Technical Specification

Transport and Main Roads Specifications
MRTS79 Fabrication of Aluminium Components

November 2020

Queensland Government

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1 Introduction

This Technical Specification applies to the fabrication of aluminium components for bridges, gantries, roadside furniture, poles and other structures.

> For steel fabrication refer to MRTS78 *Fabrication of Structural Steelwork*.
>
> For stainless steel fabrication refer to MRTS78A *Fabrication of Structural Stainless Steelwork*.

The aim of this Technical Specification is to produce fabricated aluminium which conforms to the specified Engineering Drawings and to ensure the required durability. It describes the materials, supply, welding, finishing and assembly of aluminium components. This Technical Specification is meant for the management of aluminium work which is fabricated within a designated workshop using the following processes:

- Gas Tungsten Arc Welding (GTAW), and/or
- Gas Metal Arc Welding (GMAW).

This Technical Specification shall be read in conjunction with MRTS01 *Introduction to Technical Specifications*, MRTS50 *Specific Quality System Requirements* and other Technical Specifications as appropriate.

This Technical Specification forms part of the Transport and Main Roads Specifications Manual.

> The use of commentary text, such as this, is covered by Clause 16 of MRTS01 *Introduction to Technical Specifications*.

1.1 Registered suppliers

The requirements for the fabrication of aluminium components include the use of registered suppliers. For information regarding these suppliers refer to the department's website, https://www.tmr.qld.gov.au/business-industry/Business-with-us/Approved-products-and-suppliers, or email TMRStructuralMaterials@tmr.qld.gov.au.

> Note the differing submission requirements throughout this Technical Specification. Some approvals (for example, suitability of the welding supervisor) are wholly dealt with through the registration process, some submissions (for example, welding procedures) can be assessed by SCM but signed by the Administrator after receipt of a report or similar, and others (for example, niche project specific requirements) are assessed by the Administrator.

2 Definition of terms

The terms used in this Technical Specification shall be as defined in Clause 2 of MRTS01 *Introduction to Technical Specifications*.

In addition, terms listed in Table 2 are applicable to this Technical Specification.

Table 2 – Definition of terms

Term	Definition
Approved	Approved by the Administrator (this may be on the advice from Structures Construction Materials unit).
ATIC	Australian Technical Infrastructure Committee
business days	Monday to Friday and excluding public holidays.
designer	The Registered Professional Engineer of Queensland (RPEQ) responsible for the design of the component.
Design Criteria	Departmental requirements for design details and methodology, found in different documents depending on application. In this document this refers to *Design Criteria for Bridges and Other Structures*
Engineering Drawings	RPEQ certified drawings as detailed in the Project / Contract drawings.
Fabricator	The supplier of the welded aluminium components.
fasteners	Bolts, nuts and / or washers. These may be as an assembly or as individual components.
NDE	Non-destructive examination
NDT	Non-destructive testing
PQR	Procedure Qualification Record
registered supplier	Prequalified supplier in accordance with departmental registration schemes. In this document this refers to: *Registration Scheme – Suppliers and Products for Bridges and Other Structures*. Registration for certain suppliers is a prerequisite for Administrator approval, not a substitute.
Registration Scheme	The process through which fabricators are assessed as competent to carry out aluminium fabrication.
SCM	Structures Construction Materials unit
WPS	Welding Procedure Specification
WTIA	Welding Technology Institute of Australia, now known as Weld Australia (WA)

3 Referenced documents

Table 3 lists documents referenced in this Technical Specification. The latest revision of the documents shall be used, dates are included when specific clauses have been reference.

