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ASCERTAINING COMPLIANCE OF FABRICATED STEELWORK

Synopsis

This Technical Note provides a risk-based fit-for-purpose actionable approach to ascertaining the compliance of fabricated steelwork to meet the performance intent mandated by the National Construction Code (NCC) and Australian Standards. The developed 'steelwork verification protocol' allows stakeholders to make an informed judgement on the most appropriate conformity assessment pathway.

This Technical Note has been reviewed by a panel of industry stakeholders, as detailed in Appendix A. Their support is gratefully acknowledged.

OUTLINE

1. INTRODUCTION

1.1 Context

The procurement, fabrication and erection of structural steelwork for buildings, infrastructure and resource projects involves a supply chain that is as varied as it is long. Contractual relationships and commercial and policy pressures all influence the ultimate procurement scenario, which can also change markedly over the period of project delivery. The regulatory landscape is constantly evolving, shaped by balancing the need to promote free trade, encourage innovative performance solutions, and uphold essential safety standards that ensure secure and risk-minimized environments for workplaces and homes.

The steelwork ultimately utilised in a project typically passes through a number of stakeholders in its journey along the supply chain from the manufacturer of the primary steel products to the fabrication of those products into the steelwork components and finally to inclusion in the erected steelwork structure on site. The quality and traceability of the fabricated steelwork utilised in a project is therefore ultimately dependent on a number of parties in the supply chain. If any link in this chain is broken, traceability of the product is lost and the ability to ascertain compliance compromised. Where steelwork is sourced internationally the same principles apply but overlaid with the additional requirement to ensure the steelwork in the final structure meets the performance requirements of the NCC, construction specification and Australian Standards.

Given the complexity and fluidity of supply chains in today's procurement environment, meeting duty of care for stakeholders can be challenging. There is a need to establish a common understanding of the requirements and clearly articulate responsibilities for all parties in the supply chain. The '*Steelwork Verification Protocol*' outlined in this Technical Note establishes a methodology to ascertain compliance and works in concert with the '*Responsible Steelwork Procurement Framework*' outlined in Section 8, the latter establishing stakeholder responsibilities.

As with the majority of construction products, structural steel product and fabricated steelwork intended for the Australian marketplace must meet the performance intent of:

a. The National Construction Code (NCC) (Ref. 1) for project types covered under the NCC.
b. The Australian Standards called up in either the contractual documentation (usually the specification), relevant Acts such as the Mining Act and/or the NCC as applicable to the project type.

This includes both the permanent steelwork, and the temporary steelwork required to construct the permanent structure.

Regardless of the type of project, the compliance pathways specified within the NCC provide a robust performance-based approach that should be applied to all project types.

Separate and overarching, the Workplace Health and Safety Act (Ref. 2), Regulations and Codes of Practice provide a basis for ascertaining responsibilities and duty of care for all stakeholders.

In addition, for Government funded projects (but ostensibly universally), procurement must meet a value-for-money review that considers:

a. Quality of the goods and services
b. Fitness for purpose
c. Supplier experience and performance
d. Innovation and adaptability over the lifecycle
e. Environmental sustainability
f. Whole-of-life costs

Clearly, compliant structural steelwork is of requisite quality, fit-for-purpose, risk-minimised and with a design life and whole-of-life cost that will be achieved with minimal unforeseen maintenance. It is therefore a prerequisite for value-for-money outcomes.

The recommendations on ascertaining compliance in this Technical Note are based on three significant principles:

1. The performance framework established by the NCC.
2. The basic principles of duty of care established under Workplace Health and Safety legislation in each State and Territory in Australia, and
3. The quality benchmark established by the minimum requirements detailed in the relevant Australian Standards.

The primary focus of this Technical Note is on ascertaining the compliance of fabricated structural steelwork, not the structural steel input to the fabrication process. Ascertaining compliance of structural steel is covered in ASI Technical Note TN015 (Ref. 3) and forms an integral component of the framework outlined in this Technical Note to ascertain fabricated structural steelwork compliance.

The scope of this Technical Note is not specifically intended to cover erection of structural steelwork. However, in certain sections, requirements for erection are presented, often in the interests of ensuring continuity between fabrication and erection process where erection requirements do impinge on fabrication requirements.

Note:
Unless noted otherwise, normative wording (“shall”, “mandatory” etc) should be viewed as a requirement within the context of the framework outlined in this document. Normative wording is not intended to indicate that it is necessarily either a Regulatory requirement or normatively required in Standards.

1.2 Abbreviations

ABCB	-	Australian Building Codes Board
ACRS	-	Australasian Certification Authority for Reinforcing and Structural Steels
APCC	-	Australasian Procurement and Construction Council Inc
ASI	-	Australian Steel Institute
CAB	-	Conformity Assessment Body
CompMP	-	Compliance Management Plan
CoP	-	Code of Practice

DoC	-	Declaration of Conformity
DTS	-	Deemed-to-satisfy
ILAC	-	International Laboratories Accreditation Co-operation
JAS-ANZ	-	Joint Accreditation System of Australia and New Zealand
MRA	-	Mutual Recognition Arrangement (in connection with ILAC)
NCC	-	National Construction Code
QMS	-	Quality Management System
SCA	-	Steelwork Compliance Australia
SDoC	-	Supplier Declaration of Conformity
WHS	-	Workplace Health and Safety

1.3 Definitions

Appropriate authority: means the relevant authority with the statutory responsibility to determine the particular matter (definition from the NCC)

As-built drawings: drawings, prepared from the design and/or shop drawings, that reflect any changes to the steelwork introduced during the fabrication process and intended to be a record of the structure that was actually constructed

Batch (of structural steel): A group of structural steel product consisting of finished steel of the same yield stress gradation and product form, treated in the same manner and from the same heat (generalised from Refs 7, 8, 9, 10)

Client: An organization or entity that commissions and funds a construction or infrastructure project which incorporates structural steel components. The client typically contracts with general contractors or construction managers who, in turn, manage the procurement and installation of structural steel through specialized subcontractors

Conformity assessment: demonstration that specified requirements relating to a product, process, system, person or body are fulfilled. The concept of conformity assessment is concerned with the fulfilment of specified requirements, not with the wider concept of conformity. (From AS ISO/IEC 17000 (Ref. 44))

Design drawings: drawings, forming part of the Construction Specification, that convey the design intent

First-party conformity assessment: conformity assessment activity that is performed by the person or organisation that provides the object. (From AS ISO/IEC 17000)

Second-party conformity assessment: conformity assessment that is performed by a person or organisation that has user interest in the object. (From AS ISO/IEC 17000)

Third-party conformity assessment: conformity assessment activity that is performed by a person or body that is independent of the person or organisation that provides the object, and of the user interests in the object. (from AS ISO/IEC 17000)

Conformity assessment body: body that performs conformity assessment services. (From AS ISO/IEC 17000)

Conformity assessment system: rules, procedures and management for carrying out conformity assessment. (From AS ISO/IEC 17000)

Conformity assessment scheme: the collection of all conformity assessment activities that are repeatedly applied to a specified group of products, processes, services, systems, persons or bodies

Constructor: the party undertaking the actual construction of the structural steelwork component. This includes steelwork erectors and other contractors associated with site installation

Declaration of Conformity (DoC): the document that is a first-party attestation that the object of conformity (product, process or service) fulfills specified requirements

Designer: The engineering organization, contracted either directly by the client or through a lead design consultant, that is professionally responsible for the analysis, design, and documentation of the structural steel system

Distributor: A commercial organization that purchases steel from the steel manufacturer in bulk quantities, maintains an inventory of standard structural sections and plates, and sells these products in smaller quantities to fabricators and others for subsequent processing. Steel distributors may also provide value-added services such as cutting and holing. These value-added services are termed 'processing' (refer definition of processor)

Fabricator: A specialized contractor who transforms raw steel sections and plates into completed structural steel components through processes which may include cutting, drilling, welding, surface treatment and painting

Heat (of steel): A product of a ladle of steel melted in one vessel and processed under the same conditions (from Refs 6, 7, 8, 9)

Importer: An organization that sources steel products from international manufacturers and arranges their import, including compliance with relevant national standards and regulations, customs clearance, and domestic distribution. Importers may deal in both raw steel products and prefabricated structural components, acting as an intermediary between overseas producers and local distributors, fabricators, or contractors

Manufacturer: The business operating the hot-rolling and/or cold-forming process producing the finished steel product to a nominated Standard. In the context of this Technical Note, the nominated Standards are either AS/NZS 3678, AS/NZS 3679.1, AS/NZS 3679.2 or AS/NZS 1163.

Principal contractor: The organization holding the primary contract with the client, responsible for overall project delivery including coordination of all construction activities, site management, and health and safety obligations. They typically manage multiple subcontractors, including the structural steel contractor, while maintaining responsibility for project schedule, budget, quality, and regulatory compliance

Processor: An organization that performs intermediate modification of steel products between the steel mill and fabricator stages, such as plate profiling, beam splitting, holing or cambering. Processors typically specialize in specific transformation services that require specialized equipment or expertise, but do not undertake welding to complete fabrication of structural assemblies or connection details

Procurer/purchaser: Organisation or person who is a recipient from a supplier of a product manufactured to a nominated Standard

Shop drawings: drawings, prepared from the design drawings and Construction Specification, that detail all structural steel components and assemblies and intended to provide fabrication personnel sufficient information to fabricate the components and assemblies

Structural steel: steel manufactured to a recognised steel product Standard and intended for use in fabricated steel load-carrying structures

Structural steelwork: structural steel that has been fabricated into members, assemblies and components as part of a load-carrying structure

Supplier: An organisation or person that provides steel products manufactured to a nominated Standard

Trusted relationship: a relationship between two or more parties that has developed based on a series of interactions whose performance has been judged as successful. The level of trust may be informal or based on metrics to ensure performance is measured and maintained.

1.4 Outline

This document establishes an actionable pragmatic protocol to ascertain the compliance of structural steelwork, framed within the context of the requirements of the National Construction Code and Australian Standards.

In order to achieve this aim, the document is divided into the following sections:

- Section 2 provides a summary of the requirements of the National Construction Code and outlines the distinction between a Performance Solution and a Deemed-to-satisfy Solution before establishing that **steel and/or steelwork that has not been manufactured/fabricated to Australian Standards must be considered a Performance Solution and treated accordingly.**
- Section 3 examines the relationship between product conformity and the design Standards in order to clearly enunciate the requirements for a steel to be considered as conforming to the referenced Standard.
- Section 4 documents the recommended 'Steelwork Verification Protocol', consistent with the requirements of the NCC and recognising that there are a number of stakeholders with a duty of care in the journey steel takes from the manufacturer to the finished structure. Detail to support the technical basis for the protocol is presented in subsequent sections.
- Section 5 outlines the selection of the appropriate conformity assessment pathway to operationalise the 'Steelwork Verification Protocol'. The selection of the conformity assessment pathway is risk-based and fit-for-purpose.
- Section 6 considers what 'responsible steelwork procurement' and duty of care looks like for each member of the supply chain, particularly as regards the requirements of WHS legislation.
- Section 7 clarifies stakeholder responsibilities under the WHS Act and Regulations and Codes of Practice.
- Section 8 brings together the critical elements of the previous sections to define an actionable responsible steelwork procurement framework, including importantly, the need for a 'Compliance Management Plan'.

Note:

The primary focus of this Technical Note is on ascertaining the compliance of fabricated structural steelwork, not structural steel. However, limited aspects of structural steel compliance are discussed, primarily to set the downstream context for the supply of compliant fabricated structural steelwork.

ASI has developed Technical Note TN015 to cover ascertaining the compliance of structural steel. Compliant structural steel is a necessary input to the fabrication process resulting in compliant fabricated steelwork.

1.5 Structure of approach to ascertaining compliance

Ascertaining compliance of fabricated structural steelwork is not necessarily straightforward. Consequently, the breadth and depth of information contained in this Technical Note is extensive and may be difficult to digest in first reading.

The structure of the approach to ascertaining compliance of fabricated structural steelwork in this document might best be described with reference to Figure 1, which defines the principal components, a high-level flow from project inception to conclusion, and references to the appropriate sections in this document. The reader is encouraged to make frequent reference back to Figure 1 as needed.

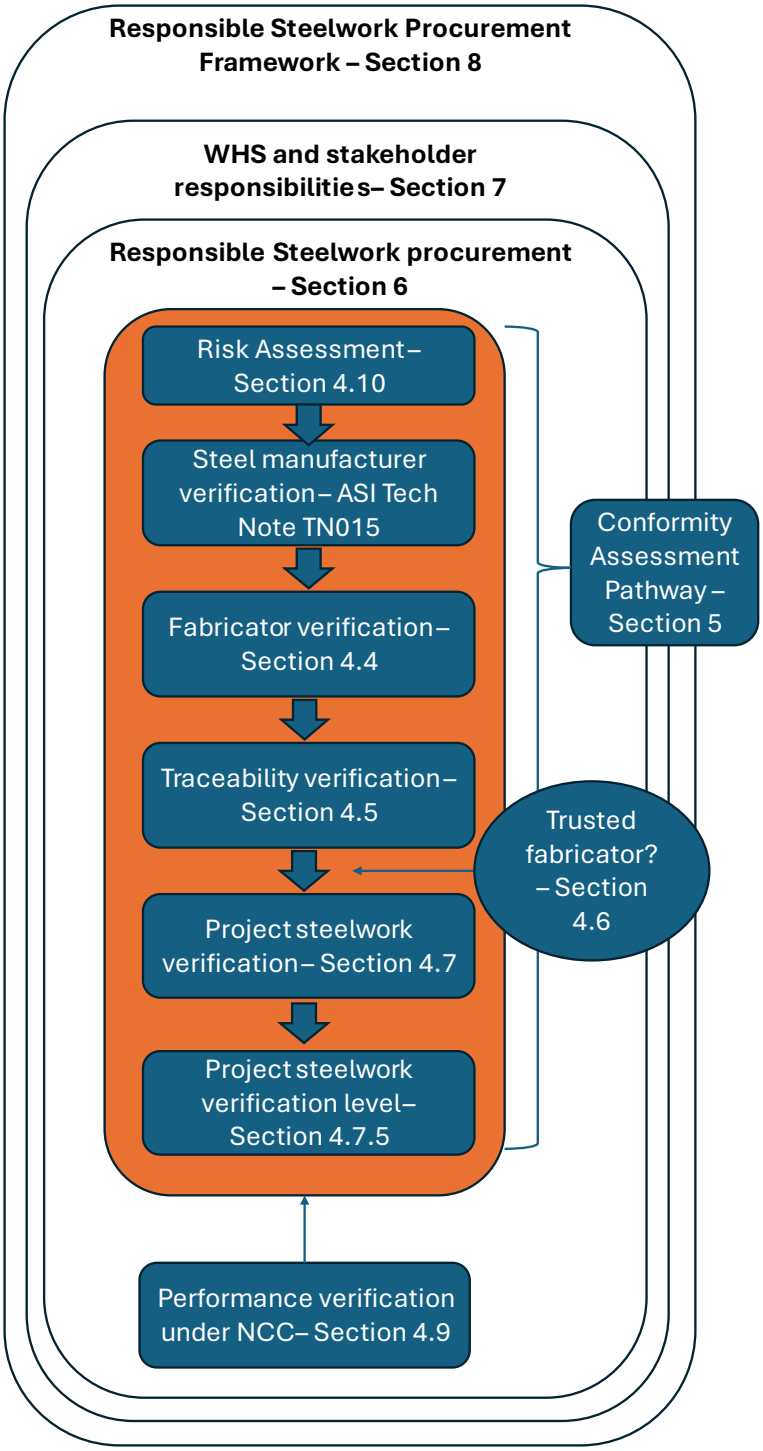

Figure 1 Structure of approach to ascertaining compliance

With regard to Figure 1:

1. The overall process is set within and driven by the contexts of:
    a. The Responsible Steelwork Procurement Framework (refer Section 8)
    b. Workplace Health and Safety Regulation and ensuing stakeholder responsibilities (refer Section 7)
    c. Responsible steelwork procurement, defined by WHS and duty of care (refer Section 6)

2. The conformity assessment process itself involves the steps of:
    a. Risk assessment (refer Section 4.10)
    b. Steel manufacturer verification (refer ASI Technical Note TN015 (Ref. 3)
    c. Fabricator verification (refer Section 4.4)
    d. Traceability verification (refer Section 4.5)
    e. Project steelwork verification (refer Section 4.7), which is enacted with auditing to a defined verification level (refer Section 4.7.5)
3. Where appropriate and possible, developing a ‘trusted fabricator’ relationship (refer Section 4.6) to expedite compliant outcomes
4. At each step in the conformity assessment process, alternate choices may be made. The combination of specific choices is termed the ‘conformity assessment pathway’ (refer Section 5)
5. The conformity assessment process itself and outcomes must meet the requirements for performance verification under the National Construction Code (NCC) (refer Section 4.9) for project types that fall under the NCC. For other project types, the performance verification framework defined by the NCC is highly recommended.

2. THE NATIONAL CONSTRUCTION CODE

The National Construction Code (NCC) (Ref. 1) is a performance-based code and specifies means to achieve compliance to a range of *Performance Requirements*. The performance requirements outline the minimum necessary standards different buildings or building elements must attain. References to the NCC cited in this Technical Note are specifically to Volume 1, applicable to Class 2 to 9 buildings.

Performance Requirements are satisfied by either:

1. A *Performance Solution*
2. A *Deemed-to-Satisfy Solution (DTS)*
3. A combination of 1 and 2

Performance Requirements must be verified using one or a combination of the following *Assessment Methods*:

- Evidence of suitability in accordance with Part A5 of the NCC
- *Verification Method,* as outlined in Clause A2.2(2)(b) of the NCC
- *Expert judgement,* as defined in the NCC
- Comparison with the deemed-to-satisfy provisions of the NCC

The relevant evidence of suitability is defined in Clause A5.2 of the NCC and may be one or a combination of:

1) A current CodeMark Australia or CodeMark *Certificate of Conformity*
2) A current *Certificate of Accreditation*
3) A current certificate issued by a *certification body* stating the properties and performance of a material, product, form of construction or design fulfil specific requirements of the NCC
4) A report issued by an *Accredited Testing Laboratory*
5) A certificate or report from a professional engineer or other appropriately qualified person as defined in the NCC
6) Another form of documentary evidence, such as but not limited to a Product Technical Statement that:
   a) demonstrates that a material, product, form of construction or design fulfils specific requirements of the NCC, and
   b) sets out the basis on which it is given and the extent to which relevant standards, specifications, rules, codes of practice or other publications have been relied upon to demonstrate it fulfils specific requirements of the NCC.

The *Verification Methods* may include:

- A calculation
- A test, using a technical procedure
- An inspection (and inspection report)
- Any other acceptable form of certification (acceptable to the appropriate authority)

The verification methods may be those provided in the NCC or such other verification methods that are acceptable to the *appropriate authority*. This Technical Note provides a verification methodology that may be acceptable to the appropriate authority.

The overall NCC verification hierarchy is outlined in Figure 2.

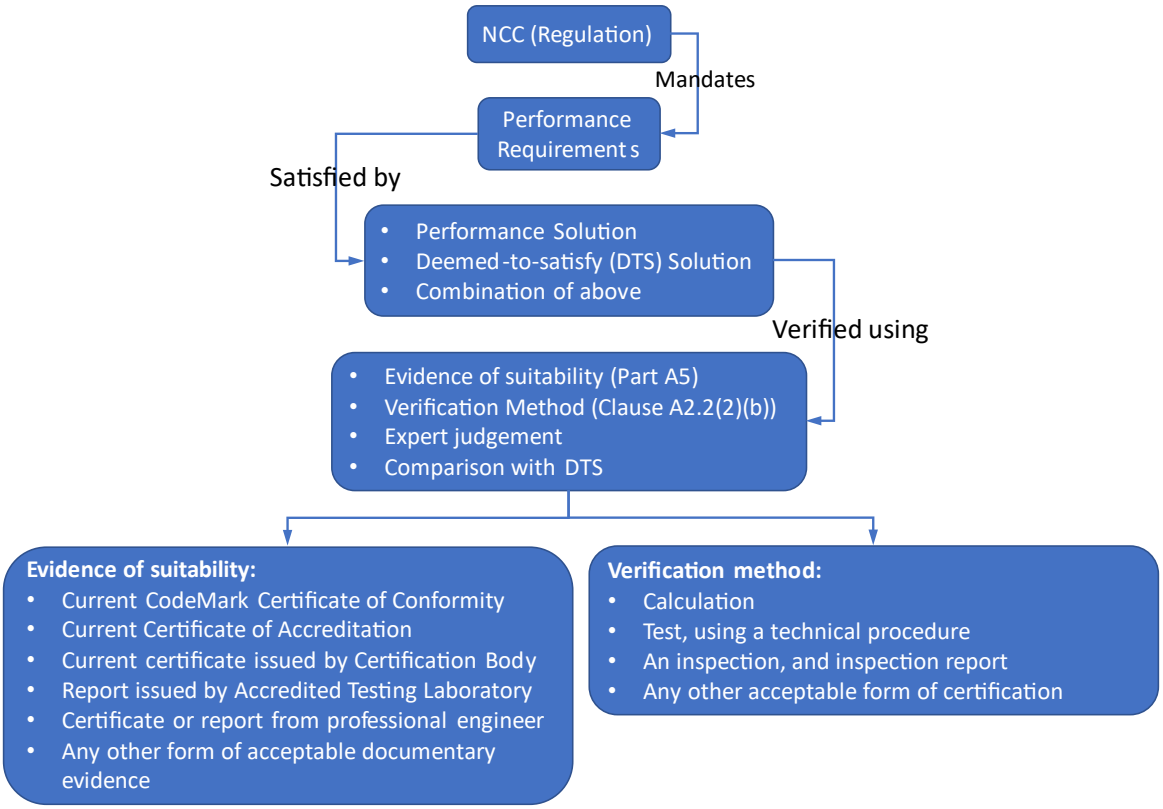

Figure 2 - NCC Verification Hierarchy

In respect of structural provisions (including structural steelwork), the Performance Requirements are defined in Part B1 and include:

1. Clause BP1.1: Structural reliability
2. Clause BP1.2: Structural resistance

The *Deemed-to-Satisfy Solution* for these Performance Requirements is outlined in Clause B1.0, which references Clause B1.4 in respect of determination of the structural resistance of materials and forms of construction.

For steel construction, Clause B1.4 states the structural resistance of materials and forms of construction must be determined in accordance with, as appropriate:

- Steel structures: AS 4100 (Ref. 4)
- Cold-formed steel structures: AS/NZS 4600 (Ref. 5)
- Residential and low-rise steel framing: NASH Standard – Residential and Low-Rise Steel Framing Part 1 or Part 2 (Ref. 6)

If a Deemed-to-Satisfy solution is being adopted, the structural steelwork must meet the requirements of AS 4100, which, in respect of steel materials, calls up the Australian Product Standards (Refs 7, 8, 9, 10) and the structural steelwork fabrication and erection Australian Standard (Ref. 11).

The *Performance Solution* for the aforementioned *Performance Requirements* is referenced from Clause B1.0 to Clauses A2.2(3) and A2.4(3). The *Performance Solution* must be at least equivalent to the *Deemed-to-Satisfy Provisions* (Clause A2.2(1)(b)) or demonstrated to comply with all relevant *Performance Requirements* through an *Assessment Method* (Clause A2.2(1)(a)).

Structural steelwork that cannot be demonstrated to have been fabricated to the requirements of the relevant Australian Standard called up in AS 4100, namely AS/NZS 5131, cannot be a deemed-to-satisfy solution but must be treated as a *Performance Solution* and must be demonstrated to comply to all relevant *Performance Requirements* through an *Assessment Method.*

Assessing a performance solution is not a trivial task, and in most cases requires information to be assessed early in the process, rather than after a building or structure has been procured. The design, as typically defined in the design drawings and specifications (collectively termed the 'construction specification in AS 4100 and AS/NZS 5131), prescribes the required product compliance, usually by reference to (Australian) Standards. If a product that does not comply with the design requirements is proposed to be procured, authorisation for the change must be obtained from the designer prior to procurement. The designer may need to undertake verification according to the requirements of the NCC (and this Technical Note) for a performance solution.

This Technical Note provides a protocol for verification of structural steelwork, including where a performance solution is required.

Key takeaways:

- The National Construction Code (NCC) is performance based
- Utilising Australian design, material and fabrication/erection Standards is the deemed-to-satisfy approach
- Structural steelwork that has not been fabricated to Australian Standards, specifically AS/NZS 5131, **must** be treated as a performance solution
- A specific verification protocol is required under the NCC for any performance solution
- If a product that does not comply with the design requirements is proposed to be procured, authorisation for the change **must** be obtained from the designer prior to procurement
- The designer must undertake verification to the NCC for any structural steelwork that is identified as requiring a performance solution (which is structural steelwork not fabricated to AS/NZS 5131)

3. PRODUCT CONFORMITY, CONFORMITY ASSESSMENT AND AUSTRALIAN DESIGN STANDARDS

3.1 Context

The Australian Standard AS 4100 'Steel structures' (Ref. 4), like most contemporary design standards around the world, is limit state format. For a structure subjected to actions, the structural steel elements and connections are designed to ensure the structure is within the limit states for strength, stability, serviceability, brittle fracture, fatigue, fire, ductility and durability. Put simply, the design action (S*) must be less than or equal to the design resistance ($ØR_u$).

Uncertainties relating to both the actions and the actual capacity of the resisting members are resolved by using a probabilistic approach in design. The actions (loads) are considered as having a probability distribution as shown in Figure 3. The design action is represented by S* on the curve, while the upper and lower limit represents the uncertainty which arises due to the lack of control over or incomplete knowledge of the actions.

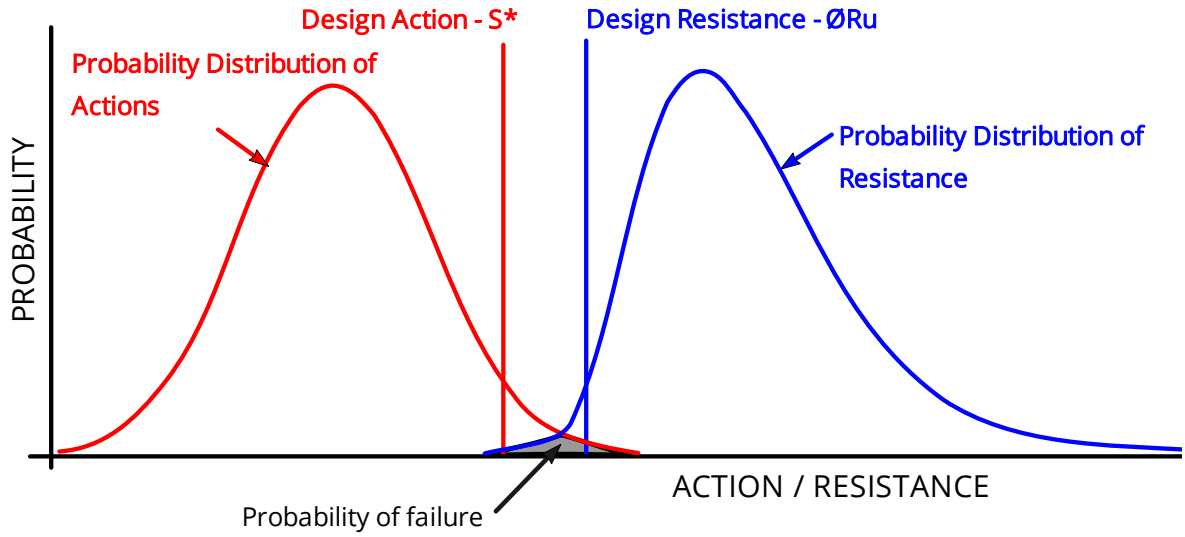

Figure 3 Probability distribution of actions and resistance superimposed

Both the actions and resistance are also subject to variabilities and uncertainties which include:

1. Variations in material properties;
2. Eccentricities due to member and building tolerances;
3. The degree of ductility and stability of any member;
4. Differences in behaviour of isolated members compared with members in a structure;
5. Simplifications and inaccuracies in design models.

The resistance is considered to have a log-normal distribution (Ref. 12)) as shown in Figure 3, with the design resistance represented by $ØR_u$ on the curve and the uncertainty represented by the upper and lower limits.

The probability of the actions exceeding the resistance (the probability of failure) is represented by the shaded area where the two curves overlap.

3.2 Basis for Design Values

The design equations in limit state structural steel design standards such as AS 4100 'Steel structures' and AS/NZS 5100.6 'Bridge design: Steel and composite construction' have been calibrated to ensure an acceptably low probability of failure. The calibration exercise considers,

amongst other things, members being understrength due to variation in material strength and section properties and the actual geometrical tolerance limits required of both individual members and the structural assembly as a whole and component parts thereof. The calibration is based on assessing reliability and results in values for the capacity factors Ø utilised in Table 3.4 of AS 4100.

The basis for the calibration exercise for design capacity of individual members is discussed in Tech Note TN015 (Ref. 3). Articles such as Ref. 12 provide further detail. The ABCB provides detail of the structural reliability verification methodology (Ref. 13) used in the NCC, and the general principles on reliability for structures is addressed in ISO 2394:2015 (Ref. 14) and AS 5104 (Ref. 15).

