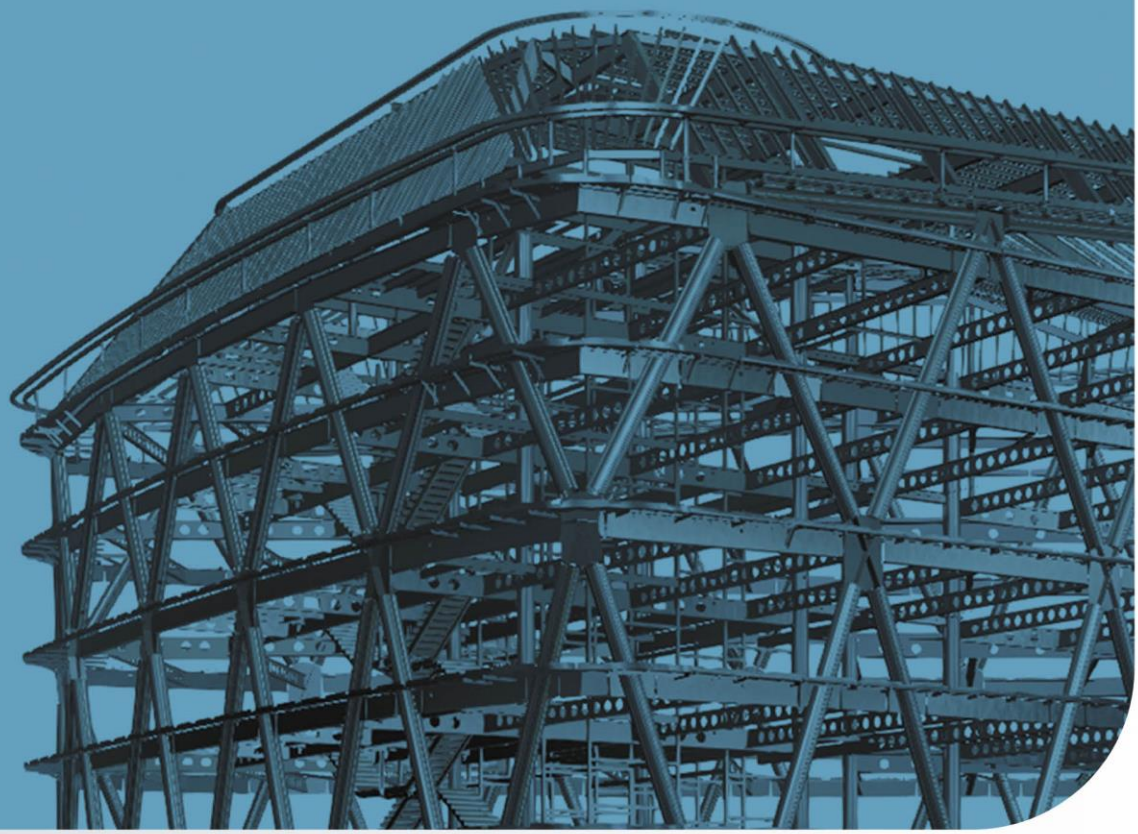
REPORT NO : SCNZ 12 : 2022

SteelDoc

CODE OF PRACTICE FOR STRUCTURAL STEELWORK DOCUMENTATION INCORPORATING STEELDOC CHECKLISTS



SCNZ® STEEL CONSTRUCTION NEW ZEALAND

STEELDOC
Code of Practice
for
Structural Steelwork Documentation

SCNZ-12: 2022

March 2022

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Steel Construction New Zealand Inc. (SCNZ) is a member-based, not-for-profit society incorporated under the Incorporated Societies Act 1908.

SCNZ has three key objectives, to:

- Promote awareness of the advantages of steel construction
- Foster excellence in the delivery of steel construction solutions
- Encourage training and career development within the steel construction sector

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Document Control

Revision History			
Revision	**Date**	**Description**	**Prepared by**
	March 2002	Report published	CH/WC
Rev 1	November 2006	Companion checklist software released	CH/AJF/XH
Rev 2	March 2022	Report updated for current practice and standards. Companion checklist document in editable Word document format published.	AJF/KC

Table of Contents

1.0 Preface

The use of structural steelwork in construction in New Zealand is rapidly increasing. Successful steel construction is an exercise in teamwork; therefore, effective and clear communication is the foundation of confidence and achievement. In steel construction, contract drawings and specifications are the primary medium of project communication. Therefore, the quality of their definition, clarity of their presentation, and conciseness of their content will largely determine the economic and technical success of the steel construction project.

The purpose of *SteelDoc: Code of Practice for Structural Steelwork Documentation (SteelDoc)* is to clearly identify what the contract documents, particularly drawings, should contain to for the steel constructor to efficiently prepare shop drawings and to minimise rework and costly delays. As with any Code of Practice, the aim is to set minimum performance criteria that are readily achievable and reflect common industry practice. It is anticipated that practitioners will quickly exceed these criteria and set their own levels of best practice for others to aspire to.

SteelDoc may be used in conjunction with industry consultant engagement documents such as the Construction Industry Council (CIC) Guidelines to allow clients to simply and easily communicate the level of service they require from their structural engineering consultant in a request for proposal. The document may be used by design engineers to promote the level of service they offer, including the tangible value this brings to their clients. The checklists can be integrated into the structural engineer's quality assurance system to help manage the quality of their work. They may also be used by steel constructors to manage tender risk.

The recommendations and checklists contained in *SteelDoc*, have been collated following wide consultation with and feedback from New Zealand steel fabricators and detailers. Valuable input from consulting engineers and construction companies has also been appreciated. Editable checklists in a Word document format are available in a companion document.

In this revision, *SteelDoc* has been updated to align its requirements with current practice and standards.

2.0 Introduction

Fabricated structural steelwork is a value-added product. Skilled design, management, labour, and machine time are added to the raw material of steel plate and sections to produce a highly versatile, customised building product. A small number of generic connection types are used for the vast majority of steelwork fabrication. By using pre-engineered standardised connections, the structural engineer can minimise design time and optimise fabrication cost. Design expertise can then be devoted to solving the non-standard connection configurations. This enables the contractor to develop efficient practices for manufacturing standardised connections.

The contract documents are the primary method of communicating construction performance requirements. Contract documents which are complex and time consuming to interpret due to being incomplete, ambiguous, or poorly presented often result in additional cost, re-work, and delays.

There is a quantifiable amount of detail and work required between conceptual design and the completion of shop drawings involving architects, engineers, project managers, the fabricator, and the shop detailer. Steel construction requires good up-front planning as most of the steelwork is prefabricated quickly off-site. It is therefore in everyone's interest that tasks and responsibilities in the documentation process are clearly defined early in the project. Where possible, these should follow commonly held conventions to minimise confusion and maximise efficiency. Oversights will occur even with the best intentions and efforts; however, good documentation practice will minimise the frequency and severity of negative effects on the contract works.

Presentation styles and extent of contract documentation vary from consultant to consultant and between geographical locations. They also vary according to the size and complexity of the project, so there is no universally recognised style or layout of drawings. However, there is a minimum amount of information that must be present on the drawings and in the specification for the contract to run smoothly.

Clear, complete, and unambiguous contract documents encourage:

- Achievement of construction programmes
- Minimisation of errors and omissions
- More knowledgeable and competitive bids
- Avoidance of duplication of effort
- Lower material supply costs
- Clearly defined responsibilities
- Minimisation of field errors
- Reduction in revision costs and delays
- Elimination of costly start-ups, Requests For Information (RFI's), clarification, and verification.
- Reduction in demobilisation and remobilisation
- Increased morale among suppliers

3.0 SteelDoc's Relationship to the CIC Guidelines

The CIC Guidelines were developed by the Construction Industry Council in 2003 in response to growing concern over the impact of poor documentation on the building industry (CIC, 2016). The Guidelines, which are intended to apply to all parties involved in a building project, define and communicate the:

- responsibilities and deliverables at all stages of the project and the scope of services each party provides to the client and
- the interactions and coordination required between all parties (CIC, 2016).

The responsibilities and deliverables for each party at the various stages of the project are communicated in a series of checklists. These checklists include limited general guidance about the type of information required in the project structural drawings and specifications. One matter which is not addressed in the CIC Guidelines is the level of information required in the structural steelwork design documentation for the contract to run smoothly. SteelDoc may be used in conjunction with the CIC Guidelines to address this deficiency, refer Section 4.1.

4.0 Why Use SteelDoc?

The use of SteelDoc brings value to many parties in the structural steelwork procurement process.

4.1 Ensuring Better Service from Structural Consultants

SteelDoc defines good practice for structural steelwork design documentation. It may, therefore, be referenced in requests for proposal for structural engineering services as a simple and clear means of communicating the level of service required. This will minimise the risk of delays and cost escalations due to poor quality structural steelwork design documentation.

4.2 Promoting the Level of Service Offered

It is widely recognised that engineers with a reputation for excellence in design documentation will generally attract better tender prices to project for their clients. This value is often overlooked by cost-focused clients. Engineering consultants who have embedded the SteelDoc checklists into their quality management system are able to promote the tangible benefit this brings to clients in their fee proposals.

4.3 Managing Quality

Design engineers will typically operate some form of system to manage the quality of their work. These systems include procedures and checklists for key tasks. The SteelDoc requirements can be integrated into the consultant's checklists to ensure that the appropriate information is in the structural steelwork documentation and that it has been co-ordinated with the work of other project consultants.