Table 3 – Referenced documents

Reference	Title
AS 1231	*Aluminium and aluminium alloys – Anodic oxidation coatings*
AS 1874	*Aluminium and aluminium alloys – Ingots and castings*
AS/NZS 1554.1	*Structural steel welding – Part 1: Welding of steel structures*
AS/NZS 1664.1	*Aluminium structures – Limit state design*
AS/NZS 1665	*Welding of aluminium structures*
AS/NZS 1734	*Aluminium and aluminium alloys – Flat sheet, coiled sheet and plate*

Reference	Title
AS/NZS 1865	*Aluminium and aluminium alloys – Drawn wire, rod, bar and strip*
AS/NZS 1866	*Aluminium and aluminium alloys – Extruded rod bar, solid and hollow shapes*
AS/NZS 1867	*Aluminium and aluminium alloys – Drawn tubes*
AS/NZS ISO 9606.1	*Qualification testing of welders – Fusion welding, Part 1: Steels*
AS/NZS ISO 18273	*Welding consumables – Wire electrodes, wires and rods for welding of aluminium and aluminium alloys – Classification*
ASTM A380 / A380M	*Standard Practice for Cleaning, Descaling and Passivation of Stainless Steel Parts, Equipment, and Systems*
ISO 3506-1	*Fasteners – Mechanical properties of corrosion-resistant stainless steel fasteners*
ISO 3506-2	*Fasteners – Mechanical properties of corrosion-resistant stainless steel fasteners*
MRTS01	*Introduction to Technical Specifications*
MRTS50	*Specific Quality System Requirements*
MRTS78	*Fabrication of Structural Steelwork*
MRTS78A	*Fabrication of Structural Stainless Steelwork*
WTIA Technical Note 2	*Successful Welding of Aluminium*
-	*Registration Scheme: Suppliers and Products for Bridges and Other Structures*

4 Standard test methods

The standard test methods referenced in the applicable materials standards shall be used in this Technical Specification.

Further details of test numbers and test descriptions are given in Clause 4 of MRTS01 *Introduction to Technical Specifications*.

All tests for the purpose of compliance including sampling shall be performed and reported by a National Association of Testing Authorities (NATA) accredited laboratory, whose scope of accreditation encompasses the test method used.

5 Quality system requirements

5.1 Hold Points, Witness Points and Milestones

General requirements for Hold Points, Witness Points and Milestones are specified in Clause 5.2 of MRTS01 *Introduction to Technical Specifications*.

The Hold Points and Milestones applicable to this Technical Specification are summarised in Table 5.1. There are no Witness Points defined.

Table 5.1 – Hold Points, Witness Points and Milestones

Clause	Hold Point	Witness Point	Milestone
7	1. Approval of Fabricator and design approval (where applicable)		Submission of Fabricator's registration certificate and design approval (10 business days)
8.2	2. Approval of welding documentation		Submission of welding documentation (5 business days)
9.2.1	3. Approval of material test certificates		Submission of material test certificates (3 business days)
9.3.2	4. Approval of material test certificates		Submission of material test certificates – fasteners (3 business days)
10.5.4	5. Inspection of butt weld preparations		Inspection request (3 business days)
10.5.5.2, 10.5.6	6. Inspection of completed welding		Inspection request (3 business days)
10.5.6	7. Inspection of completed product in Australia 8. Submission of NDE report		
10.5.7	9. Submission of weld maps		

5.2 Conformance requirements

The conformance requirements which apply to lots of work covered by this Technical Specification are summarised in Table 5.2.

Table 5.2 – Conformance requirements

Clause	Conformance Requirement
10.4	Tolerances
10.5.5	Welding
11.1.1	Coatings

6 Conditions for fabrication of aluminium components

6.1 General

All aluminium components shall be fabricated in accordance with the details shown on the Engineering Drawings and in accordance with this Technical Specification.

6.2 Manufacture by registered suppliers

Aluminium components shall be manufactured only by a registered supplier. Registered suppliers shall comply with the *Registration Scheme: Suppliers and Products for Bridges and Other Structures*.

The Registration Scheme also covers fabricators who are located outside Australia. Other requirements are specified within this Technical Specification.

6.3 New aluminium products

Alternate or innovative product designs which do not comply with the department's Standard Drawings or the Engineering Drawings shall not be used without prior approval from the department. Alternative product designs shall comply with the Design Criteria, this Technical Specification and other relevant Technical Specifications. Supply of product to alternative designs shall not occur without prior approval of the Administrator.

Alternative product designs for products covered by Standard Drawings or other innovative products shall be submitted to the relevant section of the department's Engineering and Technology Branch for consideration and approval by the relevant Deputy Chief Engineer. All product details, including welding details, shall be provided.

