

The following DESIGN CAPACITY TABLES are provided, derived using DESIGN CHECK NOS 1 to 8 inclusive.

- Table B7 Design moment capacity of bolted/welded single cover plate splice
Universal beam sections < 400 deep, M20 bolts, 6 fillets to flange plates,
5 fillets to web plates
- Table B8 Design moment capacity of bolted/welded single cover plate splice
Universal beam sections > 400 deep, M24 bolts, 8 or 6 fillets to flange plates,
5 fillets to web plates
- Table B9 Design moment capacity of bolted/welded three cover plate splice
Universal column sections, M24 bolts, 6/8 fillets to flange plates and 6 fillets to
web plates
- Table B10 Design moment capacity of bolted/welded three cover plate splice
700WB/800WB welded beam sections, M24 bolts, 6/8 fillets to flange plates and
5 fillets to web plates
- Table B11 Design moment capacity of bolted/welded three cover plate splice
900WB/1000WB welded beam sections, M24 bolts, 6/8 fillets to flange plates and
6 fillets to web plates



TABLE B7

**DESIGN MOMENT CAPACITY OF BOLTED/WELDED SINGLE COVER PLATE SPLICE
UNIVERSAL BEAM SECTIONS < 400 DEEP
M20 BOLTS, 6 FILLETS TO FLANGE PLATES, 5 FILLETS TO WEB PLATES**

Section : Grade 300

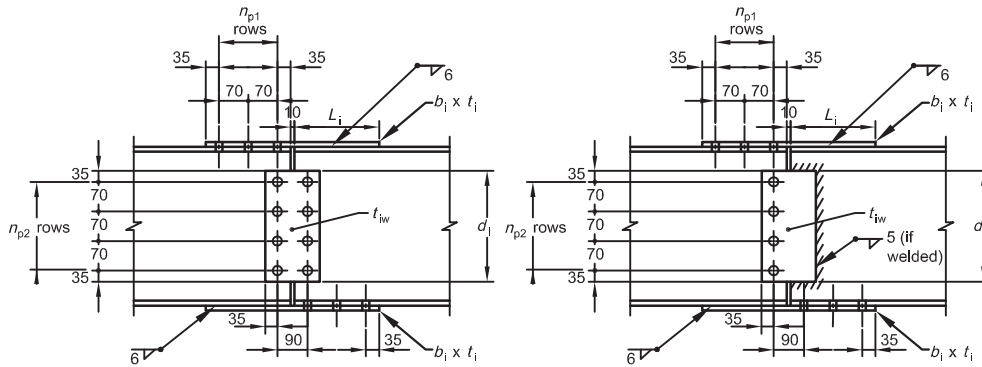
Bolts : 8.8/TB Category, 70 gauge in flange

Cover plates : Grade 250 plate

Axial force : See Note 2

Shear force : Max [0.15 × design shear cap; 40 kN]
limited to 0.60 × design shear cap