4.4 Managing Tender Risk

Poor structural steelwork documentation will generate a significant number of requests for information (RFIs) from the structural steel contractor. These matters can take significant time and be costly to resolve. It is not always possible to reasonably foresee and account for this potential problem during the tender process. One strategy for minimising this commercial risk is to include an appropriate tag that states that the tender price assumes the for construction structural steelwork documentation is in accordance with the requirements of SteelDoc.

5.0 Definitions of Terms

5.1 General

Terms used in SteelDoc are generally as defined in the New Zealand Standard, Conditions of Contract for Building and Civil Engineering Construction, NZS3910:2013; New Zealand Institute of Architects, Standard Conditions of Contract, SCC1:2018; National Building Contract (General), NBC-G1:2018.

In these General Conditions of Contract, there are two parties to the building contract: the principal and the contractor. In addition, the principal's representative is defined as having specific responsibilities and is the only person through whom documentation and instructions may be issued to the contractor. All others involved within the contract are referred to as being represented by one of these people.

The principal's representative can be referred to as the engineer, architect, or principal. However, as the duties and responsibilities of the principal's representative vary only slightly, if at all, the principal's representative, is used exclusively within this document.

5.2 Persons to the Contract

5.2.1 Principal

The person named as such in the special conditions and includes their executors, administrators, and successors.

5.2.2 Principal's Representative

The professional engineer, architect, surveyor, or other person named or identified in the special conditions, or such other person as may be subsequently appointed by the principal to act as principal's representative. This person has dual roles in the administration of the contract. One of these roles is as expert advisor to and representative of the principal and giving directions to the contractor on behalf of the principal. In the other role, the principal's representative has fiduciary responsibilities. These include acting independently of either contracting party to make the decisions required under the contract documents.

In *Conditions of Contract for Building and Civil Engineering Construction* (NZS3910:2013), the principal's representative is called the engineer. In *The New Zealand Institute of Architects Standard Conditions of Contract* (NZIA SCC1:2018), the principal's representative is called the architect. In *The National Building Contract (General)* (NBC-G1:2018), the principal's representative is termed the principal.

5.2.2 Contractor

The person whose tender has been accepted by the principal or the person who has been so named in the contract documents, including its executors, administrators, and successors of the contractor.

5.2.2 Subcontractor

Any person who contracts with the contractor to carry out or supply part of the contract works on behalf of the Contractor.

5.3 Other Terms

5.3.1 Contract Agreement

The written agreement for the fulfilment of the contract which is signed by the principal and the contractor.

5.3.2 Contract Documents

The contract agreement and the documents referred to in and forming part of the contract agreement.

5.3.3 Contract Works

The works, including temporary works, to be executed in accordance with the contract.

5.3.4 General Conditions

The Conditions of Contract for Building and Civil Engineering Construction (NZS3910:2013)

New Zealand Institute of Architects, Standard Conditions of Contract (SCC1:2018)

National Building Contract (General) (NBC-G1:2018)

5.3.5 Drawings

The drawings included in the contract documents, together with any modifications of such drawings approved and notified to the contractor.

5.3.6 Free On Board (FOB) Items

FOB items are items which can be fabricated separately to the primary structure. They do not support or prevent the structural erection of the primary structure but are usually attached to it. Allowance should be made within the primary structure to accommodate and provide attachments for FOB items.

Some FOB items such as stairs and lift steelwork may be critical path items that need to be fabricated and erected concurrently with the erection of the primary structure, to facilitate construction access. Therefore “For Construction” authorisation may be required for some FOB items at the same time as the “For Construction” authorisation of the primary structural elements they attach to.

5.3.7 “For Construction”

The contract documents are considered to fully describe the contract works. It is common practice, however, for the principal’s representative to reissue all the contract drawings, “For Construction”, upon execution of the Contract Agreement. This authorises the contractor to commence the relevant parts of the contract works. Where portions of the documents lack sufficient definition, are ambiguous, or lack sufficient clarity for construction to commence, the principal’s representative should not knowingly authorise construction of that work to commence without identifying the limitations of the documents.

In due course, any additional instructions, drawings, and specifications necessary to adequately define the relevant portion of the works should be issued.

5.3.8 Person

Includes a natural person and a partnership, body of persons, firm, company, or organisation - whether corporate or not. In NZS 3910:2013 and SCC1:2018, the principal's representative shall be a natural person.

5.3.9 Primary Structure

The steelwork necessary to allow the erection of the structure and the installation of floor decking, roof, and wall cladding elements.

5.3.10 Shop Drawings

Detailed drawings prepared by the contractor and suitable for construction trades personnel. These drawings do not form part of the contract documents.

5.3.11 Shop Drawing Inspection or Review

The principal's representative may require shop drawings prepared by the contractor to be inspected or reviewed prior to fabrication commencing. The purpose of this inspection is to assure the principal's representative that the contract documents have been correctly interpreted by the contractor. The process of interpretation may require the steel detailer to request additional information or clarification if the design documentation is unclear or incomplete. Inspection or review of the contractor's shop drawings does not relieve the contractor of responsibility of correctly interpreting the contract drawings and specification. Neither should the principal's representative unnecessarily disrupt the contractor's contract programme.

5.3.12 Special Conditions

The first schedule and such other documents as are included in the contract documents which add to or delete from or modify the general conditions.

5.3.13 Specifications

Documents included in the contract documents which contain descriptions of materials and workmanship, and other details of the contract works, together with any additions to, or modifications of, such documents approved in writing by the principal's representative and notified to the contractor, as well as other additions or modifications supplied by the principal's representative to the contractor for the purpose of the contract.

5.3.14 Tender Documents

Documents which are distributed to prospective tenderers.

5.3.15 Variation

A variation to the Contract Works.

6.0 Steel Construction Complexity Categories

Six categories of common building steel construction of varying complexity are identified below along with common steelwork components typically specified in each category.

6.1 Low Rise Residential Housing

Light beams and lintels <40 kg/m
Posts
Fixing plates, HD bolts and attachments
Bracing portal frames

6.2 Foundation Structures

Bearing piles
Sheet piles
Soldier piles

6.3 Multi-Level Structures

Beams
Trusses
Columns
Architectural steelwork: Exposed for aesthetic
K and X-bracing
Service penetrations
Lift framing
Stairs and landings
Floor decking systems
Cladding panel attachments
Embedded items and HD bolt assemblies.

6.4 Single Level and Roof Structures

Portal frames and rafters
Purlins, girts, and bridging
Gutter layouts and supports
Light gauge X-bracing and fly bracing
Doors, windows, and lintels
Roller shutter door assemblies
Overhead crane gantry girders
HVAC support platforms
Pre-cast panel attachments
Walkways
HD bolt assemblies

6.5 Canopies, Cladding, and Feature StructuresStreet front canopies

Glazing and cladding components and attachments
Pre-cast panel attachments and embedded items
Specialist coatings

6.6 Industrial Support Structures

Beams
K and X-brace
Access ladders
Composite flooring
Crane fixings
Columns
Walkways
Steel plate and mesh decking
Embedded items and attachments
Machine plinth HD bolts

7.0 Contract Documentation Responsibilities

7.1 Responsibilities of the Principal's Representative

The principal's representative roles are defined in terms of the contract documents. They are responsible for issuing contract documents and issuing clarifications or variations to the contract documents, thus making them solely responsible for the completeness and co-ordination of the contract drawings and specifications.

Accordingly, a person accepting the role as principal's representative should be competent in managing the process of contract documentation development, co-ordination, and administration. The principal's representative has a fiduciary duty of care to both the principal and the contractor to facilitate the administration of the contract, so care should be taken to ensure that the reliability or completeness of contract documents issued is not misrepresented.

The principal's representative often relies on design consultants to prepare drawings and specifications for the contract. As such, they should ensure that the design consultants have adequate documentation quality assurance systems in place and that co-ordination between design consultants is satisfactorily completed before drawings and specifications are issued to the contractor.

7.2 Identification of Documents

Steelwork drawings, specifications, and addenda should be clearly and completely identifiable as a work package and drawings should be numbered and dated for purposes of identification. All drawings that need to be used to set out, measure quantities, detail and fabricate the structural steelwork should be identified in a structural steelwork document schedule. These may include drawings prepared by the architect, structural engineer, mechanical services engineer, and others.

Maintaining a common convention for the identification of drawing revisions assists in tracking down the current construction document. The preferred convention for numbering drawing revisions is to use numbers from 1 to x for pre-construction issue drawings. At, “For Construction”, issue the revision number is then made, 0. Further revisions during construction should be identified with alphabetic characters, A, B, etc.

7.3 Sufficiency of Documents

The contract documents are assumed to provide complete structural steel design drawings which clearly define the work to be performed and giving the size, section, material grade, and the location of all members, connection types, floor levels, column centres and offsets, and camber of members. Dimensions or references to common project grids should be sufficient to accurately convey the quantity and nature of the structural steel to be furnished. Structural steel specifications should include any special requirements regulating the fabrication and erection of the structural steel.

7.4 Limitations of Tender Documents

When a project only requires use of documents that are sufficient for tender purposes, the principal’s representative should clearly and completely identify the limitations of the tender documents.

Sufficient information should be provided covering the steelwork portion of the works in the form of scope, drawings, section sizes, connection types, coatings, outline specifications, and other descriptive data. This enables the contractor to assess the proposed contract works and prepare a knowledgeable bid. In this instance, the principal’s representative should make the contractor aware of the limitations of the tender documentation and be able to identify any risks associated with the contract works that have not been fully defined.

