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WAROONA COMMUNITY PRECINCT, BIG SHED
SOUTH WESTERN HIGHWAY, WAROONA 6215

STEELWORK SPECIFICATION
SPEC-ST-002

Project Reference Number 24-151

Revision – A

Document Control			FORTH Consulting		
WAROONA COMMUNITY PRECINCT, BIG SHED – STRUCTURAL STEELWORK SPECIFICATION					
Rev No	Date	Revision Details	Authors	Verifier	Approver
A	11/02/2025	Issued for Tender and CDC	MJG	MJG	MJG

Contents

1.1 GENERAL

The Contractor shall be responsible for the supply, fabrication shop drawings, fabrication shop assembly, delivery and erection of all structural steelwork, bolts, holding down bolts, wedges, erection, cleats and bracing, etc. as shown on the drawings or as herein specified.

This Specification shall be read in conjunction with the structural drawings and the Structural Steel Fabricator shall study Architectural and Engineering Drawings thoroughly before tendering. Unless specified, all steelwork materials, construction, fabrication and erection shall be in accordance with AS 4100 and for cold formed steel AS 4600.

1.2 SHOP DRAWINGS

The name of the proposed Shop Drawing Company is to be submitted to the Superintendent for approval prior to work commencing.

The Contractor shall submit to the Superintendent for examination, comprehensive shop and construction drawings with notes and/or specification, (herein after in the Clause called "the documents" which are necessary for the proper carrying out of the works).

Before submitting these documents to the Superintendent, the Contractor shall satisfy himself that the work covered by these documents complies with the requirements of the contract.

The Contractor shall not manufacture, stockpile, supply or assemble anything affected by these documents until he has received approval back from the Superintendent and Engineer. Allow 14 working days for review of shop drawings after each packaged submission. Packages of submitted shop drawings (if produced) must be submitted in a logical sequence with sufficient supporting information and time allowances to facilitate the review.

The Superintendent and Engineer will examine the documents, and examination of these documents indicates the opinion that the Contractor's interpretation of the contract requirements is generally satisfactory. Such examination shall not relieve the Contractor of his contractual obligations nor of his responsibility of ensuring that the works are complete, accurate and correct.

Where amendments to the drawings are necessary, the amendments shall be promptly made, the three copies shall again be submitted by the Contractor to the Superintendent.

Submit shop drawings showing the following information:

- Relevant details of each assembly, component, and connection.
- Information relative to fabrication, surface treatment, transport, and erection.
- Identification.
- Steel type and grade.
- Dimensions of items.
- Required camber, where applicable.
- Fabrication methods including, where applicable, hot, or cold forming and post weld heat treatment.
- Location, type and size of welds and/or bolts and bolt holes.

- Weld categories and bolting categories.

- Orientation of members.
- Surface preparation methods and coating system if shop applied.
- Best practice details in relation to application of protective coatings.
- Breather holes for hollow sections (with seal plates) being hot-dip galvanized.
- Procedures necessary for shop and site assembly, and erection.
- Location of and preparation for site welds.
- Temporary works such as lifting lugs, support points, temporary cleats and bracing which are required for transport and erection of the structural steelwork.
- Required fixings for adjoining building elements.

1.3 MATERIALS

All materials used shall comply with the latest relevant Australian Codes and any subsequent amendments thereto.

1.4 STEEL TYPE AND GRADE

Material

Conformance: Steel members and sections shall conform to the **Steel grade (minimum) table** and or the **Steel grade schedule**.

Steel grade (minimum) table

Type of steel	**Grade**
Universal beams and columns, parallel flange channels, large angles to AS/NZS 3679.1	300
Flat, small angles, taper flange beams and columns to AS/NZS 3679.1	300
Welded sections to AS/NZS 3679.2	300
Hot rolled plates, floor plates and slabs to AS/NZS 3678	300
Hollow sections to AS 1163: - Steel pipe for fence posts - Sections other than the above	 C250/C350 C350/C450
Cold formed purlins and girts to AS 1397	G450 Z350

1.5 CONSTRUCTION CATEGORY

The steelwork for this project shall be fabricated to construction category CC3 and in accordance with AS/NZS 5131 Structural Steelwork – Fabrication and erection.

