SCNZ STEEL CONSTRUCTION NEW ZEALAND

Compliance Checklists

Recommended for Structural Steelwork to AS/NZS 5131

Introduction

This fact sheet features recommended checklists to assist engineers to establish the compliance of structural steelwork manufactured to AS/NZS 5131 (SA/SNZ, 2016b). The checklists may also be of interest to Building Consent Officials, providing an idea of the type of documents engineers should routinely be reviewing as part of their construction reviewer role.

AS/NZS 5131 specifies minimum requirements for the fabrication and erection of steelwork. An overview of this standard is provided in SCNZ fact sheet FS3 - AS/NZS 5131:2016 Fabrication and Erection of Steel Structures Standard (SCNZ, 2018a), available from the SCNZ website.

Part One: Background and Rationale

AS/NZS 5131 QUALITY MANAGEMENT REQUIREMENTS

The primary technique for managing the quality of structural steelwork is factory production control (FPC), which can be implemented in isolation or as part of an overall quality management system (QMS) operated by a structural steel contractor. AS/NZS 5131 adopts the latter approach. As such, all operations must be managed under a QMS in conjunction with FPC.

The ISO 9000 series of quality management standards includes the concept of a special process for any work where the final quality of the product cannot be verified by inspection only, such as steelmaking and welding (Karpenko, 2016). In such situations, a documented quality system is required to control the variables that could affect the quality of manufactured products. Documented quality systems are known as an FPC system (BSI, n.d.).

FPC is defined as operational techniques and all measures necessary to regulate and maintain the conformity of a product to the required standard (SA/SNZ, 2016a). The key elements of FPC include procedures, competent personnel, and inspection and testing supported by fit-for-purpose equipment.

QMSs such as ISO 9001 (ISO, 2015) do not include specific requirements for products (Smallbone, 2007), therefore, the QMS of a structural steel contractor must also include the FPC requirements of AS/NZS 5131. Conformity with these requirements is best established by expert third-party audit and certification under the SCNZ Steel Fabrication Certification scheme audited by HERA Certification. Visit steelfabcert.co.nz for more information.

PRODUCTION PLANNING
One of the FPC requirements of AS/NZS 5131 is production planning. The purpose of this is twofold: first, to establish the technical requirements of the project and, second, to map out how the structural steel contractor will execute their processes in accordance with the Standard and how they will establish conformity of materials and workmanship.

Production planning should be documented in a project-specific quality plan that addresses the following:

1. Allocation of tasks to appropriately qualified staff.
2. Work method statements, including welding procedures.
3. Material requirements, including grade and sizes (structural steels, fasteners and welding consumables).
4. Workmanship standards (e.g. weld defect levels for the appropriate weld quality category, tolerances).
5. Inspection and testing requirements applicable to each process.
6. Management of non-conformances and documentation to ensure only the latest revisions are used.

Items four and five are included in the project inspection and test plan (ITP). The complete list of quality plan requirements are specified in the Standard.

Quality plans are not mandatory for construction category 2 (CC2) projects. It is recommended these are specified for all but simple small-scale CC2 projects (e.g. residential houses).

QUALITY RECORDS
The operation of the structural steel contractor's QMS and quality plan will generate quality records in the form of inspection documents (material test certificates, test reports and product certificates), checklists and inspection reports. These documents provide evidence that the fabricator has followed their QMS and quality plan, and that materials and workmanship are to the required standard.

BASIS FOR COMPLIANCE CHECKLISTS
The compliance checklists reference the following SCNZ documents:

1. New Zealand Structural Steelwork Specification in Compliance with AS/NZS 5131 (NZSSS) (SCNZ, 2018b).
2. New Zealand Guide to the Sourcing of Compliant Structural Steels (Fussell et al., 2018).
3. Practice Note on the Sourcing of Compliant High Strength Structural Bolts (Cowie et al., 2018).
4. Practice Note on the Sourcing of Threaded Rod for Foundation Bolts (Cowie & Fussell, 2018).

These documents have been developed to assist engineers specify structural steelwork in accordance with AS/NZS 5131, and to manage the quality of materials and workmanship. Presented in Tables 1 to 3, the checklists assume the quality management practice recommended in these documents has been specified by the engineer in the contract specification.

Part Two: Compliance Checklists

Checklists have been prepared to specify the types of documentation necessary to claim compliance with the material and workmanship requirements of AS/NZS 5131 and the relevant product standards. Many quality records can be generated for even moderate-sized projects. So it's recommended that the construction reviewer focuses on key items, including materials, welding and coatings.

AS/NZS 5131 features a risk-based categorisation of the structure, or elements of the structure, into one of four categories, CC1-CC4. The CC2 quality management requirements are considered overly onerous for simple, small projects such as residential houses. Recommended compliance checklists have, therefore, been prepared for CC2 simple, CC2 standard and CC3 projects.

