Design Guide 12

Bolted end plate to column moment connections

by

T.J. Hogan

contributing author

N. van der Kreek

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Also in this series:
Handbook 1: Design of structural steel connections
Design Guide 1: Bolting in structural steel connections
Design Guide 2: Welding in structural steel connections
Design Guide 3: Web side plate connections
Design Guide 4: Flexible end plate connections
Design Guide 5: Angle cleat connections
Design Guide 6: Seated connections
Design Guide 10: Bolted end plate beam splice connections
Design Guide 11: Welded beam to column moment connections

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PREFACE

This new series of connection publications by the Australian Steel Institute (ASI) covering capacity tables, theory and design of individual rigid connections will be known as the Structural Steel Connections Series, Part 2: 1st ed. 2009 ('*Connection Series, Part 2*'). This Connection Series, Part 2 details the method of design and provides capacity tables and detailing parameters for a range of rigid connections commonly used for structural steel in Australia. Connections have a major engineering and economic importance in steel structures influencing design, detailing, fabrication and erection costs. Standardisation of design approach integrated with industry detailing is the key to minimum costs at each stage. This Connections Series, Part 2 in conjunction with the Connection Series, Part 1 for simple connections (collectively the Structural Steel Connections Series or '*Connection Series*') replaces and enhances an ASI flagship publication first released in 1978 at which time connection design theories were developed for the purpose of generating and releasing connection capacity tables. The first three editions were released in permissible stress format. The fourth edition *Design of Structural Connections* (often referred to as the Green Book) was released in 1994 in limit state format but there was no subsequent release of a limit state companion document containing connection design capacity tables.

This Design Guide is intended to provide a recommended design model for the extended bolted moment end plate connection when used as a beam-to-column connection.

The recommended design model is based extensively on the American Institute of Steel Construction Steel Design Guide 4 '*Extended end-plate moment connections, seismic and wind applications*', Second Edition, and Design Guide 13 '*Stiffening of wide flange columns at moment connections: wind and seismic applications*' and Steel Design Guide 16 '*Flush and extended multiple-row moment end-plate connections'*.

The new Connections 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. Connection models developed using the Handbook 1 theory follow a stylised page format with a numbered DESIGN CHECK procedure to simplify connection capacity assessment.

Engineering Systems has worked closely with the Australian Steel Institute to further develop Limcon as the companion program for this new Connection Design Guide 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 the worked example is included in the appendix to this Design Guide. The program is an efficient tool covering the full range of structural connections, including those beyond the scope of the Design Guide capacity tables.

An appendix to each Design Guide also contains an ASI comment form. Users of this publication are encouraged to photocopy this one page form and forward any suggested improvements which may be incorporated into future editions.

T.J. Hogan

N. van der Kreek

ABOUT THE AUTHOR

Tim Hogan is Consultant to and retired Director of SCP Consulting Pty Ltd. His academic achievements include a Bachelor of Engineering from the University of NSW with 1st Class Honours and the University Medal. Post graduate qualifications include a Master of Engineering Science and a Master of Business Administration. Tim is a Member of the Institution of Engineers Australia with CPEng and FIE Aust. status.

His early experience was on bridge design and construction with the NSW Public Works Department and subsequently as Development Engineer and then Engineering Manager with the Australian Institute of Steel Construction until 1980. Consulting experience with SCP Consulting since 1980 has included design and supervision of large steel framed buildings, industrial buildings, mill buildings, retail developments, defense infrastructure and composite steel-concrete buildings. His published works deal primarily with the areas of composite construction, steel connections, fabrication and erection of steel structures and he was a major contributor and editor of the Commentary to AS 4100. He is a member of a number of Standards Australia Committees dealing with steel and composite structures and is currently Chairman of Committee BD-001 Steel Structures and BD-032 Composite Construction. He received an award from Standards Australia for his contributions to writing of Australian Standards.

ABOUT THE CONTRIBUTING AUTHOR

Nick van der Kreek is OneSteel Manufacturing's Technical Development Manager and has held various technical and marketing roles during his 22 years with OneSteel (BHP Steel prior to 2000). Nick's activities included engineering development and design support associated with composite and steel framed building solutions—either of a generic nature or specific designs for many notable Australian multi-storey buildings. Nick is the principal author of the OneSteel composite software.

Nick has a BE from the University of Queensland and a Graduate Diploma in Computing from the University of Melbourne.

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Significant contributions were made by:

- Richard Collins—Engineering Systems in the development and upgrade of the Limcon software code in parallel with the design theory and aiding in the editing and validation of the revised models.
- Biometrical Data Processing for technical typesetting expertise.
- Whizzcad Pty Ltd with drafting and graphics for publishing.
- ASI State Engineering & Construction special Sub-Committees for progressive engineering and industry review of manuscripts.

Together with support of:

- All facets of the ASI membership including design engineers, steelwork detailers and fabricators in contributing industry best practice and standards through ASI surveys and direct consultation to establish the theory and geometry in this new ASI Connection Manual.