7.5 Dimensions

The set out and dimensioning of the structural skeleton of the building is one of the primary architectural design tasks. Responsibility for this important task is often shared by the architect along with structural and building services engineering designers. The principal’s representative should ensure that dimensioning responsibilities are clearly defined for their project. Typically, the architectural consultant will locate grids, finished floor levels, slab penetrations, and building envelope dimensions. The structural consultant sets out the structural elements relative to the architect defined dimensions and levels. The building services consultant will then refer to both the architectural and structural consultant’s drawings for setting out services. Co-ordination checks between the architect, structural, and building services engineers are essential to ensure consistency of all dimensioning information prior to drawings being issued for construction.

The structural skeleton should be fully and clearly defined to ensure that the finished surfaces, features, and amenities of the building can be properly accommodated. Accurate set out and dimensioning of the structural elements is also necessary to ensure that the strength and in-service performance of the structure is in accordance with the regulatory requirements of the Building Code as well as any special requirements of the principal.

In cases of discrepancies or ambiguities between the structural steelwork drawings and the architectural drawings or drawings for other trades, the contractor shall assume that the structural steelwork drawings govern for the following information:

- Steel member sizes, grades, cambers, and connection details

- Set out of all main members in plan
- Set out of all main members in elevation
- Set out geometry for working points

When issued “For Construction”, the structural drawings are assumed to be complete and adequately accommodate the regulatory aspects of the design in terms of set out and structural performance. To ensure that the regulatory and performance aspects of the structural design are not compromised by other trades, it is recommended that any information or dimensions that may affect the regulatory and structural performance of the steelwork structure should be found on the structural steelwork drawings. Once these are issued “For Construction”, the information found on the structural steelwork drawings should take precedence over information found on drawings of other trades.

Once issued “For Construction”, any changes made to the architectural and building services design that affect the structural steelwork should be made in conjunction with the structural engineering drawings. This is to ensure that structural performance is not compromised by the changes.

7.6 Co-ordination of Documents

The contractor is not responsible for ensuring that the drawings are fully co-ordinated and without discrepancy.

The principal’s representative should ensure that all information necessary for the construction of the structural steelwork is fully and correctly documented. Any conflicts between architectural, building services, and structural drawings should be resolved prior to being issued “For Construction’.

Where drawings other than the structural steelwork drawings are to be referred to by the contractor for setting out the structural steelwork, these should be specifically identified within the structural steelwork drawings. If it is difficult and time consuming for the contractor to find the relevant design and setting out information, there will inevitably be increased costs associated in constructing the steelwork.

Any portions of a drawing that have not been fully designed or co-ordinated by the principal’s representative at the time of being issued “For Construction”, should be clearly identified.

7.7 “For Construction” Authorisation

The contractor usually cannot proceed with the contract works until the drawings are released “For Construction”. “For Construction” issued drawings are assumed to fully and clearly define the contract works without ambiguity. “For Construction” drawings and specifications are required for the contractor to order materials, prepare shop and erection drawings, and commence fabrication of the contract works.

7.8 Development of Shop Drawings

Structural steelwork shop drawings are often prepared in three stages. The first stage is to confirm quantities of steel sections and fittings so that an accurate order may be placed with suppliers. This involves setting an accurate wire frame model of the structure. The second stage involves detailing the connections between the members whereas the third stage is to detail any service penetrations that may be required.

Where the principal’s representative wishes to fast track issuing of “For Construction” steelwork drawings and this has been communicated to the Contractor during the Tender process, it is possible

to split the “For Construction” issue into three successive stages. These are: material order, connections, and services. The documents issued at each of these stages describe completed information that has not changed at the issue of drawings at each subsequent stage. Shop drawing preparation will be commenced at the issue of drawings for material order; however, these will not usually be issued to the principal’s representative for review until “For Construction” drawings have been issued confirming connection and services accommodation requirements.

7.8.1 For Construction: Material Order

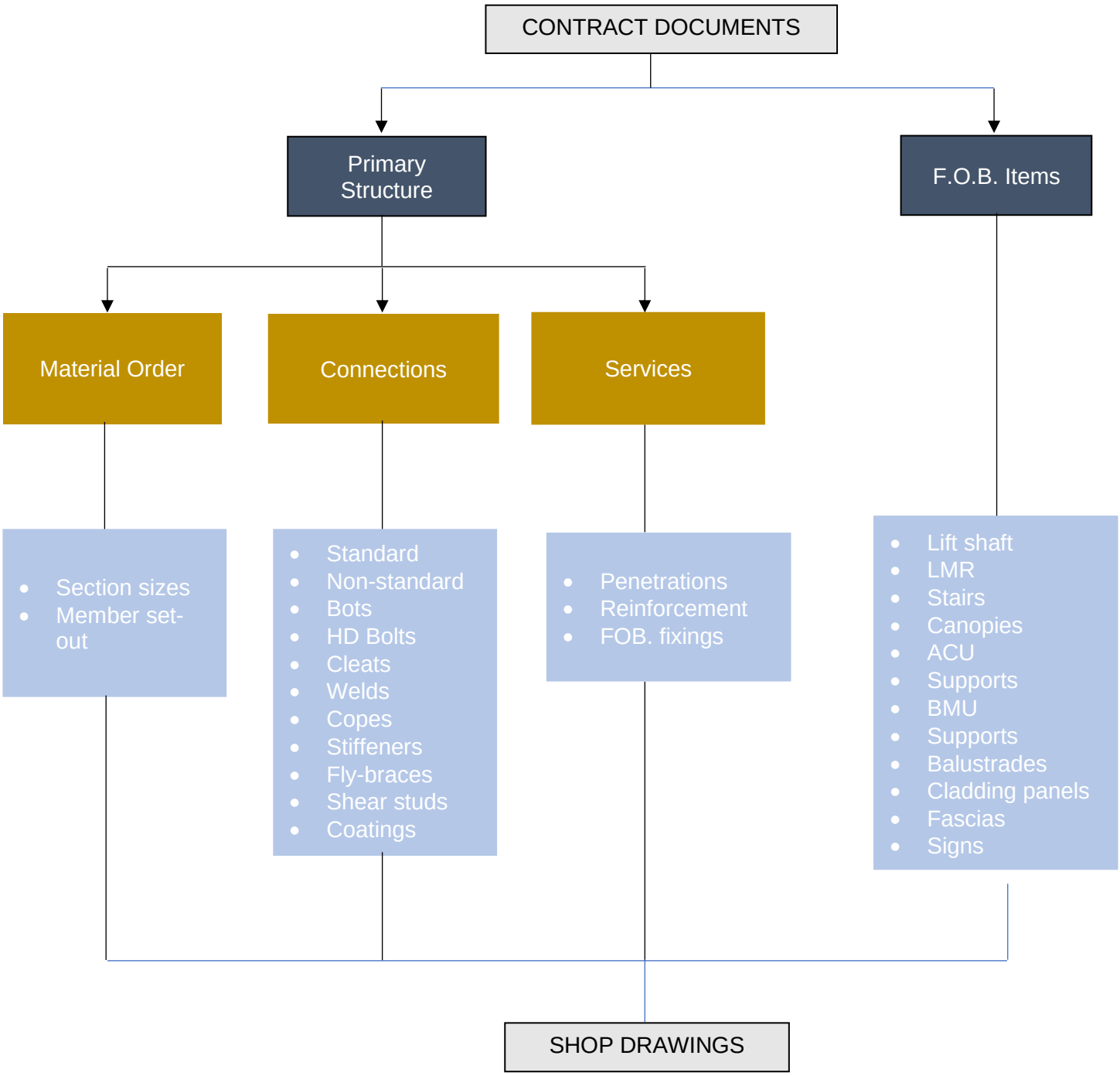
Confirmed member sizes and setting out information in plan and elevation are required. This allows a shop drawing wire frame model to be developed by the contractor which sets out the steel members relative to grids and floor levels. From these drawings, accurate steel section quantities can be determined and orders placed with steel stockists.

7.8.2 For Construction: Connections

Confirmed member to member connection details are required so that shop drawings can be progressed to near completion. Plate, bolts, and welding quantities can then be determined, and orders placed.

7.8.3 For Construction: Services

Confirmed attachments and penetrations necessary to accommodate building services such as sprinkler pipes, electrical cable trays, HVAC ductwork and architectural fittings are required.



Note: F.O.B. item details may be required to finalise primary structure shop drawings.

7.9 Design Responsibilities

The principal's representative should provide the contractor with complete and accurate contract documents that give thorough information, thus allowing the contractor to correctly interpret the design intent and to produce quality shop drawings.

When the principal's representative provides the design, drawings, and specifications, the contractor is not responsible for the suitability, adequacy, or legality of the design.

7.10 Responsibility for Dimensions

The principal's representative should provide sufficient and accurate dimensioning information on the drawings for the contractor to be able to correctly set out the structural steelwork. This information may be provided on a combination of cross-referenced and coordinated architectural, structural, and building services drawings. However, the structural engineering drawings are the most relevant information related to the structural steelwork information. This is because the structural design and drawings should meet the requirements of the architectural and building services design for the building as well as satisfy the structural performance requirements of the principal and the regulatory authorities. Any information, including member specification and set out, that affects the structural performance of the structure, in terms of regulatory and design brief, should therefore normally be found on the structural drawings.

Contract drawings describing the structural steelwork are typically prepared as A1 drawings; however, the use of A4 drawings for all non-standard connection details can also be effective. This allows the details to be kept in an A4 file and minimises the need for re-issues of A1 connection drawings when only one detail on a sheet may be affected.

7.11 Shop Drawing Inspection/Review

Shop drawings prepared by the contractor do not form part of the contract documents and therefore their review or inspection should not be regarded as part of the principal's representative's contract documentation quality assurance process. The purpose of the inspection of shop drawings is like the any inspections or reviews done by the principal's representative, that is to assure the principal's representative that the contractor has correctly interpreted the contract documents.

