Managing the design delivery
1st edition, guidance note

The guidance examines design delivery management (DDM) in the particular context of construction projects, situating it as a key process that connects the various aspects of the construction value chain. DDM is explained as an essential link between response to the client’s needs and the construction process, which brings that response into reality as a building, structure, or facility.

Some of the key topics covered in this guidance note include:

• Who manages the design delivery and how best practice is defined
• Reference, project definition and design management documentation
• Roles and responsibilities
• Hard skills and the actions of management
• Soft skills and the art of design team management
• Information exchange, and
• Choice of procurement route.
Acknowledgments

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This guidance note covers managing the process of delivering design in the context of construction projects. It is not a treatise on design practice, nor is it specifically about managing a drawing office.

The process of delivering design process starts with the client’s brief and ends up as a design delivered to the project team in a way that is timely and aligned with the requirements of the contract and of construction.

Design delivery management (DDM) is therefore a key process connecting links in the construction value chain. It is an essential connection between the interpreted response to the client’s needs (which is what the design is in essence), and the construction process which brings that response into reality as a building, structure or facility. The idea of DDM is universal to projects of any size and any location. It applies anywhere in the world, under any form of project management and any legal system and contractual form. It applies to multiple projects, programmes or portfolios with their own management structures.

It also refers to one of the areas in the construction process where mistakes are made most frequently, and made repeatedly. These problems extend from misinterpretations of the brief (or toleration of an inadequate brief) to the supply of information that is late, uncoordinated or plain wrong. It is undoubtedly true that the cost of poor information in terms of disruption and wasted energy is very high. If the design delivery was reliably right, many of the problems of construction would disappear.

The people who are responsible for managing the design delivery may seem to have a formidable task on their hands, if all is to progress smoothly. This is because of the ease with which things can go wrong, and the severity of the possible consequences. However, it is not formidable in terms of the nature of the planning involved or the actions required as, for someone who is experienced and thoughtful and who has understood the processes, managing the design delivery is not as daunting a task as it may seem. It is simply the measured employment of a range of management techniques which are not out of the ordinary or hard to understand.

This guidance note is about how that can be achieved in a managed, efficient way.

Figure 1 illustrates how an organisation (in this context, a project organisation) has an infrastructure, and makes use of this to add value to its activities. The point is that managing the design delivery, thought of as a process which ensures that connections are made effectively between activities, can add significant value to the overall process.

**Figure 1: Porter’s Value Chain**

In this model, the DDM is active in the support activities in the upper part of the diagram; s/he adds value to the primary activities in the lower part of the diagram by ensuring appropriate, timely and efficient delivery of each stage in a way that avoids re-iteration. The DDM also is active in making efficient connections between the stages and anticipating deviations from plan.
This is a guidance note. Where recommendations are made for specific professional tasks, these are intended to represent ‘best practice’, i.e. recommendations which in the opinion of RICS meet a high standard of professional competence.

Although members are not required to follow the recommendations contained in the note, they should take into account the following points.

When an allegation of professional negligence is made against a surveyor, a court or tribunal may take account of the contents of any relevant guidance notes published by RICS in deciding whether or not the member had acted with reasonable competence.

In the opinion of RICS, a member conforming to the practices recommended in this note should have at least a partial defence to an allegation of negligence if they have followed those practices. However, members have the responsibility of deciding when it is inappropriate to follow the guidance.

It is for each surveyor to decide on the appropriate procedure to follow in any professional task. However, where members do not comply with the practice recommended in this note, they should do so only for a good reason. In the event of a legal dispute, a court or tribunal may require them to explain why they decided not to adopt the recommended practice. Also, if members have not followed this guidance, and their actions are questioned in an RICS disciplinary case, they will be asked to explain the actions they did take and this may be taken into account by the Panel.

In addition, guidance notes are relevant to professional competence in that each member should be up to date and should have knowledge of guidance notes within a reasonable time of their coming into effect.

**Document status defined**

RICS produces a range of standards products. These have been defined in the table below. This document is a guidance note.

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<tr>
<th>Type of document</th>
<th>Definition</th>
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<td>Document that members with mandatory requirements under Rule 4 of the Rules for Conduct for members</td>
<td>Mandatory</td>
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<tr>
<td>RICS code of practice</td>
<td>Standard, approved by RICS, and endorsed by another professional body, that provides users with recommendations for accepted good practice as followed by conscientious practitioners</td>
<td>Mandatory or recommended good practice (will be confirmed in the document itself)</td>
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<tr>
<td>RICS guidance note</td>
<td>Document that provides users with recommendations for accepted good practice as followed by competent and conscientious practitioners</td>
<td>Recommended good practice</td>
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<tr>
<td>RICS information paper</td>
<td>Practice based information, that provides users with the latest information and/or research</td>
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1 Introduction

1.1 Who manages the design delivery?

Managing the design delivery is an activity of project management, but is not always carried out by a project manager with that title. It is sometimes not even conceived of as a management activity at all, but just happens. For example, contract administrators and professional designers often simply do it as an unnamed part of their general activity.

In this guidance note we will consider design delivery management as a specific process and the recommendations given are for whoever is managing each specific part of that process, regardless of the job title they hold.