The construction categories are as outlined in the technical framework of the National Structural Steelwork Compliance System (NSSCS)

1.6 CODES

All work shall comply with the AS 4100 Steel Structural Code.

Where relevant, work shall also comply with the following Codes:

AS 1111	ISO Metric Hexagon Commercial Bolts and Screws
AS 1252	ISO High Strength Steel Bolts
AS 3828	Guidelines for the erection of building steelwork
AS/NZS 4600	SAA Cold-formed Steel Structures
AS 1554	SAA Code for Welding in Buildings
AS/NZS 4680	Hot dip galvanised coatings on fabricated ferrous articles
AS/NZS 2312	Guide to the protection of structural steel against atmospheric corrosion by the use of protective coatings

Reference in this Specification of specific clauses of the various codes is intended to highlight those points and shall not be taken to imply a lesser importance for all other applicable clauses.

1.7 FIELD BOLTING

Commercial Bolts shall be in accordance with AS 1111, i.e. Grade 4.6.

High Strength Bolts shall be in accordance with AS 1252, i.e. Grade 8.8.

All bolted joints in structural steelwork shall be made with Grade 8.8/S bolts (snug tight) unless noted otherwise on the drawings. Purlins and girt bolting shall be in accordance with manufacturer's specifications and recommendations unless noted otherwise on the drawings.

For connections not shown on the drawings provide 10mm plates, 6m continuous fillet welds and 2-M20/8.8 Bolts.

All bolts shall have at least one full thread exposed beyond the nut after tightening.

All nuts, bolts and washers to be hot dip galvanised, corrosion free, coated in oil and in serviceable condition. Washers shall be of sufficient size to ensure compatibility with the bolt hole diameter in all situations.

1.8 BOLTS - CERTIFICATION

The Contractor is required to provide certification that all bolts used in the Project meet the requirements of the relevant Australian Standard and that the necessary testing to ensure compliance has been carried out.

1.9 REJECTIONS

Defective material or workmanship, found at any time prior to the final acceptance of the work, shall be liable to rejection. Inspection does not relieve the Contractor from responsibility.

Defective material shall be removed and replaced by the Contractor at his own expense and he shall also be responsible for all delay caused by the rejection.

The Contractor shall, after having had any material or work rejected repair or replace same without delay.

1.10 SUPPLY AND FABRICATION

No extra will be allowed on steelwork due to substitutions and/or imported steel. The Contractor shall satisfy himself that the necessary material is available and shall also accept responsibility for any substitutions, either in section or imported steel.

Orders for steelwork must be placed with an approved firm within seven (7) days of the signing of the Contract.

All steelwork must be of the sections and dimensions shown on the Drawings and assembled on the job in accordance with the Drawings.

Raised markings, where exposed to be ground off to finish smooth. The several pieces forming one built-up member shall be straight and fit closely together, be free from twists bends or open joints.

1.11 WELDING

All welding shall conform to the requirements of AS 1554. Only certified welders shall be engaged in welding.

All welding procedures shall be the responsibility of the Contractor and shall be such as to minimise distortion or restraint. Upon request by the Superintendent, the Contractor shall submit for approval details of any one or all welding procedures. Approval by the Superintendent shall not relieve the Contractor of his responsibility for the suitability of any welding procedure and for the unsatisfactory execution of the work.

Electrodes shall conform to the requirements of AS 1552 and AS 1553.

Immediately after opening a new packet of electrodes, they shall be transferred into a portable drying oven where they shall be kept at the temperature recommended by the Manufacturer. Electrodes which have been exposed to weather and especially to atmospheric moisture shall be discarded. Low hydrogen electrodes shall be kept in their sealed packets until time of actual welding.

Automatic welding procedures and electrode wire shall be of a quality exceeding the requirements for weld quality specified herein.

Welding plant and equipment shall be in accordance with AS 1966. Welds shall be thoroughly chipped to remove slag and shall be the full size specified and/or shown.

