6. HANDBOOK 1: DESIGN OF STRUCTURAL STEEL CONNECTIONS

The Handbook is the companion to both the Simple Connections DCT's, V3 and to the design guides. It consolidates industry Best Practice, references and research papers. The Handbook formulates the elemental equations for assessing bolts, bolt groups, welds, weld groups, connections components and supporting members in standardised structural steel connections.

Connections are considered in the Handbook and in AS 4100 to consist of the following connection parts:

- bolts or welds;
- plates, gussets, cleats;
- supported members; and
- supporting members.

All the above design capacities must be evaluated in order to estimate the design capacity of a connection. This Handbook deals with the design capacity of these elements as isolated elements so that the formulae derived can be used in later design guides concerned with individual connections.

Codes for the design of steel structures primarily deal with member design as a whole, rather than specifically allowing for local effects and provide only the basic information on fastener design. No code specifies a detailed design procedure for any type of connection leaving the assessment of how a connection behaves and how its behaviour should be allowed for in design to the individual designer. This presents the designer with a considerable task considering the large number of different connection types that may be encountered, each requiring individual research and assessment. A series such as this seeks to assist the designer by providing guidance in order to reduce the task considerably.

The design models contained within this Handbook are considered to be applicable only to connections which are essentially statically loaded. Connections subject to dynamic loads, earthquake loads or fatigue applications may require additional considerations.

The Handbook covers design of bolts and bolt groups, welds and weld groups, other connection components including angle, flat bar and plate as well as supported members.

Contents of Handbook 1 include:

4.10 Properties of common fillet weld groups
4.11 Practical fillet weld groups
4.12 Design example No. 4 - Design of fillet weld group loaded in-plane
4.13 Design example No. 5 - Design of fillet weld group loaded out-of-plane

5 CONNECTION COMPONENTS
5.1 Angle components
5.2 Flat bar components
5.3 Plate components
5.4 Design capacities

6 SUPPORTED MEMBERS
6.1 General
6.2 Uncoped sections
6.3 Design example No. 6 - UB unholed and holed moment and shear capacity
6.4 Single web coped sections
6.5 Design example No. 7 - UB single web coped moment and shear capacity
6.6 Double web coped sections
6.7 Design example No. 8 - UB double web coped moment and shear capacity
6.8 Lateral torsional buckling
6.9 Block shear failure of coped sections
6.10 Web reinforcement of coped supported members

7 SUPPORTING MEMBERS
7.1 Rationalised dimensions
7.2 Gauge lines

8 MINIMUM DESIGN ACTIONS ON CONNECTIONS
8.1 AS 4100 Requirements
9 REFERENCES
APPENDICES
A Limcon software
B ASI Handbook 1 comment form

7. DESIGN GUIDE 1: BOLTING IN STRUCTURAL STEEL CONNECTIONS

This design guide revises the renowned third edition of Bolting of steel structures as Design Guide 1, now known as Bolting in Structural Steel Connections. The former publication has been redeveloped into the new design guide format bringing the key designer reference material from the former appendices into the relevant sections of this design guide. New technological developments in the area of specialised direct tension measuring devices have been incorporated along with high strength structural blind bolts that are becoming a key component with the growing use of large closed sections in building construction. For this guide, international standards have been reviewed and global manufacturers of erection equipment investigated to provide updated guidance on the standard wrenches for determining erection clearances.

Structural designs are now leaner as a direct result of advanced analysis, design tools and the supply of higher strength structural members. This has increased bolt design actions, often making them the critical item in design. The most significant upgrade to this design guide lies in the area of bolt quality and certification along with the dimensional and mechanical properties of common structural assemblies. Minimising designer risk in certification of bolt quality is now a necessary process and a necessary duty of care in the structural design. All Australian standard high strength bolt assemblies are supplied from international sources following the increasing trend to reduce project costs through these commodity items. A simple checklist and guide have been developed to assist the designer in this design guide.

Following many ASI technical enquiries and feedback from the fabrication industry, Best Practice in bolt installation has been reinforced with warnings not to weld any heat treated high-strength bolt assemblies. There are very few bolt experts and designers have seldom dedicated courses at undergraduate level focusing on these key structural items. Bolts would have the least design time but generally play the key role and this design guide has been developed to consolidate the necessary bolt knowledge when using bolts in structural steel connections.

Contents of Design Guide 1 include:

1 CONCEPT OF DESIGN GUIDES
1.1 Background

2 INTRODUCTION

3 CHARACTERISTICS OF STRUCTURAL BOLTS
3.1 Thread form
3.2 Bolt types
3.3 Identification
3.4 Commercial bolts
3.5 High strength structural bolts