with a suitably sized grease packed ball bearing hinge at top (that allows adjustment of the level of the gate) and lubricated tapered roller bearing hinge at bottom. Hinges to be screwed with M10 stainless steel screws with anti-tamper drive or bolted through the gate post with a suitably sized bolt. Bolts shall be supplied with anti-tamper 'shear nuts' or similar.

Gate Latch: Gates shall be supplied and fitted with a horizontal slide bolt. The slide bolt shall be lockable using a standard padlock in the open and closed positions and is to be made from 20mm diameter steel. A steel female receiver to suit the slide bolt that is elongated in height is to be screwed and/ or bolted to the latch gate post or adjacent latch stile in the case of a double gate.

Locking the slide bolt in the open position prevents the gate being moved to the closed position and being locked closed. Elongation of the receiver allows for movement in the height of the slide bolt (due to settlement of the gate posts) without making the slide bolt inoperable.

Drop Bolt: Single and/ or double gate leaves to be supplied and fitted with Ø16mm x 500mm long lockable drop bolt that are screwed to the gate latch stile. Drop bolt to be configured such that the drop bolt can not be removed from the guides. The 'flag' or handle of the

drop bolt to be configured so as to not create a climb point over the gate.

Drop Bolt Keeper: A steel drop bolt keeper unit shall be supplied for gates as directed that allows for debris to be easily removed from the keeper. The unit shall be of a design so as to receive both drop bolts in the closed (down) position in the one unit. Ferrules or pipe are not acceptable.

For locations where the slide bolt locking hardware may be used as a climb point over the fence we would recommend perforated metal be fitted to the outside of the gate frame.

Climb Protection: All gate leaves (both leaves of a double gate) will have perforated mesh fitted to the attack side of the gate to prevent use of the slide bolt assembly as a climbing points.

2.5. GATE POSTS

Post Size: The size of the gate post shall be determined by the width of the gate leaf it supports as per the table below. i.e. a 3000mm Double gate is comprised of two (2) 1500mm gate leaves.

Gate Leaf Width	Post Size
Up to 1400mm wide	75x75x3mm SHS 1800mm long
1401mm to 2400mm wide	100 x 100 x 4mm
2401mm to 3000mm wide	100 x 100 x 5mm

Post length: Post shall be sized according to the footing design of the proposed fence installation. Typically the post shall be no shorter than 3000mm for installations in natural ground.

2.6. POST CAPS

All posts are to be capped with galvanised steel caps.

2.7. FASTENERS

Fasteners supplied shall be anti-tamper design. As a minimum 12 gauge teks screws shall be used.

Tek Screws shall comply with AS 3566.1-2002 : Self-drilling screws for the building and construction industries - General requirements and mechanical properties - Class 3 (or better.) Stainless steel rivets shall include a stainless steel mandrel.

3. STEEL

3.1. PRECISION TUBE

Fencing components as per Section 2.1 Panels, 2.2 Posts, 2.4 Gates and 2.5 Keeper Post shall be manufactured using precision tube which complies with the following standards as a minimum:

- AS 1450 – Steel tubes for mechanical purposes - Product Designation AS 1450/C250/ERW; and
- Tube manufactured using strip in accordance with AS 1397 – Steel sheet and strip – Hot-dip zinc-coated or alu/zinc coated - Product Designation AS 1397/G2/Z275.

Precision Tube shall be coated with a light mill oil or solvent for protection during transportation.

Reference to Australian Standards is not sufficient because the standards allows for numerous grades of product including product below current industry standards for fencing. Imported steel may not comply with Australian Standard and can be of significantly inferior quality.

The material specified above has a zinc coating mass of 275g/m² (as denoted by 'Z275') which offers the highest corrosion protection in pre-galvanised steel hollow section (SHS) material. Other materials can have dramatically lower zinc mass coatings making the finished product more exposed to corrosion.

3.2. STRUCTURAL STEEL HOLLOW SECTIONS

Gate Posts as per Section 2.6 shall be manufactured using structural steel sections which comply with the following minimum standards:

- AS 1163 – Structural steel hollow sections – Product Designation AS 1163 C350LO.

Galvanized (zinc coated inside and outside) in accordance with:

- AS 4750-2003 – Electro-galvanised (zinc) coating on ferrous hollow and open sections – Product Designation AS 4750 ZE 50/50; or
- AS 4792 Hot-dip galvanized (zinc) coatings on ferrous hollow sections, applied by a continuous or a specialized process AS 4792 IB 50/50; or
- AS/NZS 4680 Hot-dip galvanized (zinc) coatings on fabricated ferrous articles [Only 150 x 150 x 5mm sections and larger shall be coated using the method].

4. FABRICATION AND ASSOCIATED PROCESSES

4.1. CUTTING

Cuts shall be generally free of sharps and burrs.

4.2. GRINDING

Grinding of fencing components during fabrication shall be kept to minimum. Where grinding of weld zone is required care shall be taken to ensure galvanising is not removed from material surfaces.

4.3. WELDING

All welds are silicone bronze. Note hinges and associated parts may use structural weld electrode as required but they must be galvanised after fabrication to prevent corrosion. Welds are to be formed in neat consistent bead with good penetration. Care should be taken to ensure splatter is minimised during welding and any splatter is removed. Silicone based anti spatters shall not be used.

Silicone bronze is used to reduce damage to the galvanised coating on the SHS and enhance the corrosion resistance of the weld zone. Silicone based anti spatters may lead to de-wetting of the powder resulting in poor powder adhesion to the steel substrate.

