



AUSTRALIAN STEEL INSTITUTE

ASI

National Structural Steelwork Specification



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Australian Steel Institute

National Structural Steelwork Specification

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1	Updates for 2020 amendment 1 to AS/NZS 5131	23/08/2020
2	Updates to sustainability clauses 2.3.1 and 2.3.2 Reference added to ASI TN015 in clauses 3.2 and 4.8.3.1	4/5/2023

NOTE:

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FOREWORD

This generic specification has been configured to be applicable to general structural steel framing for buildings and structures. The specification is intended to be the implementation tool used to embed the requirements defined in the Australian Standard AS/NZS 5131 'Structural Steelwork – Fabrication and Erection' into engineering and steelwork procurement practice in Australia, in combination with the 'Standard Steelwork Drawing Notes' published by the ASI (a separate document).

The intent of this specification is to standardise the development of structural steelwork related project requirements across Australia, which will significantly improve efficiencies in project delivery, cost, quality, compliance and long-term value. In combination with the ASI 'National Structural Steelwork Compliance Scheme' (NSSCS) and contingent certification of fabricators, our community can expect risk minimised, fit-for-purpose, value engineered outcomes for structural steelwork projects in Australia.

Scope

This specification covers, and is strongly aligned to, the scope in AS/NZS 5131. It therefore addresses areas including materials used for fabrication, cutting, holing, shaping, welding, bolting, surface preparation, corrosion protection, shop assembly, handling, transport and erection. It also includes recognition of the particular requirements in AS/NZS 5131 for architecturally exposed structural steel (AESS) and cold formed purlins and girts used in conjunction with structural steelwork.

This specification is also consistent with the 2020 revision to AS 4100. The 2020 revision to AS 4100 included reference to AS/NZS 5131 for fabrication and erection and requirements for architecturally exposed structural steel and lamellar tearing.

Sustainability

Sustainability is not covered within the scope of AS/NZS 5131. However, given the increasing importance of sustainability in the built environment, this specification includes reference to the Steel Sustainability Australia Certification Program, which is recognised by the GBCA.

Structure of this document

AS/NZS 5131 places significant reliance on the 'Construction Specification' to define the project specific variables. The Construction Specification includes technical specifications (such as this document), the project drawings and associated documentation. Consequently, this specification has been structured in such a way as to minimise reference to requirements that are already called up in AS/NZS 5131. Rather, focus is placed on those requirements where choices are required for project specific selections. In general, these are classified as '**Particular Requirements**' in the following specification.

The specification is structured into sections, with Sections 4 to 14 generally similar in scope to correspondingly named sections in AS/NZS 5131. Sections 1 to 3 of this specification cover project design context and the relationship between the specification, Standards and other project documentation.

AS/NZS 5131 documents a foundation of 'good practice', applicable irrespective of project type, embedded in which are a range of project specific selections that need to be addressed to configure the generic specification for project specific use. These selections, which are documented throughout the body of AS/NZS 5131, are conveniently summarised in Tables B1 and B2 of Appendix B of AS/NZS 5131 and are presented as:

- Selections that are **mandatory** (Table B1): if the project contains material or components applicable to the selection, then the construction specification must document a choice for this particular selection.



- Selections that are **optional** (Table B2): if the project contains material or components applicable to the selection, then the construction specification may choose to address this particular selection.

Each of Sections 6 to 14 in this specification present these selections. The user needs to make choices for mandatory selections that are within the scope of the project and decide which of the optional selections are required for project specific selections.

Using this document

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This generic specification may be used in a number of ways by relevant stakeholders (engineers, architects, procurers or specifiers):

1. Essentially 'as is', in which case the specifier should delete the informative commentary and user instructions and input any mandatory or optional 'particular requirements' needed for the specific project in Sections 6 to 14.
2. Edited to suit the particular style of specification adopted by the specifier and then used as the company 'standard steelwork specification'. This standard specification then requires selection of 'particular requirements' for specific projects, as per item 1 above.
3. Used as a basis for modification of the specifier's existing specifications, to be consistent with the requirements of AS/NZS 5131. If this option is adopted, the specifier needs to ensure the various 'particular requirements' are appropriately addressed.

ASI strongly suggests that options 1 or 2 above are the preferred implementation approaches. There is significant benefit to the whole supply chain if the standardised structure to the specification is maintained, as stakeholders will know where to look for any particular or unusual requirements for the project.

It should also be noted that the majority of simpler projects will not require selection of any optional requirements and the resulting specification will therefore be simpler and standardised.

Informative material is included in a green text box thus:

This is informative material and should be deleted in the final project specification

Instructions to the user to add relevant material are shown thus: [*Add itemized list defining scope*] and should be deleted from the final project specification.

Selections which are optional are followed by [*Optional*]. Optional selections have default null requirement text "No additional requirements" and hence can be left in the final specification if so desired. There is merit in keeping these default null selections, as the structure of the resulting 'standard specification' will therefore remain similar across projects and stakeholders, contributing to industry familiarity and highlighting when extra-ordinary selections are made.

Sections 6 to 14 of this specification typically contain sub-sections headed 'Particular requirements'. These requirements are determined from AS/NZS 5131 as needing to be defined in the Construction Specification (this specification) in either a mandatory or optional sense. Requirements marked as [*Optional*] may be deleted if not required. Other requirements must be addressed if they are within the scope of the project, otherwise they may be left with the null requirement text or deleted.



Additional items not covered

There are a number of additional related items not covered in this specification that should be covered elsewhere in the project documentation, including:

- Contractual relationships. This specification does not intend to address or override contractual relationships established elsewhere. For completeness, and to help ensure the (separate) contractual requirements facilitate appropriate outcomes for this specification, Appendix A contains a discussion on contractual aspects that may need to be addressed in separate contractual documentation.
- Details of any environmental rating tool applicable. [However, certification under the Steel Sustainability Australia Certification Program, which is approved by the GBCA, is included](#)
- Design development, where required
- Site safety
- Safety in design
- Environmental sustainability in design
- Corrosion environment and atmospheric corrosivity category.

Revision of this document

This document is designed to be updated regularly based on review and feedback we receive. We encourage you to provide feedback to improve the document. All feedback will be considered for subsequent revisions.



ASI NATIONAL STRUCTURAL STEELWORK SPECIFICATION

1.0 DEFINITIONS AND ABBREVIATIONS

1.1 Definitions

For the purposes of this specification, the definitions included in AS/NZS 5131 and the following apply:

- **Contractor:** the party responsible for the relevant scope of work. The contractor shall be designated by the contractual documentation.
- **Hold point:** an identified point in a process beyond which the relevant work cannot proceed without approval.
- **Project Drawings:** the set of drawings that describe in a diagrammatic fashion the extent and detail of the Works and the relationship of the Works to the overall construction. The Project Drawings may include the detail necessary to fabricate and erect the Works, depending on the contractual relationships established for the project.
- **Steelwork:** the fabricated structural steel.
- **Witness point:** An identified point in a construction process at which an activity is observed.

1.2 Abbreviations

For the purposes of this specification, the following abbreviations apply:

- **AESS:** Architecturally exposed structural steelwork
- **ASI:** Australian Steel Institute
- **CC:** Construction Category (CC1, CC2, CC3, CC4)
- **CompMP:** Compliance Management Plan
- **EPD:** Environmental Product Declaration
- **ESC:** [ASI Environmental Sustainability Charter](#)
- **ESM:** Erection Sequence Methodology
- **FC:** Fabrication Category (FC1, FC2)
- **IL:** Importance Level
- **ILAC:** International Laboratory Accreditation Cooperation
- **ITP:** Inspection and Test Plan
- **MDR:** Manufacturer's Data Report
- **NDE:** Non-Destructive Examination
- **NSSCS:** The ASI National Structural Steelwork Compliance Scheme
- **PC:** Coating quality level
- **QP:** Quality Plan
- **SC:** Service Category (SC1, SC2)
- **SDoC:** Supplier Declaration of Conformity
- **SCA:** Steelwork Compliance Australia
- **SSA:** [Steel Sustainability Australia](#)
- **UNO:** unless noted otherwise
- **WPQR:** Welding Procedure Qualification Record
- **WQR:** Welder Qualification Record
- **WPR:** Welding Procedure Record
- **WPS:** Welding Procedure Specification

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2.0 GENERAL

2.1 Responsibilities

Table B.3 of AS/NZS 5131 details a list of responsibilities to be assigned.

For the responsibilities assigned under the scope of the project contract, the steelwork contractor shall provide a list of named personnel and organisations corresponding to the entries in Table B.3 of AS/NZS 5131 at least 5 working days prior to the respective portion of the works being undertaken.

All work on this project shall be undertaken by competent personnel. Requirements and examples of qualifications for competent personnel are contained in AS/NZS 5131.

For completeness, Appendix A.3 of this specification lists the range of responsibilities that need to be assigned. The contractual documentation should ensure these responsibilities are assigned.

2.2 Conflicts

If there is a conflict in specified requirements, such conflicts shall be documented, advised to relevant parties and resolved using a managed process.

2.3 Environmentally sustainable structural steelwork

Where the project aims to use environmentally and socially responsible steelmakers and steelwork fabricators who are actively engaged in reducing their carbon footprint, the clauses below should be included in the Specification.

Specifiers are also strongly encouraged to engage with the relevant scheme or program operator Steel Sustainability Australiaan ESC consultant if they have questions about how the Certification Programcharter operates for further information.