Where innovative products are proposed, it should be noted that the department has a strategy document on engineering innovation.

Note that approval of an alternate or proprietary design by Engineering and Technology Branch, and the approval to supply an alternative product by the Administrator are separate processes. The former is, however, a prerequisite of the latter.

With respect to intellectual property, the department has and always will respect manufacturers' intellectual property. However, it is considered necessary for all details of the product purchased by the department to be provided. These details shall not be provided to any third party.

Note: Any confidentiality document or formal agreement required would need to be negotiated between Transport and Main Roads' Legal Services and the manufacturer.

7 Prior to commencing fabrication

No fewer than 10 business days **Milestone** prior to the start of fabrication, the Contractor shall supply to the Administrator a copy of the nominated Fabricator's registration certificate and any design approvals for proprietary products where applicable. **Hold Point 1**

8 Welding

8.1 General

As a minimum, welding carried out under this Technical Specification shall be Weld Category B in accordance with AS/NZS 1665 and WTIA Technical Note 2 *Successful Welding of Aluminium*. Any requirement above Weld Category B shall be noted on the drawings.

Welding consumables shall be compatible with the parent material and shall have a classification and designation in accordance with the provisions of AS/NZS ISO 18273.

8.2 Welding documentation

No fewer than five business days prior to the start of fabrication, the Contractor shall supply the following to the Administrator: **Milestone**

a) a copy of the Welding Procedure Specification (WPS)

b) the corresponding Procedure Qualification Record (PQR)

c) macro test results for the welding staff for each submitted WPS, refer to Clause 10.5.3

d) welding wire batch certificate, and

e) a draft weld map (refer to Clause 10.5.7) to show where the WPS will be used.

The WPS shall be in accordance with AS/NZS 1665. The macro test reports shall be NATA-endorsed.

The WPS shall reflect the connection to be welded shown on the Engineering Drawings.

Welding shall not be carried out until the above documentation has been approved by the Administrator. **Hold Point 2**

> AS/NZS 1665, Appendix D and AS/NZS 1554.1, Appendix C show typical forms for welding procedures. The WPS outlines the way the welded joint needs to be prepared, the welding parameters and the run sequence for the placement of the welds.
>
> Transport and Main Roads – SCM unit can assist with the review of this documentation if the Administrator is unsure of the technical requirements. A copy of the Engineering Drawings is required to undertake this review.

9 Materials

9.1 General

The grade of the aluminium shall be as shown on the Engineering Drawings.

9.2 Aluminium sections

9.2.1 Material test certificates

No fewer than three business days prior to the start of fabrication, the Contractor shall supply a copy of the material test certificate for the material used in the fabrication. **Milestone**

Fabrication shall not commence until the Administrator has reviewed and Approved the following: **Hold Point 3**

a) a conforming material test certificate

b) material testing results as appropriate, and

c) a location map showing where the material can be found on the Engineering Drawings.

The material test certificate shall show the full chemical composition and the mechanical properties of the material, including yield, tensile and elongation results.

Third-party certification can be undertaken by an independent party for product conformity assessment. The certifying body shall be acceptable to the department. The certification will be carried out on the manufacturer of the raw material.

Material test or testing certificates are still required to prove traceability.

The submission of the material test certificates was introduced as it was found that some merchants were sourcing material which did not comply with the relevant Australian Standards.

The following are examples of the documents which could be submitted:

Option 1	Option 2
Conforming material test certificate	Material testing results
A location map showing material location	A location map showing material location

Transport and Main Roads – SCM unit can assist with the review of this documentation if the Administrator is unsure of the technical requirements. A copy of the Engineering Drawings is required to undertake this review.

If material test certificates are not available, sample testing shall comply with the requirements of Clause 9.2.1.1.

If the material specified on the Engineering Drawings is not available, it shall be raised with the designer or their nominated representative to be resolved prior to the commencement of fabrication.

9.2.1.1 Sample testing

If testing is needed, then the following sampling conditions must be completed:

- a minimum of one test per size and grade, or
- 2% of the material of the same size and grade.

