

9 RECOMMENDED DESIGN MODEL—AXIAL COMPRESSION 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

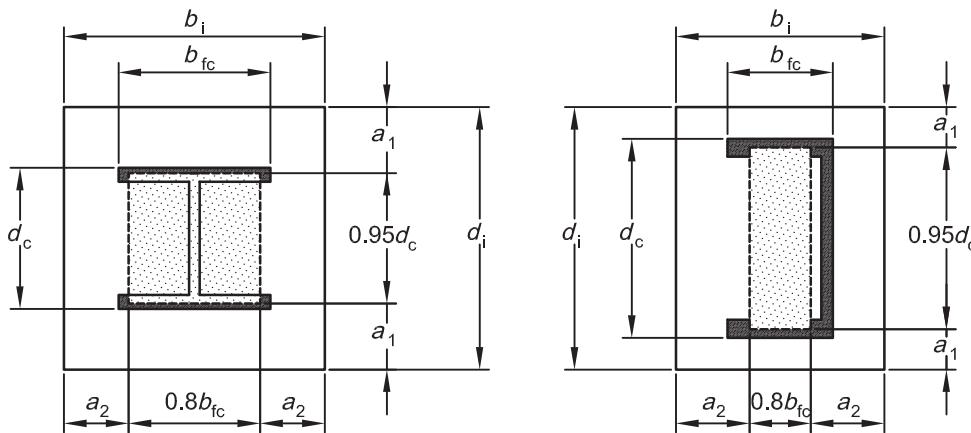
$$\phi N_c = A_i \left(\phi 0.9 f'_c \sqrt{\frac{A_2}{A_1}}; \phi 1.8 f'_c \right)_{\min} = A_i \times \phi f_b \quad (\text{AS 3600})$$

$$\phi = 0.60 \quad (\text{AS 3600})$$

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)

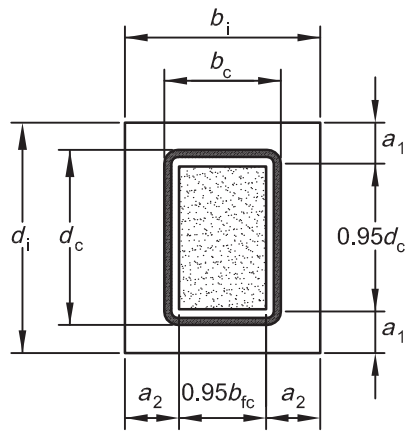
A_2 = maximum area of grout or concrete geometrically similar to and concentric with base plate area, having same aspect ratio as base plate area, and which can be inscribed on horizontal top surface of concrete foundation without going beyond the edges of the concrete foundation



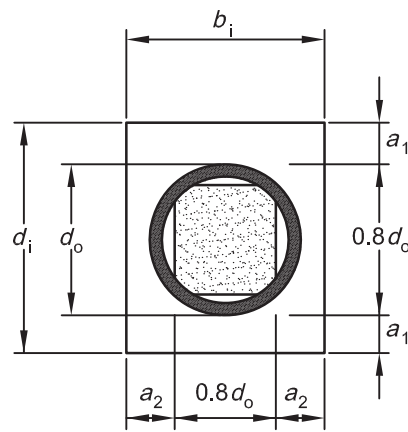
- b_i = width of base plate
- b_{fc} = flange width of column
- d_i = depth of base plate
- d_c = depth of column
- $a_1 = 0.5(d_i - 0.95d_c)$
- $a_2 = 0.5(b_i - 0.80b_{fc})$

