PART 3 SECTION PROPERTIES

3.1 General
The section property tables include all relevant section dimensions and properties necessary for assessing steel structures in accordance with AS 4100. The structural hollow sections included in these tables are:

- Circular Hollow Sections Grade C250 and C350
- Rectangular Hollow Sections Grade C350 and C450
- Square Hollow Sections Grade C350 and C450

3.2 Section Property Tables
For each group of structural hollow sections the tables include:

- Dimensions, Ratios and Properties
- Properties for Design to AS 4100

These parameters are considered in the Tables 3.1-1 to 3.1-6 inclusive.

3.2.1 Dimensions, Ratios and Properties
The Tables give standard dimensions and properties for the structural steel hollow sections noted in Sections 2.1 and 2.7. These properties, such as gross cross-section area \( A_g \), second moments of area \( I_x \), \( I_y \), elastic and plastic section moduli \( Z_x, S_x, Z_y, S_y \) and the torsion constant \( J \) are the fundamental geometric properties required by design Standards. It should be noted that Clause 5.6 of AS 4100 recommends that the warping constant \( I_w \) for hollow sections is approximately zero.

Additionally, the external surface area of the hollow section - as used in estimating quantities of protective coatings - is also considered within these Tables.

3.2.1.1 Torsion Constants
The torsional constant \( J \) and the torsional modulus constant \( C \) for square and rectangular hollow sections are defined as follows:

\[
J = \left( t^3 \frac{h^2}{3} + 2kA_h \right)
\]

\[
C = \left( \frac{t^3 \frac{h^2}{3} + 2kA_h}{t + \frac{k}{t}} \right)
\]

\[\text{AS1: DESIGN CAPACITY TABLES FOR STRUCTURAL STEEL VOLUME 2: HOLLOW SECTIONS} \]

DCT/V2/02-2004
where \( R_c = \frac{R_o + R_i}{2} \)

\[
\begin{align*}
    h &= 2[(b-t) + (d-t)] - 2R_c (4-\pi) \\
    A_h &= (b-t) (d-t) - R_c^2 (4-\pi) \\
    k &= \frac{2A_h t}{h}
\end{align*}
\]

and \( t \) = specified thickness of section
\( b \) = width of section
\( d \) = depth of section
\( R_o \) = outer corner radius
\( R_i \) = inner corner radius
\( R_c \) = mean corner radius
\( h \) = length of the mid-contour
\( A_h \) = area enclosed by \( h \)
\( k \) = integration constant

as shown in Figure 3.1.

The above calculation method for \( J \) and \( C \) is extracted from Ref.[3.1].

### 3.2.1.2 Corner Radii

The section properties presented in this publication are calculated in accordance with AS 1163.

Figure 3.2 shows the corner radii detail used in determining section properties. However it should be noted that the actual corner geometry may vary from that shown.
design capacity tables for structural steel

Volume 2: Hollow Sections
second edition

CHS - Grade C250/C350 (to AS 1163)
RHS - Grade C350/C450 (to AS 1163)
SHS - Grade C350/C450 (to AS 1163)
design capacity tables for structural steel
Volume 2: Hollow Sections
second edition

TABLE OF CONTENTS

Foreword (iv)
Acknowledgements (iv)
Preface (v)
Notation (vi)

PART ONE
Introduction 1-1

PART TWO
Materials 2-1

PART THREE
Section Properties 3-1

PART FOUR
Methods of Structural Analysis 4-1

PART FIVE
Members Subject to Bending 5-1

PART SIX
Members Subject to Axial Compression 6-1

PART SEVEN
Members subject to Axial Tension 7-1

PART EIGHT
Members subject to Combined Actions 8-1

PART NINE
Connections 9-1
PART 3  SECTION PROPERTIES

3.1  General ...................................................................................................................... 3-2
3.2  Section Property Tables .......................................................................................... 3-2
   3.2.1  Dimensions, Ratios and Properties................................................................. 3-2
   3.2.1.1  Torsion Constants.......................................................................................... 3-2
   3.2.1.2  Corner Radii ................................................................................................. 3-3
   3.2.2  Properties for Design to AS 4100.............................................................. 3-4
   3.2.2.1  Compactness................................................................................................. 3-4
   3.2.2.2  Effective Section Modulus........................................................................... 3-4
   3.2.2.3  Form Factor.................................................................................................. 3-4
   3.2.3  Example............................................................................................................... 3-5
3.3  Properties for Fire Design ..................................................................................... 3-6
3.4  Telescoping Sections ............................................................................................. 3-6
3.5  References ............................................................................................................... 3-7

TABLES

TABLES 3.1-1 to 3.1-6
Dimensions and Properties.................................................................................. 3-8

TABLES 3.2-1 to 3.2-6
Fire Engineering Design.................................................................................. 3-25

TABLES 3.3-1 to 3.3-3
Telescoping Information.................................................................................. 3-40

NOTE: SEE SECTION 2.1 FOR THE SPECIFIC MATERIAL STANDARD (AS 1163) REFERRED TO BY THE SECTION TYPE AND STEEL GRADE IN THESE TABLES