Unless otherwise shown, all fillet welds shall be continuous welds. Intermittent welds will not be permitted, unless the spaces between continuously seal welded.

Unless otherwise shown, all butt welds shall be qualified complete penetration butt welds and, where possible, shall be double V butt welds.

Welding shall be employed on those parts of the building where shown on the detail drawings. The minimum size shall be 6mm fillet weld. Profile weld all connections. All welding shall be executed by competent and reliable operators. All visible fillet welds are to be neatly executed shop welds.

1.12 WORKMANSHIP

All work shall be done in a neat, substantial and workmanlike manner conforming to the best practices as set out in AS 4100. The decision of the Superintendent shall be final as to what constitutes 'Substantial and Workmanlike'.

1.13 INSPECTION

The Superintendent or his authorised representative shall have access and give notice at all reasonable times where fabrication is carried out and the Contractor shall provide all necessary facilities for inspection during construction. Should the presence of faulty workmanship be suspected, the Contractor will be directed to cut out the parts affected and remove them for examination and testing.

The Contractor shall carry out all such cutting and dismantling and making good to the approval of the Superintendent. Should faulty workmanship and/or materials be disclosed by inspection or test, the cost of dismantling, cutting out and making good shall be borne by the Contractor.

The Contractor shall allow in his price for X-Ray and Ultra-sonic inspection of welding as required by the Superintendent or his representative. In the absence of specific requirements, refer to the table below.

Non destructive weld examination to AS/NZS 1554.1 and as per below table.

Type of weld and category	**Examination method**	**Extent (% of total length of weld type)**
Shop Fillet welds	Visual inspection	50
All Site welds, SP	Visual inspection	100
All Butt welds, SP	Visual inspection	100
	Radiographic or ultrasonic inspection	10

All radiographic/ultrasonic tests shall be examined by an independent and NATA registered company. Any welds identified by this testing as being defective shall be rectified and re-examined.

1.14 DIMENSIONS

The Contractor shall allow in his price for accurate checking of all site dimensions before erection. When measured site dimensions differ from drawing dimensions, they shall be relayed to the Steel Fabrication Shop to be used in preference to drawing dimensions. The cost of any work in connection with making good the difference shall be borne by the Contractor.

1.15 BEAM CAMBER

All roof beams and purlins shall be fabricated and erected with natural camber upwards.

1.16 GENERAL LATERAL DEVIATIONS PERMITTED

Beams up to 3mm in 3000mm.

Columns up to 3mm in 3000mm between lateral supports and not cumulative.

1.17 GENERAL LENGTH DEVIATIONS PERMITTED

Beams plus/minus 2mm.

Columns plus/minus 1mm but error shall not be cumulative in column shafts.

1.18 STRAIGHTENING

All materials before being assembled shall be perfectly straight and free from twists or warping. Any bent or twisted materials shall be straightened before assembly to comply with this requirement. Any distortions due to welding considered unacceptable by the Superintendent, shall be straightened prior to painting.

The Contractor should allow for oversize of rolled sections when stripping plates to box up sections. Where flanges of channels are not at right angles to webs, they shall be straightened before boxing.

1.19 CUTTING AND DRILLING

Steel plates may be sheared, sawn or flame-cut. Bolt holes unless shown otherwise shall be 2mm larger in diameter than the nominal diameter of the bolt and may be punched or drilled. Bolt holes shall not be flame-cut unless approved by the Superintendent.

1.20 CONNECTIONS

Connections are to be made in accordance with typical details shown on the accompanying Drawings. The ends of tubes may be flattened or otherwise formed to provide for welded or bolted connections. The material shall not be marked or injured during the process of flattening, and the change of section shall be gradual.

1.21 BOLTING

Provide all bolts, nuts and washers necessary to make all bolted connections.

Connections shall be made with steel bolts using one nut per bolt. Holding down bolts shall be provided with nuts above and below base plate and templates to ensure accurate positioning. Provide washers (tapered where necessary), one under bolt head, one under nut to all bolts.