3.3 Product Conformity

Product conformity is typically defined by the requirements contained in the relevant Australian Standards. For example, the Australian structural steel product standards (Refs. 7, 8, 9, 10) typically include product conformity requirements and conformity assessment requirements. The product conformity and conformity assessment requirements for fabrication of steelwork are defined by AS/NZS 5131. Product conformity requirements include specification of the characteristics of the product, e.g. minimum yield stress, and the inspection and test requirements for checking conformity of the product to the requirements of the standard.

The focus of this current Technical Note is fabricated steelwork, and therefore the requirements of AS/NZS 5131 are relevant. Product conformity and conformity assessment for structural steel are discussed in Technical Note TN015 (Ref. 3).

The product conformity requirements in AS/NZS 5131 are clearly documented in sections 4 to 12 of the Standard, specifically:

- Section 4 – Design, specification, documentation and traceability
- Section 5 – Materials
- Section 6 – Preparation, assembly and fabrication
- Section 7 – Welding
- Section 8 – Mechanical fastening
- Section 9 – Surface treatment and corrosion protection
- Section 10 – Architecturally exposed structural steelwork
- Section 11 – Erection
- Section 12 – Geometrical tolerances

This Technical Note will draw on the relevant sections of AS/NZS 5131 when documenting the specific aspects requiring attention when ascertaining the compliance of structural steelwork.

3.4 Conformity Assessment

Conformity assessment involves the series of processes necessary to show a product meets the requirements of the standard. The main stages in conformity assessment are inspection/testing (determination), review of the evidence of determination and attestation (statement of conformity). Conformity assessment also interacts with other fields such as quality management. It is essential that a steel fabricator operates a quality management system in conjunction with its conformity assessment activities, to ensure it consistently meets the requirements of the relevant fabrication Standard.

In respect of AS/NZS 5131, Section 13 ‘Inspection, testing and correction’ defines the conformity assessment requirements, specifically:

- Clause 13.2 – Inspection
- Clause 13.3 – Inspection of materials and components

- Clause 13.4 – Measurement of fabricated and erected components
- Clause 13.5 Inspection of preparation and assembly
- Clause 13.6 – Inspection of welding
- Clause 13.7 – Inspection of mechanical fastening
- Clause 13.8 – Inspection of surface treatment
- Clause 13.9 – Inspection of paint coatings
- Clause 13.10 – Inspection of galvanized coatings
- Clause 13.11 – Inspection of erection
- Clause 13.12 – Inspection of secondary structural elements

Subsequent sections of this Tech Note will draw on these inspection requirements, particularly as regards the documented evidence required to verify conformity assessment outcomes.

3.5 Welding of Steel Structures

Consideration of the welding of steel structures, in particular where steel to other than Australian Standards is utilised, is covered elsewhere in this Technical Note. AS/NZS 5131 (Ref. 11) references the AS/NZS 1554 (Ref. 16) Standard series for welding, which sets out the processes required for qualification of materials, welding procedures, welds and personnel.
A broad range of parent materials can be welded to AS/NZS 1554.1 (Section 2) and similarly AS/NZS 5131 (Clause 5.3), however there are limitations primarily because the materials of construction listed link into the preheat determination methods given within Section 5 of AS/NZS 1554.1. For steels non-compliant with Section 2 of AS/NZS 1554.1, or any steel with a boron content ≥0.0008%, preheat and other requirements are applicable as defined within the Australian Technical Specification SA TS 103 Structural steel welding - Limits on boron in parent materials (Ref. 17) and WTIA Technical Note 1 The Weldability of Steels (Ref. 18). Briefly, these requirements include:

(a) Verification of preheat requirements
(b) Ensuring that the brittle fracture and Charpy impact properties of the steel are compliant with Appendix B of AS/NZS 1554.1
(c) Ensuring that the steels are matched with the appropriate welding consumables (Clause 4.6 of AS/NZS 1554.1)
(d) Ensuring that the steel is assessed to confirm the performance with AS/NZS 1554.1 prequalified weld procedures, where prequalified weld procedures are to be adopted by the fabricator(1)

Note:
There will be a significant amount of work required to be undertaken by fabricators to re-qualify their welding procedures if steel is used that does not comply with the performance of the steel product used in their existing welding procedure pre-qualifications.

3.6 Bolting of Steel Structures

Bolting of steel structures is as important as welding to ensuring the strength and stability of the finished steel structure. Consequently, compliance of both the bolting components and also the installation of the bolting components into the complete connection is of paramount importance.

A detailed consideration of both bolting components and bolted connection installation is beyond the scope of this Tech Note. ASI Tech Notes TN001 (Ref. 50) and TN016 (Ref. 31) cover bolting components and installation respectively.

Key takeaways:

- The limit state design basis for our steel design Standard AS 4100 is predicated on and calibrated against five-percentile characteristic material properties, as required under the NCC
- Steelwork designed to AS 4100 must be fabricated and erected to AS/NZS 5131
- AS/NZS 5131 clearly defines the product conformity and conformity assessment required for the fabrication of structural steelwork
- Particular attention must be paid to the welding of steel structures, in particular where the steel procured is not compliant to Australian Standards
- The fabricator will need to re-qualify their existing weld procedures if using steel that is not the same as that used for their existing weld procedure qualifications
- Compliance of bolting components and bolted connection installation requires particular attention

4. STEELWORK VERIFICATION PROTOCOL

4.1 General

It is clear from Section 2 that the NCC requires the performance of fabricated steelwork to be verified, regardless of whether the steel is fabricated to Australian Standards (the deemed-to-satisfy solution) or fabricated to a different international Standard and claimed to conform to the NCC and Australian Standards (a performance solution). Section 3 outlines the particular product conformity and conformity assessment processes that need to be implemented consistent with the performance basis of Australian design, product and fabrication Standards in order to establish compliance with the NCC and Australian Standards. Faced with these requirements, manufacturers, distributors and suppliers, engineers, fabricators, procurers and constructors all have a duty of care to properly ensure the compliance of the steel and fabricated steelwork at all stages of the supply chain.

The ‘Steelwork Verification Protocol’ outlined in this section establishes a methodology to ascertain compliance and works in concert with the ‘Steelwork Procurement Framework’ outlined in Section 8, the latter establishing stakeholder responsibilities.

4.2 Context

A robust steelwork verification protocol must:

1. Establish the veracity of the input materials (structural steel products) for the fabrication process. The ‘steel verification protocol’, described in Ref. 3, establishes that veracity.
2. Maintain the veracity of the product at multiple points in the fabrication process and onward to intended use on a project.
3. Maintain verifiable traceability, that is, the ability to link the credentials (documentation provided by the manufacturer) of the steel and steelwork to the assemblies erected on site.
4. Be able to be applied to both locally fabricated product and product fabricated internationally and imported.
5. Maintain a similar ‘quality bar’ (the quality defined by the Australian Standards), regardless of point of fabrication.
6. Be cost effective and commercially viable and, ideally, reward good procurement practice with more cost-effective outcomes.
7. Be able to respond in a timely manner to supply of necessary documentation
8. Be responsive when product non-compliance is identified.

Accordingly, within the context of the current Australian procurement environment, the recommended steelwork verification protocol must:

1. Establish the acceptable quality credentials of the steelwork fabricator
2. Establish the acceptable quality credentials of the steel
3. Establish traceability of the product from procured steel through fabrication to use on the project
4. Where steelwork is not fabricated to an Australian Standard, establish the acceptable performance requirements of the steelwork defined in the applicable Australian Standard (AS/NZS 5131), as referenced from the NCC.
5. Assign appropriate responsibility to the applicable stakeholders in the supply chain.

4.3 Steelwork Verification Protocol Structure

To fulfil the requirements noted above, the steel verification protocol comprises the following separate but related steps, as indicated in Figure 4:

1. **Steelwork fabricator verification (mandatory)**: establishes the fabricator's processes and ability to meet the requirements of AS/NZS 5131. The product must be produced to AS/NZS 5131 and related Australian Standards.
2. **Traceability verification (mandatory)**: establishes the link between the manufacturer's steel products used as input to the fabrication process and the fabricated assemblies erected on the specific project.
3. **Project steelwork verification (mandatory)**: establishes the credentials of the steelwork fabricated for the project to meet the performance requirements of the NCC and AS/NZS 5131.

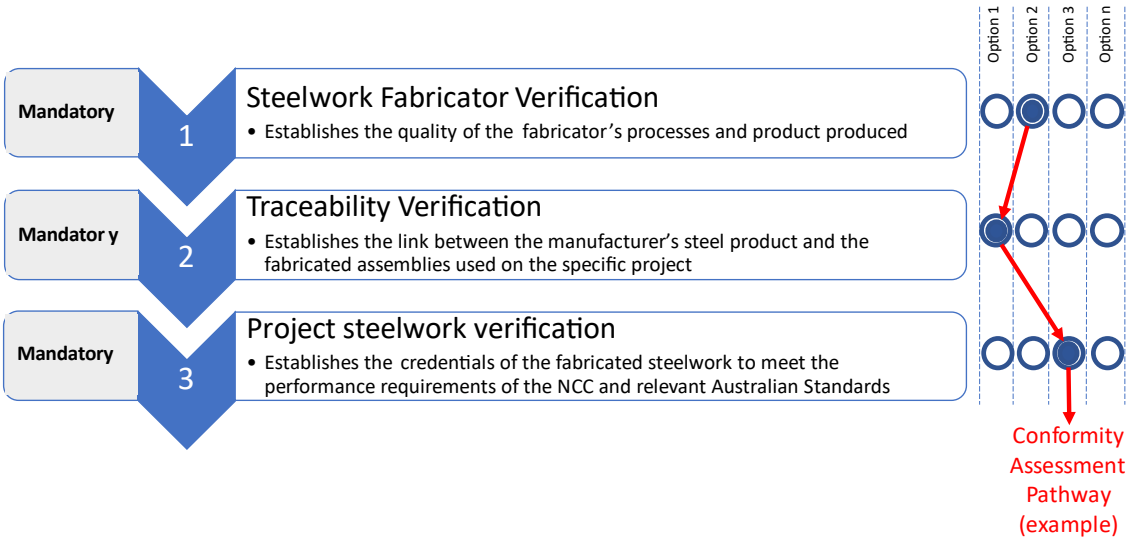

Figure 4 – Steelwork verification protocol structure using a specific conformity assessment pathway

Each of these steps is detailed in the following sections. All steps are mandatory to establish fabricated product compliance.

Within each step of the protocol, a number of options exist. The choice within each step and the combination of the exact options adopted within each step of the protocol is termed the 'conformity assessment pathway', as indicated in Figure 4. The final conformity assessment pathway may vary between projects based on project-specific procurement scenarios and contractual structures.

A risk-based approach to selecting the final conformity assessment pathway based on project type and circumstances is presented in Section 5. The risk-based approach is based on risk categorisation inherent in AS/NZS 5131, recognises the realities of project procurement processes in today's construction environment and represents a pragmatic solution balancing risk and commercial reality.

4.4 Steelwork Fabricator Verification (Mandatory)

4.4.1 Context

Verification of the steelwork fabricator is the first step in the steelwork verification protocol. The process is straightforward, as defined in Figure 5 and is used to establish the extent to which the fabricator has been independently (third-party) verified for the requirements set by Australian Standards.

Figure 5 – Steelwork fabricator verification process

The steps in verifying the steelwork fabricator (or fabricators where multiple fabricators are involved) are:

1. **Identify fabricator**: the steelwork fabricator must be able to be identified from the documentation provided for the project. The documentation should also indicate any certifications the fabricator may have, which will feed into step 2. Certifications must be current. Where the fabricator is not an Australian entity, or the fabrication is undertaken outside of Australia, an SDoC from the party importing the fabricated assemblies will be required. Refer to Appendix E for further details.
2. **Select 'Fabricator Verification Level' (FVL)**: the fabricator verification level is a function of the scope and extent of third-party certification the fabricator may have, and their demonstrable competency level as regards a track record with fabricating structures to AS/NZS 5131. Refer to Section 4.4.3 for further details.
3. **Establish evidence**: the evidence required to establish the veracity of the claims made by the fabricator and used to establish the FVL must be verified. Refer to Section 4.4.4 for further details.

Note:
Where the fabricator proposes to utilise subcontractors for components of the fabrication, these subcontracted fabricators must also be verified. The principal fabricator must also be verified for the processes required to be undertaken by AS/NZS 5131 for subcontracted works

4.4.2 Third-party Certification Context

Australian Standards in general do not reference or require third-party certification, as this is considered contractual.

Australian building Regulation (the National Construction Code) is continually being recalibrated to address emergent issues with the changing procurement and construction environment. Regulation and legislation may, at a national or state-based level, require third-party certification. The local supply chain and importers are advised to check regularly in this regard.

A range of state authorities, in particular roads authorities, have chosen to require third-party certification for fabrication and/or welding of structural steelwork, in particular reflecting the risks associated with CC3 structures. Usually, these requirements are mandated in the authority procurement specification for structural steelwork.

ASI has prepared Technical Note TN014 'Structural steelwork certification in Australia (Ref. 19) to provide stakeholders with an understanding of and clarity on the status of third-party certification of structural steelwork in Australia. Appendix G includes references to currently known state-based certification requirements.

4.4.3 Fabricator Verification Levels (FVL)

A number of levels of verification that the steelwork fabricator meets the requirements of AS/NZS 5131 are presented. These 'Fabricator Verification Levels' (FVL) are shown in Table 1 in approximate order of veracity from most (FVL1) to least (FVL5) verified.

The verification level must be demonstrated by appropriate 'evidence of suitability' (adopting terminology from the NCC), as described in Section 4.4.4.

Table 1 - Fabricator Verification Level (FVL)

Level	Detail
FVL1	**Accredited third-party fabrication certification (for fabrication to Australian Standard AS/NZS 5131)**: undertaken by an independent Conformity Assessment Body (CAB) that itself has been independently accredited. The accreditation body must be a member of the International Accreditation Forum (www.iaf.nu). The ASI National Structural Steelwork Compliance Scheme (NSSCS) (Ref. 20) with the CAB Steelwork Compliance Australia (SCA) (Steelwork Compliance Australia - Home (scacompliance.com.au)) accredited by JAS ANZ, is an example of a CAB certifying fabricators for competency to the Australian Standard AS/NZS 5131. Level 1 Project Steelwork Verification is required (refer Section 4.7)
FVL2	**Non-accredited third-party fabrication certification (for fabrication to Australian Standard AS/NZS 5131)**: in this case the CAB has not been independently accredited for the specific certification to AS/NZS 5131. The procurer is relying on the name and reputation of the CAB in respect of the quality (scope and thoroughness) of the certification itself. Level 2 Project Steelwork Verification is required (refer Section 4.7)
FVL3	**Non-certified fabricator (for fabrication to AS/NZS 5131)**: claims by a steelwork fabricator that they certify product to AS/NZS 5131 amount to first-party certification. The veracity of these claims is entirely dependent on the processes the fabricator has in place, which have not been independently verified. The procurer must undertake or organise to have undertaken independent review and auditing and may choose to rely on a 'trusted relationship' (refer Section 4.6) built up from previous procurement from the same fabricator for fabrication to AS/NZS 5131. Additional verification of the product performance will be required. Level 3 Project Steelwork Verification is required (refer Section 4.7)
FVL4	**Accredited third-party fabrication certification (for fabrication to non-Australian Standards)**: undertaken by an independent Conformity Assessment Body (CAB) that itself has been independently accredited. The accreditation body should be a member of the International Accreditation Forum (www.iaf.nu). The procurer may be reasonably assured the fabricator has in place fit-for-purpose processes. However, to ascertain compliance to AS/NZS 5131, the procurer must undertake or organise to have undertaken independent review and in-process auditing and may choose to rely on a 'trusted relationship' built up from previous procurement from the same fabricator. Level 3 Project Steelwork Verification is required (refer Section 4.7). Performance verification of the fabrication Standard is required (refer Section 4.8).
FVL5	**Non-certified fabricator (fabrication to non-Australian Standards)**: in this case the fabricator has not been independently verified and is fabricating to other than Australian Standards. The procurer must undertake or organise to have undertaken independent audit and must put in place significant continuous in-process auditing before, during and after fabrication for verification of the fabricated product performance. Level 3 Project Steelwork Verification is required (refer Section 4.7). Performance verification of the fabrication Standard is required (refer Section 4.8).

4.4.4 Evidence of Suitability

The appropriate evidence of suitability for each Fabricator Verification Level (FVL) is provided in Table 2.

Table 2 - Evidence of Suitability for Fabricator Verification Level (FVL)

Level	Appropriate evidence of suitability
FVL1	Accredited third-party fabrication certification (for fabrication to AS/NZS 5131)
	• Copy of valid AS/NZS 5131 certification, issued by accredited certification body[(a)] • Independent confirmation from certification body that fabricator certification is current[(b)] • Confirmation from accreditation body that certification body accreditation is valid and current[(c)] • Undertake Level 1 project steelwork verification[(d)], as outlined in Section 4.7.5
FVL2	Non-accredited third-party fabrication certification (for fabrication to AS/NZS 5131)
	• Copy of valid AS/NZS 5131 certification from certification body[(a)] • Independent confirmation from certification body that fabricator certification is current[(b)] • Scheme Manual[(e)] or similar providing detailed scope of the certification and methodology for conformity assessment • Outcomes from auditing of Scheme Manual and process documentation[(f)] • Undertake Level 2 project steelwork verification[(d)], as outlined in Section 4.7.5
FVL3	Non-certified fabricator[(l)] (for fabrication to AS/NZS 5131)
	• Copy of valid certification to AS/NZS ISO 9001[(g)] • Copy of fabricator initial verification audit[(h)] • Undertake Level 3 project steelwork verification[(d)], as outlined in Section 4.7.5
FVL4	Accredited third party fabrication certification (for fabrication to non-Australian Standards)
	• Copy of valid fabrication certification, issued by accredited certification body[(i)] • Independent confirmation from certification body that fabricator certification is current[(b)] • Confirmation from accreditation body that certification body accreditation is valid and current[(c)] • Performance verification of fabrication Standard[(j)], as outlined in Section 4.8 • Undertake Level 3 project steelwork verification[(d)(k)], as outlined in Section 4.7.5 • Performance verification of Scheme, including Scheme Manual[(m)] or similar providing detailed scope of the certification and methodology for conformity assessment
FVL5	Non-certified fabricator (fabrication to non-Australian Standards)
	• Non-certified fabricators undertaking fabrication to non-Australian Standards are noted under this guidance but not recommended • Performance verification of fabrication Standard[(j)], as outlined in Section 4.8 • Undertake Level 3 project steelwork verification[(d)(k)], as outlined in Section 4.7.5 • Fabricator must have trusted fabricator status[(n)], as outlined in Section 4.6

NOTES:

a) The fabricator must be able to produce a valid and current certification. The certification must state the scope of AS/NZS 5131 to which the fabricator is certified. This must cover the scope and type of fabrication being undertaken for the project in question.

b) The authenticity and currency of the certification should be independently checked. Most certification bodies maintain website lists of current certifications or can provide confirmation on request.

c) The certification must also display the independent accreditation credentials. For the purposes of confirmation that the accreditation is valid, most accreditation bodies maintain website lists of current accreditations or can provide confirmation on request.

d) Project steelwork verification is project-specific verification of the fabricated steelwork to be utilised on the project to the relevant fabrication Standard. Refer to section 4.7.

e) A product certification scheme will have a 'Scheme Manual' or similar outlining the basis and operation of the Scheme and including the basis for conformity assessment to the relevant Standard.

f) Where the certification body is not independently accredited, the procurer is relying on the good name of the certification body to be assured of the veracity of the conformity assessment undertaken. It is a reality that any party can claim that they can certify to a Standard. The Scheme Manual must be reviewed and selected documentation from a representative Scheme audit also audited by an appropriately qualified auditor.

g) AS/NZS 5131 requires the fabricator to be working under a suitable Quality Management System (QMS). ISO 9001 is the most common QMS implemented by industry. Given the fundamental importance of managing quality outcomes in fabrication, a requirement that the fabricator obtains certification of the QMS implementation is considered appropriate.

h) The fabricator initial verification audit (FIVA) establishes the technical capability of the fabricator to work to the requirements of AS/NZS 5131 and is undertaken prior to fabrication commencing. The FIVA might also be termed a technical prequalification audit and considered one component of the usual commercial prequalification undertaken by the client or procurer. Commercial prequalification might also include assessment of the fabricator's capacity and financial robustness. The FIVA is equivalent to the auditing requirements prior to fabrication commencing as documented in Appendix B.

i) The fabricator must be able to produce a valid and current certification to the nominated fabrication Standard. The certification must state the scope of the Standard to which the fabricator is certified. This must cover the scope and type of fabrication being undertaken for the project in question.

j) The fabrication Standard to which the steelwork is fabricated must be verified to meet the performance requirements of AS/NZS 5131 and referenced Standards. Refer to Section 4.8.

k) Fabrication to non-Australian Standards is treated as a *Performance Solution* and requires additional auditing, as outlined in Section 4.7.

l) A non-certified fabricator has not been independently assessed as having suitable processes in place to deliver consistent fabricated product quality. The procurer is relying on the good name of the fabricator. If the procurer accepts the risk of sourcing from a non-certified fabricator, a robust verification auditing regime must be put in place. Refer to Section 5 for the appropriate conformity assessment pathway.

m) The Scheme Manual must be reviewed and selected documentation from a representative Scheme audit also audited.

n) Trusted fabricator status is based on a long-term procurement-based relationship between the procurer and fabricator, with demonstrably compliant fabricated product supplied in all cases. Refer Section 4.6.

4.5 Traceability Verification (Mandatory)

4.5.1 Context

Traceability is the ability to maintain the connection between the test and inspection certificates and the specific steel product or fabricated assembly to which they apply throughout the process from steel manufacture through distribution to the procurer and on through fabrication and erection of the structure, as shown in Figure 6. In respect of traceability, this Technical Note is concerned primarily with the fabrication stage from receipt of the steel products by the fabricator. AS/NZS 5131 (Ref. 11) specifies requirements for the type and extent of traceability during fabrication and erection. For the stage prior to fabrication of the steel products, Technical Note TN015 (Ref. 3) should be referenced.

It can be challenging to establish the traceability of product. Instances of fraud (e.g. altered copies of certificates) and deliberate misleading information (e.g. certificates not applicable to the steel or steelwork purchased) have been reported. In this environment the procurer must request documentation prior to the purchase of the product. The documentation must be audited rigorously.

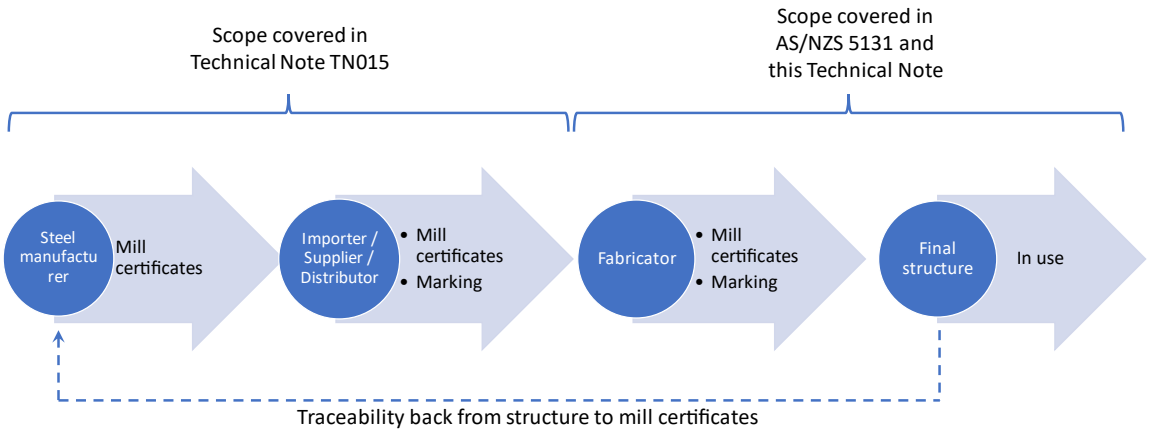

Figure 6 – Traceability connecting manufacture to the finished structure

4.5.2 AS/NZS 5131 Context

AS/NZS 5131 requires, as a starting point prior to fabrication, that the steel product meets the performance requirements of the steel product Standards (Refs. 7, 8, 9, 10). It then prescribes different levels of traceability for product through the fabrication process depending on the 'Construction Category'. The levels are defined as 'Lot', 'Piece-mark' and 'Piece' traceability and may be applied to different structural components depending on the construction category. Technical Note TN011 (Ref. 21) provides an explanation of AS/NZS 5131 and construction categories. Technical Note TN015 (Ref. 3) provides detailed explanation of and implementation guidance on the traceability requirements in AS/NZS 5131.

It is important to understand that the traceability described in AS/NZS 5131 is contingent on proper traceability having been maintained up to and including the point of steel procurement for fabrication. It is also important to understand that, regardless of the construction category (and hence type of traceability implemented during fabrication) defined in AS/NZS 5131, the procured steel must all be traceable back to the corresponding valid test and inspection certificates.

4.5.3 Verification

Verification of traceability constitutes the ability to establish a positive link between the valid test and inspection certificates provided, the actual procured steel products for each batch of product, regardless of whether the product is manufactured locally, sourced internationally or incorporated into fabricated steelwork overseas and the fabricated components and assemblies that leave the fabrication shop and are erected on site.

Each of these project phases has challenges that need to be addressed based on project-specific requirements. However, in respect of the fabrication stage and regardless of the project scenario, the following principles must be followed:

1. The procured **steel products** must be **identified** and **verified**. ASI Technical Note TN015 provides a rational protocol for steel product identification and verification.
2. The relevant **documentation** must be available at the time the physical product is available to the fabricator. The Australian steel product Standards prescribe the type and contents of the documentation that is required to be transmitted with the steel product and available to the procurer. Timely supply of documentation ensures the steel product can enter the fabrication processes correctly identified, avoiding potential traceability issues.
3. The fabricator must have in place a documented process for managing traceability to the requirements of AS/NZS 5131. The default level of traceability for CC2 and CC3 projects nominated in AS/NZS 5131 is 'Lot' traceability. Higher levels of traceability, namely 'Piece-mark' and 'Piece' traceability, are defined in AS/NZS 5131 but only required if specified in the construction specification.
4. If the fabricated structure arrives and there are concerns about the veracity of the traceability, then it is recommended the steel is treated as unidentified steel in accordance with the requirements of AS 4100, which requires the design steel yield strength to be treated as 170 MPa. A sampling and testing plan must also be implemented involving cutting of samples from the fabricated steelwork under the direction of a suitably qualified trusted third party. The sampling and testing plan must establish that the steel ductility, chemical composition and weldability meet the performance requirements of the steel product Standards, AS/NZS 5131 and AS 4100. Alternatively, that sampling and test plan can also include testing of steel strength to provide a statistically appropriate basis for assessing the material strength. ASI Technical Note TN015 (Ref. 3) provides further detail on requirements for testing and sampling plans.
5. It must be noted that if steel in a fabricated structure does not have demonstrable traceability, it is likely not known which steel members come from the same batch of steel (or even the same mill) and therefore every piece of steel must be verified if the responsible party is to certify the structural adequacy of the structure to the requirements of the NCC. This is generally a commercially unrealistic scenario and therefore it is very important that the protocols for verifiable traceability are established early in a project in order to avoid a situation where it is impossible for the responsible party to certify the structure.
6. The designer is the responsible party for the original design of the structure and must be provided sufficient information (as outlined in this Technical Note and TN015) if requested to certify the structural adequacy of the constructed structure. The designer must approve changes to the design, including use of alternative materials. Where alternative materials are sought to be used, the designer's approval must be obtained prior to procurement. Where unauthorised changes are made, for example due to procurement practices, then responsibility for (potentially detrimental) outcomes is transferred to the party making those changes.

4.5.4 Evidence of Suitability

For each of the functional requirements listed in Section 4.5.3, the recommended evidence of suitability is indicated in Table 3.

Table 3 – Evidence of Suitability for Traceability

Item	Recommended evidence of suitability
1	Identification
	• Marking of material as required by relevant Standard[a] • Identification tags on bundled product[a] • Photos of marking and ID tags[b]
3	Documentation
	• Test and inspection certificates in English[c] • Supplier Declaration of Conformity (SDoC)[d]
4	Traceability
	• Documentation providing a verifiable link between the material purchased and test and inspection certificates for each batch of material[e][f] • Process documentation for implementation of traceability to designated AS/NZS 5131 traceability level (Lot, piece-mark, piece). Example documentation for a completed project[g]

NOTES:

a) Section 11.1 of each of the Australian product Standards (Refs. 7, 8, 9, 10) specifies the requirements for identification and marking of product. Material not identified and marked in this manner must be treated as non-compliant with the requirements of the relevant Standard.

b) Where requested by the auditor, the fabricator must provide photos of the member marking and tags for the batches of material procured.

c) Section 11.2 of each of the Australian product Standards (Refs 7, 8, 9, 10) specifies the requirements for test and inspection certificates and that they must be available to the purchaser. The Standards specifically state “A test and inspection certificate shall be available to the purchaser for all products manufactured to this Standard for each batch produced” (or “for each section produced” in the case of AS/NZS 3679.2). It is recommended that test and inspection certificates are requested for all steel procured.

d) Section 11.2 of the product Standards requires the manufacturer to provide as part of the test and inspection certificates a declaration that the products supplied comply to the requirements of the Standard (refer to Appendix C). AS/NZS 5131 recommends a Supplier Declaration of Conformity is provided for purchased components. Where an SDoC is required (by the client, procurer or other party), the SDoC must be provided by the importer/supplier/distributor where material is sourced internationally, as the SdoC is required to be declared and signed by a local (Australian) entity who is taking responsibility for the compliance of the product declared. The SDoC must include reference to the verification test report or reports used to support a claim of conformity. Refer to Appendix D of Technical Note TN015 for an example of a suitable form of SDoC.

e) The test and inspection certificate would usually be relied on to provide the documented link connecting test and inspection outcomes to the marking and identification on the product purchased.

f) It can be challenging to establish the traceability of product. Instances of fraud (e.g. altered copies of certificates) and deliberate misleading information (e.g. certificates not applicable to the steel purchased) have been reported. The procurer must check documentation rigorously and may need to implement a robust verification testing process as described in Technical Note TN015 where anomalies in documentation exist.

g) Where fabricator verification is being undertaken, it is appropriate to use example documentation on a previously completed project to establish fabricator capability to manage traceability correctly. Where steelwork verification (ie of the actual steelwork for the project) the records for the project must be used for verification of traceability.