In order to avoid any confusion with other roles that may already exist within a project, we shall refer, for the purposes of the discussion, to the design delivery manager (DDM). This is not intended to suggest that the DDM is likely to be a separate appointment carrying that title; in all likelihood, the DDM will do his or her work as part of another role, such as:

- project manager
- design team leader
- project leader/lead consultant/contract administrator
- in ‘design and build’ situations, as part of the contractor’s general management structure, or as part of a subsidiary design group.

1.2 Clarifying the roles

Many projects have a design team leader (usually the designer whose work is central to the project; usually, but not always, the architect). The design team leader, though, is not necessarily the same person as the DDM. Similarly, the role of DDM may or may not be combined with that of project manager or project leader/lead consultant/contract administrator. So, if there is both a project manager and a DDM, the DDM will be acting on behalf of the project manager in fulfilling a key part of the project manager’s duties.

The most important point to remember is that the roles of the DDM should be clearly identified at the start of a project and provision should be given within the project team for these roles to work effectively, co-ordinating and integrating the flow of work and making sure that it is performed in a timely manner.

Throughout this guidance note, we will also refer, when relevant, to others who are involved in design but not specifically or solely responsible for its integrated delivery: surveyors, architects, engineers, etc.

The DDM is an integrator and brings in the various parts of the design into a coherent flow which is:

- appropriate
- time-specific.

1.3 Defining the design process

Design is rarely completely linear. It involves experiment and revisiting solutions that turn out not to be ideal. Getting design right is therefore a process that requires insight, flexibility and collaboration. Planning and managing design delivery inherits these considerations, too.

Design involves various people, and during the process the intensity of their involvement changes. For instance, the architect may have a formative role during briefing and in the phase following it, and then in the later design stages and during construction the architect’s role diminishes, while the role of specialist designer-contractors will probably start late and be very intense during parts of the construction process.

1.4 Where design starts and finishes

In construction, all design has the ultimate goal of addressing the client’s needs. Design therefore begins with the brief, in which the client’s need is interpreted into requirements for a building.

However, the brief, like the design, often evolves over a period. This is not necessarily a sign of disorganisation, but flows from reasons which affect many projects, among which are:
• the client is not entirely sure of what they want at the outset
• the client has not fully understood the implications of what they want at the outset
• the constraints of the site have not emerged at the stage when the brief is first formulated, or the site has not been identified
• planning considerations have an effect
• the cost of the proposals does not align with the client’s budget.

Under current best practice, briefing is therefore seen as a process with several stages and review points. These stages can be understood in relation to three documents: the RIBA project plan (RIBA 2000), the APM project life cycle (APM 2006) and the Code of Practice for Project Management for Construction and Development (CIOB 2010). In addition, the process laid down in BS 7000-4:1996 (BSI 1996), BS 6079-1:2000 (BSI 2000) and other standards can be plotted against one or more of these.

Under the traditional form of procurement, it might be said that design finishes when the design information is issued for construction, according to pre-set deadlines. But in ‘design and build’ situations, although deadlines are still involved, the DDM will naturally link his or her work into that of the constructors, as part of a continuum.

1.5 The project plan and project life cycle

CIOB’s Code of Practice for Project Management for Construction and Development (2010) is the document most likely to be used by surveyors, however, the corresponding Royal Institute of British Architects (RIBA) and Association for Project Management (APM) approaches will be considered first in this document in order to provide context.

The RIBA project plan has stages from A to M, defining the progress of a project in some detail. The APM project life cycle has only four phases: concept, definition, implementation and handover and close-out. Figure 2 demonstrates the general relationship between the two systems.
<table>
<thead>
<tr>
<th>Association for Project Management</th>
<th>CIOB Code of Practice for Project Management for Construction and Development</th>
<th>Office of Government Commerce (OGC)</th>
<th>British Standards BS6079-1:2000</th>
<th>British Property Federation</th>
<th>Royal Institute of British Architects (RIBA)</th>
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<tr>
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<td>Gate 0 Strategic assessment</td>
<td>1 Conception</td>
<td>1 Concept</td>
<td>A Appraisal</td>
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<td></td>
<td>2 Feasibility</td>
<td>Gate 1 Business justification</td>
<td>2 Feasibility</td>
<td>2 Preparation of Brief</td>
<td>B Design brief</td>
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<td></td>
<td></td>
<td>Gate 2 Procurement strategy</td>
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<td>Gate 3 Investment decision</td>
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<td>3 Strategy</td>
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<td>Gate 0 Strategic assessment</td>
<td>1 Conception</td>
<td>1 Concept</td>
<td>A Appraisal</td>
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<td>Includes applications to statutory authorities</td>
<td>Gate 1 Business justification</td>
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<td>2 Preparation of Brief</td>
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<td>Gate 2 Procurement strategy</td>
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<td>Gate 4 Readiness for service</td>
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<td>Implementation</td>
<td>5 Construction</td>
<td>3 Realisation</td>
<td>4 Tender documentation and tendering</td>
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<td>6 Engineering services commissioning</td>
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<tr>
<td>Handover and close-out</td>
<td>7 Completion, handover and occupation</td>
<td>4 Operation</td>
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<tr>
<td></td>
<td>8 Post-completion review/project close-out report</td>
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<td>Gate 5 Benefits evaluation</td>
<td>5 Termination</td>
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Note how the RIBA project plan seems to imply that the process is strongly linear, and it identifies several stages in briefing; that process is to be overseen by a ‘project steering group’ which will establish ‘the vision and key performance indicators’. It is not made clear whether these are related mainly to the client’s needs or to the building that might result from the project, so particular care and sensitivity is needed in following this process.