The sample tests shall be in accordance with the appropriate Australian Standard, stating the full chemical composition and mechanical test results, including yield, tensile and elongation tests. The results shall be NATA-endorsed. The sample tests shall be at no expense to the Principal.

9.2.2 Relevant Australian Standards

The grade and applicable Australian Standard for the aluminium and/or the manufacturer's part number for fittings shall be as shown in the Engineering Drawings.

Aluminium shall comply with the requirements of the following Standards:

- AS 1874 *Aluminium and aluminium alloys – Ingots and castings*
- AS/NZS 1734 *Aluminium and aluminium alloys – Flat sheet, coiled sheet and plate*
- AS/NZS 1865 *Aluminium and aluminium alloys – Drawn wire, rod, bar and strip*
- AS/NZS 1866 *Aluminium and aluminium alloys – Extruded rod bar, solid and hollow shapes*
- AS/NZS 1867 *Aluminium and aluminium alloys – Drawn tubes*

The Australian Standards noted above are the most commonly used for the supply of aluminium. Other Australian Standards may be used in the fabrication of the product if these are noted on Engineering Drawings.

9.2.3 Traceability of material

The Fabricator shall ensure there is traceability between the material test certificates and the material being used in the product. The Contractor shall demonstrate the method of traceability to the satisfaction of the Administrator.

If traceability cannot be established, then the material shall be tested by a NATA laboratory accredited for the appropriate testing. The results shall show the full chemical composition and the mechanical testing results, including yield, tensile and elongation tests. The sampling rate and number of tests shall be in accordance with Clause 9.2.1.1.

9.3 Fasteners

9.3.1 General

Bolts shall be stainless steel designation A4, nuts shall be designation A2-70, and washers shall be Grade 316 (UNS S31600), unless noted otherwise on the Engineering Drawings.

For easy reference, stainless steel bolts designated as A4 are approximately equivalent to Grade 316 (UNS S31600) and stainless steel nuts designated as A2-70 are Grade 304 (UNS S30400).

Bolts and nuts shall have ISO coarse pitch metric rolled thread.

All fasteners (bolts, nuts and washers) shall be either electro-polished or passivated in accordance with ASTM A380.

Fasteners shall be isolated from the aluminium when installed.

9.3.2 Fastener documentation

No fewer than three business days prior to the start of fabrication, the Contractor shall supply a copy of the material test certificates for the fasteners. **Milestone**

Assembly or installation shall not commence until the Administrator has reviewed and Approved the material test certificates for the fasteners. **Hold Point 4**

The material test certificate shall show the full chemical composition and mechanical properties of the material, including yield, tensile and elongation results.

9.3.3 Relevant Standards

Bolts and nuts shall comply with the requirements of the following Standards:

- ISO 3506-1 *Fasteners – Mechanical properties of corrosion-resistant stainless steel fasteners*
- ISO 3506-2 *Fasteners – Mechanical properties of corrosion-resistant stainless steel fasteners.*

9.3.4 Traceability of material

The Fabricator shall ensure there is traceability between the material test certificates and the fasteners being used in the product. The Contractor shall demonstrate the method of traceability to the satisfaction of the Administrator.

10 Fabrication

10.1 General

All aluminium components shall be fabricated in accordance with AS/NZS 1664.1 and AS/NZS 1665.

> The WTIA Technical Note 2 has useful information about the fabrication of aluminium.

10.2 Handling and storage of aluminium components

All aluminium fabrication shall be undertaken in a separate building to carbon steel unless Approved by the Administrator. The assessment of the workshop suitability is carried out during the Fabricator registration process.

Aluminium material shall not be stored in contact with carbon steel. Aluminium shall be stored in an area which is free from contaminants such as oil, grease or water and including the potential for condensation.

Tools used to fabricate or assemble aluminium components shall be dedicated tools for aluminium work. Tools previously used on carbon steel shall not be used for aluminium work.

Marking of aluminium must not be undertaken with a sharp object or a lead pencil.

10.3 Section processing

10.3.1 Cutting and edge preparation of aluminium sections

All material shall be cut to the required length as outlined by Clause 6.2 of AS/NZS 1664.1, and Clause 5.1.2 of AS/NZS 1665.

