

0341P GALVSPAN® STEEL PURLINS AND GIRTS IN STRUCTURAL STEELWORK

Branded worksection

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Worksection abstract

This branded worksection *Template* is applicable to general structural steel framing in buildings, and associated structures. It includes cold-formed purlins and girts made from GALVSPAN® steel used in conjunction with structural steelwork. It covers welding, bolting, surface preparation and treatment of structural steelwork, and architecturally exposed structural steelwork (AESS).

Background

This worksection *Template* incorporates the relevant requirements of AS/NZS 5131 and considers both the Australian Steel Institute (ASI) *National structural steelwork specification* (NSSS) and *Structural steelwork standard drawing notes* (SDN).

Cold-formed, galvanized purlins made from GALVSPAN® steel have minimum yield strengths around 60% greater than hot-rolled steel purlins. This means lighter sections can be used and fixing times can be reduced using self-drilling, self-tapping screws. Other advantages include:

- Purlins backed and warranted by BlueScope (Warranty terms and Conditions apply).
- Access to technical experts and project specific advice.
- Hi-tensile steel core, which produces a strength to weight ratio 60% greater than traditional hot-rolled steel.
- A minimum zinc coating of 350 g/m² providing excellent corrosion resistance, durability and long life.

Refer to www.steel.com.au for product information and links to detailed technical information.

Guidance text

All text within these boxes is provided as guidance for developing this worksection and should not form part of the final specification. This *Guidance* text may be hidden or deleted from the document using the NATSPEC Toolbar or the hidden text *Hide* and *Delete* functions of your word processing system. For additional information visit FAQs at www.natspec.com.au.

Optional style text

Text in this font (blue with a grey background) covers items specified less frequently. It is provided for incorporation into *Normal* style text where it is applicable to a project.

Related material located elsewhere in NATSPEC

If a listed worksection is not part of your subscription package and you wish to purchase it, contact NATSPEC.

Related material may be found in other worksections. See for example:

- 0183 *Metals and prefinishes*
- 0314 *Concrete in situ* for the installation of anchor bolts.
- 0342 *Light steel framing* for cold-formed sections used in domestic floor, wall and roof framing.
- 0436p *COLORBOND steel and ZINCALUME steel in cladding*.
- 0522 *Partitions – framed and lined* for cold-formed sections used in partition framing.

Material not included in NATSPEC

Some projects may include items not covered by NATSPEC. For these you may need to create new text or modify this text or a suitable worksection.

Documenting this and related work

You may document this and related work as follows:

- Refer to AS/NZS 5131 Section 4 for specification, documentation and traceability requirements.
- If areas are subject to plastic deformation show them on the drawings. See AS 4100 clause 13.3.6.4.

The *Normal* style text of this worksection *Template* may refer to items as being documented elsewhere in the contract documentation. Make sure they are documented.

- Connections with slotted holes.
- Weld type, size and category.
- Splice locations and details.
- Section sizes, location and connection details.

- Anchor bolt size and location.
- Purlin and girt spacing.
- Bridging requirements for purlins and girts.

Specifying ESD

The following may be specified by using included options:

- Environmentally sustainable steelwork conforming to the requirements of the ASI Environmental Sustainability Charter.

The following may be specified by including additional text:

- Recycled material content.
- High strength steel to reduce the amount of steel required to achieve the same performance.
- Use of recycled water by the steel manufacturing plant.

Refer to the NATSPEC TECHreport TR 01 on specifying ESD.

1 GENERAL

BlueScope is Australia's largest manufacturer of steel. Steel Products manufactured by BlueScope include value-added metal coated and painted steel products such as COLORBOND® steel, ZINCALUME® steel, GALVSPAN® steel and TRUECORE® steel. These products in coil form are then further processed by other manufacturers into products such as roof and wall cladding, insulated panel, rainwater goods, light structural/framing sections and fencing for use in both residential and non-residential construction.

1.1 RESPONSIBILITIES

General

Requirement: Provide GALVSPAN® purlins and girts and structural steelwork, as documented.

Documented is defined in 0171 *General requirements* as meaning contained in the contract documents.

AS/NZS 5131 clause 4.1.1(d) requires the assignment of the responsibilities listed in AS/NZS 5131 Table B3. The table lists areas where assignment of responsibilities may need to be clarified in the contract documents. The list does not represent the only areas of responsibility that need to be addressed, only those where current construction practice may vary between projects.

Performance

Construction category to AS/NZS 5131: [complete/delete]

Insert construction category. Do not delete. Refer to AS/NZS 5131 clause 4.1.2 and Appendix C to determine the construction category (CC1 to CC4) for the structure.

The requirements of each construction category are detailed in AS/NZS 5131 Table B4.

The construction category is based on the Importance level, the Service category and the Fabrication category. Refer to AS/NZS 5131 clause C3.

A construction category may apply to the whole structure or to parts of the structure or to specific details. If more than one construction category is applicable to the project, consider using a schedule in **SELECTIONS** to document the project construction categories.

Adjoining elements: Provide for the fixing of adjoining building elements that are to be connected to or supported on the structural steel.

Fixing requirements for adjoining elements may not be shown on the structural drawings. This clause makes it the contractor's responsibility to coordinate the requirements. The design effects or supplementary fixing may require professional engineer analysis.

1.2 COMPANY CONTACTS

BLUESCOPE AUSTRALIA technical contacts

Website: www.steel.com.au/support.

1.3 CROSS REFERENCES

General

Requirement: Conform to the following:

- 0160 *Quality*.

If quality documentation or a quality plan is a project requirement, consider changing this *Optional* style text to *Normal* style text. Include the requirements for quality documentation and a quality plan in 0160 *Quality*.

Alternatively, if quality is only a requirement for the structural steelwork elements of the project, consider including the requirements for quality documentation and a quality plan within this worksection.

AS/NZS 5131 clause 4.5.1 requires quality documentation for all construction categories except CC1. AS/NZS 5131 Appendix D provides guidance on the elements of a quality management system applicable to fabrication, corrosion protection and erection.

AS/NZS 5131 clause 4.5.2 requires a project quality plan for construction categories CC3 and CC4. A quality plan is optional for construction category CC2. AS/NZS 5131 Appendix E provides guidance on the content of a quality plan.

The ASI also recommends the use of a compliance management plan, which would include the quality plan requirements from AS/NZS 5131 and the following:

- Process and documentation checklists for purchasing steel.
- Process for identification and traceability of steel and steelwork from purchasing through to completion of the project.
- Process and documentation checklists for erection of structural steelwork.
- Assigned responsibilities for compliance management, including names and CV's of relevant personnel.

