

# **NRM1 COST MANAGEMENT HANDBOOK**

**DAVID P. BENGE**

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The definitive guide to measurement and estimating using NRM1, written by the author of NRM1

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For Gillian,  
my wife, soulmate and best friend,  
and  
my children  
Tim, Rebecca and Chris

# Foreword – Sean Tompkins

**Sean Tompkins, Chief Executive Officer of the Royal Institution of Chartered Surveyors**

On behalf of the Royal Institution of Chartered Surveyors, I am delighted to introduce the *NRM 1 Cost Management Handbook*. David has masterfully created a user-friendly accompaniment to the NRM 1 standard for measuring capital building works for the purpose of cost planning that speaks in a contemporary language and style to articulate a skill set that has been developed over generations.

This handbook, used in conjunction with the NRM (RICS *New Rules of Measurement*) suite will raise professional standards of quantity surveying and cost management, adding greater value to clients and improving client confidence in the process.

I am grateful that David has acknowledged how NRM 1 can be used as an integrated tool with building information modelling (BIM) enabled projects; this will help place quantity surveyors and cost managers at the heart of construction projects – right where they should be.

This handbook will also support cost managers in setting realistic elemental cost targets so that design teams can ‘design to cost’ and not ‘cost the design’, which is particularly apposite given the current UK government’s construction strategy that calls for project teams to know what projects ‘should cost’ rather than ‘did cost’. The *NRM 1 Cost Management Handbook* will help instil this new paradigm of cost management and drive this imperative forward.

Overall this book will be an excellent addition to any quantity surveyor’s or cost manager’s library, and I fully support the publication of the *NRM 1 Cost Management Handbook*.

# Foreword – Richard Steer

**Richard Steer, Chairman of Gleeds, International Management & Construction Consultants**

The *NRM 1 Cost Management Handbook* is a must have for all quantity surveyors and cost managers working in today's fast moving environment. The handbook has been created as an accessible accompaniment to the NRM 1 standard for measuring capital building works for the purpose of cost planning, and it communicates in a manner and style that works at all levels. Whilst appropriate for the current generation of construction management professionals, David has ingeniously drawn on the knowledge and background that would be familiar to quantity surveyors from earlier generations but has given the book a contemporary feel.

The book highlights the importance of measurement in cost management today and furthermore shows the need for colleges and universities to embrace and teach measurement.

On initial review, NRM 1 may appear highly detailed but when cost managers begin to reflect on how the guidance is structured and how each section can be meaningfully applied, I am convinced it will soon become a respected best practice tool, supporting day-to-day cost estimating and cost planning activities.

What David has cleverly shown is that professional cost management does not simply consist of a series of measurement rules. The NRM 1 provides a toolkit for the cost management of construction projects embracing and exemplifying best practice which will help the reader in developing a professional reputation from both an individual and corporate perspective.

It is a strength of the book that David does not just focus on best practice in the modern workplace but he also highlights the common pitfalls and advises how to avoid them. Forewarned is forearmed and it is this practical rather than purely theoretical approach that gives the book such value. I therefore thoroughly recommend this valued work, as the guidance provided by David in the *NRM 1 Cost Management Handbook* has been clearly stated and is accessible to all levels.

# Foreword – Stuart Earl

**Stuart Earl BA(Hons) BSc(Hons) FRICS, Chairman of RICS Measurement Initiative Steering Group and Director of Gleeds Cost Management Limited**

On 24 April 2012, the RICS launched its landmark measurement initiative, the New Rules of Measurement (NRM). The rules are arguably the most significant launch to the construction sector by the RICS in the past 35 years.

Before NRM, the RICS had provided quantity surveyors with rules for the measurement of building works – the ‘Standard Method of Measurement (SMM)’. However, these rules were specifically drafted to advise quantity surveyors of how to measure building works in detail for inclusion in bill of quantities that, in turn, were used to obtain tender prices from contractors; they also aided the measurement and valuation of variations issued during the construction phase. A key requirement of the SMM was the need for a full and detailed specification and drawings from the designers – which were and are now seldom provided. This resulted in the overuse of provisional sums and abuse of the use of bill of quantities. The lack of detailed design is primarily caused by the cost of finance and the need for clients to complete and put the building to use as quickly as possible, as well as the impetus to get contractors involved early in the design process to provide input on design, buildability and value for money.

