

3.6	Testing of bolts
3.7	Washers
3.8	Welding of bolts
3.9	Lock nuts
4	BOLTING CATEGORIES
5	BOLT LENGTH CONSIDERATIONS
5.1	Plain shank lengths
5.2	Threads included in shear plane
5.3	Threads excluded from shear plane
5.4	Discussion
6	DETAILING
6.1	Bolt holes
6.2	Limitations
7	INSTALLATION OF BOLTS
7.1	Introduction
7.2	Snug-tightening
7.3	Full tensioning methods
7.4	Part turn of nut method
7.5	Direct tension indication method
7.6	Issues with tensioning bolts
7.7	Clearances
7.8	Inspection of bolted connections
7.9	Blind bolts
8	CORROSION PROTECTION
8.1	Corrosion protection of bolts
8.2	Corrosion protection of interfaces
9	Certification to AS/NZS 1252:1996
10	REFERENCES
	APPENDIX
A	ASI Design Guide 1 comment form

8. DESIGN GUIDE 2: WELDING IN STRUCTURAL STEEL CONNECTIONS

Design Guide 2: Welding in Structural Steel Connections has been introduced into the ASI Connection Series as a complementary document to Design Guide 1: Bolting in Structural Steel Connections. The intention of Design Guide 2 is to act as a basic primer on all aspects of welding as applied to structural steel connections. Extensive reference is made to sources which can supply more detailed information - many of these references are more general and apply to fabricating in general using welding.

Design Guide 2 addresses the matters covered in Australian Standards with the exception of weld design which is dealt with in Handbook 1. This design guide discusses welding processes, consumables and

procedures in sufficient detail for the structural engineer to understand the basis of what occurs in a fabrication shop when connections are being fabricated. Welding in the fabrication shop and bolting onsite remain the key to economical structural steelwork.

Design Guide 2 also discusses the issues of workmanship, imperfections in welds, when imperfections become defects, how welds can be inspected and repair of welds.

Contents of Design Guide 2 include:

1	CONCEPT OF DESIGN GUIDES
1.1	Background
2	INTRODUCTION
3	TYPES OF WELD
3.1	Weld types
3.2	Fillet welds
3.3	Butt welds
3.4	Edge preparations
3.5	Prequalified joint preparations
3.6	Standard weld symbols
4	WELDABILITY OF STEEL
5	WELDING PROCESSES
5.1	Introduction
5.2	Fusion welding process
5.3	Terminology
5.3.1	Weld metal
5.3.2	Partially mixed weld metal
5.3.3	Fusion (boundary) line
5.3.4	Heat-affected zone
5.3.5	Multi-run welds
5.4	Manual metal arc welding
5.5	Gas metal arc welding and flux cored arc welding
5.6	Summary of characteristics of welding processes
5.7	Welding positions
6	WELDING CONSUMABLES
6.1	Manual metal arc welding
6.2	Gas metal arc welding
6.3	Flux cored arc welding
6.4	Prequalified welding consumables
7	WELDING PROCEDURES
7.1	Qualification of a welding procedure
7.2	Prequalified welding procedure
7.3	Qualification by testing
7.4	Requalification of welding procedures

8	WORKMANSHIP
8.1	Edge preparation
8.2	Assembly
8.3	Preheat
8.4	Tack welds
8.5	Distortion and residual stress
8.6	Cleaning and dressing welds
9	WELD IMPERFECTIONS
9.1	Weld categories
9.2	Levels of inspection
9.3	Imperfection levels
9.4	Weld defects
9.5	Weld repairs
10	WELD INSPECTION
10.1	Introduction
10.2	Visual examination
10.3	Magnetic particle examination
10.4	Liquid penetrant examination
10.5	Radiographic examination
10.6	Ultrasonic examination
11	PRACTICAL CONSIDERATIONS
11.1	Clearances for welding
11.2	Site welding
11.3	Economical design and detailing
12	REFERENCES
	APPENDIX
A	ASI Design Guide 2 comment form

9. DESIGN GUIDE 3: WEB SIDE PLATE CONNECTIONS

Design Guide 3 covers the web side plate (WSP) connection and includes references to the Handbook 1, Design of Structural Steel Connections. This allows the web side plate connection model to remain concise and practical for efficient design assessment. The presentation of the connection model follows a stylised page format with a numbered DESIGN CHECK procedure to simplify the design capacity assessment.

The most significant upgrades in reviewing and consolidating the previous WSP design model are the consideration of the support condition, detailing limitations (in particular weld sizing) for standard plate components, refinements to block shear assessments and rotation checks. Improvements have been made to local stability of coped beams and local capacity of the supporting member checks with the latter now including some closed sections. Design Guide 3 includes standardised detailing and DCTs for the web

side plate connection derived using the design model in this Design Guide. The DCTs have been rigorously checked firstly by hand calculation, then by spreadsheet and also using the Limcon software for consistency and validity. An ASI connections survey revealed that practising engineers in designing common connections firstly consult their DCTs, then if required, follow with hand calculations, spreadsheet formulation and finally detailed computer assessments. Special surveys of the Australian steel industry provided Best Practice for component and dimensional standardisation. The results tabulated for each WSP configuration are only for the dimensional and geometrical limitations and design actions specified. Any additional loads, load combinations and geometry arrangements beyond the limits specified must be undertaken by a competent professional person and supported by engineering research, theory or principles. New modified theory that may be used to assess an extended WSP configuration has also been included in Section 15 of this Design Guide.

The new Connection Series format with separate design guides for individual connection types is intended to facilitate addition to or revision of connection model theory using relevant new local or international research as deemed appropriate by the ASI.

Engineering Systems has worked closely with the ASI to further develop Limcon as the companion program for this new Connection series. The latest version of Limcon fully implements the new connection design models and it was employed in checking the design tables. The Limcon output for one or more of the worked examples is included in an appendix to each design guide. The program is an efficient tool covering the full range of structural connections, including those beyond the scope of the Simple Connections DCT's V3.

Contents of Design Guide 3 include:

1	CONCEPT OF DESIGN GUIDES
1.1	Background
2	DESCRIPTION OF CONNECTION
3	TYPICAL DETAILING OF CONNECTION
4	DETAILING CONSIDERATIONS
5	COMPLIANCE WITH AS 4100 REQUIREMENTS FOR CONNECTIONS
6	BACKGROUND INFORMATION
7	BASIS OF DESIGN MODEL
8	SHORT AND LONG WEB SIDE PLATES
9	CONNECTION GEOMETRY