

4.3. DESIGN AND DETAILING RULES FOR MOMENT RESISTING FRAMES

4.3.1. Design criteria

4.3.1.1 – Moment resisting frames shall be designed so that plastic hinges form in the beams or in the connections of the beams to the columns, but not in the columns, in accordance with **4.3.1.2**.

4.3.1.2 – In moment resisting frame systems, including frame-dominant dual systems as defined in **4.1.3.1**, the following condition should be satisfied at all beam-column joints:

$$\sum M_{Rc} \geq 1.3 \sum M_{Rb} \quad (4.2)$$

4.3.1.3 – Slab reinforcement parallel to the beam and within the effective flange width shall be considered to contribute to the beam flexural capacities taken into account for the calculation of $\sum M_{Rb}$ in **Eq.(4.2)**, if it is anchored beyond the beam section at the face of the joint.

4.3.1.4 – **Eq.(4.2)** shall be satisfied separately for both earthquake directions and senses with the column moments always opposing the beam moments to yield the most unfavourable result. In calculating the column moment resistances, axial forces shall be taken to yield the minimum moments consistent with the sense of earthquake direction.

4.3.1.5 – If the structural system is a frame or equivalent to a frame in only one of the two main horizontal directions of the structural system, then **Eq.(4.2)** should be satisfied just within the vertical plane through that direction.

4.3.1.6 – Special situations regarding the application of **Eq.(4.2)** are given in the following:

(a) **Eq.(4.2)** need not to be satisfied at the base of any frame.

(b) **Eq.(4.2)** need not to be checked in single storey buildings and in joints of topmost storey of multi-storey buildings.

4.3.1.7 – **Eq.(4.2)** may be permitted not to be satisfied in a given earthquake direction at a certain number of joints at the bottom and/or top of a storey, provided that **Eq.(4.3)** holds.

$$\alpha_i = \frac{V_{is}}{V_{ic}} \geq 0.75 \quad (4.3)$$

4.3.1.8 – In the case where **Eq.(4.3)** is satisfied, bending moments and shears of columns satisfying **Eq.(4.2)** at both bottom and top joints shall be amplified by multiplying with the ratio $(1/\alpha_i)$ within the range of $0.75 \leq \alpha_i < 1.00$.

4.3.2. Beams

4.3.2.1 – Beams should be verified as having sufficient resistance against lateral and lateral torsional buckling in accordance with EN 1993, assuming the formation of a plastic hinge at one end of the beam. The beam end that should be considered is the most stressed end in the seismic design situation.