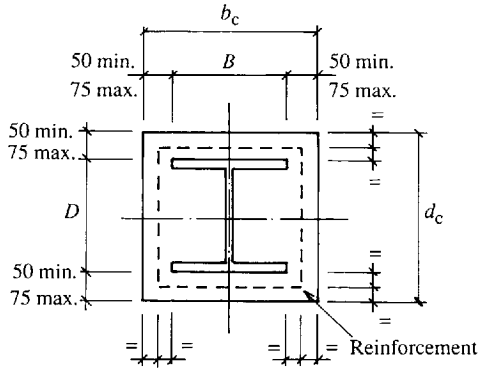

Figure 5.39 *Typical cross-section through a cased UC column*

b_c minimum width of solid casing within the depth of the steel section, as indicated in Figure 5.39

d_c minimum depth of solid casing within the width of the steel section, as indicated in Figure 5.39

r minimum radius of gyration of the uncased steel section, that is r_y for UC sections

(b) The radius of gyration r_y of the cased section should be taken as $0.2b_c$ but never more than $0.2(b + 150)$ mm. This implies that any casing above 75 mm cover should be ignored for structural purposes. The radius of gyration r_x should be taken as that of the uncased steel section.

(c) The compression resistance P_c of a cased column should be determined from the following expression:

$$P_c = \left(A_g + 0.45\frac{f_{cu}}{p_y}A_c\right)p_c$$

However, this should not be greater than the short strut capacity of the section, given by

$$P_{cs} = \left(A_g + 0.25\frac{f_{cu}}{p_y}A_c\right)p_y$$

where

A_c gross sectional area of the concrete, ($b_c d_c$ in Figure 5.39) but neglecting any casing in excess of 75 mm or any applied finish

A_g gross sectional area of the steel section

f_{cu} characteristic concrete cube strength at 28 days, which should not be greater than 40 N/mm^2

p_c compressive strength of the steel section determined in the manner described for uncased columns in Section 5.12.1, but using the r_y and r_x of the cased section

p_y design strength of the steel: $p_y \leqslant 355$ N/mm^2

P_{cs} short strut capacity, that is the compression resistance of a cased strut of zero slenderness

When a cased column is subject to axial load and bending it must satisfy the following relationships:

(a) Local capacity check:

$$\frac{F_c}{P_{cs}} + \frac{M_x}{M_{cx}} + \frac{M_y}{M_{cy}} \leqslant 1$$

(b) Overall buckling resistance:

$$\frac{F_c}{P_c} + \frac{mM_x}{M_b} + \frac{mM_y}{M_{cy}} \leqslant 1$$

The radius of gyration r_y for calculating the buckling resistance moment M_b of a cased column should be taken as the greater of the r_y of the uncased section or $0.2(B + 100)$ mm, where B is as indicated in Figure 5.39. The value of M_b for the cased section must not exceed $1.5M_b$ for the same section uncased.

Example 5.14

Determine the compression resistance of the grade 43 203 × 203 × 86 kg/m UC column shown in Figure 5.40, which is structurally cased to the minimum requirements of BS 5950. The column is effectively held in position at both ends but not restrained in direction, as indicated in Figure 5.41

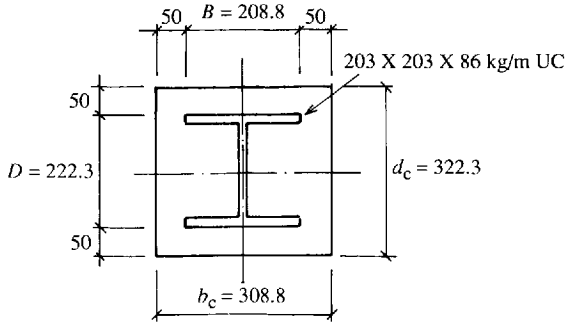

Figure 5.40 *Cross-section through cased column*

The properties of the cased section are as follows, from section tables where appropriate:

Gross area of concrete $A_c = b_c d_c = 308.8 \times 322.3 = 99\,526$ mm

Gross sectional area of steel section $A_g = 110$ cm$^2 = 110 \times 10^2$ mm^2