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Cost Estimation of Structures in Commercial Buildings

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To my wife Manjit

my children

Rajwinder, Anjli, Sonia, Harmeen

and my grandchildren

Navreen and Gurmukh

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Preface

Approximate cost estimates for structural works are always needed for one reason or another at the initial design stage in the building construction industry, and the techniques generally used for their preparation are the percentage estimate method, the superficial or floor area method (also known as the square metre method) and the approximate quantities method. A proper application of the first two methods requires an in-depth knowledge of historical cost information of completed buildings and of the effect of design parameters on the construction cost.

Information on constituent quantities of completed buildings is not readily available. Realistic estimates may thus require the engineer to work out different schemes so that the most economical one may be selected. It is time consuming and unsystematic if this has to be done for every project. With these drawbacks in mind, the author has supplied the basic data and discussed, in relation to commercial buildings ranging from 5 to 50 storeys, the effect of different design parameters on quantities of constituents for common structural systems, namely the reinforced

concrete beam and slab system, the flat slab and waffle slab systems, and the prestressed concrete beam and reinforced concrete slab system. This approach to constituent quantities will enable both students and professionals to develop estimates with ease, speed and accuracy.

A critical review of the previous work relating to structural design economics has indicated that the investigations were either based on records of past completed projects or on first principles by analysis, design and computation of quantities. The former approach has a number of drawbacks and, in view of this, the author decided to follow the more scientific approach of analysis, design and computation of quantities for structures of varying heights and structural systems based on the latest British Standards and Codes.

The information on constituent quantities is presented in the form of charts and the effects of design parameters such as column grid size, number of storeys, location of structural components, arrangement of beams, grades of concrete, etc. on the quantities of various constituents of concrete construction for different structural systems have been discussed.

Using the charts presented, applications for comparative cost estimation to assess the effect of various design parameters, for approximate structural cost estimation of an overall project given its design features, for checking the estimates for structural works, for calculation of quantity index for structural works, and for various other building economics studies have been illustrated.

Singapore, 1994

SURINDER SINGH

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List of Symbols

The symbols used in this book are as follows:

f_{cu}	Characteristic concrete cube strength
f_y	Characteristic strength of reinforcement
f_{pu}	Characteristic strength of prestressing tendons or strands
G_k	Characteristic dead load
Q_k	Characteristic imposed load
W_k	Characteristic wind load
N/mm^2 or $N/sq\ mm$ }	Newtons per square millimetre
kN/m^2 or $kN/sq\ m$ }	
	Kilonewtons per square metre