Provide all bolts, straps, dowels, cleats and steel fixings required by 'Concreter' and 'Carpenter' and 'Joiner' even though they are not specifically mentioned herein, or shown on Drawings.

Bolts denoted on Drawings as HSFG bolts shall have their holes reamed out to a driving fit. HSFG bolt connections shall have unpainted contact surfaces.

1.22 STORAGE

All members shall be handled, stored and erected in such a way that they are not subjected to excessive stress of any kind. All steelwork liable to damage by moisture and exposure shall be kept in a dry, covered place.

1.23 SHOP PROTECTIVE TREATMENTS

Galvanised

All exterior steelwork, steelwork in corrosive/wet internal areas, steelwork cast into concrete and steelwork in brickwork cavities after fabrication shall be prepared and hot dipped in zinc in accordance with AS/NZS 4680.

Protective Coatings

Where required provide protective coatings in accordance with AS/NZS 2312 Guide to the protection of structural steel against atmospheric corrosion by the use of protective coatings

General

All articles to be galvanised shall be handled in such a manner as to avoid any mechanical damage and to minimise distortion.

Design features that may lead to difficulties during galvanising should be pointed out prior to dipping.

Galvanising parameters such as galvanising temperature, time of immersion and withdrawal speed shall be employed to suit the requirements of the article.

The composition of the zinc in the galvanising bath shall not be less that 98.0% zinc.

Coating Requirements - Thickness

The thickness of the galvanised coating shall conform to Table 1 and Table 2 in AS/NZS 4680:

TABLE 1

Requirements for coating thickness and mass for articles that are NOT centrifuged.

Article Thickness mm	Local Coating Thickness Microns	Average Coating Thickness Microns	Average Coating mass g/m²
1.5mm or less	35	45	320
Over 1.5 to 3mm	45	55	390
Over 3 to 6mm	55	70	500
Over 6mm	70	85	600

TABLE 2			
Requirements for coating thickness and mass for articles that are centrifuged.			
Article Thickness (including castings) mm	Local Coating Thickness Microns	Average Coating Thickness Microns	Average Coating Mass g/m²
Less than 8mm	25	35	250
8mm and over	40	55	390

The thickness of the galvanised coating shall first be certified by the galvaniser, using an approved magnetic device. In the event of any dispute, an independent test shall be carried out in accordance with AS/NZS 4680, Appendix G.

Surface Finish

The galvanised coating shall be continuous, adherent, as smooth and evenly distributed as possible, and free from any defect that is detrimental to the stated end use of the coated article. On silicon killed steels, the coating may be dull grey, provided the coating is sound and continuous.

The integrity of the coating shall be determined by visual inspection and coating thickness measurements.

Where slip factors are required to enable high strength friction grip bolting, where shown, these shall be obtained after galvanising by suitable mechanical treatment of the faying surfaces.

Where a paint finish is to be applied to the galvanised coating, this should be advised at the time of order and all spikes shall be removed and all edges shall be free from lumps and runs.

Steelworks in contact with soil shall be coated with tar epoxy secondary coat in addition to galvanised coating. Coordinate the height to which this secondary coating application is required with concrete contact length.

Adhesion

The galvanised coating shall be sufficiently adherent to withstand normal handling during transport and erection.

Scope

This specification does not apply to the galvanised coating on semi-finished products such as wire, tube or sheet galvanised in continuous, semi-continuous or specialised plants.

Red Oxide Zinc Chromate Primer

All interior (concealed in ceiling space within the envelope of a building) steelwork unless otherwise specified shall be blast cleaned to Class 2, and prior to the formation of any visible secondary corrosion, shall be coated with an approved red oxide zinc chromate primer to provide a dry film thickness of 50 microns.

Inorganic Zinc Silicate

Interior steel exposed to view, shall be sand blasted to Class 2 and a half. and prior to the formation of any visible secondary corrosion, shall be coated with an approved Inorganic Zinc Silicate to provide a dry film thickness of 75 microns.

