

CONTENTS

	<i>Page</i>		<i>Page</i>
List of figures	iv	6 DETAILING	27
List of tables	iv	6.1 Bolt holes	27
Preface	v	6.2 Limitations	29
About the author	vi	7 INSTALLATION OF BOLTS	31
About the contributing author and editor	vi	7.1 Introduction	31
Acknowledgements	vii	7.2 Snug-tightening	32
1 CONCEPT OF DESIGN GUIDES.....	1	7.3 Full tensioning methods	33
1.1 Background	1	7.4 Part turn of nut method	34
2 INTRODUCTION	2	7.5 Direct tension indication method	36
3 CHARACTERISTICS OF STRUCTURAL BOLTS	3	7.6 Issues with tensioning bolts	40
3.1 Thread form	3	7.7 Clearances	42
3.2 Bolt types	4	7.8 Inspection of bolted connections	44
3.3 Identification	5	7.9 Blind bolts	46
3.4 Commercial bolts	6	8 CORROSION PROTECTION	47
3.5 High strength structural bolts	9	8.1 Corrosion protection of bolts	47
3.6 Testing of bolts	11	8.2 Corrosion protection of interfaces	49
3.7 Washers	12	9 Certification to AS/NZS 1252:1996.....	51
3.8 Welding of bolts	14	10 REFERENCES	56
3.9 Lock nuts	15	APPENDIX	
4 BOLTING CATEGORIES	16	A ASI Design Guide 1 comment form	57
5 BOLT LENGTH CONSIDERATIONS.....	19		
5.1 Plain shank lengths	19		
5.2 Threads included in shear plane	21		
5.3 Threads excluded from shear plane	22		
5.4 Discussion	23		



LIST OF FIGURES

	<i>Page</i>		<i>Page</i>		
Figure 1	Bolt head marking identification.....	5	Figure 12	Bolt tension and turn of nut.....	32
Figure 2	Use of a tapered washer.....	13	Figure 13	Marking for part turn of nut method	34
Figure 3	Cover plates for long slotted holes.....	13	Figure 14	Load indicator washer	36
Figure 4	Lock nut configuration	15	Figure 15	Load indicator washer assembly ...	36
Figure 5	Threads included in shear plane...	19	Figure 16	Load indicator washer completion .	36
Figure 6	Threads excluded from shear plane	19	Figure 17	Location of load indicator washer when bolt is rotated	37
Figure 7	AS 4100 requirements for thread projection.....	23	Figure 18	Relationship between bolt tension, load indicator gap and turn of nut..	38
Figure 8	Worked example—Threads included.....	25	Figure 19	Swage lock fastener	39
Figure 9	Worked example—Threads excluded.....	26	Figure 20	A drift pin made from a bolt	41
Figure 10	Edge distance and applied force ..	29	Figure 21	Area requiring masking.....	50
Figure 11	Pitch and bearing force design provisions	30	Figure 22	Sample high strength bolt assembly test certificate	55

LIST OF TABLES

	<i>Page</i>		<i>Page</i>		
Table 1	ISO Metric screw threads to AS 1275.....	3	Table 16	Shank lengths and permissible grips—Threads included in shear plane, M20 high strength structural bolts	20
Table 2	Metric hexagon commercial bolts Property Class 4.6	6	Table 17	AS 4100 provisions for slotted and oversize holes	27
Table 3	Metric hexagon commercial bolts, bolt sizes generally available	7	Table 18	AS 4100 full size hole punching limitations	28
Table 4	Metric hexagon commercial bolt thread lengths.....	7	Table 19	AS 4100 minimum edge distances	29
Table 5	Nuts for use with metric hexagon commercial bolts.....	8	Table 20	AS 4100 minimum bolt tensions	33
Table 6	High strength structural bolts Property Class 8.8	9	Table 21	AS 4100 nut rotation from the snug tight condition	35
Table 7	High strength structural bolts, bolt sizes generally available.....	10	Table 22	Dimensions of wrenches for determining erection clearances: Dimensions of open ended wrenches. Dimensions of sockets—Hand wrenches	42
Table 8	High strength structural bolt thread lengths.....	10	Table 23	Dimensions of wrenches for determining erection clearances: Dimensions of impact wrenches	43
Table 9	Nuts for use with high strength structural bolts	10	Table 24	Indicative cost-in-place ratios for an M20 bolt in a group.....	47
Table 10	Washers for use with metric hexagon commercial bolts	12	Table 25	Summary of slip factors	49
Table 11	Washers for use with high strength structural bolts	12	Table 26	CHECKLIST for compliance/test certificate documentation.....	53
Table 12	Bolt types and bolting categories..	16	Table 27	GUIDE to the key Australian Standard specification requirements in checking compliance/test certificate documentation.....	54
Table 13	Simple (flexible) joints statically loaded in shear	17			
Table 14	Rigid and semi-rigid joints statically loaded in shear	18			
Table 15	Shank lengths and permissible grips—Threads included in shear plane, M20 commercial bolts	20			