4.6 Trusted Fabricator Status (Optional except where otherwise noted)

4.6.1 Context

The ease with which product can be sourced from either local or international suppliers and the ensuing competition drives cost as a primary consideration. A focus on cost alone has reduced the practice of identifying and utilising 'trusted suppliers' that was the cornerstone of previous supply chain verification and helped ensure cost-effective compliant solutions.

Within the context of this Technical Note, the supplier is the fabricator, whether locally or internationally based. The fabricator is charged with ensuring the steel and component inputs, the fabrication process and the fabricated steelwork output is compliant to AS/NZS 5131, related Standards and the NCC (where appropriate).

Strictly speaking, Trusted Fabricator Status is not required if the other mandatory protocols described in this Technical Note are enacted. For this reason, for the current market, Trusted Fabricator Status is noted as optional. However, ASI strongly encourages procurers to develop and rigorously maintain trusted relationships with fabricators.

Trusted Fabricator Status is a pure commercial imperative on the part of the procurer, put in place to manage risk, improve efficiency in the procurement process and minimise the likelihood of non-compliant fabricated product. **Trusted Fabricator Status has no legal or regulatory context**.

4.6.2 Performance Requirements

The primary performance requirements of the fabricator as regards fabricated steelwork compliance is to ensure the requirements of the Standards and the NCC are supported, specifically in relation to:

1. **Identification and compliance**: of the steel products and components input into the fabrication process, according to the relevant Standard. ASI Technical Note TN-015 (Ref. 3) provides guidance on ascertaining compliance of structural steel.
2. **Documentation**: AS/NZS 5131 prescribes the type and form of documentation that is required to be provided with the fabricated steelwork product and available to the procurer. The documentation is usually provided in the form of an MDR (refer to Section 4.7.4)
3. **Traceability**: AS/NZS 5131 prescribes the extent of traceability. Refer to Section 4.5.
4. **Project steelwork verification**: AS/NZS 5131 prescribes a range of testing and inspection that must be undertaken by the fabricator (refer to Section 4.7).

In addition, the steelwork fabricator must:

5. be an **Australian legal entity**: If fabricated product is imported directly, then the importer of the product must provide an SDoC for the fabricated product (refer to Appendix E for the recommended form of an SDoC) in addition to the requirements noted above.
6. operate a **Quality Management System**: typically, AS/NZS ISO 9001. The QMS is the foundation for the delivery of quality but may need to be extended to support requirements from specific procurers. Documentation sufficient to verify the QMS must be provided.

4.6.3 Trusted fabricator status

Trusted Fabricator Status is a relationship between a fabricator and a particular procurer. Trusted Fabricator Status is 'awarded' by the procurer to the fabricator based on an established procurement relationship built up over a period of time and continually tested.

The assessment of the fabricator will depend on the commercial and contractual relationships in play. However, as a minimum, the following requirements must be addressed:

1. The fabricator has in place a QMS, preferably certified, that also addresses the elements detailed in Table 4.

2. Where the fabricator is not FVL1, the procurer must undertake a Level 3 Project Steelwork Verification (refer Section 4.7.5) at least every three years, or every project, whichever is the longer time period.
3. Preparation by the procurer of a project summary at the completion of every project undertaken with the fabricator. The project summary is a distillation of the Manufacturer Data Report (MDR) highlighting any issues or opportunities for improvement for the fabricator.
4. The procurer has in place a performance monitoring protocol for the fabricator. The performance monitoring protocol must include:
   a. Review and assessment of any changes to the fabricator corporate structure that may affect quality outcomes
   b. Review and assessment of changes to key personnel, including management and supervisory staff that may affect quality outcomes
   c. Regular review of the project summaries noted above, in particular to inform tender review for upcoming projects
5. The fabricator provides to the procurer a 'Supplier Declaration of Conformity' (refer to Appendix E) for the fabricated product and has on request the MDR as the basis for the stated declaration.

The recommended evidence of suitability for each of the performance requirements listed in Section 4.6.2 is shown in Table 4.

Table 4 – Evidence of Suitability for trusted fabricator

Item	Recommended evidence of suitability
1	Identification and compliance
	• Refer ASI Technical Note TN015 (Ref. 3)
2	Documentation
	• Manufacturer Data Report (MDR) (refer to Appendix D) • Supplier Declaration of Conformity (SDoC)[(a)]
3	Traceability
	• Documentation providing verifiable link between material purchased, test and inspection certificates for each batch of material and the final fabricated components and assemblies[(b)]
4	Project steelwork verification[(c)]
	• Refer Section 4.7
5	Australian legal entity
	• ABN and name and address for fabricator
	• Name and address of importer
6	Quality Management System
	• Certification for Quality Management System[(d)]
	• Documentation from auditor stating that the QMS covers the elements detailed in this Technical Note[(e)]

NOTES:

a) Section 11.2 of the product Standards requires the manufacturer to provide as part of the test and inspection certificates a declaration that the products supplied comply to the requirements of the Standard. AS/NZS 5131 recommends a Supplier Declaration of Conformity is provided for purchased components. An SDoC must be provided by the importer where material or fabricated steelwork is sourced internationally. The SDoC must include reference to the verification test report or reports used to support any claim of conformity. Refer Appendix E for a discussion on and typical example of the form of the SDoC.

b) The test and inspection certificate would usually be relied on to provide the documented link connecting test and inspection outcomes to the marking and identification on the steel product purchased. The fabricator must then have systems in place to implement the 'Lot', 'Piece-mark' or 'Piece' traceability required by AS/NZS 5131.

c) Refer Section 4.7 for a detailed explanation of project steelwork verification.

d) Certification of the Quality Management System must be undertaken by an auditor who is accredited by a signatory to the International Accreditation Forum's Multilateral Recognition Agreement (eg. JAS ANZ).

e) The audit of the fabricator must include the elements detailed in this Technical Note, specifically the elements of the fabricator verification protocol outlined in Section 4.4. The auditor may either document this within the audit report or as a separate audit outcome.

4.7 Project Steelwork Verification (mandatory)

4.7.1 Context

Project steelwork verification (PSV) is verification of the steelwork actually fabricated for the project in question. As distinct from ascertaining the Fabricator Verification Level (FVL) discussed previously, which establishes that the fabricator is capable of performing to the requirements of AS/NZS 5131 for the applicable Construction Category, project steelwork verification establishes that the fabricator has actually produced steelwork that complies with the requirements of AS/NZS 5131 for the project in question.

For the purposes of convenient project implementation, project steelwork verification may be divided into the three stages shown in Figure 7. AS/NZS 5131 defines a range of requirements for inspection and testing that may be conveniently assigned to each of these stages.

Figure 7 – Project steelwork verification process

Note:

The verification before, during and after fabrication described in this section is additional to and separate from the usual quality control procedures that must be put in place by the fabricator to ensure fabrication is undertaken to meet the requirements of AS/NZS 5131. The verification outlined in this section must not replace the fabricators own quality control.

4.7.2 Verification prior to fabrication

The quality control procedures put in place prior to commencement of fabrication are paramount to ensuring quality outcomes for the fabricated steelwork. This is especially true of welding, which is defined as a 'special process'.

Verification requirements prior to fabrication required by AS/NZS 5131 are extensive, and, in high level terms, include:

- **Accessible Standards:** the fabricator having expedient access to the primary referenced Standards covering the work to be undertaken, principally AS/NZS 5131 and related Standards.
- **Quality Management System (QMS):** the fabricator must have an appropriate Quality Management System implemented.
- **Quality documentation:** a range of documentation and documented processes related to quality and quality management underpins fit-for-purpose quality outcomes. Most importantly, these processes and documentation MUST be put in place before fabrication commences, as quality cannot be back-fitted. The documentation includes but is not limited to:
    - Procedures, methods and work instructions
    - Allocation of tasks and authorities
    - Inspection and test plans (ITP's) specific to the works
    - Procedures for handling changes and modifications
    - A procedure for handling nonconformances
    - A procedure for handling disputes related to quality
    - Documented hold and witness points
    - A procedure for document control and control of records
    - A procedure for corrective and preventative actions
    - A procedure for quality audits, both internal and external
    - Contractual and technical reviews
- **A Quality Plan:** required for CC3 and CC4 projects
- **Purchasing:** including for components and subcontracted services
- **Traceability:** implementation of 'Lot', 'Piece-mark' and 'Piece' traceability as required
- **Supervision:** by trained and competent personnel
- **Welding:** qualification of welding procedures, qualification of welders, welding coordination
- **Mechanical fastening:** work method statements, supervision
- **Surface treatment and corrosion protection:** work method statements, supervision
- **Architecturally exposed structural steelwork**
- **Geometric tolerances:** review of requirements
- **Inspection, testing and correction:** ITP's, qualification and competency of inspection personnel

A detailed tabulation of the above requirements based on AS/NZS 5131 is included in Appendix B. These detailed requirements must be actioned by and documented by the auditor prior to fabrication commencing in order to demonstrate compliance to AS/NZS 5131.

The range of auditing requirements indicated above and detailed in Appendix B might be termed a 'Fabricator initial verification audit' or a technical prequalification audit. As such, these auditing requirements might be used as the technical component of any proposed fabricator tender prequalification exercise.

It must also be noted that the client construction specification may contain requirements additional to or extending on those in AS/NZS 5131. The contract review processes undertaken prior to fabrication must identify these and incorporate the additional requirements into the quality documentation (ITP's and the like).

4.7.3 Verification during fabrication

Verification requirements during fabrication required by AS/NZS 5131 follow on from the structure set up by the pre-fabrication requirements noted in Section 4.7.2, and, in high level terms, include:

- **Quality records:** the quality documentation defined in AS/NZS 5131 and reviewed during the verification prior to fabrication (Section 4.7.2) is actioned on the project, with the quality records produced during fabrication audited.
- **Purchasing:** records audited for compliance to AS/NZS 5131 requirements
- **Subcontracted services:** process and records audited to ensure subcontractors are provided the correct information and the ensuing products/services are compliant to AS/NZS 5131.
- **Materials:** audited to ensure procured materials are verified as meeting the performance intent of the relevant Australian Standards and the NCC (where appropriate).
- **Traceability:** inputs to the fabrication process have correct identification and marking and processes are in place and actioned to meet the 'Lot'. 'Piece-mark' or 'Piece' (as specified) requirements of AS/NZS 5131.
- **Preparation, assembly and fabrication:** processes undertaken according to the requirements of AS/NZS 5131, with Inspection and Test Plans (ITP's) and Work Method Statements (WMS's) prepared and verified as actioned in the workshop.
- **Welding:** qualification of welders and welding procedures confirmed as applied on the actual project, records maintained and processes undertaken according to the requirements of AS/NZS 5131.
- **Mechanical fastening:** processes undertaken according to the requirements of AS/NZS 5131, with Inspection and Test Plans (ITP's) and Work Method Statements (WMS's) prepared and actioned. Mechanical fastening may occur on site as part of the erection of the structure.
- **Surface treatment and corrosion protection:** processes undertaken according to the requirements of AS/NZS 5131, with Inspection and Test Plans (ITP's) and Work Method Statements (WMS's) prepared and actioned.
- **Architecturally exposed structural steelwork:** processes undertaken according to the requirements of AS/NZS 5131.
- **Geometric tolerances:** tolerances checked (in particular essential tolerances) according to the requirements of AS/NZS 5131.
- **Inspection, testing and correction:** inspection records as required by AS/NZS 5131 and the construction specification available and audited for all of the abovementioned processes.

A detailed tabulation of the above requirements based on AS/NZS 5131 and as related to auditing is included in Appendix C. These detailed requirements must be actioned by and documented by the auditor during the fabrication process in order to demonstrate compliance to AS/NZS 5131. Importantly, the in-process checks during fabrication establish the link between the quality framework and client expectations established pre-fabrication and the fit-for purpose outcomes (the fabricated structure) expected by the Standards and defined in the client's construction specification.

4.7.4 Verification post-fabrication

If the pre-fabrication processes detailed in Section 4.7.2 and during-fabrication processes detailed in Section 4.7.3 have been undertaken rigorously, then verification requirements post-fabrication required by AS/NZS 5131 should be straightforward, and necessary simply to provide a complete documentation set for client records and regulatory purposes.

In high level terms, the primary documentation required to be available includes:

- **Construction specification:** review of construction specification to ascertain any particular requirements additional to those in AS/NZS 5131
- **Quality documentation and Quality Plan:** to establish the basis for managing quality outcomes on the project
- **Procurement procedures and records:** for purchasing of materials, components and subcontracted services. Verified records help ensure compliance of the inputs to fabrication
- **Fabrication records**: necessary to confirm compliance to the requirements of AS/NZS 5131
- **Welding procedures and records:** includes completed ITP's, welder/supervisor/coordinator/inspector qualifications, weld procedure qualifications and NDE records. Necessary to confirm compliance to AS/NZS 5131 welding requirements
- **Bolting procedures and records:** includes completed ITP's, bolting installer/supervisor competencies and completed records
- **Surface preparation and coating application:** includes completed ITP's, installer competencies and completed records
- **Erection:** including planning, execution, completed ITP's, risk analysis and Erection Sequence Methodology (ESM) (where required)

A detailed tabulation of the above requirements based on AS/NZS 5131 is included in Appendix D, configured into what may be treated as a standardized structure for the 'Manufacturer Data Report' (MDR), compiling all of the information required to be submitted by the fabricator before, during and after the fabrication works. These detailed requirements must be verified by the auditor after the fabrication process is complete, in order to demonstrate compliance to AS/NZS 5131 for commercial or regulatory compliance.

4.7.5 Project steelwork verification level

Project steelwork verification (PSV) as described above, can be onerous and time consuming, depending on project scenarios. It is therefore important that project steelwork verification is responsive to the various project scenarios possible. These project scenarios will influence the particular conformity assessment pathway (refer to Section 5) selected for the project.

To facilitate responsive application of the project steelwork verification process, the PSV is categorised into three levels, PSV1, PSV2, and PSV3, from least to most extent of verification required. A general description of the PSV level is provided in Table 5. The PSV requirements tabulated in Appendices B, C and D are scoped into these PSV levels.

Table 5 – Project Steelwork Verification (PSV) Level

PSV Level	Description
1	Project specific documentation only
	• Confirm fabricator certification[(a)] • Obtain quality system and process documentation[(b)] • Audit and verify completed MDR[(c)]
2	Project specific documentation + limited auditing[(d)]
	• Audit and verify fabricator quality system and process documentation prior to fabrication commencing • Limited auditing of process during fabrication • Audit and verify completed MDR[(c)]
3	Project specific documentation + full auditing[(e)]
	• Audit and verify fabricator quality system and process documentation prior to fabrication commencing • Full auditing of process during fabrication • Audit and verify completed MDR[(c)]

NOTES:

a) PSV Level 1 is based on the fabricator having a current approved accredited third-party certification to AS/NZS 5131 to either Construction Categories CC2 or CC3. Refer Section 4.10 for more detail of Construction Categories. Certification is encouraged but not required for CC1 projects.

b) PSV Level 1 is based on the fabricator having a current approved accredited third-party certification to AS/NZS 5131 to either Construction Categories CC2 or CC3. On this basis it is not necessary to audit quality documentation, but quality documentation should be obtained to form part of the project records.

c) The Manufacturer Data Record (MDR) is a compilation of the complete documentation set required by AS/NZS 5131, to be submitted by the fabricator in its entirety at the end of the project. The form and structure of the MDR may be defined by the procurer and may be developed over the course of the project in collaboration with the procurer. Refer to Appendix D for more detail.

d) The limited project auditing recommended for PSV Level 2 (compared to PSV Level 3) is specifically targeted at ensuring the fabricator has the quality systems and processes in place to satisfy the requirements of AS/NZS 5131 before fabrication commences. Limited auditing is also undertaken during the fabrication process to ensure these processes are being actioned on the project.

e) The full project auditing recommended for PSV Level 3 is specifically targeted at ensuring the fabricator has the quality systems and processes in place to satisfy the requirements of AS/NZS 5131 before fabrication commences and follows through with corresponding processes during fabrication.

4.8 Performance verification of fabrication Standard

4.8.1 Context

It is assumed the steel structure has been designed to AS 4100. Assessing the compliance for steel structures that have been designed to a Standard other than AS 4100 is beyond the scope of this Technical Note and would require performance verification of that alternate design

Standard against the design intent of AS 4100 by a suitably competent engineer with substantial working experience in both Standards.

If a project is intended to be fabricated to a standard other than AS/NZS 5131 (which is the deemed-to-satisfy reference for fabrication and erection called up by AS 4100), the fabrication of the structure must be treated as a performance solution under the National Construction Code (NCC) (refer to Section 2). The NCC Guide to BCA Volume 1 (Ref. 22) states categorically in Clause B1.4 “For designers seeking structural compliance via Performance Solutions, a major principle in determining structural resistance is that the reliability level of the structure or its components must be at least equal to that already achieved in the Deemed-to-Satisfy Provisions”.

Accordingly, there are at least three aspects that must be considered:

- Does the fabrication Standard meet the performance intent of AS 4100? As noted in Clause 1.7.4 of AS 4100: “Minimum required standards of workmanship ensure that the design assumptions remain valid”
- Following on from the above, does the fabrication Standard meet the performance intent and quality expectations of AS/NZS 5131? This will require a detailed clause by clause comparison between AS/NZS 5131 and the fabrication Standard in question.
- Following on from the above, does the fabrication Standard provide differentiation based on risk, with similar risk assessment input parameters as utilised in AS 4100 and AS/NZS 5131. Risk assessment is enacted in AS 4100 and AS/NZS 5131 via the use of ‘Construction Categories’ (refer to Section 4.10)

These three aspects are considered in the following sections. However, where differences are significant, a full reliability analysis may be required to verify application of the target fabrication Standard results in a reliability level of the structure or its components at least equal to that already achieved in the Deemed-to-Satisfy Provisions of the National Construction Code.

It should be noted that undertaking a performance verification of a fabrication Standard is a significant task, and one which requires specialist competency in both structural engineering, fabrication and reliability analysis. The outcomes must satisfy the verification requirements of the National Construction Code.

4.8.2 Alignment with AS 4100 performance intent

There are a range of fundamental performance assumptions inherent in AS 4100 that directly translate into fabrication requirements in AS/NZS 5131. This is no different to any other international Standard or specification combination of design and fabrication/erection. The design Standard is ‘paired’ to the fabrication/erection Standard through shared performance assumptions.

In this scenario, it is therefore very important that, if the Standards are not paired, the shared performance assumptions are identified and engineering undertaken to address inconsistency.

In respect of AS 4100, the performance assumptions of relevance to be considered related to fabrication and erection include:

- **Steel properties:**
    - Nominal (design) steel grades: as noted in the ABCB Handbook: Structural Reliability Verification Method (Ref. 13), our structural design Standards for steel, concrete and timber, adopt the five-percentile characteristic material properties according to the NCC Volume 1 (Ref. 1) BP1.2, which states in part “The structural resistance of materials and forms of construction must be determined using five percentile characteristic material properties…”. This is consistent with recommendations in ISO 2394 (Ref. 14) (or the equivalent AS 5104 (Ref. 15)) on which our suite of structural steel related Standards are based. Refer to ASI Technical Note TN-015 for further detail. Therefore, it must be verified that the steel used when fabricating to the target fabrication Standard has a design steel grade that is a five-percentile characteristic value and is consistent with the required steel grades in the construction specification for the project

- Steel material properties must meet the requirements of Clauses 2.1 and 2.2 of AS 4100
- Through thickness deformation properties: as per Clause 2.2.5 and Appendix M of AS 4100, to provide ductility and toughness against lamellar tearing
- Brittle fracture: steel materials shall meet the requirements of Section 10 of AS 4100

- **Fasteners:**
  - Bolt assemblies: to meet or exceed the requirements of Clauses 2.3.1 and 2.3.2 of AS 4100, to ensure the connection design capacity meets design intent
- **Connections:**
  - Detailing (hole sizes, clearances etc) to ensure design assumptions regarding connection behaviour are not invalidated
- **Member strength:**
  - Member tolerances: the member strength assessment in AS 4100, and more specifically the capacity factors Ø, are based on a reliability analysis that allows for, amongst other things, the geometrical tolerance limits specified in AS/NZS 5131, specifically the 'Essential tolerances' specified in Appendix F of AS 5131. According to Clause 12.1 of AS/NZS 5131, essential tolerances are those "that are essential for the mechanical resistance and stability of the completed structure. In many cases these are compatible with assumptions made in formulating the expressions for design capacity in AS 4100…". It is therefore necessary to ensure that the essential tolerances in the target fabrication Standard as equal to or better than those in AS/NZS 5131.
- **Structure strength:**
  - Erection tolerances: similar to member tolerances, essential tolerances for erection specified in Appendix F of AS/NZS 5131 must be respected. It is therefore necessary to ensure the erection essential tolerances comply with AS/NZS 5131.

4.8.3 Alignment with AS/NZS 5131 performance intent

The performance intent of AS/NZS 5131 is defined by the detailed requirements listed within every Clause of the Standard. Ascertaining alignment requires a methodical review of every performance-related clause in AS/NZS 5131 and comparison with clauses addressing similar performance intent in the target fabrication Standard. The suggested approach is:

1 Identify and tabulate each performance-related clause in AS/NZS 5131

2 For each of the above, identify reference to a clause(s) with similar performance intent in the target fabrication Standard

3 Assess each pair of clauses on the following basis:

a) Where the performance requirement in the target fabrication Standard is 'better' or 'equal to' the corresponding requirement in AS/NZS 5131, consider this line item verified. Some judgement may be required on what is considered 'better' or 'equal to', in order that the analysis is defendable and the basis documented

b) Where the performance requirement in the target fabrication Standard is 'less than' or 'worse' than that in AS/NZS 5131, undertake a verification according to the requirements of the NCC. The verification must ensure that the target reliability of the completed structure is no worse than the reliability required by the NCC or that inherent in AS 4100 and AS/NZS 5131

4 Ensure all performance requirements have been assessed and verified as aligned. Where this is not the case, specific controls may need to be put in place before, during and after fabrication and/or erection to ensure the outcomes are aligned with the performance expectation in AS/NZS 5131.

4.8.4 Alignment with risk assessment

Construction risk and the risk assessment process undertaken in AS 4100 and similarly in AS/NZS 5131 is discussed in Section 4.10. Construction risk, including the consequences of failure and the complexity of the construction works, is recognised through categorisation of the structure or parts thereof into one of four 'construction categories', CC1 to CC4. The assessment of the Construction Category is a function of:

- The '**Importance Factor**', which reflects the risk to life and consequences of failure. The Importance Factor is obtained from either the National Construction Code or AS/NZS 1170.0 (Ref. 23)
- The '**Service Category**', which reflects the uncertainty in the exposure of the structure to actions that may expose flaws in the structure during use. The Service Category is defined in Table C1 of AS/NZS 5131 and similarly in AS 4100
- The '**Fabrication Category**', which reflects the complexity of the fabrication inherent in the structure or parts of the structure. The Fabrication Category is defined in Table C2 of AS/NZS 5131 and similarly in AS 4100

From Clause L.2 of AS 4100: "The selection of a "construction category", as applicable to a steel structure or components thereof, is a risk based approach intended to provide consistency with the reliability based philosophy and principles on which the fundamental load assessment (AS/NZS 1170 series) and structural design (this Standard and AS/NZS 5100.6) is based" and "The construction category classification provides a fit-for-purpose level of quality assurance to reduce risks associated with fabrication and erection. It achieves this through reliability differentiation from inspection and supervision levels".

Where there is not a clear alignment of philosophy between the risk assessment in AS/NZS 5131 and the fabrication Standard in question, the engineer will need to undertake a rational defendable analysis to select an appropriate level of risk in the fabrication Standard (if supported) and then undertake an analysis of the alignment between the fabrication Standard and AS/NZS 5131 performance intent, as described in Section 4.8.3.

4.9 Application to National Construction Code (NCC)

4.9.1 Context

The NCC requires that compliance is demonstrated using either the deemed-to-satisfy or performance routes. Verification is required, with the form of verification depending on the route chosen. The NCC does not typically mandate certification (except for certain high-risk products) and requires that compliance is verified for all construction products covered by the primary referenced Standards (AS 4100 in this case, which in turn references AS/NZS 5131).

The particular requirements of the NCC (refer to Section 2) may be interpreted as applying to structural steelwork verification as outlined in Table 6 and the accompanying notes, based on three distinct scenarios:

1. The steel product manufactured to an Australian product Standard ('Australian Standard Product'), whether the manufacturer is located in Australia or elsewhere, and the steelwork fabricated to AS/NZS 5131
2. The steel product manufactured to a product Standard other than an Australian product Standard ('Alternative Standard Product'), and the steelwork fabricated to AS/NZS 5131
3. The steel product manufactured to a product Standard other than an Australian product Standard ('Alternative Standard Product'), and the steelwork fabricated to a fabrication Standard other than AS/NZS 5131 ('Alternative fabricated product Standard')

Alternative three noted above is not recommended, as it requires extensive review and verification of the alternative fabricated product Standard for alignment with AS/NZS 5131 (refer Section 8). It is however included to illustrate that the requirement for fabrication to an alternative fabricated product Standard must be treated as a performance solution under the NCC.

Table 6 - Protocol for Fabricated Product Performance Verification

(aligned with NCC)

Product Type	**Product Mix**		
Structural steel:[a]	Australian Standard Steel Product	Alternative Standard Product	Alternative Standard Product
Fabricated steelwork:[b]	To AS/NZS 5131	To AS/NZS 5131	To alternative fabricated product Standard
Steel product manufacturer	Verified, preferably[c] (to MVL 1,3,4,5)	Verified, preferably[c] (to MVL 2,3,4,5)	Verified, preferably[c] (to MVL 2,3,4,5)
Traceability	Verified[d]	Verified[d]	Verified[d]
Solution type[e]	*Deemed-to-Satisfy*	*Performance*	*Performance*
Assessment method	*Expert Judgement*	*Expert Judgement* *Verification Method* Comparison with *DTS*	*Expert Judgement* *Verification Method* Comparison with *DTS*
Evidence of suitability[f]	*Certificate of Accreditation* Certificate from *Certification Body*[g] *Accredited Testing Laboratory* report[h] Report/certificate from professional engineer[i] (required for MVL 3, 4, 5 only) Other documentary evidence	*Certificate of Accreditation* Certificate from *Certification Body*[g] *Accredited Testing Laboratory* report[h] Report/certificate from professional engineer[i] Other documentary evidence	*Certificate of Accreditation* Certificate from *Certification Body*[g] *Accredited Testing Laboratory* report[h] Report/certificate from professional engineer[i] Other documentary evidence
Verification Method	Not applicable	Test, using a technical procedure[j] Certification from professional engineer[k]	Test, using a technical procedure[j] Certification from professional engineer[k]

NOTES:

a) The structural steel is the manufactured steel and component inputs to the fabrication process

b) The fabricated steelwork takes the structural steel as input and is fabricated with processes compliant to the nominated fabrication Standard (usually AS/NZS 5131)

c) Regardless of the type of product (Australian, Alternative), the fabricated product performance verification outlined in this Table assumes the steel manufacturer has been verified to Manufacturer Verification Level MVL 1, 2, 3 or 4, as described in ASI Technical Note TN015 (Ref. 3)

d) Product whose traceability has not been verified according to the guidance in Section 4.5 must not be used, as there is no established link between what is used on the project and product quality that can be suitably demonstrated with the evidence of suitability required by the NCC.

e) As defined by the NCC.

f) Detail of the appropriate evidence of suitability is provided in TN015 (Ref. 3) for the steel manufacturer (steel quality), Table 2 for fabricator verification, Table 3 for traceability verification and Table 4 where a trusted relationship with the fabricator must be verified.

g) Refer ASI Technical Note TN014 (Ref. 19) for details of suitable third-party certification.

h) Refer Section 5.3.2 of ASI Technical Note TN015 (Ref. 3) for a discussion on suitable testing laboratories to undertake testing of steel product. For testing of fabricated assemblies or complete structures, AS 4100 (Ref. 4) Section 17 provides guidance on both proof testing and prototype testing.

i) The NCC Guide to BCA Volume 1 (Ref. 22) states categorically in Clause B1.4 “For designers seeking structural compliance via Performance Solutions, a major principle in determining structural resistance is that the reliability level of the structure or its components must be at least equal to that already achieved in the Deemed-to-Satisfy Provisions”. Refer to Section 3 for guidance on assessment of reliability in respect of steel product performance.

j) Refer to Section ASI Technical Note TN015 for guidance on scope of verification testing required for steel products. Refer to AS 4100 Section 17 for scope of testing required for fabricated assemblies.

k) The professional engineer should be registered for practice in Australia based on the registration requirements for the particular state concerned and the regulatory requirements in the NCC.

