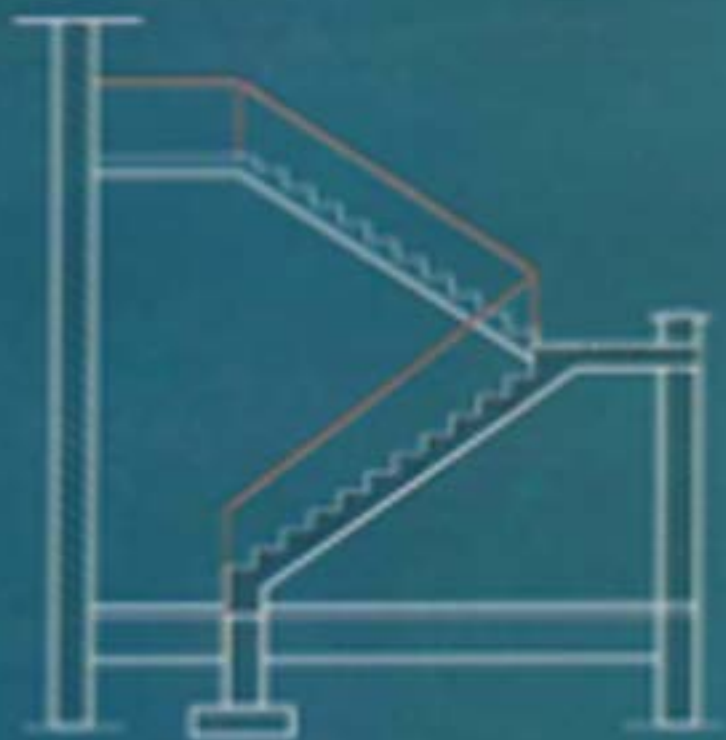


*N.A. Shah • S.P. Chandola*

# Quantity Surveying

*[Principles and Applications]*

*P.K. Guha*



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# QUANTITY SURVEY

[Principles and Applications]

*includes*

**Computerised Estimation, Costing, Specification, Valuation and  
Construction Management**

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**P.K. Guha**

*B.A. (Cal.) M.I.S., F.I.E. (India)*

*Chartered Engineer and valuer, Retired Executive Engineer,  
Public Works Department, Govt. of West Bengal,  
Formerly Director, Planning and Development, Kolkata Municipal Corporation*



**KHANNA PUBLISHERS**

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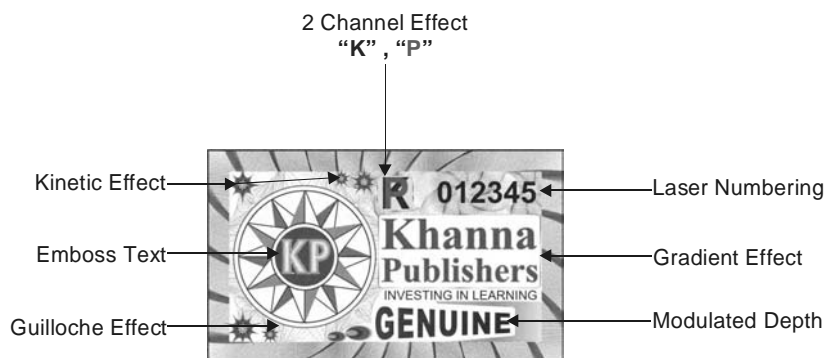
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*Dedicated to my*  
**Grand-daughters**  
**Abheree Roy**  
**and**  
**Prajna Paramita Guha**

In these days of super-technology, when physical distances have melted away to conceptual nearness, among the international communities, with heterogeneous level of development; It is the scientists and technologists of the developing countries, who have to bear the burnt of the tremendous techno-economic upsurge, to meet the aspirations of their nations. Timely completion of ecofriendly, environmentally-compatible projects and structures, achieving maximum cost-benefit, by employing optimum latest technology in man, machine and material is the motto of the day. This is the crux of the national strategy of developing nations. And the study, teaching and employment of all the branches of technologies, including 'Quantity Survey' are to follow that.

The subject 'Quantity Survey' of Civil Engineering structures, has long transcended its basic boundaries of estimation of probable quantities of work prior to construction, in commensurate with the drawings, details, sketches, specifications of works etc., as laid down by the Architect and Civil Engineer. It now includes measurement of quantities of works completed or partly completed in stages, including additional and supplementary works required to be done to complete the work; Assessment of progressing physical and financial status, project management, payment, Arbitration and allied works, etc.