Welds: SP category E40XX/W50X electrodes



Section, Grade 300	ϕM_s kNm	$\phi M_s'$ kNm	Flange—1 Plate (Note 3)				Web—2 Plates				CASE 1		CASE 2, $N^* \neq 0$		Refer Note 1
			b_i	t_i	n_{p1}	L_i	d_i	t_{iw}	n_{p2}	Max V^*	$N^*=0$	Max V^*	Max N^*	ϕM_{conn} kNm	
										(plus or minus) kN	ϕM_{conn} kNm	(plus or minus) kN	(Tens or Comp) kN		
360UB56.7	273	245	150	20	4	280	280	6	4	297	193	297	98.0	183	
			150	16	3	210	280	6	4	297	184	297	98.0	173	
			150	12	3	210	280	6	4	75.0	163	74.4	98.0	150	
360UB50.7	242	217	150	16	3	210	280	6	4	269	169	269	87.5	159	
			150	12	2	140	280	6	4	67.4	143	67.4	87.5	132	
			150	10	2	140	280	6	4	93.7	136	91.4	87.5	125	
360UB44.7	222	198	150	16	3	210	280	6	4	251	141	251	82.5	133	
			150	12	3	210	280	6	4	251	136	251	82.5	128	
			150	10	2	140	280	6	4	63.0	123	63.0	82.5	112	
310UB46.2	197	174	150	16	3	210	210	6	3	213	143	213	80.0	135	
			150	12	3	210	210	6	3	213	117	213	80.0	109	
			150	10	2	140	210	6	3	213	98.1	213	80.0	90.1	
310UB40.4	182	161	150	16	3	210	210	6	3	191	122	191	75.0	114	
			150	12	3	210	210	6	3	191	117	191	75.0	109	
			150	10	2	140	210	6	3	191	97.7	191	75.0	90.3	
310UB32.0	134	117	130	12	2	140	210	6	3	169	82.0	169	59.0	76.7	
			130	10	2	140	210	6	3	169	78.2	169	59.0	72.9	
			130	8	2	140	210	6	3	169	62.6	169	59.0	57.3	
250UB37.3	140	121	130	16	2	140	210	6	3	42.5	94.8	42.5	68.5	86.8	
			130	12	2	140	210	6	3	53.7	90.8	49.6	68.5	84.2	
			130	10	2	140	210	6	3	96.0	75.6	91.9	68.5	69.1	
250UB31.4	114	99.1	130	10	2	140	210	6	3	40.0	75.6	40.0	57.5	69.2	
			130	8	2	140	210	6	3	86.1	61.8	82.5	57.5	56.5	

NOTES:

- ϕM_{conn} = design moment capacity of connection
 ϕM_s = design section moment capacity of full section
 $\phi M_s'$ = design section moment capacity of section with holes in one flange
- Case 1 applies to splices with no axial force ($N^*=0$)
Case 2 applies to splices where axial force N^* does not exceed the value tabulated (approx 5% of design section capacity)
- 6 mm plate not used for flange cover plates due to concerns about plate buckling



Design Guide 13
Splice connections

by

T.J. Hogan

contributing author

N. van der Kreek

first edition—2009



AUSTRALIAN STEEL INSTITUTE
(ABN)/ACN (94) 000 973 839

Design Guide 13
Splice connections

Copyright © 2009 by AUSTRALIAN STEEL INSTITUTE

Published by: AUSTRALIAN STEEL INSTITUTE

All rights reserved. This book or any part thereof must not be reproduced in any form without the written permission of Australian Steel Institute.

Note to commercial software developers: Copyright of the information contained within this publication is held by Australian Steel Institute (ASI). Written permission must be obtained from ASI for the use of any information contained herein which is subsequently used in any commercially available software package.

FIRST EDITION 2009 (LIMIT STATES)

National Library of Australia Cataloguing-in-Publication entry:

Hogan, T.J.

Design Guide 13: Splice connections

1st ed.

Bibliography.

ISBN 978 1 921476 16 7 (pbk.).

ISBN 978 1 921476 17 4 (pdf.).

1. Steel, Structural—Standards – Australia.
2. Steel, Structural—Specifications – Australia.
3. Joints, (Engineering)—Design and construction.
 - I. van der Kreek, N.
 - II. Australian Steel Institute.
 - III. Title

(Series: Structural steel connection series).

This publication originated as part of
Design of structural connections
First edition 1978
Second edition 1981
Third edition 1988
Fourth edition 1994

Also in this series:

Design capacity tables for structural steel. Volume 3: Simple connections—Open sections

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

Design Guide 12: Bolted end plate to column moment connections

Design capacity tables for structural steel. Volume 4: Rigid connections—Open sections

Disclaimer: The information presented by the Australian Steel Institute in this publication has been prepared for general information only and does not in any way constitute recommendations or professional advice. While every effort has been made and all reasonable care taken to ensure the accuracy of the information contained in this publication, this information should not be used or relied upon for any specific application without investigation and verification as to its accuracy, suitability and applicability by a competent professional person in this regard. The Australian Steel Institute, its officers and employees and the authors of this publication do not give any warranties or make any representations in relation to the information provided herein and to the extent permitted by law (a) will not be held liable or responsible in any way; and (b) expressly disclaim any liability or responsibility for any loss or damage costs or expenses incurred in connection with this publication by any person, whether that person is the purchaser of this publication or not. Without limitation, this includes loss, damage, costs and expenses incurred as a result of the negligence of the authors or publishers.