If a compliance management plan is a project requirement, document requirements in *0160 Quality*.

The ASI also recommends the submission of a fabricator Manufacturer's data report (MDR), the structure and contents of which are defined in ASI NSSS clause 4.8.8. If the submission of a fabricator MDR is a project requirement, document requirements either in *0160 Quality* or in the **SUBMISSIONS** clause of this worksection.

The requirements for Inspection and Test Plans (ITPs) should be included in the quality plan. Include such requirements in *0160 Quality*. Refer to AS/NZS 5131 Section 13.

- *0171 General requirements*.

0171 General requirements contains umbrella requirements for all building and services worksections.

- *0344 Steel – hot-dip galvanized coatings*.
- *0345 Steel - protective paint coatings*.
- *0346 Structural fire protection systems*.

List the worksections cross referenced by this worksection. *0171 General requirements* references the *018 Common requirements* subgroup of worksections. It is not necessary to repeat them here. However, you may also wish to direct the contractor to other worksections where there may be work that is closely associated with this work.

NATSPEC uses generic worksection titles, whether or not there are branded equivalents. If you use a branded worksection, change the cross reference here.

1.4 STANDARDS

General

Materials and design: To AS 4100.

For background information and guidance to this standard, see AS 4100 Supp 1. AS 4100 also includes information relating to the fabrication and erection of structural steelwork, which is now covered by AS/NZS 5131. It is the intention of Standards Australia to revise AS 4100 to align with AS/NZS 5131, principally through removal of material that is covered in AS/NZS 5131. NATSPEC therefore refers to AS/NZS 5131 for fabrication and erection of structural steelwork.

Materials and design of cold-formed decking, purlins and girts: To AS/NZS 4600.

AS/NZS 4600 specifies design and material requirements for structural members made by cold-forming carbon and low alloy steel strip or sheet. However, AS/NZS 5131 covers the fabrication and erection of these members. The material and design requirements for cold formed structural hollow sections conforming to AS/NZS 1163 are covered by AS 4100.

Fabrication and erection: To AS/NZS 5131.

AS/NZS 5131 sets out the minimum requirements for the construction of structural steelwork involving fabrication, preparation of steel surfaces for corrosion protection, corrosion protection comprising painting and galvanizing, erection and modification of steelwork.

For further information on steel fabrication and erection, refer to ASI TN011.

1.5 MANUFACTURER'S DOCUMENTS

Technical manuals

Website: www.steel.com.au/library.

1.6 INTERPRETATION

Abbreviations

General: For the purposes of this worksection the following abbreviations apply:

- AESS: Architecturally Exposed Structural Steelwork.

- CC: Construction Category.
- NDE: Non-Destructive Examination.

Edit the **Abbreviations** subclause to suit the project or delete, if not required. List alphabetically.

Definitions

General: For the purposes of this worksection the definitions given in AS/NZS 5131 apply.

1.7 TOLERANCES

General

Requirement: To AS/NZS 5131 Section 12 and Appendix F.

Amend if departing from tolerances described in AS/NZS 5131 Appendix F.

Tolerance class: 1.

Change the default to Class 2 if required.

Class 1 tolerances are the default requirement in AS/NZS 5131 and should be acceptable for most steelwork construction. They are generally equivalent to what was previously specified in AS 4100.

Class 2 tolerances are tighter and might be considered for higher specification work. AS/NZS 5131 recommends Class 2 should be considered for CC3 and CC4 structures or components.

AESS: To the **AESS schedule**.

AESS may require more stringent tolerances. Document the required tolerances in the **AESS schedule**.

1.8 SUBMISSIONS

Design documentation

Adequacy of structure: Submit calculations to verify the adequacy of the structure to sustain loads and/or procedures, which may be imposed during construction.

If calculations to justify the adequacy of the structure during construction are necessary or are a requirement of the Erection sequence methodology (ESM), include this *Optional* style text by changing to *Normal* style text.

Fabrication details

Distortions: Submit proposals for the following:

- Preventing or minimising distortion of galvanized components, welded components or welded and galvanized components.
- Restoration to the designed shape.

Identification marks: If members and/or connections will be exposed to view, submit details of proposed marking.

Program: Submit a fabrication program showing the proposed sequence of operations and time required.

Refer to AS/NZS 5131 Section 6 for fabrication requirements.

Execution details

Anchor bolts: If anchor bolts do not meet documented location tolerances, submit proposals for rectification before proceeding.

Bolting connections: For connections not documented, submit proposals.

Bolt tensioning procedure: Submit details of procedure, equipment to be used and calibration of the process.

Refer to AS/NZS 5131 clause 8.5 on the tensioning of high-strength bolts.

Erection sequence methodology (ESM): Submit ESM conforming to AS/NZS 5131 clause 11.5.1.

If an ESM is required, include this *Optional* style text by changing to *Normal* style text. ESM's would usually be required for high risk construction work or work of an unusual or atypical nature, where a risk assessment has identified the need for an ESM.

Refer to the *ASI Practical guide to planning the safe erection of steel structures* for further information.

Site base plate holing: If hand cutting of bolt holes in column base plates is required, submit details.

AS/NZS 5131 clause 6.7.1 permits hand flame cutting of bolt holes only as site rectification of base plates.

Purlins and girts: If purlins and girts support components other than roofing or cladding, submit details.

All fixing to purlins for the suspension of ducts and services etc. is through the web of the section.

Site modifications: Submit details of proposed on-site modifications or rectifications to any steel member, connection component, mechanical fastener, weld or corrosion protection.

Refer to AS/NZS 5131 Section 14.

Splices: If variations to documented splice locations or additional splices are proposed, submit details.

Temporary connections or attachments: If not documented, submit details.

Undocumented weld types: Submit proposals for weld type and electrodes.

Welding plan: Submit a welding plan to AS/NZS 5131 clause 7.2.

AS/NZS 5131 clause 7.2 refers to the requirements of a welding procedure specification, a template for which is included in AS/NZS 1554.1 Appendix C.

Work method statement: Before any erection work commences, submit a work method statement to AS/NZS 5131 clause 11.2.3.

If proof of registration of all lifting equipment used on site is required to be available for inspection at all times, include this requirement. Refer to AS/NZS 5131 clause 11.2.5.

Operation and maintenance manual

Purlin and girt maintenance: On completion, submit a manual of GALVSPAN®'s recommended maintenance procedures, including frequency of inspection and access methods for inspection, cleaning, repair and replacement.