Steel and fabricated steelwork shall conform to the requirements of the ASI Environmental Sustainability CharterSteel Sustainability Australia Certification Program (see Steel Sustainability Australia - Certifying sustainable steel)<https://www.steel.org.au/focus-areas/environmental-sustainability/environmentally-aware-steelwork-fabrication-and-pr/>.

Specifically:

2.3.1 Steel purchased:

All semi-finished steel purchased must be either:

- a) Sourced from steelmakers who are verified to meet the requirements under 4.1 Steel Supply Sourcing of the Steel Sustainability Australia (SSA) Certification Program – that is, a SSA verified steel producer. Contractor must provide a valid SSA Verified Supplier Certificate; or
- b) Sourced from steelmakers who have a product-specific Environmental Product Declaration (EPD) for their steel product/s AND are certified to any of the following certification schemes:
 - i. GECA Steel and Steel Products (SSP v1.0i-2019), or
 - ii. ResponsibleSteel™ Standard (v 1.1 or v2.0), or
 - iii. Global GreenTag International Standard v4 (Green Rate - Level A), or
 - iv. Any other scheme listed as a recognised initiative under the Green Building Council of Australia Responsible Product Framework that assesses ESG sustainability performance in steelmaking operations



Contractor must provide evidence of certification to any of the above schemes, together with Environmental Product Declarations (EPDs) for all products manufactured by the steelmaker that are included in the project. All steel purchased must be either:

Note also any requirement for steel manufacturer certification in Section 4.5.

(a) Sourced from steelmakers who are certified to ISO 14001. Contractor to provide evidence of certification together with Environmental Product Declarations (EPD) of all products manufactured by the steelmaker which are included in the project; or

(b) Supplied from steelmakers who are certified to ISO 14001 and are members of the worldsteel climate action group (see <http://www.worldsteel.org/steel-by-topic/climate-change/members.html>). Contractor to provide evidence of steelmaker certification and of climate action group membership.

2.3.2 Steelwork:

Fabricated, manufactured or processed steelwork must be:

a) Supplied from steelwork fabricators, reinforcing processors, roll formers, manufacturers or other fabricated or processed steelwork provider whose facilities are certified to the ASI Steel Sustainability Australia (SSA) Certification Program and are listed as certified on the SSA Supplier Listing on the SSA website (see <https://www.steelsustainability.com.au/supplier-listing/>).

Contractor must provide a copy of a valid SSA Certificate of Compliance listing the site/s that manufactured the products procured for the project. Steelwork must be either:

Steelwork fabricators who have been certified under the Steel Sustainability Australia (SSA) Certification Program are members of the ASI ESC can ensure builder clients secure a green star points for the project under the GBCA Greenstar Building Rating Tool.

Note also any requirement for fabricator certification in Section 4.5.

(a) Supplied from steelwork fabricators who are members of the ASI Environmental Sustainability Charter (ESC) and listed on the ESC section of the ASI website (see <https://www.steel.org.au/about-us/committees-and-groups/find-a-charter-member/>); or

(b) Supplied from steelwork fabricators who have an environmental management system certified under ISO 14001. Contractor to provide evidence of fabricator certification.

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3.0 REFERENCED DOCUMENTS

3.1 Standards

The following Standards and codes applicable to and referenced in this Specification shall be regarded as describing the minimum standard of materials and workmanship to be provided:

Standard	Title
AS 1111	ISO metric hexagonal commercial bolts and screws
AS/NZS 1163	Cold-formed structural steel hollow sections
AS/NZS 1214	Hot-dip galvanized coatings on threaded fasteners (ISO metric coarse thread series) (ISO 10684:2004, MOD)
AS/NZS 1252.1	High-strength steel bolt assemblies comprising bolts, nuts and washers for structural engineering – Part 1: Technical requirements
AS/NZS 1252.2	High-strength steel bolt assemblies comprising bolts, nuts and washers for structural engineering – Part 2: Verification testing
AS/NZS 1554	Structural steel welding (several parts, as applicable)
AS/NZS 1594	Hot-rolled steel flat products
AS/NZS 2312.1	Guide to the protection of structural steel against atmospheric corrosion by the use of protective coatings – paint coatings
AS/NZS 2312.2	Guide to the protection of structural steel against atmospheric corrosion by the use of protective coatings – hot-dip galvanizing
AS 3597	Structural and pressure vessel steel – Quenched and tempered plate
AS/NZS 3678	Structural steel – Hot-rolled plates, floorplates and slabs
AS/NZS 3679.1	Structural steel – Part 1: Hot-rolled bars and sections
AS/NZS 3679.2	Structural steel – Part 2: Welded I sections
AS 4100	Steel structures
AS/NZS 4600	Cold-formed steel structures
AS/NZS 4680	Hot-dip galvanized (zinc) coatings on fabricated ferrous articles
AS/NZS 5131	Structural steelwork – Fabrication and erection
AS 5216	Design of post-installed and cast-in fastenings in concrete
SA TS 102	Structural steel – Limits on elements added
SA TS 103	Structural steel welding – Limits on boron in parent materials

3.2 Other referenced documents

This technical specification shall be read in conjunction with:

1. ASI TN011 'AS/NZS 5131 Structural steelwork – Fabrication and erection: Implementation guide for engineers, specifiers and procurers'.
2. ASI 'Practical guide to planning the safe erection of steel structures'.
- 2-3. [ASI TN015 'Ascertaining compliance of structural steel'](#)
- 3-4. [\[List additional documents\]](#)

The specifier should edit and augment these suggested normative reference documents with documents specific to the project.

4.0 DESIGN, DOCUMENTATION AND QUALITY CONTROL / MANAGEMENT

4.1 Construction Category

In accordance with the requirements of AS 4100 and AS/NZS 5131 the Construction Categories for the project are defined in the table below:



	Element	Importance Level	Service Category	Fabrication Category	Construction Category
1	All structural steelwork UNO.	IL2	SC1	FC1	CC2
2	<i>[Provide a list of drawings, components or assemblies where a different CC to above is required]</i>	<i>[IL2]</i>	<i>[SC2]</i>	<i>[FC1]</i>	<i>[CC3]</i>

In accordance with the requirements of AS 4100, a Construction Category or Categories shall be assigned to the structure described by the scope of work. Construction Categories (CC1 to CC4) may apply to the whole of the structure, to a part of the structure or to specific details. A structure can include several Construction Categories.

Guidance on the calculation of the Construction Category can be found in Appendix L of AS 4100 and identically in Appendix C of AS/NZS 5131 and is based on the 'Importance Level' (IL), the 'Service Category' (SC) and the 'Fabrication Category' (FC).

See also ASI TN011 'AS/NZS 5131 Structural steelwork – Fabrication and erection: Implementation guide for engineers, specifiers and procurers' for further details.

4.2 Treatment grades

Unless noted otherwise in the Project Drawings, for the elements on this project, the treatment grades according to AS/NZS 5131 shall be:

	Element	Treatment grade
1	All painted structural steelwork UNO.	P2
2	<i>[Provide a list of drawings, components or assemblies which are intended to be painted where a different treatment grade to above applies]</i>	<i>[P3]</i>



Treatment grades (P1 to P3 in AS/NZS 2312 and AS/NZS 5131) are related to the expected life of the corrosion protection and may be related to the type of corrosion protection system used in a particular area of the structure. Refer to Clause 9.8.4 of AS/NZS 5131 for a definition of the treatment grades.

Treatment grades may apply to the whole structure or to a part of the structure or to specific details. A structure can include several treatment grades. A detail or group of details will normally be ascribed one treatment grade.

Refer ASI 'Australian steelwork corrosion and coatings guide' or ISO 8501-3 for more information.

Notes:

1. Unless AESS is required, surface preparation to treatment grades is not necessary for galvanized products.
2. The galvanized surface may require surface preparation if is to be painted after galvanizing.
3. Intumescent coatings may require specific surface preparation and assessment for compatibility with corrosion protection systems. The specifier should review manufacturer data in this regard.

4.3 Quality Assurance

A quality management system complying as a minimum to AS ISO 9001 is required to be operated by the Contractor for the Works and for a specified product or service.

ASI strongly recommends that quality management systems consistent with the requirements of AS ISO 9001 as a minimum are required for all product or service associated with safety critical structural steelwork fabrication and erection.

4.4 Quality documentation

Provide quality documentation as required by Clause 4.5.1 of AS/NZS 5131.

Provide a Quality Plan as required by Clause 4.5.2 of AS/NZS 5131.

Clause 4.5.1 of AS/NZS 5131 requires the specified quality documentation for CC2, CC3 and CC4 categories.

According to Clause 4.5.2 of AS/NZS 5131, a Quality Plan is optional for Category CC2 and mandatory for Categories CC3 and CC4.

4.5 Certifications and compliance

The following certifications are required for this project:

- (a) All structural steel shall be sourced from mills with a relevant JAS ANZ accredited third party certification scheme such as the ACRS Scheme (see <http://steelcertification.com/>). Alternative sourcing of third party certified structural steel shall be submitted for review and must be approved prior to the commencement of procurement.
- (a)(b) All structural steel shall be sourced from mills with an accredited sustainability certification scheme as referenced in 2.3.1 (b)
- (c) Steelwork shall be fabricated by fabricators certified under the ASI 'National Structural Steelwork Compliance Scheme' (NSSCS) (see <http://www.scacompliance.com.au/>).