Oxygen-acetylene (flame) cutting is not a permitted cutting process.

Mechanical cutting may be used with the appropriate oil free lubricant.

All edges of material which will be welded shall be prepared as outlined by Clause 5.1.2 of AS/NZS 1665.

The edges of a welded section shall be cleaned of any moisture or greases with a non-residual solvent just prior to welding and not exceeding six hours.

10.3.2 Holes

All circular holes shall be drilled. Punching of holes is not permitted.

Slotted holes shall be machine cut or formed by drilling two adjacent holes and completed by hand cutting between the holes.

All holes shall be finished accurately to size and in the position shown on the Engineering Drawings. All holes shall be cleaned of all burrs and rough edges.

The axis of the hole shall be at right angles to the surface where the hole was originated, unless shown otherwise on the Engineering Drawings.

10.3.3 Bending of plate or sheet

Prior to bending, any rough edges shall be smoothed by grinding to reduce the chance of the material cracking or splitting.

Bending of plate or sheet shall be carried out in a press brake with a round die to produce a straight bend. The surfaces of the die shall be clean so that the plate will not be scratched or pick up contaminants.

There shall be no distortion in the adjacent flat surfaces as a result of the bending process.

10.3.4 Rolling of plate or sheet

Prior to rolling, any rough edges shall be smoothed by grinding to reduce the chance of the material cracking or splitting.

The surfaces of the rollers shall be clean so that the plate will not be scratched or pick up contaminants.

10.4 Tolerances

10.4.1 General

Tolerances shall comply with the requirements of Clauses 10.4.2 or 10.4.3, as applicable.

10.4.2 Bridge traffic barrier and balustrade

The tolerances listed in Table 10.4.2 shall apply to aluminium bridge traffic barrier and balustrade.

Table 10.4.2 – Tolerances for aluminium fabrication

Location	Tolerance
Length of rails and balustrade	±2 mm
Height of posts	±2 mm
Centre of holes	±2 mm
Finished height of balustrade	±2 mm
Bow in rail and balustrade	1 mm / m

10.4.3 Components other than bridge barrier

Unless specified otherwise on the Engineering Drawings the fabrication tolerances shall be ±2 mm.

10.5 Welding

10.5.1 General

Welding shall be carried out in accordance with AS/NZS 1665 except as amended by Clauses 10.5.1, 10.5.2, 10.5.3, 10.5.5, 10.5.6 and 10.5.7 of this Technical Specification.

Where welding is undertaken outside Australia, all the clauses shall be complied with unless modified with the relevant additional clauses in this Technical Specification.

10.5.1.1 Administrator supervision for fabrication outside Australia

All fabrication shall be overseen by the Administrator or their representative who conforms to the following requirements (at the Contractor's expense):

- Clause 4.5.2 (a) or (b) of AS/NZS 1665
- has a culturally different background to the country where the fabrication is being undertaken.

10.5.2 Welding supervisor

All work shall be carried out under the supervision of a welding supervisor who conforms to at least one of the requirements of Clause 4.5.2 (a) to (f) of AS/NZS 1665.

The nominated welding supervisor shall be physically present in the workshop or factory office during all welding processes, including tack welding.

The welding supervisor's qualifications and competency shall be assessed through the Registration Scheme.

> The welding supervisor is responsible for the daily supervision of fabrication.
>
> The inspections undertaken by the Administrator does not mitigate the responsibility of the welding supervisor.

10.5.2.1 Welding supervision for fabrication outside Australia

All work shall be carried out under the supervision of a welding supervisor who conforms to one of the requirements of Clause 4.5.2(a) of AS/NZS 1665.

10.5.3 Welding personnel

All welding personnel shall comply with the qualification requirement (a) of Clause 4.5.3 of AS/NZS 1665.

After the initial qualification, all welding personnel shall undertake a macro test on a 12-monthly basis. The macros shall be for each welding procedure specification used on Transport and Main Roads projects.

Welder qualification to AS/NZS ISO 9606.1 is not acceptable.

Welding personnel nominated to carry out welding for Transport and Main Roads shall be assessed and approved under the Registration Scheme.