Products and materials

Steel members and sections: Submit test reports or test certificates conforming to AS 4100 clause 2.2.2.

AS/NZS 5131 clause 4.6.2 allows for a Supplier Declaration of Conformity (SDoC) to be provided. If required, include requirements for SDoC.

Steelwork designed to AS 4100 and conforming to the BCA requires the use of steel conforming to Australian Standards, otherwise the requirements of AS 4100 clause 2.2.3 apply.

AS/NZS 1163 defines the requirements for cold-formed hollow sections.

AS/NZS 1594 defines the requirements for hot-rolled steel flat products.

AS/NZS 3678 defines the requirements for hot-rolled steel plates.

AS/NZS 3679.1 defines the requirements for hot-rolled steel sections and requires all steel sections that are 150 mm or greater in depth to have a rolled in raised mark indicating the manufacturer and the letters AS to indicate that it has been produced to AS/NZS 3679.1.

AS/NZS 3679.2 defines the requirements for welded I sections.

Refer to ASI TN005 and ASI TN007 for further guidance on conforming steel.

Bolts, nuts and washers: Submit test reports or test certificates conforming to AS/NZS 1252.1 Section 6.

Verification testing of bolt assemblies: Submit test reports or certificates conforming to AS/NZS 1252.2 Section 2, together with the Supplier Declaration of Conformity (SDoC).

Verification testing is undertaken by the supplier who first puts the product into the market in Australia or New Zealand. Attestation of compliance to AS/NZS 1252.2 takes the form of a SDoC, refer to AS/NZS 1252.2 clause 3.2.

Note: The verification testing is additional to the testing required by AS/NZS 1252.1.

As all high-strength bolt assemblies are imported, these are essential requirements.

ASI TN001 deals comprehensively with the relevant issues.

Anchor bolts: If anchors, other than those documented, are required or proposed for supporting or fixing structural steel, submit evidence of the anchor capacity to carry the load.

Substitution: If alternative sections or connections are proposed, submit details.

Records

Survey: Submit survey of erected structural steel to verify components have been installed as documented.

Periodic surveys may be required for the project. If so, include here project stages where survey submissions are required.

If a certificate from a licensed surveyor is required, specify the particulars here.

Drawings: Submit as-built structural drawings, upon completion.

Samples

AESS: Submit samples of AESS to the **AESS schedule**.

Delete this clause if no samples are requested in the **AESS schedule**.

Special finishes: Submit samples of finished steel to the **Special finishes schedule**.

Minimum sample size: 0.1 m².

Shop detail documentation

General: Submit shop detail documentation to a scale that best describes the detail, conforming to AS/NZS 5131 clause 4.4.

If erection drawings are to be prepared in addition to shop detail documentation, include requirements here. Refer to AS/NZS 5131 clause 11.7.

Document any restrictions on fabrication methods arising from brittle fracture considerations set out in AS 4100 Section 10.

See also ASI TN009 for guidelines on information to include in the documentation of structural steel.

Drawing format: [complete/delete]

Nominate the format for the shop detail documentation, e.g. 2D or 3D CAD, pdf, etc. Also, nominate if hard copy or electronic copy only is required.

Alternatively, shop detail documentation may be in the form of a building information model, refer to AS/NZS 5131 clause 4.3.

Approval of shop detail documentation: [complete/delete]

Nominate the person(s)/organisation responsible for review and approval of the shop documentation. Refer to AS/NZS 5131 clause 4.4.4.

Subcontractors

General: Submit names and contact details of proposed fabricator, detailer and installer.

Refer to the ASI website (www.steel.org.au) for information on fabricators such as QA, size, and special facilities. Delete if supplier/installer details are not required.

Responsibilities: Submit names and contact details corresponding to the person/organisation assigned responsibility to the items listed in AS/NZS 5131 Table B3.

In some instances AS/NZS 5131 requires, and the ASI recommends, the submission of names, CV's, qualifications, roles and responsibilities for all key personnel. If requirements greater than those defined in AS/NZS 5131 are a project requirement, document such requirements here.

Tests

0171 *General requirements* covers tests in **Definitions** and calls for an inspection and testing plan under **SUBMISSIONS, Tests**.

Site tests: Submit results, as follows:

- Bars and sections: Non-destructive tests.
- Plates: Ultrasonic tests.
- Welds: Non-destructive examinations.

If any other testing, such as impact or production testing of welds is required, include a requirement here to submit results.

Warranties

Purlins and girts: On completion, submit the GALVSPAN® published product warranties.

If the warranty is in the form of separate material and installation warranties, require the signatures of both the manufacturer and installer.

BlueScope Steel offers a warranty of 10 years from the date of installation against perforation by natural degradation, when used within the building envelope (not exposed to natural environment). Warranty terms and conditions apply. Please call BlueScope and visit www.steel.com.au to see what warranty may apply to your project.

1.9 INSPECTION

Notice – off-site

Inspection: Give notice so that inspection may be made of the following:

Amend to suit the project, if necessary.

- Materials including welding consumables before fabrication.
- Testing of welding procedures and welder qualification tests.
- Commencement of shop fabrication.
- Commencement of welding.
- Complete penetration butt welds before the placement of root runs.

- High-strength bolt tensioning (when completed off-site).
- Completion of fabrication before surface preparation.
- Surface preparation before protective coating.
- Completion of protective coating before delivery to site.

Notice – on-site

Inspection: Give notice so that inspection may be made of the following:

Amend to suit the project adding critical stage or mandatory inspections required by legislation or regulation.

Hold points, if required, should be inserted here.

- Steelwork on-site before erection.
- Anchor bolts in position before casting in.
- Steelwork and column bases erected on site, before grouting, encasing, site protective coating or cladding.
- Tensioning of bolts in categories 8.8/TB and 8.8/TF.

Note: TF is friction-type and TB is bearing-type as defined in AS 4100 clause 9.2.

- Reinforcement and formwork in place before any encasement.
- Completed grouting, encasement, fire protection or site applied protective coating.

- Mechanical or chemical anchor proof load testing.

- The loading and unloading of temporary works.

If either of the last two points above are a project requirement, consider including this *Optional* style text by changing to *Normal* style text.

2 PRODUCTS

2.1 GENERAL

Product substitution

Other products: Conform to PRODUCTS, **GENERAL**, **Substitutions** in 0171 *General requirements*.

The 0171 *General requirements* clause sets out the submissions required if the contractor proposes alternative products. Refer also to NATSPEC TECHnote GEN 006 for more information on proprietary specification.