Making Good

Surfaces to be cleaned of all welding slag, scale, rust, grease, etc. Damage to galvanised treatments to be touched up with an approved zinc rich paint. Damage to other treatments to be touched up with better or equivalent surface treatment.

1.24 ERECTION

All erection shall be carried out in accordance with requirements of AS 4100 and of this Specification and Drawings. No section of work shall be erected unless copies of the relevant shop details checked and signed by the Superintendent are held on site by the Contractor.

The Contractor shall set out lines and levels, fix and maintain marks for the erection and checking positions of steelwork, and shall arrange all plant and temporary loads during erection so as not to exceed, in any part, the allowable relevant working stress specified in AS 4100.

The Contractor shall be responsible for planning erection procedures, including the design, certification and provisions of all necessary guying, temporary bracing (including any temporary footings) and the like, so as to ensure the safety of the structure under all conditions of wind and erection loads occurring during the construction period. At all times the number of field erection bolts used shall be sufficient to ensure that the structure is adequately and accurately held together and in position.

Upon completion of the work and when approved by the Superintendent, all temporary bracing and its connections shall be removed, holes plugged and the steelwork including the protective coatings specified, made good. The cost of designing, supplying, erecting and removing the temporary bracing and making good on completion, shall be borne by the Contractor.

Units shall be erected in such a manner, and lifted from such points, that members shall not be overstressed or distorted during lifting operations.

During erection, the use of iron sledge hammers in driving or hammering beams, columns, or other steelwork will not be allowed except with the approval of the Superintendent. Wooden mauls shall be used whenever practicable. Care shall also be exercised to prevent the material from falling or from being in any way subjected to heavy shock.

All portions of the framework shall be true and plumb and shall be approved by the Superintendent before any field welding is carried out. All machined butt splices shall be inspected by the Superintendent and checked before any reaming or bolting is carried out. Joints using high strength steel torque bolts shall be inspected by the Superintendent both before and after tensioning.

Upon request by the Superintendent, the Contractor shall provide adequate and safe scaffolding to enable the Superintendent to inspect any unit or connection.

1.25 GROUT

Dry packed grout to base plates shall consist of one part of Portland cement to not more than two parts of fine sand mixed to a dry consistency. Within twenty (20) minutes of mixing, it shall be tightly rammed between base plates and footing, adequately protected from damage and cured. Where specified, grout shall contain 'Expandite' or similar approved used strictly in accordance with the Manufacturer's instructions.

1.26 ARCHITECTURAL FIXINGS

The holes, cleats, brick ties and other architectural fixings shall be supplied and fixed by the Contractor, in accordance with the true meaning of the Architectural Drawings.

1.27 LINTELS

Supply to Bricklayer all lintels required to bridge all openings. See under 'Bricklayer'. All lintels shall be 'Dimet' treated or galvanised. Patent cold formed galvanised lintels may be used subject to the Superintendent's approval. Weld bridging flat across lintels where exposed to view and for cavities in excess of 50mm.

1.28 HOLDING DOWN BOLTS

Holding down bolts shall be galvanised MS bolts of sizes shown on Drawings and shall be set in concrete on accurately established lines and at established levels. Templates provided by Steel Fabricator are to be used for the setting out of holding down bolts. Allow for grouting as specified.

1.29 BRACING

Particular attention is drawn to the necessity of providing and installing, and afterwards removing if necessary, sufficient temporary bracing to keep the structure plumb and in true alignment until other structural units provide the necessary permanent bracing. The steel structure with the bracing members shown on the plans are those required in design for the finished structure only and are not to be assumed as necessarily adequate for construction purposes. Any failure to make proper and adequate provision against damage during erection shall be entirely at the sole risk and responsibility of the Contractor.

1.30 SITE CUTTING, DRILLING & WELDING

During erection steel members shall not be cut, burnt, welded or drilled without approval. Drifting may only be used for bringing parts into position, not to match unfair holes, enlarge holes or distort metal.

1.31 SETTING OUT TOLERANCE

The positioning and leveling of all steelwork, plumbing and placing of all steelwork shall be in accordance with the tolerances set out in Section 15 of AS 4100.