

# CONTRIBUTIONS TO ELABORATION OF SOME EUROPEAN AND NATIONAL REGULATIONS SPECIFIC TO REINFORCED CONCRETE STRUCTURES

## Summary

The habilitation thesis presents a synthesis of professional achievements and personal contributions to the present and future development of the field of reinforced concrete structures, emphasized by research and teaching performances.

The thesis, in Part A, presents the scientific performances achieved by its author, Prof.dr.ing. Dan Georgescu, especially concerning the elaboration of some national technical regulations for Romania and Republic of Moldova and the research developed in this purpose, for covering a wide range of activities for realizing reinforced concrete structures: concrete (specification, performance, production and conformity), design of structures/ elements of reinforced and prestressed concrete, execution of concrete structures, assessment of in-situ compressive strength in structures and pre-cast concrete components. In this part, I also present some of my scientific results, publications (articles, books, lectures, guide-books, etc.) and communications at national and international conferences, my activity in some national and international technical committees and in the editing committee of a specialized journal, as well as details regarding my didactic activity.

**Part B** presents the prospects of my professional career, a personal approach regarding the development of this domain with a view to research and didactic activity. **Part C** presents bibliographical references.

### Part A

The scientific activity in the last few years has focused on the elaboration of some studies and researches aimed to harmonizing the national regulations in Romania and Republic of Moldova with the European ones:

- i. Study of durability of concrete prepared with cements containing additives for the purpose of extending the domains of their use (Chapter 1).
- ii. Enunciating at an European level and applying a new concept regarding durability classes for concrete, internationally presented at *fib* Congress in Washington in 2011 and developed by the author in a "Design Guide for durability" (Chapter 2). This concept drawn by the author in the years 2005-2006 in a national research program will be proposed in an evolved form by the European Committee (whose member I am), at the level of regulations of producing concrete and planning, as a new method of evaluating/assessing of concrete's durability. By collaborating at the level of European Committee, I contribute towards creating new concepts concerning durability (as presented in Part B) and to elaborating of some European regulations.
- iii. Carbon dioxide uptake during concrete life cycle. For the first time at a national level, I performed works in this domain, showing concrete's capability to absorb CO<sub>2</sub> (Chapter 3).
- iv. Experimentally applying - for the first time in Romania - of "k value concept for slug" in case of using additives in concretes (Chapter 4).
- v. Applying some modern concepts regarding "Principles of the Equivalent Concrete Performance Concept" (Chapter 5).
- vi. Elaborating the regulations in Romania and Republic of Moldova regarding concrete production and execution of concrete structures and harmonizing them with European standards EN 206 and EN 13670 (Chapter 6).
- vii. Participating to drawing up of the National Annex of Romania and of Republic of Moldova at Eurocode 2, elaborating some guides for designing of the reinforced concrete and prestressed elements as well as some lectures and guide books of a didactic nature (Chapter 7).

- viii. Implementing, at the level of the regulations and guides of application in Romania and Republic of Moldova, of some modern methods of assessment of in-situ compressive strength in structures and pre-cast concrete components based on the latest recommendations of EN 13791 standards (Chapter 8). Referring to the evaluation the concrete in existing buildings, I performed some works in order to determine the characteristics of the concrete in U3 and U4 reactors envelope of Cernavoda nuclear power plant and its annex constructions, by applying some complex and correlated methods, working together with prof. Denis Mitchell from McGill University, some of these being among the present proposals for EN 13791 standard of 2017.
- ix. Other original contributions regarding: Applying of some experimental methods for determining of drying shrinkage of concrete, in the context of a higher intensity of this phenomenon and the consequences of concrete cracking, for the concretes poured in Romania, proposals that are to be found when revising Eurocode 2; Applying some methods of performance when evaluating the durability of the concrete in existing buildings (Chapter 9).

The results of scientific research gave me the opportunity to take part in the elaboration of some essential technical regulations, including at a European level (EN 206 and EN 1992-1-1), covering a wide range of specific activities for realizing of reinforced concrete buildings elaborated both for Romania and also for The Republic of Moldova. Among these regulations, I mention the most recent ones:

- NE012-1: Practice Code for execution of concrete, reinforced and prestressed structures. Part 1: Producing the concrete;
  - NE012-2: Practice Code for execution of concrete, reinforced and prestressed structures. Part 2: Execution of concrete structures;
  - NP 137: Normative for “Assessment of in-situ compressive strength in structures”;
  - National Document and Guide for applying SM EN 206-2013 standard (Republic of Moldova);
  - SM EN 1992-1-1. National Annex. Design example’s (Republic of Moldova);
  - Normative for “Execution of concrete structures as per SM EN 13670” (Republic of Moldova);
  - Normative for “Assessment of in-situ compressive strength in structures as per EN 13791-2016” (Republic of Moldova);
- National and international recognition is presented in Chapter 10.

## **Part B**

The second part of the thesis presents a strategy - in my personal view - for developing the domain of reinforced concrete structures, especially by modern approaching of the durability, as well as concerning reorganizing the present national regulation system in Romania regarding reinforced concrete structures and harmonizing it with the European one. I present herein the results obtained so far, as well as the perspectives/ proposals of some studies, researches and analyses that must be performed as milestones for developing the domain of reinforced concrete, in a new approach concerning durability as it follows from the conclusions of the studies performed by European Committee for concrete durability, whose member I am together with well-known specialists at a European level such as: Steinar Leivestad, Rolf Breitenbücher, Giuseppe Mancini, Tom Harrison etc. This part includes the project for future development of didactic career, by proposing a closer joining of its components: teaching, creative and research practice including experimental, and normative practice for applying the specific regulations.

## **Part C**

Bibliographical references associated to the sections **A** and **B**