5.7 Tension members

If a member is connected in such a way as to eliminate any moments due to connection eccentricity, the member may be designed as a simple tension member. Where a member is connected eccentrically to its axis, then the resulting moment has to be allowed for.

The tensile capacity of a member (P_t) may be evaluated from

$$P_t = A_e \, . \, P_y \qquad (5.26)$$

Where

A_e is the effective area of the section making due allowance for the type of member (angle, plain channel, Tee section etc) and the type of connection (eg. connected through one leg only or through the flange or web of a T- section).

p_y is design strength (N/mm^2)

Guidance on calculation of A_e is provided in Codes of Practice (eg. BS 5950, Part 5). The area of the tension member should invariably be calculated as its gross area less deductions for holes or openings. (The area to be deducted from the gross sectional area of a member should be the maximum sum of the sectional areas of the holes in any cross section at right angles to the direction of applied stress).

Reference is also made to the chapter on "Tension Members" where provision for enhancement of strength due to strain hardening has been incorporated for hot rolled steel sections. The Indian code IS: 801-1975 is in the

process of revision and it is probable that a similar enhancement will be allowed for cold rolled steel sections also.

When a member is subjected to both combined bending and axial tension, the capacity of the member should be ascertained from the following:

$$\frac{F_t}{P_t} + \frac{M_x}{M_{cx}} + \frac{M_y}{M_{cy}} \leq 1 \qquad \textbf{(5.27)}$$

and

$$\frac{M_x}{M_{cx}} \leq 1 \qquad \textbf{(5.28)}$$

and

$$\frac{M_y}{M_{cy}} \leq 1 \qquad \textbf{(5.29)}$$

Where F_t = applied load

P_t = tensile capacity (see eqn. 5.12)

M_x , M_y , M_{cx} and M_{cy} are as defined previously.