CHAPTER 3
SEISMIC DESIGN REQUIREMENTS FOR REINFORCED CONCRETE BUILDINGS

3.1. SCOPE AND DESIGN CONCEPTS

3.1.1. Scope

3.1.1.1 – This chapter applies to the seismic design of elements of reinforced concrete buildings.

3.1.1.2 – The rules given in this chapter are additional to those given in EN 1992-1-1:2004.

3.1.2. Design Concepts

3.1.2.1 – Design of earthquake resistant reinforced concrete 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.

3.1.2.2 – Reinforced concrete buildings may alternatively be designed for low dissipation capacity and low ductility, by applying only the rules of EN 1992-1-1:2004 for the seismic design situation, and neglecting the specific provisions given in this chapter. The class of such buildings are identified as *Low Ductility Class* (DCL).

3.1.2.3 – Reinforced concrete buildings other than those to which **3.1.2.2** 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 (e.g. flexure) should precede brittle failure modes (e.g. shear) with sufficient reliability. The class of such buildings are identified as *Normal Ductility Class* (DCN), for which reinforced concrete seismic design requirements are given in the remainder of **Chapter 3**.

3.1.2.4 – Unless a more accurate analysis of the cracked elements is performed, the elastic flexural and shear stiffness properties of reinforced concrete elements may be taken to be equal to one-half of the corresponding stiffness of the uncracked elements.

3.1.3. Structural types and Behaviour Factors

3.1.3.1 – Reinforced concrete 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) *Coupled structural wall system* is defined as a structural system composed of coupled structural walls only. Coupled structural walls are made from isolated structural walls connected with relatively stiff *coupling beams* such that base overturning moments of isolated walls are reduced by at least 25% under the same lateral loads.