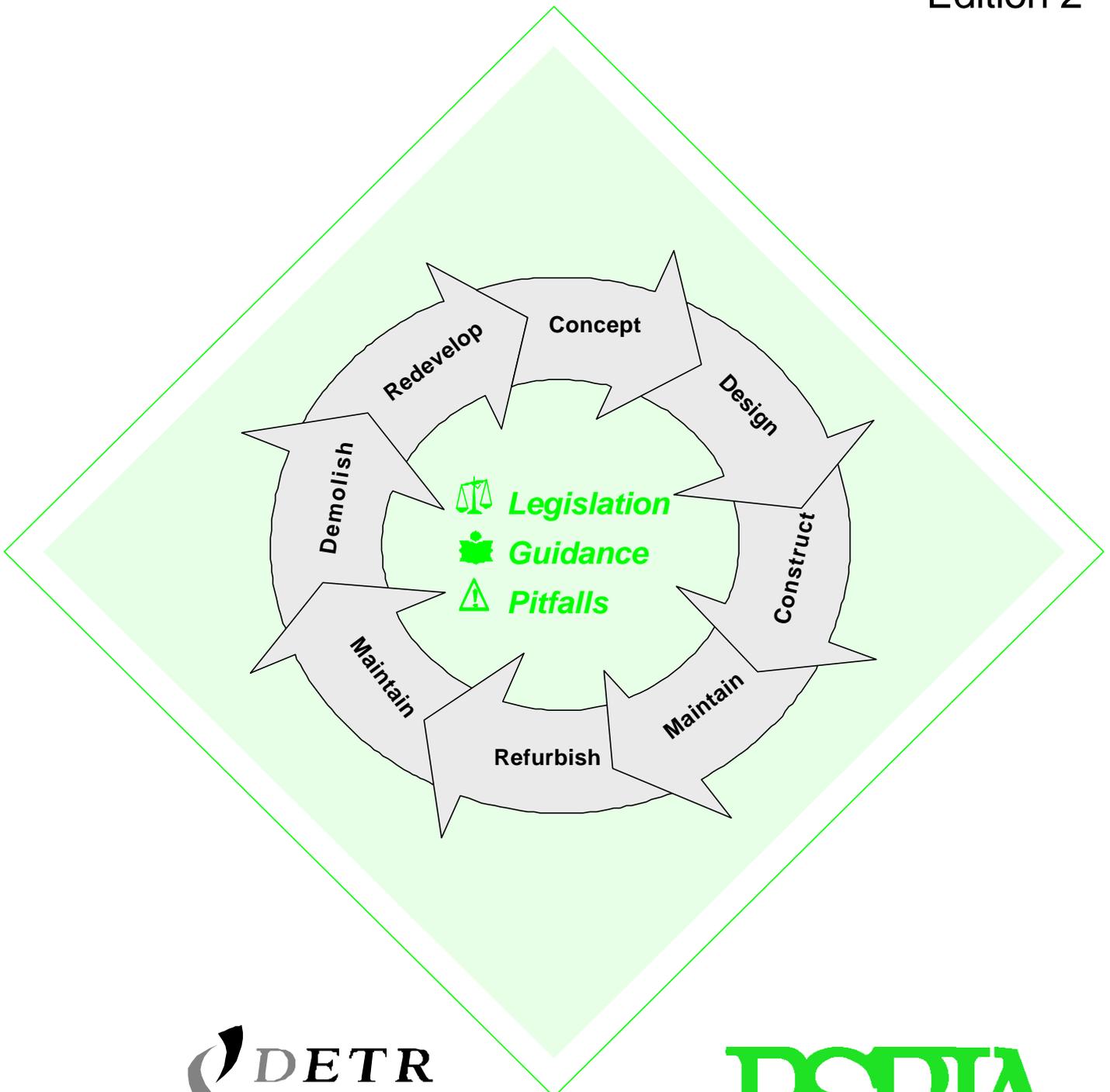


ENVIRONMENTAL CODE OF PRACTICE FOR BUILDINGS AND THEIR SERVICES

Edition 2



Code of Practice COP 6/99

ENVIRONMENTAL CODE OF PRACTICE

R H D Rawlings

**The Building Services Research
and Information Association**

Old Bracknell Lane West,
Bracknell, Berkshire RG12 7AH
Tel: + 44 (0)1344 426511 Fax: + 44 (0)1344 487575
e-mail: bsria@bsria.co.uk www.bsria.co.uk

The logo for BSRIA, consisting of the letters 'BSRIA' in a bold, serif font. The letters are black and have a slightly stylized appearance with some internal shading or texture.