Third party certification of steel and steelwork is not mandated in AS/NZS 5131, as this is against Standards drafting rules. However, ASI strongly recommends that in the present procurement environment, third party construction product certification provides necessary surety on compliance.

Refer <http://steel.org.au/key-issues/compliance> for further details.

(d) Steelwork shall be fabricated by fabricators certified under the ASI Steel Sustainability Australia (SSA) Certification Program (see www.steelsustainability.com.au)

(b) _____
(e)(e) _____ High strength structural bolts shall be verified to AS/NZS 1252.2.

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The procurement, fabrication and erection of structural steelwork shall be undertaken under a documented Compliance Management Plan (CompMP). The CompMP shall include the requirements of the Quality Plan in 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 for review of steel and steelwork documentation to ensure the performance requirements of the NCC and nominated Australian Standards is met
- Process and documentation checklists for erection of structural steelwork
- Assigned responsibilities for compliance management, including names and CV's of relevant personnel

The CompMP shall be provided by the contractor prior to first procurement of materials for the project.

The ASI strongly recommends the 'Compliance Management Plan' (CompMP) as providing a documented process bringing together the requirements of AS/NZS 5131 and project specific process and responsibilities to facilitate improved compliance outcomes.

The CompMP is not a requirement of AS/NZS 5131.

4.6 Identification and traceability

The Contractor shall implement systems to ensure identification and traceability complying with AS/NZS 5131 for the appropriate Construction Category, including by all subcontractors.

Identification and traceability of materials and components is a key requirement of AS/NZS 5131. All stakeholders in the supply chain must implement systems to support the performance requirements of AS/NZS 5131. Importantly, subcontracted services need to ensure continuity of requirements.

4.7 Purchasing – components and subcontracted services

The processes and documentation required for purchasing of components or subcontracted services shall meet the requirements of Clause 4.6 of AS/NZS 5131.

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



4.8 Submittals

The submittals required are defined in AS/NZS 5131. The timing on specific submittals shall be:

Submission	Timeframe	Hold / Witness
Personnel	5 days of contract award	Hold
Origin of steel	48 hours after fabricated steel delivery to site	Witness
Submission of shop drawings	Allow three weeks for review	Hold
Notice for inspections	48 hours' notice required	Witness

The specifier should adjust this table as necessary to reflect required submission timing or delete if this is addressed in the contractual documentation.

In particular, submittals shall include the following:

4.8.1 Personnel

If requested, submit names, CV's, qualifications, roles and responsibilities for all key personnel to be involved with the project.

4.8.2 Quality Plan and ITPs

The requirements for submission of Quality Plans and ITP's are provided in Section 13.

4.8.3 Products and materials

4.8.3.1 Origin of steel

The requirements in AS/NZS 5131 for documentation to demonstrate compliance with Australian Standards apply.

Steel shall be certified by an accredited third-party certifier. Provide documentation to demonstrate JAS ANZ accredited third-party certified steel has been sourced for this project. Where this is not possible, specific written approval shall be obtained for non-JAS ANZ accredited third-party certified steel.

[Where non-JAS ANZ certified steel is proposed to be procured, the compliance of the steel shall be established with reference to the requirements in ASI Tech Note TN015 'Ascertaining compliance of structural steel'.](#)

[ASI Tech Note TN015 'Ascertaining compliance of structural steel' provides a rigorous and defensible process consistent with the performance requirements of the National Construction Code. Note also any requirement for steel manufacturer certification in Section 4.5.](#)

4.8.3.2 Chemical composition of steel

In addition to the requirements of the Australian Standards for structural steel (refer Section 5.2), the steel shall also comply with the following requirements for boron content:

- the material test certificates shall report all elements required by the Australian Standards listed above, plus total boron.
- If boron is not specified on the material test certificates, then the material shall be tested to determine the total boron.



Parent steel materials with a total boron equal to or exceeding 0.0008% will require requalification of welding procedures using the higher boron content material.

4.8.3.3 Bolts

Provide documentation demonstrating compliance to the relevant Standard (refer Section 5.3) prior to delivery of bolts to site. Bolts delivered to site without complete documentation shall be rejected.

The high strength structural bolts for this project are required to have verification testing to AS/NZS 1252.2. Provide documentation and a 'Supplier Declaration of Conformity' as defined in AS/NZS 1252.2.

Submit details of the bolt tensioning procedure and calibration of the process and equipment to be used.

Submit details of training to be provided to personnel involved with bolt tensioning.

Submit details of the inspection procedure to be undertaken.

4.8.4 Shop drawings

Submit shop drawings and any supporting documentation providing the range of information required for the shop detailing documentation in AS/NZS 5131.

Shop drawings are to include all provisions documented in all project drawings across all design disciplines involved in the project.

Shop drawing numbers shall be maintained. Changes to shop drawings shall be clouded.

The contractor is to submit all proposed changes to the documented design for approval prior to submitting shop drawings for approval.

The shop drawings shall be reviewed and approved, certifying that they have been checked for compliance with the technical specification and Project Drawings.

Provide one copy in Adobe PDF format.

The specifier should decide what form and extent of shop detailing submission is required. Electronic-only submission can save costs and time.

4.8.5 Execution details

4.8.5.1 Subcontractors

Submit names and contact details of any proposed fabricator, detailer, surface preparation contractor, painter/galvanizer and erector/installer.

4.8.5.2 Fabrication

Provide documentation to demonstrate NSSCS certified fabricators or subcontractors will be utilised for the Works.

Approval to use non-NSSCS certified fabricators must be formally requested and approved. In this case, documentation shall be provided to demonstrate compliance with AS/NZS 5131.

Where it is proposed to use a non-NSSCS certified fabricator, the requirements in AS/NZS 5131 for documentation to demonstrate compliance with Australian Standards still applies and should be stated.

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



Submit plan for the marking of members to ensure material and component traceability meets the requirements of AS/NZS 5131.

Submit the completed 'Supplier declaration of conformity' (SDoC) for the fabricated structure or components, as defined in AS/NZS 5131.

4.8.5.3 Erection documentation

Submit the 'Erection Sequence Methodology' (ESM) as defined in AS/NZS 5131 for review and approval.

The 'Erection Sequence Methodology' (ESM) is recommended for projects where a risk assessment has been undertaken and indicates the need. The scope and extent of the ESM is an outcome of the risk planning workshops.

Refer ASI 'Practical guide to planning the safe erection of steel structures' for further guidance.

If required by the ESM, submit calculations to justify the adequacy of the structure for the intended erection methodology.

4.8.5.4 Connections

For bolted connections, submit inspection records for completed installation.

For bolted connections not fully documented, submit proposals for approval.

For bolted connections requiring rectification, submit proposals for approval before proceeding.

For anchor bolts that do not meet documented location tolerances, submit proposals for rectification for approval before proceeding.

For temporary connections, if not documented, submit proposals for approval.

If splicing of structural members is proposed, submit details for approval.

Where alternative anchors are proposed, submit documentation for approval to substantiate the anchor capacity to carry the load where mechanical or chemical anchors are required or proposed for the support or fixing of structural steel.

4.8.5.5 Steelwork exposed to view

Submit details of proposed member, connection and component marking for steelwork identified as AESS or otherwise exposed to view.

4.8.5.6 Rectification works

Proposals for rectification works shall be submitted in writing and approved before being undertaken.

4.8.6 As-built documentation

Submit the survey of erected structural steelwork to verify the structure and components have been installed as defined on the Project Drawings to the tolerances defined in AS/NZS 5131 and this specification.



Submit as-built documentation.

4.8.7 Non-conforming Work

Where a section of the Works does not comply with the requirements of the specification and the Project Drawings (including requirements for inspection and testing), the Contractor shall submit a non-conformance report detailing the non-conformance and the proposed rectification method for approval. Where deemed necessary, the non-conformance report must be reviewed and/or inspected by the relevant consultant(s).

4.8.8 Manufacturers Data Report (MDR)

Submittals are required in the form of a fabricator's MDR, the structure and contents of which is defined in the following table:

Content	Required		
	CC1	CC2	CC3/CC4
Scope of work:			
Insert a brief description of the contract Scope of Work applicable to the MDR at the front of report.	✓	✓	✓
Section 1 – Design and detailing:			
Design calculations (if relevant)			
Technical queries / requests for information		✓	✓
Authorised deviations		✓	✓
Material and equipment lists			
Drawing list including revision number		✓	✓
General arrangement drawings		✓	✓
Marking plans		✓	✓
Shop detail and vendor drawings		✓	✓
Assembly drawings (where applicable)		✓	✓
As-built drawings		✓	✓
3D model(s) (if applicable)			
Section 2 – Steel fabrication:			
Signed off ITPs for each stage of the work		✓	✓
Final Inspection Check Sheets or Reports	✓	✓	✓
Material Certificates and Supplier Declarations of Conformity	✓	✓	✓
High strength bolt verification test documentation (to AS/NZS 1252.2)	✓	✓	✓
Material and consumable map for traceability			✓
Welding consumables certificates		✓	✓
Welding Procedure Specifications (WPS)	✓	✓	✓
Welding Procedure Qualification Records (WPQR)	✓	✓	✓
Welder Qualification Records (WQR)	✓	✓	✓
Material Heat Traceability Records		✓ (partial)	✓ (full)
Inspection and Non Destructive Testing (NDT) Records	✓	✓	✓
NDT Personnel Certifications		✓	✓
Production Test Plate Reports (if applicable)			
Weld maps identifying NDT records against location			✓



Weld maps identifying welders and WPS used for each weld			✓
Hardness Test Records (to be included in NDT traceability)			✓
Heat Treatment Records		✓	✓
Map for identifying heat treatment records against welds and/or location			✓
Inspection records for shop installed bolted connections		✓	✓
Non-conformances, concessions and technical queries	✓	✓	✓
Final release certificate (works) or Inspection Release and Handover Certificate (Site)		✓	✓
Section 3 – Corrosion Protection:			
Signed off ITPs for each stage of the work		✓	✓
Material batch numbers and test certificates		✓	✓
Surface preparation Records		✓	✓
Coating application and thickness records		✓	✓
Protective Treatment Certificate		✓	✓
Section 4 – Structural Steel Erection:			
Signed off ITPs for each stage of the work		✓	✓
Installation record sheets		✓	✓
Approved Erection Sequence Methodology (ESM) (as required based on risk assessment)			
Any records described in preceding sections that may be relevant to Site Erection		✓	✓
Section 5 – Statutory Approvals, Registrations and Certificates			
Lifting equipment certification (if applicable)			

Note: ✓ = required

The specifier should review these selections and adjust the required options accordingly. The default selections are recommended by ASI.