The principal's representative may prepare and issue contract documents to a such level of detail that the contractor decides not to prepare additional shop drawings. However, the principal's representative is still responsible for the completeness and accuracy of all such drawings.

When the contractor prepares shop drawings, prints or digital files may be submitted to the principal's representative for review and release for fabrication if this is specifically required by the contract documents. Contract documents generally allow seven calendar days in the schedule for the principal's representative to return the shop drawings to the contractor but wherever possible, this review time should be reduced so as to minimise material order and fabrication delays. Typically, the dimensional set out of members and items calculated by the detailer are not checked by the principal's representative, however inspection and review of shop drawings by the principal's representative does not in any way relieve the responsibility of the contractor to correctly interpret the contract documents. As with other inspections performed by the principal's representative, portions of the works may be selected for detailed review, so as to provide adequate assurance of the contractor's interpretation and compliance with the requirements of the documents.

Returned shop drawings will fit into one of three categories: release for fabrication with no comments, release subject to corrections as noted, or request to correct and resubmit. If required, the contractor makes any corrections and furnishes corrected prints or digital files to the principal's representative. Following the review of the shop drawings, if the principal's representative wishes to make changes to the steelwork drawings or specifications, a variation should be ordered in accordance with the terms of the contract (this may be subject to a claim). Variations made at the shop drawing review stage are likely to have contract programme and cost implications for the principal. Any variation that compromises the contractor's right and flexibility to determine the fabrication schedule necessary to meet the project's requirements, are also likely to have cost and contract programme implications.

The role of the detailer is to suitably interpret the contract documents and prepare shop drawings for each item of steelwork for construction tradespeople to fabricate and erect the items. Where the design documentation is unclear or incomplete, the shop detailer may require additional information or clarification from the design engineer. The contractor is not required to verify the accuracy of or co-ordinate contract drawings and specifications. Where the principal's representative wishes to use a shop detailer to assist in co-ordination of contract drawings, the detailer should be engaged as part of the principal's representative's contract documentation development team.

Where the principal's representative wishes the contractor to co-ordinate design and specification activities of subcontractors to the contract documents, this should be clearly stated in the contract documents.

Where the contractor finds that contract drawings and specifications are incomplete, contain errors, or are inadequately coordinated with other trades work, then the contractor shall issue a formal RFI to the principal's representative. Where the principal's representative confirms that the drawings or specifications are incomplete or erroneous, the Contractor's costs associated with preparing the RFI shall be considered as extra work for which the contractor is entitled to compensation.

8.0 Steelwork Contract Documentation: General Requirements

Completed contract drawings should meet the following requirements:

8.1 All Structural Steelwork Drawings Identified

All structural steel items should be clearly located and identified on the principal's representative's structural steelwork drawings. Where architectural, mechanical, or electrical drawings contain structural requirements, these should be coordinated with the structural engineer's drawings and clearly cross-referenced.

8.2 Printed at Scale Drawn

The drawings should be issued at the scale in which they are drawn. Additional copies at a reduced scale may be supplied to the contractor upon request.

8.3 CAD and 3D Modelling Files

Clear direction should be provided as to the software type, accuracy, and completeness of CAD and 3D modelling files for direct use for member placement and other detailing requirements of the steel

constructors shop drawings. If CAD or 3D files are issued for use by the contractor, they should be accompanied by configuration information to allow correct printing of the documents.

The requirements and preparation of steelwork shop drawings and the associated manufacturing information system data required by steel constructors is a very important and specialist area not covered by this document. In order to ensure maximum productivity in the steel construction process, it is strongly recommended that the steel constructor engaged by the contractor also manage the development of any structural steelwork shop drawings and associated 3-D modelling.

8.4 Coordination with Mechanical, Electrical, and Architectural

The structural drawings should be coordinated with architectural and mechanical requirements.

8.5 Specifications

The specifications should be customised to the particular project and be in agreement with the drawings. The New Zealand Structural Steelwork Specification in Compliance with AS/NZS 5131 and SCNZ Report No. 112:2018 is a recommended base specification.

8.6 Standard Steelwork Notes

Depending on the particular job, these generally should cover the following:

- *General*
- *Abbreviations*
- *Steelwork including: Weld classes and grades, structural bolts, holes, purlins, grouting under base plates, painting, inspection and any other specific requirements*
- *Drill-in fixings*
- *Attachment to masonry*
- *Attachment of timber*
- *Special construction sequences required*

8.7 Dimensions

These should show setting out dimensions for all project grids and floor levels.

These show setting out dimensions for all items of structural steelwork relative to project grids and floor level datums.

8.8 Materials

Provide sizes and material grade of all members, beams, columns, and bolts, etc. Simplicity and repetition result in cost savings. Standardise the use of AS/NZS 3679.1 G300 steel sections, AS 3679.1 G300 steel flat bar, and AS/NZS 3678 G300 steel plate.

State whether section types may be substituted with welded or other similar hot rolled sections.

Specify, not infer, special requirements such as minimum plate through thickness properties (Z Grade), fracture critical material (low temperature or seismic applications), Charpy V-notch testing, and any additional sourcing requirements to ensure the supply of compliant structural steels etc., for all required members and pieces. Sourcing requirements are discussed in SCNZ report 111:2018 – *The New Zealand Guide to Sourcing of Compliant Structural Steels* (SCNZ, 2018a).

8.9 Bracing Frame and Member Seismic Category

The seismic category and structural type of steel bracing frames shall be identified in terms of the *New Zealand Steel Structures Standard, NZS3404:1997*, particularly where specification clauses for material, weld quality, and inspection requirements may refer to frame or member seismic category.

8.10 Steelwork Construction Category/Categories

A feature of the structural steelwork – *Fabrication and Erection Standard* AS/NZS 5131 (SA/SNZ, 2016) is the categorisation of the structure, or parts of the structure into construction categories. This standard includes common and construction categories, specific technical, and quality requirements. The design documents must specify the construction category designation/s of all steelwork.

8.11 Member Orientation

Verify orientation of columns on each plan.

8.12 Pre-camber

Is the camber information complete?

8.13 Shear Studs

Identify the size, number, and spacing of shear studs.

8.14 Splice Locations

Provide specific column, truss, and girder splice details. Identify zones over which splice locations may be located to accommodate fabricators preferred locations for transport and section stock lengths.

8.15 Baseplates and Cast-in Plates/Items

Complete base plate and holding down requirements including base plate elevations for all columns, type of levelling system, material grade, diameter, embedment, hole pattern and size of holes, plate orientation, and weld requirements.

Complete cast-in plates/items and attached studs or welded reinforcing bar requirements, including level and location, material grade, plate orientation, and weld requirements.

8.16 Passive Fire Protection

Clearly indicate location, type, and limits of members requiring passive fire protection.

8.17 Protective Coatings

Clearly locate and identify special cleaning, passive fire protection, galvanizing, and painting systems (type, colour, exposed, etc.) and locations on design drawings.

8.18 Special Erection Requirements

Clearly specify any special erection requirements.

8.19 Foundation Plan

- *Clear and complete gridline set out*
- *Location and orientation of all columns*
- *Necessary dimensional information relating columns to ground beams, insitu concrete piles, footings, etc*
- *RL to TOC (Top of concrete)*
- *H.D (Holding down) bolt detail including size, grade, embedment, bolting arrangement, corrosion protection and any other specific detail*
- *Base plate thickness, size and orientation, offset (if any), bleed holes if necessary*
- *Grouting details*
- *Weld requirements*

8.20 Typical Floor Plan

Complete plan of structural steel for every level, checked for erect ability and fully dimensioned, including:

- *Clear grid layout*
- *Member locations dimensioned from grids*
- *Section, size and orientation of every member (particularly for non-symmetrical sections: PFC, Angles)*
- *RL TOS (Top Of Steel)*
- *Pre-camber*
- *Designation for standard connections/splices and reference detail for specifically designed connections/splices. Where possible use Industry Standard ref. Structural Steelwork Connection Guide SCNZ-14:2007*
- *Specific details of any services requirements showing location, dimensions, and any other requirements*
- *All relevant details interfacing other trades e.g., pipe and underfloor penetrations*
- *Concrete Floor: RL's, thickness, steps, rebates, slopes, special reinforcement, shear studs, voids to be trimmed, ponding allowance assumed, etc.*
- *Timber Framing: Reference to details showing, connections, timber sizes, location relative to steel member, any cleats, holes, etc.*
- *Any other specific items requiring coordination and setting out e.g., voids for stairs, lifts, concrete panels, spandrels, parapets, glazing, louvres, timber walls, and bracing.*

8.21 Roof Plan

Complete plan showing all members, particularly rafters, ties, eave members, outriggers and any canopy framing, checked for erect ability and fully dimensioned, including:

- *Clear grid layout*
- *Where possible, members dimensioned from grids*
- *Accurate roof pitch*
- *Identify all ridge and/or valley lines and references to details*
- *Section, size and orientation every member (particularly for non-symmetrical sections- Purlins, PFCs, Angles)*
- *Purlin span details e.g., simple, double, lapped and lap length*
- *No. of rows and types of bridging*
- *If applicable- Type and location of roof bracing and reference to connection details of same*
- *If applicable- Type and location of fly bracing and reference to connection details of same*
- *Type of purlin trimmers*

- *Dimensions from grids and any other relevant information relating to any openings e.g., skylights, access ladders, fans, walkways, etc.*
- *All relevant details interfacing other trades e.g., Timber Framing for Gutters and soffits: Reference to details showing, connections, timber sizes, location relative to steel member, any cleats, holes, etc.*
- *Location and size of box gutters and supports*
- *Reference to any other sections or details required for further information*

8.22 Elevations

Complete fully dimensioned elevation showing all members particularly "between floor" members such as stair supports, lift shaft steel, trusses, K-braces, hangers etc. and all connections. Information on drawings should include:

- *Clear grid layout*
- *Member locations dimensioned from grids*
- *Floor levels (RL's)*
- *Top of steel (TOS) that is not noted on plans*
- *Type of wall bracing and reference to connection details of same*
- *Dimensions from grids and any other relevant information relating to any door and/or window openings*
- *If applicable- Girt type, size, spacing and any other dimensional information required to place them on walls*
- *If applicable- roof slope, Apex RL, required purlin spacing*
- *All connections not shown on plans*

8.23 Connections

In the preparation of contract drawings, the principal's representative has two options for communicating connection details.