As a consequence, over the past 20 years, the use of design and build contract strategies have come to the forefront; with contracts commonly being awarded based on ‘Concept Design’ or ‘Developed Design’ (RIBA Work Stages 2 or 3). Well before the completion of ‘Technical Design’ (RIBA Work Stage 4), at which stage the use bill of quantities could be considered. For these reasons, cost planning has become an essential cost management tool.

NRM 1 (the RICS *New rules of measurement: Order of cost estimating and cost planning of capital building works*) is an overdue statement of how cost planning is applied in practice and is a significant step forward in improving professional standards. Firstly, it re-establishes measurement as the focus of our professional standing and secondly, it makes it easier to benchmark our cost planning procedures against those which are widely accepted as best practice. It also provides learning establishments with a much clearer statement of the cost planning competencies required by students.

Moreover, NRM 1 presents a clear framework, which facilitates a systematic approach to compiling and managing cost estimates and cost plans. In this *NRM 1 Cost Management Handbook*, David has successfully augmented the rules and provides clear sound advice on how to use the tools that can be found ensclosed in them. He must be congratulated for this work.

I am also pleased to see that David has used the in this *NRM 1 Cost Management Handbook* to bring NRM 1 into line with the latest RIBA Plan of Work (i.e. ‘RIBA Plan of Work 2013’).

For those practitioners who have yet to implement the best practice guidance provided by NRM 1, and those who want to be more informed about it, I am certain

that David's *NRM 1 Cost Management Handbook* will be seen as an indispensable aid that greatly assists you in moving forward to embrace best practices in cost estimating and cost planning. Furthermore, understanding and using NRM 1 will be an essential selling point when working in other countries, helping to avoid misunderstandings that often arise due to different countries.

Learning and adopting best practice is essential.

# Preface

As part of its commitment to continually raising the standards that its members work to, the RICS launched the RICS *New rules of measurement: Order of cost estimating and cost planning for capital building works* – now commonly called NRM 1. RICS standards are recognised across the globe as the best technical practice in construction.

There has never been a more pressing time to introduce NRM 1. The reforms set out in the UK government's Construction Strategy, as well as the UK's chief construction adviser's efficiency agenda, the increasing focus on building information modelling (BIM) and the economic challenges that face the construction industry at the present time, all demand a step change in working culture – including the working culture of the cost manager.

The relevance of NRM 1 within a BIM-enabled construction industry is particularly pertinent. BIM is intended to address issues of process management and data retention, bringing the collection of co-ordinated data to the forefront. NRM 1 is linked to this, enabling the consistent collection of construction cost data that is synchronised with the design data – as is NRM 3, in respect of building maintenance cost data.

NRM 1 represents the essentials of best practice and forms the 'cornerstone' of good cost management of construction projects. The rules provide a standard of measuring for the purpose of developing order of cost estimates and cost plans, and enable effective, accurate and transparent cost advice to be given. They also facilitate better pre- and post-contract cost control. Consequently, NRM 1 sets out the standards required that cost managers, contractors and any others should follow.

It is important to understand that NRM 1 is a toolkit for cost management, not just a set of rules for the quantification of capital building works. Along with other advice, the rules provide guidance on:

- *How the method of measurement changes as the design of a building project develops* – from high-level measurement of areas and/or functional units to the measurement of more detailed elements, sub-elements and cost-significant components.
- *Total project fees* – considering fees in connection with consultancy services from cost managers, architects, engineers and legal advisers, as well as those in connection with site surveys – both desktop and intrusive investigations – in addition to main contractor's pre-construction fees and main contractor's and subcontractors' design fees.
- *Total building project costs* – how all cost centres, including non-construction items, relating to the building project can be considered and pulled together into a single cost plan for the entire building project.
- *Risk* – based on the properly considered assessment of dealing with risks should they materialise – dispensing with the widely mismanaged concept of contingences.

- *Information requirements* – what information is required by the cost manager from the employer and other project team members at each design stage to enable more certainty in their cost advice.
- *Key decisions* – that the client needs to make at each Work Stage of the RIBA Plan of Work, or OGC Gateway.
- *Codification* – providing a framework for codifying elements, sub-elements and components so that structure of cost plans can be converted from elemental to work package, and vice versa, to facilitate the management of costs through both the bid and construction phases of a building project.
- *Reporting* – providing advice on communicating cost advice to clients.
- *Data collection* – providing a common basis for analysing and collecting real-time cost data that can be used for benchmarking and to estimate the cost of future building projects.

