SCALE
SUPPORT | MATERIALISE

SCALE

SUPPORT | MATERIALISE

COLUMNS, WALLS, FLOORS

EDITORS
ALEXANDER REICHEL
KERSTIN SCHULTZ

AUTHORS
HENNING BAURMANN
JAN DILLING
CLAUDIA EULER
JULIUS NIEDERWÖHRMEIER

Birkhäuser
Basel

EDITORS' FOREWORD

Structure and material – without these two elements, architecture would be unthinkable and designs certainly not buildable. Structure and material are the elementary components of any construction and of any building. They form and shape it. For this reason, the third volume of the SCALE series is exclusively dedicated to these important elements, which are essential to a building and have to be considered at the beginning of a design. As in the previous volumes, the issue is that of the interaction between construction and design, which determines the appearance of a building.

This volume begins with an introductory section on the logic of structural systems in general – the structure – and goes on to describe the implementation of these principles using the respective construction material – the enclosing material. The last section of the book is dedicated to built examples, which demonstrate how the interaction between aesthetics and structure functions in practice. The illustrations include numerous drawings and plans to help the reader assimilate the process – from design to the completed building – and the resulting atmospheric quality.

The structural systems and developments illustrated here relate to the special structural and formal features of ideal structural systems. These structural principles are delineated so as to allow a general application, without requiring analysis and proof in terms of structural calculations. The idea is to create essential design tools that can be used in a successful design process – thus creating an interface that highlights the common ground between architects and engineers.

The structures are illustrated with their jointing details and principal dimensions and, at the same time, the range of materials best suited for a certain structural system is described. The selection of systems focuses on clear basic principles, such as skeleton and wall construction, in order to create clarity – and hence assist comprehension – in the knowledge that the complexity of modern building practice often involves hybrid structural systems, which could not be described, however, without this elaboration of basic principles. The quality of architectural expression, its general legibility and hence its acceptance by users is exemplified by the clear implementation of the different principles, such as column or girder, arch or frame, skeleton or wall construction.

The logic of the structure follows through in the selection of the material – as was stated by Louis Kahn in 1972. "When you talk to a brick and ask it what it wants, it will say: an arch. And when you reply: but look, arches are expensive, and it is simpler to use a lintel made of concrete, the brick will reply: I know that it is expensive, and I fear that currently it probably cannot be built, but if you ask me what I really want, it is still the arch." (From: Louis I. Kahn: *Writings, Lectures, Interviews*. New York, 1991). Using materials in a way that is appropriate to their properties is one of the basic prerequisites of sustainable building. This is the only way in which to achieve economic use of resources and to build a building with a long service life

and low maintenance costs. The questions raised will have to be answered anew when new materials or new construction methods appear.

The relevant knowledge and background are introduced in detail in the main part of the book. Construction details and rules are illustrated for the different materials, i.e. masonry, concrete, timber and steel, using section drawings of selected buildings. With the help of the principles introduced, readers can pursue more detailed research on specific subjects and thereby arrive at a solution that suits their project. Building components such as walls, columns and floors, as well as bracing and jointing details, are illustrated at different scales and in different construction methods.

Not every material is suitable for every structure, and so it becomes apparent – when selecting the appropriate material – how important a detailed knowledge of the principles, jointing methods and special characteristics is, in order to ensure that material and structure form a homogeneous unit. The principles explained here supplement that part of the SCALE series of books that illustrates the construction principles of an independent building envelope. "Envelope and Construct" is that volume of the series in which the outer envelope, including roof and facade, is introduced in its multi-faceted architectural expression and, just as in this current volume, is shown with its design and construction details.

These two volumes are intended to document a variety of current architectural approaches while at the same time offering the basic principles leading to the synthesis of construction, form and shape. The quality of the architecture is the result of a process, which starts with a conceptual design and which is developed by applying a construction principle and selecting appropriate materials.

We thank the authors for their inspirational work in creating this book, Andrea Wiegelmann for her continuous conceptual support of the series and Birkhäuser publishers for the many years of consistent cooperation.

Darmstadt, Kassel, 31 March 2013
Alexander Reichel, Kerstin Schultz

SUPPORT | MATERIALISE
INTRODUCTION

CHAPTER 1