



SLOVENIAN EXPERIENCE IN USING EUROCODES

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Eurocodes

Series of 10 European Standards, EN 1990 - EN 1999, providing a common approach for the design of buildings and other civil engineering works and construction products.

The EN Eurocodes are:

- a **complete set of design standards** that cover all principal construction materials, all major fields of structural engineering and a wide range of types of structures and products;
- the most **up-to-date** codes of practice;
- **flexible**, offering the possibility for each country to adapt the Eurocodes to their specific conditions regarding climate, seismic risk, traditions, etc. through the Nationally Determined Parameters.

Why Eurocodes

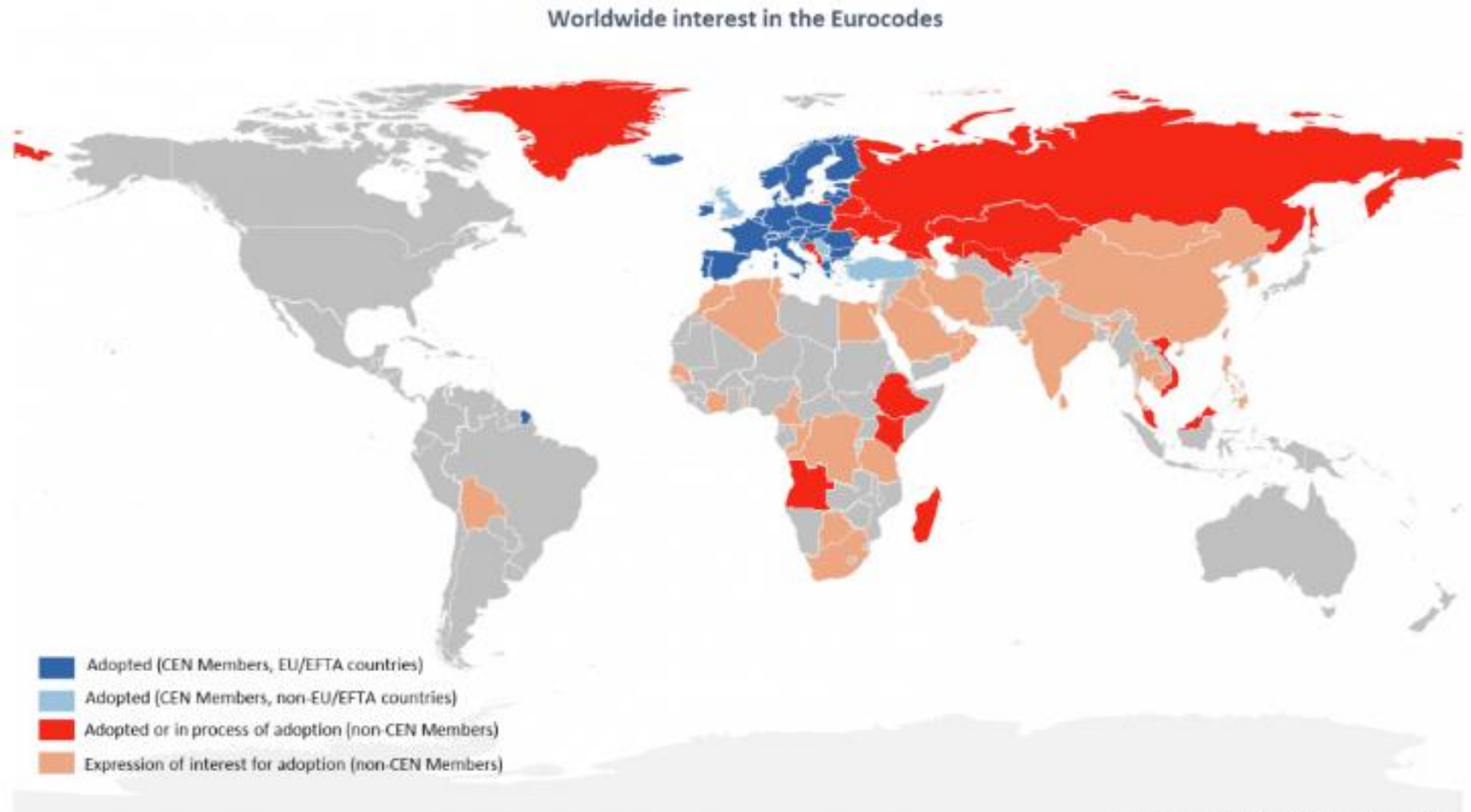
The Eurocodes help make **companies more competitive and increase safety in the construction industry.**

