

CHAPTER 4

SEISMIC DESIGN REQUIREMENTS FOR STRUCTURAL STEEL BUILDINGS

4.1. SCOPE AND DESIGN CONCEPTS

4.1.1. Scope

4.1.1.1 – This Chapter applies to the seismic design of elements of structural steel buildings.

4.1.1.2 – The rules given in this Chapter are additional to those given in EN 1993-1-1:2004.

4.1.2. Design Concepts

4.1.2.1 – Design of earthquake resistant steel buildings shall provide the structure with an adequate energy dissipation capacity without substantial reduction of its overall resistance against horizontal and vertical loading. Adequate resistance of all structural elements shall be provided, and non-linear deformation demands in critical regions should be compatible with the overall ductility assumed in calculations.

4.1.2.2 – Steel buildings may alternatively be designed for low dissipation capacity and low ductility, by applying only the rules of EN 1993-1-1:2005 for the seismic design situation, and neglecting the specific provisions given in this chapter. The class of such buildings is identified as *Low Ductility Class* (DCL).

4.1.2.3 – Steel buildings other than those to which **4.1.2.2** applies, shall be designed to provide energy dissipation capacity and an overall ductile behaviour. Overall ductile behaviour is ensured if the ductility demand involves globally a large volume of the structure spread to different elements and locations of all its storeys. To this end ductile modes of failure should precede brittle failure modes with sufficient reliability. The class of such buildings is identified as *Normal Ductility Class* (DCN), for which steel seismic design requirements are given in the remainder of **Chapter 4**.

4.1.3. Structural types and Behaviour Factors

4.1.3.1 – Steel buildings are classified with respect to structural types and their combinations as follows:

(a) *Moment-resisting frame system* is defined as a structural system composed of moment-resisting frames only.

(b) *Concentric braced frame system* is defined as a structural system composed of concentric braced frames only.

(c) *Eccentric braced frame system* is defined as a structural system composed of eccentric braced frames only.

(d) *Frame-dominant dual system* is defined as a structural system composed of moment-resisting frames, which resist more than 50% of the total calculated base shear, in combination with eccentric or concentric braced frames.