The verification of steel and fabricated product performance to alternative product Standards is potentially a time consuming and costly path depending on the particular conformity assessment pathway selected (refer to Section 5).

4.10 Construction Risk

4.10.1 AS/NZS 5131 Context

In respect of structural steelwork fabrication, the publication of AS/NZS 5131 ‘Structural steel – Fabrication and erection’ (Ref. 11) introduced a risk-based approach to fabrication and erection of structural steel, for both the permanent structure and also temporary works. Project risk, including the consequences of failure and the complexity of the construction works, is recognised through categorisation of the structure or parts thereof into one of four ‘construction categories’, CC1 to CC4, as defined in Table 7. The assessment of the construction category is provided in AS 4100 (Ref. 3) and AS/NZS 5131 (Ref. 11) and discussed in Ref. 21.

Table 7 AS/NZS 5131 Example structure types assigned to construction categories

Construction Category	Example structure types[1]
CC1	• Farm sheds; greenhouses; fences; gates; small signs
CC2	• Low- to medium-rise buildings (industrial buildings, residential buildings, offices, residential apartments and retail) • Single and two level school buildings and structures
CC3	• Large structures (e.g. high-rise buildings) • Large stadia • Road and rail bridges • Post-disaster buildings (e.g. hospitals)
CC4	• Structures with extreme consequences of structural failure

Notes:

1. The structure types shown are indicative only. The assessment of the construction category is the responsibility of the engineer based on the guidance provided in AS 4100 and AS/NZS 5131. The 'Building importance level' from the NCC is one factor in the assessment of the construction category.

4.10.2 Component-specific risk

For certain components or assemblies, there may be a heightened risk profile or criticality due to the type or magnitude of stress on the component or assembly. These scenarios need to be addressed on a case-by-case basis, but common examples include:

1. **Complete penetration butt welds on highly loaded connections**: an increased rate of non-destructive examination (NDE) may be adopted
2. **Lamellar tearing on highly constrained connections**: the 2020 revision of AS 4100 introduced new guidance on the selection of materials for the avoidance of lamellar tearing. Thicker plates in connections where welding induces high through-thickness stresses may require special consideration. Where the plate has been manufactured and ordered for improved through-thickness ductility (for example, for the avoidance of lamellar tearing), a statistical approach to verification testing (Level 2 sampling and test plan in ASI Technical Note TN-015) for through-thickness ductility is recommended. Project-specific ultrasonic testing, as outlined in AS 4100, may also be required at specific locations of particular connections. It must be noted that steel not ordered with improved through-thickness ductility cannot be subjected to testing for verification to an improved through-thickness ductility grade. Such grades require special steelmaking and processing practices to achieve such a grade uniformly and robustly.
3. **Brittle fracture requirements**: matters related to the design service temperature require consideration

Component-specific risk is, to some extent, application dependent and details of risk-heightened components and specific inspection and testing required may be provided in the construction specification, based on client or procurer experience.

Key takeaways:

- Manufacturers (steel mills) must be verified with appropriate evidence of suitability
- Establishing the traceability of steel and steelwork is paramount. Without traceability between the steel procured, the documentation (mill certificates etc) and the fabricated steel assembly, the compliance of every piece of steel and steelwork is unknown
- Distributors and suppliers must take responsibility for maintaining traceability with correct documentation for each batch of steel
- Performance verification of both the steel products and fabricated steelwork assemblies must be undertaken to meet the requirements of the NCC
- The extent of performance verification undertaken should be reflective of the project risk level, as defined by the Construction Category from AS 4100 and AS/NZS 5131
- Component-specific risk must be addressed and may be specified in the construction specification

5 CONFORMITY ASSESSMENT PATHWAY SELECTION

5.1 Context

The conformity assessment pathway operationalises the 'Steelwork Verification Protocol' described in Section 4.3. A fundamental principle influencing the selection of the appropriate conformity assessment pathway is that the approach must be risk-based, considering both project and supply risk. Project risk includes the consequence of failure, and the complexity of the construction works and is quantified utilising the construction category designation from AS 4100 and AS/NZS 5131. The supply risk relates to the reliability of the product, and this is based on the steel manufacturer, the fabricator and the chain of custody of steel products from the mill to the fabrication workshop, and then to site.

A risk-based approach will ensure that the protocol is both responsive to regulatory requirements and cost-effective, commensurate with the risk involved.

The conformity assessment pathway selection framework is based on the following principles:

a) Steel manufacturer verification is undertaken according to the protocols developed in ASI Technical Note TN015. Regardless of the ensuing Manufacturer Verification Level (MVL) pathway taken, the steel product is deemed acceptable to be submitted into the conformity assessment pathway detailed herein. However, the selection of the appropriate pathway may be affected by elements of the MVL.

b) The Fabricator Verification Level (FVL) provides the first differentiation as to pathway selection, based principally on the level of surety the procurer has that the fabricator has the processes in place to demonstrably comply to the requirements of AS/NZS 5131. Fundamentally, third-party certification by an appropriately accredited Certification Body provides the highest level of surety of compliance. First-party (fabricator) claims of compliance provide the least surety.

c) The risk of non-compliance is arguably reduced if the steel fabricator has worked with the procurer on previous projects in which demonstrably compliant solutions were provided. If enacted, this 'trusted fabricator' relationship must be managed and regularly audited and verified.

d) It is vital product traceability is maintained through the whole supply chain. The supply chain must support the requirements for product marking and traceability. There is the opportunity for the supply chain to play a proactive role in managing steel supply to ensure cost-effective solutions.

e) Product traceability and compliance becomes significantly more challenging for steelwork fabricated outside of Australia, due to the loss of product markings (bundle or individual products or assemblies) and traceability by the time the fabricated components arrive in Australia. In this situation it is recommended there is robust auditing undertaken at the fabrication site involving trusted third parties. Depending on the particular Project Steelwork Verification Level (PSV), this auditing may be continual during the fabrication process, requiring the auditor to preferably reside in-country for the period concerned. If the certification authority or statutory authority has concerns about the veracity of the auditing to be undertaken, these concerns should be discussed with the principal contractor early in the project process. Auditing and verification of fabricated steelwork when it arrives in Australia is too late to effect change and non-compliant outcomes may result in significant project dislocation and additional costs.

f) For high-risk structures (CC3 or CC4 projects), accredited third-party certification of the fabricator is highly recommended. Whilst some level of project-specific checking will always be required (PSV 1), appropriately certified fabricators provide the best opportunity for quality outcomes and lower the level of project-specific auditing required. Many large infrastructure projects in Australia require the fabricator(s) to be certified.

g) Low-risk (CC1) structures will generally not be covered under the NCC. A requirement for verification is not regulated but a basic duty of care under WHS remains. Steelwork supplied from certified manufacturers and fabricators only requires PSV Level 1 auditing.

Steelwork supplied from non-certified manufacturers and fabricators who are not verified or trusted requires higher PSV Level 2 auditing.

h) Some overseas products or fabricated assemblies may be covered by certification such as CE marking. The validity of the certification must be verified. The products and fabricated assemblies still require performance verification as to suitability to comply with our Standards and the NCC.

5.2 Conformity Assessment Pathway Selection

The conformity assessment pathway selection process flowcharts, based on the above principles, are presented in Appendix F for each of CC1, CC2 and CC3 project risk categories.

Key takeaways:

- Separate conformity assessment pathways are presented based on project risk, that is, for each of construction categories CC1, CC2 and CC3
- The conformity assessment pathway and the extent of auditing required is fundamentally predicated on the assessed veracity of the steel fabricator. With certified fabricators, reduced auditing may be required.
- Procurers should consider carefully the benefits of a certified fabricator, in respect of product risk, project schedule risk and reputational risk from the consequences of failure

6 RESPONSIBLE STEELWORK PROCUREMENT – A SUPPLY CHAIN SOLUTION

6.1 Context

The procurement, fabrication and erection of structural steelwork for buildings, infrastructure and resources projects involves a supply chain that is as varied as it is long. Contractual relationships and commercial and policy pressures all influence the ultimate procurement scenario, which can also change markedly over the period of project delivery. The regulatory landscape is constantly evolving, shaped by balancing the need to promote free trade, encourage innovative performance solutions, meet sustainability targets and uphold essential safety standards that ensure secure and risk-minimized environments for workplaces and homes.

Regardless of the procurement permutations implemented and the project type, there is an overarching duty of care prescribed by Regulation for all stakeholders. Taken within the context of a supply chain, this may be contextualised as a 'chain of responsibility', linking the duty of care of each stakeholder through overlapping responsibilities designed to ensure a shared responsibility and a consistent and seamless approach to compliant outcomes.

The following sections explore Workplace Health and Safety (WHS), duty of care and the responsibilities for each stakeholder in the supply chain. Because the Model WHS Act is implemented slightly differently in each State, for information on the operation of WHS laws in your particular jurisdiction, please contact your WHS regulator.

6.2 Workplace Health and Safety and Duty of Care

6.2.1 Model Workplace Health and Safety Act

The Model Workplace Health and Safety Act 2011 (Ref. 2) (the WHS Act) provides a framework to protect the health, safety and welfare of all workers at work. It also protects the health and safety of all other people who might be affected by the work. The WHS Act also provides protection for the public so that their health and safety is not placed at risk by work activities. The general requirements of this Act have been implemented in most, but not all, jurisdictions in Australia.

The WHS Act places the primary health and safety duty on a person conducting a business or undertaking (PCBU). The PCBU must ensure, so far as is *reasonably practicable*, the health and safety of workers at the workplace.

Reasonably practicable is specifically defined, meaning that which is, or was at a particular time, reasonably able to be done to ensure health and safety, taking into account and weighing up all relevant matters, including:

- The likelihood of the hazard or the risk concerned occurring
- The degree of harm that might result from the hazard or the risk
- What the person concerned knows, or ought reasonably to know, about the hazard or risk, and ways or eliminating or minimising the risk
- The availability and suitability of ways to eliminate or minimise the risk
- After assessing the extent of the risk and the available ways of eliminating or minimising the risk, including whether the cost is grossly disproportionate to the risk.

There are two elements to what is *reasonably practicable*. A duty-holder must first consider *what can be done*, that is, what is possible in the circumstances for ensuring health and safety. They must then consider whether it *is reasonable, in the circumstances*, to do all that is possible.

In practice, this means that what can be done should be done unless it is reasonable in the circumstances for the duty-holder to do something less.

The question of what is *reasonably practicable* is to be determined objectively, and not by reference to the duty-holder's capacity to pay or other particular circumstances. A duty-holder

cannot expose persons to a lower level of protection simply because it is in a lesser financial position than another duty-holder.

Safe Work Australia have prepared a guide (Ref. 24) on determining what is reasonably practicable to meet a health and safety duty.

6.2.2 Codes of Practice

The Work Health and Safety Act 2011 references a range of 'Codes of Practice' (CoP) that provide implementation guidance. CoP's relevant to the current discussion include:

- 'Managing the risks of plant in the workplace'
- 'Safe design of structures'
- 'Construction work'

The Model Codes of Practice may be freely downloaded from:

https://safeworkaust.govcms.gov.au/resources-publications/model-codes-of-practice.

Specific state implementations of these may be found on the relevant State Regulator (usually WorkSafe or SafeWork) website.

Codes of Practice are admissible in court proceedings under the WHS Act and Regulations. An approved code of practice provides practical guidance on how to achieve the standards of work health and safety required under the WHS Act and the Work Health and Safety Regulations (the WHS Regulations) and effective ways to identify and manage risks. Courts may regard a Code of Practice as evidence of what is known about a hazard, risk or control and may rely on the code in determining what is reasonably practicable in the circumstances to which the code relates.

Whilst there are a number of codes of practice relevant to construction work and the supply chain, the 'Safe design of structures' Code of Practice 2015 (Ref. 25) is of particular relevance.

6.2.3 Stakeholder Scope

The overarching focus of the 'Safe Design of Structures' CoP is on those who provide design services and deliverables (including as specifically stated architects, building designers, engineers, building surveyors, interior designers, landscape architects, town planners, building contractors and all other design practitioners contributing to, or having overall responsibility for, any part of the design). However, it is significant to note that the Act/Regulation and/or CoP also outlines specific duties for:

1. **Clients** (a person conducting a business or undertaking who commissions a design or construction work or a construction project)
2. The **principal contractor**
3. The **manufacturer** (including of a product or a structure). This includes steel manufacturers and steelwork fabricators.
4. The **importer** (including of material or a structure). This includes importers of steel material and also of fabricated steel structures.
5. The **supplier** (including of material or a structure). This includes distributors of steel materials, components and structures.
6. The **constructor** (of the steel structure). This includes steelwork erectors and other contractors associated with site installation.

Examples of these duties are referenced in the following sections outlining responsibilities of specific stakeholders. It is important to note that the Act specifically states that duties assigned to a person under the Act cannot be transferred. The duty of care cannot be abrogated through contractual undertakings.

Significantly, the CoP states:

"Where more than one person has a duty for the same matter, each person retains responsibility for their duty and must discharge it to the extent to which the person has the capacity to influence

or control the matter or would have had that capacity but for an agreement or arrangement claiming to limit or remove that capacity".

6.2.4 Safety in Design

Safety in design promotes the integration of hazard identification and risk assessment methods early in the design process to eliminate or minimise the risks of injury throughout the life of the product being designed. It applies to products and processes used for work, such as buildings, structures, equipment and vehicles. Safety in design is required by Australian WHS legislation and is guided by the Code of practice - Safe design of structures (Ref. 25) issued by SafeWork Australia.

A safe design approach begins in the conceptual and planning phases with an emphasis on making choices about design, materials used and methods of manufacture or construction to enhance the safety of the finished product.

The key principles of safe design are:

- **Principle 1**: Persons with Control – persons who make decisions affecting the design of products, facilities or processes are able to promote health and safety at the source.
- **Principle 2**: Product Lifecycle – safe design applies to every stage in the lifecycle from conception through to disposal. It involves eliminating hazards or minimising risks as early in the lifecycle as possible.
- **Principle 3**: Systematic Risk Management – the application of hazard identification, risk assessment and risk control processes to achieve safe design.
- **Principle 4**: Safe Design Knowledge and Capability – should be either demonstrated or acquired by persons with control over design.
- **Principle 5**: Information Transfer – effective communication and documentation of design and risk control information between all persons involved in the phases of the lifecycle is essential for the safe design approach.

The compliance of construction products, including steel and steelwork, clearly must be addressed as part of safety in design to minimise risk and achieve safe design, both during construction and in the in-service structure.

6.2.5 The Safety Report

The WHS Regulation and CoP make specific reference to the '*Safety Report*' as the written report that the designer **must** provide to the client that specifies the hazards relating to the design of the structure that, so far as the designer is reasonably aware:

- Create a risk to persons who are to carry out the construction work, who use the structure as a workplace or during demolition; and
- Are associated only with the particular design and not with other designs of the same type of structure

The *Safety Report* should include information about:

- Any hazardous materials or structural features and the designer's assessment of the risk of injury or illness to construction workers arising from those hazards
- The action the designer has taken to control those risks

The client must provide a copy of the *Safety Report* to the principal contractor.

Working with WHS (Qld), ASI has established a definitive link between non-compliant construction products (in this case steel and steelwork) and the duties of care under the WHS Regulation (Ref. 26). It is therefore clear that the steps taken to address risks associated with the known issue of potential non-compliance of steel and fabricated steelwork must be included in the Safety Report.

6.3 Chain of Responsibility and the Steel Supply Chain

The overlapping duties of care mandated in the WHS Act and Regulations and contextualised in codes of practice such as the Safe Design of Structures Code of Practice (Ref. 25) create, in effect, a 'chain of responsibility' connecting all parties in the supply chain, to ensure safe carriage of the overarching obligation to provide our community with risk-minimised safe outcomes that are applicable to all project types.

More recently, in response to demonstrable issues with non-conforming construction products across all construction materials, the Qld State Government enacted the "Building and Construction Legislation (Non-conforming Building Products—Chain of Responsibility and Other Matters) Amendment Act 2017" (Ref. 27) that establishes a chain of responsibility, placing duties of building product supply chain participants (including product designers, manufacturers, importers, suppliers and installers) to ensure building products used in Queensland are safe and fit for intended purpose.

Other jurisdictions are in the process of addressing non-conforming building products. The reader is encouraged to actively track the status of implementation in their respective State. The status at the time of writing is provided in Appendix G which also lists websites containing further information on non-conforming building products for each State.

Separate to the above, in some states, the supply chain is also required to comply with chain of responsibility requirements for the transportation of products from yard to site.

6.4 Risk Assessment and Documentation

The Safe Design of Structures Code of Practice (CoP) pays particular attention to assessment of risks and establishing documentation to ensure all relevant parties are informed throughout the lifecycle of the project and structure.

The CoP speaks to the risk management process as a systematic way of making a workplace as safe as reasonably practicable and being used as part of the design process. The following steps are recommended:

- Identify hazards – find out what could cause harm
- Assess risks, if necessary – understand the nature of the harm that could be caused by the hazard, how serious the harm could be and the likelihood of it happening. This step may not be necessary if you are dealing with a known risk with known controls
- Control risks – implement the most effective control measure that is reasonably practicable in the circumstances and ensure it remains effective over time
- Review hazards and control measures to ensure they are working as planned

The 'steelwork verification protocol' outlined in this Technical Note provides the engineer the tools necessary to dependably address all the points noted above in relation to potential hazards created by non-compliant steel and steelwork products.

In respect of establishing documentation, the CoP recommends key information about identified hazards and action taken or required to control risks should be recorded and transferred from the design phase to those involved in later stages of the lifecycle. Communicating this information to other duty holders will make them aware of any residual risks and reduce the likelihood of the design being altered by those engaged in subsequent work on or around the building or structure. As regards construction products, this would include procurement decisions, which must be based on full knowledge of the requirements for steel and steelwork compliance.

The CoP suggests a 'Safety Report' (refer Section 6.2.5) as an appropriate vehicle to transfer this information to other stakeholders.

6.5 Emerging supply chain imperatives - sustainability

A discussion on responsible steel procurement would not be complete without highlighting the emerging imperative of sustainability that is driving the shape of future supply chains.

Sustainability and the broader corporate social responsibility context are driving procurement decisions. Increasingly, sustainability is being defined using ESG Principles which relate to a set of standards for company operations that cover environmental, social and governance best practice:

- **Environment**: The supply chain must demonstrate environmental sustainability credentials aligned with a focus to reduce the carbon footprint, reduce waste and use of resources, increase participation in the circular economy – Reduce | Reuse | Recycle | Remanufacture, and to prevent harm to the environment, community and its ecosystems.
- **Social**: This area considers societal impact of the company, which includes diversity, human rights and the health, safety and welfare of employees. From a lifecycle perspective, procurement of compliant construction products ensures fit-for-purpose outcomes that minimise long term maintenance, rework and the likelihood of early failure of the structure. The Modern Slavery Act came into effect on 1st January 2019. The social issue of modern slavery occurs in sourcing from global supply chains and business has the power and influence to be watchful of, and to address. Modern slavery comprises practices such as human trafficking, slavery, forced labour, child labour, and slavery-like practices. The Act prescribes a reporting regime relating to responsible materials sourcing for larger businesses (annual revenue more than AUD $100M) with voluntary reporting for all others. Fabrication of steelwork overseas is an obvious contender for due diligence in this regard.
- **Governance**: Covers the rights, conduct and responsibilities of management of the company, and includes employee pay and compensation, transparency and responsible processes, stewardship, and ethical business conduct.

A detailed discussion of these aspects is beyond the scope of this Technical Note. However, stakeholders in the steel supply chain would be well advised to educate themselves as to the likely current and emerging influences of these aspects on supply chain operation.

Key takeaways:

- WHS Duty of Care is overarching. WHS Codes of Practice, in particular the ‘Safe design of structures code of practice’ mandate specific duties for most stakeholders in the supply chain
- Both WHS and legislative changes that have or are being implemented by various States establish a ‘chain of responsibility’ between all stakeholders in the building product supply chain.
- WHS requires designers to identify potential hazards, which would include that of non-compliant construction products, and for other stakeholders in the supply chain to ensure risks are minimised with respect to potential non-compliant construction products.
- Sustainability and ESG (Environmental – Social – Governance best practice) principals are key influences that will shape the supply chain moving forward.

7 WHS AND STAKEHOLDER RESPONSIBILITIES

7.1 Context

Section 6 outlined the framework for responsible steel procurement established by the WHS Act and Safe Design of Structures Code of Practice (CoP). That framework both mandates and implies a range of responsibilities for the various stakeholders in the supply chain, as further elaborated in this section.

The WHS Act is implemented at a state-based level, with some state-specific differences. For projects that are designed, fabricated and erected in potentially different states, stakeholders must be cognisant of the particular requirements of the state in which they operate and in which the structure will be sited.

7.2 Responsibilities of Designers

Section 22 of the WHS Act speaks to the responsibilities of “persons conducting businesses or undertakings that **design** plant, substances or structures”. Paraphrasing the significant aspects:

- The designer must ensure, so far as is reasonably practicable, that the plant, substance or structure is designed to be without risks to the health and safety of persons.
- The designer must carry out, or arrange the carrying out of, any calculations, analysis, testing or examination that may be necessary for the performance of the duty imposed.
- The designer must give adequate information to each person who is provided with the design for the purpose of giving effect to it concerning, among other things, any conditions to ensure the structure is without risks to health and safety during construction, use as a workplace and demolition. The development of a work health and safety (WHS) file for a structure could assist the designer meet the duty to provide information to others. It could include copies of all relevant health and safety information the designer prepared and used in the design process, such as the safety report, risk register, safety data sheets, manuals and procedures for safe maintenance, dismantling or eventual demolition.
- The designer, on request, must, so far as is reasonably practicable, give current relevant information on the matters referred to in the item above to a person who carries out, or is to carry out, any of the activities referred to.

The Safe Design of Structures CoP provides clarity on who is considered a designer, paraphrased:

- architects, building designers, engineers, building surveyors, interior designers, landscape architects, town planners and all other design practitioners contributing to, or having overall responsibility for, any part of the design
- building service designers, engineering firms or others designing services that are part of the structure
- contractors carrying out design work as part of their contribution to a project.
- temporary works engineers
- persons who specify how structural alteration, demolition or dismantling work is to be carried out.
- Persons who modify a design without reference to the original designer take on the duties of a designer

The CoP also provides further clarity regarding responsibilities of designers, paraphrased:

- Safe design begins at the concept development phase of a structure when making decisions about: …materials to be used…
- In addition to core design capabilities relevant to the designer’s role, a designer should also have: …knowledge of technical design standards…

- So far as is reasonably practicable, the duty holders involved must consult each other on the hazards and risks associated with the building and work together on appropriate design solutions.

The designer has a responsibility to inform his client fully of the expectations regarding process when the designer is required to certify the structure as fit-for-purpose under the protocols required in the NCC. It is highly recommended that appropriate wording is added to the drawing notes and/or construction specification. Recommended wording would be of the form:

“The design of the steelwork has been based on the requirements set out in the contract specifications and AS 4100, together with the corresponding referenced Australian Standards for supply of steelwork, supply of fasteners and welding consumables and fabrication. The contractor is to provide all documentation in English that the steelwork complies with the construction specification and the Standards. Any deviation to these requirements, unless approved by the design engineer, may render the structural steel and steelwork not fit-for-purpose and not compliant with the requirements of the NCC. The structural steel and/or steelwork will need to be verified and/or re-supplied under these circumstances”.

It is highly recommended that the designer reviews and provides input into the ‘Compliance Management Plan’ (refer to Section 8.3) prepared by the principal contractor prior to commencement of the project. A shared understanding of the process and requirements necessary to ascertain compliance at the commencement of the project will help ensure cost-effective compliant outcomes and minimisation of potential project dislocation caused by non-compliant building products.

7.3 Responsibilities of Manufacturers

Section 23 of the WHS Act applies to “a person (the **manufacturer**) who conducts a business or undertaking that manufactures” plant, a substance or a structure. Paraphrasing the significant aspects:

- The manufacturer must ensure, so far as is reasonably practicable, that the plant, substance or structure is manufactured to be without risks to the health and safety of persons.
- The manufacturer must carry out, or arrange the carrying out of, any calculations, analysis, testing or examination that may be necessary for the performance of the duty imposed.
- The manufacturer must give adequate information to each person to whom the manufacturer provides the plant, substance or structure concerning, among other things, the results of any testing and of any conditions necessary to ensure the structure is without risks to health and safety during construction, use as a workplace and demolition.
- The manufacturer, on request, must, so far as is reasonably practicable, give current relevant information on the matters referred to in the item above to a person who carries out, or is to carry out, any of the activities referred to.

7.4 Responsibilities of Importers

Section 24 of the WHS Act applies to “a person (the **importer**) who conducts a business or undertaking that imports” plant, a substance or a structure. Paraphrasing the significant aspects:

- The importer must ensure, so far as is reasonably practicable, that the plant, substance or structure is without risks to the health and safety of persons.
- The importer must: (a) carry out, or arrange the carrying out of, any calculations, analysis, testing or examination that may be necessary for the performance of the duty imposed or (b) ensure that the calculations, analysis, testing or examination have been carried out.
- The importer must give adequate information to each person to whom the importer provides the plant, substance or structure concerning, among other things, the results of any testing and of any conditions necessary to ensure the structure is without risks to health and safety during construction, use as a workplace and demolition.

- The importer, on request, must, so far as is reasonably practicable, give current relevant information on the matters referred to in the item above to a person who carries out, or is to carry out, any of the activities referred to.

7.5 Responsibilities of Distributors and Suppliers

Section 25 of the WHS Act applies to "a person (the **supplier**) who conducts a business or undertaking that supplies" plant, a substance or a structure. Paraphrasing the significant aspects:

- The supplier must ensure, so far as is reasonably practicable, that the plant, substance or structure is without risks to the health and safety of persons.
- The supplier must (a) carry out, or arrange the carrying out of, any calculations, analysis, testing or examination that may be necessary for the performance of the duty imposed or (b) ensure that the calculations, analysis, testing or examination have been carried out.
- The supplier must give adequate information to each person to whom the supplier supplies the plant, substance or structure concerning, among other things, the results of any testing and of any conditions necessary to ensure the structure is without risks to health and safety during construction, use as a workplace and demolition.
- The supplier, on request, must, so far as is reasonably practicable, give current relevant information on the matters referred to in the item above to a person who carries out, or is to carry out, any of the activities referred to.

7.6 Responsibilities of Fabricators

Fabricators are not specifically named in the WHS Act, which is understandable, as fabrication is one of the myriad of functions that cannot all be specifically named. However, Section 23 of the WHS Act is applicable as the fabricator is "a person (the **manufacturer**) who conducts a business or undertaking that manufactures … a structure that is to be used, or could reasonably be expected to be used, as, or at, a workplace". Paraphrasing the significant aspects:

- The manufacturer (fabricator) must ensure, so far as is reasonably practicable, that the plant, substance or structure is manufactured to be without risks to the health and safety of persons.
- The manufacturer (fabricator) must carry out, or arrange the carrying out of, any calculations, analysis, testing or examination that may be necessary for the performance of the duty imposed.
- The manufacturer (fabricator) must give adequate information to each person to whom the manufacturer provides the plant, substance or structure concerning, among other things, the results of any testing and of any conditions necessary to ensure the structure is without risks to health and safety during construction, use as a workplace and demolition.
- The manufacturer (fabricator), on request, must, so far as is reasonably practicable, give current relevant information on the matters referred to in the item above to a person who carries out, or is to carry out, any of the activities referred to.

7.7 Responsibilities of Principal Contractors

Section 26 of the WHS Act applies to "persons conducting businesses or undertakings that install, construct or commission plant or structures". Paraphrasing the significant aspects:

- The person must ensure, so far as is reasonably practicable, that the way in which the plant or structure is installed, constructed or commissioned ensures that the plant or structure is without risks to the health and safety of persons who install or construct the plant or structure, who use the plant or structure, who carry out reasonably foreseeable activities such as decommissioning, dismantling, demolition or disposal or who are in the vicinity and whose health and safety may be affected by the actions noted above.

The CoP provides further clarity regarding responsibilities of principal contractors:

“The principal contractor is a person conducting a business or undertaking that:

- commissions the construction project (the client), or
- is engaged by the client to be the principal contractor and is authorised to have management or control of the workplace.

The principal contractor has duties to ensure the construction work is planned and managed in a way that eliminates or minimises health and safety risks so far as is reasonably practicable. Further guidance on managing risks for construction projects and principal contractor duties is available in the Code of Practice: Construction Work.”

Principal contractors should note that there will be additional time and costs associated with certification by the engineer where verification of steel and steelwork is required. Refer to Section 7.2.

7.8 Responsibilities of Clients

The responsibilities of clients are not specifically referenced in the WHS Act. However, as a stakeholder driving the final procurement outcomes for a project, there is clearly a primary duty of care prescribed under Section 19 of the WHS Act. Paraphrasing the significant aspects:

- A person conducting a business or undertaking must ensure, so far as is reasonably practicable, that the health and safety of other persons is not put at risk from work carried out as part of the conduct of the business or undertaking.
- A person conducting a business or undertaking must ensure, so far as is reasonably practicable: (a) the provision and maintenance of a work environment without risks to health and safety; and (b) the provision and maintenance of safe plant and structures.