Firstly, the principal's representative may specify standard connections from the *Structural Steelwork Connections Guide,* SCNZ-14:2007. All the connections and connection types should be identified by the full description e.g., WP-70-NC, WP-30-SWC, BPP-80. All requirements for bracing details, stiffeners, doubler plates, web or cope reinforcement or similar items necessary for the completeness of the design should be sized and shown in complete detail.

The principal's representative may fully design and detail connections. In this case, the principal's representative has the obligation to show all fastener sizes, arrangement, quantities, and grades as well as specifying all connection material and weld types, sizes, and lengths for each individual member or part to be joined. All requirements for bracing details, stiffeners, doubler plates, web or cope reinforcement, or similar items necessary for the completeness of the design should be sized and shown in complete detail.

The contractor may suggest alternative details to some connections based on their subcontractor's most efficient shop and erection processes, however, such changes should be forwarded to the principal's representative for review and approval.

In all cases, the release of the shop drawings by the principal's representative constitutes acceptance of design responsibility for the structural adequacy of the connections shown on the shop drawings. Where design responsibility for some aspects of the contract works is to be allocated to the contractor, this should be clearly stated in the contract documents.

Designation for standard connections/splices from *Structural Steelwork Connection Guide SCNZ - 14:2007* should be shown on plans and elevations. Details relating to any specifically designed connections/splices should include:

- *Bolt size and grade*
- *Number, gauge and spacing of bolts*
- *Plate thicknesses*
- *Stiffener requirements*
- *Weld details including category and inspection requirements*
- *Copes*
- *Packer plates*
- *Connection details of any other members not shown on plans or elevations e.g., bracing elements, purlins, girts, etc.*
- *Any relevant details interfacing other trades not shown on plans or elevations*
- *Precast concrete panels or stairs: Fixing details.*

9.0 Preliminary Steelwork Documentation: General Requirements

9.1 General

During the development of a project design, and prior to building contract documentation being initiated, many options are considered by the principal and his or her design and cost consultants. Preliminary design documents are often prepared for the purposes of quantifying a design and assessing its cost. In this case, where incomplete drawings and specifications are to be used for preliminary pricing, the following is recommended for preliminary documentation that will allow realistic preliminary pricing information to be prepared for structural steelwork. The documents prepared will also be in a position to be readily upgraded to contract documentation status with the minimum amount of effort.

Drawings and specifications for preliminary pricing should include the following:

9.2 Scope of Preliminary Structural Steelwork Documents Identified

All structural steel items should be clearly located and identified on the preliminary structural steelwork drawings. Exclusions should be clearly stated, such as stairs, handrails, embedded items, etc. The purpose of the preliminary drawing should be identified, i.e., option selection purposes.

9.3 Specification Clauses on Drawings

All specification clauses that may be expected to affect pricing should be noted on the preliminary drawings e.g., propping, pre-cambering, surface treatment.

9.4 Dimensions

Draw to scale and allow scaling for materials quantity measurement. Otherwise show setting out dimensions for all project grids, floor levels, all items of structural steelwork relative to project grids and floor level datums.

9.5 Materials Required

Provide sizes and material grade of all members, beams, columns, and bolts, etc. Standardise the use of *AS/NZS 3679.1 G300 steel sections, AS3679.1 G300 steel flat bar and AS/NZS 3678 G300 steel plate*. Identify where special grades of steel are required, such as L0, L15, and SO steels, and if there are any requirements to ensure the sourcing of compliant steel materials such as the use of third party certified product.

State whether section types may be substituted with welded or other similar hot rolled sections.

9.6 Materials and Weld Testing

Specify, not infer, special requirements such as through-thickness, Charpy V-notch and radiography / ultrasound weld testing, etc., on all required members and pieces.

9.7 Bracing Frame Seismic Category

Identify the primary method of providing seismic lateral bracing to the structure.

The seismic category and structural type of steel bracing frames should be identified in terms of the *New Zealand Steel Structures Standard, NZS3404:1997.*

9.8 Pre-camber

Are the members requiring pre-camber identified?

9.9 Shear Studs

Identify the diameter, typical welded height and number of shear studs per member or average spacing of shear studs.

9.10 Connections and Baseplates

As structural steel fabrication is primarily involved with handling, cutting and joining steel members, it is important that the extent of connection work required is identified so that an accurate estimate of fabrication time and cost may be made. Indication of the intended connection type and relevant design load ratios significantly help estimators quantify that cost. A statement such as, ”All secondary beam connections to be WP30, all primary beam to column connections to be FE 50, unless noted otherwise….”, may cover much of the steelwork.

Standard details should preferably reference *Structural Steelwork Connection Guide SCNZ-14:2007*. Non-standard details should be identified at least with the following identification system. Preferably use this identification system in conjunction with sketch details showing the typical arrangement of the connection. The *Manual of Standard Connection Details for Structural Steelwork HERA Report R4-58* contains over 55 different connection configuration sketches that can be referenced or pasted into preliminary Drawings and Specifications. These are available as a CAD library.

9.10.1 Fixing System:

Identification should include the predominant fixing system of the member to the frame, e.g., welding (W) or bolting (B).

9.10.2 Design Action Type:

The significant design action types that the connection should transfer should be identified, e.g., tension (T), compression (C), moment (M), and shear (S).

For example, a non-standard welded connection transferring tension moment and shear would be designated W-T/M/S. A bolted connection transferring moment and shear would be designated, B-M/S.

The connection details may then be fully developed by the Principal's Representative to coincide with the tendering process and commencement of detailing to ensure the detailing and fabricating processes will not be delayed. In addition, the Principal's Representative should consult with the Contractor regarding preferred practices for fabrication and erection. A pre-detailing meeting between the Principal's Representative and the Contractor may be appropriate to facilitate this exchange of information. In the event that design loads or other information necessary for selection of standard connections is not shown on the contract documents, this information should be furnished to the Contractor in a timely manner.

9.11 Splice Locations

Identify expected splice locations. Advise whether Contractor can adjust splice locations for standard section supply lengths.

9.12 Embedded Items and Edge Trimmers

Identify embedded items and decking trimmers to concrete walls.

9.13 Mechanical, Electrical Penetrations, and Architectural Fixings

Identify if penetrations to beams or additional fittings for architectural claddings are likely to be required.

9.14 Passive Fire Protection

Clearly indicate location, type, and limits of members requiring passive fire protection.

9.15 Protective Coatings

Special cleaning, passive fire protection, galvanising and painting systems (type, colour, exposed, etc.) and locations should be clearly located and identified on design drawings.

9.16 Special Erection Requirements

Clearly specify any special erection requirements.

9.17 Temporary Bracing Requirements

Temporary bracing requirements should be considered as part of the overall construction methodology. Consideration should be given as to how the structure will react in an unbraced state.

10. STEELDOC Checklists

PROJECT CONTACTS LIST

Project Name: _____

Site Address: _____

Details of the parties involved in the design of this project are as follows:

		Company	Contact Person	Phone	Email
1	Structural				
2	Architect				
3	HVAC				
4	Mechanical				
5	Electrical				
6	Civil				
7	Sprinkler				
8	Main Contractor				
9	Steel Constructor				

DOCUMENTATION RESPONSIBILITY CHECKLIST

The checklist identifies the agreed responsibilities for the design and documentation of structural steelwork within this project. The default allocation of responsibilities may be modified to suit the project.

Project:
Date:

1 GENERAL NOTES AND SPECIFICATIONS

Item	Description	Responsibility	Date
1.1	Material grades specified for all structural items.	Struct.	
1.2	Bolts completely specified (grades, installation procedures).	Struct.	
1.3	Welding completely specified (weld types, grade, quality, sizes).	Struct.	
1.4	Oversize hole criteria given for the typical connection holes.	Struct.	
1.5	Oversize hole criteria given for the anchor bolt/base plate holes.	Struct.	
1.6	Paint, galvanising, and metal spray requirements specified.	Struct.	
1.7	Paint and no-paint areas completely specified.	Struct.	
1.8	Galvanised and metal spray areas completely specified.	Struct.	
1.9	Drill in or masonry anchors specified.	Struct.	
1.10	Standard notes complete.	Struct.	
1.11	Shop drawing review procedures specified.	Struct.	
1.12	All material, fabrication, and coating inspection and testing requirements specified.	Struct.	