5. POWDER COATINGS

5.1. CLEANING AND CHEMICAL PRE-TREATMENT

The following applies for all fencing panels, posts and gates prior to application of the specified coating system. New galvanised surfaces are examined for welding flux residues, light roll forming oils, dirt and grit and other foreign matter, all of which are removed prior to powder coating. Surfaces that show local areas of white storage stain (white rust) or other types of corrosion products are to be rejected. Powder application shall occur within 24 hours of substrate pre-treatment.

Pre-treatment systems are maintained and tested in accordance with AS 4506.2005 Metal finishing - Thermoset powder coatings and the pretreatment chemical supplier's recommendations.

White rust can lead to adhesion problems or out-gassing of the powder coating. Leaving products for more than 24hrs after pretreatment increases the likelihood of coating failure.

5.2. OPTION 1 - STANDARD COATING SYSTEM

This option will consist of a polyester powder coating (or other approved exterior grade powder) in the nominated colour and gloss finish, applied in accordance with AS4506.2005 Table 2.1 Atmospheric Classification C2 – Moderate (Exterior) Medium.

Polyester type coatings are the industry standard in Australia for external finishes and are manufactured extensively in Australia specifically for Australian conditions. Atmospheric Classification C2 covers all installation locations except those in tropical, high marine, industrial or worse environments.

Testing of powder coated products shall be carried in accordance with AS 4506.2005 Section 2 for the stated atmospheric classification. In addition to the requirements of AS 4506 products will be required to:

1. Have minimum thickness of 80 micron; and
2. Achieve 500 hrs Neutral Salt Spray Performance.

The 80 micron thickness specification is higher than the 60 micron minimum specified by AS4506.2005 to ensure consistent colour, gloss and an extended coating life in accordance with industry best practice. 500 hrs Neutral Salt performance is the accepted industry standard for Atmospheric Classification C2 conditions.

5.3. OPTION 2 – ANTI GRAFFITI COATING SYSTEM

The coating will consist of polyurethane anti graffiti powder coating in the nominated colour and gloss finish applied in accordance with AS4506.2005 Table 2.1 Atmospheric Classification C2 – Moderate (Exterior) Medium.

Testing of powder coated products shall be carried in accordance with AS 4506.2005 Section 2 for the stated atmospheric classification. In addition to the requirements of AS 4506 products will be required to:

1. Have minimum thickness of 80 micron; and
2. Achieve 500 hrs Neutral Salt Spray Performance.

This coating allows the ready removal of graffiti by way of a prescribed cleaning process. Using anti-graffiti coatings can significantly reduce the maintenance costs of an installation in graffiti prone areas.

5.4. OPTION 3 – CORROSION PROTECTION COATING SYSTEM

This Coating System can be applied as a primer coat in addition to an Option 1 or Option 2 top coat as directed. A zinc rich epoxy primer is applied to the pre-treated substrate in accordance with AS 4506.2005 Table 2.1 Atmospheric Classification D High Marine / Industrial. Curing (or partial curing) of the zinc rich coating shall be carried out prior to application of the top coat in accordance with the powder coating suppliers recommendations.

Testing of powder coated products shall be carried in accordance with AS 4506.2005 Section 2 for the stated atmospheric classification. In addition to the requirements of AS 4506 products will be required to:

1. Have a minimum thickness of 60 micron for the Zinc Rich Primer coat;
2. Have minimum thickness of 80 micron for Option 1 or Option 2 top coat; and
3. The combined coating system shall achieve 1000 hrs Neutral Salt Spray Performance.

This coating of a zinc rich primer dramatically enhances the corrosion resistance qualities of the product to withstand more corrosive environments like sites in close proximity to large salt water bodies.

6. QUALITY ASSURANCE

6.1. QUALITY MANAGEMENT PLAN

The manufacturer and powder coater shall ensure Quality Management Plan is maintained in respect of the product fabrication and powder coating processes, which includes Inspection and Test Plans (ITP's). The manufacturer may be required to produce copies of relevant ITP to demonstrate compliance with the requirement of this Technical Specification.

6.2. CERTIFICATES OF COMPLIANCE

Certificate of Compliance must be provided by the manufacture and powder coating applicator at the completion of the supply of the materials as follows.

1. A Certificate of Conformance from the manufacturer of the Precision Tube certifying that all Precision Tube meets or exceed the requirements of Section 3.1 – Precision Tube.
2. A Certificate of Conformance from the manufacturer of the Structural Steel Hollow Sections certifying that all Structural Sections meet or exceed the requirements of Section 3.2 – Structural Steel Hollow Sections.
3. A Certificate of Conformance from the powder coat applicator certifying that all coatings meet or exceed the requirements of AS 4506 – 2005 Metal finishing - Thermoset powder coatings and the specific requirements for the specified coating option as per Section 4 of this document.

When considering the voracity of a Certificate of Compliance the purchaser should consider whether or not the party making the statement is reputable, has its own Quality Assurance System ideally certified to be in accordance with ISO 9001, and its relationship to the supplier of the fencing. Consideration should also be given to whether or not materials used are imported.

7. COPYRIGHT

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8. REVISIONS

REV.	DESCRIPTION OF CHANGE	DATE	AUTHORISED BY
A (original)		14/11/08	L. Colquhoun
B	Section 2.3 – add material thickness 3mm	11/6/08	L. Colquhoun
C	Various	11/6/13	S. Belfield