The supply of 3D models as a deliverable from design and detailing is preferred.

Submissions in the form of an MDR are not mandatory in AS/NZS 5131.

4.9 Inspection

4.9.1 Inspection scheduling

4.9.1.1 Bookings:

[Optionally, provide direction on process and timing for booking inspections]

4.9.1.2 Inspection times:

[Optionally, provide direction on usual inspection times]

4.9.2 Off-site witness points

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

- Materials including welding consumables prior to fabrication
- Testing of welding procedures and welder qualification tests



- Commencement of shop fabrication
- Commencement of welding
- Prior to placement of root runs of complete penetration butt welds
- High strength bolt tensioning (when completed in shop)
- Completion of fabrication prior to surface preparation
- Surface preparation prior to protective coating
- Completion of protective coating prior to delivery to site

4.9.3 On-site witness points

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

- Steelwork on site before commencement of erection
- Anchor bolts in position before casting in
- Column bases prior to grouting
- Installation and tensioning of bolts in categories /TB or /TF
- Completion of erection prior to any encasing, field protective coating or fixing of cladding
- Mechanical or chemical anchor proof load testing
- Reinforcement and formwork in place prior to any encasement
- After any grouting, encasement, fire protection or field protective coating is completed
- The loading and unloading of temporary works

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4.9.4 Hold points

The required hold points and submission details are defined in the table below. Hold points will be released after written approval.

No.	Hold point	Submission requirements
1	Reviewed shop drawings prior to commencing fabrication	Completed shop drawings issued for construction/fabrication
2	Submission of QP/ITP's for approval	Completed QP / ITP's
3	Certification of fabricated steelwork prior to packing and transport to site	Supplier Declaration of Compliance (SDoC) from fabricator
4	Prior to commencement of erection	Where required, agreed 'Erection Sequence Methodology'
5	Completed erected steelwork prior to any encasing or fixing of cladding	SDoC from the structural steelwork erector Survey of erected structural steelwork
6	<i>[Add other hold points as required]</i>	

The specifier should review these hold points for applicability for the specific project.



5.0 MATERIALS AND COMPONENTS

5.1 General

Members and components shall be packed, supported, lifted and transported in a manner to prevent distortion, loss of camber or damage to the steelwork and its protective coating.

Damaged items shall be reported and rectified or replaced. Where rectified, the method of rectification shall be subject to approval.

Documentation supplied with materials and components shall conform to the requirements of AS/NZS 5131.

5.2 Structural steel

5.2.1 General

All structural steel materials and components shall conform to the following table UNO:

Component	To conform with Australian Standard	Grade
Hot rolled steel sections	AS/NZS 3679.1; TS 102	300; 350
Plates and flats	AS/NZS 3678; AS/NZS 1594; TS 102	250; 300; 350; 400; 450; WR350
	AS/NZS 1594; TS 102	HA250; HA300; HA350; HA400 HW350
Hollow sections: Circular Square Rectangular	AS/NZS 1163; TS 102	C250L0; C350L0; C450L0 C350L0; C450L0 C350L0; C450L0
Welded beams and columns	AS/NZS 3679.2; TS 102	300; 400
Shear studs (composite slab to steel)	AS/NZS 1554.2	380
Quench & tempered plate	AS 3597	500; 600; 700; 900; 1000
Purlins and girts	AS 1397	G250; G300; G350; G450; G500; G550

The specifier should review these steel grades and delete or add as required.

Hot rolled steel sections, plates and flats are available in multiple impact grades. Where required, check with manufacturer.

5.2.2 Level of traceability

Construction Category	Type of traceability	Extent of traceability
CC1	Not required	Not applicable
CC2	Lot	Main structural members, connections between main structural members and major plate components
CC3	Lot	Lot traceability for all items (including cleats, brackets and the like).
CC4	Lot	Lot traceability for all items (including cleats, brackets and the like).

Note: 'Lot', 'Piece' and 'Piece-mark' traceability are defined in AS/NZS 5131 Clause 4.7



[The above table corresponds to the default required level of traceability in AS/NZS 5131. Optionally select 'Piece' or 'Piece-mark' traceability for CC3 or CC4 if required]

5.3 Bolt assemblies

5.3.1 Bolt Designation

Designation	To conform with Australian Standard	Tightening process	Property class
4.6/S	AS 1111	Snug tight	4.6
8.8/S	AS/NZS 1252.1	Snug tight	8.8
8.8/TB	AS/NZS 1252.1	Fully tensioned to AS 4100 as a bearing type joint	8.8
8.8/TF	AS/NZS 1252.1	Fully tensioned to AS 4100 as a friction type joint. Connecting surfaces to be left uncoated.	8.8
10.9/TB	AS/NZS 1252.1	Fully tensioned to AS 4100 as a bearing type joint	10.9
10.9/TF	AS/NZS 1252.1	Fully tensioned to AS 4100 as a friction type joint. Connecting surfaces to be left uncoated.	10.9

The connecting surfaces of friction type joints may be coated if the friction coefficient of the coated joint has been tested according to AS 4100 Appendix J.

5.3.2 Bolt assembly verification

High strength bolt assemblies to AS/NZS 1252.1 shall be verified to AS/NZS 1252.2. Documentation to meet the requirements of AS/NZS 1252.2 shall be provided.

ASI strongly recommends that high strength bolt assembly verification to AS/NZS 1252.2 is specified, given the demonstrable issues with ensuring bolt compliance in today's procurement environment. If bolts verified to AS/NZS 1252.2 are not practical, then Appendix I of ASI Tech Note TN-001 provides a 'Recommended batch testing regime' that should be required to be undertaken by the bolt supplier.

5.3.3 Bolt finish

All bolts shall be hot dip galvanized to AS/NZS 1214.

5.4 Welding consumables

Welding consumables shall conform to the requirements of AS 4100, based on the yield strength of the steel to be welded, as defined in the table below:

Nominal yield strength of steel to be welded	To conform with Australian Standard
≤ 500 MPa	AS/NZS 1554.1
>500MPa; ≤ 690 MPa	AS/NZS 1554.4



5.5 Mechanical and chemical anchors

Mechanical and chemical anchors shall meet the requirements defined in AS 5216.

5.6 Studs and shear connectors

Studs and shear connectors shall meet the requirements defined in AS/NZS 5131.

5.7 Special fasteners

Special fasteners shall meet the requirements defined in AS/NZS 5131.

5.8 Fasteners for thin gauge components

Fasteners for thin gauge components shall meet the requirements defined in AS/NZS 5131.

5.9 Locking devices

Where required, locking devices to prevent loosening of fasteners are noted on the Project Drawings. Locking devices shall meet the requirements of AS/NZS 5131.

5.10 Footing bolts

Footing bolts shall meet the requirements of AS/NZS 5131.

5.11 Grouting materials

Materials used for grouting under steel base plates and bearing plates shall meet the requirements defined in AS/NZS 5131.

5.12 Testing

5.12.1 Lamellar tearing

Joint details which are susceptible to lamellar tearing (LT) are indicated on the project drawings as "LT susceptible". The identified plate in joints that have been assessed as 'LT susceptible' shall be ultrasonically tested to AS 1710 Class 1.

5.12.2 Z-plate requirement

Joints that are designated 'LT susceptible' (see clause 5.12.1) and further require plate to a nominated Z-value are indicated on the project drawings with a designated Z-value. The plate identified in these joints shall be ordered to the designated Z-value and shall be ultrasonically tested to AS 1710 Class 1.

Guidance is provided in Appendix M of AS 4100 for the choice of Z-qualities to avoid lamellar tearing in welded connections subject to tension stresses in the through-thickness direction.

Available design Z-values for plate according to AS/NZS 3678 is Z15, Z25 or Z35.

'LT susceptible' joints include cruciform joints and T-butt joints at or near plate cut edges.

5.12.3 Supplementary ultrasonic testing



Supplementary ultrasonic testing to AS 1710 Class 1 is required for all plates 40mm thickness and over.

Thicker plates may contain inclusions and laminations that affect the through-thickness ductility. For critical projects or joints it is highly recommended that the plate is ordered requesting UT to AS 1710 Class 1.