2 PLANS

Item	Description	Responsibility	Date
2.1	All grids defined and dimensioned.	Architect	
2.2	All member sizes and orientations specified.	Struct.	
2.3	Plan location and orientation of each column specified.	Struct.	
2.4	Specific location of each beam dimensioned.	Struct.	
2.5	Sufficient reference dimensions given in non-rectangular areas.	Struct.	
2.6	Beams requiring pre-cambering clearly identified.	Struct.	
2.7	Shear studs specified.	Struct.	
2.8	Details provided for any other special reinforcing plates to be included.	Struct.	
2.9	The purlin span details provided e.g., single, double, lapped, and lap length.	Struct.	
2.10	Roof purlin bridging, fly bracing, and light cross bracing clearly specified and located.	Struct.	
2.11	Specific dimensions provided for trimming out openings for other trades e.g., Air conditioning ducts, stair/lift voids	Struct.	
2.12	Gutter slopes and fall directions clearly identified.	Struct.	

1.13	All special construction procedures and sequences specified.	Struct.	
1.14	Passive fire protection requirements noted.	Struct.	
1.15	Member seismic categories specified for elements of lateral load resisting systems.	Struct.	
1.16	Fixings to timber elements specified.	Struct.	
1.17	Construction category/categories specified.	Struct.	
1.18	Weld failure consequence category/categories specified.	Struct.	
1.19	Seismic weld demand category/categories specified.	Struct.	
1.20	The extent of any steel elements subject to architecturally exposed structural steel requirements including AESS designation specified.	Struct.	
1.21	Fabricator qualifications specified.	Struct.	
1.22	Sourcing requirements to ensure the supply of compliant structural steels specified.	Struct.	
1.23	Any amendments to AS/NZS 5131 default requirements specified (e.g., treatment grades, functional tolerances, Quality plans for CC2 projects etc.).	Struct.	
1.24	Proprietary system specified.	Struct.	
1.25	Propping requirements specified.	Struct.	
1.26	Other (specify)	Struct.	

2.13	All relevant steelwork plans, elevations, and connection drawings; and electrical, HVAC, mechanical, and architectural drawings referenced and coordinated.	Struct.	
2.14	Standard connectons specified (e.g., WP30 NC).	Struct.	
2.15	Correct detail referencing.	Struct.	
2.16	Other (specify)	Struct.	

The checklist identifies the agreed responsibilities for the design and documentation of structural steelwork within this project. The default allocation of responsibilities may be modified to suit the project.

Project:
Date:

3 ELEVATIONS AND SECTIONS

Item	Description	Responsibility	Date
3.1	All grids defined and dimensioned.	Architect	
3.2	All member sizes and orientations specified.	Struct.	
3.3	All RL's of bottom of base plates shown.	Struct.	
3.4	All top of steel RL's (TOS) given.	Struct.	
3.5	All column, rafter, and beam splice locations given.	Struct.	
3.6	"Between floor" member locations specifically dimensioned.	Struct.	
3.7	Sufficient reference dimensions given in sloping areas.	Struct.	
3.8	Specific dimensions provided for trimming out openings for other trades e.g., window/door openings.	Struct.	
3.9	Girts, hangers, fly braces, and cross-bracing specifically dimensioned and located.	Struct.	
3.10	Supports for door opening machinery coordinated with door supplier.	Struct.	
3.11	Standard connections fully specified (e.g., WP30 NC).	Struct.	
3.12	Correct detail referencing.	Struct.	

4 CONNECTIONS

Item	Description	Responsibility	Date
4.1	Columns		
4.1.1	All base plates and hold down bolt connections designed, specified, and sufficiently dimensioned.	Struct.	
4.1.2	Grout thickness sufficient to contain the jacking nuts.	Struct.	
4.1.3	The bottom ends of the hold down bolts sufficiently contained within the footings and sufficiently dimensioned.	Struct.	
4.1.4	Top ends of the hold down bolts sufficiently covered with the finish floor and sufficiently dimensioned.	Struct.	
4.1.5	All other construction items such as rebar unaffected by the hold down installation.	Struct.	
4.1.6	The hold down bolt patterns sufficiently contained within the footings and sufficiently dimensioned.	Struct.	
4.1.7	Column to column splice details and locations.	Struct.	
4.1.8	If required, column caps specified.	Struct.	
4.1.9	Other (specify)	Struct.	
4.2	Beams		
4.2.1	Other cast-in or site drilled connections designed, specified, and sufficiently dimensioned.	Struct.	

3.13	Other (specify)	Struct.	

4.2.2	Cast-ins suffiently contained in the walls and/or floor slabs.	Struct.	
4.2.3	All other construction items, such as rebar, unaffected by the cast-in or site drilled connection installation.	Struct.	
4.2.4	Beams to cast-ins or drilled on-site connections.	Struct.	

The checklist identifies the agreed responsibilities for the design and documentation of structural steelwork within this project. The default allocation of responsibilities may be modified to suit the project.

Project:
Date:

4 CONNECTIONS (continued)

Item	Description	Responsibility	Date
4.2	Beams continued		
4.2.5	Beam to beam one-sided	Struct.	
4.2.6	Beam to beam two-sided	Struct.	
4.2.7	Beam to beam splice	Struct.	
4.3	Beam to column		
4.3.1	Non-moment beam to column flange	Struct.	
4.3.2	Non-moment beam to column web	Struct.	
4.3.3	Moment beam to column flange	Struct.	
4.3.4	Moment beam to column web	Struct.	
4.3.5	Beam on supporting column	Struct.	
4.3.6	Column to supporting beam	Struct.	
4.4	Bracing to beams or columns	Struct.	
4.5	Connections for FOB items	Struct.	
4.3.6	Other (specify)	Struct.	

5 STAIRS

Item	Description	Responsibility	Date
5.1	All relevant grids defined and dimensioned.	Architect	
5.2	All member sizes and orientations specified.	Struct.	
5.3	Specific dimensioning given to locate the stairs in relation to the main structure.	Struct.	
5.4	All RL's of bottom of base plates shown.	Struct.	
5.5	All top of steel RL's (TOS) given and set downs noted.	Struct.	
5.6	All column splice locations given.	Struct.	
5.7	"Between floor" members specifically dimensioned.	Struct.	
5.8	Sufficient reference dimensions given in sloping areas.	Struct.	
5.9	Cast-in fixings to concrete work coordinated with concrete drawings.	Struct.	
5.10	All relevant steelwork plans, elevations, and connection Drawings and Architect Drawings referenced and coordinated.	Struct.	
5.11	Connections fully specified.	Struct.	
5.12	Correct detail referencing.	Struct.	
5.13	Other (specify)	Struct.	

The checklist identifies the agreed responsibilities for the design and documentation of structural steelwork within this project. The default allocation of responsibilities may be modified to suit the project.

Project:
Date:

6 LIFT FRAMING

Item	Description	Responsibility	Date
6.1	All relevant grids defined and dimensioned.	Architect	
6.2	All member sizes and orientations specified.	Struct.	
6.3	Specific dimensions given to locate lift framing in relation to the main structure.	Struct.	
6.4	All RL's of bottom of base plates shown.	Struct.	
6.5	All top of steel RL's (TOS) given and set downs noted.	Struct.	
6.6	All column splice elevations given.	Struct.	
6.7	"Between floor" members specifically dimensioned.	Struct.	
6.8	All relevant steelwork plans, elevations, and connection Drawings and Electrical, Mechanical, and Architectural Drawings referenced and coordinated.	Struct.	
6.9	Connections fully specified.	Struct.	
6.10	Correct detail referencing.	Struct.	
6.11	Other (specify)	Struct.	

7 WALKWAYS AND ACCESS LADDERS

Item	Description	Responsibility	Date
7.1	All relevant grids defined and dimensioned.	Architect	
7.2	All member sizes and orientations specified.	Struct.	
7.3	Specific dimensioning given to locate all framing in relation to the main structure.	Struct.	
7.4	All RL's of bottom of base plates shown.	Struct.	
7.5	All top of steel RL's (TOS) given and set downs noted.	Struct.	
7.6	All member splices located	Struct.	
7.7	"Between floor" members specifically dimensioned.	Struct.	
7.8	Hand and guard-rails specified and set out dimensions given.	Struct.	
7.9	Foot tread plate, foot mesh, ladder rungs and fixings specified and set out.	Struct.	
7.10	All relevant steelwork plans, elevations, and connection Drawings and Electrical, HVAC, Sprinkler, and Architectural Drawings referenced and coordinated.	Struct.	
7.11	Connections fully detailed.	Struct.	
7.12	Correct detail referencing.	Struct.	
7.13	Other (specify)	Struct.	

The checklist identifies the agreed responsibilities for the design and documentation of structural steelwork within this project. The default allocation of responsibilities may be modified to suit the project.

Project:
Date:

8 OVERHEAD CRANE RUNWAY GIRDERS

Item	Description	Responsibility	Date
8.1	All relevant grids defined and dimensioned.	Architect	
8.2	All member sizes and orientations specified.	Struct.	
8.3	All RL's of bottom of base plates shown.	Struct.	
8.4	All top of steel RL's (TOS) given.	Struct.	
8.5	Members specifically dimensioned.	Struct.	
8.6	Pre-cambers specified.	Struct.	
8.7	Special levelling tolerances specified.	Struct.	
8.8	Crane rail and crane rail attachment systems to girders adequately specified.	Struct.	
8.9	End buffer specified.	Struct.	
8.10	The design satisfies crane supplier requirements for serviceability and strength.	Struct.	
8.11	Any foot tread plate, foot mesh, and fixings specified and set out.	Struct.	
8.12	All relevant steelwork plans, elevations, and connection Drawings and Electrical, HVAC, Sprinkler, and Architectural Drawings referenced and coordinated.	Struct.	
8.13	Girder splices located	Struct.	
8.14	Connections fully specified	Struct.	
8.15	Correct detail references	Struct.	
8.16	Other (specify)	Struct.	