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





RHS,SHS

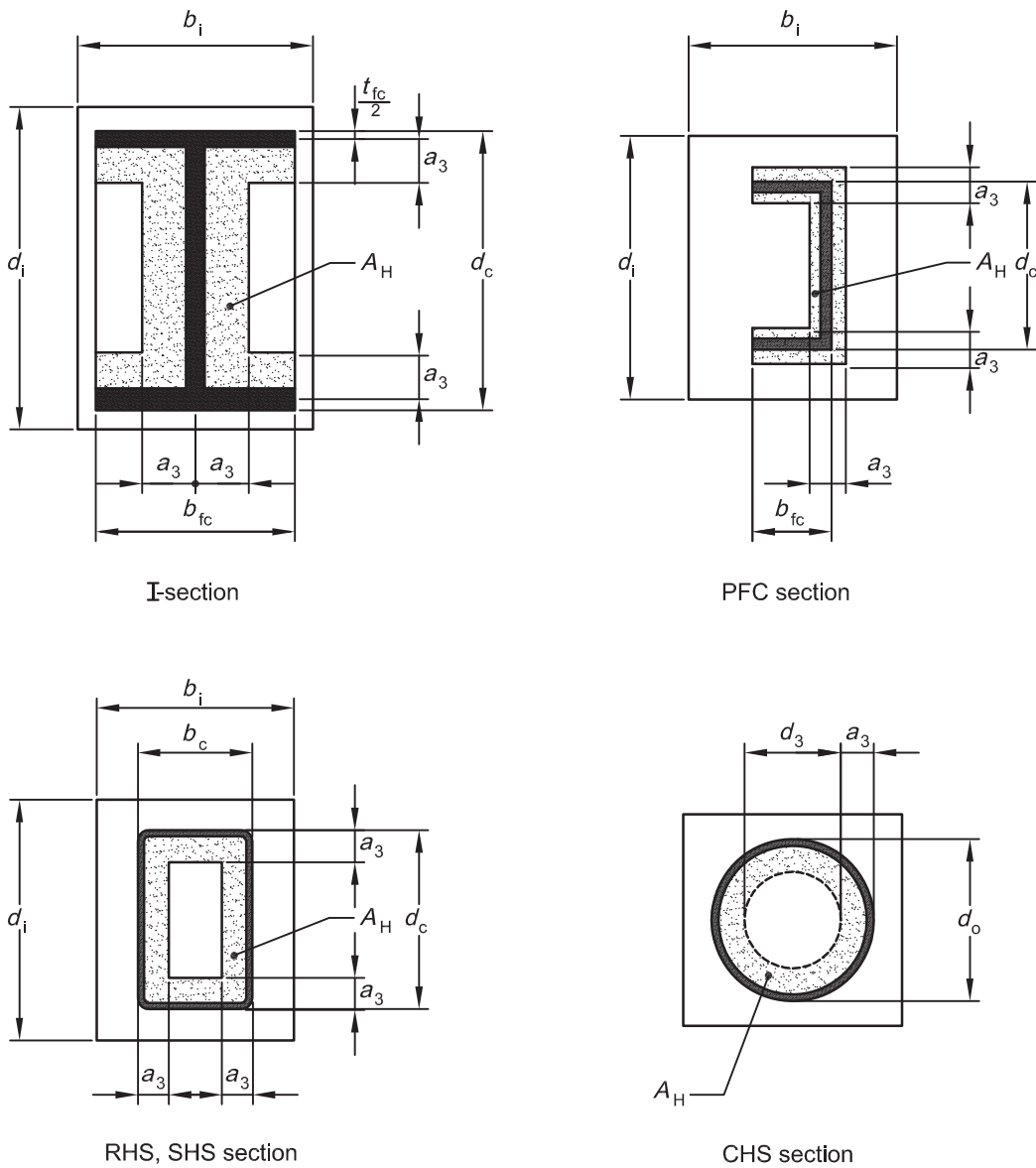


CHS - rectangular plate (circular plate - use equivalent square plate with same clearance between edge of plate and edge of CHS)

- | | | |
|-----------|--------------------------------|--------------------------------|
| | 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— | $a_1 = 0.5(d_i - 0.95d_c)$ | CHS— d_o = outside diameter |
| | $a_2 = 0.5(b_i - 0.95b_{fc})$ | CHS— $a_1 = 0.5(d_i - 0.8d_o)$ |
| | | CHS— $a_2 = 0.5(b_i - 0.8d_o)$ |

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





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)



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Pinned base plate connections for columns
by

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CONTENTS

	<i>Page</i>		<i>Page</i>
List of figures	iv	9.4 DESIGN CHECK NO. 4—Design capacity for horizontal shear transfer by friction at base plate/concrete interface	35
List of tables	v	9.5 DESIGN CHECK NO. 5—Design capacity for horizontal shear transfer by bearing of embedded steel column	36
Preface	vi	9.6 DESIGN CHECK NO. 6—Design capacity for horizontal shear transfer through shear key	38
About the author	vii	9.7 DESIGN CHECK NO. 7—Design capacity for horizontal shear transfer through anchor bolts	40
Acknowledgements	viii		
1 CONCEPT OF DESIGN GUIDES.....	1	10 RECOMMENDED DESIGN MODEL—	
1.1 Background	1	AXIAL TENSION AND SHEAR.....	43
2 DESCRIPTION OF CONNECTION	2	10.1 DESIGN CHECK NO. 8—Design capacity of steel base plate	43
3 TYPICAL DETAILING OF CONNECTION..	4	10.2 DESIGN CHECK NO. 9—Design capacity of weld at column base	51
4 DETAILING CONSIDERATIONS.....	6	10.3 DESIGN CHECK NO. 10—Design capacity of anchor bolts in tension	52
4.1 Base plate dimensions for open sections	6	10.4 DESIGN CHECK NO. 5	56
4.2 Base plate detailing	8	10.5 DESIGN CHECK NO. 6	56
4.3 Anchor bolt detailing	11	10.6 DESIGN CHECK NO. 7	56
5 CODE REQUIREMENTS	14	10.7 DESIGN CHECK NO. 11—Design capacity for horizontal shear and tension applied to anchor bolts	57
6 BASIS OF DESIGN MODEL.....	15	11 DESIGN EXAMPLES	58
6.1 Axial compression	15	11.1 Axial compression and shear—Design Example No. 1	58
6.2 Horizontal shear	17	11.2 Axial compression or axial tension and shear—Design Example No. 2	62
6.3 Anchor bolts in shear	19	12 REFERENCES.....	67
6.4 Axial tension	21	APPENDICES	
6.5 Anchor bolts in tension	24	A Limcon software	69
6.6 Anchor bolts subject to tension and shear simultaneously	26	B ASI Design Guide 13 comment form	76
7 CALCULATION OF DESIGN ACTIONS ...	27		
8 RECOMMENDED DESIGN MODEL—SUMMARY OF DESIGN CHECKS.....	28		
9 RECOMMENDED DESIGN MODEL—AXIAL COMPRESSON AND SHEAR	29		
9.1 DESIGN CHECK NO. 1—Design capacity for bearing on concrete support	29		
9.2 DESIGN CHECK NO. 2—Design capacity of steel base plate	32		
9.3 DESIGN CHECK NO. 3—Design capacity of weld at column base	34		