Table 1: *Recommended CC2 Compliance Checklist – Simple*

Item	Check	Normative reference	Documentation required to claim compliance
Materials			
1	Is the steel certified under a recognised product certification scheme e.g. ACRS, BSI[1]?	Contract documents	Valid product certificate/s
2	Do all construction materials comply with specified grades and section designations?	AS/NZS 5131, Section 13.3; contract documents	Material test certificate/s
3	Has the material been supplied with test reports or test certificates prepared by a laboratory accredited by signatories to the International Laboratory Accreditation Cooperation (ILAC) Mutual Recognition Agreement (MRA) on behalf of the manufacturer?	Material supply standard	Material test certificate/s

Welding (non-SFC-qualified structural steel contractor)[2]			
4	Has the fabricator qualified their welding procedures prior to welding?	AS/NZS 5131, Section 7.4.1	Procedure qualification record/s (PQR) or welding procedure specification/s (WPS)
5	Are welders suitably qualified to carry out tasks according to welding procedures?	AS/NZS 1554.1, Section 4.12; AS/NZS 5131, Section 7.4.2	Welder/welding operator qualification certificate/s
6[4]	Has welding been carried out under the supervision of a welding supervisor qualified in accordance with Clause 4.12.1 of AS/NZS 1554.1[3]?	AS/NZS 5131, Section 7.4.3; AS/NZS 1554.1, Section 4.12.1	Welding coordination personnel qualification record/s
Welding (structural steel contractor certified under SFC)			
7	Does the structural steel contractor comply with construction category requirements of the SFC scheme?	SFC Implementation Rules	Valid SFC certificate
Welding inspection			
8	Has inspection been carried out in accordance with AS/NZS 1554?	AS/NZS 1554.1, Section 7	Inspection report/s
9	Are visual welding inspection personnel properly qualified?	AS/NZS 1554.1, Section 7.2; AS/NZS 5131, Clause 13.6.1.3	Welding inspection personnel qualification record/s
10	Are non-destructive examination personnel properly qualified?	AS/NZS 1554.1, Section 7.4; AS/NZS 5131, Clause 13.6.1.3	NDT personnel qualification record/s
11	Do final inspection reports exist stating that inspected welds comply with the permissible level of imperfections of GP or SP weld as applicable?	AS/NZS 1554.1, Section 6	Final inspection report/s

Notes.
1. The range of product typically used in small, simple projects will meet this requirement.
2. If the engineer lacks the technical expertise to assess compliance with items 4 to 6, they could require the fabricator or builder to engage a qualified independent welding inspector to review the personnel and weld procedure documentation.
3. The engineer may allow the fabricator to contract an independent, qualified welding inspector to supervise and inspect the work if they lack a suitably qualified person to supervise the work. This approach is appropriate for simple, small-scale projects.
4. Documents related to items 1-7 should be submitted prior to fabrication commencing.

Table 2: *Recommended CC2 Compliance Checklist – Standard*

Item	Check	Normative reference[1]	Documentation required to claim compliance
QMS and FPC			
1	Does the structural steel contractor have a QMS and FPC system that meets the requirements of AS/NZS 5131 for the appropriate construction category[2]?	AS/NZS 5131, clauses 5.1.2, 6.1.2, 7.1.1, 8.1.2, 9.2.1, 11.2.2	SFC-qualified structural steel contractor Valid SFC certificate
			Non-SFC-qualified structural steel contractor Quality manual, quality plan

Quality plan[3]			
2	Does the project quality plan comply with AS/NZS 5131?	AS/NZS 5131, Clause 4.5.2	Quality plan
3	Are key supervision personnel appropriately qualified?	Welding coordination: AS/NZS 5131, Clause 7.4.3	Qualification and work record/s
		Fabrication: AS/NZS 5131, Clause 6.12	Qualification and work record/s
		Coatings: AS/NZS 5131, Clause 9.9.20	Qualification and work record/s
4	Are key inspection personnel appropriately qualified[4]?	Welding visual examination: AS/NZS 5131, Clause 13.6.1.3	Qualification record/s
		Welding non-visual examination: AS/NZS 5131, Clause 13.6.1.3	Qualification record/s
		Coatings: NZSSS, Clause 13.3.1.1	Qualification record/s
5	Have welders been suitably qualified to carry out tasks according to welding procedures?	AS/NZS 1554.1, Section 4.12; AS/NZS 5131, Section 7.4.2	Welder/welding operator qualification certificate/s
6	Has the fabricator qualified welding procedures prior to welding?	AS/NZS 5131, Section 7.4.1	Procedure qualification record/s (PQR) or welding procedure specification/s (WPS)
ITP[4]			
7	Does the ITP cover all the operations specified in AS/NZS 5131?	AS/NZS 5131, Section 13	ITP
8	Does the ITP specify the correct steel grades and is there the required evidence to demonstrate product compliance in accordance with the NZ Guide to the Sourcing of Compliant Structural Steels?	Contract documents and the New Zealand Guide to the Sourcing of Compliant Structural Steels	ITP
9	Does the ITP specify the requirements of Steel Advisors Mat 1010 and 1011 for demonstrating conformity of the PC 8.8 fasteners and anchor bolts[5]?	Steel Advisor Mat 1010 and Mat 1011	ITP
10	Does the ITP specify the appropriate weld consumables and the weld acceptance criteria for the weld quality category specified by the engineer?	PQR or WPS; AS/NZS 1554.1, Clause 6.2	ITP