The APM project life cycle is more abstract and less task-based. Less detail is provided, and there is nothing about it which is specific to the construction industry. On the other hand, the APM approach seems to be favoured by government. There is sufficient difference between the RIBA and APM approaches to make an exact correlation between the two impossible.

This is the APM’s supporting narrative of its project life cycle:

**Project life cycles**

Project life cycles consist of a number of distinct phases. All projects follow a life cycle and life cycles will differ across industries and business sectors. A life cycle allows the project to be considered as a sequence of phases which provides the structure and approach for progressively delivering the required outputs.

**Concept**

*Concept is the first phase in the project life cycle.* During this phase the need, opportunity or problem is confirmed, the overall feasibility of the project is considered and a preferred solution identified. The business case for the project will be produced in this phase.

**Definition**

*Definition is the second phase of the project life cycle.* During this phase the preferred solution is further evaluated and optimised. Often an iterative process, definition can affect requirements and the project’s scope, time, cost and quality objectives. As part of this phase the project management plan (PMP) is produced and the resources required during the implementation phase will be identified.

**Implementation**

*Implementation is the third phase of the project life cycle,* during which the project management plan (PMP) is executed, monitored and controlled. In this phase the design is finalised and used to build the deliverables.

**Handover and closeout**

*Handover and closeout is the fourth and final phase in the project life cycle. During this phase final project deliverables are handed over to the sponsor and users. Closeout is the process of finalising all project matters, carrying out final project reviews, archiving project information and redeploying the project team.*


The differing vocabulary of the two systems says much about the way that the architectural perspective of the RIBA tends to be tied to the production of a built space, whereas the APM’s definition is more elastic and thinks in terms of a ‘capability that allows benefits to be achieved.’ Even allowing for the fact that not all projects are building projects, and that architecture is essentially about buildings, there is still a different mind-set at work in either case; the project manager is characteristically more attuned in the early stages of a project to thinking in terms of the need, problem or opportunity to be addressed, rather than of the constraints that shape a design. That is not to say that one approach is better than the other – but managing the design delivery requires an understanding of which particular process is being followed. Also, what is not really indicated in either case is the repeated iteration that may be required within, or even beyond, each phase to review analysis and proposals.

The Office of Government Commerce (OGC) has produced a process called ‘Gateway Review’. This involves independent practitioners from outside the project examining the project process and commenting on the likelihood of its successful delivery; it is an external perspective. There is a focus on how robust the processes are, and this challenge can have a very healthy effect.

The CIOB’s *Code of Practice for Project Management for Construction and Development* (2010) exhibits an alternative approach to the APM and RIBA. RICS was involved in its compilation, and it shows signs of being based in property development; it considers the process of site acquisition in detail, which neither the APM nor RIBA processes do. It is comprehensive and easy to use. Figure 3 shows stages in a project and some of the key documents that go with them.
Figure 3: Stages of CIOB approach and accompanying documentation

<table>
<thead>
<tr>
<th>Stages</th>
<th>Documents</th>
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</thead>
<tbody>
<tr>
<td>Inception</td>
<td>Client’s objectives, Site selection criteria</td>
</tr>
<tr>
<td>Feasibility – strategy</td>
<td>Outline project brief</td>
</tr>
<tr>
<td>Pre-construction</td>
<td>Detailed project brief, Detailed design brief, Scheme design and cost plan</td>
</tr>
<tr>
<td></td>
<td>Detailed design and production information, Project execution plan</td>
</tr>
<tr>
<td>Construction</td>
<td>Overall design schedule</td>
</tr>
<tr>
<td>Engineering services</td>
<td></td>
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<tr>
<td>Completion/handover,</td>
<td></td>
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<tr>
<td>client occupation</td>
<td></td>
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<tr>
<td>Post-completion review</td>
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</tbody>
</table>

Many surveyors may be more familiar with this system. However, the APM and RIBA equivalents should not be overlooked, and an understanding of several systems is desirable for the DDM. The CIOB’s Code of Practice for Project Management for Construction and Development (2010) sets out a comparison of its stages with those of some other systems, and a version of this extended to include the APM Life cycle, is included here at Figure 3.

Overall despite the usefulness of the CIOB approach, the RIBA Project Plan is probably the closest to being an ‘industry common standard’.

Figure 2 shows an analysis of various definitions of the Project Life cycle, set against one another. This is drawn from the CIOB Code of Practice, but expanded to include the APM scheme. It will be apparent that there is no straightforward reconciliation of all systems across the board.