Materials

Requirement: To AS/NZS 5131 Section 5.

Storage and handling

Requirement: Pack, support, transport and handle members and components without overstressing, deforming or damaging them or their protective coating.

Refer to AS/NZS 5131 clause 6.11.

Damaged items: Rectify or replace. Do not assemble into the structure without approval.

Protection: Wrap or otherwise protect members or components to prevent damage to surface finishes during handling and erection.

Storage: Store off the ground.

Lifting points: Do not allow steel slings to come into direct contact with coated steelwork.

Purchasing and traceability

Purchasing documentation and procedure: To AS/NZS 5131 clause 4.6.

All stakeholders in the supply chain must implement systems to support the requirements of AS/NZS 5131. Importantly, the purchasing process needs to maintain continuity of requirements.

Level of traceability: As defined in AS/NZS 5131 clause 4.7 and the following:

- CC1: Basic traceability.
- CC2: Partial traceability.
- CC3: Full traceability.
- CC4: Full traceability.

Full traceability for CC3 and CC4 may be based on records for batches of product allocated to a common production process, unless traceability for each product separately is required. If required, document here.

Marking

Identification: Marked to show the following:

- Manufacturer's identification.
- Product brand name.
- Product type.
- Quantity.
- Product reference code and batch number.
- Date of manufacture.

Edit the list to suit the project or delete if not required.

2.2 STRUCTURAL STEEL**Steel members and sections steel grade table**

Type of steel	Minimum grade
Hot-rolled sections to AS/NZS 3679.1 and SA TS 102	300
Welded sections to AS/NZS 3679.2	300
Hot-rolled plates, floor plates and slabs to AS/NZS 3678 and SA TS 102	250
Hot-rolled flat products to AS/NZS 1594	HA300
Hollow sections to AS/NZS 1163 and SA TS 102: Circular sections less than 166 mm nominal outside diameter	C250
Hollow sections to AS/NZS 1163 and SA TS 102: Sections other than circular sections less than 166 mm nominal outside diameter	C350
GALVSPAN® steel purlins and girts to AS 1397	G450, Z350 or Z450

The values given in the table are the minimum grades commonly available. If the grade required on a project is higher than the values tabulated, amend the values to suit the project. Refer to the manufacturer for the available steel grades.

See AS 4100 clause 2.2. If steel is not identified or tested for conformance, it must be downgraded as required by AS 4100 clause 2.2.3.

Steel grade varies with sheet thickness.

GALVSPAN® steel is available with two standards of corrosion protection. These are:

- Galvanized steel with a zinc coating weight of 350 g/m².
- Galvanized steel with a zinc coating weight of 450 g/m².

Certification

Steel: Minimum requirements for test and inspection certificates, to the following:

- Hot-rolled bars or sections: To AS/NZS 3679.1 clause 11.2.4.
- Welded I sections: To AS/NZS 3679.2 clause 11.2.4.
- Hot-rolled plate: To AS/NZS 3678 clause 11.2.4.
- Cold-formed hollow sections: To AS/NZS 1163 clause 11.2.4.

Test certificates must be written in alphanumeric English and must include the chemical composition of the steel.

The ASI recommends that all steel be sourced from mills certified by an organisation with relevant JAS ANZ accreditation, e.g. The Australian Certification Authority for Reinforcing and Structural Steels (ACRS) who certify manufacturers and suppliers of steel reinforcing, steel prestressing and structural steels under the ACRS scheme (see www.steelcertification.com). If certification to this (or any alternative) scheme is a project requirement, document such requirements here.

Environmentally sustainable steelwork

Requirement: Conform to requirements of the ASI Environmental Sustainability Charter, including:

- Steel: Sourced from steelmakers certified to ISO 14001.
- Steelwork: Supplied by fabricators who are members of the ASI Environmental Sustainability Charter or who are certified to ISO 14001.

If environmentally sustainable steelwork to the ASI Environmental Sustainability Charter is a project requirement, consider including this *Optional* style text by changing the style to *Normal* style text.

More information on the Charter can be found at <http://steel.org.au/asi-committees/environmental-sustainability-charter>.

Testing

Requirement: To the **Non-destructive testing of bars and sections schedule**.

Ultrasonic testing of plates

Quality level to AS 1710: [complete/delete]

Select the required quality grade, e.g. Level 1, Level 2 or Level 3. Where an edge is an additional requirement, designate it as Level 1E, Level 2E or Level 3E, as appropriate.

The ASI recommends indicating joint details that are susceptible to lamellar tearing on the project drawings as 'LT susceptible' and requiring that such plate be ultrasonically tested to AS 1710 Level 1.

The ASI also recommends supplementary ultrasonic testing to Level 1 for all plates 40 mm thick and over.

Include any detailed testing requirements in the **Non-destructive testing of bars and sections schedule**.

2.3 PURLINS AND GIRTS

Material

Requirement: GALVSPAN® steel.

Zinc coating class: [complete/delete]

Nominate one of the two levels of protection offered by GALVSPAN® steel: Zinc coating class Z350 or Z450.

Specify Z450 purlins and girts for environments requiring additional corrosion protection. Call BlueScope, for assistance with purlin or girt specifications for severe exposure environments.

Alternatively, a complete guide to coating class recommendations is provided in the BlueScope Technical Bulletin: Download TB17 - Selection guide for galvanized steel purlin products.

The zinc coating on purlins and girts made from GALVSPAN® steel is fully compatible with the zinc and zinc/aluminium coatings used on roof and wall sheeting made from other quality BlueScope products. If minor damage occurs to the coating on the purlins or girts, the base steel is protected by its own surrounding coating. The protective coating on the sheeting is not corroded by minor damage such as scratches.

Material selection and design: To the manufacturer's recommendation, including for severe environments.

2.4 MECHANICAL FASTENERS

Standards

Bolts: To AS 1110.1, AS 1111.1 and AS/NZS 1252.1.

Nuts: To AS 1112.1, AS 1112.2, AS 1112.3, AS 1112.4 and AS/NZS 1252.1.

Bolting category

Requirement: To the **Bolting category schedule**.

It is preferable to show this information on the drawings. If it is, delete **Bolting category** and the **Bolting category schedule**.

Refer to AS 4100 clause 9.3.1 for bolt categories.

Certification

High-strength bolt assemblies: Minimum requirements for test reports, to AS/NZS 1252.1 clause 6.4.2.

As all high-strength bolt assemblies are imported, these are essential requirements.

Finish

Bolts, nuts and washers: Hot-dip galvanized to AS/NZS 1214, corrosion-free, and in serviceable condition.