Shri P.K. Guha, in his book 'Quantity Survey', has very nicely incorporated the entire spectrum of it, in its broadest concept. While dealing the subject mostly with modern technique and concept, the rudimentary elements even were not lost sight of by him; which has made the book versatile and useful for all. Chapter 17 needs a special emphasis. In this chapter, he has included computerised estimation of quantities of work and drawn its comparison with that of the manually calculated method. This is befitting with time. And will go a long way towards encouraging the students, teachers and professionals in the field alike. Wide employment of computerised systems in estimation and other fields of project management are inescapable need of the day.

The author, by virtue of his vast experience in the academic and practical fields, has dealt with the subject exhaustively from appropriate angles, which has made the subject more penetrating, pragmatic and interesting, I am sure, this book will be acceptable with eagerness by students, teachers and professionals alike.

Block GD, Plot No. 371  
Salt Lake City,  
Kolkata-700106

**Sd/- A. K. Dan**, B.E. (Cal.) C.E.  
Diploma in Housing,  
(School of Planning and Architecture, New Delhi)  
Retired Engineer in Chief,  
Public Works Department,  
Govt. of West Bengal.  
Formerly, Housing Commissioner,  
West Bengal Housing Board.

Quantity survey is generally considered as one subject, *i.e.* Estimation of the probable quantities of work prior to construction. But actually it is not so. Quantity Survey comprises of a group of subjects of which Estimation is one. Estimation of the quantities of items of work prior to commencement of work involved is a part of the Quantity Survey. It also involves measurement of the completed work and preparation of bills for interim and final payment. It also includes costing and preparation of specification and Analysis of Rates.

Apart from the above, Quantity Survey involves other various subjects Building Economics, Tendering procedure, Arbitration, Valuation and Construction Management. All these are now parts of Quantity Survey Subject. Quantity Survey is now included in the all Syllabus in many Universities in India and in foreign countries.

While teaching the subject in the Institution of Urban Management of K.M.C., difficulties of the students in reading the drawings and taking out the quantities was observed. Attempts have been made to remedy those and make the subject easy and acceptable.

Construction Management has become essential for implementation of the project small or large. Quantity Surveyor does the most important functions in this respect. He is the man behind Construction Management. Appreciating the contribution of Quantity Surveyor in Construction Management a chapter on the subject has been incorporated.

Now a days in the era of computer, incorporation of computer in estimation has become essential to eliminate human error and expediting the process. A chapter has been devoted on this which has been possible due to the kind help extended by Dr. P.N. Basu of CMC.

A Quantity Surveyor is often asked to solve Valuation problems. He has to deal the Arbitration cases and often he has to scrutinize the arbitration papers and prepare the cases for presentation before the Arbitrator. A chapter each for Valuation and Arbitration has been incorporated for the persons dealing in the subjects.

Efforts have been made to make the book useful for the students of the subject and for practising Engineers both of Degree and Diploma streams.

In spite of all attempts, there is possibility of lapses leaving scope for improvement. There may be shortcomings in conception or mistakes may have crept in. Any reference, correction and/or suggestion for improvement of any matter will be gratefully acknowledged.

—P.K. Guha

Anand Lok- A/8,  
A/1/1, C.I.T. Scheme VIIM  
Kolkata-700054.

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Extensive help has been received in all aspects in writing the book from Shree Shyambenode Banerjee, an Engineer and my friend, for which I shall remain ever grateful.

Help has been taken from the book “Estimating, costing, specification, Valuation in Civil Engineering by Shree M. Chakravorty and the books as mentioned under Reference. I am deeply indebted to them all and take the opportunity to extend my gratefulness to them and also thank them.

—Author

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# 1

## QUANTITY SURVEY

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### 1.1.0 QUANTITY SURVEY

The term Quantity Survey covers a wide range of functions related to any Civil Engineering work. Quantity Survey is misunderstood as 'estimating' the probable quantities of items of works to be done; Estimating is a part of Quantity Survey but not the whole.