The information in this publication should not be relied upon as a substitute for independent due diligence, professional or legal advice and in this regards the services of a competent professional person or persons should be sought.



CONTENTS

	<i>Page</i>		<i>Page</i>
List of figures	iv	B3 Detailing considerations	48
List of tables	v	B4 Basis of design model	49
Preface	vi	B5 Recommended design model— Summary of design checks	50
About the author	vii	B6 Recommended design model— DESIGN CHECK NO. 1	51
About the contributing author	vii	B7 Recommended design model— DESIGN CHECK NO. 2	56
Acknowledgements	viii	B8 Recommended design model— DESIGN CHECK NO. 3	59
1 CONCEPT OF DESIGN GUIDES.....	1	B9 Recommended design model— DESIGN CHECK NO. 4	61
1.1 Background	1	B10 Recommended design model— DESIGN CHECK NO. 5	65
2 AS 4100 REQUIREMENTS	2	B11 Recommended design model— DESIGN CHECK NO. 6	67
2.1 Minimum design actions	2	B12 Recommended design model— DESIGN CHECK NO. 7	68
2.2 Member section capacity at splice location	3	B13 Recommended design model— DESIGN CHECK NO. 8	69
2.3 Full contact splices in columns	6	B14 Design example	70
3 CALCULATION OF DESIGN ACTIONS	7	B15 Design capacity tables	76
4 REFERENCES.....	12	PART C FULLY WELDED SPLICE	82
PART A BOLTED COVER PLATE SPLICE..	13	C1 Description of connection	82
A1 Description of connection	13	C2 Typical detailing of connection	83
A2 Typical detailing of connection	14	C3 Detailing considerations	84
A3 Detailing considerations	16	C4 Basis of design model	85
A4 Basis of design model	17	C5 Recommended design model— Summary of design checks	86
A5 Recommended design model— Summary of design checks	19	C6 Recommended design model— DESIGN CHECK NO. 1	87
A6 Recommended design model— DESIGN CHECK NO. 1	20	C7 Recommended design model— DESIGN CHECK NO. 2	88
A7 Recommended design model— DESIGN CHECK NO. 2	26	C8 Recommended design model— DESIGN CHECK NO. 3	89
A8 Recommended design model— DESIGN CHECK NO. 3	28	C9 Recommended design model— DESIGN CHECK NO. 4	91
A9 Recommended design model— DESIGN CHECK NO. 4	32	C10 Design example	93
A10 Recommended design model— DESIGN CHECK NO. 5	33	C11 Design capacity tables	96
A11 Recommended design model— DESIGN CHECK NO. 6	34	APPENDICES	
A12 Design example	35	A Limcon software	99
A13 Design capacity tables	39	B ASI Design Guide 13 comment form	108
PART B BOLTED/WELDED COVER PLATE SPLICE	45		
B1 Description of connection	45		
B2 Typical detailing of connection	46		