Transport and Main Roads reserves the right to withdraw a welder's approval if the welding is below the minimum requirements outlined in AS/NZS 1665.

> All welding personnel require a minimum trade qualification as outlined by the Registration Scheme.

10.5.3.1 Welding personnel (robot welder)

All welding undertaken by a robot welder shall comply with the qualification requirement (a) of Clause 4.5.3 of AS/NZS 1665.

After initial qualification the robot welder shall undertake a macro test on a 12-monthly basis. The macros shall be for each WPS used on Transport and Main Roads projects.

Transport and Main Roads reserves the right to withdraw approval of the robot welder if the welding is below the minimum requirements outlined in AS/NZS 1665.

10.5.4 Butt welding preparation

No fewer than three business days **Milestone** prior to welding commencing on any butt welded connection, the Contractor shall notify the Administrator that the joint is ready for inspection. The Administrator shall ensure the butt weld preparation has been assembled in accordance with the approved WPS, including bevel angle and root gap. **Hold Point 5**

If the joint does not comply with the details on the WPS, the Fabricator shall either:

a) modify the aluminium so the joint complies with the WPS, or

b) develop and test a PQR with the new joint details, then qualify the necessary welding staff to the subsequent WPS in accordance with Clause 10.5.3.

This clause was added to the Technical Specification as some Fabricators had not prepared the butt weld joint in accordance with the drawings and WPS requirements. Some Fabricators did not understand the welding symbols or thought the joint was over-designed and did not require the weld type specified. This problem has been reduced with the inclusion of this Hold Point and the implementation of the Registered Suppliers List.

This Hold Point may take place at several stages during the fabrication process.

Transport and Main Roads – SCM unit can assist with this inspection if the Administrator is unsure of the technical requirements. A copy of the Engineering Drawings and the WPS are required to undertake this inspection.

10.5.5 Completed welds

10.5.5.1 Quality of welds

Permissible levels of imperfection in fillet and butt welds shall conform to weld Category B as defined in AS/NZS 1665.

10.5.5.2 Inspection of welding

No fewer than three business days **Milestone** prior to items being sent for protective coating, the Contractor shall notify the Administrator that the completed welds are ready for inspection.

The Fabricator shall ensure the welded items are positioned so they can be inspected; that is, stacking of items that restricts visibility of completed welds is not permitted. All welds shall pass a visual inspection by the Administrator prior to coating. **Hold Point 6**

Additional testing, that is, non-destructive examination, shall be either outlined on the Engineering Drawings or at the request of the Administrator.

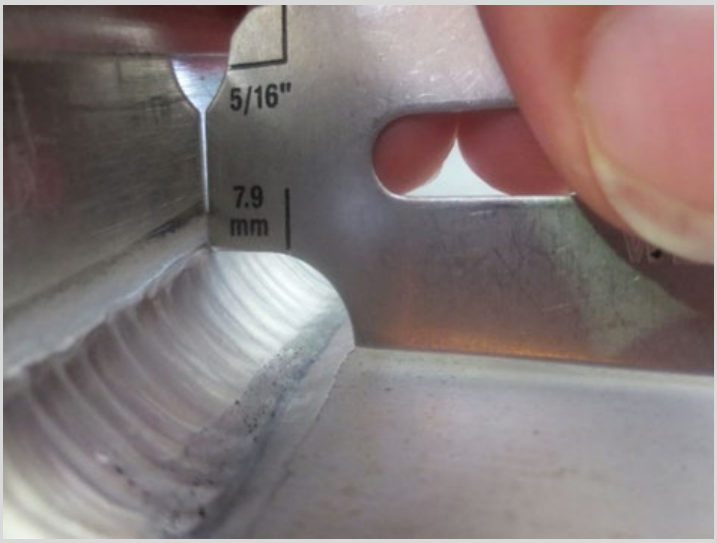
Any minor welding defects identified shall be repaired prior to the application of the protective coating. Any suspected major welding defects shall be tested with a suitable non-destructive test.

The inspection in this Clause is to ensure the welds are the correct size and free from visible welding defects.

This Hold Point may take place at several stages during the fabrication process.

