

TS-750-007 Tubular Steel QLD DETA School Fencing Technical Specification.docx

The italicised paragraphs in this proforma specification are notes to the user. The user may wish to delete these sections from the document before using in procurement documents made available to suppliers.

We recommend that this proforma specification is used in conjunction with a separate installation specification that sets out recommended parameters for the installation process such as post footing sizes.

This specification sets out recommended minimum standards for the materials and processes used to manufacture powder coated tubular steel security fencing compliant with the [QLD Department of Education \(DET\) specification](#). This specification has been developed to assist purchasers obtain value for money and manage the material quality risks. More specifically, to receive a product that is fit for purpose, safe, compliant, 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 that addresses the material quality and manufacturing processes of powder coated tubular steel fencing, consisting of a pre-fabricated (welded) panel that connects to a post with a series of brackets and self-drilling tek screws. 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 manage material quality risks.

There is an Australian Standard for the manufacture of steel tube and for powder coating processes and these are incorporated below.

1. FENCE COMPONENTS

1.1. FENCE PANELS

Panel Length:	Maximum 2400mm
Panel Height:	2100mm
Pickets:	25mm x 25mm x 1.6mm SHS with a pressed form sharp spear top profile
Rails:	40mm x 40mm x 2mm SHS
Picket Spacing:	Maximum 123mm 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 is to be 210mm, 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 123mm picket centres provide increased security as compared to an industry norm of 140mm centres.

1.2. FENCE POSTS

Post (natural ground footing): 75mm x 75mm x 3mm. Typically the post shall be no shorter than 3000mm to suit a 2100mm high panel.

Longer posts might be required where the terrain is slopped or where the fence needs to be significantly stepped.

Post (concrete surface): 75mm x 75mm x 3mm. Typically the post shall be no shorter than 2250mm to suit a 2100mm high panel. Posts to have a base plate (flange) welded to the base of the post. The base plate shall be galvanised with the minimum dimensions of 130x130x8mm with a Ø12mm hole in each corner to suit an M10 fastener. The weld zone on the plate should be repaired with a zinc stick or equivalent before powder coating.

1.3. PANEL BRACKETS

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 five (5) places. One point to fix the bracket to the rail of the panel and four points to fix the bracket to the post.

1.4. 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. Drawings are to be provided and approved by the client before manufacture.

Gate opening sizes: 1000mm single gate

2000mm single gate

4000mm double gate

6000mm double gate

Leaf Height: 2100mm

Picket: 25mm x 25mm x 1.6mm SHS with pressed form sharp spear top profile

Rails: 65mm x 65mm x 1.6mm SHS

Gate Stiles: 65mm x 65mm x 2.5mm SHS fitted with steel caps

Picket Spacing: Maximum 123mm Centre to Centre

Rail Configuration: Manufactured with a twin bottom rail configuration (3 rails total) with the top rail to be 210mm 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 above welding regime significantly enhance the strength of the gate. 65mm section is almost 30% stronger as compared to 50mm.

1.5. GATE HINGES

Gate Hinges: Supplied and fitted with a suitably sized grease packed sealed ball bearing in the top hinge assembly. The top assembly shall allow the level of the gate to be easily adjusted. The lower hinge assembly to use a greasable tapered (load bearing) roller bearing hinge. Top and bottom hinge arrangements to be screwed with 4 x 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. The hinge design shall be such that the gate leaf can be swung back on itself 180 degrees from the closed position. Hinges shall not be welded to the gate posts.

The hinge arrangement will also include a safety chain arrangement at top and bottom, connecting the gate post to the hinge stile so as to prevent the gate leaf falling over in case the hinge is caused to fail.

There are light ball bearing hinges (Goliath or equivalent) available in the market but in our experience these are unsuitable for school security fencing applications. The reason being, they are not able to handle the loads applied to the gates in service, for example, students swinging on the gates. If the hinge fails the gate leaf could fall on the child causing serious injury. Ball bearing hinges also do not have the capacity to allow adjustment of the level of the gate.

Self-closing Hinges: Where a single gate is to be self closing it shall be fitted with a set (i.e. master and slave) heavy duty hydraulic self closing hinges with adjustable tension ([D&D SureClose Readifit](#) or equivalent) with "snap close" action. The latch stile of the gate shall also be fitted with a gate stop to prevent the gate leaf over-swinging resulting in potential damage to the hinge. A keeper post shall also be installed to prevent the gate leaf being over opened again causing damage to the hinge.

1.6. LOCKING HARDWARE

Gate Latch: Gates shall be fitted with a Broadhurst locking arrangement positioned 1500mm (nom.) from the bottom of the gate. This arrangement consists of: a steel section welded to the gate frame, two Broadhurst lock boxes welded to this section, and a 20mm diameter steel bar slide bolt with handle. The slide bolt operates between the lock boxes. A shackles lock is positioned inside either lockbox to effect the slide bolt being locked in the open or closed position. The arrangement shall have a female receiver for the slide bolt with an elongated opening for the bolt. The receiver shall be screwed or bolted to the closing post, or the adjacent gate stile in the case of a double gate.