The Eurocodes contribute to the **establishment and functioning of the internal market** for construction products and engineering services by eliminating the disparities that hinder their **free circulation within the Community.** Further, they are meant to lead to **more uniform levels of safety in construction in Europe.**

Advantages

- **quality** based on internationally established and verified knowledge,
- covering **all key aspects of designing** building structures (required level of safety, loads, design rules for different types of building materials, including foundation, fire and earthquake safety),
- **high degree of mutual coordination** of individual standards,
- use in **all** countries of the **European Union** and in **most** other **European countries**.

Use of Eurocode standards around the world



© EuroGeographics for the administrative boundaries

Source: Joint Research Centre - European Commission

Fundamental requirements of the Eurocodes

- **Safety** requirement - the structure will sustain all actions and influences likely to occur during execution and use.
- **Serviceability** requirement - the structure during its intended life will remain fit for the use for which it is required, with the appropriate degrees of reliability and in an economic way.
- **Fire** requirement - the structural resistance shall be adequate for the required period of time.
- **Robustness** requirement - the structure will not be damaged by events such as explosion, impact or consequences of human errors, to an extent disproportionate to the original cause.

Essential requirements

Eurocodes also serve as reference documents for proving the compliance of building and civil engineering works with the essential requirements of Council Directive 89/106/EEC, particularly:

- Essential Requirement N°1 – Mechanical resistance and stability and
- Essential Requirement N°2 – Safety in case of fire;