The CoP provides further clarity regarding responsibilities of clients:

“A person conducting a business or undertaking that commissions construction work (the client) has specific duties under the WHS Regulations to:

- consult with the designer, so far as is reasonably practicable, about how to ensure that health and safety risks arising from the design during construction are eliminated or minimised, and
- provide the designer with any information that the client has in relation to the hazards and risks at the site where the construction work is to be carried out.”

Clients should also note that there will be additional time and costs associated with certification by the engineer where verification of steel and steelwork is required. Refer Section 7.2.

Key takeaways:

- The WHS Act and codes of practice, in particular the ‘Safe design of structures code of practice’, impose particular and very significant responsibilities on most members of the supply chain
- These shared responsibilities create, in effect, a ‘chain of responsibility’ where all stakeholders must work together to ensure risk-minimised outcomes
- There will be additional time and costs for the engineer to certify where verification of steel and steelwork is required.

8 RESPONSIBLE STEELWORK PROCUREMENT FRAMEWORK

8.1 Context

The responsibilities mandated by the WHS Act unite the supply chain for a building or structure into a 'chain or responsibility' through a shared duty of care to ensure risk-minimised outcomes.

Appendix A of the Safe Design of Structures CoP (Ref. 25) documents the consultation, cooperation and coordination duties between stakeholders for a range of different contractual project structures. Figure 8, reproduced from Appendix A of the Safe Design of Structures CoP, illustrates the responsibilities of and interactions between the stakeholders in a project based on a design-build contractual model. Other contractual models are, of course, possible. Notice the responsibility for consultation, cooperation and coordination is required, irrespective of the contractual relationship between the parties.

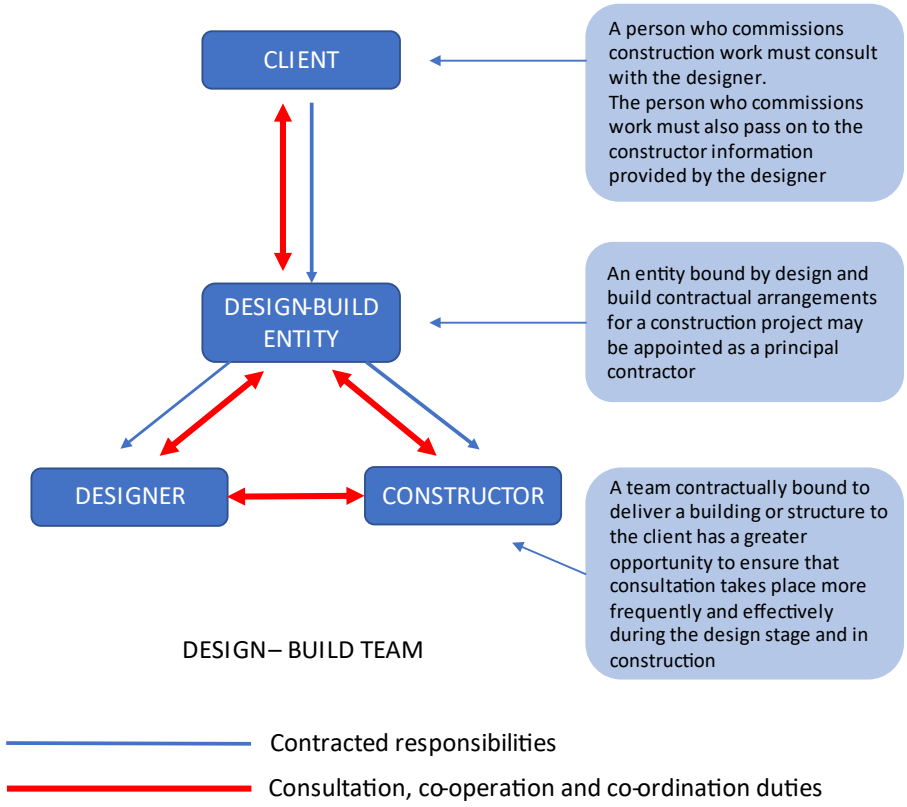

Figure 8 – Responsibilities for consultation, cooperation and coordination Design-build contractual structure

8.2 Responsibilities for Steel Procurement

Figure 9 presents a flowchart of the steelwork procurement process based on the recommendations in this Technical Note and highlighting the responsible parties contextualised from the general responsibilities derived from WHS Regulation and noted in Section 7. The intent of the flowchart is valid irrespective of the contractual relationships enacted on a particular project, for example, as illustrated in Fig. 8. It is important to reiterate that the duty of care and responsibilities defined in the WHS Act cannot be abrogated or re-assigned by a particular contractual relationship.

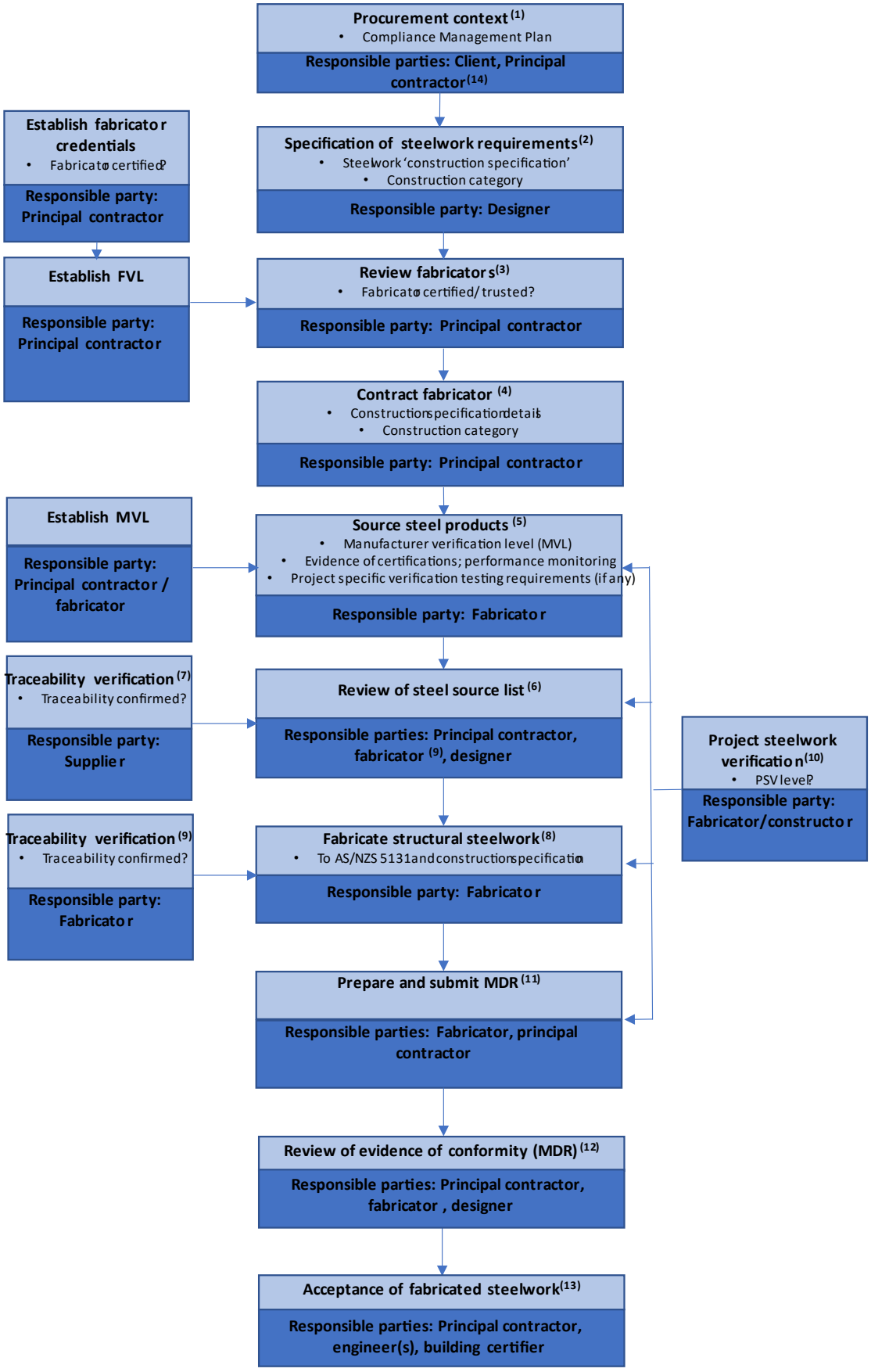

Figure 9 – Responsibilities within steelwork procurement process

Notes to Fig. 9:

(1) The client must take shared responsibility for understanding the contemporary procurement environment and engaging with the project delivery team to ensure a cost-effective risk-minimised quality solution is the outcome. Along with all other stakeholders, clients do have responsibilities under WHS Regulation. The principal contractor should prepare a Compliance Management Plan (refer to Section 8.3) prior to the project procurement commencing as an agreed protocol to address potential non-compliance. The Compliance Management Plan should be discussed with the certifying engineer prior to project commencement to align expectations.

(2) The requirements for the 'construction specification' are defined in AS 4100 (Ref. 4) and AS/NZS 5131 (Ref. 11). The construction specification, including drawings, is prepared by the designer. ASI have developed the 'National Structural Steelwork Specification' (Ref. 28) to support designers in properly implementing AS/NZS 5131 into the project process.

(3) The review of fabricators and the use of certified fabricators is strongly recommended. Support for certification of fabricators in this manner provides the best opportunity to introduce cost-effective compliant outcomes. It is important to establish the Fabricator Verification Level (FVL) as part of the selection process for the fabricator.

(4) Orders for steelwork placed with the fabricator must clearly transcribe the relevant requirements of the construction specification, in particular the Construction Category, and state that steelwork must meet the 'Steelwork verification protocol' defined in this Technical Note. Purchase orders might conveniently be appended with a summary of the protocol as part of the standard conditions.

(5) The selected fabricator(s) must provide details of the steel sources proposed. The credentials of the steel sources, including the assessed MVL, evidence of certifications and results of performance monitoring, as described in ASI Tech Note TN-015, must be available. Where project specific verification testing is required, this must also be available for review. It would be convenient for the fabricator to develop these credentials for the steel sources commonly utilised.

(6) Specific review of the proposed steel source list and evidence of conformity are recommended hold points. A mandated review will help ensure the veracity of the procurement process.

(7) Review and confirmation of traceability at the point of steel supply is required to ensure the steel materials are traceable at the point where they enter the fabrication process

(8) The fabrication of the structural steelwork must be undertaken to the requirements of AS/NZS 5131 and the construction specification. Verification of traceability is required and auditing pre, during and post-fabrication enacted.

(9) Review and confirmation of traceability during fabrication is required to ensure the fabricated assemblies maintain traceability to the extent required by AS/NZS 5131 and the construction specification (Lot, piece-mark or piece traceability).

(10) Project steelwork verification is required to help ensure compliant quality outcomes on the specific project. The extent of auditing is dependent on the exact conformity assessment pathway adopted (refer to Section 5), utilising the Project Steelwork Verification (PSV) level (refer to Section 4.7.5).

(11) The fabricator must, with input from the principal contractor, prepare the Manufacturer Data Report (MDR) (refer to Appendix D).

(12) The submitted MDR must be approved by the principal contractor (whose engagement during the MDR creation process will help ensure approval), with the support of the fabricator and engineer.

(13) The formal acceptance of the fabricated steelwork is usually a contractual requirement, with the responsible parties defined in the contract. Acceptance may be contingent on formal certification by relevant engineers and the building certifier.

(14) Depending on project type and size, the responsibilities of the principal contractor may also be assumed by the specialist structural steel contractor, who subcontracts fabrication to the fabricator.

8.3 The role of the Construction Specification and Drawings

Both AS 4100 and AS/NZS 5131 define the Construction Specification as “set of documents covering technical data and other requirements for a particular steel structure, including those specified to supplement and qualify the provisions of this document”. In the usual case the primary documents would be:

- the technical specification, usually a textual document outlining the technical requirements for the structure
- the drawings, which can take a number of forms as the project progresses:
  - **Design drawings**: are developed by the designer, for the purpose of unambiguously transferring design intent to the stakeholders charged with turning the design into reality (the constructor and fabricator)
  - **Shop drawings**: are prepared by the steelwork detailer, who may work for the fabricator or be subcontracted. The shop drawings define the configuration of each individual component of the steelwork and their relationship in the steelwork assemblies that are erected on site. Shop drawings are intended to be used directly by the fabrication personnel to fabricate the components and assemblies.
  - **As-build drawings**: are prepared to document the final fabricated components and configuration and reflect any changes that may have been made during the fabrication process due to last-minute changed client requirements, value engineering or practical issues with fabrication process.

Whilst the specification and development of the drawings is intended to ensure design intent is correctly transferred into the completed structure, there is potential for non-compliance of the completed structure with design intent, due to:

1. **Inadequately resolved design documentation**: time and cost pressures have resulted in instances where the design documentation is not fully resolved or completed, expecting that the shop drawing phase will highlight issues to be resolved. This potentially heightens risk and puts significant pressure on the shop drawing processes to identify and resolve issues. A lack of resolution or mistakes can result in non-compliance.
2. **Lack of rigorous shop drawing process**: the design engineer **must** review and approve the shop drawings, to ensure design intent has been fulfilled and a certification by the engineer can be provided. If no checks are undertaken, then there is significant potential for fabrication to be non-compliant with design intent.
3. **As-built drawings not completed**: where as-built drawings are not completed, there is no record of the actual structure fabricated and erected and hence no ability to ascertain compliance after the fact, or have confidence in the structure present, should subsequent retrofitting or modification be required.

Stakeholders, in particular the engineer and constructor, need to ensure fit-for-purpose processes are in place such that non-compliances are not introduced due to inadequate translation of design intent into the completed structure. The designer must be provided the resources to properly document the design and must be contractually obligated to review and approve the shop drawings. The constructor must implement a rigorous process for ensuring changes are properly resolved and the as-built configuration documented.

8.4 Compliance Management Plan

The compliance of construction products and the final structure on a project cannot be assumed. An internationalised procurement environment, price competition and the complexity of ascertaining compliance make it difficult for stakeholders to adequately respond within project timeframes to situations where the compliance of particular products is in question.

Given this environment, the principal contractor must have in place a plan for managing procurement and compliance of structural steelwork to ensure cost effective, timely risk minimised outcomes. The procurement, fabrication and erection of structural steelwork should be undertaken under a documented Compliance Management Plan (CompMP).

The CompMP should include:

- the requirements of the Quality Plan in AS/NZS 5131
- 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 ascertaining compliance of structural steel (as defined in Technical Note TN015)
- Process and documentation for ascertaining compliance of the fabricated steelwork (as defined in this Technical Note)
- Process and documentation checklists for erection of structural steelwork
- Assigned responsibilities for compliance management, including names and CV's of relevant personnel
- A response to any specific issues documented in the designer's 'Safety Report' (refer Section 6.2.4) required under WHS

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

Key takeaways:

- WHS responsibilities and duty of care cannot be abrogated or re-assigned by a particular contractual relationship
- The procurement process and responsibilities indicated in Figure 9 are considered good practice and consistent with duty of care under WHS
- A 'Compliance Management Plan' prepared by the principal contractor is strongly recommended to proactively minimise project impact caused by potential non-compliant construction products and processes and ensure all stakeholders on the project understand their responsibilities for managing compliance on the project. The Compliance Management Plan should be agreed with the certifying engineer.

9 REFERENCES

1. Australian Building Codes Board, '*National Construction Code*', 2019.
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3. Australian Steel Institute, Technical Note TN015 '*Ascertaining compliance of structural steel*', Version 1, July, 2021.
4. Standards Australia, AS 4100:2020 '*Steel structures'*.
5. Standards Australia, AS/NZS 4600:2018 *'Cold-formed steel structures'*.
6. NASH Standard – Residential and Low-Rise Steel Framing Part 1 or Part 2
7. Standards Australia, AS/NZS 3678:2016 *'Structural steel - Hot-rolled plates, floorplates and slabs'*.
8. Standards Australia, AS/NZS 3679.1:2016 *'Structural steel - Part 1: Hot-rolled bars and sections'*.
9. Standards Australia, AS/NZS 3679.2:2016 *'Structural steel - Part 2: Welded I sections'*.
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APPENDIX A

INDUSTRY STAKEHOLDER REVIEW PANEL

The Technical Note was prepared under the guidance of an ASI steering committee and was peer reviewed by a range of representatives and organisations as listed below. The contribution of these entities for the benefit of the Australian steel community is gratefully acknowledged.

Name	Company	Company type
Arun Syam	Infrabuild	Manufacturer
Chris Kilmore	Bluescope	Manufacturer
David McNeil	Infrabuild	Manufacturer
Doug Hawkes	Structural Integrity Engineering	Engineer
Glenn Gibson	IDEC	Fabricator
George Vorobieff	Head to Head International	Consultant
John Merrick	Arcadis	Engineer
Mark Bubicich	Liberty Primary Steel	Manufacturer
Pablo Santos	S & L Steel	Fabricator
Patrick Beshara	Modulus Pty Ltd	Consultant

APPENDIX B

AUDITING REQUIREMENTS PRIOR TO FABRICATION COMMENCING

(FABRICATOR INITIAL VERIFICATION AUDIT)

B.1 Context

AS/NZS 5131 references a range of requirements that logically must be actioned prior to fabrication commencing. This is particularly as regards establishing the quality inputs to the fabrication process, to help ensure demonstrable and verifiable quality outcomes.

AS/NZS 5131 implements a risk-based approach by categorising structures (or parts thereof) as one of Construction Categories CC1, CC2, CC3 or CC4. The tabulated requirements in Section B.2 are referenced to the applicable Construction Category.

The scope of auditing required for each of the Construction Categories is defined in Section B.2. The scope applicable to each Project Steelwork Verification (PSV) Level (refer to Section 4.7.5) is also indicated.

B.2 Scope of auditing required – Prior to fabrication

AS/NZS 5131 clause reference	Activity	Audit requirements[1]	Applicable Construction Category[2]			Note	PSV Level[3]		
			CC1	CC2	CC3 & CC4		1	2	3
2. Normative referenced Standards									
2.1, 2.2	Standards and Codes	Indicated 'primary' referenced Standards must be held (where relevant to the type of work undertaken).	√[4]	√	√	(6)		✓	✓ (5)
4. Design, specification, documentation and traceability									
4.4.2	Scope of documentation	Shop detailing documentation shall show clear and complete information on each assembly.	Opt[7][8]	√	√	(9)		✓	✓
4.4.3	Production of shop detail documentation	Shop detail drawings to have numbering system allowing traceability and revisioning system. RFIs and responses to be documented.	Opt	√ √	√ √	(9)			✓
4.5.1	Quality documentation	The following quality records shall be available:				(10)			
		a) The allocation of tasks and authority during the various phases of the project.	Opt	√	√		✓* (5)	✓	✓
		(b) The procedures, methods and work instructions to be applied.	Opt	√	√		✓*	✓	✓
		(c) An inspection and test plan specific to the works.	Opt	√	√		✓*	✓	✓

		(d) A procedure for handling changes and modifications.	Opt	√	√		✓ *	✓	✓
		(e) A procedure for handling nonconformities.	√**(9)	√	√		✓ *	✓	✓
		(f) A procedure for handling requests for concessions.	Opt	√	√		✓ *	✓	✓
		(g) A procedure for handling disputes related to quality.	Opt	√	√		✓ *	✓	✓
		(h) Any hold points or requirements to witness inspections or tests, and any consequent access requirements.	Opt	√	√		✓ *	✓	✓
		(i) A procedure for document control and control of records.	Opt	√	√		✓ *	✓	✓
		(j) A procedure for corrective and preventative actions.	Opt	√	√		✓ *	✓	✓
		(k) A procedure for quality audits.	Opt	√	√		✓ *	✓	✓
		(l) A review of contractual requirements: Undertaken Undertaken & documented	 √** Opt	 √ Opt	 √ √		 ✓ * ✓ *	 ✓ ✓	 ✓ ✓
		(m) A technical review of contractual requirements: Undertaken Undertaken & documented	 √** Opt	 √ Opt	 √ √		✓ *	✓	✓

4.5.2	Quality plan	For CC3 and CC4 and for Coating Quality level PC2, a quality plan shall be prepared for execution of the works. A quality plan shall include the following: (a) Review of the specification requirements against process capabilities. (b) Staff responsible for each aspect of the construction. (c) Arrangements for inspection (d) Quality documentation prior to construction (e) Details of records of inspections and checks including hold points.			√	(12)	✔*	✔	✔
4.6.1	Purchasing – components and sub-contracted services	A documented purchasing procedure for both components and sub-contracted services shall be maintained. Purchasing information shall describe the product to be purchased, including the following where appropriate: (a) Requirements for approval of product (b) Requirements for qualification of personnel (c) Quality management system requirements (d) The required construction category (e) Requirements for verification of product, including where applicable, verification at the suppliers' premises. A procedure shall be in place to document inspection to ensure that purchased product meets specified purchase requirements.	Opt	√	√	(13)	✔*	✔	✔
Table D1.16 Table D2.19 Table D3.20	Calibration or verification of measuring, inspection and testing equipment	The calibration or verification of measuring, inspection and testing equipment shall be undertaken.	Opt	√	√	(14)		✔	✔

5. Materials									
5.1.2	Quality management system	The operations detailed in Section 5 of AS/NZS 5131 shall be managed under a suitable quality management system such as AS/NZS ISO 9001.	Opt	√	√	(15)	✓ *	✓	✓
5.2.3	Level of traceability	The level of traceability shall be: a) No specific traceability for CC1 b) Lot traceability for CC2 and CC3 'Piece-mark' and 'Piece' traceability for CC3, where required in the Construction Specification	√	√	√	(16)	✓ *	✓	✓
6. Preparation, assembly and fabrication									
6.1.1 Table D1.10 Table D2.8	Application	All equipment shall be suitably maintained. Documented plans and records required.**	√ Opt	√ Opt	√ √	**(17) (18)			✓
6.1.2	Quality management system	The operations detailed in Section 6 of AS/NZS 5131 shall be managed under a suitable quality management system such as AS/NZS ISO 9001. Levels of quality documentation shall be according to Table D1 of AS/NZS 5131. The required level of quality documentation increases from C1 to C2 to C3.**	Opt √	√ √	√ √	**(17)	✓ * ✓ *	✓ ✓	✓ ✓
Table D1.10	Production planning	Undertaken Documented plans and records.**	Opt Opt	√ Opt	√ √	**(17)	✓ *	✓	✓
6.1.3	Work method statements	A documented work method statement shall be prepared for each operation and made available to all relevant personnel involved in the works.	Opt	√	√	(19)	✓ *	✓	✓
6.2	Tracking system	A tracking system shall be established.	√	√	√		✓ *	✓	✓

6.12	Supervision	Cutting, holing, shaping and assembly shall be supervised by a competent person.		√	√	(20)	✔ *	✔	✔
7. Welding									
7.1.1	Quality requirements	Welding shall be carried out and managed under the following quality requirements: CC1: AS/NZS ISO 3834.4 and AS/NZS 1554 CC2: AS/NZS ISO 3834.3 CC3: AS/NZS ISO 3834.2	√	√	√	(21)	✔ *	✔	✔
7.1.2	Welding requirements	The welding of structural steels shall comply with the requirements of the relevant part of AS/NZS 1554. Requirements for weld categories are as follows: GP SP FP	√	√	√	(22)	✔ *	✔	✔
7.1.3	Requirements of construction specification	Before any welding commences, the construction specification shall be checked for consistency with Section 4 of AS/NZS 5131.	Opt	√	√	(23)		✔	✔
7.2	Welding plan	A welding plan should be provided as part of the production planning process. Where provided, the contents are defined in Clause 7.2.2 of AS/NZS 5131.	Opt	Opt	Opt		✔ *	✔	✔
7.4.1	Qualification of welding procedures	Welding shall be carried out using qualified procedures using a welding procedure specification (WPS) complying with the relevant provisions in the relevant part of AS/NZS 1554. For CC3, weld procedure traceability is required.	Opt	√	√	(24)	✔ *	✔	✔

7.4.1	Validity of welding procedure qualification	The validity of a welding procedure qualification shall comply with Clause 7.4.1.2 of AS/NZS 5131.	√	√	√	(24)	✓*	✓	✓
7.4.2	Qualification of welders	Welders shall be qualified in accordance with the following requirements: a) For CC1 and CC2: the relevant part of AS/NZS 1554. b) For CC3: AS/NZS 2980 or ISO 9606-1 or AS/NZS 1554. c) For CC3: identification and traceability of welders is required.	√	√	√ √	(25)	✓*	✓	✓
7.4.3	Welding coordination	For all construction categories, welding coordination shall be maintained during the execution of welding. Required welding supervisor or coordinator qualifications are: a) For CC1 and CC2: AS/NZS 1554. b) For CC3: ISO 14731.	√ √	√ √	√ √	(26)	✓*	✓	✓
8. Mechanical fastening									
8.1.2	Quality management system	The operations detailed in Section 8 of AS/NZS 5131 shall be managed under a suitable quality management system such as AS/NZS ISO 9001.	Opt	√	√		✓*	✓	✓
8.1.3	Work method statements	A documented work method statement shall be prepared for each operation and made available to all relevant personnel involved in the works.	Opt	√	√	(19)	✓*	✓	✓
8.9	Supervision	Mechanical fastening shall be supervised by a competent person.	Opt	√	√	(20)	✓*	✓	✓
9. Surface treatment and corrosion protection									
9.2.1	Quality documentation	Quality documentation required, complying with Clause 4.5.1 of AS/NZS 5131.	√	√	√	(10)	✓*	✓	✓

9.2.1	Quality Plan	Quality plan required, complying with Clause 4.5.2 of AS/NZS 5131 and covering the requirements for either PC1 or PC2. PC1. PC2.	 Opt Opt	 Opt √	 Opt √	(27) (28) (29)	✓ *	✓	✓
9.2.2	Work method statements	A documented work method statement (WMS) shall be prepared for each stage of the work.	Opt	√	√	(19)	✓ *	✓	✓
Table D2.7, 8, 9	Assess facilities	Equipment suitable** Facilities suitable** Storage suitable**	Opt	√	√	(11)		✓	✓
10. Architecturally exposed structural steelwork									
10.3	Construction specification information	Elements of AESS shall be identified in the construction specification.	Opt	√	√	(30)	✓ *	✓	✓
12. Geometric tolerances									
12.1	General	Quantitative values for both essential tolerances and functional tolerances (Class 1 or Class 2) shall conform to Appendix F of AS/NZS 5131. Class 1. Class 2 may be specified.	 √ Opt	 √ Opt	 √ Opt	(31)	✓ *	✓	✓
13. Inspection, testing and correction									
13.1	General	All inspection and testing at each stage shall be undertaken in accordance with a documented inspection and test plan (ITP).	Opt	√	√	(32)	✓ *	✓	✓

13.2	Inspection	The competency of the inspection personnel shall, at a minimum, conform to the requirements of Section 13 of AS/NZS 5131.	Opt	√	√	(20)	✔*	✔	✔
13.3.7	Non-conforming steel or components	A procedure for dealing with nonconforming material or components shall be documented and available. The results of any testing shall be fully documented.	Opt	√	√	(33)	✔*	✔	✔
13.6.1.3	Qualifications of inspection personnel	Inspection of welding shall be undertaken by personnel qualified in accordance with the relevant application Standard. Non-destructive examination (NDE) other than visual examination shall be carried out by personnel qualified to the requirements in Clause 13.6.1.3 of AS/NZS 5131.	Opt	√	√	(20)	✔*	✔	✔
13.7.2	Competency of inspection personnel	Inspection of mechanical fastening shall be undertaken by a competent person.	Opt	√	√	(20)	✔*	✔	✔
13.8.2	Competency of inspection personnel	Inspection of surface treatment shall be undertaken by a competent person.	Opt	√	√	(20)	✔*	✔	✔
13.9.2	Competency of inspection personnel	Inspection of paint coatings shall be undertaken by a competent person.	Opt	√	√	(20)	✔*	✔	✔

Notes:

1) These are the requirements which must be audited as part of the project steelwork verification process

2) Indicates to which Construction Category the requirement is applicable

3) The Project Steelwork Verification (PSV) Level is defined in Section 4.7.5

4) '√' = indicates a requirement that is either specified or implied in AS/NZS 5131 for the particular Construction Category and that the auditor must check, through either direct or indirect means. See also Note 8.

5) ✔ = indicates that the particular requirement must be audited as part of the scope of the nominated PSV Level, where the requirement is indicated as necessary for the corresponding Construction Category.

✔* = indicates that for PSV Level 1 the quality documentation required prior to fabrication commencing needs to be obtained (for project records) but not audited. The quality documentation would usually be included as part of the MDR.

6) The fabricator must have a copy of the required Standards available for reference. AS/NZS 5131 is a primary requirement

7) 'Opt' = 'Optional', indicating a requirement that is either specified or implied in AS/NZS 5131 for the particular Construction Category but is optional for the auditor to check, because it is not considered critical. However, the auditor is encouraged to review these requirements where practicable and provide appropriate encouragement for the fabricator to meet these requirements. See also Note 8.