Critical joints might include joints that have high through-thickness stresses due to in-service loading. The engineer should identify such locations and plates on the project drawings.



6.0 PREPARATION, ASSEMBLY AND FABRICATION

6.1 General

Operations comprising cutting, shaping, holing and assembly into fabricated components shall conform to the requirements of AS/NZS 5131.

Particular requirements from AS/NZS 5131 are outlined in Section 6.2, together with a reference to the applicable clause in AS/NZS 5131.

For the 'Particular requirements' detailed below, in cases where it is stated that the items are "designated on the Project Drawings" the specifier should ensure, where appropriate, the items are designated on the Project Drawing set. Refer also to the companion ASI 'Standard Drawing Notes'.

6.2 Particular requirements

	Clause in AS/NZS 5131
6.2.1 Architecturally exposed structural steelwork (AESS) Areas applicable to AESS are designated on the Project Drawings. Refer Section 10 for further details.	6.1.5
6.2.2 Identification and traceability	6.2
6.2.2.1 Hard stamping: Areas where hard stamping is prohibited are designated on the Project Drawings.	
6.2.2.2 Identification marks: Areas where identification marks are not permitted or shall not be visible after completion are designated on the Project Drawings.	6.2
6.2.3 Cutting	
6.2.3.1 Cutting processes: No additional requirements. <i>[State if any cutting processes are specifically excluded] [Optional]</i>	6.5.1
6.2.3.2 Yielding regions: Yielding regions for seismic design categories D & E are designated on the Project Drawings.	6.5.1
6.2.3.3 Fatigue detail category: Details with fatigue detail category ≥ 80 MPa are designated on the Project Drawings.	6.5.2
6.2.4 Holing	
6.2.4.1 Friction-type connections: Friction-type connections are designated on the Project Drawings in the manner detailed in Section 5.3.1.	6.7.4
6.2.5 Full contact bearing surfaces Full contact bearing surfaces are designated on the Project Drawings.	6.8
6.2.6 Assembly	
6.2.6.1 Camber and preset: Camber and preset requirements are designated on the Project Drawings.	6.9
6.2.6.2 Assembly check: No additional requirements. <i>[List of assemblies where templates, accurate measurements or trial assembly is required, if any] [Optional]</i>	6.10



7.0 WELDING

7.1 General

Welding shall conform to the requirements of AS/NZS 5131.

Particular requirements from AS/NZS 5131 are outlined in Section 7.2, together with a reference to the applicable clause in AS/NZS 5131.

For the 'Particular requirements' detailed below, in cases where it is stated that the items are "designated on the Project Drawings" the specifier should ensure, where appropriate, the items are designated on the Project Drawing set. Refer also to the companion ASI 'Standard Drawing Notes'.

7.2 Weld category

The weld categories shall be as per the table below UNO:

Element	Weld category (GP/SP/FP)
Shop welds	SP <i>[consider GP]</i>
Site welds	GP

Weld categories for specific details are indicated on the project drawings.

The specifier should ensure weld categories are designated on the Project Drawings.

ASI is encouraging industry to consider GP welds as the default nomination for shop welds unless the additional performance of SP welds is specifically required. In this case, those welds should be noted on the Project Drawings.

There is not a significant cost difference between GP and SP welds in respect of the actual welding process. However, GP welds have an increased level of defects allowable. The cost of NDT and any necessary rectification may therefore be reduced.

Given the challenges with controlling inputs for site welding, it may be advisable to design and call up any site welds as GP.

7.3 Particular requirements

	Clause in AS/NZS 5131
7.3.1 General	
Additional welding requirements: No additional requirements. <i>[List any additional requirements for welding] [Optional]</i>	7.1.2
7.3.1.1 Weld details: Weld category, size, type and extent are designated on the Project Drawings.	7.1.3
7.3.1.2 Non-destructive examination: Extent of non-destructive examination (NDE) is given in Section 13.2.3.	7.1.3
7.3.2 Welding plan No additional requirements. <i>[List any additional items to be included in the welding plan] [Optional]</i>	7.2
7.3.2.1 Requirement for welding plan	7.2.1



<i>[State whether a welding plan is required] [Optional]</i>	
Note: A welding plan is recommended for the scenarios listed in Clause 7.2.1 of AS/NZS 5131	
7.3.2.2 Content of a welding plan <i>[State any additional requirements to be included in the welding plan, where a welding plan is required] [Optional]</i>	7.2.2
7.3.3 Welding processes No additional requirements. <i>[List any alternative welding processes permitted] [Optional]</i>	7.3
7.3.4 Qualification of welding procedures and welding personnel	
7.3.4.1 Impact tests: No additional requirements. <i>[List areas where impact tests are required] [Optional]</i>	7.4.1.1
7.3.4.2 Welding production testing: No additional requirements. <i>[List areas where welding production testing is required] [Optional]</i>	7.4.1.2
7.3.4.3 Qualification of welders: No additional requirements. <i>[Specify if the role of examiner or examining body is to be undertaken by other than the welding coordinator] [Optional]</i>	7.4.2
7.3.4.4 Qualification of welding supervisor or coordinator: No additional requirements. <i>[Specify if for CC3 work the welding supervisor or coordinator needs specific technical knowledge] [Optional]</i>	7.4.3
7.3.5 Preparation and execution of welding	
7.3.5.1 Temporary attachments: Areas where welding of temporary attachments are not permitted are designated on the Project Drawings.	7.5.6
7.3.5.2 Run-on/run-off tabs: No additional requirements. <i>[State if run-on/run-off tabs shall be used] [Optional]</i>	7.5.9.1
7.3.5.3 Backing plates: No additional requirements. <i>[State whether permanent steel backing plates must not be used] [Optional]</i>	7.5.9.2
7.3.5.4 Post-weld heat treatment: No additional requirements. <i>[State if post-weld heat treatment is required for specific welded components] [Optional]</i>	7.5.14
7.3.5.5 Arc strikes: No additional requirements. <i>[State if certain members do not require treatment for arc strikes] [Optional]</i>	7.5.15.1
7.3.5.6 Dressing of butt welds: No additional requirements. <i>[State if any additional dressing of finished butt welds is required] [Optional]</i>	7.5.15.1
7.3.6 Acceptance criteria	
7.2.6.1 Alternative acceptance criteria: No additional requirements. <i>[State if there are any acceptance criteria other than that in AS/NZS 1554] [Optional]</i>	7.6.1
7.3.6.2 Alternative assessment of nonconformity: No additional requirements. <i>[State if there are any alternative assessment criteria for nonconformity other than that in AS/NZS 1554] [Optional]</i>	7.6.1



7.3.6.3 Fatigue design assumptions: No additional requirements. <i>[List any additional execution requirements necessary to comply with the fatigue design assumptions]</i>	7.6.3
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8.0 MECHANICAL FASTENING

8.1 General

Mechanical fastening shall conform to the requirements of AS/NZS 5131.

Type /TB and /TF bolts are to be tightened using either the part-turn method or load indicating washers. Where the part-turn method is used, the nut and shank are to be clearly marked to allow easy visual identification of degree of turn.

Where load indicating washers are proposed, provide manufacturer installation data to the engineer prior to installation. Ensure all washers required by the manufacturer are installed in the correct location relative to the part to be turned prior to tightening.

Particular requirements from AS/NZS 5131 are outlined in Section 8.2, together with a reference to the applicable clause in AS/NZS 5131.

8.2 Particular requirements

	Clause in AS/NZS 5131
8.2.1 Bolts, nuts and washers	
8.2.1.1 Locking of nuts: No additional requirements. <i>[Where required to secure nuts against loosening from vibration, state:</i> (a) <i>Location (or state location indicated on Project Drawings)</i> (b) <i>Whether by tightening or alternative means] [Optional]</i>	8.2.3
8.2.1.2 Washers: No additional requirements. <i>[State if washers are required under both the bolt head and nut, to limit the potential for touch-up painting from paint damage caused by the tightening process] [Optional]</i>	8.2.4
8.2.2 Preparation of contact surfaces on connected plies	
8.2.2.1 Coating of friction-type connection surfaces Friction type connection surfaces are not to be coated unless noted otherwise on the project drawings <i>[If friction-type connection surfaces are to be coated, state coating type. Note that coated surfaces will require testing according to AS 4100]</i>	8.4.2
8.2.3 Tensioning of high strength bolts	
8.2.3.1 Part-turn tightening: No additional requirements. <i>[State whether location marks to measure part-turn method need to be permanent] [Optional]</i>	8.5.6
8.2.4 Specialised fasteners No additional requirements. <i>[For any specialised fasteners, state:</i> • <i>Requirements</i> • <i>Any procedure testing required</i>	8.7



<ul style="list-style-type: none"> • <i>Inspection procedures</i> • <i>Training procedures for installation personnel</i> 	
8.2.5 Installation of mechanical and chemical anchors Mechanical and chemical anchors, where required, are noted on the project drawings <i>[Where mechanical or chemical anchors are used, identify either:</i> <i>(a) the manufacturer, anchor designation and embedment length; or</i> <i>(b) the design actions on the anchor]</i>	8.8.1

9.0 SURFACE TREATMENT AND CORROSION PROTECTION

9.1 General

Surface treatment and corrosion protection shall conform to the requirements of AS/NZS 5131.