A DDM should also be aware of Prince2. This is a process-based method for project management, in use internationally. It comes out of the organisation now known as the Office for Government Commerce (OGC). However, it lies beyond the scope of this document. OGC life cycle stages are shown in Figure 2.

1.6 How best practice is defined

Given the three varying approaches discussed in section 1.5, and the slight tension between them, what is the stance within design management, and how is best practice defined in that quarter? There is no simple answer to this, though BS 7000-4:1996 Guide to Managing Design in Construction (BSI 1996) has a status which might put above criticism someone who followed it unswervingly. It has two other advantages as well.

The first is that it is unambiguously construction-specific. This is helpful in a situation where much project management information and guidance is generic and not tailored to the particular circumstances of the construction industry.

The second is that it places emphasis on the briefing process as one of development, which starts from the ‘initial brief’, and arrives in its mature form as the ‘consolidated brief’. Guidelines are given on what the fundamental requirements of the initial brief might include:

(a) The purpose of the construction
(b) Functional requirements
(c) Special, innovative or unusual features
(d) Healthy, safety and environmental constraints
(e) Financial policy
(f) Time policy
(g) Quality strategy
(h) Aesthetic considerations

(BS 7000-4:1996, 2.3.2)

After looking at brief development and project planning in some detail, BS7000-4 then moves on to consider the plan of work (BS 7000-4:1996, Figure 2), which it says may be based on the RIBA plan of work (now known as the RIBA project plan) or some bespoke equivalent. It describes this as ‘a sequence of activities’ or ‘linear function’, and comments that ‘completion of a stage is conditional on co-ordination of design between all team members and the approval of the design team leader and possibly the client. To anticipate approval may result in work having to be corrected at a later stage’. (BS 7000-4: 1996, 2.5). It is apparent that the BS takes a stance on a couple of issues, which is notable:

- The linear model can only succeed and continue to be linear if there is a complete and competent review process at the end of each
stage. Otherwise, back-tracking and re-work are likely to be required, and an excessively iterative model results.

- The sequence of activities is secondary to a briefing process which has priority over it and runs parallel with it; the design is as it were, the child of that process, and the child is ‘brought up’ in a continuing briefing process which extends up to the start of the detail design phase (RIBA project plan stage E).

BS 7000 refers to the ‘design team leader’, and not to the ‘design manager’ or ‘design delivery manager’. If a DDM is appointed, therefore, the role of design team leader as envisioned in BS 7000 will be part-devolved to the DDM. However, there is no single way of splitting the roles; care will be needed in defining where one set of responsibilities ends and another begins.

In any case, the really important thing is to understand the fundamental message of the evolving brief: how the client’s needs are met by the design, building process and the built solution. That includes an understanding of how a shift in the design or the building process would affect the client: would his or her needs then be met more or less fully? If consideration is given to the balance between time, cost and quality, where does the appropriate balance lie? It is worth considering all these aspects.

1.7 The work of the integrator

Many of the actions of the DDM are iterative – they are to be reviewed or used for review purposes at each stage of the job. For example, briefs and method statements for design development may originate early in the job, but they need to be revisited frequently to ascertain whether they still apply in the same way, whether the objectives concerned have changed or are endangered in any way, and what adjustment is needed.

These iterative items often originate at a point somewhere between the concept and pre-construction stages. These stages are shown coloured light and mid-blue in Figure 4 (overleaf), while the iterative items are in a separate area coloured dark blue. These items become the basis of iterative actions and a documentation system which supports those actions. They represent the core from which the DDM’s activities derive; design management and design delivery stand at the point at which the analytical work of the brief and the creative response to it, the design, become fused together, or ‘consolidated’ to use the word from BS 7000. This can be seen clearly in Figure 4 (overleaf).

The work of the DDM is, at a fundamental level, one of consolidation and integration; it involves understanding of the balance of the brief and the qualitative response of the design; of the priorities of time, cost and quality, which inform the design; the nature of the design team and its members, their strengths and weaknesses; and the mutual suitability of design approach and procurement route.

1.8 Recommendations

1.8.1 The DDM should be to be aware of the systems in use to define project processes: APM, CIOB and RIBA.

1.8.2 The DDM or PM should establish which system is in use in a particular project, or agree a suitable composite system where there are seen to be benefits in a bespoke process.

1.8.3 The DDM may be in a position of coping with members of the team who naturally use the system they are already accustomed to. The DDM may have to ‘translate’ from one system to another and interpolate between systems.

1.8.4 The DDM’s core work lies in the establishment of systems shown in Figure 4; the DDM’s documents and actions are derived from these.
**Figure 4: Project life cycle and the project execution plan (PEP)**

