

## 4.5. DESIGN AND DETAILING RULES FOR FRAMES WITH ECCENTRIC BRACINGS

### 4.5.1. Design criteria

**4.5.1.1** – Frames with eccentric bracings shall be designed so that specific elements or parts of elements called seismic links are able to dissipate energy by the formation of plastic bending and/or plastic shear mechanisms.

**4.5.1.2** – Seismic links may be horizontal or vertical components.

### 4.5.2. Seismic links

**4.5.2.1** – The web of a link should be of single thickness without doubler plate reinforcement and without a hole or penetration.

**4.5.2.2** – Seismic links are classified into 3 categories according to the type of plastic mechanism developed:

- (a) Short links, which dissipate energy by yielding essentially in shear;
- (b) Long links, which dissipate energy by yielding essentially in bending;
- (c) Intermediate links, in which the plastic mechanism involves bending and shear.

**4.5.2.3** – For I sections, the following parameters are used to define the design resistances and limits of categories:

$$M_{p,link} = f_y b t_f (d - t_f) \quad (4.12)$$

$$V_{p,link} = (f_y / \sqrt{3}) t_w (d - t_f) \quad (4.13)$$

**4.5.2.4** – If  $N_{Ed} / N_{pl,Rd} \leq 0.15$ , the design resistance of the link should satisfy both of the following relationships at both ends of the link:

$$\begin{aligned} V_{Ed} &\leq V_{p,link} \\ M_{Ed} &\leq M_{p,link} \end{aligned} \quad (4.14)$$

where  $N_{Ed}$ ,  $M_{Ed}$ ,  $V_{Ed}$  are the design axial force, design bending moment and design shear, respectively, at both ends of the link.

**4.5.2.5** – If  $N_{Ed} / N_{pl,Rd} > 0.15$ , **Eqs.(4.14)** should be satisfied with the following reduced values  $V_{p,link,r}$  and  $M_{p,link,r}$  used instead of  $V_{p,link}$  and  $M_{p,link}$ :

$$\begin{aligned} V_{p,link,r} &= V_{p,link} \sqrt{1 - (N_{Ed} / N_{pl,Rd})^2} \\ M_{p,link,r} &= M_{p,link} (1 - N_{Ed} / N_{pl,Rd}) \end{aligned} \quad (4.15)$$

**4.5.2.6** – If  $N_{Ed} / N_{pl,Rd} \leq 0.15$ , link length  $e$  should not exceed: