

PREFACE

In the recent two decades, rapid deterioration of existing bridge structures has become a serious technical and economical problem in many countries, including highly developed ones. Therefore, bridge rehabilitation is one of the most important tasks of contemporary civil engineering.

In general, bridge rehabilitation can be defined as a multi-component process leading to the safe utilization of existing bridges, which are structurally deficient and/or functionally obsolete. Therefore, in its most general meaning, bridge rehabilitation can include bridge repair, strengthening and modernization as well as replacement of the “old” structure or some of its structural members by “new” ones.

Bridge rehabilitation relates not only to technical and economical aspects, but also to social ones. For instance, when old bridges with historical values demand to be restored and modernized to meet the requirement of new traffic conditions, aesthetical aspect should be taken into account and the selection of material and structural solutions in the bridge rehabilitation process itself is crucial.

It should be emphasized that in many situations, the rehabilitation process is more difficult and complex than construction of new bridges, as for instance in case of severely deteriorated large concrete structures.

Bridge rehabilitation process should be preceded by assessment and evaluation of the structure to determine its actual technical condition and to select the proper rehabilitation techniques and materials. The anticipated period of the future service of the bridge and the traffic conditions during

this period should also be determined prior to the rehabilitation project and operations.

All the above general remarks show that bridge rehabilitation covers many technical and economical problems, including inspection system.

Bridge rehabilitation needs to be performed in every stage — from inspection before rehabilitation works, through preparing an adequate project and quality control of all relevant operations, to examination of the rehabilitation effectiveness after the works are completed — by highly experienced engineering staff.

Technical experience is based on two fundamental sources — everyday engineering practice and engineering knowledge from adequate education developed during the university studies of future bridge engineers and professional activities of bridge engineers after studies — permanent education is absolutely necessary for contemporary engineers. A well-prepared book is very useful for this.

This book, entitled “*Bridge Rehabilitation*”, is written mainly for postgraduate university students in civil engineering. However, it is also useful for bridge practitioners and researchers.

Because of the wide scope of problems concerning bridge rehabilitation, it is necessary to make careful selection for presentation in this book. The selection has been made according to the author’s subjective opinion and, therefore, can be questionable. However, this book covers in synthetic form nearly all the most important problems concerning bridge rehabilitation — the typical damage observed in bridges; assessment and evaluation techniques of their technical condition; rehabilitation of bridge substructures, including foundations; and bridge superstructure, including bridge deck, bearings, expansion joints and other bridge accessories. Some economical and aesthetical problems of bridge rehabilitation, including bridge modernization, are also presented.

This book concerns rehabilitation of existing concrete and steel bridges, mainly highway ones. Rehabilitation of masonry or wooden bridges is performed not as commonly as the concrete and steel ones and requires specific restoration techniques.

Because of space limitation, some special problems, such as rehabilitation or replacement of cables or stays in the suspension or cable-stayed bridges, are neglected in this book. These problems can be presented in its prospective next editions.

This book is the result of the author's study and engineering knowledge. It is natural that some parts of this book are based on the Polish experience. This is reflected among others by relatively numerous Polish publications cited in text. However, it should be emphasized that the Polish experience is in accordance with that in many other countries because the nature of bridge engineering is in general the same everywhere.

Because of potential international readers, mainly postgraduate students, all the problems presented in this book are mostly in their physical, chemical and technical as well as economical aspects and the relevant requirements are treated as objective ones, i.e., irrespective of the rules, standards or other regulations particular to any country. According to the author's intention, this approach gives the book a more general character and, therefore, makes it a useful text for most civil engineering courses.

Any remarks concerning this book, including critical ones, from the readers addressed directly to the author or to the publisher will be highly appreciated and can be taken into consideration in its prospective next editions.

This book was written over a relatively long time, mainly because of my many other academic, scientific and engineering duties in Poland and abroad. Moreover, English is not a native language of the author and, therefore, the text required extensive editorial operations.

I am most obliged to the publisher and the main editors, Ms. Chean Chian Cheong and Mr. Yeow-Hwa Quek, for editorial preparation of this book.

It is also the author's pleasure and obligation to present his gratitude to the individuals for their help in preparation of this book. The thanks are addressed to my co-workers in the Institute of Roads and Bridges, Warsaw University of Technology: Mrs. Alicja Karpińska, my secretary, for her kind assistance; Mrs. Ewa Łukaszuk, librarian, for supplying many useful

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It is the author's hope that this book will be useful to its readers. It would be his best satisfaction.

Wojciech Radomski

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