LIST OF FIGURES

		<i>Page</i>			<i>Page</i>
Figure 1	Flange hole configurations.....	3	Figure B4	Typical detailing in tension member	47
Figure 2	Design actions at splice.....	7	Figure B5	Geometry of flange splice plates	53
Figure 3	Section dimensions— Symmetrical section	8	Figure B6	Fillet weld arrangement at flanges.....	57
Figure 4	Alternative stress distributions in section due to M^*	10	Figure B7	Single line of bolts—Bolt forces acting towards an edge	61
Figure 5	Design factors for unsymmetrical sections	11	Figure B8	Double line of bolts—Bolt forces acting towards an edge	62
Figure 6	Design moment at a column splice	11	Figure B9	Geometry and design actions on web weld	65
Figure 7	Preferred column splice location.	11	Figure B10	Geometry of web cover plates	67
Figure A1	Bolted cover plate splice.....	13	Figure B11	Design example—Column splice not prepared for full contact.....	70
Figure A2	Typical detailing in flexural member	14	Figure B12	Section with holes in one flange—Elastic section	74
Figure A3	Typical detailing in column/beam-column	15	Figure B13	Section with holes in one flange—Plastic section	75
Figure A4	Typical detailing in tension member	15	Figure C1	Fully welded splice	82
Figure A5	Eccentricity in flange cover plates.....	18	Figure C2	Typical detailing of welded splice	83
Figure A6	Geometry of flange splice plates	22	Figure C3	Use of backing strips	84
Figure A7	Single line of bolts—Bolt forces acting towards an edge.....	28	Figure C4	Preferred splice location in column.....	84
Figure A8	Double line of bolts—Bolt forces acting towards an edge....	29	Figure C5	Staggering of flange and web splice locations	85
Figure A9	Geometry of web cover plates	32	Figure C6	Design actions on flange welds ...	87
Figure A10	Design example—Beam splice ...	35	Figure C7	Web cover plate dimensions	89
Figure B1	Bolted/welded cover plate splice	45	Figure C8	Geometry and design actions on web weld	91
Figure B2	Typical detailing in flexural member	46	Figure C9	Design example—Beam splice....	93
Figure B3	Typical detailing in column/beam column.....	47	Figure C10	Web fillet weld geometry for design example	94



LIST OF TABLES

		<i>Page</i>			<i>Page</i>
Table 1	Universal beams Grade 300— Design section moment and shear capacities.....	4	Table B5	Values of ϕV_{bf} and ϕV_{bi}	56
Table 2	Parallel flange channels— Grade 300—Design section moment and shear capacities.....	5	Table B6	Design strengths of cover plates	60
Table 3	Welded beams— Grade 300—Design section moment and shear capacities.....	5	Table B7	Design moment capacity of bolted/welded single cover plate splice, Universal beam sections < 400 deep, M20 bolts, 6 fillets to flange plates, 5 fillets to web plates.....	77
Table A1	Summary of design actions from Section 3	19	Table B8	Design moment capacity of bolted/welded single cover plate splice, Universal beam sections > 400 deep, M24 bolts, 8 or 6 fillets to flange plates, 5 fillets to web plates	78
Table A2	Reduction factor for lap connections (k_r)	21	Table B9	Design moment capacity of bolted/welded three cover plate splice, Universal column sections, M24 bolts, 6/8 fillets to flange plates and 6 fillets to web plates	79
Table A3	Strength limit state 8.8/TB, 8.8/TF bolting categories	21	Table B10	Design moment capacity of bolted three cover plate splice, 700WB/800WB welded beam sections, M24 bolts, 6/8 fillets to flange plates and 5 fillets to web plates	80
Table A4	Serviceability limit state 8.8/TF bolting category	22	Table B11	Design moment capacity of bolted/welded three cover plate splice, 900WB/1000WB welded beam sections, M24 bolts, 8 or 6 fillets to flange plates and 6 fillets to web plates	81
Table A5	Values of ϕV_{bf} and ϕV_{bi}	25	Table C1	Summary of design actions from Section 3	86
Table A6	Design strengths of cover plates	27	Table C2	Design strengths of web cover plates.....	90
Table A7	Design moment capacity of bolted single cover plate splice— Universal beam sections < 400 deep—M20 bolts	40	Table C3	Universal beams—Grade 300— design section moment and shear capacities	96
Table A8	Design moment capacity of bolted inle cover plate splice— Universal beam sections > 400 deep—M24 bolts	41	Table C4	Welded beams—Grade 300— Design section moment and shear capacities	97
Table A9	Design moment capacity of bolted three cover plate splice— Universal column sections— M24 bolts.....	42	Table C5	Universal columns/welded columns—Grade 300—Design section moment and shear capacities	98
Table A10	Design moment capacity of bolted three cover plate splice 700WB/800WB Welded beam sections—M24 bolts	43			
Table A11	Design moment capacity of bolted three cover plate splice 900WB/1000WB Welded beam sections—M24 bolts	44			
Table B1	Summary of design actions from Section 3	50			
Table B2	Reduction factor for lap connections (k_r)	52			
Table B3	Strength limit state—8.8/TB, 8.8/TF bolting categories	52			
Table B4	Serviceability limit state— 8.8/TF bolting category	53			

