

Introduction of Eurocode 8: Design of structures for earthquake resistance

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1. INTRODUCTION

Recently Eurocodes, the European structural design standards, have been widely adopted for designs in countries outside of Europe and have increased influence on the international standards. In this paper, the design process in Eurocode8, the structural design standard of seismic design will be introduced. By comparing Eurocodes with Design Standards for Railway Structures and Commentary, this study attempts to consider Japanese construction field how to correspond to international standards considering expansion into international markets.

2. OUTLINE OF EUROCODES

Eurocodes are unified structural standards of Europe issued by CEN (European Committee for Standardization). These standards have been adopted in the EU (European Union) and EFTA (European Free Trade Association). Figure 1 shows the whole structure of Eurocodes. As a performance design criteria, general rules and basis are summarized in EN 1990: Eurocode and EN 1991: Eurocode 1. Eurocode 2-6 and 9 specify technical rules for the design of each structure (e.g. Concrete structures, Steel structures, etc.). Eurocode 7 which specify the design of Geotechnical Structures and Eurocode 8 which relate to seismic design are applied to each structure in common. Also, in order to cope with differences in such as weather and some other specific situation in EU area, National Annex is published for getting flexibility.

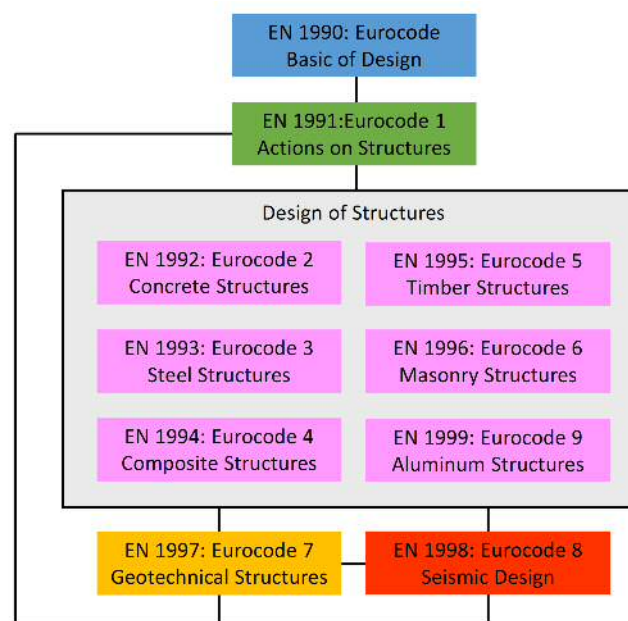


Figure 1. Whole Structure of Eurocodes

3. SCOPES OF EUROCODE 8

Eurocode 8 are divided into 6 parts as shown in Table. 1. The scope of EN 1998-1 is specification of general rules, performance requirements and general concept of seismic design of buildings but also all other parts of EN 1998. Other parts of Eurocode 8 shows application rules of seismic design for each kinds of structures (EN1998-2, 4~6). EN1998-3 covers the repair and strengthening of buildings, monuments considering commonly used structural materials.

Table 1. Subdivided parts of Eurocode 8

EN 1998-1	General rules, seismic actions and rules for buildings
EN 1998-2	Bridges
EN 1998-3	Assessment and retrofitting of buildings
EN 1998-4	Silos, tanks and pipelines
EN 1998-5	Foundations, retaining structures and geotechnical aspects
EN 1998-6	Towers, masts and chimneys

Keywords: Eurocodes, Earthquake, Seismic design, International Standard

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3. SEISMIC DESIGN PROCEDURE IN EUROCODE 8

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This section shows outline of seismic design procedure in Eurocode 8 and comparison of design flow of Japanese structural design standard. Figure 2 shows the flow of seismic design in Eurocode 8. 2 set of earthquake strength are considered for performance verification as seismic action. About computation of structural response values, response spectra analysis and lateral force are also used in Eurocode 8. Figure 3 shows seismic design flow of Design Standard of Railway Structures and Commentary (DSRSC) as an example of Japanese structural standard. In DSRSC, Dynamic analysis is shown for computation of response values together with response spectra analysis.

4. CONCLUSION

Outline of Eurocode and design standard of seismic design (Eurocode 8) were introduced. Through the comparison of seismic design process between Eurocode 8 and DSRSC, both standards use similar way. For example, 2 set of earthquake strength are considered for performance requirement and response spectra analysis is used for calculation of response value. However, DSRSC shows more complex method of analysis and uses larger seismic force than Eurocode 8. It comes from severe condition of Japan about frequency and size of earthquakes which happens in Japan comparing with Europe. Considering with the situation which Eurocodes are being de facto standard of structural design, it is important that understand the difference of seismic design between Eurocodes and Japanese standard.

REFERENCE

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BS EN 1991-1-1: Eurocode 1, Actions on structures – Part 1-1: General actions – Densities, self-weight, imposed loads for buildings

BS EN 1998-1: 2004 Eurocode 8, Design of structures for earthquake resistance – Part 1: General rules, seismic actions and rules for buildings

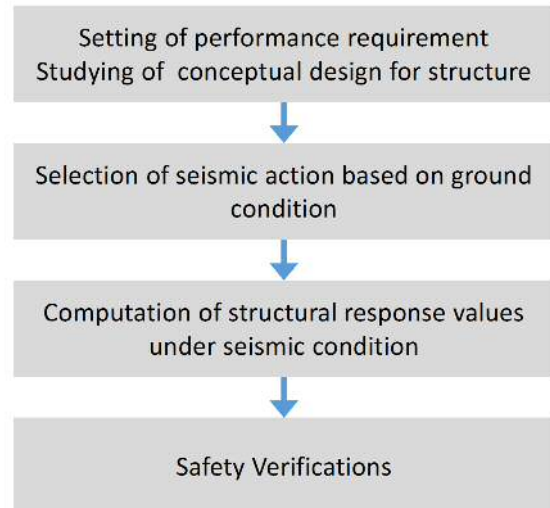


Figure 2. Seismic design procedure in Eurocode8

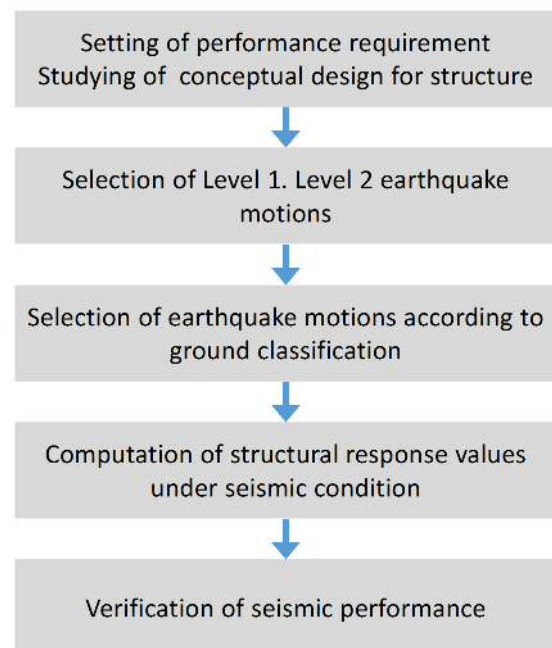


Figure 3. Seismic design procedure in DSRSC