To be effective, a cost manager must be able to understand and use the rules of measurement, as well as being able to apply common sense. In contrast, an effective project manager must have an understanding of how cost managers construct their cost estimates and cost plans to be able to discuss from a position of knowledge.

Use of the rules by cost managers demonstrates a professional and responsible approach to the cost management of building projects. Moreover, it is beneficial to project managers, clients and others involved in financial management who wish to better understand the cost management of building projects.

I hope that this *NRM 1 Cost Management Handbook* will help that understanding.

David P. Bengel

## About this handbook

My aim in writing this handbook has been to provide a text which is practical enough to be useful to practitioners but which also has enough academic content to meet the requirements of degree courses.

The handbook is designed to take the reader step-by-step through the latest RICS best practice guidance (NRM 1) on preparing and communicating cost estimates and cost plans for capital building projects. In addition to showing how NRM 1 is to be interpreted and used, the handbook provides sound practical advice on the cost management of building projects, as well as on the pitfalls to be avoided.

The unique features of this handbook are:

### Style of writing

- The language used in this handbook is lucid, easy to understand and facilitates easy grasp of concepts.
- The chapters have been logically arranged in sequence.
- The handbook is written in a reader-friendly manner both for students and practitioners.
- Explanations are supported by diagrams wherever required.

## Content of the handbook – theory

- The handbook explains how to use and apply the principles of measurement and the tools advocated by NRM 1.
- Sufficient worked examples have been included to reinforce understanding.

## Content of the handbook – practical

- In addition to explaining how to use and apply the principles of NRM 1, the theory is supported by practical information on the quantification of building works, as well as discussion on the pitfalls to be avoided when preparing cost estimates and cost plans.
- Certain chapters include templates that can be adopted and amended for practical use.

## Targeted readership

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This handbook has been written keeping in mind both students and practitioners who wish to acquire a practical understanding of the RICS *New rules of measurement: Order of cost estimating and elemental cost planning* (NRM 1) quickly.

Although primarily written for a UK audience, the handbook provides essential guidance for students and practitioners worldwide – the principles and tools within NRM 1 apply in whichever country you are situated.

This handbook is well suited for students studying HNC/D, BSc degrees and MSc degrees in:

- cost management;
- quantity surveying;
- project management;
- commercial management;
- construction management;
- construction procurement management;
- building surveying.

It is essential reading for any graduate embarking on the RICS Assessment of Professional Competence (APC).

## Structure of the handbook

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This handbook is divided into the following seven parts:

Part 1 (Introduction) comprises two chapters: Chapter 1 describes the basic principles and importance of cost management, outlines the role of the cost manager, explains the purpose and benefits of NRM 1 and its relationship with NRM 2 and NRM 3, explains how NRM 1 is integral to Building Information Management (BIM) and describes the cost management cycle; and Chapter 2 considers the composition of cost estimates and cost plans, defines the relationship between NRM 1 and the RIBA Work Stages and OGC Gateways, describes the formal cost-estimating stages, considers the

impact of procurement and contract strategies on the cost-planning process and identifies the responsibilities of the project team in the cost-planning process.