Anchor bolts

Hexagonal bolts: To AS 1111.1.

Hexagonal nuts: To AS 1112.3.

Plain washers: To AS 1237.1.

Requirement: Provide each anchor bolt with 2 nuts and 2 oversize washers with sufficient thread for the levelling nut and washer to set below the base plate.

Supply of anchor bolts is usually included with the supply of structural steel, but installed by others. If the steel fabricator or erector is responsible for installing the anchor bolts, make reference to the installation requirements in EXECUTION,

ERECTION, Anchor bolts. See **CORES, FIXINGS AND EMBEDDED ITEMS** in 0310 Concrete – combined or 0314 Concrete *in situ* for installation of the bolts. Consider special conditions requiring a fabricated bolt to be provided.

Mechanical and chemical anchors: To SA TS 101, installed to manufacturer's recommendations:

- Product: [complete/delete]

Insert required product. If more than one anchor type is required or the product name/code is not specific enough to describe the anchor required, consider using a schedule in **SELECTIONS** to document the various anchor types, locations, loadings, etc. If fasteners for thin gauge components, special fasteners or explosive fasteners are required, refer to AS/NZS 5131 clauses 5.5.10, 5.5.11 and 5.7 and document requirements here.

- Proof testing of mechanical anchors: [complete/delete]

If proof testing is required, nominate the testing requirements (e.g. to BS 8539), otherwise delete.

2.5 OTHER MATERIALS

Welding consumables

Requirement: To the relevant part of the AS/NZS 1554 series.

Refer to ASI TN008 for information on welding consumables and design.

Studs and shear connectors

Requirement: To AS/NZS 5131 clause 5.6.

Grade: [complete/delete]

Type: [complete/delete]

Length: [complete/delete]

If more than one type of stud or shear connector is required, consider using a schedule in **SELECTIONS** to document the various types.

Grout

Requirement: To AS/NZS 5131 clause 5.8.

Method: [complete/delete]

e.g. Pressure grouting, Dry pack with stiff cement mortar.

Type: [complete/delete]

e.g. 1 cement: 2 sand or use a proprietary brand name. Consider non-shrink grout.

Minimum compressive strength (MPa): [complete/delete]

Minimum thickness (mm): [complete/delete]

Maximum thickness (mm): [complete/delete]

3 EXECUTION

3.1 PREPARATION, ASSEMBLY AND FABRICATION

See AS/NZS 5131 Section 6 and AS/NZS 1554.1.

The ASI recommends that all steelwork be fabricated by fabricators certified under the *National Structural Steelwork Compliance Scheme* (NSSCS) (see www.scacompliance.com.au). If certification to this (or any alternative) scheme is a project requirement, document such requirements here.

Identification

Traceability: To AS/NZS 5131 clause 6.2.

Marking: Provide marks or other means of identifying each member compatible with the finish, for setting out, locating, erecting and connecting the steelwork to the marking plans.

Show on the drawings any areas where identification marks are not permitted.

Hard stamping to AS/NZS 5131: [complete/delete]

Permitted, or Not Permitted. If permitted, show on the drawings any areas where hard stamping is not allowed. If not permitted, nominate if soft or low stress stamps may be used.

High-strength bolting: If the work includes more than one bolting category, mark high-strength structural bolted connections with a 75 mm wide flash of colour, clear of holes.

Certain marking may be restricted for AESS. Refer to **ARCHITECTURALLY EXPOSED STRUCTURAL STEELWORK**.

Cold-formed members: Clearly mark material thickness.

Monorail beams: Identify and mark rated capacity in conformance with AS 1418.18 clause 5.12.6.

Natural beam camber

General: If steel beams have a natural camber, within the straightness tolerance, fabricate the steelwork element with the camber up.

Taking advantage of natural camber is particularly important in cold-formed sections such as purlins for low-pitched roofs.
Document any requirements for induced camber or preset on the drawings.

Cutting

Refer to AS/NZS 5131 clause 6.5.

Shearing: Do not shear edges in areas designated as yielding regions for seismic design to AS 4100 earthquake design categories D and E.

Designate yielding regions for seismic design on the drawings.

Also, identify details with a fatigue detail category greater than or equal to 80 MPa. Refer to AS/NZS 5131 clause 6.5.2.

Prohibited cutting methods: [complete/delete]

Refer to AS/NZS 5131 clause 6.5.1.

Shaping

Requirement: Where forming, shaping or correcting distorted members, avoid damage and conform to AS/NZS 5131 clause 6.6.

Holing

Refer to AS/NZS 5131 clause 6.7.

Slotted holes: Do not use slotted holes for connections, other than those documented.

Finish for pinned connections: [complete/delete]

Refer to AS/NZS 5131 clause 6.7.6. Pins and holes shall be finished so that the forces are distributed evenly to the joint plies.

Tolerances

Measurement: Check tolerances by measurement after fabrication and application of corrosion protection.

Assembly check

Trial assembly and temporary erection: [complete/delete]

If a trial assembly and temporary erection of elements of the steelwork is required, include this *Optional* style text by completing the prompt to nominate the elements requiring a trial assembly and temporary erection and changing to *Normal* style text.

Refer to AS/NZS 5131 clauses 6.10 and 11.5.10.

3.2 WELDING

General

Requirements: To AS/NZS 5131 Section 7.

In the welding plan include requirements for non-treatment to surfaces affected by stray arc strikes, additional requirements for the dressing of butt welds and acceptance criteria or assessment of non-conformity allowable other than that in the relevant part of the AS/NZS 1554 series.

Standard: To AS/NZS 1554.1.

Other parts of AS/NZS 1554 may also need to be referenced e.g. AS/NZS 1554.2 for studs or AS/NZS 1554.5 for elements subjected to fatigue loading. See also WTIA TN11 for a commentary on the series. Some additional requirements, which may need to be stated in the contract, are discussed in AS/NZS 1554.1 Appendix D and AS/NZS 1554.5 Appendix D. Refer to ASI TN008 for information on welding consumables and design.

Document any additional project welding requirements.

The ASI recommends that parent steel materials with a chemical composition of total boron equal to or exceeding 0.0008%, require requalification of welding procedures using the higher boron content material. The value of 0.0008% is taken from SA TS 102 which specifies limits for elements in the chemical composition of structural steel below which they would be considered residual and not intentionally added.

Weld category

Weld categories not documented: Category GP.

Document all weld categories on the drawings.

Weld type

Weld type not documented: Submit proposals for weld type and electrodes.