The Broadhurst gate latch system uses a lockbox into which a shackleless lock is inserted and thus protected from attack. Locking in the open position prevents the gate being moved to the closed position and being locked closed. Elongation of the receiver allows for some settlement of the gate.

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- Drop Bolt:** A Ø16mm x 700mm (min.) long drop shall be fitted to double gate leaves. The flag (handle) on the top of the drop bolt shall fit over a locking lug, that is welded to the gate, that allows the drop bolt to be locked in the down position with a standard padlock. The drop bolt will be fitted to two 5mm gauge drop bolt guides welded to the latch stile. The flag (handle) of the drop bolt shall be configured so as to not create a foot climbing point in the down (locked) position from the attack side of the gate.
- Drop Bolt Receiver:** A steel drop bolt receiver unit shall be installed below ground level in closed position to receive the drop bolts. The unit shall be of a design so as to receive both drop bolts in the closed (down) position in the one unit and allow easy clean out of debris. Ferrules or pipe are not acceptable.

For sites with a higher risk of unauthorised entry we recommend the fitting of perforated metal to the attack side of the gate.

- Climb protection:** All gate leaves (both leaves of a double gate) shall have a perforated metal sheet fitted to the attack side of the gate to prevent the use of the locking hardware being used as climbing points. The metal will be made of 1.5mm gauge (min.) pregalvanised mild steel material with 11mm diameter (nom.) holes and trim around the border of the sheet.

1.7. 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 2400mm wide	100 x 100 x 4mm
2401 up to 3000mm wide	150 x 150 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.

- Post length:** Typically the post shall be no shorter than 3000mm to suit a 2100mm high gate for installations in natural ground.

We recommend against using base flanged gate posts and suggest core-drilling the hard surface to install a post in a concrete footing.

1.8. POST CAPS

All posts after installation are to be fitted with a tight fitting steel cap.

1.9. FASTENERS

Brackets shall be fixed to the post using 12gx25mm LG (min.) self-drilling tek screws. The screws shall be of an anti-tamper design such as [PentaForce](#) or equivalent.

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).

2. STEEL

2.1. PRECISION STEEL HOLLOW SECTIONS

The fence panels (uprights and rail), posts and gates (stiles, rails and uprights) in section sizes up to 65x65x2.5mm shall be manufactured using premium grade [GalvaBond® tube supplied by Orrcon Steel](#) or equivalent 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 for moisture protection during transportation and storage.

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.

2.2. STRUCTURAL STEEL HOLLOW SECTIONS

Fencing posts in section sizes greater than 65mm x 65mm x 2.5mm shall be manufactured using [AllGal® tube supplied by Orrcon Steel](#) or equivalent that comply with the following minimum standards:

- AS 1163 – Structural steel hollow sections – Product Designation AS 1163 **C350**LO.

The material specified above has a minimum yield strength of 350mpa (as denoted by 'C350') which makes it suitable for more structural applications.

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.

The steel tube shall have a minimum zinc coating mass of 100 g/m² (combined coating mass inside and out). The steel tube shall be coated with a light mill oil (if being powder coated) for moisture protection during transportation and storage.

2.3. ZM 275 MAXI-TUBE®

We recommend the use of this steel tube material for higher corrosion environments

The tube and pipe supplied shall be manufactured as [ZM 275 MAXI-TUBE®](#). The tube or pipe shall be manufactured from pre-coated steel conforming to the ZM 275 coating class specified in AS1397. The structural tube and pipe must be manufactured in accordance with AS/NZS 1163. The coated steel shall be cold formed and welded into the desired section size using Electric Resistance Welding (ERW). The ERW zone shall be coated by Metal Spray utilising the MAXI-TUBE® Wire alloy material. The zinc coating mass on the steel sheet used to produce the tube shall conform to AS1397 coating class ZM 275. The exterior and interior surface shall have a combined ZM alloy coating weight of 275g/m². The coating mass of 275 g/m² is the total amount for both sides measured by the triple spot test in accordance with AS 1397.

3. FABRICATION AND ASSOCIATED PROCESSES

3.1. CUTTING

Cuts shall be generally free of sharps and burrs.

3.2. 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.

3.3. WELDING

All welds are to be silicone bronze. Note hinges and associated parts may use structural weld electrode as required but they must be zinc plated or 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.

4. POWDER COATINGS

4.1. 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.

4.2. 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.

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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.

4.3. 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.

4.4. 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.

5. QUALITY ASSURANCE

5.1. QUALITY MANAGEMENT PLAN

The manufacturer and powder coater shall ensure a 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.

5.2. 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 2.1 – 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 2.2 – 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.
4. A certificate listing each finished component and the country of manufacture.

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, and its relationship to the supplier of the fencing. Ascertaining the material's country of manufacture greatly increases the purchasers ability to correlate durability issues to both material origins and suppliers quality control.