8) A number of requirements may be difficult to check through direct means (e.g. by physical viewing of outcomes) at the time of the site audit. Typically this will be for processes that are not undertaken regularly or evident on the shop floor at the time of the site audit. In this case the auditor must verify the requirement through indirect means. 'Indirect means' includes a range of evidentiary documentation either prescribed or recommended in AS/NZS 5131 or that are considered 'good practice'. Sighting a documented procedure and review of prior project documentation would be examples. ISO/TR 3834-6:2007 provides guidance on implementing ISO 3834. The auditor is encouraged to note any requirements that could not be checked through direct means in the audit report and follow up at the next audit. The competency and experience of the auditor in judging the evidentiary documentation required is important in this regard.

9) The shop detail drawings must be audited to ensure information is clear, complete and consistent with the information presentation expected in Australian practice. The 'Australian Steel Detailers Handbook' (Ref. 29) provides direction in this regard. The shop detail drawings must also be audited for consistency with the requirements of the construction specification.

10) The range of quality related documentation that is required to be audited prior to commencement of fabrication is extensive and reflects the importance that must be placed on quality processes and documentation thereof. Refer Section 4.7.2 for further details

11) Requirements indicated with ** are sourced from the recommendations on quality system elements in the relevant tables in Appendix D of AS/NZS 5131.

12) Although AS/NZS 5131 does not specifically require a Quality Plan for CC2, it does state that it may be required by the Construction Specification for CC2. Therefore, the CC2 fabricator should have as a minimum a template for a Quality Plan available.

13) Purchase orders for steel must include a reference to the applicable Standard (as required in the Construction Specification), the grade of steel and whether the steel is required to be third-party certified.

14) These requirements are also in AS/NZS ISO 3834 and have been documented to facilitate the integration of AS/NZS ISO 3834 checks into the audit process. AS/NZS ISO 3834 is a normative requirement in AS/NZS 5131.

15) Meeting AS/NZS 5131 requirements in itself does not satisfy all of the requirements to meet ISO 9001, although there is significant overlap. There are additional requirements for ISO 9001.

16) 'Lot', 'Piece-mark' and 'Piece' traceability are defined in Clause 4.7 of AS/NZS 5131:2016. The auditor must ensure the fabricator has the documented processes in place. For CC3 fabricators, these processes must include for 'Piece-mark' and 'Piece' traceability.

17) Requirements indicated with ** are sourced from the recommendations on quality system elements in the relevant tables in Appendix D of AS/NZS 5131.

18) These requirements are also in AS/NZS ISO 3834 and have been documented to facilitate the integration of the AS/NZS ISO 3834 checks into the audit process.

19) The availability of appropriate work method statements (WMS) should be verified prior to fabrication commencing

20) The auditor should review specific personnel competency as one component of the overarching review of the organisational structure, personnel and assignment of responsibilities. AS/NZS 5131 provides some guidance around suitable qualifications in this regard. It is noted that requirements for personnel competency under regulation such as Workplace Health and Safety also apply and take precedence.

21) ISO/TR 3834-6 provides guidelines on implementing ISO 3834, including control systems, documentation and the like. The auditor should review appropriate evidentiary documentation such as documented procedures and prior projects.

22) AS/NZS 5131 relates expected weld category designation (GP, SP, FP) to the Construction Category and nominates a requirement of GP alone for Construction Category CC1. However, based on AS 4100, the weld category is designated by the structural engineer based predominantly on strength considerations, not necessarily the CC. There is therefore the (small) potential for a CC1 project to be designated with SP welds. To help inform the CC1 fabricator, the auditor should make the fabricator aware and encourage them to have a process to address this issue with the engineer.

23) The auditor should ensure the applicant has a procedure to ensure the required information is shown on the shop detail drawings.

24) The auditor must review all welding procedures to be used on the project and ensure they cover the full scope of welding to be undertaken on the project. The validity of the welding procedure qualifications must also be reviewed.

25) The auditor must check the qualification of all welders to be used on the project. For CC3 and CC4, welders shall be qualified in accordance with the requirements of AS/NZS 2980 or AS/NZS ISO 9606-1 (refer Clause 7.4.2 of AS/NZS 5131).

26) Reference is made to Table 7.4 of AS/NZS 5131 and the definitions provided in the Notes attached to that table.

27) The Coating Quality Level PC1 or PC2 is independent of the risk and complexity-based considerations used to assess the Construction Category and it is therefore likely that a fabricator performing to either CC2 or CC3 will be required to be able to perform to either PC1 or PC2. Therefore, CC2 and CC3 fabricators should be checked against PC2 requirements. The auditor should ensure the documentation and procedures are in place to meet the requirements of AS/NZS 5131. In many cases, painting is sub-contracted, in which case Note 28 is relevant.

28) For sub-contracted services, the auditor must ensure that the fabricator has processes and documentation in place to adequately manage the work of the sub-contractor in such a manner that the sub-contractor meets the requirements of AS/NZS 5131. That should include documented evidence that the fabricator audits sub-contractors on a regular basis.

29) The Quality Plan and Inspection and Test Plan should preferably be prepared by the entity performing the surface preparation and paint coat application. Where that is a sub-contractor to the fabricator, the fabricator should review and accept the sub-contractor's Quality Plan and Inspection and Test Plan. Where that is not practical or possible, the sub-contractor should work in accordance with the fabricator's Quality Plan and Inspection and Test Plan.

30) In respect of Architecturally Exposed Structural Steelwork (AESS), requirements may be difficult to check through direct means (e.g. by physical viewing of outcomes) at the time of the site audit. In this case the auditor must verify the requirement through indirect means. 'Indirect means' includes a range of evidentiary documentation either prescribed or recommended in AS/NZS 5131 or that are considered 'good practice'. Sighting a documented procedure and review of prior project documentation would be examples. Given that AESS usually includes an agreed AESS client specification, the fabricators procedures should reference this.

31) Tolerances for fabrication may be difficult to check through direct means (e.g. by physical viewing of outcomes) at the time of the fabricator audit. In this case the auditor must verify the requirement through indirect means. 'Indirect means' includes a range of evidentiary documentation either prescribed or

recommended in AS/NZS 5131 or that are considered ‘good practice’. In particular, where the applicant is intending to undertake bridgework, for which AS/NZS 5100.6 prescribes Class 2 functional tolerances, the capability of the fabricator to meet these tolerances must be checked.

32) Inspection and Test Plans (ITP) are a fundamental requirement for implementing verifiable quality outcomes. The auditor must check that ITP’s are in place covering as a minimum the requirements of AS/NZS 5131 and any requirements of the construction specification.

33) The auditor must review the procedure for dealing with non-conforming materials or components. ASI Technical Note TN-015 (Ref. 3) provides guidance on ascertaining the compliance of structural steel.

APPENDIX C

AUDITING REQUIREMENTS DURING FABRICATION

C.1 Context

AS/NZS 5131 references a range of requirements that must be actioned during fabrication. This is particularly as regards establishing verifiable linkage to the pre-fabrication requirements outlined in Appendix B, to help ensure demonstrable and verifiable quality outcomes.

AS/NZS 5131 implements a risk-based approach by categorising structures (or parts thereof) as one of Construction Categories CC1, CC2, CC3 or CC4. The tabulated requirements in Section C.2 are referenced to the applicable Construction Category.

The scope of auditing required for each of the Construction Categories is defined in Section C.2. The scope applicable to each Project Steelwork Verification (PSV) Level (refer to Section 4.7.5) is also indicated.

C.2 Scope of auditing required – During fabrication

AS/NZS 5131 clause reference	Activity	Audit requirements[1]	Applicable Construction Category[2]			Note	PSV Level[3]		
			CC1	CC2	CC3 & CC4		1	2	3
4. Design, specification, documentation and traceability									
4.5.1	Quality documentation	The following quality records shall be available:	Opt[4]	√[5]	√	(7)		✓ *	✓ [6]
4.5.4	As-built documentation	Sufficient documentation shall be prepared during construction as a record of the as-built structure.	Opt	√	√	(8)		✓ *	✓
4.6.1	Purchasing – components and sub-contracted services	A documented purchasing procedure for both components and sub-contracted services shall be maintained. Purchasing information shall describe the product to be purchased, A procedure shall be in place to document inspection to ensure that purchased product meets specified purchase requirements.	Opt	√	√	(9)		✓	✓
4.6.3	Subcontracted services	The sub-contractor shall fully comply with the relevant requirements of AS/NZS 5131 for the scope of work undertaken, including provision of full documentation.	Opt	√	√	(10)		✓	✓
5. Materials									
5.1.1	Application	The properties of supplied materials shall be documented in a way that enables them to establish compliance with the construction specification and AS/NZS 5131.	Opt	√	√	(11)		✓	✓

5.2.1	Designation	Different grades and/or qualities of material shall be designated with a mark that identifies the grade. Methods of marking shall conform to AS/NZS 5131.		√	√	(12)		✓*	✓
5.2.2	Documentation	Inspection documentation as per relevant product specification shall be available.	Opt	√	√	(13)		✓*	✓
5.2.3	Level of traceability	The level of traceability shall be: c) No specific traceability for CC1 d) Lot traceability for CC2 and CC3 'Piece-mark' and 'Piece' traceability for CC3, where required in the Construction Specification	√	√	√	(14)	✓	✓	✓
5.3.1	General	Steel products and any coating shall conform to the requirements of the relevant Product Standards specified in AS 4100 or AS 5100.6 as appropriate.	√	√	√	(15)	✓	✓	✓
5.3.2	Thickness tolerances	Shall conform to the requirements of the relevant Standard or specification.	Opt	√	√	(16)			✓
5.3.3	Surface condition	Shall conform to the requirements of the relevant Standard or specification.	Opt	√	√	(16)			✓
5.3.4	Additional requirements	Shall conform to any additional requirements in the construction specification.	Opt	√	√	(16)		✓	✓
5.3.5	Lamellar tearing	The suitability of material for through-thickness requirements should be considered.	Opt	√	√	(16)(17)		✓	✓
5.4	Welding consumables	Shall conform to the requirements of AS/NZS 1554.	Opt	√	√	(16)		✓*	✓
5.5	Mechanical fasteners	All mechanical fasteners shall comply with the requirements of Section 5.5 of AS/NZS 5131.	Opt	√	√	(16)		✓*	✓
5.6	Studs and shear connectors	Studs for arc stud welding shall comply with the requirements of Section 5.6 of AS/NZS 5131.	Opt	√	√	(16)		✓*	✓
5.7	Explosive fasteners	Explosive fasteners shall comply with the requirements of Section 5.7 of AS/NZS 5131.	Opt	√	√	(16)		✓*	✓

5.9	Storage of materials	All material shall be stored according to the manufacturer's specifications. Identification shall be maintained during storage.	Opt	√	√	(16)			✓
6. Preparation, assembly and fabrication									
6.1.3	Work method statements	A documented work method statement shall be prepared for each operation and made available to all relevant personnel involved in the works.	Opt	√	√	(16)		✓	✓
6.2	Identification and traceability	A record of test reports and test certificates shall be maintained.	√	√	√	(19)			✓
6.2	Tracking system	A tracking system shall be established.	√	√	√			✓ *	✓
6.2	Traceability of welders	Traceability of welders to individual welds shall be available.			√	(20)		✓	✓
6.2	Traceability of WPS's	Documentation showing traceability of welding procedures (WPS) to individual welds shall be available.			√	(20)		✓	✓
6.2	Unidentified steel	Unidentified steel shall be treated according to the requirements of AS/NZS 5131.	√	√	√	(21)		✓	✓
6.4	Customer supplied property	Customer supplied property provided for use or incorporation into the works shall be identified, verified, protected and safeguarded.	Opt	√	√	(22)			✓
6.5.1	Methods of cutting	Methods of cutting shall comply with Clause 6.5.1 of AS/NZS 5131.	Opt	√	√	(22)		✓ *	✓
6.5.2	Roughness of cut	The roughness of cut shall comply with Clause 6.5.2 of AS/NZS 5131. Max roughness < 25 CLA Fatigue Category>80MPA < 12CLA	√ Opt	√ Opt	√ √			✓ *	✓
6.5.3	Re-entrant corners	Re-entrant corners shall comply with Clause 6.5.3 of AS/NZS 5131.	Opt	√	√	(22)			✓

6.5.4	Cut edges to be painted	Cut edges which are to be painted shall comply with the requirements of Clause 6.5.4 of AS/NZS 5131.	Opt	√	√	(22)		✓*	✓
6.6.1	Shaping - general	Where steel material is subject to bending, forming or shaping, limits on bending strain shall be calculated according to AS 4100 Supp 1.	Opt	√	√	(22)			✓
6.6.2	Hot forming	Limits on temperature for hot forming shall comply with Clause 6.6.2 of AS/NZS 5131.	Opt	√	√	(22)			✓
6.6.3	Flame straightening	Limits on temperature for flame straightening shall comply with Clause 6.6.2 of AS/NZS 5131.	Opt	√	√	(22)			✓
6.6.4	Cold forming	Minimum radii for cold bending of plate or rolled sections shall comply with the requirements of Clause 6.6.4 of AS/NZS 5131.	Opt	√	√	(22)			✓
6.7.1	Holing methods	Holing methods shall comply with Clause 6.7.1 of AS/NZS 5131. Punch if fy<360MPA, t<5600/fy Otherwise punch 3mm undersize and ream.	√	√	√	(22)		✓*	✓
6.7.2	Circular hole diameters	Circular hole diameters shall comply with Clause 6.7.2 of AS/NZS 5131.	Opt	√	√	(22)		✓*	✓
6.7.3	Oversize and slotted holes	The size of oversize and slotted holes shall comply with the requirements of Clause 6.7.3 of AS/NZS 5131.	Opt	√	√	(22)		✓*	✓
6.7.4	Limitations on use of oversize and slotted holes	Limitations on use of oversize and slotted holes shall comply with Clause 6.7.4 of AS/NZS 5131.	Opt	√	√	(22)			✓
6.7.5	Countersinking	Countersinking shall comply with the requirements of Clause 6.7.5 of AS/NZS 5131.	Opt	√	√	(22)			✓
6.7.6	Holes for pin connections	Holes for pin connections shall comply with the requirements of Clause 6.7.6 of AS/NZS 5131.	Opt	√	√	(22)		✓*	✓
6.7.7	Weld access holes	The location and extent of weld access holes shall be subject to approval by the engineer. The	Opt	√	√	(22)			✓

		geometry of weld access holes shall comply with the requirements of Clause 6.7.7 of AS/NZS 5131.							
6.8	Full contact bearing surfaces	Full contact bearing surfaces shall comply with the requirements of Section 6.8 of AS/NZS 5131.	Opt	√	√	(22)		✓ *	✓
6.9	Assembly	Assembly shall comply with the requirements of Section 6.9 of AS/NZS 5131.	Opt	√	√	(22)			✓
6.10	Assembly check	The fit between fabricated members and components at more complex connections shall be checked and documented.	Opt	√	√			✓ *	✓
6.11	Transit to site	All fabricated members and components shall be protected from damage in transit before they leave the fabrication shop.	Opt	√	√	(22)		✓	✓
6.12	Supervision	Cutting, holing, shaping and assembly shall be supervised by a competent person.		√	√	(23)		✓	✓
7. Welding									
7.4.1	Qualification of welding procedures	Welding shall be carried out using qualified procedures using a welding procedure specification (WPS) complying with the relevant provisions in the relevant part of AS/NZS 1554. For CC3, weld procedure traceability is required.	Opt	√	√	(24)		✓	✓
7.4.1.2	Production test plates of welds	When required under the contract.			√				✓
7.4.2	Qualification of welders	Welders shall be qualified in accordance with the following requirements: a) For CC1 and CC2: the relevant part of AS/NZS 1554. b) For CC3: AS/NZS 2980 or ISO 9606-1 or AS/NZS 1554. c) For CC3: identification and traceability of welders is required.	√	√	√ √	(25)		✓	✓

7.4.3	Welding coordination	For all construction categories, welding coordination shall be maintained during the execution of welding. Required welding supervisor or coordinator qualifications are: For CC1 and CC2: AS/NZS 1554. For CC3: ISO 14731.	√ √	√ √	√ √	(26)		✓	✓
7.5.1	Joint preparation	Joint preparation shall comply with Clause 7.5.1 of AS/NZS 5131.	√	√	√	(27)		✓*	✓
7.5.2	Storage and handling of welding consumables	Storage and handling of welding consumables shall comply with Clause 7.5.2 of AS/NZS 5131.	√	√	√	(27)		✓*	✓
7.5.3	Weather protection	The welder, the consumables and the working area shall be adequately protected against the effects of wind, rain and snow in accordance with Clause 7.5.3 of AS/NZS 5131.	√	√	√	(27)			✓
7.5.4	Assembly for welding	The assembly for welding shall be in accordance with Clause 7.5.4 of AS/NZS 5131.	Opt	√	√	(27)		✓*	✓
7.5.5	Preheating	The need and processes for preheating shall comply with Clause 7.5.5 of AS/NZS 5131.	Opt	√	√	(27)		✓*	✓
7.5.6	Temporary attachments	Any areas where welding of temporary attachments is not permitted shall be specified.	Opt	√	√	(27)			✓
7.5.7	Tack welds	Tack welds shall be made using a qualified welding procedure.	Opt	√	√	(27)		✓*	✓
7.5.8	Fillet welds	Fillet welds shall comply with Clause 7.5.8 of AS/NZS 5131.	√	√	√	(27)		✓	✓
7.5.9	Butt welds	Butt welds and butt welding process shall comply with Clause 7.5.9 of AS/NZS 5131.	√	√	√	(27)		✓	✓

7.5.9.2	Steel backing bar for single-sided welds	Backing bar fitted tightly Backing bar continuous by butt weld.	√	√	√ √	(27)		✓ *	✓
7.5.10	Welds on weathering steel	Welds on weathering steel shall comply with Clause 7.5.10 of AS/NZS 5131.	Opt	√	√	(27)		✓ *	✓
7.5.11	Stud welding	Stud welding shall comply with Clause 7.5.11 of AS/NZS 5131.	Opt	√	√	(27)		✓	✓
7.5.12	Seal, slot and plug welds	Seal, slot and plug welds shall comply with Clause 7.5.12 of AS/NZS 5131.	Opt	√	√	(27)		✓	✓
7.5.13	Arc spot welds for light gauge components	Arc spot welds for light gauge components shall comply with Clause 7.5.13 of AS/NZS 5131.	Opt	√	√	(27)		✓	✓
7.5.14	Post weld heat treatment	Where post weld heat treatment is required, it shall comply with Clause 7.5.14 of AS/NZS 5131.	Opt	√	√	(27)		✓ *	✓
7.5.15.1	Execution of welding - general	Execution of welding shall comply with Clause 7.5.15.1 of AS/NZS 5131.	Opt	√	√	(27)		✓	✓
7.5.15.2	Welds on steel to be painted or galvanized	Welds on steel to be painted or galvanized shall comply with Clause 7.5.15.2 of AS/NZS 5131.	Opt	√	√	(27)		✓ *	✓
7.5.15.3	Welds on architecturally exposed structural steel	Welds on architecturally exposed structural steel shall comply with Clause 7.5.15.3 of AS/NZS 5131.	Opt	√	√	(27)		✓ *	✓
7.6.1	Acceptance criteria – routine requirements	Acceptance criteria for weld imperfections and defects shall comply with Clause 7.6.1 of AS/NZS 5131.	Opt	√	√	(27)		✓	✓
7.6.3	Acceptance criteria – fatigue requirements	Acceptance criteria for welds subject to fatigue loadings shall comply with Clause 7.6.3 of AS/NZS 5131.	Opt	√	√	(27)		✓	✓
8. Mechanical fastening									

8.1.3	Work method statements	A documented work method statement shall be prepared for each operation and made available to all relevant personnel involved in the works.	Opt	√	√	(18)		✓	✓
8.2.1, 8.2.2, 8.2.3, 8.2.4	Installation of bolts, nuts and washers	The installation of bolt assemblies shall conform to the general requirements of Section 8.2 of AS/NZS 5131.	Opt	√	√	(28)		✓*	✓
8.2.5	Storage	Fastener components shall be protected from dirt and moisture.	Opt	√	√	(28)		✓*	✓
8.3	Snug tightening of bolts	Bolt assemblies shall be snug tightened in accordance with Section 8.3 of AS/NZS 5131.	Opt	√	√	(28)		✓	✓
8.4	Preparation of contact surfaces on connected plies	Contact surfaces of connected plies shall be prepared in accordance with Section 8.4 of AS/NZS 5131.	Opt	√	√	(28)		✓	✓
8.5	Tensioning of high strength bolts	High strength bolts shall be tensioned in accordance with Section 8.5 of AS/NZS 5131.	Opt	√	√	(28)		✓	✓
8.6	Fastening of thin gauge components	Thin gauge components shall be fastened in accordance with Section 8.6 of AS/NZS 5131.	Opt	√	√	(28)		✓*	✓
8.7	Use of specialised fasteners and fastening methods	Specialized fasteners and fastening methods shall be used in accordance with Section 8.7 of AS/NZS 5131.	Opt	√	√	(28)		✓*	✓
8.8	Installation of mechanical and chemical anchors	Mechanical and chemical anchors shall be installed in accordance with Section 8.8 of AS/NZS 5131.	Opt	√	√	(28)		✓	✓
8.9	Supervision	Mechanical fastening shall be supervised by a competent person.	Opt	√	√	(23)(28)		✓	✓
9. Surface treatment and corrosion protection									
9.2.1	Inspection and Test Plan (ITP)	An inspection and test plan (ITP) is required, satisfying the requirements for preparation of surfaces for painting (9.3), painting (9.8), galvanising (9.9) and repairs to corrosion protection				(16)(29)		✓	✓

		and complying with Clauses 13.8.1 and 13.8.2 of AS/NZS 5131. PC1. PC2.	Opt Opt	Opt √	Opt √				
9.2.2	Work method statements	A documented work method statement (WMS) shall be prepared for each stage of the work.	Opt	√	√	(18)(29)		✓	✓
9.2.3.1	Painting specification	Requirements of Clause 9.2.3.1, as may be applicable, shall be passed through to the fabricator paint department or sub-contractor.	√	√	√	(29)		✓*	✓
9.2.3.2	Galvanizing specification	Requirements of 9.2.3.2, as may be applicable, shall be passed through to the galvaniser including the purchasing documentation for the work.	√	√	√			✓*	✓
9.3.1, 9.9.1, Table D2.4, 5, 6	Competent personnel	Personnel to be competent (NACE, ACA, experienced) – supervision, operatives.	Opt	√	√	(30)		✓	✓
QP, ITP and Various sections of AS/NZS5131, Table D2.22	Quality records	Defined and provided.**	Opt	√	√	(31)		✓*	✓
Tabel D2.19	Calibration	Measuring and test equipment available and calibrated.**	Opt	√	√	(31)			✓
9.3, 9.4, 9.5	Surface preparation	As per AS/NZS 5131 9.3, 9.4, 9.5	Opt	√	√	(29)		✓*	✓
9.8	Fabrication and welding considerations	Fabricator QMS shall include inspection procedures for checking the condition of the cleaned steel after fabrication and after surface preparation.	Opt	√	√			✓*	✓

		All welds shall comply with required finish and presentation before surface preparation commences. Treatment Grades P1, P2, P3 shall have been nominated by the fabricator and applied. Cut edges shall be dressed as per 9.8.5.							
9.9	Application of paint coatings	As per AS/NZS 5131 9.9	Opt	√	√	(29)		✓*	✓
9.10	Application of galvanized coatings	As per AS/NZS 5131 9.10	Opt	√	√	(29)		✓*	✓
9.11	Painting of galvanized coatings	As per AS/NZS 5131 9.11	Opt	√	√	(29)		✓*	✓
9.12	Repairs to corrosion protection	As per AS/NZS 5131 9.12	Opt	√	√	(29)			✓
10. Architecturally exposed structural steelwork									
10.4	Additional fabrication requirements for AESS	Fabrication requirements shall conform to Section 10.4 of AS/NZS 5131.	Opt	√	√			✓*	✓
10.5	Additional erection requirements for AESS	Erection requirements shall conform to Section 10.5 of AS/NZS 5131.	Opt	√	√			✓*	✓
12. Geometric tolerances									
12.1	General	Quantitative values for both essential tolerances and functional tolerances (Class 1 or Class 2) shall conform to Appendix F of AS/NZS 5131.				(32)		✓	✓

		Class 1. Class 2 may be specified.	√ Opt	√ Opt	√ Opt				
13. Inspection, testing and correction									
13.2	Inspection	Inspection shall be undertaken at each stage of the overall process of material and component procurement, fabrication, surface preparation, painting, galvanizing and erecting the structural steel.	Opt	√	√	(33)		✓	✓
13.3	Inspection of materials and components:								
13.3.1	General	Documents supplied with materials, in accordance with the requirements of Section 5 of AS/NZS 5131, shall be checked against the order requirements.	Opt	√	√	(34)			✓
13.3.2	Inspection and Test Plan (ITP)	An ITP shall be prepared, covering the inspection against the relevant Standards for materials and components.		√	√	(34)		✓	✓
13.3.4	Structural steels	Documentation complying with Clause 5.2 of AS/NZS 5131 shall be inspected and checked to verify that the information contained therein complies with the requirements of AS/NZS 5131, the construction specification and the order.	Opt	√	√	(34)		✓	✓
13.3.5	Metallic coated steels	Documentation in respect of all metallic coated steels supplied to AS 1397 shall be inspected and checked.	Opt	√	√	(34)			✓
13.3.6	Pre-fabricated components	Documentation complying with Clause 5.2 of AS/NZS 5131 shall be inspected and checked to verify that the information contained therein complies with the requirements of AS/NZS 5131, the construction specification and the order.	Opt	√	√	(34)			✓

13.3.7	Non-conforming steel or components	A procedure for dealing with nonconforming material or components shall be documented and available. The results of any testing shall be fully documented.	Opt	√	√	(34)		✓	✓
13.3.9	Offcuts or unused material	The traceability shall be maintained on all offcuts or unused material.	Opt	√	√	(34)		✓	✓
13.4	Measurement of fabricated and erected components	Appropriate dimensions of members, components, fabricated assemblies and erected structures shall be inspected and checked against the tolerance requirements of Appendix F of AS/NZS 5131.	Opt	√	√	(34)		✓*	✓
13.5	Inspection of preparation and assembly:								
13.5.1	Inspection and Test Plan (ITP)	An ITP shall be prepared, covering the inspection against the relevant Standards for preparation and assembly.	Opt	√	√	(34)		✓	✓
13.5.3	Inspection report	The results of all inspections shall be documented.	Opt	√	√	(34)		✓*	✓
13.6	Inspection of welding:								
13.6.1.1	Inspection of weldments - general	Inspection requirements throughout the fabrication process shall conform to Table 13.6 of AS/NZS 5131.	√	√	√	(34)		✓	✓
13.6.1.2	Inspection and test plan for welding	An ITP shall be prepared, the requirements for which shall conform to Clause 13.6.1.2 of AS/NZS 5131.	Opt	√	√	(34)		✓	✓
13.6.1.3	Qualifications of inspection personnel	Inspection of welding shall be undertaken by personnel qualified in accordance with the relevant application Standard. Non-destructive examination (NDE) other than visual examination shall be carried out by personnel	Opt	√	√	(34)		✓*	✓

		qualified to the requirements in Clause 13.6.1.3 of AS/NZS 5131.							
13.6.1.4	Inspection report	The results of all inspections shall be documented.	Opt	√	√	(34)		✓*	✓
13.6.2.1	Inspection after welding - timing	The NDE of a weld (other than visual scanning and examination) shall not be completed until after the minimum hold time given in Table 13.6.2.1 of S/NZS 5131.	Opt	√	√	(34)		✓*	✓
13.6.2.2	Scope of inspection	The degree of welding inspection (visual and NDE) shall conform to the requirements of Clause 13.6.2.2 of AS/NZS 5131.	√	√	√	(34)		✓*	✓
13.6.2.3	Visual examination	Visual examination shall conform to the requirements of Clause 13.6.2.3 of AS/NZS 5131.	Opt	√	√	(34)		✓	✓
13.6.2.4	Non-destructive examination (NDE)	NDE shall conform to the requirements of Clause 13.6.2.4 of AS/NZS 5131.	Opt	√	√	(34)		✓*	✓
13.6.3	Inspection and testing of welded shear studs	Inspection and testing of welded shear studs shall conform to the requirements of Clause 13.6.3 of AS/NZS 5131.	Opt	√	√	(34)		✓	✓
13.7	Inspection of mechanical fastening:								
13.7.1	Inspection and Test Plan	An ITP shall be prepared, covering the list of items in Clause 13.7.1 of AS/NZS 5131.		√	√	(34)		✓	✓
13.7.3	Inspection report	The results of all inspections shall be documented.	Opt	√	√	(34)		✓*	✓
13.7.4	Inspection prior to erection of steelwork	Documentation and packaging shall be inspected and checked against the requirements.	Opt	√	√	(34)		✓*	✓
13.7.6	Inspection prior to installation of fasteners	Prior to installation, nuts, bolts and washers shall be visually inspected.	Opt	√	√	(34)		✓*	✓

13.7.7	Inspection after snug tightening of fasteners	All snug tightened connections shall be inspected to the requirements of Clause 13.7.7 of AS/NZS 5131.	Opt	√	√	(34)		✓	✓
13.7.8	Inspection of tensioned high strength bolted connections	High strength bolted connections shall be inspected according to the requirements of Clause 13.7.8 of AS/NZS 5131.	Opt	√	√	(34)		✓	✓
13.7.9	Inspection of fasteners in thin gauge components	Fasteners in thin-gauge components shall be inspected according to the requirements in Clause 13.7.9 of AS/NZS 5131.	Opt	√	√	(34)		✓*	✓
13.7.11	Inspection of mechanical and chemical anchors	Mechanical and chemical anchors shall be inspected according to the requirements of Clause 13.7.11 of AS/NZS 5131. Proof testing of a sample may be required.	Opt	√	√	(34)		✓	✓
13.8	Inspection of surface treatment								
13.8.1	Inspection and Test Plan	For Coating Quality Level PC2, an ITP shall be prepared, covering the list of items in Clause 13.8.1 of AS/NZS 5131.	Opt	√	√	(34)		✓	✓
13.8.3	Inspection report	The results of all inspections shall be documented.	Opt	√	√	(34)		✓*	✓
13.8.4	Pre-painting condition report	The condition of the steel surface shall be documented prior to any painting commencing.	Opt	√	√	(34)			✓
13.9	Inspection of paint coatings:								
13.9.1	Inspection and test plan	For Coating Quality Level PC2 an ITP shall be prepared, covering the list of items in Clause 13.9.1 of AS/NZS 5131.	Opt	√	√	(34)		✓	✓
13.9.3	Inspection report	The results of all inspections shall be documented.	Opt	√	√	(34)		✓*	✓

13.10	Inspection of galvanized coatings:								
13.10.1	Inspection	Inspection documentation shall be provided, sufficient to allow checking against the requirements of AS/NZS 4680.	Opt	√	√	(34)		✔	✔
13.10.2	Inspection report	The results of all inspections shall be documented.	Opt	√	√	(34)		✔*	✔

Notes:

1) These are the requirements which must be audited as part of the project steelwork verification process
2) Indicates to which Construction Category the requirement is applicable
3) The Project Steelwork Verification (PSV) Level is defined in Section 4.7.5
4) 'Opt' = 'Optional', indicating a requirement that is either specified or implied in AS/NZS 5131 for the particular Construction Category but is optional for the auditor to check, because it is not considered critical. However, the auditor is encouraged to review these requirements where practicable and provide appropriate encouragement for the fabricator to meet these requirements.
5) '√' = indicates a requirement that is either specified or implied in AS/NZS 5131 for the particular Construction Category and that the auditor must check, through either direct or indirect means.
6) ✔ = indicates that the particular requirement must be audited as part of the scope of the nominated PSV Level, where the requirement is indicated as necessary for the corresponding Construction Category. The particular requirement should be audited during the fabrication process.