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted in any form or by any means electronic, mechanical, photocopying, recording or otherwise without prior written permission of the publishers.

ACKNOWLEDGEMENTS

BSRIA acknowledges the financial support of the Department of the Environment, Transport and the Regions (DETR) and would also like to thank NatWest Environmental Management as a sponsor for their contribution which has led to the production of this edition of the Code of Practice.



Department of the Environment, Transport and the Regions
NatWest Environmental Management

The research project was undertaken under the guidance of a project steering group drawn from industry representatives. The Steering Group contributors were:

John Ahern, John Ahern & Associates
Colin Burden, Plincke Landscape
Peter Charnley, NatWest Environmental Management
Dermott Galvin, Iain Paul, Carl Saxon & Hereford & Worcester County Council
Bill Gething, Feilden Clegg Architects
Matthew Hill, Leeds Environmental Design Associates
Rod Hughes, Lowe Rae Architects
Rob Jarman & Judy Richmond, National Trust
Keith Lodge, Ecologic Ltd
John Parker, Geoscience Ltd
Lynette Warren, University of Luton Research Centre

Particular thanks are due to Peter Charnley, BSRIA's external project assessor and John Ahern for his contribution to updating the Code and his guidance on maintaining a truly inter-disciplinary approach.

BSRIA also gratefully acknowledges the contributions from the many other people who have provided valuable comments and feedback on use of the Code.

Every opportunity has been taken to incorporate the views of the editorial panel, but final editorial control of this document rests with BSRIA.

Funding support from the DETR was provided under the partners in innovation (PII) scheme. This scheme provides partial support for industry-led initiatives such as this research project. PII funded initiatives often provide both government and industry with valuable perspectives on important issues. However, the DETR contribution to funding does not imply that the views expressed in published outcomes are necessarily accepted or endorsed by the DETR.

PREFACE

This revised edition of the Environmental Code of Practice is one of three outputs from the fourth phase of a BSRIA research project undertaken with the support of government and industry to produce, evaluate and update BSRIA's *Environmental Code of Practice for Buildings and their Services*. Phase I and II of this project involved drafting, piloting and publishing the first edition of the Code. Phase III was an evaluation of the Code as used in practice which identified the importance of feedback to the design process. As a result a fourth phase, Feedback was initiated, which produced three publications: this updated version of the Code of Practice, Rules of Thumb for addressing the environmental consequences of building projects in the UK and a set of case studies.

SCOPE OF THE REVISIONS

The scope of the Code has been broadened to consider the whole design and construction process in more detail. It is now aimed at all professional disciplines rather than just those involved in determining the type and level of a building's services. Because of the multi-disciplinary approach of the original Code it has not been necessary to change the basic structure of the code, however Part D which was previously System Design, has been changed to Scheme Design and a subsection, DS: System Design, contains the recommendations related to systems.

New recommendations have been added to provide more guidance on issues not directly related to building services and individual recommendations have been revised or new recommendations added which reflect changes in legislation, guidance available and progress generally in understanding the concept of sustainable building.

The Rules of Thumb, included in the original Code of Practice, are now available as a separate publication. The former sections entitled New Ground and Unresolved Issues have been removed as feedback showed that they were of limited use. References to Legislation and guidance material and the general bibliography have all been updated.