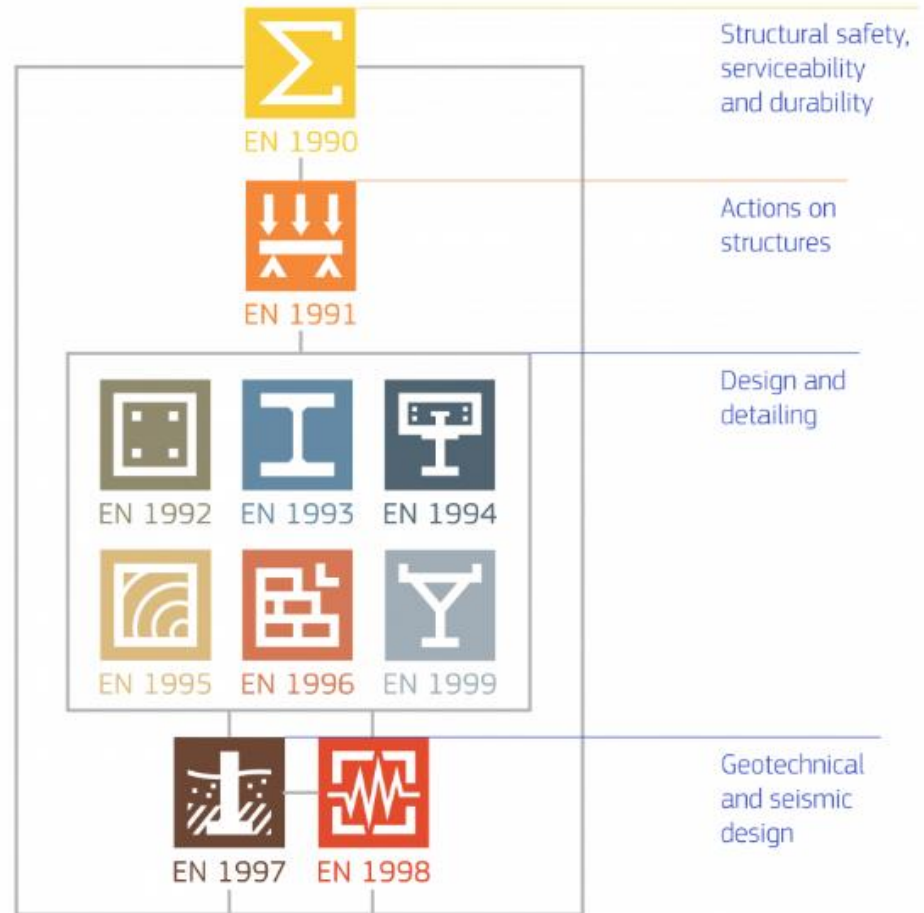
General assumption of Eurocodes

- the choice of the structural system and the design of the structure is made by **appropriately qualified and experienced personnel**,
- **execution** is carried out by personnel having **the appropriate skill and experience**, **adequate supervision and quality control** is provided during execution of the work, i.e. in design offices, factories, plants, and on site,
- **the construction materials and products** are used as specified in EN 1990 or in EN 1991 to EN 1999 or in the relevant **execution standards**, or reference material or product specifications;
- the structure will be **adequately maintained**;
- the structure will be **used in accordance with the design assumptions**.

Numerical values for partial factors and other reliability parameters are recommended as basic values that provide an acceptable level of reliability. They have been selected assuming that **an appropriate level of workmanship and of quality management** applies.

Eurocodes - Fields of application

- basis of structural design (EN 1990)
- actions on structures (EN 1991)
- the design of concrete (EN 1992), steel (EN 1993), composite steel and concrete (EN1994), timber (EN 1995), masonry (EN 1996) and aluminium (EN 1999) structures
- geotechnical design (EN 1997)
- the design, assessment and retrofitting of structures for earthquake resistance (EN 1998)



Eurocodes – basic composition

Each Eurocode consists of several standards that cover different aspects of design, e.g. basic rules and building design, bridge design, fireproof design constructions...

Example – parts of Eurocode 2 (Design of concrete structures):

- EN 1992-1-1: Part 1-1: General rules and rules for buildings
- EN 1992-1-2: Part 1-2: General rules - Structural fire design
- EN 1992-2: Part 2: Concrete bridges - Design and detailing rules
- EN 1992-3: Part 3: Liquid retaining and containment structures
- EN 1992-4: Part 4: Design of fastenings for use in concrete

Eurocodes – basic composition

Example of composition of Slovenian SIST EN 1990:

- SIST EN 1990: 2004 - Eurocode - Basis of structural design
- SIST EN 1990:2004/A101:2005 - Eurocode - Basis of structural design (National annex)
- SIST EN 1990:2004/A1:2006 - Eurocode - Basis of structural design (Amendment)
- SIST EN 1990:2004/A1:2006/A101:2009 - Eurocode - Basis of structural design (National annex)
- SIST EN 1990:2004/A1:2006/AC:2009 - Eurocode - Basis of structural design (Corrigendum)
- SIST EN 1990:2002/A1:2005/AC:2010 - Eurocode - Basis of structural design (Corrigendum)

Principles and Application Rules

The Principles comprise :

- general statements and definitions for which there is no alternative;
- requirements and analytical models for which no alternative is permitted unless specifically stated.

The Principles are identified by the letter P following the paragraph number.

The Application Rules are generally recognised rules which comply with the Principles and satisfy their requirements.

It is permissible to use alternative design rules different from the Application Rules for works, provided that it is shown that the alternative rules accord with the relevant Principles and are at least equivalent with regard to the structural safety, serviceability and durability which would be expected when using the Eurocodes. In this case cannot be claimed that the resulting design is wholly in accordance with EN 1990 although the design will remain in accordance with the Principles of EN 1990.

Current status and future changes of Eurocodes

The Eurocodes are currently at the stage of maintenance and evolution in order to address the variety of new methods, new materials, new regulatory requirements and new societal needs developing and to extend harmonisation.

The next generation of the Eurocodes will be published by 2026.

Use of Eurocodes in Slovenia

September 2005: Pravilnik o mehanski odpornosti in stabilnosti objektov

- January 1, 2006: Eurocodes were used in parallel with JUS
- January 1, 2008: Mandatory use of Eurocodes

Using of other design methods is not explicitly prohibited, but in such cases it is necessary to prove that the level of reliability achieved is at least equal to the level prescribed by the Eurocodes. This opens the door especially for those special cases not covered by Eurocodes.