9 HVAC / SPRINKLER / ELECTRICAL SUPPORTS

Item	Description	Responsibility	Date
9.1	All relevant grids defined and dimensioned.	Architect	
9.2	All member sizes and orientations specified.	Struct.	
9.3	Specific dimensioning given to locate all the framing in relation to the main structure.	Struct.	
9.4	All top of steel RL's (TOS) given and set downs noted.	Struct.	
9.5	All relevant steelwork plans, elevations, and connection Drawings and Electrical, HVAC, Sprinkler and Architectural Drawings referenced and coordinated	Struct.	
9.6	Connections fully specified	Struct.	
9.7	Correct detail references	Struct.	
9.8	Other (specify)	Struct.	

The checklist identifies the agreed responsibilities for the design and documentation of structural steelwork within this project. The default allocation of responsibilities may be modified to suit the project.

Project:
Date:

10 CLADDING SYSTEMS

Item	Description	Responsibility	Date
10.1	All relevant grids defined and dimensioned.	Architect	
10.2	All member sizes and orientations specified.	Struct.	
10.3	Specific dimensioning given to locate any framing for cladding panels in relation to the main structure.	Struct.	
10.4	All top of steel RL's (TOS) given and set downs noted.	Struct.	
10.5	"Between floor" members specifically dimensioned.	Struct.	
10.6	Relevant steelwork plans, elevations, and connection Drawings, Architectural Drawings, and any other proprietary drawings referenced and coordinated.	Struct.	
10.7	Connections fully detailed	Struct.	
10.8	Correct detail referencing	Struct.	
10.9	Other (specify)	Struct.	

STRUCTURAL STEELWORK DRAWINGS LIST

List drawing numbers of all drawings necessary to prepare shop drawings, order materials, fabricate, coat, and erect steelwork required as part of the contract works.

Project:

Date:

	Drawing Category	Drawing Title	Drawing No.	Due date	Other Referenced Drawings							
					Architect	HVAC	Mechanical	Electrical	Civil	Sprinkler	Main Contractor	Other
1	General notes and specifications											
2												
3												
4	Plans											
5												
6												
7												
8	Elevations & Sections											
9												
10												
11												
12												
13	Connections											
14												
15												
16												
17												
18	Stairs											
19												
20												
21												
22												
23	Lift Framing											

24												
25												
26												
27												
28	Walkways and Access Ladders											
29												
30												
31												
32	Overhead Crane Runway Girders											
33												
34												
35												
36	HVAC / Sprinkler / Electrical Supports											
37												
38												
39												
40	Cladding Systems											
41												
42												
43												
44												
45												
46												
47												
48												

DOCUMENTATION DRAWING COMPLETION CHECKLIST

Project Name: _____

Drawing type: **General Notes and Specifications**

Drawing title:

Revision:

Drawing Number:

Issue purpose:

Issue date:

Other Non-Steelwork Drawings Referenced

Consultant	Drawing	Aspect Governed	Consultant	Drawing	Aspect Governed
Architect			Civil		
HVAC			Sprinkler		
Mechanical			Main Contractor		
Electrical			Other		

Item	Description	Issue Category	Completion Checked	Comments
1.1	Material grades specified for all structural items.	M		
1.2	Bolts completely specified (grade, installation procedures).	C		
1.3	Welding completely specified (weld type, grade, quality, sizes).	C		
1.4	Oversize hole criteria given for the typical conneciton holes.	C		
1.5	Oversize hole criteria given for the anchor bolt/base plate holes.	C		
1.6	Paint, galvanizing, and metal spray requirements specified.	M		
1.7	Paint and no-paint areas completely specified.	C		
1.8	Galvanized and metal spray areas completely specified.	M		
1.9	Drill in or masonry anchors specified.	C		
1.10	Standard notes complete.	C		
1.11	Shop drawing review procedures specified.	C		
1.12	All material, fabrication, and coating inspection and testing requirements specified.	M		
1.13	All special construction procedures and sequences specified.	C		
1.14	Passive fire protection requirements noted.	M		
1.15	Member seismic categories specified for elements of lateral load resisting systems.	C		
1.16	Fixings to timber elements specified.	C		
1.17	Construction category/categories specified.	M		
1.18	Weld failure consequence category/categories specified.	C		
1.19	Seismic weld demand category/categories specified.	C		

1.20	The extent of any steel elements subject to architecturally exposed structural steel requirements including AESS designation specified.	M		
1.21	Fabricator qualifications specified.	M		
1.22	Sourcing requirements to ensure the supply of compliant structural steels specified.	M		
1.23	Any amendments to AS/NZS 5131 default requirements specified (e.g., treatment grades, functional tolerances, Quality plans for CC2 projects etc.)	M		
1.24	Proprietory system specified.	C		
1.25	Propping requirements specified.	M		
1.26	Other (specify)			

Note: For Material Order Issue, all category M items must be checked; For Construction Issue, all category M and C items must be checked.

STEELWORK DRAWING COMPLETION CHECKLIST

Project Name: _____

Drawing Type: **Plans**

Drawing Number:

Drawing Title:

Issue Purpose:

Revision:

Issue Date:

Other Non-Steelwork Drawings Referenced

Consultant	Drawing	Aspect Governed	Consultant	Drawing	Aspect Governed
Architect			Civil		
HVAC			Sprinkler		
Mechanical			Main Contractor		
Electrical			Other		

Item	Description	Issue Category	Completion Checked	Comments
2.1	All grids defined and dimensioned.	M		
2.2	All member sizes and orientations specified.	M		
2.3	Plan location and orientation of each column specified.	C		
2.4	Specific location of each beam dimensioned.	C		
2.5	Sufficient reference dimensions given in non-rectangular areas.	C		
2.6	Beams requiring pre-cambering clearly identified.	M		
2.7	Shear studs specified.	M		
2.8	Details provided for any other special reinforcing plates to be included.	C		
2.9	The purlin span details provided e.g., single, double, lapped and lap length.	C		
2.10	Roof purlin bridging, fly bracing, and light cross bracing clearly specified and located.	C		
2.11	Specific dimensions provided for trimming out openings for other trades e.g., Air conditioning ducts, Stair/lift voids.	C		
2.12	Gutter slopes and fall directions clearly identified.	C		
2.13	All relevant steelwork plans, elevations and connection drawings and Electrical, HVAC, Mechanical, and Architectural Drawings referenced and coordinated.	C		
2.14	Standard connection specified (e.g., WP30 NC)	C		
2.15	Correct detail referencing	C		
2.16	Other (specify)	C		

Note: For Material Order Issue, all category M items must be checked; For Construction issue, all category M and C items must be checked.

STEELWORK DRAWING COMPLETION CHECKLIST

Project Name: _____

Drawing Type: **Elevations and Sections**
Drawing Title:
Revision:

Drawing Number:
Issue Purpose:
Issue Date:

Other Non-Steelwork Drawings Referenced

Consultant	Drawing	Aspect Governed	Consultant	Drawing	Aspect Governed
Architect			Civil		
HVAC			Sprinkler		
Mechanical			Main Contractor		
Electrical			Other		

Item	Description	Issue Category	Completion Checked	Comments
3.1	All grids defined and dimensioned.	M		
3.2	All member sizes and orientations specified.	M		
3.3	All RL's of bottom of base plates shown.	C		
3.4	All top of steel RL's (TOS) given.	C		
3.5	All column, rafter and beam splice locations given.	M		
3.6	"Between floor" member locations specifically dimensioned.	C		
3.7	Sufficient reference dimensions given in sloping areas.	C		
3.8	Specific dimensions provided for trimming out openings for other trades e.g., Window/door openings.	C		
3.9	Girts, hangers, fly braces and cross-bracing specifically dimensioned and located.	C		
3.10	Supports for door opening machinery coordinated with door supplier.	C		
3.11	Standard connections fully specified (e.g., WP30 NC)	C		
3.12	Correct detail referencing	C		
3.13	Other (specify)	C		

Note: For Material Order Issue, all category M items must be checked; For Construction issue, all category M and C items must be checked.

Project Name: _____

Drawing Type: **Connections**
Drawing Title:
Revision:

Drawing Number:
Issue Purpose:
Issue Date:

Other Non-Steelwork Drawings Referenced

Consultant	Drawing	Aspect Governed	Consultant	Drawing	Aspect Governed
Architect			Civil		
HVAC			Sprinkler		
Mechanical			Main Contractor		
Electrical			Other		

Item	Description	Issue Category	Completion Checked	Comments
4.1	Columns			
4.1.1	All base plates and hold down bolt connections designed, specified and sufficiently dimensioned.	C		
4.1.2	Grout thickness' sufficient to contain the jacking nuts.	C		
4.1.3	The bottom ends of the hold down bolts sufficiently contained within the footings and sufficiently dimensioned.	C		
4.1.4	Top ends of the hold down bolts sufficiently contained with finish floor and sufficiently dimensioned.	C		
4.1.5	All other construction items such as rebar unaffected by the hold down installation.	C		
4.1.6	The hold down bolt patterns sufficiently contained within the footings and sufficiently dimensioned.	C		
4.1.7	Column to column splice details and locations	C		
4.1.8	If required, column caps specified	C		
4.19	Other (specify)			
4.2	Beams			
4.2.1	Other cast-in or site drilled connections designed, specified, and sufficiently dimensioned.	C		
4.2.2	Cast-in's sufficiently contained in the walls and/or floor slabs.	C		
4.2.3	All other construction items, such as rebar, unaffected by the cast-in or site drilled connection installation.	C		
4.2.4	Beams to cast-ins or drilled on-site connections.	C		
4.2.5	Beam to beam one-sided	C		

4.2.6	Beam to beam two-sided	C		
4.2.7	Beam to beam splice	C		
4.3	Beam to column			
4.3.1	Non-moment beam to column flange	C		
4.3.2	Non-moment beam to column web	C		
4.3.3	Moment beam to column flange	C		
4.3.4	Moment beam to column web	C		
4.3.5	Beam on supporting column	C		
4.3.6	Column to supporting beam	C		
4.4	Bracing to beams or Columns	C		
4.5	Connections for FOB items	C		
4.6	Other (specify)			

Note: For Material Order Issue, all category M items must be checked; For Construction issue, all category M and C items must be checked.