Quantity Survey is not limited to working out quantities of work only, but in actual fact is a separate specialised subject embracing Civil Engineering, Construction Economics, Tendering procedures and Contractual arrangements, Taking measurement of work done, Preparation of bill for payment, etc. In view of the above, the subject covers the following :

- (i) Estimation : Taking out quantities, preparation of abstract of cost and bill of quantities of works,
- (ii) Building economics,
- (iii) Tendering and contractual procedures and drafting of Contract document,
- (iv) Specifications of items of works,
- (v) Procedure for taking measurements of work done and preparation of bills,
- (vi) Analysis of prices of items of works,
- (vii) Arbitration, and
- (viii) Valuation of land and immovable properties.

In addition to the above activities, it also includes construction management, Law relevant to construction and Accountancy, Construction technology, Financial administration of contracts, Contract law and other allied subjects of Civil Engineering such as Building materials and Construction drawing, Engineering mathematics, Structural design, Land survey, etc. These are separate independent subjects and to be studied separately in details.

### 1.2.0 STUDY OF QUANTITY SURVEY AND APPLICATION

A comprehensive study of Quantity Survey and its application need detailed study of the following :

#### 1.2.1 Estimation

Estimation is computation of the quantities required and cost likely to be incurred in the construction work. It is prepared by calculating the quantities from the dimensions furnished in the drawings of various items of work to complete the project/work and computing the cost of the work on the basis of unit cost of the items.

#### **Purpose of estimation**

Preparation of estimate for a work or project is necessary mainly for the following :

- (i) To ascertain the probable cost of the work for knowing the probable fund required for

the work. In the Public Works Department system, estimate is required for obtaining Administrative Approval and Technical Sanction of the work or project.

- (ii) To ascertain the quantities of different materials that would be required and programming for procurement of the same.
- (iii) To ascertain the mandays required of different categories of labour that would be required for completion of the work in the desired period of time.
- (iv) To ascertain the requirement of tools, plants, equipments and appliances which would be required during execution of the work.
- (v) To fix up a probable date of completion on the basis of quantities of works to be done.
- (vi) It helps in drawing up a comprehensive work programme for management of the construction by Bar-Chart or PERT or CPM. It also helps in financial planning and programming of the work.
- (vii) To evaluate the cost benefit ratio and economic viability of the work/project.
- (viii) It is required for inviting tenders and for preparation of bill of quantities.
- (ix) Estimate for existing property is required for assessing the valuation of it.

#### **Estimates are of different kinds**

- (i) **Preliminary estimate** is an estimate prepared on the basis of any of the approximate methods e.g., Plinth area of the structure, Cubic content of the structure, Number of units, Kilometer length, etc., for a quick assessment of the cost.
- (ii) **Detailed estimate** is a comprehensive estimate in which the quantities of various items of work are worked out and the estimated cost of each item is arrived at on the basis of the prevalent schedule of Rates or at Market Rates in an abstract form with the Bill of Quantities.
- (iii) **Revised estimate** is the estimate required to be framed when substantial deviation is observed from the original detailed estimate either in cost or quantity or due to any other reason inviting revised administrative approval of the work.
- (iv) **Supplementary estimate** is required to be prepared for execution of additional item or items of work not included in the original detailed estimate.
- (v) **Supplementary and Revised estimate** is initiated when there is deviation from the original detailed estimate due to both the causes necessitating initiation of supplementary and Revised estimates.
- (vi) **Maintenance estimate** need be prepared for 'Maintenance and Repair works'. These are prepared for undertaking any repair work to an already damaged structure or as protective measure against any anticipated damage. Maintenance estimates are also prepared for routine maintenance works to be done annually.
- (vii) **Annual maintenance estimate** is prepared for routine maintenance works that are to be undertaken during the year for keeping the structure serviceable and useful. It is prepared on percentage basis of the capital cost of the structure excluding the cost of land. While preparing the estimate, Capital cost need be updated and then the amount of the estimate shall be found out. The percentage varies from 2% to 9% according to the nature of construction and life of the structure.  
However, now a days the method of preparation of the estimate on percentage basis has been discontinued. The quantities of work to be done are assessed after surveying the structure and then the estimate is prepared on the basis of actual requirement.
- (viii) **Special Repairs estimate** Annual Repair estimates are meant for meeting the cost

of routine maintenance works. When the amount required is large and cannot be met from the Annual Repairs fund, Special Repairs estimate is prepared to meet the cost of actual requirement. The estimate is prepared after actually surveying the structure and assessing the quantities. The work is treated as a separate work. Sometimes, addition and alteration works are also included in the Special Repairs estimates.