Document all weld types on the drawings.

For elements subjected to fatigue loading, refer to AS 4100 Section 11. Show welding details to AS/NZS 1554.5 on drawings.

Butt weld run-on/run-off tabs: [complete/delete]

Nominate if permitted or not-permitted or nominate in welding plan. Refer to AS/NZS 5131 clause 7.5.9.1.

Stress relief treatment

Type: [complete/delete]

If required and not shown on the drawings, state here the extent and method (e.g. Post weld heat treatment).

Non-destructive weld examination (NDE)

Requirement: To AS/NZS 5131 clause 13.6.2.

AS/NZS 5131 Tables 13.6.2.2(A) and 13.6.2.2(B) provide recommended extent and type for NDE. If additional NDE is required for seal welds, document requirements here. The ASI suggests that the recommended extent of NDE can be varied both up and down based on results to date.

Non-visual NDE: By a third party testing authority.

Repairs: Repair welds revealed as faulty by NDE and repeat the examination.

If it is acceptable for fracture mechanics, or other suitable methods of assessment, to be used to demonstrate that defects will not be injurious to the performance of the structure, document the methods here. Refer to AS/NZS 5131 clause 13.6.2.5.

If any other testing, such as impact or production testing of welds is required, document requirements here or in welding plan. Refer to AS/NZS 5131 clause 7.4.

Site welds

Completion: Weld only when correct alignment and preset or camber have been achieved.

3.3 MECHANICAL FASTENING**Connection contact surfaces**

General: To AS/NZS 5131 clause 8.4.1.

Bolting category 8.8/TF: Clean, as rolled and free from applied finishes.

Document friction-type (TF) connections on the drawings. Refer to AS/NZS 5131 clause 8.4.2.

Washers

Requirement: Place one washer under the part rotated during tightening process (nut or bolt head).

To limit the need for touch up of paint damaged by the tightening process, a washer may be placed under both the nut and the bolt head. If required, edit text above. Refer to AS/NZS 5131 clause 8.2.4.

Lock nuts

General: Provide lock nuts to AS/NZS 5131 clause 8.2.3 for bolts in moving parts or parts subject to vibration and for vertical bolts in tension.

If lock nuts are required, include this *Optional* style text by changing to *Normal* style text. Edit text as necessary and show position of lock nuts on drawings. Lock nuts should not be required for tensioned connections.

Tensioning of bolting categories 8.8/TB and 8.8/TF

Method: Use part-turn method or a direct tension indicator device.

Refer to AS/NZS 5131 clause 8.5. If the part-turn method is being used, nominate if permanent location marks are required for later inspection.

Permanent bolting

Completion: Bolt only when correct alignment and preset or camber has been achieved.

3.4 SURFACE PREPARATION AND TREATMENT**General**

Requirement: Conform to *0344 Steel – hot-dip galvanized coatings* and/or *0345 Steel - protective paint coatings*, as appropriate.

For guidance on steel corrosion, coatings, and design and detailing for corrosion protection, refer to the *Australian steelwork corrosion and coatings guide* and *Steel construction (Volume 47 Number 2)*.

If no surface preparation or treatment is considered necessary, delete text above and state that no surface preparation or treatment is required.

There are situations where coating steelwork to protect against damaging corrosion is neither necessary nor economically feasible, such as where anticipated corrosion rates are too low to compromise the structure, steelwork is to be encased for fire-resisting or sacrificial corrosion of sections has been allowed for in the selection of section thicknesses. AS/NZS 2312.2 clause 6.1 discusses when coating may not be required and AS/NZS 2312.1 clause 1.2 lists typical situations for which coating for corrosion resistance is not required. It also lists reasons other than protection for which steelwork may be surface treated, including aesthetics.

For these situations replace the **General** subclause above, with the following *Optional* style text.

General

Requirement: Coat structural steelwork not encased in concrete.

Treatment grade to AS/NZS 5131 clause 9.8.4: P1.

P1 = Light treatment.

Surface preparation: To AS/NZS 5131 clause 9.3.2.

Abrasive blasting to AS 1627.4: Blast as follows:

- AESS: Class 2 blast and to the requirements of AS/NZS 5131 Section 10.
- Other steelwork: Class 1 blast.

Amend to suit anticipated equipment availability e.g. power wire brush in lieu of blasting.

Coating: Coat prepared steelwork to AS/NZS 5131 clause 9.9 and as follows:

- Primer: Zinc phosphate primer.

If a particular colour or manufacturer is required, enter details here.

- Thickness: 75 µm. Verify and record thickness.

Edit default thickness if necessary.

- Time delay: Prime the steel surface as soon as possible after surface preparation (maximum 4 hours if outdoors) and before the surface deteriorates. If the surface is contaminated or rust bloomed, repeat surface preparation before priming.
- Concrete encasing: Where members are to be part concrete encased, extend the priming 50 mm into the surface to be encased.
- Clearances: Keep priming clear of members and components to be site welded, and surfaces against which concrete is to be poured (including concrete encasing except as noted above). On completion of site welding, of concrete pouring and of 8.8/TF bolting, prime to completely cover exposed surfaces.
- Inaccessible surfaces: Where surfaces will be in contact or near contact after fabrication or erection, apply the finish and allow it to dry before assembly.

Marking: On the contact surfaces of friction type joints, minimise the use of marking ink for marking hole positions.

Shop work: Where possible, apply the primer to the structural steel before delivery to the site.

Transport and handling: Do not damage the paintwork.

Specify the desired result or outcome, leaving the method (e.g. protection, waiting until the paint is dry) up to the contractor.

Site work: After erection, repair damage to the shop coating and apply any coating omitted at site connections.

Decorative finishes, and on-site touch up to the paint coatings specified here, are covered in *0671 Painting*.

Refer also to *0183 Metals and prefinishes*.

3.5 SPECIAL FINISHES

General

Requirement: Apply special finishes to the **Special finishes schedule**.

This clause can be applied if surfaces of steel members or welds are to be dressed after fabrication for appearance or other purposes. Such finishes are generally assessed by comparing to a sample. They would typically be surfaces of steel members or welds to be dressed by abrasive blasting, grinding or the like, either for appearance or as part of a connecting or contact surface.

It is preferable to document these requirements on the drawings. If the special finishes require the steelwork to be classified as AESS, then document the requirements in **ARCHITECTURALLY EXPOSED STRUCTURAL STEELWORK**. Edit or delete the **Special finishes schedule**, as required. If deleted, also remove all reference to the **Special finishes schedule** in the worksection.