CONTENTS

INTRODUCTION	1
Impact of the building environment	1
Integrated building design	1
Target audience.....	2
Environmental policy	3
ENVIRONMENTAL CODE OF PRACTICE.....	4
PART A: INCEPTION AND OUTLINE BRIEFING.....	7
A1: Inception	7
A2: Outline briefing	12
PART B: FEASIBILITY	17
PART C: OUTLINE PROPOSALS.....	22
C1: The brief	23
C2: Design strategy.....	23
C3: The site	25
C4: Energy	25
C5: Water.....	26
C6: Materials	27
C7: Health and comfort.....	27
C8: Transport	28
C9: Occupation	28
C10: Regeneration/Replacement	28
C11: Life cycle analysis	29
C12: Consolidation	29
PART D: SCHEME DESIGN	33
D1: The brief.....	34
D2: Design strategy	35
D3: The site.....	36
D4: Energy	37
D5: Water.....	37
D6: Materials	38
D7: Health and comfort	39
D8: Transport	39
D9: Occupation.....	40
D10: Life cycle analysis	40
D11: Consolidation and review	41
PART DS: SYSTEMS DESIGN	42
DS1: Air conditioning and refrigeration.....	43
DS2: Ventilation.....	44
DS3: Heating system	45
DS4: Lighting.....	46
DS5: Conveying.....	47
DS6: Fire systems	47
DS7: Electrical systems.....	48
DS8: Water.....	48
DS9: Controls	49
DS10: Systems efficiency.....	50
PART E: DETAIL DESIGN.....	54
PART F/G: PRODUCTION INFORMATION	60
PART H: TENDER ACTION.....	64
H1: Tender Documentation	64
H2: Tender Evaluation.....	66

PART J: PRE-CONSTRUCTION.....	68
PART K: CONSTRUCTION.....	72
PART L: COMPLETION.....	77
L1: Commissioning.....	77
L2: Handover.....	79
PART M: OCCUPATION: FACILITIES MANAGEMENT, OPERATION AND MAINTENANCE	82
PART N: FEEDBACK AND EVALUATION	89
N1: Feedback.....	89
N2: Evaluation	92
PART P: REFURBISHMENT AND RECOMMISSIONING	95
P1: Building Refurbishment.....	95
P2: Plant refurbishment	97
PART Q: DECOMMISSIONING.....	100
PART R: DISMANTLING AND DISPOSAL	103
FURTHER INFORMATION.....	107
Bibliography	107
Useful Addresses.....	116
Glossary	119

INTRODUCTION

The Code of Practice provides a strategy to assist all those involved to minimise the environmental impact of buildings over the entire building life cycle. It is a working document which makes recommendations for designing best practice environmentally friendly buildings, minimising the adverse environmental impact of buildings in use, and refurbishing buildings and ultimately disposing of them in an environmentally sound way. It will be of use to, clients, architects, project managers, building services engineers, quantity surveyors, and facilities staff.

It complements other publications such as *CIRIA's Environmental Handbooks* (which provide detailed information on the environmental issues and obligations to be met during design, construction and demolition) and assessment methods such as *BREEAM* which provide a means of assessing and demonstrating compliance with environmental objectives.

IMPACT OF THE BUILDING ENVIRONMENT

Since the First Edition of the Code was published in 1994, increasing evidence of man-induced climate change has made reducing CO₂ emissions a priority and led to increased awareness of the need for sustainability in construction. The construction and use of buildings is responsible for a large proportion of the UK total emissions of CO₂, the major greenhouse gas, of which:

- about 50% result from energy used in buildings
- 10% are from energy used in construction (including the energy needed to produce and transport materials)
- and an estimated 22% result from energy used to transport people between buildings.

A well designed building can help to minimise impact on the environment due to the consumption of energy and other resources (water, materials, land) and the waste produced over its lifecycle.

There are thus increasing pressures to ensure that buildings:

- enhance living, working and leisure environments
- consume minimum energy and other resources over their lifecycle
- use renewable resources wherever possible
- generate minimum waste over their lifecycle

and do not:

- endanger the health of the occupants or any other parties
- cause unnecessary damage to the natural environment
- use materials from threatened species or environments.

INTEGRATED BUILDING DESIGN

To best meet these pressures, the Code of Practice recommends an integrated building design process, which considers all aspects of a building, its environment and life cycle, by a team which includes all relevant professionals and stakeholders working together throughout the process, rather than sequentially and independently.