If a paint coating system is required, the specifier will need to determine the actual coating system using AS/NZS 2312.1 or similar documentation. AS/NZS 5131 does **not** give guidance on paint system selection (generic type, thickness, number of coats, etc). It provides the specification once the system has been selected.

The Coating Quality Level (PC1, PC2) shall be assessed according to AS/NZS 5131.

The Coating Quality Level (PC1 or PC2) is a function of the corrosion category and type of preparation. Clause 9.2.1 of AS/NZS 5131 provides guidance on assessment of the Coating Quality Level.

Particular requirements from AS/NZS 5131 are outlined in Section 9.2, together with a reference to the applicable clause in AS/NZS 5131.

9.2 Particular requirements

	Clause in AS/NZS 5131
9.2.1 Requirements for painting and galvanizing	
9.2.1.1 Requirements for painting: <i>[Specify key requirements for painting, as appropriate:</i> <i>(a) Areas to be coated and coating specification</i> <i>(b) Colour and gloss requirements and paint Standards</i> <i>(c) Specifications for any special areas (bolted connections, concrete to steel interfaces, wet areas and the like)</i> <i>(d) Specifications for any on-site repair of handling damage</i> <i>(e) Any requirement to record environmental conditions during paint application and curing and special paint manufacturer instructions</i> <i>(f) Surface preparation and surface cleanliness inspection requirements</i> <i>(g) Requirements for limits on fabrication defects, intermittent welds or weld surface quality</i> <i>(h) Need and method for sealing intermittent welds</i> <i>(i) Surface profile measurement requirements</i> <i>(j) Checks for presence of, measurement of and removal of soluble salts and non-visible contaminants</i> <i>(k) Dry film thickness requirements</i> <i>(l) Curing requirements</i> <i>(m) Requirements for limits of pin holes, misses and other paint defects</i> <i>(n) The level of inspection required</i>	9.2.3.1



(o) <i>The record keeping required</i>	
The specifier may prepare a separate painting specification to cover these requirements. In this case, the separate painting specification should be referenced from this document.	
9.2.1.2 Requirements for hot-dip galvanizing: Hot-dip galvanizing shall comply with AS/NZS 4680. <i>[In addition, specify key requirements for galvanizing, as appropriate:</i> (a) <i>Any special coating thickness or repair requirements</i> (b) <i>The nature, chemical composition and mechanical properties of the product to be galvanized and its end use, including the location of any significant surfaces</i> (c) <i>Any special detailing requirements, such as venting and draining</i> (d) <i>Any special or supplementary requirements of the coating</i> (e) <i>The level of inspection required</i>] It is not normally necessary to specify the coating thickness for steelwork galvanized to AS/NZS 4680 or fasteners to AS/NZS 1214 as this is mandated in the Standards.	9.2.3.2
9.2.2 Preparation of steel surfaces	
9.2.2.1 Preparation of exterior steelwork No additional requirements. <i>[State whether abrasive blast cleaning of exterior steelwork to other than Sa2.5 is required]</i>	9.3.2
9.2.2.2 Testing for soluble salts: No additional requirements. <i>[State whether testing of surfaces for presence of soluble salts is required]</i> <i>[Optional]</i>	9.3.2
9.2.2.3 Weather resistant steel surfaces: No additional requirements. <i>[For any weather resistant steel surfaces, state:</i> (a) <i>Any special requirements for blast cleaning</i> (b) <i>Any procedures to prevent contamination</i> (c) <i>Any procedures for treatment when in contact with other steels]</i> <i>[Optional]</i>	9.3.5
9.2.2.4 Surfaces in contact with concrete: No additional requirements. <i>[State if any surface protection extending past the first 50mm is required for steelwork embedded in concrete]</i> <i>[Optional]</i>	9.3.7
9.2.3 Abrasive blasting	
9.2.3.1 Abrasive blast cleaning: No additional requirements. <i>[State any special requirements for abrasive blast cleaning, other than the requirements of AS1627.4]</i> <i>[Optional]</i>	9.4.1
9.2.3.2 Alternative surface finishes: No additional requirements. <i>[State if any alternative surface finish for abrasive blast cleaning, other than that specified in AS/NZS 5131]</i> <i>[Optional]</i>	9.4.4
9.2.4 Sealing of enclosed spaces	
9.2.4.1 Enclosed spaces: No additional requirements. <i>[State if there are any requirements for surface preparation and corrosion protection of surfaces in enclosed spaces. State if the same or a different (or no) coating system is to be used on such regions]</i> <i>[Optional]</i>	9.6.1



<p>9.2.4.2 Sealed spaces: No additional requirements. <i>[State weld quality for any sealed spaces. State any sealants or welding procedures required for such regions] [Optional]</i></p>	9.6.1
<p>9.2.5 Fabrication and welding considerations</p>	
<p>9.2.5.1 Rectification of surface defects: The fabricator shall rectify any surface defects not meeting the requirements of AS/NZS 5131. <i>[If other than fabricator, state who is responsible for rectification of defects in surfaces to be painted]</i></p>	9.8.3
<p>9.2.5.2 Surfaces to be painted: No additional requirements. <i>[State if a treatment grade other than P2 is required for surfaces to be painted] [Optional]</i></p> <p style="border: 1px solid green; padding: 5px;">P2 requires chamfered edges, welds dressed smooth etc. This should be adequate for most atmospheric situations so will not require additional specification. For internal unseen regions, level P1 should be sufficient, and for severe environments (immersed, underground, splash zone – see Appendix C in AS/NZS 2312) P3 should be specified. P3 is the default in AS/NZS 5131 for AESS.</p>	9.8.4
<p>9.2.5.3 Surfaces to be galvanized: No additional requirements. <i>[For surfaces intended to be galvanized, state if treatment other than that required by AS/NZS 4680 is required] [Optional]</i></p>	9.8.4
<p>9.2.5.4 Treatment of cut edges: No additional requirements. <i>[State extent of treatment of cut edges, if additional to Clause 6.5 in AS/NZS 5131] [Optional]</i></p>	9.8.5
<p>9.2.5.5 Welding and repair of pre-coated steel: Welding and repair of pre-coated steel shall be in accordance with the manufacturer's written instructions <i>[State method for welding of pre-coated steel and repair of coating after welding, if other than to manufacturer's instructions]</i></p>	9.8.6
<p>9.2.6 Application of paint coatings</p>	
<p>9.2.6.1 Monitoring of conditions: Air and surface temperatures, relative humidity and dew point shall be regularly monitored and recorded. <i>[State whether regular monitoring and recording of air and surface temperatures, relative humidity and dew point can be waived] [Optional]</i></p> <p style="border: 1px solid green; padding: 5px;">In most cases, regular monitoring should be undertaken</p>	9.9.10
<p>9.2.6.2 Testing of film continuity: No additional requirements. <i>[State whether testing of film continuity is required] [Optional]</i></p>	9.9.16
<p>9.2.6.3 Testing of degree of cure: No additional requirements. <i>[State whether testing of degree of cure is required] [Optional]</i></p>	9.9.17
<p>9.2.6.4 Corrosion protection of fasteners: No additional requirements. <i>[State whether corrosion protection of fasteners by other than galvanizing is required] [Optional]</i></p>	9.9.18
<p>9.2.7 Application of galvanized coatings</p>	
<p>9.2.7.1 Control of distortion:</p>	9.10.4



No additional requirements <i>[State provisions for stress relieving where it is expected distortion may occur]</i>	
9.2.7.2 Galvanizing process – double dipping: Double dipping of galvanized components is permitted, subject to written approval for the particular components. <i>[State if double dipping is permitted] [Optional]</i>	9.10.5
9.2.7.3 Galvanizing process – test lot: No additional requirements. <i>[State if an initial test lot for galvanizing is required] [Optional]</i>	9.10.5
9.2.7.4 End use of galvanized components: No additional requirements. <i>[For galvanized components, state any special provisions relating to end use of the component to be galvanized] [Optional]</i>	9.10.6
9.2.7.5 Adherence of coating: No additional requirements. <i>[For galvanized components, state any special provisions for adherence of coating] [Optional]</i>	9.10.8
9.2.7.6 Wet storage staining: Wet storage staining shall be removed. <i>[For galvanized components, state if removal of wet storage staining is not required] [Optional]</i>	9.10.10



10.0 ARCHITECTURALLY EXPOSED STRUCTURAL STEEL

10.1 General

Architecturally exposed structural steel (AESS) shall conform to the requirements of AS/NZS 5131.

Areas to be treated as AESS and the AESS category (1,2,3,4 or C) are designated on the Project Drawings.

Architecturally sensitive connection details are indicated on the Project Drawings.

Particular requirements from AS/NZS 5131 are outlined in Section 10.2, together with a reference to the applicable clause in AS/NZS 5131.

The engineer should carefully assess the appropriate AESS categories for the components of the project, based on the requirements in AS/NZS 5131. In general, it is expected that AESS 2 (for elements viewed at a distance) and AESS 3 (for elements viewed at close range) will be the categories most commonly specified.

The ASI publication 'Guide for Specifying Architecturally Exposed Structural Steel' provides further information.

For the 'Particular requirements' detailed below, in cases where it is stated that the items are "designated on the Project Drawings" the specifier should ensure, where appropriate, the items are designated on the Project Drawing set. Refer also to the companion ASI 'Standard Drawing Notes'.