<table>
<thead>
<tr>
<th>CIOB Code of Practice for Project Management for Construction and Development (RIBA)</th>
<th>Royal Institute of British Architects (RIBA)</th>
<th>Project execution plan (PEP)*</th>
<th>PEP iterative items</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Inception</td>
<td>A Appraisal</td>
<td>Project definition + Brief</td>
<td>Statement of objective</td>
</tr>
<tr>
<td>2 Feasibility</td>
<td>B Design brief</td>
<td>Feasibility &amp; value analysis</td>
<td>All briefs</td>
</tr>
<tr>
<td></td>
<td>C Concept</td>
<td>Business plan + market predictions</td>
<td>Safety &amp; environmental issues</td>
</tr>
<tr>
<td>3 Strategy</td>
<td>D Design development</td>
<td>Functional &amp; aesthetic brief</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Management of information systems</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Project planning &amp; phasing</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Organisation chart</td>
<td></td>
</tr>
<tr>
<td>4 Pre-construction</td>
<td>E Technical design</td>
<td>Quality assurance</td>
<td>Project planning &amp; phasing</td>
</tr>
<tr>
<td></td>
<td>F Production information</td>
<td>Limits of authority</td>
<td>Quality assurance</td>
</tr>
<tr>
<td></td>
<td>G Tender documentation</td>
<td>Financial procedures</td>
<td>Design review against business plan</td>
</tr>
<tr>
<td></td>
<td>H Tender action</td>
<td></td>
<td>Project management policy</td>
</tr>
<tr>
<td></td>
<td>J Mobilisation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 Construction</td>
<td></td>
<td>Work breakdown structure</td>
<td></td>
</tr>
<tr>
<td>6 Engineering services commissioning</td>
<td>K Construction to practical completion</td>
<td>Work breakdown structure</td>
<td></td>
</tr>
</tbody>
</table>

*PEP* indicates the process through which the project is executed, encompassing various stages and iterative items detailed above.
This section summarises the documents a DDM will be likely to work with, or should create.

### 2.1 Reference documents

There are several other documents which define good practice.

#### 2.1.1 Definitions of project stages
- The RIBA project plan
- The APM project life cycle
- The CIOB Code of Practice for Construction and Development Project Process.

#### 2.1.2 Descriptions of process
- *Code of Practice for the collaborative production of architectural, engineering and construction information*, BS 1192:2007

These documents define good practice, and every DDM should be familiar with them.

### 2.2 Project definition documents

#### 2.2.1 Project brief. This defines the client’s need. It may well be developed in stages.

#### 2.2.2 Design brief. This defines the design response to the client’s need. It should be developed in stages, as laid out in BS 7000-4:1996

#### 2.2.3 Cost plan. This begins with the budget and reconciles the design to it in cost terms.

#### 2.2.4 Project quality plan. Thus document defines the quality expectations the project must achieve and how they will be met.

#### 2.2.5 Responsibility matrix or organisation chart. This maps out the range of activities required to develop the design information and assigns those activities to specific team members or to external bodies (for instance, statutory undertakers such as a water company). The responsibility matrix should make clear where the boundaries between responsibilities lie.

#### 2.2.6 Procurement strategy document or development strategy and procurement route. This describes the reasons for choosing a particular procurement route and maps out how that procurement route will be adopted, including its effects on the design team. There may be several procurement packages, and each would have its own strategy document.

### 2.3 Documents generated in design management

This is a typical list, but not all are necessarily required, particularly for smaller projects.

#### 2.3.1 Design management plan. This sets out the principles and procedures to be used to manage the design process. It is a sort of ‘management overview’ of how the design management process is to be handled. Other names for it include ‘design management handbook’ and ‘design project handbook’.

#### 2.3.2 Design team structure. This is something for the DDM to agree with the PM, design team leader, etc.

#### 2.3.3 Design programme. This is subsidiary to the general project programme, and describes in detail how the design process unfolds in time.

#### 2.3.4 Design information standard. This is a project-specific catalogue of how design information is going to be presented, referenced and indexed.

#### 2.3.5 Design management procedures. This is a description or manual of the procedures that will be followed in design management.

#### 2.3.6 Schedule of deliverables. This lists all the information to be produced, and is a matter of agreement between the various professional disciplines.
2.3.7 Design review meeting minutes. These record progress, deviations from plan, issue, problems, and the measures decided upon to resolve them.

2.4 Information control

This is sometimes described as configuration control or change control, but is, in fact, more general than that name suggests. It includes:

- requests for information (RFI) or information requirement schedules (IRS)
- information issue sheets, such as drawing issue sheets, which may be an extract from a drawing register
- instructions, such as pre-contract instructions and architect’s instructions.

2.5 Information quality

Quality (in the sense of quality management, which focuses on quality as a measure of the extent to which needs are met, or suitability for purpose) is a difficult matter to legislate for within a project because often the design team members are from organisations, which have their own quality systems. The procedures laid down under such systems may not be mutually compatible, and sometimes cannot be waived or adapted to fit with those of other team members without causing an apparent lapse in the quality performance in the home system. A group of systems, all of which comply with ISO 9000, should have fewer problems of compatibility than others which are differently based.

So, although project quality plans are desirable, they may not realistically be achievable. Instead, quality is defined by other systems, which have the nature of quality systems but another name. Examples of this are information control systems, design information standards, etc., as referred to above.

2.6 Recommendations

2.6.1 The DDM should be familiar with the three definitions of project stages listed in 2.1.1.

2.6.2 The DDM should be familiar with the design management process described in BS 7000-4:1996, and the CoP for collaborative production of architectural, engineering and construction information, BS 1192:2007.