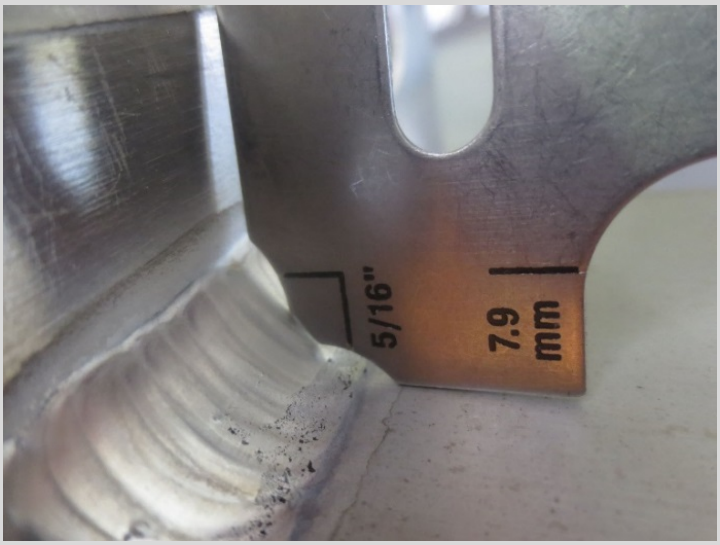
Transport and Main Roads – SCM unit can assist with this inspection if the Administrator is unsure of the technical requirements. A copy of the Engineering Drawings is required to undertake this inspection.

Figure 10.5.5.2(a) – Fillet weld leg length



The weld fillet gauge verifies the weld leg length is the correct size. Figure 10.5.5.2(a) shows the leg length on the vertical face is 8 mm (7.9 mm).

Figure 10.5.5.2(b) – Fillet weld throat thickness



The weld fillet gauge also verifies the weld throat thickness is the correct size. Figure 10.5.5.2(b) shows the throat thickness is compliant with the requirements of an 8 mm (7.9 mm) fillet weld.

A potential defect with aluminium is lack of fusion. An issue found on a major project in Brisbane was the lack of fusion of some base plates to posts on pedestrian rail.

Figure 10.5.5.2(c) shows where the post separated from the base plate. The outline of the weld can be seen, but this weld did not fuse with the base plate. This is due to poor welding technique.

Figure 10.5.5.2(c) – Welding defect (lack of fusion)

Figure 10.5.5.2(d) – Welding defect (lack of fusion)

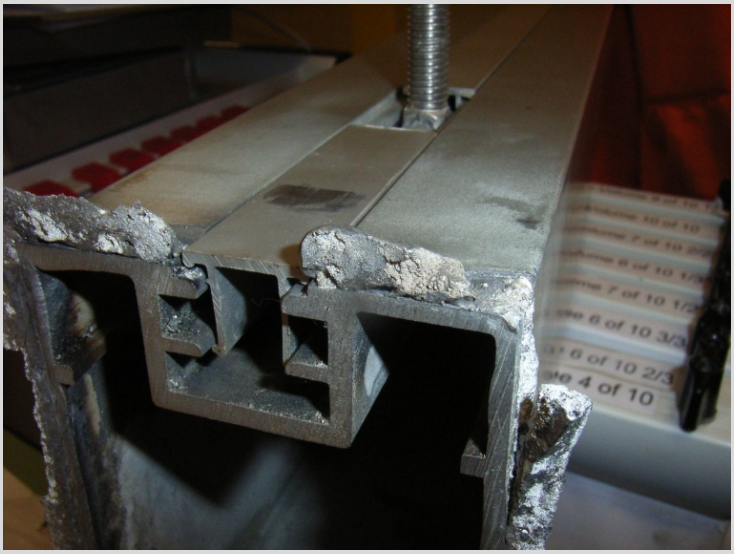


Figure 10.5.5.2(d) shows the post and the residual weld metal.

10.5.6 Inspection of welding for fabrication outside Australia

No fewer than three working days **Milestone** prior to items being transported to Australia, the Contractor shall notify the Administrator that the completed welds are ready for inspection.