10.2 Particular requirements

	Clause in AS/NZS 5131
10.2.1 General	
10.2.1.1 Category AESS C elements: Where applicable, AESS C elements are designated on the Project Drawings. <i>[Where required, designate any elements that are to have custom treatment on the Project Drawings and note here any special requirements]</i>	10.3
10.2.1.2 Visual samples: No additional requirements. <i>[State if there is a requirement for any visual samples and, if so, the form of visual sample] [Optional]</i>	10.3
10.2.2 Tolerances No additional requirements. <i>[State whether any special tolerances are required for AESS] [optional]</i>	10.5

Areas designated as AESS may require a specific coating system, or special finish requirements (e.g. no runs and sags, overspray etc.)



11.0 STRUCTURAL STEELWORK ERECTION

11.1 General

Structural steelwork erection shall conform to the requirements of AS/NZS 5131.

Particular requirements from AS/NZS 5131 are outlined in Section 11.2, together with a reference to the applicable clause in AS/NZS 5131.

The steelwork erection contractor shall supply and install all temporary bracing and the like necessary for the safe erection of the structure.

The contractor shall be responsible for the temporary stability of the structure during construction.

The ASI guide: 'Practical guide to planning the safe erection of steel structures' provides guidance on the erection planning process, assignment of responsibilities and risk management.

11.2 Particular requirements

	Clause in AS/NZS 5131
11.2.1 Site planning	
11.2.1.2 Lifting equipment: No additional requirements. <i>[State whether the steelwork erection contractor shall ensure registered lifting equipment has proof of registration available for inspection on site] [Optional]</i>	11.2.5
11.2.1.3 Erection sequence methodology: An Erection Sequence Methodology (ESM) shall be prepared if assessed as required by AS/NZS 5131. <i>[State whether an Erection Sequence Methodology (ESM) is required] [Optional based on assessment of risk]</i>	11.5.1
11.2.2 Temporary erection (trial assembly) No additional requirements. <i>[State whether steelwork shall be temporarily erected at the fabrication works for review and sign-off by a competent person] [Optional]</i>	11.5.10
11.2.3 Supports	
11.2.3.1 Temporary shims and packers: Temporary shims and packers used during erection shall be removed. <i>[State whether temporary shims and packers may be left in place once erection has been completed] [Optional]</i>	11.6.3
11.2.3.2 Grouting at supports: No additional requirements. <i>[State if any treatment of the steelwork, baseplates, bearings or concrete surfaces is required before grouting] [Optional]</i>	11.6.4
11.2.4 Erection drawings No additional requirements. <i>[State whether specific erection drawings and calculations shall be prepared and by whom] [Optional] (if not, the shop detail drawings will be used)</i>	11.7

11.3 Transportation and delivery

The structural steel fabricator shall schedule, coordinate and sequence structural steel transportation and delivery in cooperation with the erection of the structural steel by the structural steel erection contractor.



Components noted as AESS shall be marked and particular care taken to meet the requirements for handling in AS/NZS 5131.

The Contractor shall perform all work necessary to ensure safe loading, transportation, unloading and storage of structural steel. The Work shall consist of loading at the Fabricator's plant, transporting to the site, and unloading and storing at the site, including temporary works for access.

Structural steel shall be loaded for shipping in such a manner that it can be transported and unloaded at its destination in the correct orientation for erection without being excessively stressed, deformed, or otherwise damaged.

Structural steel shall be stockpiled in such a manner to avoid excessive stress, deformation or other damage while stored.

The Transportation Plan and schedule shall be provided not less than 7 Days before any shipping begins.

The Transportation Plan (which may also be termed the Logistics Management Plan) outlines the sequence for delivery of components to site, to suit the Erection Sequence Methodology (ESM) and site constraints for storage and handling of the steelwork prior to erection.



12.0 GEOMETRICAL TOLERANCES

12.1 General

Fabrication and erection tolerances shall conform to the requirements of AS/NZS 5131.

Particular requirements from AS/NZS 5131 are outlined in Section 12.3, together with a reference to the applicable clause in AS/NZS 5131.

12.2 Class for functional tolerances

The tolerance class for functional tolerances shall be Class 1 UNO on the project drawings.

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 had previously been specified in AS 4100.

Class 2 tolerances are tighter and might be considered for higher specification work such as major bridges and the like. AS/NZS 5131 suggests Class 2 should be considered for CC3 and CC4 structures or components.

12.3 Particular requirements

	Clause in AS/NZS 5131
12.3.1 Special or additional tolerances No additional requirements. <i>[State whether there are any special or additional tolerances, in which case the following should be defined:</i> (i) <i>Any amendment to specific tolerances in AS/NZS 5131</i> (ii) <i>Parameters and permissible values for any special or additional tolerances</i> (iii) <i>Whether the special or additional tolerances apply to all affected components or particular components</i> <i>[Optional]</i>	12.1



13.0 INSPECTION, TESTING AND CORRECTION

13.1 General

Inspection, testing and correction shall conform to the requirements of AS/NZS 5131.

A quality plan shall be prepared covering each stage of the fabrication of the structure.

Particular requirements from AS/NZS 5131 are outlined in Section 13.3, together with a reference to the applicable clause in AS/NZS 5131.

13.2 Additional project-specific testing

13.2.1 Testing of 'LT susceptible' joints

Completed welded joints which are indicated on the project drawings as 'LT susceptible' shall be ultrasonically tested to AS 2207 and AS/NZS 1554.1. The extent of ultrasonic testing is detailed on the project drawings.

WTIA Tech Note TN06 'Control of lamellar tearing' provides guidance on welding process to manage lamellar tearing.

13.2.2 Testing of highly stressed joints

Joints which are highly stressed and utilise thick plates may be susceptible to failure through reduced ductility. Such locations are identified on the project drawings. The critical plates in such joints shall be ultrasonically tested prior to fabrication. The extent of ultrasonic testing is detailed on the project drawings.

For critical structures or joints in situations where plates are subjected to high through-thickness stress due to in-service loading or the quality of the plate is such that the through-thickness ductility of the plate is in question, it may be advisable to specify that plates thicker than 40mm are ultrasonically tested to AS 2207 and AS/NZS 1554.1.

[State whether any additional testing outside the requirements of AS/NZS 5131 is required. Where required, provide details] [Optional].

13.3 Particular requirements

	Clause in AS/NZS 5131
13.3.1 Inspection personnel	
13.3.1.1 Competency of inspection personnel: No additional requirements <i>[State whether specific competencies, such as particular qualifications, are required for certain inspection personnel] [Optional]</i>	13.2
AS/NZS 5131 provides guidance on the expected competency of inspection personnel. Additional requirements may be appropriate for particular structures.	
13.3.2 Inspection of materials and components	
13.3.2.1 Inspection and test plan (ITP): An ITP shall be prepared covering the inspection against the relevant Standards for the materials and components.	13.3.2
AS/NZS 5131 recommends an ITP is prepared for Construction Categories CC2, CC3 and CC4.	



<p>13.3.2.2 Non-conforming steel or components: If the documentation supplied does not meet the requirements of AS/NZS 5131, the steel or components shall be treated as non-conforming and treated as unidentified steel according to the requirements of AS/NZS 5131.</p>	13.3.7
<p>13.3.2.3 Testing of non-conforming steel or components: Testing of non-conforming steel or components shall be to the requirements of AS/NZS 5131.</p> <p>If testing of non-conforming steel or components is undertaken to establish conformity, the type and extent of testing must be consistent with that specified in AS/NZS 5131 and sufficient to establish a proper statistical basis. Single or limited test results do not usually present a rational statistical basis.</p>	13.3.8
<p>13.3.3 Inspection of preparation and assembly</p> <p>13.3.3.1 Inspection and test plan (ITP): An ITP shall be prepared covering the inspection against the items specified in Section 13.5.1 of AS/NZS 5131.</p> <p>AS/NZS 5131 recommends an ITP is prepared for Construction Categories CC2, CC3 and CC4.</p>	13.5.1
<p>13.3.4 Inspection of welding</p> <p>13.3.4.1 Inspection and test plan (ITP): An ITP shall be prepared covering the inspection against the items specified in Section 13.6.1.2 of AS/NZS 5131. <i>[Optional for CC1, CC2. Mandatory for CC3, CC4]</i></p> <p>AS/NZS 5131 requires an ITP is prepared for Construction Categories CC1 and CC2 under certain circumstances. ITP's are mandatory for CC3 and CC4.</p>	13.6.1.2
<p>13.3.4.2 Scope of inspection after welding: The extent and type of NDE corresponding to the designated Construction Category or Categories shall be as per Table 13.6.2.2(A) of AS/NZS 5131. <i>[For structures designed and detailed to AS 4100 earthquake design Categories D and E, the extent and type of NDE shall be as per Table 13.6.2.2(B) of AS/NZS 5131.]</i></p> <p>The extent and type of NDE is 'recommended' in AS/NZS 5131, as it is a reflection of the confidence in the fabrication process. It is acceptable to vary these recommendations based on knowledge of specific fabricator competency or confidence gained during the fabrication process for the project. WTIA Tech Note TN11 provides guidance on the basis for selection of the extent and type of NDE.</p> <p>For structures designed to AS 4100 earthquake design categories D and E, the type and extent of NDE shall be the greater of that defined in Table 13.6.2.2(A) and Table 13.6.2.2(B).</p>	13.6.2.2
<p>13.3.4.3 Assessment of weld defects: No additional requirements. <i>[State whether fracture mechanics may be used to assess weld defects] [Optional]</i></p>	13.6.2.5
<p>13.3.4.4 Welds on enclosed spaces: No additional requirements. <i>[State whether any additional NDE is required for seal welds] [Optional]</i></p>	13.6.4
<p>13.3.5 Inspection of mechanical fastening</p>	