3.6 METAL SPRAYING

General

Standard: To ISO 2063.

Requirement: Apply sprayed metal finishes to the **Metal spray schedule**.

Process: Electric arc.

Application: Apply the coating as soon as possible after blasting.

Delete clause and **Metal spray schedule** if no metal spray finishes are required.

3.7 FIRE PROTECTION COATINGS

General

Requirement: Apply fire protection to structural steelwork to *0346 Structural fire protection systems*.

Make sure *0346 Structural fire protection systems* is included in the specification. Delete this clause if fire protection is not required.

3.8 ARCHITECTURALLY EXPOSED STRUCTURAL STEELWORK

Delete this clause and any other reference to AESS within this worksection if AESS is not proposed.

General

Requirement: Provide AESS to AS/NZS 5131 Section 10 and the **AESS schedule**.

It is preferable to document AESS requirements on the drawings. Edit or delete the **AESS schedule**, as required. If deleted, also remove all reference to the **AESS schedule** from the worksection.

For further guidance, see the *ASI Guide for specifying architecturally exposed structural steel* and the *ASI AESS Sample specification (for engineers)*. These are available to download from the ASI website www.steel.org.au.

AESS category

AESS category to AS/NZS 5131 clause 10.2: [complete/delete]

Clearly indicate all AESS on the drawings. If more than one AESS category is proposed, indicate locations on drawings and list additional requirements for each location either on the drawings or in the **AESS schedule**.

AESS categories:

- AESS 1: Basic elements requiring enhanced workmanship.
- AESS 2: Feature elements viewed at a distance greater than 6 m.
- AESS 3: Feature elements viewed at a distance equal to or less than 6 m.
- AESS 4: Showcase elements where form is the only visible feature.
- AESS C: Custom elements which may select any of the requirements from the AESS categories. Nominate requirements for AESS C here or on drawings.

Fabrication

Additional requirements: To AS/NZS 5131 clause 10.4.

For further information refer to the *ASI AESS Code of Practice (for fabricators)*, freely available from the ASI website.

Corners and edges: Grind smooth sharp, marred, or roughened corners and edges.

Rough surfaces: Deburr and ground smooth.

Erection

Additional requirements: To AS/NZS 5131 clause 10.5.

3.9 ERECTION

General

Execution: Make sure every part of the structure has sufficient design capacity and is stable under construction loads produced by the construction procedure.

Calculations: Verify the adequacy of the structure to sustain any loads and/or procedures, which may be imposed.

If calculations to justify the adequacy of the structure during construction are necessary or are a requirement of the Erection sequence methodology (ESM), include this *Optional* style text by changing to *Normal* style text.

Temporary work

General: Provide all necessary temporary bracing or propping.

Temporary connections: Detail required cleats, if not shown on shop detail documentation.

Certain connections may be restricted for AESS. Refer to **ARCHITECTURALLY EXPOSED STRUCTURAL STEELWORK**.

Temporary members: If temporary members are required, fix so as not to weaken or deface permanent steelwork.

Anchor bolts

General: For each group of anchor bolts, provide a template with set-out lines clearly marked for positioning the bolts when casting in.

Anchor bolts are frequently fitted with a sleeve when casting in to allow minor adjustment. If applicable show on the drawings details of the sleeve.

Beam camber

Requirement: If beam elements have a camber (natural or induced), erect them with the camber up.

Site work

General: Other than work shown on the shop detail documentation as site work, do not fabricate, modify or weld structural steel on-site.

If site modifications are necessary, refer to AS/NZS 5131 Section 14.

Purlins

Trimming members: Provide to support edges of roof sheeting along hips, valleys and roof penetrations.

Movements

General: Allow for thermal movements during erection.

Grouting at supports

See AS/NZS 5131 clause 11.6.4.

Preparation: Before grouting steelwork supported by concrete or masonry, set steelwork on packing or wedges.

- Permanent packing or wedges: Form with solid steel or grout of similar strength to the permanent grout.
- Temporary packing or wedges: Remove before completion of grouting.

If any treatment of the steelwork, base plates, bearings or concrete surfaces are required before grouting, include requirements here.

Timing: Grout at supports before constructing supported floors, walls and roofing.

Temperature: Do not grout if the temperature of the base plate or the footing surface exceeds 35°C.

Drifting

Limitation: Use drifting only to bring members into position, without enlarging holes or distorting components.

See AS/NZS 5131 clause 11.5.7.

3.10 REPAIRS

General

Requirement: Repair finishes to restore the full integrity of any coating.

3.11 COMPLETION

Tolerances

Conformance: After completing erection, verify conformance with AS/NZS 5131 Section 12 and Appendix F.

Temporary connections

General: Remove temporary cleats on completion and restore the surface.

4 SELECTIONS

Schedules are a way of documenting a selection of proprietary or generic products or systems by their properties. Indicate their locations here and/or on the drawings. Refer to NATSPEC TECHnote GEN 024 for guidance on using and editing schedules.

4.1 SCHEDULES

GALVSPAN® steel purlins and girts schedule

Select purlins and girts from www.steel.com.au/products.

Item	Material	Type
Purlins	BlueScope GALVSPAN® steel	
Girts	BlueScope GALVSPAN® steel	

Type: Purlins and girts made from GALVSPAN® steel are roll formed into two standard shapes: C and Z.

In some applications such as grain or coal handling facilities or wood machining factories, the upturned lip of conventional Z and C section purlins may form a trap for dust and debris. For this reason, Z sections are also available with downturned bottom lips. These sections are normally only used over simple spans with the ends butted rather than lapped. Nominate downturned bottom lip here if this is appropriate and not already shown on the drawings.

Non-destructive testing of bars and sections schedule

Item to be tested	Test method	Other requirements

See AS/NZS 3679.1 Appendix A for requirements at time of ordering steel.

Bolting category schedule

Joint location	Bolt type/size	Bolting category

Bolting categories are defined in AS 4100 clause 9.3.1.

AESS schedule

Location	AESS category	Tolerance	Samples	Connections

Location: Element location code or project specific identifier.

AESS category:

- AESS 1: Basic elements requiring enhanced workmanship.
- AESS 2: Feature elements viewed at a distance greater than 6 m.
- AESS 3: Feature elements viewed at a distance equal to or less than 6 m.
- AESS 4: Showcase elements where form is the only visible feature.
- AESS C: Custom elements which may select any of the requirements from the AESS categories.

Tolerance: To a specific standard or more stringent requirements, i.e. half the tolerances stated in AS/NZS 5131.

Samples: e.g. 3D rendering, physical sample, first off inspection.