Potential benefits of integrated design include:

- addressing the needs of clients, occupants and the environment
- a better designed product (design teams can explore a wider range of solutions)
- more efficient design and construction (consultants can identify design opportunities and constraints early on)
- increased building performance and customer satisfaction (promotes better understanding of building use and performance by all concerned)
- the most holistic, sustainable and appropriate environmental solutions.

The DETR in their recent publication *Sustainable Development: Opportunities for Change - Sustainable Construction*, say that “the early involvement of tenants, residents and businesses in project design can lead to significantly better quality capital investment decisions in housing and construction generally”.

Although most construction professionals would agree that a well-designed building cannot be produced without teamwork, a range of factors conspire to reduce the level of integration. For example the scope for involvement of other professions in the important preliminary stages of a project is often limited if the client has settled on an outline design with an architect before the rest of the team is appointed. Contractual arrangements will also have an effect on the environmental implications of building.

Thus a completely integrated and environmentally conscious approach may thus not be appropriate for all building projects but elements the Code of Practice can be successfully incorporated into the majority of projects.

TARGET AUDIENCE

All professions need to be prepared to share knowledge and responsibility, particularly during the important early stages of design. All those involved also need to think more globally and not regard the tasks they have been given as immutable requirements or constraints, but to question them and consider whether more environmentally friendly alternatives could be offered.

The client, design professionals, quantity surveyors, contractors, owners and occupiers all have different priorities and perspectives and all need different kinds of advice and reference information. All can contribute in an important way to reducing the environmental impact of a building:

The client:

by investigating, identifying and clearly instructing the design team with regard to the real needs, requirements and priorities of the users. By being prepared to move away from the syndrome of lowest price in pursuit of quality and by supporting, as far as possible, design selection and plant

procurement on the basis of lifecycle costs and environmental impact. Much can be achieved by establishing the right priorities at an early stage, in order to achieve the right kind of building in the right place.

The design team:

by responding to - challenging and influencing if necessary - the client's requirements in order to produce the best result. Designers must think through issues leading to over-design and inefficiencies; pay attention to detail and give forethought to maintenance and manageability; integrate the architecture, structure and service strategies and take account of lifecycle costs and environmental impact in product selection.

Quantity surveyors:

by considering waste minimisation and the requirements for materials and costs over the whole lifecycle.

Contractors, manufacturers and suppliers:

by meeting the requirements in an environmentally sound way; by minimising any wastage, pollution, hazards and risk associated with their products, services and working practices; and by providing occupiers with better training, information and support.

Owners, occupiers and facilities managers:

by occupying, managing and altering buildings in an environmentally sound way, making improvements where practicable and recognising and pursuing quality.

ENVIRONMENTAL
POLICY

To ensure that the necessary consideration is given to environmental issues it is recommended that an environmental policy is developed for projects. and an environmental management system established to implement it. This should focus not only on environmental, but also social and economic impacts, and should aim to make the building sustainable. A stated environmental policy, which is reviewed throughout the design and construction phases, will help to ensure a well designed building with low running costs and resource consumption (in the form of energy, water and materials), which is appropriate for the use intended, and is flexible enough to accommodate changes in use which can be reasonably expected. All of these features are consistent with a more sustainable building.

The existence of an environmental policy and an environmental management system through which it can be implemented, is equally important for minimising the adverse environmental impact of buildings in use.

ENVIRONMENTAL CODE OF PRACTICE

The Code of Practice is structured around the main stages in the building process, following the sequence of a new building (see page 6), from inception through to ultimate demolition and disposal, however, this is for convenience of presentation only, as users of the Code may be involved in a range of activities. The sequence is more of a life cycle than a linear process and the structure of the Code allows for a starting point at any stage. It encourages a review of design to date if environmental issues have not previously been included.

