Australian Government

Department of Education, Employment and Workplace Relations

# MSATCS501A Detail standardised structural connections

**Revision Number: 1**

## MSATCS501A Detail standardised structural connections

# Modification History

Not applicable.

# Unit Descriptor

| | |
|---|---|
| **Unit descriptor** | This unit covers the skills and knowledge required to identify bolted or welded connections for structural steelwork that is consistent with design specifications and to detail these connections in structural steelwork detailed drawings. Both steel to steel and steel to non-steel connections are covered by this unit. Portal frame haunch connections, column base plate and holding down bolt layouts, and steel to non-steel connections are also covered by this unit. |

# Application of the Unit

| | |
|---|---|
| **Application of the unit** | This unit applies to a structural steel detailer who has to detail the various types of standard connections used in structural steelwork. Standard connections are those listed in the latest edition of the Australian Steel Institute's *Standardised Structural Connections* publication.<br><br>Connections covered include flexible and rigid connections and purlin cleats.<br><br>The unit may apply to structural steel detailing carried out for residential, commercial, industrial or mining fabrication and construction projects. The detailing may be done manually or by using CAD and/or proprietary steel detailing software.<br><br>The unit assumes that knowledge of basic technical drawing conventions and procedures such as view, dimensioning, drawing layout, etc. is already held.<br><br>Work is conducted according to defined procedures.<br><br>Work may be conducted in small to large scale enterprises and may involve individual and team activities.<br><br>This unit requires the application of skills associated with planning and organising to complete structural steel detail drawings. Communication and numeracy skills are used to refer to patterns and specifications and complete and label sketches. Self management skills are used to ensure conformance of own work to quality standards. |

# Licensing/Regulatory Information

Not applicable.

# Pre-Requisites

| | | |
|---|---|---|
| **Prerequisite units** | *MEM09002B* | *Interpret technical drawing* |
| | *MEM05051A* | *Select welding processes* |
| | *MSATCS301A* | *Interpret architectural and engineering design specifications for structural steel detailing* |

# Employability Skills Information

| | |
|---|---|
| **Employability skills** | This unit contains employability skills. |

# Elements and Performance Criteria Pre-Content

| | |
|---|---|
| Elements describe the essential outcomes of a unit of competency. | Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide. |

# Elements and Performance Criteria

| ELEMENT | PERFORMANCE CRITERIA |
|---|---|
| 1. Determine shop and field connections from design drawings | 1.1. Fabrication shop capabilities and preferences are discussed with fabricator<br>1.2. Connections are allocated as shop or field welded in conjunction with fabricator<br>1.3. Connections to be field bolted are allocated and extent of shop preparation of connections decided<br>1.4. Connection fittings for structural connections are allocated to either columns or beams to suit fabrication efficiency or design requirements |
| 2. Identify required connections | 2.1. Members requiring connections are identified from design information and any potential or specified non standard connections are identified<br>2.2. Design information is checked for specification of standard and non standard connections<br>2.3. Adequacy of design information for non standard connections is checked and request for further information made if necessary<br>2.4. Standard connections not specified by the designer are identified and connection type specified in conjunction with the fabricator<br>2.5. Approval is sought from designer before detailing and fabrication |
| 3. Detail connections | 3.1. Connections suitable for standard detailing parameters are identified and detailed<br>3.2. Connection components are detailed using standard detailing parameters<br>3.3. Copes and notches are detailed for beams and columns as required<br>3.4. Non standard connections are detailed according to supplied design information |
| 4. Detail purlin and girt cleats | 4.1. Purlins and girts are identified on design information<br>4.2. Cleat length and bolt spacing is identified from purlin or girt manufacturer's instructions or design information<br>4.3. Cleats are detailed |
| 5. Detail haunches for portal frame buildings | 5.1. Haunch specifications, bolting information, eave and apex information supplied by designer are checked<br>5.2. Exact haunch sizes and dimension haunches on shop drawings and erection diagrams are calculated |

| ELEMENT | PERFORMANCE CRITERIA |
|---|---|
| | 5.3. Pre-sets for column tops are inserted into shop drawings and erection plans where specified in design information |
| 6. Detail column base plates | 6.1. Holding down bolt layout plan is prepared according to design information<br>6.2. Grouts and shims are specified for column base plates<br>6.3. Holding down bolts are specified from design information |
| 7. Detail steel to non-steel connections | 7.1. Edge clearances for concrete and other non-steel members or components are determined from designer or non-steel detailer<br>7.2. Casting plates types are identified from design information<br>7.3. Reinforcement locations are identified and clashes with connections avoided<br>7.4. Interference with post tensioning cables and holding down bolts is avoided for upper floor connections<br>7.5. Fixings are identified from design information<br>7.6. Steel to non-steel connections are detailed according to design information |

# Required Skills and Knowledge

**REQUIRED SKILLS AND KNOWLEDGE**

This section describes the skills and knowledge required for this unit.

