# APPENDIX E

# NOMINAL SECTION MOMENT CAPACITY FOR COMPOSITE SECTIONS UNDER SAGGING MOMENTS

(Informative)

The nominal section moment capacity of composite sections under sagging moment determined by simple plastic theory using the assumptions of Clause 6.3.3 may be calculated from Cases 1, 2 or 3, as appropriate.

**Case 1 Compression zone entirely within the concrete slab**

This case is applicable if—

$d_h \leq d_s$ (see Figure E1)— ... E(1)

where

$d_h$ = depth of the compression block shown in Figure E.1

$$= \frac{f_y A}{0.85 f'_c b} \quad \text{... E(2)}$$

$d_s$ = thickness of the composite concrete slab

$A$ = area of the cross-section of the steel section

$b$ = width of the concrete flange of the composite section

For these conditions, the nominal section capacity ($M_p$) may be calculated as follows:

$$M_p = A f_y \left( d_g + \frac{d_s - d_h}{2} \right) \quad \text{... E(3)}$$

where

$d_g$ = distance from the centroid of the steel beam to the centroid of the composite concrete slab

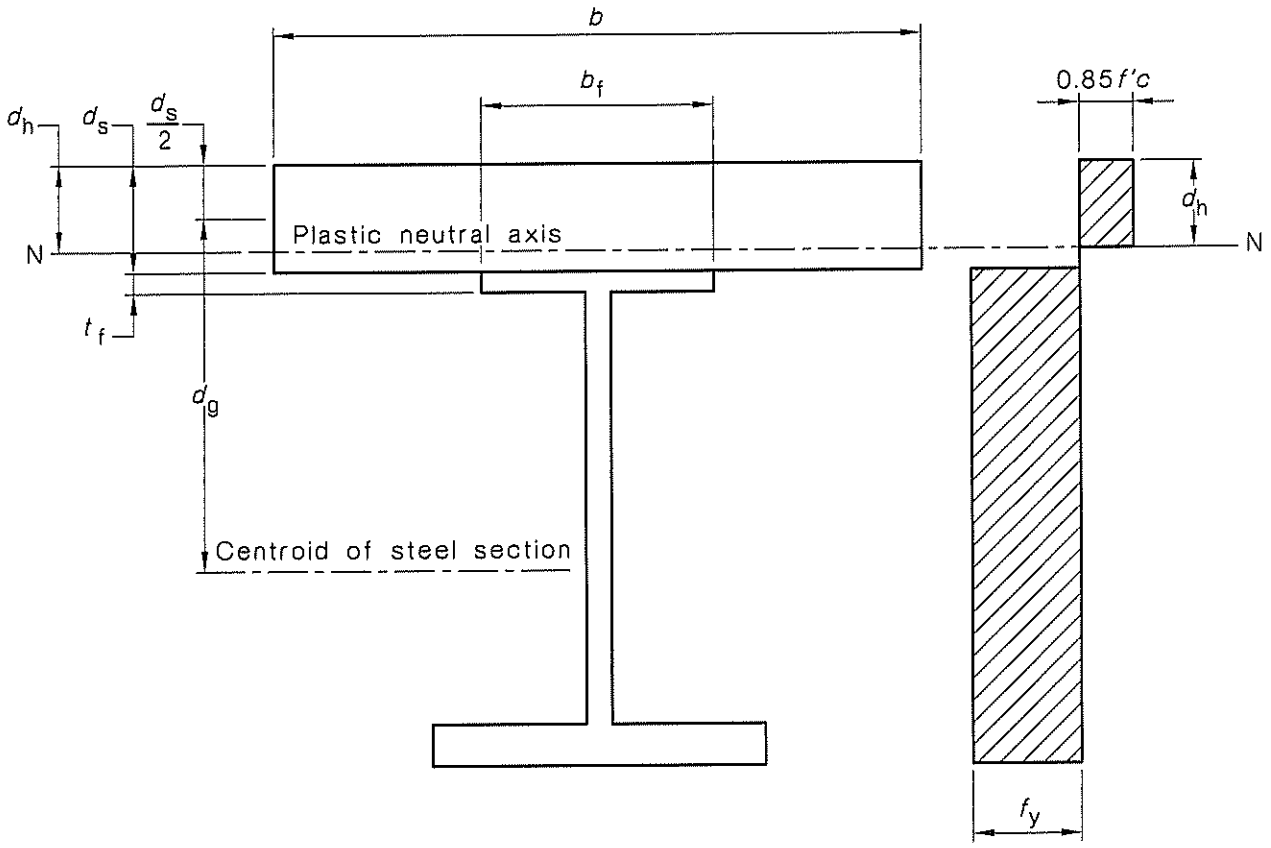


FIGURE E1 SECTION MOMENT CAPACITY COMPRESSION ZONE ENTIRELY WITHIN THE CONCRETE SLAB

**Case 2 Compression zone extends into the top flange of the steel section**

This case is applicable if—