Usage issues and experiences in Slovenia

- high purchase price of Eurocode standards
 - “non-mandatory,, use of Eurocode standards
 - translations of standards
 - a complex design process that requires simultaneous consideration of all relevant provisions from numerous standards, cross-referencing
 - differences in the calculation of some types of constructions in comparison with JUS
 - new details - especially to ensure earthquake resistance
 - changes in the way of working on construction sites
 - higher safety of structures
 - old existing structures
 - revision of design documentation
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- **the use of Eurocodes has a significant effect on better design practice and increased (seismic) safety of buildings**

Lectures and workshops at Slovenian Chamber of Engineers

In the Slovenian Chamber of Engineers, we set ourselves the task of helping in **the education of our members**, as the new regulations were extremely extensive, and in most areas completely **new approaches and principles** were introduced in terms of calculations and constructing of individual structural elements.

The section of civil engineers at IZS established **a working group for the introduction of Eurocodes into engineering practice**.

In **2007 and 2008 intensive lectures and workshops** was held at Slovenian Chamber of Engineers in cooperation with the Faculty of Civil and Geodetic engineering from University of Ljubljana with the aim for engineers, above all to those who did not learn about Eurocodes at the faculty, as well as to younger ones, **to give the knowledge necessary for transition from the old design methods to design based on Eurocode standards**.

Lectures and workshops at Slovenian Chamber of Engineers

First level:

- four courses.
- the basic knowledge covered by Eurocodes was given.

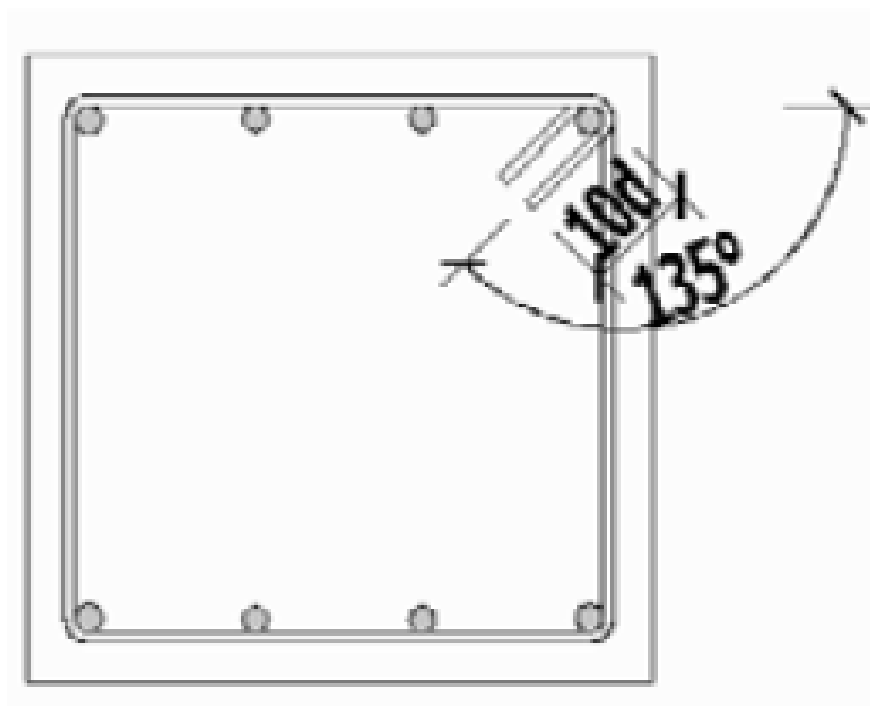
Second level:

- consisted of 30 seminars with 532 hours
- nine basic standards was presented and discussed in detail
- the theoretical as well as the application part of each Eurocode was presented separately
- attended by more than 1000 listeners

Design manual

Design manual of building constructions according Eurocode standards (2009, new revision 2017)





Thank you for your attention!

Slovenian Chamber of Engineers

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