   ✔* = indicates that for PSV Level 2 it needs to be confirmed that the particular requirement is being actioned during fabrication but the veracity of application of the requirement does not need to be confirmed by auditing.
7) The auditor must check that the quality documentation required is being implemented during the fabrication process.
8) The auditor should confirm that as-built fabrication drawings are being prepared.
9) The auditor should confirm that the purchasing procedure is being implemented for all applicable products and purchased
10) The auditor should confirm that purchasing of subcontracted services is undertaken with the correct provision of information to the subcontractor and the necessary reviews of the subcontractor output, as required by AS/NZS 5131.
11) The auditor should confirm procurement is undertaken with sufficient information received on procured products to establish compliance
12) The specific marking to differentiate grade/quality (only) of materials in circulation in the workshop is not currently standard practice. It is acceptable for the auditor to verify the intent of this requirement is robustly actioned by fabricators through a combination of processes, such as the required product marking

of stock and the traceability back to material grade through piece marks and shop drawings. The auditor should document the processes utilised in the audit report.

13) Inspection documentation required by the relevant product Standard would usually include the appropriate test and inspection certificates (often called 'mill certificates')

14) 'Lot', 'Piece-mark' and 'Piece' traceability are defined in Clause 4.7 of AS/NZS 5131:2016. The auditor must ensure the fabricator is actioning the correct traceability during the fabrication. It is too late to verify this after fabrication, because traceability may have been lost.

15) Assessing the compliance of steel products properly is a significant and potentially time-consuming undertaking, but vitally necessary to reduce risk to an acceptable level in today's procurement environment. The auditor shall ensure the fabricator has a documented robust process for sourcing and verification of all steel and fasteners as meeting the performance requirements of the appropriate Australian Standards. The fabricator shall demonstrate a process for ascertaining the compliance of structural steel consistent with that described in ASI Tech Note TN015 (Ref. 3). For structural steel, the use of steel certified by a JAS ANZ accredited third-party certification scheme shall be considered sufficient evidence of conformity. ACRS (Ref. 30) is an appropriate scheme. For the absence of doubt, these requirements apply to both locally manufactured and imported steel and to fabrication undertaken outside of Australia. Where testing is undertaken, testing laboratories shall be accredited to the requirements defined in the Australian steel product Standards.

16) The auditor shall review ITP's and the like to ensure the required checks are being undertaken.

17) The assessment of lamellar tearing potential is a design issue and addressing that assessment a shared conversation between the designer and fabricator. The requirement for assessment of lamellar tearing and guidance on lamellar tearing is included in Appendix M of AS 4100. However, the auditor should encourage awareness of lamellar tearing issues with the fabricator and verify that the fabricator's procedures do include review of any requirements associated with lamellar tearing.

18) The auditor should verify that Work Method Statements (WMS) for all relevant operations are available to personnel and demonstrably utilised on the project.

19) The auditor should verify that test reports and certificates for the project are available and properly managed.

20) The traceability of welders and Welding Procedure Specifications (WPS's) to individual welds needs to be confirmed by the auditor for CC3 and CC4 structures

21) Unidentified steel must be managed properly to ensure no unidentified steel is used in projects under AS/NZS 5131. The auditor should verify processes are in place to action this on the project.

22) The auditor should specifically check these operations initially and then monitor them regularly during fabrication to ensure the processes are maintained at the level compliant with AS/NZS 5131

23) The auditor should regularly review that supervision is being undertaken and engage with the supervisors as required

24) The auditor must verify that the qualified welding procedures checked prior to fabrication commencing are actually being used on a day-to-day basis for fabrication on the project

25) The auditor must verify that the qualified welders checked prior to fabrication commencing are actually being used on the day-to-day basis for fabrication on the project

26) The auditor must verify that welding coordination is being undertaken during the execution of welding on the project

27) Competent qualified welding personnel, supervisors, coordinator and inspector will help ensure welding requirements are undertaken correctly and ease the burden on the auditor to verify requirements continuously. Welding records must be kept current and audited rigorously.

28) Installation of mechanical anchors (in particular bolt assemblies) is rarely undertaken in the fabrication shop and is generally undertaken on the project site. Therefore, these requirements may be difficult to audit through direct means in a fabrication workshop or erectors' facility. However, if the fabricator is also undertaking the erection of the structure, then they should have in place Work Method Statements and the like that can be verified. ASI Technical Note TN016 (Ref 31) details installation of high strength bolted connections to AS/NZS 5131

29) The Coating Quality Level PC1 or PC2 is independent of the risk and complexity-based considerations used to assess the Construction Category and it is therefore likely that a fabricator performing to either CC2 or CC3 will be required to be able to perform to either PC1 or PC2. Therefore, CC2 and CC3 applicants are checked against PC2 requirements. The CB should ensure the documentation and procedures are in place to meet the requirements of AS/NZS 5131. In many cases, painting is sub-contracted, in which case Note 28 in Table B.2 is relevant.

30) Competent qualified personnel will help ensure AS/NZS 5131 requirements are implemented correctly and ease the burden on the auditor to verify requirements continuously. The auditor must check that the personnel assessed as competent during the pre-fabrication audit are being used on the project.

31) Requirements indicated with ** are sourced from the recommendations on quality system elements in the relevant tables in Appendix D of AS/NZS 5131.

32) Tolerances for fabrication may be difficult to check through direct means (e.g. by physical viewing of outcomes) at the times of the fabricator audit. In this case the auditor must verify the requirement through indirect means. 'Indirect means' includes a range of evidentiary documentation either prescribed or recommended in AS/NZS 5131 or that are considered 'good practice'. In particular, where the applicant is intending to undertake bridgework, for which AS/NZS 5100.6 prescribes Class 2 functional tolerances, the capability of the fabricator to meet these tolerances must be checked.

33) The auditor must liaise with the fabricator inspection personnel to verify that inspections are being undertaken. Records of inspections must be reviewed.

34) The inspections indicated are undertaken by the inspection personnel, who are usually in-house. There may also be third-party inspectors, where required by the contract. The auditor is not expected to undertake all of these inspections, but rather audit outcomes and records.

APPENDIX D

AUDITING REQUIREMENTS AFTER FABRICATION

D.1 Context

AS/NZS 5131 references a range of requirements that must be actioned after fabrication. Auditing after fabrication in particular:

1. Confirms the fabricated structure is fit-for-purpose and meets the requirements of AS/NZS 5131, the construction specification and the NCC (where applicable), when taken in combination with auditing before and during fabrication
2. Provides a record of process and outcomes to be included in the handover to the client

The requirements for auditing after fabrication essentially focus on ensuring the outcomes of the pre-fabrication and during-fabrication process and records are adequately maintained, packaged and transferred to the next stakeholder in the process, become in effect part of the ‘building manual’ provided to the client at handover.

The range of documentation required to be provided by the fabricator may be in any acceptable format. Traditionally, this compilation of documentation, in whatever format, has become known as the ‘Manufacturer Data Report’ or MDR.

The content of an MDR for fabricated and erected steelwork is defined by the requirements in AS/NZS 5131, as variously referenced in Appendices B & C. However, the form and structure of an MDR is not defined by the Standard. The AS/NZS 5131 requirements can be satisfied by submission of a range of separate reports on individual items or a single compiled comprehensive report. Often the client or principal contractor will define the required format for the MDR.

In the interests of both defining the required contents and suggesting a standardised structure for a single comprehensive report, Table D.1 tabulates the required information with clause references, under a defined document structure.

The auditor should ensure that the range of information provided by the fabricator (in whatever format) meets the scope defined in Table D.1.

Table D.1 – Contents and suggested structure for the Manufacturer Data Report (MDR)

Section	Title	Description	AS/NZS 5131 Clause	Frequency
1	**Contract Management**			
1.1	Introduction, project scope & index	High level description of project and its scope. Include index (based on this document)		One-off
1.2	Prequalification checks	Confirmation of usual prequalification checks by the head contractor	Head contractor systems	One-off
1.3	Project Responsibilities	Describes the general and specific responsibilities required to comply with the standard and contract requirements in actioning the project	4.1.1 Appendix B3	One-off
1.4	Construction specification and associated procedures/plans	AS/NZS 5131 requires the Construction Specification to incorporate a wide range of design, technical requirements, and responsibilities - refer Appendix B of AS/NZS 5131 for options. The Construction Specification must be developed by the designer but should be reviewed for completeness by the Head Contractor and their Fabricator/Installer. Clause 4.1.1 requires procedures for variations to the Construction Specification and for resolution of any discrepancies. Must specify extent and method of Weld NDE (13.6.1.1). Must specify galvanising inspection and certification requirements (13.10.1) Must include paint requirements (9.2.3.1 Painting) Must include Galvanising thickness and certification requirements (AS/NZS 4680 App A)	4.1 13.6.1.1 App B1 AS/NZS 4680 Appendix A	Issued prior to procurement - live document potentially updated during delivery
1.5	Traceability procedure	Fabricator needs to compile a procedure (could be part of Quality Plan) which describes how they will manage and maintain traceability downstream (i.e. through their supply chain) from material procurement through their own fabricated works (i.e. welding/competency) in line with Construction Category requirements) into Lot/Piece/Piece-Mark Traceability.	4.7 5.2.3 6.2	Standard fabricator QMS documentation

1.6	Quality documentation	Quality Documentation for the management and delivery of the steel package. Noting that some of the Procedures (i.e. concession requests and NCRs) will have to be agreed by the Client.	4.5.1	One-off
1.7	MDR Index proposal/approval	Completion of this document - should cover Project Responsibilities above. Head Contractor and Fabricator to develop the index collaboratively based on this document - Head Contractor will need to agree this with the Client and Designer.	N/A	Issued for discussion with Construction Spec
2	**Production/fabrication**			
2.1	**Production/fabrication planning**			
2.1.1	Fabricator Quality Plan (Optional for CC2 - Mandatory for CC3)	A quality plan shall include the following: (a) A general management document which shall contain a review of the specification requirements against process capabilities. (b) An organization chart and managerial staff responsible for each aspect of the construction. (c) Arrangements for inspection including allocation of responsibility for each inspection task. (d) Quality documentation prior to construction, as defined in Clause 4.5.1, which shall be produced before execution of the construction step to which they relate. (e) Details of records of inspections and checks to be carried out or demonstration of qualification or certification of intended implemented resources. Include notification that execution records related to a hold-point that affect continuation of construction shall be produced before the hold-point is released.	4.5.2 Appendix E	Draft during tender - finalised prior to fabrication
2.1.2	Purchasing procedure	A documented purchasing procedure for both components and subcontracted services shall be maintained. The procedure shall be capable of monitoring trends in supplier performance. The procedure shall be operated by a named representative. All purchases shall reflect the requirements of the construction specification and conform to the requirements specified in the order. A system shall be established to maintain and document inspection or other activities sufficient to ensure that purchased product meets specified purchase	4.6.1	Standard fabricator QMS documentation

		requirements - including verification of purchased product (refer ASI Tech Note TN015 for example)		
2.1.3	Fabrication and Coating: - Procedures, - Method Statements & - ITP Template Include NDT Procedure and Heat Treatment Procedure	Fabricator QMS - Including all the relevant Quality System Elements and Templates - to show that they have the controls and capability to fabricate and coat steel to the relevant construction category. Procedure for management of prefabricated components. (Generic fabricator content)	4.5.2e 6.1.3	Standard fabricator QMS documentation
2.1.4	Fabrication Preparation and Assembly ITP Template	Contract-specific Inspection and Test Plan for Fabrication	13.5.1	Draft during tender - finalised prior to fabrication
2.1.5	Surface Treatment ITP Template (required for Coating Quality Level PC2)	Contract-specific Inspection and Test Plan for Surface Preparation and Treatment	13.8.1	Draft during tender - finalised prior to fabrication
2.1.6	Submission of details of any prefabricated components	Fabricator needs to provide details of sub-fabricators who are fabricating components for them - and confirm the assurance/control/inspection/verification regime they will be putting in place to ensure conformity of their works is in line with their Procedures.	13.3.6	Prior to Fabrication - so that Head Contractor can assure themselves.
2.1.7	Architecturally exposed structural steelwork (AESS)(if required)	Specific checks incorporated into fabrication ITP's encompassing the scope of requirements in AS/NZS 5131 Clause 10.4	10.4	Prior to Fabrication - so that Head Contractor can assure themselves.
2.2	**Welding planning**			
2.2.1	Welding ITP Template	Contract-specific Inspection and Test Plan for Welding (refer 13.6.1.2 for when an ITP is required for CC1/CC2/CC3)	13.6.1.2	Draft during tender - finalised prior to fabrication
2.2.2	Welding Plan (Optional)	(where required in the Construction Specification) list of possible contents in 7.2.2	7.2	Draft during tender - finalised prior to fabrication

2.2.3	Welding Procedure Specification / Weld Procedure Qualification Record	Weld Procedure Register showing Weld Types and Qualification for each type of weld required Weld Procedure Qualification Record Test Certification (Note weld procedure traceability required for CC3)	7.4.1	Draft during tender - finalised prior to fabrication
2.2.4	Welder Register and WQR	Welder Register showing WQR and positions Welder Competency Certification (Tickets) Welder Qualification Records Evidence of Welder undertaking Welds within past 6 months (think this is AS1554)	7.4.2	Draft during tender - finalised prior to fabrication - updated if personnel change
2.2.5	Qualifications of Welding Supervisor (Welding Coordination)	Qualifications of the Welding Supervisor(s) - where more than one Welding Supervisor is used, provide a register	7.4.3	One-off (unless personnel changes)
2.2.6	Preparation and Assembly Inspection Competency	Provision of a register of Fabricator Personnel along with details of competency (Fabricator System)	13.5.2	One-off (unless personnel changes)
2.2.7	Welding Inspection Competency	Qualifications of the Welding Inspector used - where more than one Welding Inspector is used, provide a register	13.6.1.3	One-off (unless personnel changes)
2.2.8	NDT Personnel Register and Qualifications	Shall be carried out by personnel qualified according to Level 2 as defined in AS ISO 9712 or by personnel qualified according to Level 1 as defined in AS ISO 9712 under the supervision of a Level 2 qualified person	13.6.1.3(b)	One-off (unless personnel changes)
2.3	**Trial assemblies**			
2.3.1	Trial Assembly Records (if req)	Reports showing fit-up of trial assemblies prior to shipping.	6.10	Per Trial Assembly
2.4	**Fabrication Records per Delivery Lot**			
2.4.1	Supplier Declaration of Conformity (SDoC)	Confirming review of records and compliance, listing relevant pieces, standards, construction category and project specifications. Signed by Fabricator's Owner/Senior Manager. Including final Inspection Release prior to shipping to confirm that the pieces in the lot have been inspected and are fit for shipping	ASI Tech Notes TN015 and TN018	Per "Delivery Lot" of Steel

2.4.2	Completed Fab ITP/ITR	Register of pieces within the lot accompanied by completed Fabrication ITPs/ITRs / Reference to Weld Maps / Dimensional Checks / Testing Records / Traceable to Mill Certs / Consumable Certs / Paint and/or Galvanising Records	13.6.1.2 13.5.3.	Per "Delivery Lot" of Steel
2.4.3	Heat Treatment Records (where not included in Fabrication ITP/ITR)	Register and reference.	13.6.1.2	Per "Delivery Lot" of Steel
2.4.4	Updated Weld Maps / Register / Statement	For CC3 - register of Welds and/or Marked-up Shop Drawings showing each of the welds undertaken and which Qualified Welder undertook the weld / consumables/testing. For CC2 - statement that the "Lot" was welded by the competent welders above.	7.4.1.2 for weld procedure traceability for CC3 and CC4 7.4.2 for identification and traceability of welders for CC3 and CC4 ASI Tech Note TN017	Per "Delivery Lot" of Steel
2.4.5	NDT Result Sheet, Reports and NDT Weld Maps	Provide a register of NDT demonstrating correct % of NDT as per the specification and copies of NDT reports/weld maps.	13.6.2	Per "Delivery Lot" of Steel
2.4.6	Paint Records (if painting undertaken)	Register of pieces with completed Paint ITPs / ITRs - also indicating Fire Protected Members Copies of Completed Paint ITPs / ITRs Calibration of any testing equipment. Copies of Paint Manufacturer Inspection Visit Reports and evidence of rectification of any issues Copies of daily inspection reports and final inspection report	9.9 9.9.5 9.9.15 13.9.3 13.9.4	Per "Delivery Lot" of Steel
2.4.7	Galvanising Records (if galvanising undertaken)	Register of pieces with completed Galvanising ITPs/ITRs Copies of Galvanising ITPs/ITRs Copies of any Inspection Visit Reports and evidence of rectification of any issues	9.10 13.10.2 AS/NZS 4680	Per "Delivery Lot" of Steel

2.4.8	Records of prefabricated components (if prefabrication undertaken)	Register of prefabricated components, certification/SDoC from sub-fabricator and evidence of Fabricator Inspections and Verifications.	13.3.6	Per "Delivery Lot" of Steel
2.5	**Goods receipt**			
2.5.1	Goods Receipt Inspection Records	Evidence that the received steel has been inspected on receipt and certification verified prior to release for use	13.3 Head Contractor Systems	Per delivery
3	**Materials and coatings**			
3.1	**Steel material records**			
3.1.1	SDoC Confirming Steel Conformance	Supplier Declaration of Conformity from the Fabricator confirming that the raw steel provided comes from sources manufactured to Australian Standards (refer to attached register of Mill Certs). Where steel is not manufactured to Australian Standards, additional verification of compliance will be required.	4.6.2 ASI Technical Note TN015	One-off (assuming materials purchased in one order)
3.1.2	Mill Certs for All Fabrications	Register of Mill Certs. Copies of Mill Certs.	4.6.2 13.3.4 ASI Technical Note TN015	One-off (assuming materials purchased in one order)
3.1.3	Green Steel Certification	Register of Green Steel Certification. Copies of Green Steel Certs (typically Environmental Product Declarations)(EPD)	N/A	One-off (assuming materials purchased in one order)
3.2	**Weld consumable records**			
3.2.1	All Weld Consumable Certs	Register of Weld Consumable Certs Copies of Weld Consumable Certs	4.6.2 AS/NZS 1554 series AS3560	One-off (assuming consumables purchased in one order)
3.3	**Paint planning**			

3.3.1	Paint Compliance	Evidence of Paint compliance with AS/NZS 3750 series	9.9.3 AS/NZS 3750 series	One-off
3.3.2	Painting ITP Template	Contract-specific Inspection and Test Plan for Surface Preparation and Treatment Contract-specific ITP for Paint Coatings	13.8.1 13.9.1	One-off
3.3.3	Paint Repair Methodology	Paint Manufacturer's instructions for repairing paint defects.	9.12.1 9.12.2	One-off
3.3.4	Paint Warranty Info	Paint Manufacturer's Warranty Documentation. Cleaning and maintenance information for painted coatings. Repair information for painted coatings.	Contract Specifications	One-off
3.3.5	Competency of Painting Personnel	Register of surface treatment/painting/ inspection personnel - and evidence of qualifications (i.e. NACE or Australian Corrosion Association qualifications)	9.9.1 13.8.2 13.9.2	One-off (unless personnel changes)
3.4	**Galvanizing planning**			
3.4.1	Galvanizing Approval	Submission of the proposed Galvaniser for the project	13.10	One-off
3.4.2	Galvanizing Repair Methodology	Proposed instructions for repairing damage to galvanising - to comply with AS/NZS 4680 clause 8	9.10.9 AS/NZS 4680 cl 8	One-off
3.4.3	Galvanizing Certification and Inspection Reports	Galvanising inspection and test reports Galvanising product certification scheme	9.10 13.10.2 AS/NZS 4680 App B	Per "Delivery Lot" of Steel
3.5	**Coating Application and Inspection Records**			
3.5.1	Surface Prep and Pre-painting Condition Reports		13.8.3 13.8.4	Per "Delivery Lot" of Steel

3.5.2	Painting Inspection and Daily Inspection Reports	The report shall also record paint batch numbers, paint system and paint quantities used.	13.9.3 13.9.4	Per "Delivery Lot" of Steel
3.5.3	Final Paint Warranties	Final Warranty Certificate including paint inspections and witnessing by Paint Supplier to confirm product warranty is valid.	Contract Specifications	Once at Completion for Whole Asset
4	**Design**			
4.1	**Design Project Management**			
4.1.1	Fire Engineering Design Documentation	Project Fire Engineering Report Project Fire Engineering Design	AS 4100 Section 12 Fire Engineering Report Fire engineered performance solution	One-off - unless design or asset usage changes
4.1.2	Erection Sequence Methodology (inc. Lifting Plan)	Collaboratively produced by all parties - driven by the Head Contractor - integrating with the Temporary Works Design and construction/erection/loading sequence and methodology. Site Delivery and Storage Methodology. (including 3D design for erection).	11.5.1	One-off - unless design or erection sequence/ methodology changes
4.1.3	Approved Temporary Works Design	Certification for the Temporary Works Design - to confirm compliance with Head Contractor Procedure	Temporary Works Procedures	For each element of Temporary Works Design
4.1.4	Erection Drawings (if req)	Erection drawings including temporary works required.	11.7	For each element of Installation Design
4.1.5	Register of Australian Standards Compliance			One-off

4.1.6	Calculation Sheets	Calculation sheets demonstrating design for loadings	Head Contractor Requirements	One-off
4.1.7	Design Queries / RFIs / Deviations / Changes / Concessions	Registers and copies of related Queries, RFIs, Deviations, Design Changes and Concessions	4.1.1 Head Contractor Requirements	One-off - copy from EDMS
4.2	**Fabrication Design Management**			
4.2.1	Shop Drawing Register	Register of planned Shop Drawings for the project - compliant with the project drawing numbering schema.	Head Contractor Requirements	One-off at beginning of job - statused for MDR at completion
4.2.2	Approved Shop Drawings	Shop drawings (or workshop drawings) detail the dimensions, material and welds for each piece to be constructed. Shop drawings must take into account the Erection Sequence and Temporary Works Design. Shop drawings are typically produced by the Fabricator (may be subcontracted) and reviewed by the Head Contractor and Designer.	4.4.4	Shop Drawings provided progressively in EDMS - full set provided at completion
4.2.3	Shop Drawing review for Galvanising (where galvanised elements are present)	Evidence of review of the Shop Drawings by a reviewer who is familiar with galvanising risks.	GAA Guide - Design for Galvanising	With Shop Drawings
4.2.4	As-Fabricated Shop Drawings (OPTIONAL - if required by Client)	Provision of "As-Fabricated" shop drawings on completion of Fabrication.	4.5.4	At completion
4.3	**Site Engineering Design Management**			
4.3.1	Site Survey Results	Survey as required for the installation of the structural steel - including position of any holding down bolts	11.3	Created progressively.
4.3.2	Temporary Works Site Verification	Inspection Sheets /ITPs confirming correct construction and inspection of temporary works prior to loading.	11.5.4 11.5.5 Head Contract Temporary	Created progressively.

			Works Procedures	
4.3.3	3D Design Information (BIM) (if required)	Provision of coordinated BIM Model for the fabrication and installation.	4.3 Contract Requirements	Provided at fabrication - progressively updated.
4.3.4	As-installed Drawings	As-installed drawings	Contract Requirements	At completion
5	**Fastener Assemblies**			
5.1	**Fastener Planning**			
5.1.1	Fastener Register	Register of fasteners for the project - indicating size, grade, AS reference and number - with space for vendor and heat number to be added for each purchase of fasteners. Also include any load-indicating washers. Also include any mechanical/chemical anchors.	AS/NZS 1252.1/.2 Roads Authority Specifications	Proposal during tender - updated and resubmitted with each purchase of fasteners.
5.1.2	Fastener Vendor Details	Nomination of Fastener providers for the project - and confirmation that they will be providing fasteners which are compliant with AS/NZS 1252.1:2016 (the latest version). Include provision of chemical anchor products and test evidence.	AS1252.1/.2 Roads Authority Specifications	One-off (unless proposal to change vendors)
5.1.3	Bolt Tensioning Procedure	Tensioning procedure indicating method of applying tension, tightening patterns etc where tensioned connections are indicated in the construction specification	8.1.3	One-off
5.2	**Fastener Lot Records (with each delivery of fasteners to site)**			
5.2.1	Updated Fastener Register	Update of the original fastener register to include the vendor, heat number and reference to SDoC or MDoC	4.6.2 AS/NZS 1252.1/.2 Roads Authority Specifications	Update with each delivery to site

5.2.2	Fastener Assembly Certification - including MDoC / SDoC	Copies of new fastener certifications - including MDoC /SDoC	4.6.2 AS/NZS 1252.1/.2 Roads Authority Specifications	With each delivery to site
5.2.3	Bolt Goods Receipt Inspection and Quarantine Release Certificate	The documentation and packaging shall be inspected and checked against the requirements for the mechanical fastener or mechanical or chemical anchor that was specified in the construction specification. Evidence that the fastener assemblies have been inspected and that their certification has been checked prior to release for use	13.7.4	With each delivery to site
6	**Erection**			
6.1	**Erection Planning**			
6.1.1	Erection Quality Plan	A quality plan shall include the following: (a) A general management document which shall contain a review of the specification requirements against process capabilities. (b) An organization chart and managerial staff responsible for each aspect of the construction. (c) Arrangements for inspection including allocation of responsibility for each inspection task. (d) Quality documentation prior to construction, as defined in Clause 4.5.1, which shall be produced before execution of the construction step to which they relate. (e) Details of records of inspections and checks to be carried out or demonstration of qualification or certification of intended implemented resources. Include notification that execution records related to a hold-point that affect continuation of construction shall be produced before the hold-point is released.	4.5.2 Appendix E	One-off
6.1.2	Erection ITP Template	Template Erection ITP covering the acceptance of the substrate/preexisting structure, trial erections, temporary works, installation, fastener tensioning etc	AS/NZS 5131 13.11.1	One-off

		Mechanical fastening ITP to be provided - including space for traceability to Fastener Heat Number.	AS/NZS 5131 13.7	
6.1.3	Erection Risk Assessment	Risk Assessment following workshop to determine hazards and feed into the Erection Sequence Methodology / Contruction Method Statement / Lifting Plan / Shop Drawings / Temporary Works Design	11.2.4	One-off (unless risks change)
6.1.4	Install Method Statement	Installation Method Statement to feed into the Head Contractor ESM and other design and control documentation. May result in changes to Temporary Works / Lifting Plans etc.	4.5.2e 11.2.3	One-off (unless Methodology Changes)
6.1.5	Bolt Installation Inspection Competency	Register and evidence of competency of personnel who will be undertaking / inspecting mechanical fastening.	13.7.2	One-off (unless personnel change)
6.1.6	Erection Supervision Competency	Register and evidence of competency of personnel who will be undertaking / supervising steel erection	11.9	One-off (unless personnel change)
6.1.7	Erection Inspection Competency	Register and evidence of competency of personnel who will be undertaking / inspecting steel erection	13.11.2	One-off (unless personnel change)
6.1.8	Architecturally exposed structural steelwork (AESS)(if required)	Specific checks incorporated into erection ITP's encompassing the scope of requirements in AS/NZS 5131 Clause 10.5	10.5	Prior to erection - so that Head Contractor can assure themselves.
6.2	**Installation Lot Records (Aconex MDR Format)**			
6.2.1	Completed Install ITP/ITR	Completed installation ITP/ITR - including Survey Reports and inspection of Secondary Steel	13.7.3 13.11.3 13.11.4 13.12.3	On completion of installation of each Lot of Steel
6.2.2	Mechanical Fastener ITP/Traceability	Mechanical Fastening ITP completed to confirm: - fastener installation and snug tightening in line with method statement and tightening procedure - fastener tensioning in line with method statement and tightening procedure	11.5.6	On completion of installation of each Lot of Steel

		- traceability to Fastener MDoC/SDoC previously received (to degree required by contract), and - completion/inspection by competent person. (could be part of Installation ITP)		
6.3	Hold Point / Witness Point Records	HP/WP inspections as nominated in the Construction Specification - confirming sisfactory independent inspection of aspects of the installation.	Contract Specifications	HP/WP provided progressively in EDMS - full set provided at completion
6.4	Daily Installer Report	General report from the Erection Contractor confirming daily progress and completion.	13.11.3	Reports provided progressively in EDMS - full set provided at completion
6.5	Cathodic Protection Report	Evidence of the satisfactory inspection and testing of the cathodic protection system.	9.13	On completion of works or CP Lot
6.6	Consultant/Third Party Inspection Reports and Close-out	Register, copies and close-outs for all third-party inspection reports (where not covered in HP/WP records)	Contract Specifications	Reports provided progressively in EDMS - full set provided at completion
6.7	**Completion Certificate**			
6.7.1	Completion Certificates	Any certificates required under state legislation.	Contract and Statutory Requirements	On completion
7	**General Quality Records**			
7.1	**Repairs and Non-Conformance Reports**			
7.1.1	Register and Copies of Fabrication Repairs and Non-Conformance Reports	Any NCRs identified - with evidence of satisfactory disposition and remediation	Contract Requirements	NCRs provided progressively in EDMS - full set

				provided at completion
7.1.2	Register and Copies of Site Repairs and Non-Conformance Reports	Any NCRs identified - with evidence of satisfactory disposition and remediation	Contract Requirements	NCRs provided progressively in EDMS - full set provided at completion
7.2	**Calibrated Tools and Measuring Equipment**			
7.2.1	Calibration Register and Certification - Fabrication	Register of equipment - including IMTE, Welding Equipment etc, and copies of Certificates		One-off (unless tools change)
7.2.2	Calibration Register and Certification - Installation	Register of equipment - including IMTE, Welding Equipment etc, and copies of Certificates		One-off (unless tools change)

APPENDIX E

SUPPLIER DECLARATION OF CONFORMITY (SDoC)

E.1 Context

AS/NZS 5131 (Ref. 3) recommends a Supplier Declaration of Conformity (SdoC) is provided for purchased components. An SDoC must be provided by the importer who first puts the product in the market in Australia where product is sourced internationally. The SDoC must include reference to the verification test report or reports used to support any claim of conformity.