- (ix) **Estimates for Emergent Repair works** The estimate is required to be framed to meet the cost of emergent works necessitated for restoration of a structure damaged due to natural calamities, like flood, storm, earthquake, etc. The estimate is prepared after proper survey of the structure, ascertaining the actual requirement of works to be done. The work is treated as a separate work.

### 1.3.0 DEFINITION OF TERMS

Some of the terms used in connection with estimating :

#### 1.3.1 Abstract Cost

Abstract cost is the summary of the cost of various items of work shown in the detailed estimate.

#### 1.3.2 Administrative Approval

The concerned department or the client on receipt of the estimate will go through the same and study it along with the report, examine the physical and financial viability and specially the availability of the fund in the department. When the estimate is found to be acceptable, the concerned department shall accord Administrative Approval of the estimate and communicate the approval to the department entrusted for the execution in writing.

Administrative approval of the estimate is normally accorded on the detailed estimate. Preparation of detailed estimate require considerable time. For saving time and expediting the work, Administrative approval is often accorded on the basis of preliminary estimate with report.

#### 1.3.3 Technical Sanction

Technical sanction is the sanction accorded by the competent authority in the technical department of the executive agency on the detailed estimate prepared complying with the requirements of the requisitioning department and for which administrative approval has been accorded. If the detailed estimate on which technical sanction is sought for varies exceeding the permissible limit of 5%, revised administrative approval is to be obtained prior to technical sanction.

#### 1.3.4 Capital Cost

Capital cost of a project is the cost including building structure, external and internal services and contingent expenditure, including cost of land. Capital cost required in connection with the repair estimate shall be excluding the cost of land.

#### 1.3.5 Schedule of Rates

Various items of works are involved in construction of Civil Engineering Projects *e.g.* Buildings, Roads, Water Supply, Sewerage, Drainage, etc.

Government Departments and large organisations who often undertake such works, standardise the major items of works and compile in a schedule, called Schedule of Items. The rates of cost of the schedule items are analysed and incorporated in the schedule and a book is compiled. The book is called 'Schedule of Rates'.

**1.3.6 Contingency**

Provision for contingency in the detailed estimate is made varying from 1/2 to 5% to meet the cost of unforeseen items of works. Contingency is not meant for meeting the excess cost arising due to extra item of works or due to quantitative excess of any item for which supplementary or revised estimate shall be prepared.

**1.3.7 Plinth Area**

Plinth area is the area covered by the structure at the plinth level. The area is also called covered area.

**1.3.8 Carpet Area**

Carpet area is the net area of a building comprising of the living rooms *i.e.* area of living excluding the space where carpet is not generally spread *e.g.* kitchen, pantry, store, boxroom, verandah, toilet bath, etc.

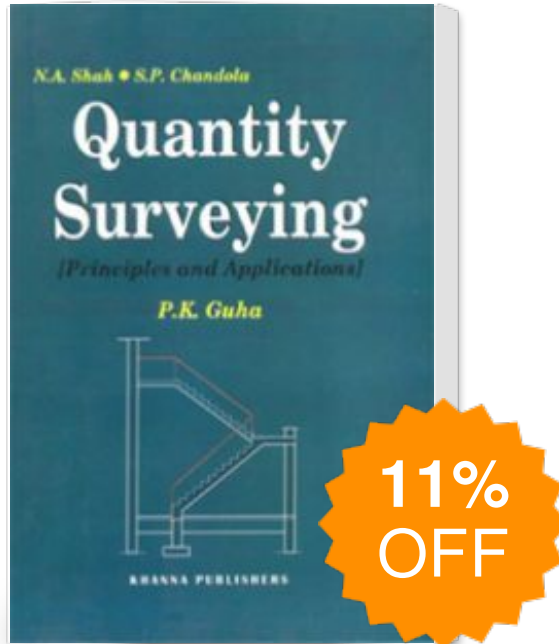
**1.3.9 Bill of Quantities**

Bill of quantities is the abstract of quantities with rates and amount.

**1.3.10 Service Charges**

Charges levied on percentage basis on the actual cost of work, when work of a department or a statutory body or a municipal body is proposed to be executed by another department of the Government to meet the administrative charges of the department that would be required for the work.

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