The Fabricator shall ensure welded items are positioned so they can be inspected; that is, stacking of items that restricts the visibility of completed welds is not permitted. All welds shall pass a visual inspection by the Administrator prior to coating. **Hold Point 6**

Any minor welding defects identified by the Inspector shall be repaired prior to the application of the protective coating. Any suspected major welding defects shall be tested with a suitable non-destructive test.

All fabricated products shall also be inspected by the Administrator in Australia at a location nominated by the Administrator prior to the application of the protective coating. **Hold Point 7**

All welding shall have the following non-destructive examination undertaken:

- minimum 50% of all butt welds shall be ultrasonically tested, and
- minimum 50% of all fillet welds dye penetrant tested.

If any welds are found to be non-compliant, then 100% of all welds shall be tested.

Transport and Main Roads reserves the right to increase the minimum level of non-destructive examination.

Non-destructive examination shall be carried out by a suitably qualified person. The examination report shall be NATA-endorsed.

Any welding defects found either during the inspection or testing shall be repaired by a registered Fabricator prior to the application of the protective coating.

The Contractor shall submit the non-destructive examination reports for review. **Hold Point 8**

> The requirement to inspect all welded products in Australia prior to protective coating is to ensure the non-destructive examination (visual and ultrasonic) can be successfully carried out. Any defects can then be easily repaired.

10.5.7 Weld maps

Once the welding has been completed, the Fabricator shall provide a weld map outlining the welding undertaken in the manufacture of the aluminium components. The weld map shall outline, for each connection, the following:

- WPS number used
- welder's initials (or welder ID) and date welded, and
- nominated welding supervisor's initials (or welder ID) and date inspected.

The weld maps shall be submitted to the Administrator for approval prior to the aluminium product being released for protective coating. **Hold Point 9**

A table or legend shall be made available if requested to identify the welder's full name and corresponding initials or welder ID.

It is important to record which staff member welded a joint and which staff member checked that joint, as a part of the conformance documentation.

This Hold Point may take place at several stages during the fabrication process, depending on the method the Fabricator uses. The weld map template is reviewed during the supplier audit process.

Transport and Main Roads – SCM unit can assist with the review of this documentation if the Administrator is unsure of the technical requirements. A copy of the weld map, WPS and macro test results are required to undertake this review.

11 Protective coating

11.1 Aluminium products

11.1.1 Bridge barriers, balustrades and rails

All fabricated aluminium bridge barriers, balustrade and rails shall be clear anodised in accordance with the requirements of AS 1231. The coating thickness designation shall be AS 1231 AA25.

All anodised aluminium components shall be subject to the following special conditions:

a) no repairs to the anodised coating shall be made

b) the use of power-operated sanding tools or grinders shall not be permitted

c) all items shall be dressed free of all lumps, spikes and other protrusions, and

d) ash and dross marks shall be removed.

The anodising is applied to aluminium items once the fabrication is complete. The anodising increases both corrosion and wear resistance.

11.1.2 All other components

Aluminium components other than those in Clause 11.1.1 shall be coated in accordance with the details shown on the Engineering Drawings.

11.2 Aluminium and concrete interface

Any aluminium surface which interacts with a concrete surface shall be painted with two coats of a zinc chromate primer in accordance with manufacturer's requirements.

This may include, but is not limited to, the bottom surface of a post or stanchion base plate.

The reaction between aluminium and concrete produces hydrogen gas. The zinc chromate primer is used to isolate the aluminium from the concrete.

12 Transportation and installation

Handling, transportation and installation of the anodised products shall be carried out so to avoid surface damage.

12.1 Bolt tensioning

Bolts and nuts shall be tightened to the manufacturer's recommended torque requirement using an appropriate torque wrench.

Nuts shall be lubricated with a nickel-based, anti-seize lubricant subject to the approval of the Administrator. The anti-seize compound shall be serviceable up to 80ºC and UV stable. Anti-seize compounds containing graphite or other elemental carbon shall not be used.

Some anti-seize compounds designated as marine grade contain graphite and are not suitable for use with stainless steel.

12.2 Washing requirements

Fabricated items coated to AS 1231 AA25 shall be washed at intervals in accordance with Appendix H, Table H1 of AS 1231.