- Part 2 (Order of cost estimates) comprises seven chapters. Chapter 3 explains the purpose of order of cost estimates; Chapter 4 describes the planning of an order of cost estimate and sets out the information required by the cost manager to provide more cost certainty at an early stage; Chapters 5 and 6 provide step-by-step guidance on preparing an order of cost estimate; Chapter 7 provides a worked example of an order of cost estimate using a real building project; Chapter 8 explains the purpose of the elemental method of estimating and shows how to prepare an initial elemental cost model using the elemental method of estimating; and Chapter 9 provides step-by-step guidance on how to generate element unit quantities and pull together a elemental cost model.
- Part 3 (Cost planning) comprises 18 chapters: Chapter 10 explains the concepts and objectives of cost planning, describes the different types of cost plans and sets out the information required by the cost manager at each RIBA Work Stage and OGC Gateway to provide more cost certainty; Chapter 11 describes the format, structure and codification of cost plans; Chapter 12 gives step-by-step guidance on preparing a cost plan; Chapter 13 shows how to use the tabulated rules within NRM 1, defines and distinguishes between prime cost sums and provisional sums, considers the pitfalls to be avoided when recording dimensions and quantities ascertained when using electronic measuring devices, provides guidance on quantification and the formulation of component descriptions, and advises on how to quantify and describe components for which there is inadequate design information; Chapters 14 to 22 provide step-by-step guidance on how to measure and describe the components with each element and sub-element, giving examples of how to formulate descriptions for components; Chapter 23 illustrates the hierarchical structure of cost data, considers the pitfalls associated with 'in-house' and 'published' cost data, and provides worked examples on how to determine unit rates for components; Chapter 24 shows how to calculate the building works estimate; Chapter 25 defines the items that constitute main contractor's preliminaries, explains how to deal with subcontractor's preliminaries, considers factors that can significantly influence the cost of main contractor's preliminaries, describes how to calculate main contractor's and subcontractors' preliminaries, and provides worked examples on cost checking the adequacy of main contractor's preliminaries; Chapter 26 defines and shows how to calculate both the main contractor's and subcontractor's overheads and profit; and Chapter 27 explains how to calculate the works cost estimate.
- Part 4 (Estimating cost targets for non-building works items and risk allowances) comprises six chapters: Chapter 28 describes the categories of project and design team fees in a building project, provides step-by-step guidance on estimating fees, together with worked examples, and explains how to deal with main contractor and subcontractor design fees; Chapter 29 defines and explains the approach to estimating other development and project costs; Chapter 30 discusses the risk management of building projects and provides guidance on the setting and managing of risk allowances; Chapter 31 defines the concept of inflation, illustrates how inflation is dealt with in the context of building projects and gives guidance on estimating the possible effects of

inflation; Chapter 32 provides step-by-step guidance on how to establish the cost limit; and Chapter 33 discusses the different types of taxes and incentives applicable to building projects.

- Part 5 (Writing cost estimate and cost plan reports) comprises one chapter: Chapter 34 provides guidance on the writing of cost estimate and cost plan reports using a progressive worked example, and discusses how to communicate the cost estimate or cost plan to the employer and other stakeholders.
- Part 6 (Designing pricing documents using NRM 1) comprises one chapter: Chapter 35 explains how the NRM 1 framework can be used to formulate a pricing document, together with worked examples.
- Part 7 (Analysing bids and collecting data using NRM 1) comprises one chapter: Chapter 36 discusses the impact that changing procurement strategies have had on the ability of the cost manager to collect and analyse cost data for use in future building projects, illustrates the problems with collecting historical cost data, explains how the NRM 1 framework can be used for collecting and analysing historical cost data and considers the way in which benchmarking is used by cost managers.

## Learning aids

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The book aims to help readers to understand how order of cost estimates and cost plans are prepared in the real world. To assist with this aim I have incorporated a number of learning aids:

- chapter opening summaries providing a list of key points covered by each chapter;
- headings and sub-headings to break up material into clearly defined topics, giving readers quick access to the topics they need;
- diagrams to clearly illustrate the overall logic of the rules;
- tables to present certain information in an easy-to-read format, as well as to support real-time management of cost estimates and cost plans;
- process maps to provide step-by-step guidance on preparing cost estimates and cost plans;
- flow charts to illustrate work flows;
- worked examples using real-time project information;
- templates for use in practice;
- cross-referencing to enable the reader to refer to applicable sub-sections or definitions; and
- definitions of key terms and phrases used in each chapter.

# Acknowledgements

I should like to thank the various people who have helped to bring this book to completion. First of all, Stuart Earl (Chair), Joe Martin (Executive Director of BCIS) and the other members of the RICS Measurement Initiative Steering Group for having the confidence in entrusting me with the writing of RICS *New rules of measurement: Order of cost estimating and cost planning for capital building works* (now commonly referred to as NRM 1). Second, I must acknowledge the helpful comments of my colleagues at Gleeds, who reviewed parts of the book as it was written; I hope that they will recognise the effects of their comments in the final result. Third, I must thank Bryan Avery, of Avery Associate Architects, for kindly allowing me to use his drawings to illustrate the use of NRM 1. Last but not least, my long-suffering and patient family – Gillian, Tim, Rebecca and Chris. To all those other people that I have forgotten, my apologies.

