9 RECOMMENDED DESIGN MODEL—AXIAL COMPRESSON AND SHEAR

9.1 DESIGN CHECK NO. 1—Design capacity for bearing on concrete support

Design requirement

$$\phi N_c \geq N_c^*$$

where N_c^* = design axial compression force in column at base plate

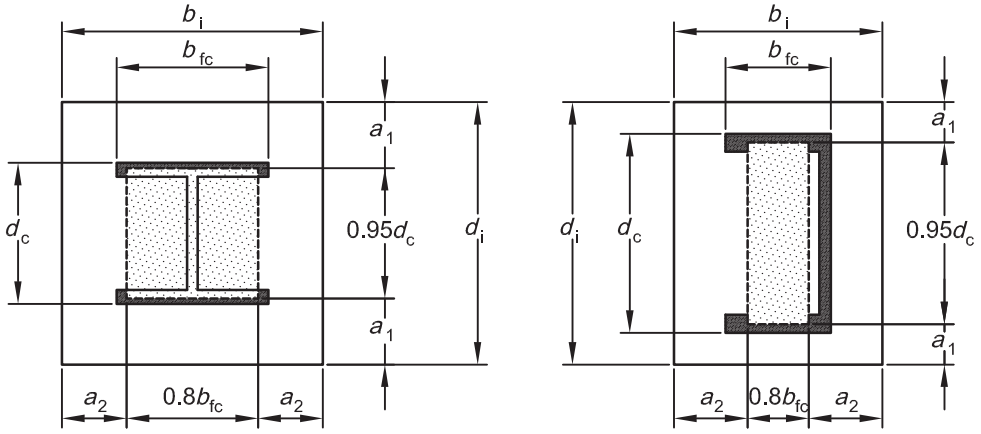
$$\phi N_c = A_i \left(\phi 0.9 f_c' \sqrt{\frac{A_2}{A_1}}; \phi 1.8 f_c' \right)_{min} = A_i \times \phi f_b \quad \text{(AS 3600)}$$

ϕ = 0.60 (AS 3600)

f_c' = characteristic compression cylinder strength of grout or concrete at 28 days, whichever is being assessed.

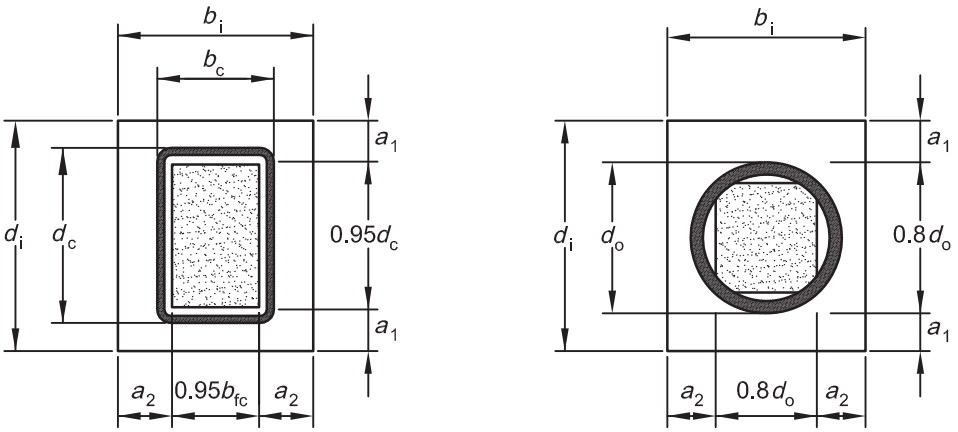
A_1 = A_i = area of base plate = $b_i d_i$ (Figures 18 and 19)

A_2 = maximum area of grout or concrete geometrically similar to and concentric with base plate area, having same aspect ratio as base plate area, and which can be inscribed on horizontal top surface of concrete foundation without going beyond the edges of the concrete foundation



b_i = width of base plate
b_{fc} = flange width of column
d_i = depth of base plate
d_c = depth of column
a_1 = $0.5(d_i - 0.95d_c)$
a_2 = $0.5(b_i - 0.80b_{fc})$

FIGURE 18 BASE PLATE DIMENSIONS AND ASSUMED LOADED AREA OF BASE PLATE (shown shaded) FOR OPEN SECTIONS—CANTILEVER METHOD



RHS,SHS

CHS - rectangular plate (circular plate - use equivalent square plate with same clearance between edge of plate and edge of CHS)

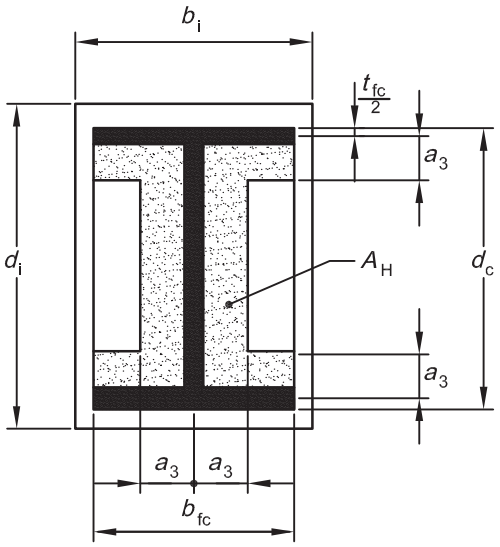
b_i = width of base plate
b_c = flange width of column
d_i = depth of base plate
d_c = depth of column