Code of Practice sections (typical work stages)		Generalised activities	ACE work stages
A	Inception and outline briefing	Pre- Design	1
B	Feasibility		2
C	Outline proposals		3
D	Scheme design	Design	4
E	Detailed design		5
F/G	Production information	Preparing to Build	6/7
H	Tender action		7
J	Pre-construction		8
K	Construction	Construction	8
L	Completion		8
M	Occupation: facilities management, operation and maintenance	Occupation	
N	Feedback		
P	Refurbishment and recommissioning	Refurbishment	
Q	Decommissioning	Demolition	
R	Dismantling and disposal		

The most important decisions affecting the environmental impact of the building are taken at the earliest stage in building conception and design but the occupation and feedback stages of the lifecycle are also crucial both to environmental management and to feeding essential information into the design process to encourage innovation.

The recommendations which follow and their supporting notes provide a basis for enquiry and decision making throughout a building's lifecycle. The design of building services is crucial to the environmental impact of a building so detailed guidance on the design of building services has been given its own subsection.

Green shaded boxes below each recommendation indicate for which of the disciplines/stakeholders it is most likely to be relevant. These should only be used as a rough guide as all professions need to be prepared to share knowledge and responsibility, particularly during the important early stages of design. The following broad groupings have been used:

- Client** - all client types
Designer - any/all members of the design team
QS - quantity surveyors
Contractor - all types of contractor
FM - facilities managers and building users

The example below shows that the recommendation is most relevant for clients, designers and facilities managers or building users.

Client	Designer	QS	Contractor	FM
--------	----------	----	------------	----

The icon sections associated with each stage indicate:



Legislation/Obligations (things which have to be done)