STEELWORK DRAWING COMPLETION CHECKLIST

Project Name: _____

Drawing Type: **Stairs**

Drawing Number:

Drawing Title:

Issue Purpose:

Revision:

Issue Date:

Other Non-Steelwork Drawings Referenced

Consultant	Drawing	Aspect Governed	Consultant	Drawing	Aspect Governed
Architect			Civil		
HVAC			Sprinkler		
Mechanical			Main Contractor		
Electrical			Other		

Item	Description	Issue Category	Completion Checked	Comments
5.1	All relevant grids defined and dimensioned.	M		
5.2	All member sizes and orientations specified.	M		
5.3	Specific dimensioning given to locate the stairs in relation to the main structure.	C		
5.4	All RL's of bottom of base plates shown.	C		
5.5	All top of steel RL's (TOS) given and set downs noted.	C		
5.6	All column splices located.	M		
5.7	"Between floor" members specifically dimensioned.	C		
5.8	Sufficient reference dimensions given in sloping areas.	C		
5.9	Cast-in fixings to concrete work coordinated with concrete drawings.	C		
5.10	All relevant steelwork plans, elevations, and connection Drawings and Architectural Drawings referenced and coordinated.	C		
5.11	Connections fully specified.	C		
5.12	Correct detail referencing.	C		
5.13	Other (specify)	C		

Note: For Material Order Issue, all category M items must be checked; For Construction issue, all category M and C items must be checked.

STEELWORK DRAWING COMPLETION CHECKLIST

Project Name: _____

Drawing Type: **Lift Framing**
Drawing Title:
Revision:

Drawing Number:
Issue Purpose:
Issue Date:

Other Non-Steelwork Drawings Referenced

Consultant	Drawing	Aspect Governed	Consultant	Drawing	Aspect Governed
Architect			Civil		
HVAC			Sprinkler		
Mechanical			Main Contractor		
Electrical			Other		

Item	Description	Issue Category	Completion Checked	Comments
6.1	All relevant grids defined and dimensioned.	M		
6.2	All member sizes and orientations specified.	M		
6.3	Specific dimensions given to locate lift framing in relation to main structure.	C		
6.4	All RL's of bottom of base plates shown.	C		
6.5	All top of steel RL's (TOS) given and set downs noted.	C		
6.6	All column splices located.	C		
6.7	"Between floor" members specifically dimensioned.	C		
6.8	All relevant steelwork plans, elevations, and connection Drawings and Electrical, Mechanical, and Architectural Drawings referenced and coordinated.	C		
6.9	Connections fully detailed	C		
6.10	Correct detail referencing	C		
6.11	Other (specify)	C		

Note: For Material Order Issue, all category M items must be checked; For Construction issue, all category M and C items must be checked.

STEELWORK DRAWING COMPLETION CHECKLIST

Project Name: _____

Drawing Type: **Walkways and Access Ladders**
Drawing Title:
Revision:

Drawing Number:
Issue Purpose:
Issue Date:

Other Non-Steelwork Drawings Referenced

Consultant	Drawing	Aspect Governed	Consultant	Drawing	Aspect Governed
Architect			Civil		
HVAC			Sprinkler		
Mechanical			Main Contractor		
Electrical			Other		

Item	Description	Issue Category	Completion Checked	Comments
7.1	All relevant grids defined and dimensioned.	M		
7.2	All member sizes and orientations specified.	M		
7.3	Specific dimensioning given to locate all framing in relation to the main structure.	C		
7.4	All RL's of bottom of base plates shown.	C		
7.5	All top of steel RL's (TOS) given and set downs noted.	C		
7.6	All member splices located.	C		
7.7	"Between floor" members specifically dimensioned.	C		
7.8	Hand and guard-rails specified and set out dimensions given.	C		
7.9	Foot tread plate, foot mesh, ladder rungs, and fixings specified and set out.	C		
7.10	All relevant steelwork plans, elevations, and connection Drawings and Electrical, HVAC, Sprinkler, and Architectural Drawings referenced and coordinated.	C		
7.11	Connections fully detailed.	C		
7.12	Correct detail referencing.	C		
7.13	Other (specify)	C		

Note: For Material Order Issue, all category M items must be checked; For Construction issue, all category M and C items must be checked.

Project Name: _____

Drawing Type: **Overhead Crane Runway Girders**
Drawing Title:
Revision:

Drawing Number:
Issue Purpose:
Issue Date:

Other Non-Steelwork Drawings Referenced

Consultant	Drawing	Aspect Governed	Consultant	Drawing	Aspect Governed
Architect			Civil		
HVAC			Sprinkler		
Mechanical			Main Contractor		
Electrical			Other		

Item	Description	Issue Category	Completion Checked	Comments
8.1	All relevant grids defined and dimensioned.	M		
8.2	All member sizes and orientations specified.	M		
8.3	All RL's of bottom of base plates shown.	C		
8.4	All top of steel RL's (TOS) given.	C		
8.5	Members specifically dimensioned.	M		
8.6	Pre-cambers specified.	M		
8.7	Special levelling tolerances specified.	C		
8.8	Crane rail and crane rail attachment systems to girders adequately specified.	C		
8.9	End buffers specified.	C		
8.10	The design satisfies crane supplier requirements for serviceability and strength.	M		
8.11	Any foot tread plate, foot mesh, and fixings specified and set out.	M		
8.12	All relevant steelwork plans, elevations, and connection Drawings, Electrical, HVAC, Sprinkler, and Architectural Drawings referenced and coordinated.	C		
8.13	Girder splices located	C		
8.14	Connections fully detailed.	C		
8.15	Correct detail referencing.	C		
8.16	Other (specify)	C		

Note: For Material Order Issue, all category M items must be checked; For Construction issue, all category M and C items must be checked.

STEELWORK DRAWING COMPLETION CHECKLIST

Project Name: _____

Drawing Type: **HVAC / Sprinkler / Electrical Supports**
Drawing Title:
Revision:

Drawing Number:
Issue Purpose:
Issue Date:

Other Non-Steelwork Drawings Referenced

Consultant	Drawing	Aspect Governed	Consultant	Drawing	Aspect Governed
Architect			Civil		
HVAC			Sprinkler		
Mechanical			Main Contractor		
Electrical			Other		

Item	Description	Issue Category	Completion Checked	Comments
9.1	All relevant grids defined and dimensioned.	M		
9.2	All member sizes and orientations specified.	M		
9.3	Specific dimensioning given to locate all the framing in relation to the main structure.	C		
9.4	All top of steel RL's (TOS) given and set downs noted.	C		
9.5	All relevant steelwork plans, elevations, and connection Drawings and Electrical, HVAC, Sprinkler, and Architectural Drawings referenced and co-ordincated.	C		
9.6	Connections fully specified	C		
9.7	Correct detail references	C		
9.8	Other (specify)	C		

Project Name: _____

Drawing Type: **Cladding Systems**
Drawing Title:
Revision:

Drawing Number:
Issue Purpose:
Issue Date:

Other Non-Steelwork Drawings Referenced

Consultant	Drawing	Aspect Governed	Consultant	Drawing	Aspect Governed
Architect			Civil		
HVAC			Sprinkler		
Mechanical			Main Contractor		
Electrical			Other		

Item	Description	Issue Category	Completion Checked	Comments
10.1	All relevant grids defined and dimensioned.	M		
10.2	All member sizes and orientations specified.	M		
10.3	Specific dimensioning given to locate any framing for cladding panels in relation to the main structure.	C		
10.4	All top of steel RL's (TOS) given and set downs noted.	C		
10.5	"Between floor" members specifically dimensioned.	C		
10.6	Relevant steelwork plans, elevations, and connection Drawings, Architectural Drawings, and any other proprietary drawings referenced and coordinated.	C		
10.7	Connections fully specified.	C		
10.8	Correct detail referencing.	C		
10.9	Other (specify)	C		

Note: For Material Order Issue, all category M items must be checked; For Construction issue, all category M and C items must be checked.

11.0 SteelDoc Implementation

SteelDoc checklists are presented in an editable Word document format on the SCNZ website (www.scnz.org). The checklists may be used by consulting engineers in a number of ways, for example, to:

1. Use as a basis for the development of office drafting standards and practice for structural steelwork projects.
2. Review existing office drafting standards and practice to ensure they reflect best practice.
3. Train inexperienced engineers and draftspersons in the requirements for structural steelwork documentation.
4. Use as project-specific checklists for building projects warranting additional quality control such as complex and high-risk projects

12.0 Conclusion

The use of structural steelwork in construction in New Zealand is rapidly increasing. While the design and construction methods used are constantly changing, the three fundamentals of good design documentation remain. These are: clarity of presentation, lack of ambiguity, and completeness in defining the contract works.

The principal's representative and the design consultants who prepare the contract documents issued on behalf of the principal have a pivotal role in facilitating the continuing development of a reliable and cost-effective construction industry in New Zealand.

SteelDoc: Code of Practice for Structural Steelwork Documentation aims to clarify the issues that should be addressed to ensure the success of steel construction projects in New Zealand.

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