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ENVIRONMENTAL WIND ENGINEERING
AND
DESIGN OF WIND ENERGY STRUCTURES

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PREFACE

The present volume presents topics from environmental aerodynamics, which in the last decade has significantly progressed, particularly at the computational front. The volume is divided into two parts; the first is devoted to environmental wind engineering, whereas the second addresses the design of wind energy support structures.

In the first part of the present volume, the fundamentals of both experimental and computational approaches along with examples from actual studies involving pedestrian level winds, comfort levels, relevant legislation and remedial measures. Pollutant dispersion in the building environment is also presented and discussed along with the methodologies available to deal with potentially critical design problems, which—if left unattended—could jeopardize the successful operation of new construction developments.

Considering that wind energy production involves special wind turbine support structures, the second part of this volume concerns their design, which needs some special reliability assessment. Experimental and computational approaches are analyzed in order to make the reader familiar with the uncertainties involved and the currently available design methodologies and codes framework.

The volume contains seven chapters written by wind engineering experts. Chapters 1 and 2, authored by Theodore Stathopoulos, include a broad introduction to environmental aerodynamics, their fundamentals and applications respectively. Chapter 3, by Bert Blocken, introduces the theory and applications of computational wind engineering, an area of vital contemporary interest in the evolution of wind engineering.

Chapter 4, co-authored by Alberto Zasso, Paolo Schito, Carlo Bottasso and Alessandro Croce, refers to the fundamental interaction mechanism between the wind flow and the wind turbine that is the basis for the design of wind turbines applying numerical and wind tunnel modeling approaches. Chapter 5, by Peter Schaumann, Cord Böker, Anne Bechtel and Stephan Lochte-Holtgreven, introduces the different types of support structures for onshore and offshore wind energy converters including the relevant design criteria for different limit design states. Chapter 6, by Charalampos Baniotopoulos, Iakovos Lavassas, George Nikolaidis and Pantelis Zervas, deals with specific

topics on the design of tubular steel wind turbine towers considering that the design is governed by extreme wind and earthquake loading when the Aeolian park is constructed in seismic hazardous regions. Finally, Chapter 7, co-authored by Claudio Borri, Paolo Biagini and Enzo Marino, addresses structural design questions for large wind turbines in seismic areas with reference to main dimensioning criteria, international Norm specifications and erection technologies. This chapter includes a thorough discussion on various structural analysis approaches and the design, construction and in-situ testing.

The editors would like to thank all contributors to this volume for the excellence of their work and to also extend their sincere appreciation to the CISM General Secretary, Professor Bernhard Schrefler, the CISM Rector, Professor Giulio Maier, the Editor of the Series Professor Paolo Serafini, as well as to the entire CISM staff in Udine for their excellent cooperation.

The produced volume will be of interest to engineers, researchers and academicians who work on relevant scientific research or design topics in research centers or institutes, universities, industry and government agencies. The volume is written to address the interests of practicing engineers and professionals as well.

C.C. Baniotopoulos, C. Borri, and T. Stathopoulos

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