

### 11.3.9 Proportioning of longitudinal reinforcement

#### 11.3.9.1 Extension of longitudinal reinforcement

At every section, the longitudinal reinforcement shall be designed to resist the additional tension forces caused by shear as specified in Clauses 11.3.9.2 and 11.3.9.3. Alternatively, for members not subjected to significant tension or significant torsion, these requirements may be satisfied by extending the flexural tension reinforcement a distance of  $d_v \cot \theta$  beyond the location needed by flexure alone.

#### 11.3.9.2 Flexural tension side

Longitudinal reinforcement on the flexural tension side shall be proportioned so that the factored resistance of the reinforcement at all sections, taking account of the stress that can be developed in this reinforcement, shall be greater than or equal to the force  $F_{lt}$ , as follows:

$$F_{lt} = \frac{M_f}{d_v} + 0.5N_f + (V_f - 0.5V_s - V_p)\cot\theta \quad \text{Equation 11.14}$$

where  $M_f$  and  $V_f$  are taken as positive quantities and  $N_f$  is positive for axial tension and negative for axial compression. In Equation 11.14,  $V_s$  shall not be taken greater than  $V_f$  and  $d_v$  may be taken as the flexural lever arm corresponding to the factored moment resistance.

#### 11.3.9.3 Flexural compression side

At sections where the moment term,  $M_f/d_v$ , in Equation 11.14 is less than the sum of the terms accounting for axial load and shear, longitudinal reinforcement on the flexural compression side of the section shall be proportioned so that the factored tensile resistance of this reinforcement, taking account of the stress that can be developed in this reinforcement, shall be greater than or equal to the force  $F_{lc}$ , as follows:

$$F_{lc} = 0.5N_f + (V_f - 0.5V_s - V_p)\cot\theta - \frac{M_f}{d_v} \quad \text{Equation 11.15}$$

where  $M_f$  and  $V_f$  are taken as positive quantities and  $N_f$  is positive for axial tension and negative for axial compression. In Equation 11.15,  $V_s$  shall not be taken greater than  $V_f$ .

#### 11.3.9.4 Compression fan regions

In regions adjacent to maximum moment locations, the area of longitudinal reinforcement on the flexural tension side of the member need not exceed the area required to resist the maximum moment acting alone. This provision shall apply only if the support or the load at the maximum moment location introduces direct compression into the flexural compression face of the member and the member is not subject to significant torsion.