# About the author

**David P Benge BSc, MSc, FRICS, MACostE** is a Fellow of the Royal Institution of Chartered Surveyors (RICS) with over 30 years experience as a quantity surveyor and educator. As Head of Quality Management at Gleeds, International Management and Construction Consultants, David focuses on service improvement for all aspects of quantity surveying and project management activities – with a worldwide remit.

David holds a BSc Degree in Quantity Surveying and an MSc Degree in Construction Procurement, obtained from South Bank Polytechnic (now University) and Nottingham Trent University, respectively.

He became a Member of the RICS in 1986 and a Member of the Association of Cost Engineers in 1988. He was made an Honouree Fellow in 2012 at the personal invitation of the RICS Chief Executive and the Chairman of the Quantity Surveying and Construction Professional Group.

His career spans both the private and public sectors, in almost equal periods, from which he draws his significant experience.

His research interests include the quality of service delivery in cost management and construction procurement management.

David authored both the first and second editions of the 'RICS New rules of measurement: Order of cost estimating and cost planning for capital building works (referred to as NRM 1)', which is an RICS best practice publication and the first edition became effective on 1 May 2009. He also co-authored 'NRM 2 (the RICS New rules of measurement: Detailed measurement for building works)' and 'NRM 3 (the RICS New rules of measurement: Order of cost estimating and cost planning for building maintenance works)'.

He lives in St Leonards-on-Sea, East Sussex with his wife Gillian. They have three grown-up children - Tim, Rebecca and Chris - who have absolutely no interest in either quantity surveying or cost management!

Through Gleeds, David provides quality consulting services and training on the use and application of the NRM suite of measurement rules. He can be reached at [david.benge@gleeds.co.uk](mailto:david.benge@gleeds.co.uk).

# Abbreviations

ACMs	asbestos-containing materials
BCIS	Building Cost Information Service
BIM	building information modelling
BMU	building maintenance unit
BQ	bill of quantities
BREEAM	Building Research Establishment Environmental Assessment Method
CAD	computer aided design
CBS	cost breakdown structure
CDP	Contractor's Design Portion
CFA	continuous flight auger
CFP	cased flight auger piles
CHP	combined heat and power
CO <sub>2</sub>	carbon dioxide
cost/m <sup>2</sup>	cost per square metre
DDA	Disability Discrimination Act
DPM	damp-proof membrane
EU	European Union
EUQ	element unit quantities
EUR	element unit rate
FF&E	fittings, furnishings and equipment
GEA	gross external area
GIA	gross internal area (synonymous with GIFA)
GIFA	gross internal floor area (synonymous with GIA)
GL	ground level
ha	hectare(s)
HSE	Health and Safety Executive
HV	high-voltage
IPT	insurance premium tax
IT	information technology
JCT	Joint Contracts Tribunal
kg	kilogram(s)
kN	kilonewton
KPI	key performance indicator
kW	kilowatt(s)
LPG	liquefied petroleum gas
LV	low-voltage
m	metre(s)
m <sup>2</sup>	square metre(s)
m <sup>3</sup>	cubic metre(s)
mm	millimetre(s)
m/sec	metres per second
M&E	mechanical and electrical
MoD	Ministry of Defence

NHBC	National House-Building Council
NIA	net internal area
nr	number
NRM	new rules of measurement
OGC	Office of Government Commerce
QMS	quality management system
PC	prime cost
PCSA	Pre-Construction Services Agreements
RIBA	Royal Institute of British Architects
RICS	Royal Institution of Chartered Surveyors
RVF	regional variation factors
SA	site area
SFCA	Standard Form of Cost Analysis
SMM7	Standard Method of Measurement
SRO	Senior Responsible Owner
SUDS	sustainable urban drainage schemes
t	tonne(s)
TCM	total cost management
TPI	tender price index
UK	United Kingdom
UPS	uninterrupted power supply
VAT	value added tax
VAV	variable air volume
VE	value engineering
VM	value management
VfM	value for money
VRV	variable refrigerant volume
WBS	work breakdown structure
WPC	Working Platform Certificate
£GBP	pound (sterling)