

BASICS OF CONCRETE SCIENCE

L. Dvorkin and O.Dvorkin

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L.Dvorkin and O.Dvorkin
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ABSTRACT

There are enlightened basic aspects of scientific concrete science. There is given summary of modern ideas about hardening and structure-forming of cement stone and concrete, rheological and technological properties of concrete mixes, strength, strain and other properties, which determine concrete operate reliability and durability. There are considered basic types of normal weight cement concrete, lightweight and cellular concrete, non-cement mineral binders concrete, mortars.

The book is addressed to students and post-graduate students of construction specialties of higher educational establishments, scientists and technologists.

BASIC MONOGRAPHS OF AUTHORS

1. L.I.Dvorkin "Optimum Design of Concrete Mixtures", Lvov, Vusha Skola, 1981, 159 p. (Rus.)
2. L.I.Dvorkin, V.I.Solomatov, V.N. Vurovoi, S.M.Chydnovski "Cement Concrete with Mineral Admixtures", Kiev, Bydivelnik, 1991, 137 p. (Rus.)
3. L.I.Dvorkin, O.L.Dvorkin "Effective Cement - Ash Concrete", Rivne, Eden, 1999, 195 p. (Rus.)
4. O.L.Dvorkin "Design of Concrete Mixtures. (Bases of Theory and Methodology)", Rivne, NUWMNR, 2003, 265 p. (Rus.)
5. V.I.Bolshakov, L.I.Dvorkin "Building Materials", Dniepropetrovsk, Dnipro-VAL, 2004, 677 p. (Rus.)
6. V.I.Bolshakov, L.I.Dvorkin, O.L.Dvorkin " Bases of Theory and Methodology of Multi-Parametrical Design of Concrete Mixtures", Dniepropetrovsk, PGASA, 2006, 360 p. (Rus.)
7. L.I.Dvorkin, O.L.Dvorkin " Building materials from wastes of industry", Rostov-na-Dony, Phenics, 2007, 363 p. (Rus.)

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REFERENCE

on the manuscript of book
of Doct. of Tech. Science, Prof. L. Dvorkin and
Doct. of Tech. Science O. Dvorkin
“Basics of Concrete Science”

By now concrete science became one of the fundamental material sciences, at which modern construction technology is based. A large body of literature is devoted to certain problems and sections of concrete science.

In this connection famous monographs of V. Ramachandran, A. Neville, F. Lee, A. Sheykin and other authors should be mentioned. Chapter “Concrete science” in educational literature is adduced in manuals on concrete and reinforced concrete technology (manuals of O.Gershberg, Y.Bazhenov etc.).

Therewith wide theoretical and empirical data have been accrued till present time that makes preparation of the books with recital of general essentials of concrete science as independent discipline order of the day. Discipline subject is studying of concrete structure and properties of different types and influence of various factors on them.

Authors of the book under review attempted to solve this problem. The book consists of 10 chapters, comprising main subjects of material science and enlightening qualitative peculiarities of raw materials and admixtures, chemical and physical processes in concrete structure forming, complex of concrete properties which characterize concrete durability, types of cement and mostly wide-spread non-cement concrete and mortars. Distinctive features of the book accessible and in the same time deep enough recital of the data, generalization of wide experimental data, accent on the problems of forecasting and management of concrete properties, their proportioning.

To our opinion the book appeared to be “full-blooded” and original. Along with classical statements there are enlightened modern data and conceptions.

**Doct. of Tech. Science, Professor, Director of Scientific and
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REFERENCE

on the manuscript of book
of Doct. of Tech. Science, Prof. L. Dvorkin and
Doct. of Tech. Science O. Dvorkin
“Basics of Concrete Science”

Basically concrete science is engineering science, development of which greatly defines a level of modern construction technology. The series of editions educational chiefly prepared by professors B.G. Scramtaev, Y.M. Bazhenov and others are devoted to recitals of concrete science essentials. Therewith dynamic development of concrete science in recent years causes necessity of preparation the works, where modern theoretical essentials of that science would be generalized and accessibly stated. The book prepared by famous specialists Doctors of Technical Science, Professors L.Dvorkin and O.Dvorkin subserves this purpose.

Therewith it should be mentioned that the book presented can be considered as in-depth course of concrete science basics which can be useful for wide readership – students, post-graduate students, scientists and technologists.

Structure of the course suggested is appeared to be straight enough; authors sequentially enlighten peculiarities of raw materials, rheological and technological properties of concrete mixes, issues of concrete structure forming, its influence on strength, deformability, concrete resistance to physical and chemical aggression effect. There are discovered interestingly and deeply enough the issues of concrete creep and shrinkage.

Accessible logical recital, wide range of the problems enlightened, generalization of wide experimental data obtained by large group of researchers including the authors themselves, high level of using diagrams, tables, quantitative dependences are characteristic for the book under reference.

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FOREWORD

L. Dvorkin and O.Dvorkin

Modern concrete science is dynamically developed applied science which subject is studying of structure and properties of the composite materials received at hardening of binders and aggregates.

The primary goal of concrete science is working out the theory of producing of concrete with given properties, maintenance of their working capacity and necessary durability in structures and constructions at influence of service factors.

Considering many-sided nature of concrete science, huge luggage of theoretical workings out and the practical experience, saved up by present time, the statement of concrete science essentials is an uneasy problem.

By preparation of the book authors pursued the goal to shine well and at the same time without excessive simplification such sections of concrete science as structure of a cement stone and concrete, its basic properties and types, design of concrete mixtures. Principal views of noncement concrete and mortars are considered in short also.

The offered book as authors hope, can be used not only by students of building specialities of universities, but also to be useful to post-graduate students, scientists, a wide range of technologists.

Authors are grateful to reviewers: Prof. P.Komohov, Prof. P. Krivenko and Prof. A.Ysherov-Marshak for valuable advices and remarks; and also PhD N.Lyshnikova who have assisted in preparation of presentation.

INTRODUCTION. SHORT HISTORICAL ESSAY

L. Dvorkin and O.Dvorkin

Concrete science is a science about concrete, its types, structure and properties, environmental impact on it. Concrete science develops in process of development of construction technology, improving of experimental methods of research.

Concrete application in civil engineering can be divided conventionally into some stages:

1. The antique
2. Application of a hydraulic lime and Roman cement.
3. Portland cement technology formation and plain concrete application.
4. Mass application of concrete for manufacturing of reinforced concrete constructions.
5. Application of concrete for manufacturing of prestressed and precast reinforced concrete constructions
6. Wide use of concrete of the various types modified by admixtures.

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