$$d_s < d_h < (d_s + t_f) \text{ (see Figure E2)} \qquad \ldots \text{E(4)}$$

where

$d_s$ = thickness of the composite concrete slab

$t_f$ = top flange thickness of the steel beam

For these conditions, the nominal section capacity ($M_p$) may be calculated as follows:

A1

$$M_p = f_y [A d_g - b_f (d_h - d_s) d_h] \qquad \ldots \text{E(5)}$$

where

$$d_h = \frac{f_y A - 0.85 f'_c b d_s}{2 f_y b_f} + d_s \qquad \ldots \text{E(6)}$$

$b_f$ = width of the top flange of the steel section

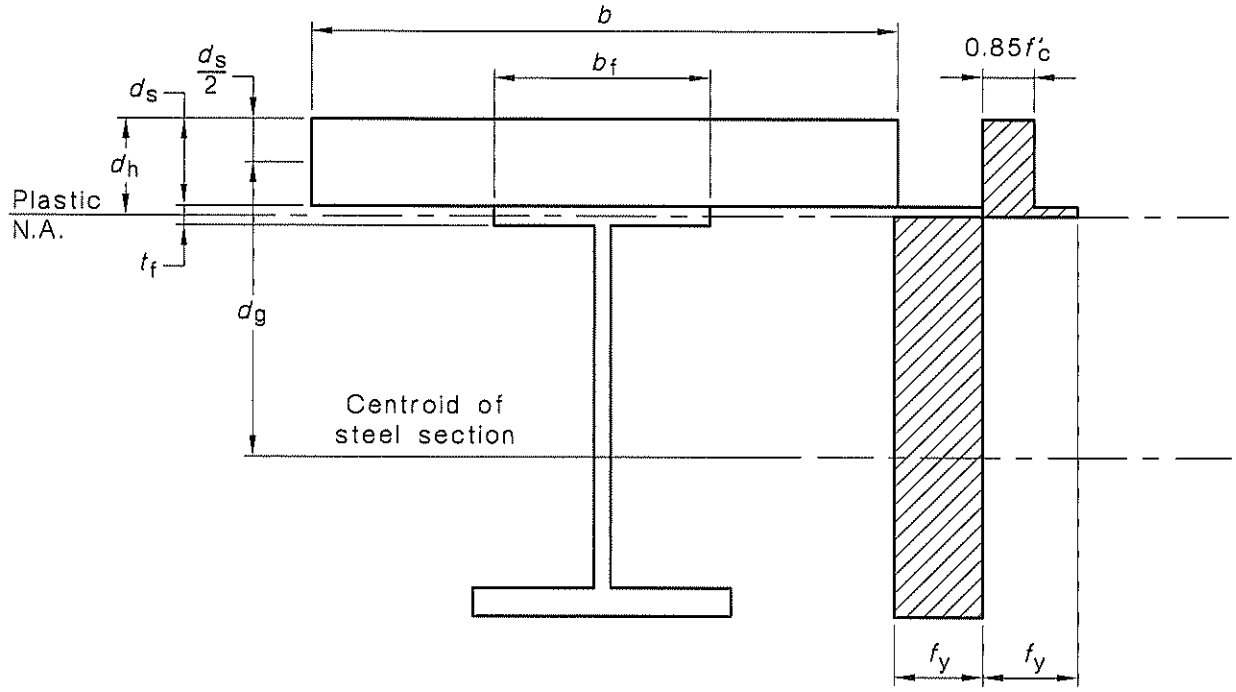


FIGURE E2 SECTION MOMENT CAPACITY COMPRESSION ZONE EXTENDS INTO THE TOP FLANGE OF THE STEEL SECTION

**Case 3 Compression extends into the steel beam**

This case is applicable if—

$$d_h > (d_s + t_f) \text{ (see Figure E3)} \quad \ldots \text{E(7)}$$

where

$d_s$ = thickness of the composite concrete slab

$t_f$ = top flange thickness of the steel beam

For these conditions, the nominal section capacity ($M_p$) may be calculated as follows:

$$M_p = f_y[Ad_g - b_f t_f (d_s + t_f) - t_w (d_h + t_f)(d_h - d_s - t_f)] \quad \ldots \text{E(8)}$$

where

A1

$$d_h = d_s + t_f + \left[\frac{f_y(A - 2b_f t_f) - 0.85 f'_c b d_s}{2 f_y t_w}\right] \quad \ldots \text{E(9)}$$

