[Çağrılı Tema Sunumu]

EUROPEAN SEISMIC DESIGN CODES FOR CONCRETE STRUCTURES: PAST, PRESENT, FUTURE

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ABSTRACT:

Since the 1990s European Earthquake Engineering has focused on the development of a European Standard for seismic design, Eurocode 8. The "Seismic Annex" to the CEB/FIP Model Code 1978 was the basis for the Pre-Standard version of Eurocode 8 in the early 1990s and of the European Standard (EN) one decade later. In those codes design was force-based for two Limit States: Life Safety and Damage Limitation. The reduction factor applied to the 5%-damped elastic spectrum in the first Limit State depends on the choice of Ductility Class: Low, Medium or High. The two upper Classes employed prescriptive detailing and capacity design for a global and local ductility factor commensurate to the reduction factor. The EN-Eurocode 8 gives a mechanics-based link between the reduction factor and the curvature ductility factor for detailing plastic hinges and applies capacity design to prevent shear failures and keep the foundation elastic. It promotes rigorous seismic analysis over equivalent lateral force methods and allows design with nonlinear analysis and direct verification of flexural deformation demands against capacities. For the evaluation and retrofitting of buildings EN-Eurocode 8 uses a full-fledged performance- and displacement-based approach, with nonlinear analysis (sometimes simplified into linear with the 5%-damped spectrum for the deformations and equilibrium for the forces), expressions for the flexure- or shear-controlled rotation capacities of plastic hinges and for the secant-to-yield-point stiffness of members. In the forthcoming revision of EN-Eurocode 8 this approach may also be adopted for design of new structures. Guidance for this evolution will be provided by the ***fib*** Model Code 2010 for new structures, which employs four Performance Levels and nonlinear dynamic analysis as the reference method.

KEYWORDS: Concrete structures, displacement-based seismic design, Eurocode 8, fib Model Code 2010, performance-based seismic design, seismic codes.