Connections: e.g. All welded, as documented.

Special finishes schedule

Steelwork location	Shop or site application	Defined special finish

Steelwork location	Shop or site application	Defined special finish

Define here any special finishes required, and their applicable steelwork locations. If the special finishes require the steelwork to be classified as AESS, then document the requirements in **ARCHITECTURALLY EXPOSED STRUCTURAL STEELWORK**.

Metal spray schedule

Steel member or surface	Abrasive blast cleaning to AS 1627.4	Metal spray type	Minimum thickness (µm)	Seal coat

Abrasive blast cleaning to AS 1627.4: e.g. grit blasting to Sa 2½ or Sa 3 to ISO 8501-1 as cited in AS 1627.9 with a profile height of 50 µm or 75 µm.

Metal spray type: e.g. Zinc, Aluminium, Duplex, or Composite metal spray/paint systems.

Minimum thickness: Nominate required thickness. e.g. Indoor applications: 125 µm. Outdoor applications: 175 µm.

Seal coat: Required for enhanced performance in aggressive environments, or as a decorative finish. If a seal coat is required to metal spray finishes, state requirements. e.g. Two coats of vinyl seal to a total dry film thickness of 80 µm. Usually not required where composite systems are used.

REFERENCED DOCUMENTS

The following documents are incorporated into this worksection by reference:

AS 1110		ISO metric hexagon bolts and screws - Product grades A and B
AS 1110.1	2015	Bolts
AS 1111		ISO metric hexagon bolts and screws - Product grade C
AS 1111.1	2015	Bolts
AS 1112		ISO metric hexagon nuts
AS 1112.1	2015	Style 1 - Product grades A and B
AS 1112.2	2015	Style 2 - Product grades A and B
AS 1112.3	2015	Product grade C
AS 1112.4	2015	Chamfered thin nuts - Product grades A and B
AS/NZS 1163	2016	Cold-formed structural steel hollow sections
AS/NZS 1214	2016	Hot-dip galvanized coatings on threaded fasteners (ISO metric coarse thread series)
AS 1237		Plain washers for metric bolts, screws and nuts for general purposes
AS 1237.1	2002	General plan
AS/NZS 1252		High-strength steel fastener assemblies for structural engineering - Bolts, nuts and washers
AS/NZS 1252.1	2016	Technical requirements
AS/NZS 1252.2	2016	Verification testing for bolt assemblies
AS 1397	2011	Continuous hot-dip metallic coated steel sheet and strip - Coatings of zinc and zinc alloyed with aluminium and magnesium
AS 1418		Cranes (including hoists and winches)
AS 1418.18	2001	Crane runways and monorails
AS/NZS 1554		Structural steel welding
AS/NZS 1554.1	2014	Welding of steel structures
AS/NZS 1594	2002	Hot-rolled steel flat products
AS 1627		Metal finishing - Preparation and pretreatment of surfaces
AS 1627.4	2005	Abrasive blast cleaning of steel
AS 1710	2007	Non-destructive testing - Ultrasonic testing of carbon and low alloy steel plate and universal sections- Test methods and quality classification
AS/NZS 3678	2016	Structural steel - Hot-rolled plates, floorplates and slabs
AS/NZS 3679		Structural steel
AS/NZS 3679.1	2016	Hot-rolled bars and sections
AS/NZS 3679.2	2016	Welded I sections
AS 4100	1998	Steel structures
AS/NZS 4600	2005	Cold-formed steel structures
AS/NZS 5131	2016	Structural steelwork - Fabrication and erection
SA TS 101	2015	Design of post-installed and cast-in fastenings for use in concrete
SA TS 102	2016	Structural steel - Limits on elements added
ISO 2063	2005	Thermal spraying - Metallic and other inorganic coatings - Zinc, aluminium and their alloys

The following documents are mentioned only in the *Guidance text*:

AS/NZS 1554		Structural steel welding
AS/NZS 1554.2	2003	Stud welding (steel studs to steel)
AS/NZS 1554.5	2014	Welding of steel structures subject to high levels of fatigue loading
AS 1627		Metal finishing - Preparation and pretreatment of surfaces
AS 1627.9	2002	Pictorial surface preparation standards for painting steel surfaces
AS/NZS 2312		Guide to the protection of structural steel against atmospheric corrosion by the use of protective coatings
AS/NZS 2312.1	2014	Paint coatings
AS/NZS 2312.2	2014	Hot dip galvanizing
AS 4100	1998	Steel structures
AS 4100 Supp 1	1999	Steel structures - Commentary (Supplement to AS 4100-1998)
ASI Corrosion	2015	Australian steelwork corrosion and coatings guide
ASI Journal	2015	Steel construction - Volume 47 Number 2: Design and detailing for corrosion protection of steel structures
ASI NSSF	2016	National structural steelwork specification
ASI Practical guide	2016	Practical guide to planning the safe erection of steel structures
ASI SDN	2017	Standard drawing notes
ASI/SCNZ AESS A	2012	Guide for specifying architecturally exposed structural steel
ASI/SCNZ AESS E	2012	Architecturally exposed structural steelwork (AESS) - Sample specification (for engineers)
ASI AESS F	2012	Architecturally exposed structural steelwork (AESS) - Code of Practice (for fabricators)
ASI TN001	2017	High strength structural bolt assemblies to AS/NZS 1252:2016
ASI TN005	2012	Guidelines for designing to AS 4100 when imported materials are involved
ASI TN007	2012	Compliance issues and steel structures
ASI TN008	2012	Welding consumables and design of welds in AS 4100-1998 with amendment 1, 2012.
ASI TN009	2012	Documentation of structural steel
ASI TN011	2016	AS/NZS 5131 - Structural steelwork fabrication and erection - Implementation guide for engineers, specifiers and procurers
BlueScope TB-17	2013	Selection guide for galvanized steel purlin products
NATSPEC GEN 006	2007	Product specifying and substitution
NATSPEC GEN 024	2015	Using NATSPEC selections schedules
NATSPEC TR 01	2016	Specifying ESD
WTIA TN11	2016	Commentary on the structural steel welding standard AS/NZS 1554
BS 8539	2012	Code of practice for the selection and installation of post-installed anchors in concrete and masonry
ISO 8501		Preparation of steel substrates before application of paints and related products - Visual assessment of surface cleanliness
ISO 8501-1	2007	Rust grades and preparation grades of uncoated steel substrates and of steel substrates after overall removal of previous coatings
ISO 14001	2015	Environmental management systems - Requirements with guidance for use