$t_w$ = thickness of the web of the steel beam

A1

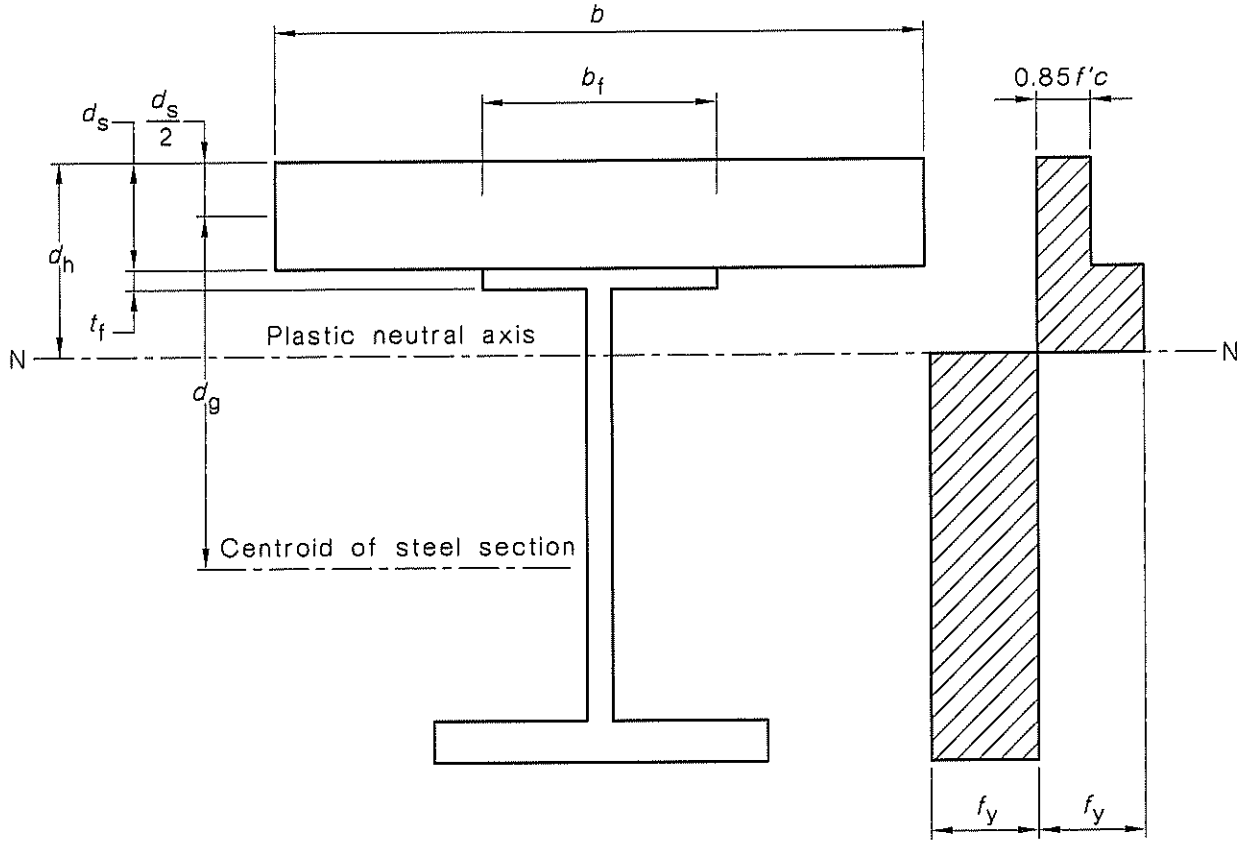


FIGURE E3 SECTION MOMENT CAPACITY FULL COMPOSITE ACTION, PLASTIC NEUTRAL AXIS IN WEB OF STEEL SECTION