**Required skills**

- assess design information for adequacy of information needed for structural steel detailing
- liaise with architects and engineers
- assess scope of structural steel detailing tasks and priorities
- interpret design drawings, sketches and schedules, to determine dimensions, layouts, types and grades of materials
- interpret manufacturers catalogues and product information
- use basic trigonometry to determine dimensions not given in design information
- work according to OHS practices of the enterprise and workplace which may include requirements prescribed by legislation, awards, agreements and conditions of employment, standard operating procedures, or oral, written or visual instructions
- communicate at all levels about technical issues related to patterns and specifications
- reading and numeracy is required to the level of interpreting workplace documents and technical information

**Required knowledge**

- architectural and engineering design drawings including standard symbols, terms, abbreviations and sketches
- connections used in structural steel construction
- the difference between design and detail drawing processes
- drawing office procedures
- fabrication processes and procedures
- the Australian steel structures limit state design code's (AS4100) requirements in so far as they impact on steel detailing
- characteristics of portal frame construction especially the behaviour of the frame under load and points of high stress

# Evidence Guide

| EVIDENCE GUIDE | |
|---|---|
| The Evidence Guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package. | |
| **Overview of assessment** | • |
| **Critical aspects of for assessment and evidence required to demonstrate competency in this unit** | Demonstrates skills and knowledge to:<br>• identify and interpret architect and engineer design specifications for structural steel constructions including design information for steel to steel and steel to non-steel connections<br>• relate design information to structural steel detailing processes for connections<br>• establish efficient administrative arrangements for liaison with designers including arrangements for formal requests for further information<br>• establish drawing and document control procedures<br>• identify standard components and connections from industry publications, manufacturers' catalogues and Australian or other relevant standards |
| **Context of and specific resources for assessment** | Assessment may occur on the job or in an appropriately simulated environment<br>Resource implications for this unit include:<br>• access to real or appropriately simulated detailing of structural steel connections including provision of suitable design information<br>• computer with suitable CAD software or manual drafting equipment and material including work areas, materials and equipment<br>• access to steel and component manufacturers' catalogues or websites<br>• access to relevant standards through either hard copy or internet access.<br>Where applicable, reasonable adjustment must be made to work environments and training situations to accommodate ethnicity, age, gender, demographics and disability.<br>Access must be provided to appropriate learning and/or assessment support when required. Where applicable, physical resources should include equipment modified |

| EVIDENCE GUIDE | |
|---|---|
| | for people with disabilities. |
| **Method of assessment** | • Assessment must satisfy the endorsed assessment guidelines of the Manufacturing Training Package<br>• Assessment methods must confirm consistency and accuracy of performance (over time and in a range of workplace relevant contexts) together with application of underpinning knowledge<br>• Assessment methods must be by direct observation of tasks and include questioning on underpinning knowledge to ensure its correct interpretation and application<br>• Assessment may be applied under project related conditions (real or simulated) and require evidence of process<br>• Assessment must confirm a reasonable inference that competency is able not only to be satisfied under the particular circumstance, but is able to be transferred to other circumstances<br>• Assessment may be in conjunction with assessment of other units of competency where structural steel detailing is involved |
| **Guidance information for assessment** | Assessment processes and techniques must be culturally appropriate and appropriate to the oracy, language and literacy capacity of the assessee and the work being performed. |

# Range Statement

| RANGE STATEMENT | |
|---|---|
| The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included. | |
| **Legislative/regulatory requirements** | All work must comply with relevant Federal and State or Territory legislative or regulatory requirements |
| **Connections** | All connections are steel to steel unless specifically noted |
| **Design information** | Design information is the information provided to the detailer and fabricator by the architects and consulting engineers for a project. For some projects the design information may only be provided by an engineer. The design information will usually be in the form of design drawings or sketches but may also be via material lists and written instructions and computer files |
| **Standard connections** | Standard connections are those specified in the Australian Steel Institute's publication *'Standardised Structural Connections'* |
| **Connection type** | • Connections may be standard flexible or rigid connections<br>• Flexible connections may include:<br>  • angle seats<br>  • bearing pads<br>  • flexible end plates<br>  • angle cleats<br>  • web side plates<br>• Rigid connections may include:<br>  • fully welded end plates<br>  • bolted moment end plates |
| **Standard detailing parameters** | Standard detailing parameters are connections suitable to be detailed using the standard bolting and welding specifications contained in the Australian Steel Institute's publication |

| RANGE STATEMENT | |
|---|---|
| | 'Standardised *Structural Connections'*. These details include:<br>• size of fillet welds<br>• electrode and MIG welding wire specification<br>• bolt type and size<br>• arrangement of holes for bolts<br>• back gauge dimensions and minimum edge distances<br>• distance from beam top to the first row of bolts<br>• detailing parameters for components such as cleat plates, gussets, end plates, base plates and angle plates |
| **Components** | Components may include cleat plates, gussets, end plates, base plates and angle plates |
| **Standard welding symbols** | Standard welding symbols as described in AS 1101 Part 3 |
| **Non-steel connections** | Non-steel connections are those between steel members and concrete, timber, glass or plastic or other building or fabricated component required to be shown on a structural steel detail drawing. The connection may be for structural or decorative purposes. An example would be steel supports for a timber deck |
| **Haunch specifications** | Haunches are special connections used in portal frame buildings. Haunch specifications supplied by designers will normally include:<br>• roof slope<br>• details of haunch location and size sufficient to ensure design requirements<br>• end plate specification<br>• bolting information<br>• location and sizes of welds<br>• fly bracing requirements |
| **Fixings** | Fixings may include standard bolts, dynabolts, chemsets, female internal thread tube bolts, and other specialist steel to non-steel fixings |
| **Work environment** | Detailing may be undertaken in a variety of work environments including commercial, home office |

| RANGE STATEMENT | |
|---|---|
| | or fabrication or construction enterprise.<br>Work may be performed individually on a contracting/project basis or as part of a project team and in response to combinations of paper based and electronic instructions. |

# Unit Sector(s)

| | |
|---|---|
| **Unit sector** | Structural steel detailing |

# Competency field

| | |
|---|---|
| **Competency field** | |

# Co-requisite units

| | | |
|---|---|---|
| **Co-requisite units** | | |
| | | |