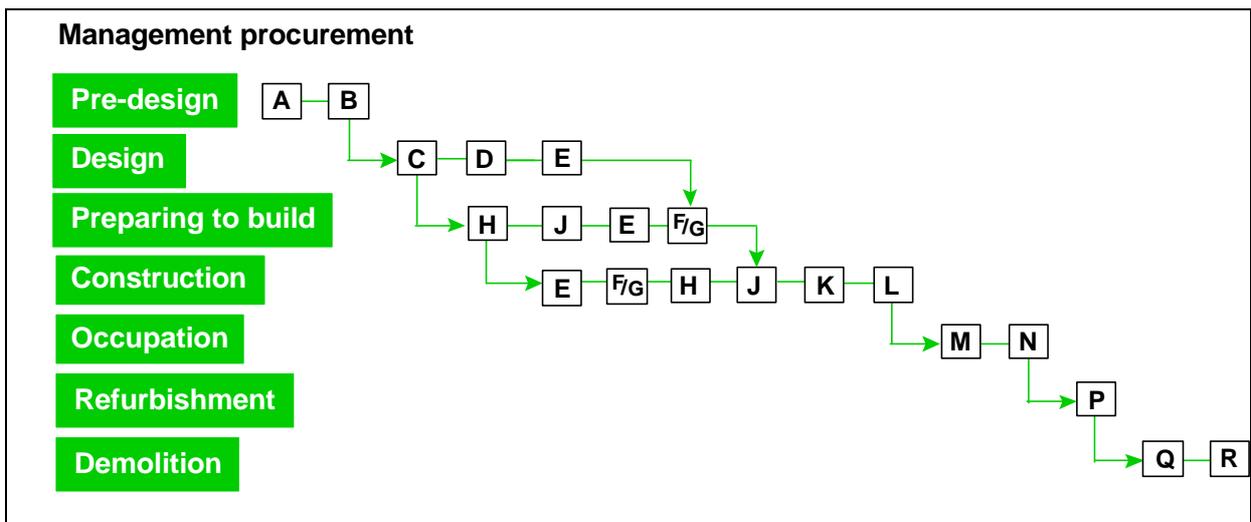
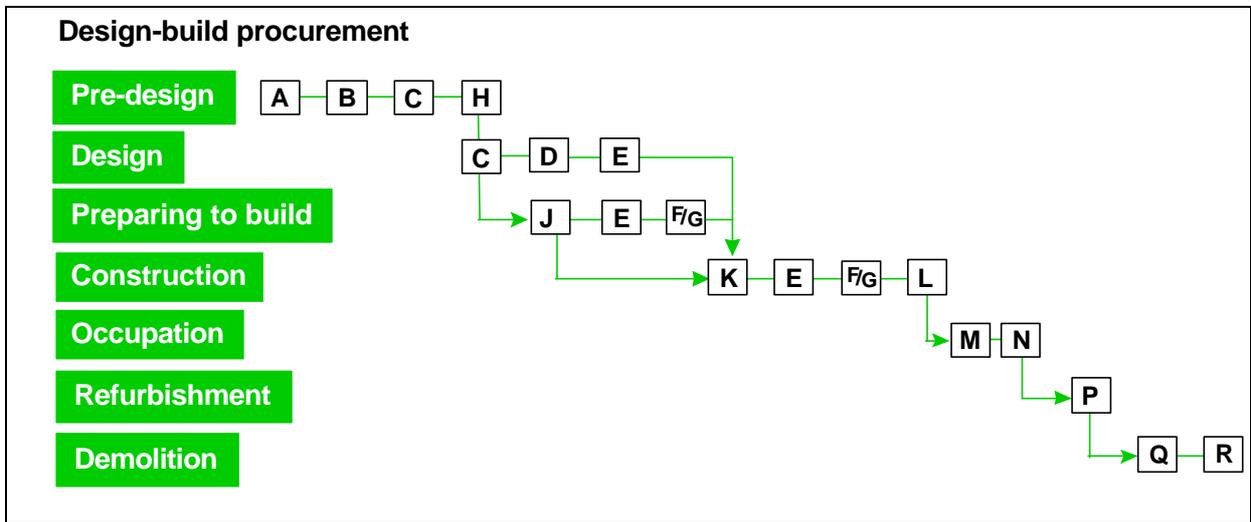
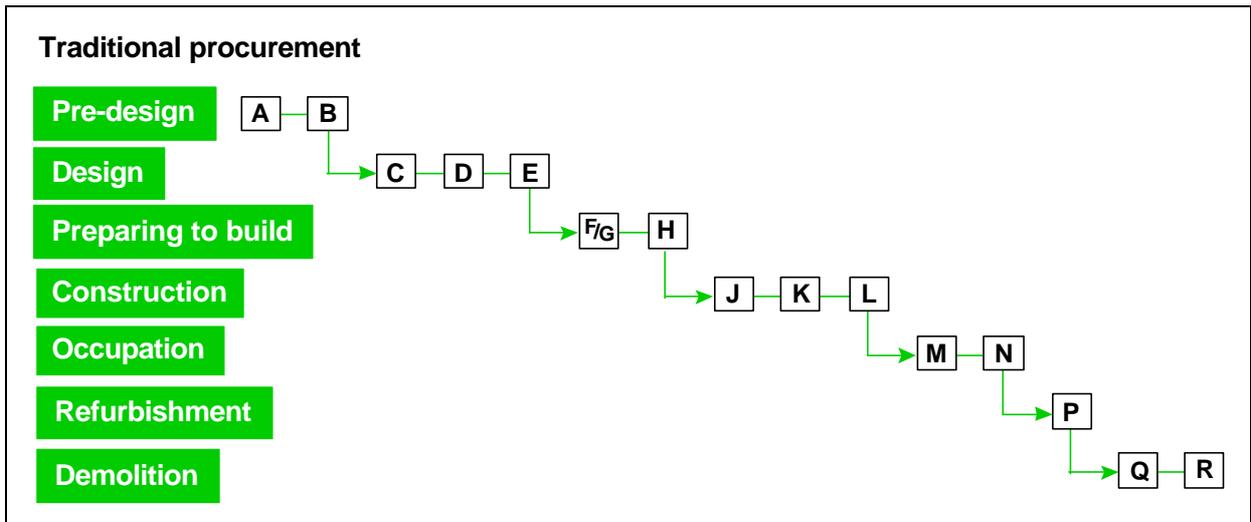


Guidance (where to look for examples of good, better and best practice)



Pitfalls (where things can easily go wrong).

Typical sequences of work stages



PART A: INCEPTION AND OUTLINE BRIEFING