2.6.3 The DDM should have a working knowledge of the documents to be generated in design management and design delivery; be flexible as to what documents will suit any particular project best.
3 Roles and responsibilities

3.1 Appointment of consultants

It is not normally within the remit of the DDM to appoint consultants, or to advise on whom should be appointed. However, depending upon what procurement route is selected (section 7), the timely appointment of suitable consultants is something that may profoundly affect the DDM’s work, and it is therefore in the DDM’s interests to monitor the process where possible and raise any concerns at the earliest stage.

Legitimate concerns would include the completeness of the array of designers (bearing in mind that under some circumstances design input is provided in some defined areas by contractors), and the coherence of the team structure. A dysfunctional design team is not only a liability to the client, but can also make a DDM’s job impossible to fulfil adequately.

It needs to be clear to all, from the start, who is going to do what, and who is going to report to whom. The relationship of any management roles (project manager, lead designer, design manager, DDM) needs to be mutually understood and expressed, including the boundaries to authority. It can prove valuable for the DDM to create a process diagram (see Figure 5), which shows how the various parties interact as the design-construction process unfolds.

Sometimes the design and construction process do not fall into a simple sequence, in which the two main phases (design and construction) are discrete. When they are fundamentally more mixed, as in a design and build or construction management process, for instance, the scheme cannot all be mapped out in advance, but has to be built up incrementally.

3.2 Design by contractors and subcontractors

Under all forms of procurement design input by contractors is possible, though it happens to a much greater extent outside traditional procurement and within vehicles configured for the purpose, like design and build (D&B) and build operate transfer (BOT).

Figure 5: Example of a design management process diagram

Where contractors’ design is involved, the question immediately arises of how their work is to be integrated into the work of the design team. At one extreme, it simply comes later, and gets added to a design that is otherwise more or less complete. The contractors’ design fills a space that has been temporarily filled by the design team with an interim, undeveloped or provisional design solution.

At the other extreme, contractors’ designers emerge early enough to be integrated into the professional design team. In that case, it is the job of the various managers to ensure that the newcomers are adequately inducted into the team and its procedures, and received by the other team members in a way that indicates a commitment to co-operate.

Between these two extremes lies an uneasy territory where specialist contractors are employed by the client outside the contract. This is one of the more difficult situations to handle, since such specialists may not perceive themselves as members of a design team, and may lack a sense of belonging to the project. Their loyalty to the client, even if strong, may be narrowly defined.
and may not include inward commitment to team-working.

Two-stage tendering, in which a preferred contractor is selected on partial rather than complete project information, and cost and time certainty are arrived at by a subsequent round of negotiation once the design has been completed. Sometimes, design work is carried out by aspiring contractors pre-appointment, sometimes at the contractor’s or specialist’s own cost, on the basis that he or she will be rewarded only if successful in a competitive tendering situation. There can be quality problems inherent in design work carried out on such a basis resulting from the initial round of work not being properly thought-through.

### 3.3 Where liability resides

In the scramble to shed risk, which has been such a prominent feature of the industry in the last ten years, the pattern of appointments has changed, as clients select procurement routes which reduce their duties and liabilities. We therefore see clients opting for procurement, for example, in which the contractor would take at least some of the design liability, or to prime contracting or BOT, in which the client receives the building as a facility, designed and maintained by others, and takes no design risk at all.

Beneath these changes, liability for a design continues to reside principally with the designer, and that is why the professional institutions insist on their members taking out professional indemnity insurance. Designers may also be the easy ones to blame, even when a problem may result at least partly for management issues. But in the bigger picture, liability may be tracked back to those who appointed the designer. Under this view, the blocks of responsibility are simpler: employer and contractor may be the first stops and last resorts for liability, and this continues to be the case even when designers have given some form of indemnity.

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**Example 1**

A new academy in north London, a £35 million contract, was let on the basis of design and build with the designers novated to the contractor. The production information was produced on a rolling programme as the construction proceeded, but there were issues causing reiteration of design work. The lack of time allowed between the dates for production of the drawing batches and the programmed start of each phase of the construction meant that the required dialogue, revision and development of some of the details created timing issues which were hard to manage. Intense pressure by the project manager on a junior in the firm of structural engineers for instant issue of a bending schedule for a reinforced concrete staircase for construction immediately resulted in the issue of the wrong information, unchecked by a superior. The staircase collapsed shortly after construction and the engineer was sued.

There is another factor in this emergent norm: these days, construction tends to start earlier in the process, before the design is complete. This may mean that the contractor is appointing a design team (or taking on an existing one as his or her own) for the detailed design of the project. The ramifications of this will be examined further in section 7.

It is useful to remember that the professional institutions maintain a helpline service for their members, with legal advice available. This can prove a valuable resource where there are concerns about liability that need clarifying.
3.4 Recommendations

3.4.1 Ensure roles and responsibilities within the team are clear and expressed.

3.4.2 If the DDM has doubts about the completeness or appropriateness of the array of designers, raise the issue and pursue it until it is resolved.

3.4.3 If there is any ambiguity about boundaries between roles, raise the issue and pursue it until it is resolved.

3.4.4 Understand, and ensure clarity on how the work of contractors’ designers and others who will come later to the team is provided for in the design and organisational scheme.