11	Does the weld sampling rate for visual and non-visual examination meet the requirements of the engineer's specification?	Contract specification	ITP
Quality records[6,7]			
12	Is each stage of work signed off on the ITP?	AS/NZS 5131, Section 13	ITP
13	Is there a check sheet or inspection report for each operation?	AS/NZS 5131, Section 13	Completed checklists and final inspection reports
Materials			
14	Are there material traceability records for the structural sections and plate?	AS/NZS 5131, Clause 5.2.3	Traceability records
15	Have steels been sourced in accordance with the NZ Guide to the Sourcing of Compliant Structural Steels?	New Zealand Guide to the Sourcing of Compliant Structural Steels	Material test certificate/s, valid product or FPC certificate/s, test report/s, supplier declaration of conformity
16	Do all construction materials comply with specified grades and section designations, and are records available?	AS/NZS 5131, Section 13.3	Material test certificate/s
17	Has the material been supplied with test reports or test certificates prepared by a laboratory accredited by signatories to the ILAC MRA on behalf of the manufacturer?	Material supply standard	Material test certificate/s
18	Has the correct welding consumable been used?	PQR or WPS	Material test certificate/s
19	Have the bolts and anchor bolts been sourced in accordance with MAT 1011 and Mat 1011, respectively (if specified in contract specification)?	Steel Advisor Mat 1010 and Mat 1011	Material test certificate/s, test report/s, supplier declaration of conformity
Welding			
20	Has inspection been carried out in accordance with the AS/NZS 1554?	AS/NZS 1554.1, Section 7	Inspection report/s
21	Do final inspection reports exist, stating that inspected welds comply with the permissible level of imperfections of GP or SP weld as applicable?	AS/NZS 1554.1, Section 6	Final inspection report/s
Coating			
22	Has the correct coating system been applied?	Contract specification	Final inspection report/s
23	Are there surface preparation records?	AS/NZS 5131, Clause 13.8	Final inspection report/s
24	Are there records of coating application and thickness?	AS/NZS 5131, Clause 13.9	Final inspection report/s

Bolting			
25	Have the bolts been installed correctly?	Contract documents; AS/NZS 5131 clauses 8.3, 8.5 and 8.8	Final inspection report/s

Notes.
1. Some of the referenced AS/NZS 5131 requirements are construction category specific e.g. traceability requirements.
2. AS/NZS 5131:2016 recommends that the structural steel contractor's weld QMS complies with the appropriate AS/NZS ISO 3834 (ISO, 2005) weld quality level requirements (standard: CC2; comprehensive: CC3). The 2020 revision mandates that the fabricator's welding QMS complies with AS/NZS ISO 3834. Until this new revision is cited as a means of establishing compliance with the Building Code, it is recommended that engineers mandate the structural steel contractor's weld QMS complies with AS/NZS ISO 3834.
3. It is recommended engineers only review quality plans for CC2 standard and CC3 projects involving non-SFC-qualified structural steel contractors as the SFC audit requirements address many of the AS/NZS 5131 quality plan provisions. In some instances, a building consent condition will require the engineer to review the quality plan for a high-risk project regardless of the structural steel contractor's qualifications.
4. AS/NZS 5131 does not address the independence of inspections i.e. who should undertake them. A risk-based approach to specifying the independence of inspections is presented in SCNZ document NZSSS.
5. Verification testing of pc 8.8 structural fasteners and anchor bolts is recommended for critical connections. A critical connection is defined as one in which the bolts are highly stressed (high utilisation ratio), and the consequences of failure is high.
6. The NZSSS document specifies the construction category specific documentation the structural steel contractor is required to submit to the construction reviewer.
7. Quality records are also known as manufacturer data records.

Table 3: *Recommended CC3 Compliance Checklist*

Item	Check	Normative reference	Documentation required to claim compliance
1-25	Refer Table 2	Refer Table 2	Refer Table 2
Quality records			
26	Welder and weld procedure traceability to welds	AS/NZS 5131, clauses 7.4.1.2 and 7.4.2	Welder and weld procedure traceability records

Note. Some of the AS/NZS 5131 requirements referenced in Table 2 are more onerous for CC3 projects compared to those for CC2 projects.

THE ROLE OF THE CONSTRUCTION REVIEWER

In addition to reviewing key structural steel contractor documents, it is also recommended the construction reviewer undertakes periodic workshop inspections to observe first-hand that the fabricator is operating their QMS and FPC system for high-risk projects.

WHERE TO GET HELP

If the construction reviewer requires assistance to review the compliance checklist documentation, the following options are recommended:

1. Contract specialist expertise (fabrication or weld inspection company)
2. Consult the SCNZ Compliance Toolbox Fact Sheet, FS6 (SCNZ, 2019), available for download from the SCNZ website.

DOCUMENT CONTROL

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SCNZ STEEL CONSTRUCTION NEW ZEALAND

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