RHS, SHS— $a_1 = 0.5(d_i - 0.95d_c)$
$a_2 = 0.5(b_i - 0.95b_{fc})$

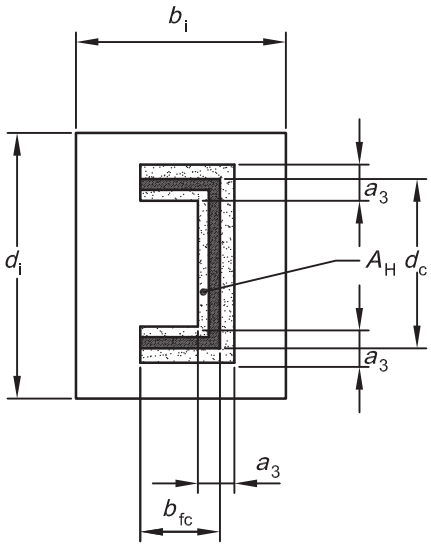
d_o = outside diameter

CHS— $a_1 = 0.5(d_i - 0.8d_o)$
$a_2 = 0.5(b_i - 0.8d_o)$

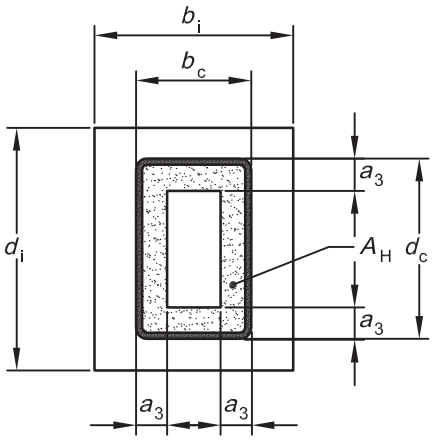
FIGURE 19 BASE PLATE DIMENSIONS AND ASSUMED LOADED AREA OF BASE PLATE (shown shaded) FOR CLOSED SECTIONS—CANTILEVER METHOD



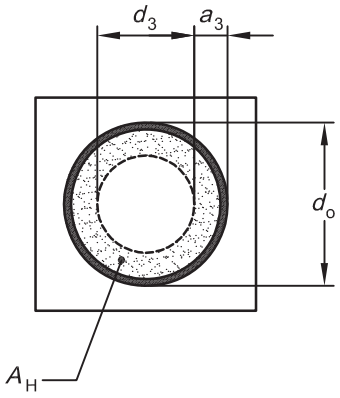
I-section



PFC section



RHS, SHS section



CHS section

Section	a_3	A_H
I-shape	$\frac{(d_c + b_{fc}) - \sqrt{(d_c + b_{fc})^2 - 4A_H}}{4}$	$2b_{fc}a_3 + 2a_3(d_c - 2a_3)$
Channel	$\frac{(2b_{fc} + d_c) - \sqrt{(2b_{fc} + d_c)^2 - 8A_H}}{4}$	$2b_{fc}a_3 + (d_c - 2a_3)a_3$
RHS/SHS	$\frac{(d_c + b_c) - \sqrt{(d_c + b_c)^2 - 4A_H}}{4}$	$d_c b_c - (d_c - 2a_3)(b_c - 2a_3)$ $= 2(d_c + b_c)a_3 - 4a_3^2$
CHS —rectangular plate —circular plate	$\frac{d_o - \sqrt{d_o^2 - 4A_H/\pi}}{2}$	$\pi(d_o^2 - d_3^2)/4 = \pi(d_o a_3 - a_3^2)$ where: $d_3 = d_o - 2a_3$

FIGURE 20 MURRAY-STOCKWELL MODEL—ASSUMED SHAPE OF PRESSURE DISTRIBUTION (after Ref. 8)

Design Guide 7

Pinned base plate connections for columns

by

T.J. Hogan

first edition—2011

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

Design Guide 7
Pinned base plate connections for columns

Published by: AUSTRALIAN STEEL INSTITUTE

FIRST EDITION 2011 (LIMIT STATES)

National Library of Australia Cataloguing-in-Publication entry:
Hogan, T.J.
Design Guide 7: Pinned base plate connections

1st ed.
Includes bibliographic references.
ISBN 978 1 9214762 4 2 (pbk.).
Steel, Structural—Standards – Australia.
Steel, Structural—Specifications – Australia.
Joints (Engineering)—Design and construction.
Australian Steel Institute.
(Series: Structural steel connections 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 moment end plate beam splice connections
Design Guide 11: Welded beam to column moment connections
Design Guide 12: Bolted end plate beam to column moment connections
Design Guide 13: Splice connections
Design capacity tables for structural steel. Volume 4: Rigid connections—Open sections

CONTENTS