E.2 Performance Requirements of the SDoC

A Supplier Declaration of Conformity is not uncommon in today's procurement environment for higher risk products. For example, in Australia, the Australian Communications and Media Authority (ACMA) require an SDoC for certain telecommunication products.

In all cases, the essential performance requirements of the SDoC include:

1) **Supplier details:** The declaration is made by an entity with business registration in the country concerned. This is to ensure that the entity is reachable by the legal system in the country concerned if action is required on the grounds of a false or misleading declaration or the product does not meet the performance requirements of the Standards or specifications referenced in the SDoC.
2) **Product details and date of manufacture:** a description of the product in terms of brand name, product type, model, lot, batch or serial number, as applicable. For the case of fabricated steelwork, that would include sufficient specific information to uniquely define the scope of assemblies covered.
3) **Compliance – technical Standards and supporting documentation:** the title and number of all applicable technical Standards and, as evidence of compliance with the stated Standards, reference to test reports and the like. These test reports may be from an accredited or non-accredited test lab, depending on the level of compliance required (as defined in the Standards or client specification). The MDR would be an appropriate document to reference in the case of fabricated steelwork.
4) **Declaration statement:** a standard declaration statement by the responsible supplier, who is authorised to declare and sign
5) **Signature:** of the authorised party, including position in company and date

Apart from a link to compliance via reference to technical Standards and test reports, the primary feature of an SDoC is the declaration by a local country-based entity that is reachable should legal action be required.

E.3 Typical Form of SDoC

Figure E.1 provides an outline of the typical form of an SDoC for structural steel or fabricated steelwork.

Notes to Figure E.1:

1. Each SDoC must have a unique number for identification purposes
2. Company details must include the company name, registered business address, ABN and contact details. The street address of the location of manufacture (for steel manufacture) or fabrication (for fabricated steelwork) must also be included.
3. For steel material, the 'Unique product identification' will usually be the combination of the product name and the mill certificate credentials, the latter comprising the manufacturer name, the mill certificate number and the steel batch number. For fabricated steelwork, the project name and scope of supply would be appropriate.

4. For steel material, the Standards to which conformity is declared will be one of the relevant Australian steel product Standards (Refs. 7, 8, 9, 10). For fabricated steelwork, AS/NZS 5131 is the applicable reference.
5. The intended use of the product describes the expected application of the product. In most cases for both structural steel and fabricated steelwork this might be “Steel structures or composite steel and concrete structures as defined in the scope of AS 4100, AS/NZS 5100.6 and AS/NZS 2327”.
6. The ‘Evidence of Conformity’ will depend on the exact conformity assessment pathway selected up to the point of supply of the steel material or fabricated steelwork and would include the appropriate combination of the following:
    a. Documentation demonstrating the applicable Manufacturer Verification Level (MVL) (Refer Technical Note TN015 (Ref. 3)) or Fabricator Verification Level (FVL) (Refer to Section 4.4). This might include certification credentials of the steel manufacturer, accreditation credentials of the conformity assessment body (CAB) certifying the steel manufacturer and accreditation credentials of the CAB certifying the steelwork fabricator, as appropriate
    b. Mill or test certificates from the steel manufacturer
    c. Evidence of marking and identification to verify traceability (refer Section 4.5)
    d. Test reports or test certificates where performance verification is required
    e. Assessment report where test reports or test certificates are used with an assessment method to verify product performance
7. The declaration must be signed and dated by a party authorised to make the declaration on behalf of the company.

SUPPLIER DECLARATION OF CONFORMITY

SDoC Number:

1. Company Details:
(including Corporate address and street address where product manufactured, if applicable)

2. Unique product identification:
Name:
Unique identification code:

3. Standard(s) to which conformity declared:

4. Intended use:

5. Evidence of conformity:
Manufacturer verification level:
Mill certificates:
Marking & identification:
Test reports/test certificates:
Assessment reports:

Declaration:
I hereby declare that the product noted at item 2 complies with the Standards noted at item 3 based on the evidence of compliance noted at item 4
Name: Signed: Date:
Position:

Figure E.1 Typical Form of SDoC

E.4 Manufacturer Test or Inspection Certificates as an SDoC

A typical test or inspection certificate issued by an Australian steel manufacturer and including all of the information required by the applicable Australian steel product Standard contains all of the information required of an SDoC and therefore meets the performance intent of an SDoC. Therefore, a test or inspection certificate from an Australian steel manufacturer should be accepted as an SDoC from that steel manufacturer.

In the case of a test or inspection certificate issued by an overseas steel manufacturer, there is no direct link to an Australian based entity and therefore the test or inspection certificate cannot in itself be considered as complying with the requirements for an SDoC. A separate SDoC referencing the test or inspection certificate must be completed and signed by the Australian-based party importing the steel product.

APPENDIX F

CONFORMITY ASSESSMENT PATHWAY SELECTION

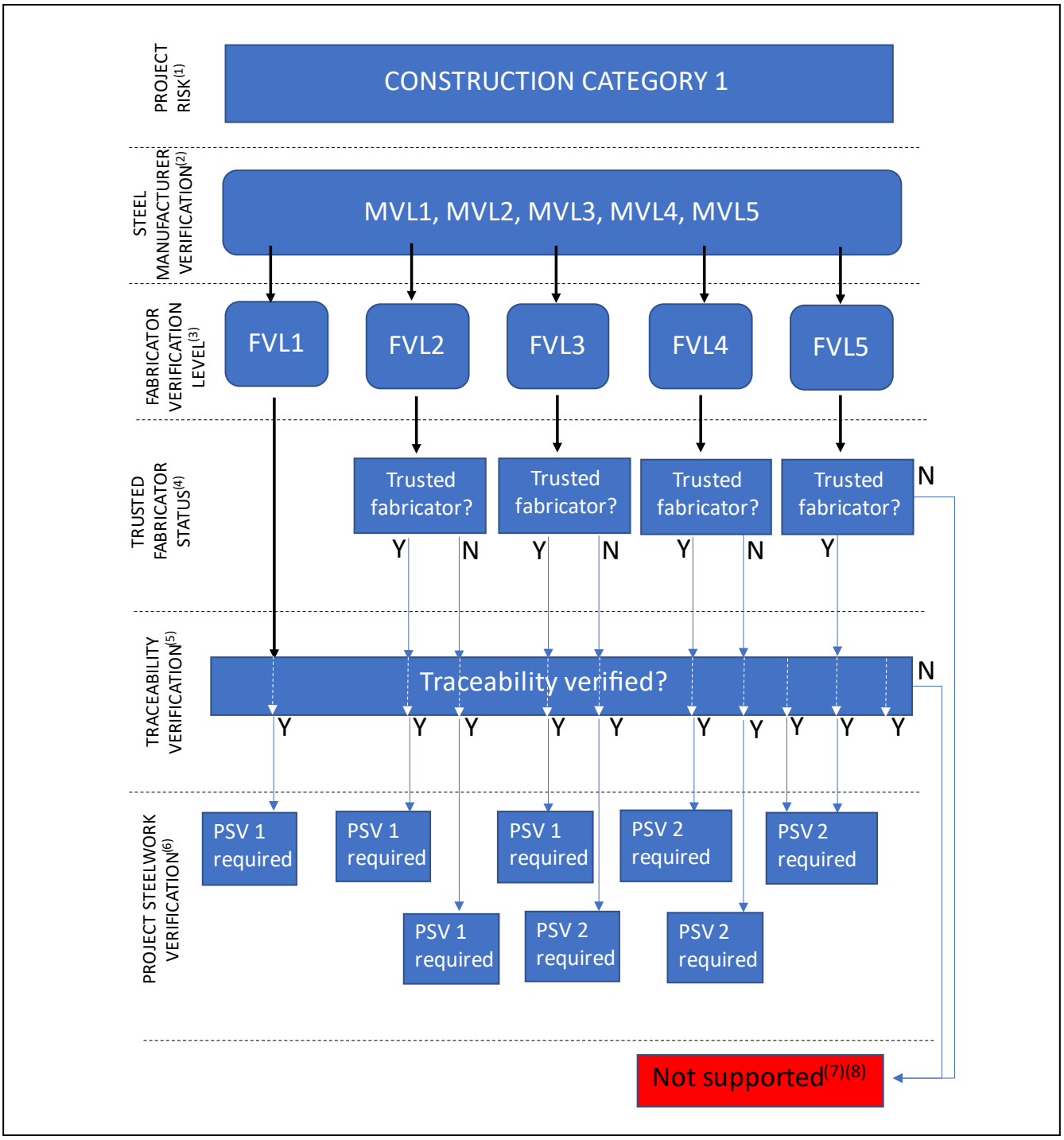
F.1 Context

The conformity assessment pathways detailed in subsequent sections have been configured as a function of the Construction Category (CC) assessed for the project based on AS 4100:2020 and identically in AS/NZS 5131:2020. Construction Categories from CC1 to CC4 are defined, from least to most risk. The designer is required to assess the Construction Category for the structure or part of the structure.

Fabrication and erection requirements for CC1 to CC3 are defined in AS/NZS 5131, including for material identification, traceability, fabrication and conformity. CC4 represents projects that are of national significance or present very high risk or consequence of failure and whose requirements are greater or additional to those for CC3 but cannot be pre-defined.

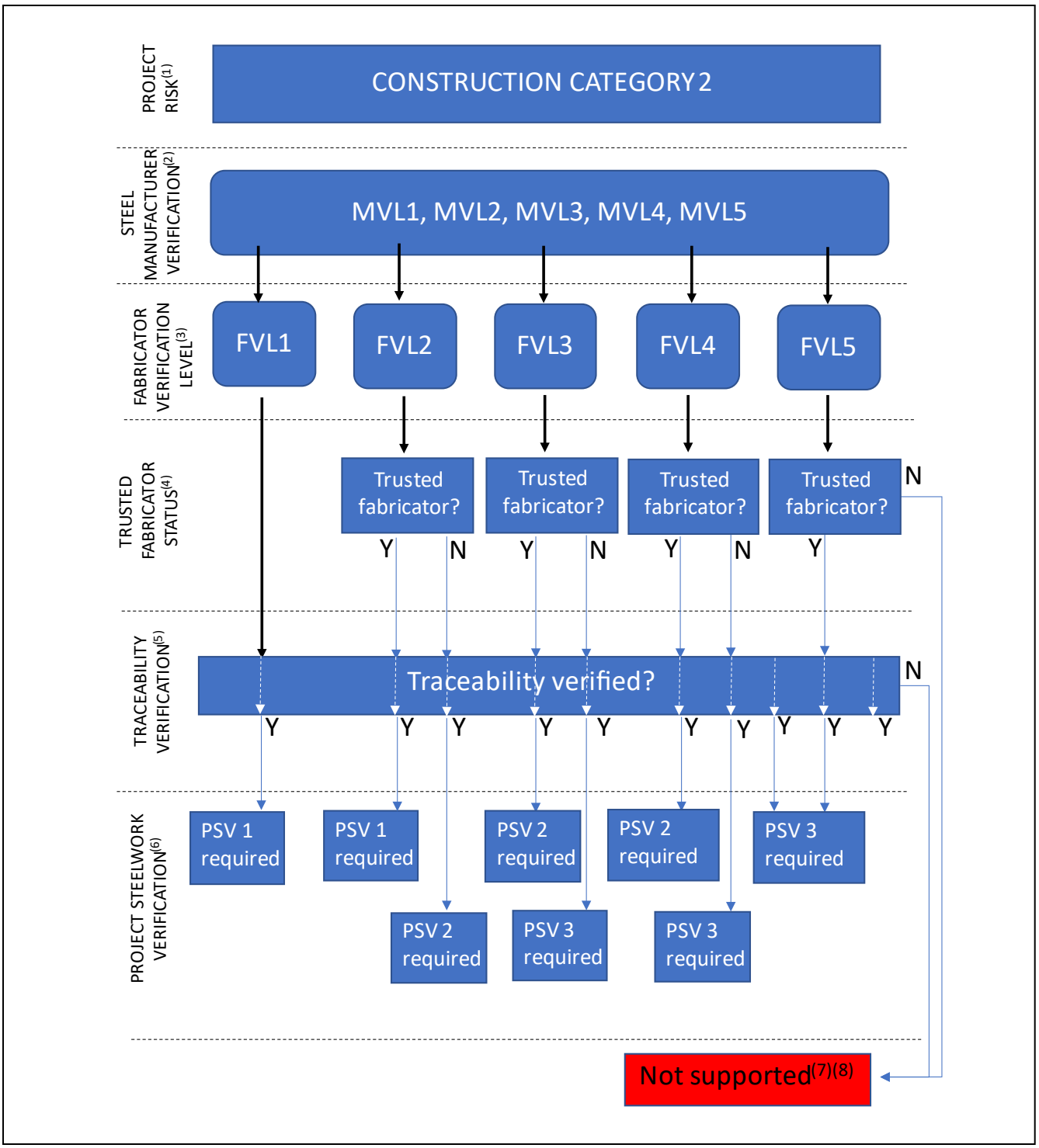
The requirements for CC4 above and beyond CC3 must be defined for the specific project. Consequently, the conformity assessment pathway for CC4 cannot be pre-defined, excepting to note that it should be at least as rigorous as CC3.

F.2 Construction Category 1



For notes, refer to Section F.5.

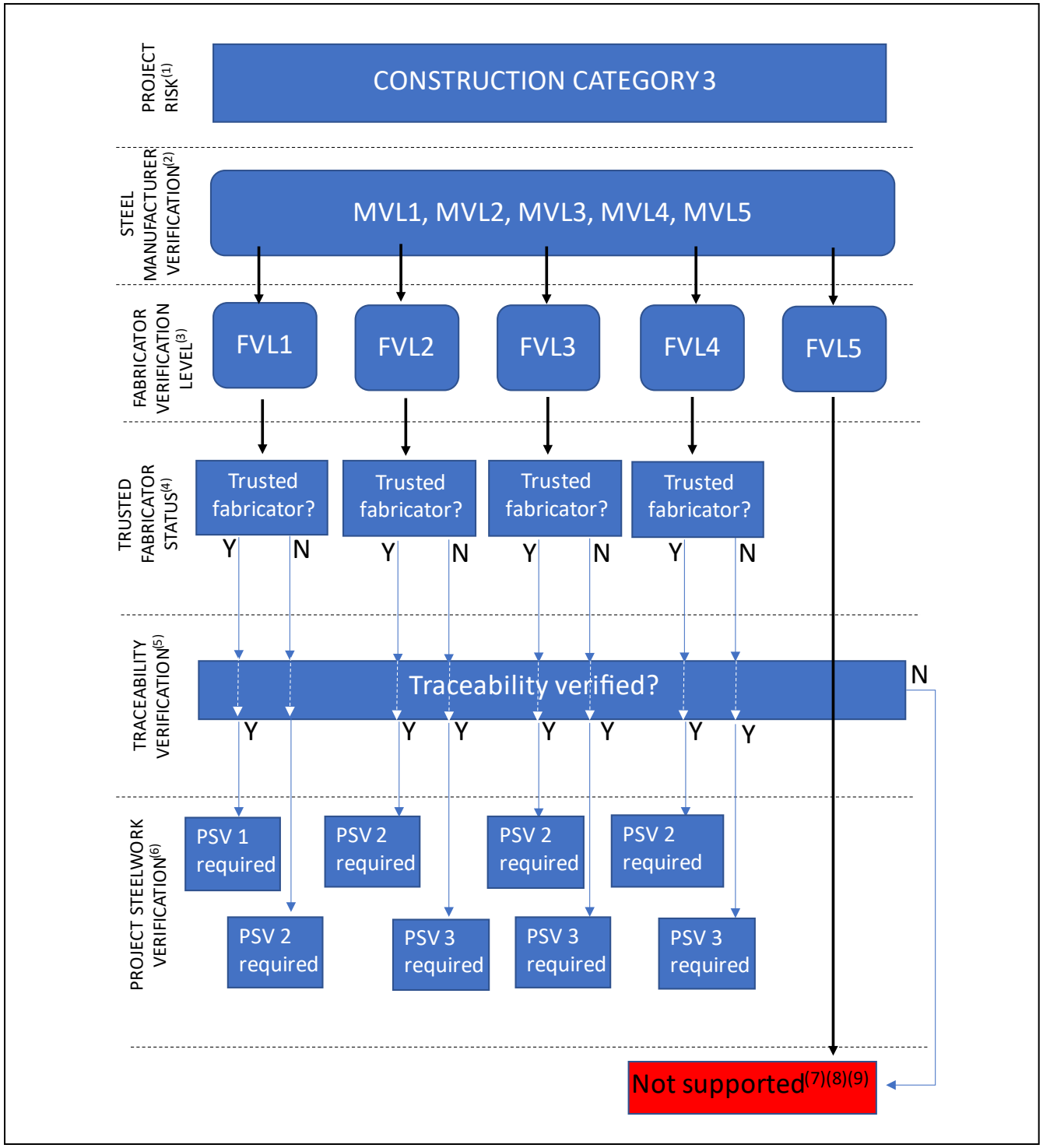
F.3 Construction Category 2



For notes, refer to Section F.5

F.4 Construction Category 3 (and CC4 as Noted)

Note: This may also be applied to Construction Category 4. Refer to Section F.5 for further detail.



For notes, refer to Section F.5.

F.5 Notes

(1) Refer to Section 4.10 for details of assessment of project (construction) risk.
(2) The Steel Manufacturer Verification Level (MVL) is outlined in ASI Technical Note TN015 and is one component of the protocol for ascertaining the compliance of the structural steel the fabricator procures for the project. This current Technical Note is based on the requirement that the steel sourced has been subjected to the protocol outlined in Technical Note TN015.
(3) Refer to Section 4.4 for details of the assessment of the fabricator verification level (FVL)
(4) Refer to Section 4.6 for a discussion on Trusted Fabricator Status
(5) Refer to Section 4.5 for details of traceability verification. For the case of a certified fabricator, traceability verification should be trivial. Where the fabricator is not certified, traceability verification must be completed, otherwise there is no verified link between the material provided, the documentation or manufacturer and the fabricated assemblies.
(6) Refer to Section 4.7 for details of project steelwork verification.
(7) Where there is no verified traceability between the fabricated assemblies and the material supplied, it is not possible to establish compliance of the fabricated assemblies and therefore this option is not supported
(8) The risk associated with an FVL5 fabricator who is not a trusted fabricator is substantial. This option is therefore not supported
(9) FLV 5 fabricators are not supported for CC3 structures. The risk associated with CC3 structures requires a fabricator who has experience with fabrication to AS/NZS 5131 and, preferably, has been independently certified
(10) The conformity assessment pathway selection for CC3 may be applied to CC4 with consideration as to whether any project-specific additional requirements are necessary. CC4 is for special purpose structures where the requirements are at least at the level of CC3 if not greater, but any requirements over and above CC3 are based on the specific project, and are usually defined in the construction specification.

APPENDIX G

STATE-BASED REFERENCES TO NCBP ACTIONS AND CERTIFICATION REQUIREMENTS

G.1 Context

Issues with non-compliant building products and the pressure on building regulation to address very public instances of building and structure failure (of various forms) has resulted in a number of state and federal working groups and reports to understand and ultimately address the root causes.

Currently, all states are addressing the recommendations from the Shergold Weir Report 'Building Confidence' (Ref. 32), which the Building Ministers Forum commissioned in mid-2017 as an assessment of the effectiveness of the compliance and enforcement systems for the building and construction industries across Australia, a response to a number of significant and publicly documented failures in structures to that date (and subsequently).

Of the 24 recommendations in that report, a number are relevant to the responsibilities of stakeholders outlined in this current discussion:

- **Recommendation 13:** That each jurisdiction requires building approval documentation to be prepared by appropriate categories of registered practitioners, demonstrating that the proposed building complies with the National Construction Code.
- **Recommendation 14:** That each jurisdiction sets out the information which must be included in performance solutions, specifying in occupancy certificates the circumstances in which performance solutions have been used and for what purpose.
- **Recommendation 15:** That each jurisdiction provides a transparent and robust process for the approval of performance solutions for constructed building work.
- **Recommendation 17:** That each jurisdiction requires genuine independent third-party review for specified components of designs and/ or certain types of buildings.
- **Recommendation 21:** That the Building Ministers' Forum agrees its position on the establishment of a compulsory product certification system for high-risk building products.

The list of actions following are non-exhaustive and predominantly focus on those resulting from the Shergold Weir Report where available.

The Association of Consulting Architects Australia (ACA) provides a summary of implementation plans for Shergold Weir Report recommendations in each state (Ref. 33).

More specifically, as regards structural steelwork, a number of state authorities have also mandated requirements for certifications as regards fabricated structural steelwork. The following sections include reference to these requirements known at the time of publication of this Technical Note.

G.2 Construction Risk

Procurement of non-compliant materials, components and fabricated assemblies represents a clear and present risk to the construction phase on any building project and has been unequivocally recognised for many years (Ref. 34). Quantifying that risk for the purposes of putting in place a risk-based approach to cost-effectively minimising risk is a work in progress in Australia, in particular incentivised by the recommendations of the Shergold Weir Report into a number of significant building failures. Currently the ABCB and every State regulator has processes in place to operationalise the Shergold Weir recommendations.

At the time of publication of this Technical Note, and in partial response to the Shergold Weir recommendations, the ABCB are developing a classification of buildings by '*building complexity*', which means "those attributes that are complicated or organisational, which increase the

likelihood of non-compliance in a situation where the safety and/or health consequences of that non-compliance would be significant". There are six complexity levels from 0 to 5 corresponding to increasing complexity from 0.

The building complexity categorisation is inherently intended to support currently evolving approaches to risk-based inspection schedules and other yet undefined components of ensuring a compliant solution. The building complexity categorisation may well become a future component of the steelwork verification protocol outlined in this Technical Note.

G.3 References to New South Wales NCBP Actions and certification requirements

The NSW Government has and is addressing the recommendations of the Shergold Weir Report with a number of initiatives, summarised on the NSW Fair Trading website (Ref. 35).

The NSW Government enacted the 'Design and Building Practitioners Act 2020 (NSW)' (Ref. 36) on 11th June 2020. A prominent feature of the Act is the establishment of a new, non-delegable statutory duty of care that will be owed to building owners by builders, designers, product manufacturers, suppliers and supervisors and the prohibition against such duty being contracted out by parties to a construction contract. The Act also imposes a regime requiring design and building practitioners to provide design compliance declarations and building compliance declarations in respect of compliance with requirements of the NCC and other applicable requirements. Both 'registered design practitioners' and 'registered principal design practitioners' are recognised in the Act with specific responsibilities. Unregistered design practitioners cannot provide declarations.

The NSW Government has also enacted the 'Building Legislation Amendment Bill 2023' (NSW) (Ref. 45) which amends several Acts to expand the powers of the Building Commissioner. One of the goals of the Bill is to create accountability in the building products supply chain by:

- creating a "chain of responsibility" for building products and clarify the duties owed by each person in the chain;
- enhancing the powers of the Secretary to identify and intervene in the use of non-conforming building products; and
- creating new executive liability offences for directors and individuals in management positions in respect of building product safety risks.

G.4 References to Victorian NCBP Actions and certification requirements

The Victorian Government commissioned a review of Victoria's Building System (Ref. 37) and has enacted the 'Building Legislation Amendment Bill 2023' (Vic) (Ref. 46) which introduces a 'Building Monitor', the 'State Building Surveyor', expanded building industry registration requirements, updated governance requirements for the Architects Registration Board of Victoria, strengthened information sharing and a new requirement for a 'Building Manual'.

The Victorian Government has also enacted, through the Victorian Building Authority (VBA), a new Code of Conduct for Building Surveyors (Ref. 38) as a direct response to one of the recommendations of the Shergold Weir Report.

In respect of certification requirements:

- Vic Roads / Victoria Dept of Transport & Planning – Standard Specification 630 Fabrication of Steelwork (Ref. 47) includes mandatory requirements relating to prequalification in which as of the 1 January 2024, the Fabricator shall be certified as conforming to Construction Category CC2, CC3 or CC4 of AS/NZS 5131, as applicable to the works or to parts of the works. The certification of Construction Category applies to those Sections of AS/NZS 5131 that are applicable to the work carried out by the Fabricator.

G.5 References to Queensland NCBP Actions and certification requirements

The Queensland Government has introduced a number of reforms, including:

- Strengthening the professional indemnity insurance environment for building industry professionals, with amendments to the requirements for professional indemnity insurance (Ref. 39)
- The Department of Housing, Local Government, Planning and Public Works has issued a Building Plan (Ref. 40) with action items to help address recommendations of the Shergold Weir Report.
- 'Building and Construction Legislation (Non-conforming Building Products – Chain of Responsibility and other matters) Amendment Act 2017' (Ref. 27). This legislation is enforced by the Queensland Building and Construction Commission (QBCC) - https://www.qbcc.qld.gov.au/worksite-building-practice/non-conforming-building-products

G.6 References to South Australian NCBP Actions and certification requirements

The South Australian Government has implemented building reforms under their 'Planning, Development and Infrastructure Act 2016' (Ref. 41). In respect of addressing Shergold Weir Report recommendations, the 'Planning, Development and Infrastructure (Accredited professionals) Regulations 2019 (Ref. 42), which sit under the Act, address the registration and professional development recommendations in Shergold Weir.

In respect of certification requirements:

- The ***Master Specification - ST-SS-S1 Fabrication of Structural Steelwork*** (Ref. 48) must be followed. Page 5, Section 2 states: "*The fabricating structural steelwork for SA Government projects shall be certified in the appropriate category under the National Structural Steelwork Compliance Scheme (NSSCS).*" Please see ***ST-SS-S1 Fabrication of Structural Steelwork*** document: https://www.dit.sa.gov.au/contractor_documents/masterspecifications/Structures
- The *South Australia Industry Participation Policy (SAIPP)* (Ref. 49) must be followed. On Page 9, Section 5.2, the following is stated: "*Steelwork fabricators must be certified to the relevant Construction Category in accordance with the National Structural Steelwork Compliance Scheme (refer http://www.scacompliance.com.au) in accordance with the Fabricator Code of Practice. Contractors must retain records to provide evidence that the fabrication of steelwork has been undertaken by a company certified to the required Construction Category and must make such records available to the Office of the Industry Advocate for review, upon request.*"

G.7 References to Western Australian NCBP Actions and certification requirements

The Western Australian Government Department of Energy, Mines, Industry Regulation and Safety has implemented a range of reviews of building legislation (Ref. 43), including for registration of engineers, building and construction industry (Security of payment) Regulation, registration of builders, approval processes for commercial buildings and single residential buildings and building surveyors code of conduct.