3.4.5 If there is any ambiguity on where design liability lies, ensure that a mutual understanding is arrived at and that all parties are aware of this.
4 ‘Hard’ skills and the actions of management

4.1 Programming

Programming is the mechanism for showing how project activities relate to each other in time, what dependencies exist between them, and where the critical path, which determines overall progress, lies. To speak of programming in connection with managing the design delivery may be tantamount to saying that the DDM has to have project management training. At the very least, he or she needs to be able to use project management tools.

Most programming work is now done on specialist software, such as Microsoft Project™. This is easy to use at a simple level, so the person without a background in this activity who simply decides to ‘have a go’ might seem to make good progress initially, but then find the more subtle and advanced aspects much harder to master. The best advice for anyone in this position is to get some training, as moving to the next level of competence will pay dividends in understanding how to work with concepts like lead and lag, and how to get the most from finite resources in the time available.

A full working understanding of such systems is strongly recommended for a DDM.

4.2 Monitoring and review: the skill base involved

Monitoring and review depend to some extent on personal skills, and success is likely to come from an approach that combines management technique with attitude in the areas of teamwork, co-ordination, checking and impartial judgement. In the terms of the Belbin analysis of team roles, a DDM needs to span a number of types: Teamworker, Co-ordinator, Implementer and Monitor-Evaluator (Belbin, 2010a, 2010b):

- Teamworker helps the team to gel, using their versatility to identify the work required.
- Co-ordinator focuses on the team’s objectives, draw out team members and delegate work appropriately.
- Implementer plans a practical, workable strategy and carry it out as efficiently as possible.
- Monitor-evaluator provides a logical eye, make impartial judgements where required and to weighs up the team’s options in a dispassionate way.

However, there are some types who might not be successful as a DDM: for instance, using Belbin’s example again, an opinionated individual, who has lots of drive and a preconception as to direction (a ‘shaper’), may turn out to be an unhelpful type of DDM.

Monitoring and reviewing is about measuring progress, and comparing existing and projected situations with the plan. To this extent, the practical skills involved coincide largely with those of programming (section 4.1); it is the context of ongoing review which is particularly important here.

It is often helpful for the DDM to get inside situations and spot delays early, not after they have become both inevitable and prolonged. As part of this, he or she may break down units of work into smaller units set out in a task matrix, monitor these, and observe deviations form plan at an earlier stage than would otherwise have been possible. The important skill here is not having just a microscopic view, but combining it with a broad overview and active understanding of the main issues. Monitoring should avoid failing to see the bigger picture because of too close a focus on the detail.

The DDM, in keeping both macro and micro views, will be closely in touch with the team, and integrated into its thinking and activities, not interfering within specialities but able to help in relating them to the totality of the design effort and understand the options available in keeping the design process on track to deliver.

The DDM is also a controller of information and its quality. He or she understands where the responsibilities and authority for decision-making lie, knows the approval processes, and is skilled in programming, monitoring and review and change...
control. He or she is able to engage in and make use of risk management, cost control, value management and value engineering techniques.

The DDM is therefore skilled in a range of ‘hard’ techniques in project management. But he or she should also be able to explain the techniques in use to other team members who are not familiar with them.

4.3 Risk management and the design delivery

Risk management tends to be only partially employed in many projects; frequently, a risk register is compiled, and the team works co-operatively to enumerate and rank the risks according to their severity and probability of being realised.

This is not a full risk management approach, which would be founded on a risk management plan and a method such as the Project Risk Analysis and Management (PRAM) approach (APM) or Risk Analysis and Management for Projects (RAMP) approach (Institution of Civil Engineers (ICE)). However, it is a lot better than nothing, in that a forum is created for sharing knowledge about risk and getting various perspectives on it. The DDM should be an active and knowledgeable participant in the risk management process, aware of the risks to the project posed by the uncertain situations that have been detected by the team, and able to use this understanding to be proactive in determining measures to counter or mitigate the effects of the risk.

4.4 Change control

It is conventional wisdom that changes in projects tend to cause delay and additional cost, so why does change continue to be allowed in projects? Why do changes occur? There are a number of reasons:

(1) changed needs on the part of the client
(2) better ideas
(3) problems with the site
(4) problems with the design.

It is easy to dismiss (2), (3) and (4) as the products of a poor design process, and (1) as the product of an inadequate investigation at briefing stage.

Though there could be truth in such a view, there is often more to the situation.

It has already been noted that it is in the nature of design for solutions to emerge from a process in which understanding deepens through design and through the interaction of the design team. This reflection and working over of the ideas of the project extends back into the client’s brief, so it is the foundational ideas of the project which are subject to refinement, not just the detail.

It is therefore in the nature of projects for even its fundamental defining points to stand in need of review and possible adjustment. Such a situation is sometimes avoided (and the need for review suppressed) because of a fear of throwing the project into chaos. Indeed, there is a risk of the disruption of planned timings and budgets, but the priority must be faithful orientation of the project to the client’s needs.

How is this risk to be dealt with? It is recommended that two measures are implemented:

(1) Have well-developed systems for coping with change, so it can be dealt with in an orderly way, with information about the need for the change and the response to the need shared at the earliest time.