<p>13.3.5.1 Inspection and test plan (ITP): An ITP shall be prepared covering the inspection against the items specified in Section 13.7.1 of AS/NZS 5131.</p> <p>AS/NZS 5131 recommends an ITP is prepared for Construction Categories CC2, CC3 and CC4.</p> <p><i>[State whether there are any special inspection requirements] [Optional]</i></p>	13.7.1
<p>13.3.5.2 Non-conforming mechanical fasteners: If the documentation supplied does not meet the requirements of AS/NZS 5131, the mechanical fasteners shall be treated as non-conforming until such time as it can be reliably established that the mechanical fasteners meet the requirements of AS/NZS 5131.</p>	13.7.4
<p>13.3.5.3 Testing of mechanical fasteners: If testing of mechanical fasteners is undertaken to establish conformity, the type and extent of testing shall be consistent with that specified in AS/NZS 5131 and shall be sufficient to establish a proper statistical basis. Single or limited test results shall not be acceptable.</p>	13.7.5
<p>13.3.6 Inspection of fully tensioned high strength bolted connections</p>	
<p>13.3.6.1 Sampling plan: No additional requirements. <i>[State whether a sampling plan different to that complying with the principles of ISO 2859-5 is required] [Optional]</i></p>	13.7.8
<p>13.3.7 Inspection of mechanical and chemical anchors</p>	
<p>13.3.7.1 Proof testing: No additional requirements. <i>[State whether proof testing of a sample of anchors is required, and particular requirements if other than in BS 8539] [Optional]</i></p>	13.7.11
<p>13.3.8 Inspection of surface treatment</p>	
<p>13.3.8.1 Inspection and test plan (ITP): For Coating Quality Level PC2, an ITP shall be prepared covering the inspection against the items specified in Section 13.8.1 of AS/NZS 5131. <i>[State whether there are any special inspection requirements] [Optional]</i></p>	13.8.1
<p>13.3.9 Inspection of paint coatings</p>	
<p>13.3.9.1 Inspection and test plan (ITP): For Coating Quality Level PC2, an ITP shall be prepared covering the inspection against the items specified in Section 13.9.1 of AS/NZS 5131. <i>[State whether there are any special inspection requirements] [Optional]</i></p>	13.9.1
<p>13.3.10 Inspection of galvanized coatings</p>	
<p>13.3.10.1 Inspection requirements: Inspection shall be undertaken according to the requirements of AS/NZS 4680.</p>	13.10.1
<p>13.3.10.2 Additional or special inspection requirements: No additional requirements. <i>[State any additional or special inspection requirements, including acceptance inspection, sampling requirements and acceptance criteria] [Optional]</i></p>	13.10.1
<p>13.3.11 Inspection of erection</p>	
<p>13.3.11.1 Inspection and test plan (ITP): An ITP shall be prepared covering the inspection against the items specified in Section 13.11.1 of AS/NZS 5131.</p> <p>AS/NZS 5131 mandates an ITP is prepared for Construction Categories CC2, CC3 and CC4.</p>	13.11.1
<p>13.3.11.2 Additional or special inspection requirements: No additional requirements.</p>	13.11.1



<p><i>[State any additional or special inspection requirements, including acceptance inspection, sampling requirements and acceptance criteria] [Optional]</i></p>	
<p>13.3.11.3 Location and frequency of measurements: No additional requirements. <i>[State if positional accuracy of the erected steelwork is to be measured under other than self-weight of steelwork only. If so, specify permissible deviations and movements due to imposed loads] [Optional]</i></p>	13.11.7
<p>13.3.12 Inspection of secondary structural elements</p>	
<p>13.3.12.1 Inspection of installation: An ITP shall be prepared covering the inspection of purlins and girts against the items specified in Section 13.12.2 of AS/NZS 5131.</p>	13.12.2
<div style="border: 1px solid green; padding: 5px; margin: 5px 0;"> <p>AS/NZS 5131 lists mandatory inspection items but does not mention an ITP as required.</p> </div>	



14.0 SITE MODIFICATIONS AND REPAIR

14.1 General

Site modifications and repair shall conform to the requirements of Section 14 of AS/NZS 5131.

14.2 Particular requirements

No site modification to any steel member, connection component, mechanical fastener, weld or corrosion protection shall be made without a detailed written procedure. The written procedure shall be approved by the Project Superintendent.



APPENDIX A CONTRACTUAL ASPECTS

A.1 Context

The NSSS addresses the technical requirements for the structural steelwork component of the project. Aspects that are usually considered to be of a contractual nature and normally addressed in other contract documentation have been excluded from the main body of the specification.

However, given the tightly integrated technical requirements and ensuing relationships between the various stakeholders on the project, best outcomes will be obtained when the contractual documentation is responsive to the expectations on which the technical requirements have been structured. Accordingly, this Appendix provides some suggested wording and guidance on several aspects that should be addressed in the contractual documentation, including:

- Scope of works for the particular project
- Inclusions and exclusions
- Coordination with other trades
- Responsibilities

A.2 Scope of work – structural steel

A.2.1 Extent: The work covered in this Specification consists of:

1. The supply of materials and fabrication of structural steel components for the Works, as shown and described on the Project Drawings and in this Specification;
2. The supply of all associated welding consumables and bolted connection components for both in-shop and on-site assembly of the Works;
3. Shop detailing documentation;
4. Surface preparation;
5. Corrosion protection, including 'touch-up' repairs;
6. Handling and storage of all materials and components;
7. Loading and transportation of fabricated components to the job site;
8. Erection of the components and assemblies on-site;
9. Fixing of adjoining building elements connected to or supported on the structural steel;
10. The quality control of all materials, components, assemblies and processes associated with the scope of work; and
11. The compliance management of all materials, components and finished assemblies associated with the scope of the work.

A.2.2 Inclusions:

Generally, the following:

[Add itemised list of components of the project]

A.2.3 Exclusions:

Specifically, the following:

[Add itemised list of components specifically excluded]



A.2.4 Deemed to be included:

[Add itemised list of items deemed to be included]

The specifier should carefully review the generic scope presented above and edit as required for the specific project.

A.2.5 Co-ordination with other trades:

The contractor shall allow for the extent of liaison and coordination necessary with adjoining trades to identify all necessary fitments, flashing plates, brackets, holding down bolts and the like that either support or are supported by, or otherwise interact with the steelwork under scope of this project.

All work shall be undertaken in accordance with the Project Drawings and shall comply with the various Australian Standards and other reference documents as prescribed in this technical specification.

A.3 Responsibilities to be assigned

Appendix B.3 of AS/NZS 5131 tabulates a range of responsibilities detailed in the Standard that need to be assigned. Standards do not assign responsibilities, as this is considered contractual.

For completeness, and to ensure the requirements of the NSSS specification are actioned appropriately, the contract documents need to assign at least the following responsibilities to relevant parties. The relevant party depends on the structure of the contract and scope of the project.

Responsibility to be assigned	Clause in AS/NZS 5131
4. Design, specification, documentation and traceability	
Preparation of the construction specification, including the individual parts of the specification	4.1.1
Where required, preparation of the 'Project BIM brief' or 'BIM management plan'	4.3
Preparation of the shop detail documentation	4.4.1
Approval of shop detail documentation	4.4.4
Preparation of quality documentation	4.5.1
Preparation of quality plan	4.5.2
Preparation of as-built documentation	4.5.4
Preparation of purchasing procedure	4.6.1
Responsibility for operating the purchasing procedure	4.6.1
5. Materials	
Responsibility for operation of quality management system	5.1.2
6. Preparation, assembly and fabrication	
Responsibility for operation of quality management system	6.1.2
Preparation of work method statements	6.1.3
Responsibility for supervision	6.12
7. Welding	
Responsibility for operation of quality management system	7.1.1
Preparation of welding plan	7.2.1
Responsibility for welding coordination	7.4.3
8. Mechanical fastening	
Responsibility for operation of quality management system	8.1.2
Responsibility for preparation of work method statements	8.1.3
Responsibility for supervision	8.9



9. Surface treatment and corrosion protection	
9.2 Planning	
Preparation of work method statements	9.2.3
9.9 Application of paint coatings	
Responsibility for supervision	9.9.20
9.10 Application of galvanized coatings	
Responsibility for supervision	9.10.11
11. Erection	
Preparation of safety plan	11.2.1
Responsibility for operation of quality management system	11.2.2
Preparation of work method statements	11.2.3
Preparation of Erection Sequence Methodology (ESM)	11.5
Review of ESM	11.5
Preparation of erection drawings	11.7
Responsibility for supervision	11.9
13. Inspection, testing and correction	
Responsibility for inspection and testing for each stage of the project	13.2
14. Site modifications during erection and modification and repair of existing structures	
Preparation of detailed written procedure	14.2

A.4 The Project Superintendent

Reference is made to the 'Project Superintendent' at various points in the NSSS. The project superintendent is the person responsible for the scope of work at a particular stage of the project or for a particular component of the work. This responsibility should be assigned by the contractual documentation. There can be one or more project superintendents, depending on the size, structure and phase of the project.