(2) Limit the time at which changes occur, on the basis that the later they come, the less avoidable the impact. This limitation can take the form of an instruction, ‘no more changes’, which is another way of saying ‘the design is frozen’. However, for this to be meaningful, the problems that give rise to the change have to be dealt with some way in advance of any such edict, so that the design can be developed and finalised in a way that removes the impact of the problems.

In order to carry out these measures in an appropriate and timely way, the DDM should ensure that the design team has the information to make fully informed design decisions and that the dialogue within the team has fully explored the effect of such information.

Whatever the source of design changes, it is important that all the project team are informed as soon as possible. Changes should be tracked using some form of record sheet, such as a project change notice pro forma.
### Figure 6: Example of a project change notice

<table>
<thead>
<tr>
<th>PROJECT CHANGE NOTICE</th>
<th>Sheet 1 of</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Project Title</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Ref. No.</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Project Manager</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Description of change (add sheets if necessary)</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Justification for change (add sheets if necessary)</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Aspects of proposal for which approval is not required</strong></td>
<td></td>
</tr>
</tbody>
</table>

**Status:**
- Proposed ✗
- Implemented ✗
- Post Contract ✗
- Within P.D. ✗
- Outside P.D. ✗
- Client Change ✗
- Design/Implementation ✗

**Distribution List**
- Project Manager ✗
- ..................................... ✗
- ..................................... ✗
- ..................................... ✗

**Agreed in principle:**
- Project Manager: .................................................
- Signature: ...................................................
- Date: ..........................

### PROJECT CHANGE APPROVAL

<table>
<thead>
<tr>
<th>Sheet 1 of</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Comment</strong></td>
</tr>
</tbody>
</table>

- Full Approval ✗
- Provisional Approval ✗
- Rejection ✗

**Explanatory Notes (provisional approval or rejection), add sheets if necessary**

**Signatures**
- Project Manager: .............................................
- Date: ..........................
- .............................................
- Date: ..........................

**Distribution**

P.D. = Project Definition
4.5 Approval processes

The client’s approval is required for aspects of the design. Such approval is normally sought after the design team has done its work up to a logical point, so it may be assumed that what is presented to the client is fit for purpose and congruent with the client’s needs. Therefore, information is usually presented to the client for approval at the end of a work stage (either one of the formal stages, defined in the project plan, or an intermediate point which is significant in the context of the particular project).

The client’s approval therefore is the gate to the next work stage. Delays in obtaining that approval would have a straight knock-on effect to that next work-stage. For that reason, it is desirable that the approval process should be planned and even rehearsed, so that the client is aware what is expected of him or her and has an awareness of the framework within which the approval process exists. The DDM has a significant role to play in managing the delivery of information to the client in a timely way; the approval processes should be scheduled and detailed in a timetable.

4.6 Cost control

Although cost control is not a DDM function, it is an area which affects him or her if cost control and the work of the designers are to be integrated. A mutual understanding of what is happening in both areas will help avoid the trauma and waste of the design being found to be incompatible with the cost plan, and therefore having to be revised.

The DDM has an input to make here as one engaged in the integration of the project effort. For that reason, it is advisable for the DDM and the designers to have access to a cost plan from the start. Of course, if the Code of Practice for Project Management for Construction and Development (CIOB 2010) is being followed, a cost plan will have been in place since scheme design stage, and this plan, if competently handled, will have been developed progressively as the design states proceed. In this connection, the DDM should be aware of the RICS New Rules of Measurement (RICS 2012). It is worth adding that cost planning is required from briefing stage, as the development of a concept which is incompatible with the budget is futile.

It is part of the skill of designers to design to a price, and it is certainly a part of the brief of any manager, including the DDM, to check that the design work has not become detached from budgetary considerations. So, in this important respect, the DDM is once again an integrator.

Within most cost plans there are contingency sums. These exist in recognition of perceived risks, which may be only roughly quantified. An example of this would be dealing with buried services which have not yet been able to be inspected, and for which there is therefore no design solution available for the time being. Sooner or later, a solution will be identified, designed for and costed, and the management of that process, which lies on the limits of what the DDM can plan for, will require careful timing if delays are not to occur. Sometimes, information on contingencies is withheld from design teams, for fear that they will use up the funds allowed. While such thinking is understandable to a degree, it does nothing to help in getting the input of the design team focussed onto what is required of them, in relation to this risk, at the various stages of the design. Indeed, it would be worth exploring the risks involved in the risk register, so that the contingency sum is related to the risk of a possible expenditure, which can be quantified.

4.7 Value management and value engineering

Value management (VM) is about the perceived value to the client that the project is to generate. It is a view taken within the context of the project aims; it therefore evaluates design solutions under that perspective. Often, a value manager team co-ordinator (VMTC) will be appointed to act as a facilitator. This process can do good work in making the underlying purpose of the project apparent to the design team, and thereby adding to team unity and the effectiveness of team co-operation. This is particularly the case when VM is implemented early in the project life. However, very often the role of the VMTC is not expressed, and the whole process becomes a tacit aspect of project management.

Value engineering (VE) is an activity at a lower level than VM, looking to get function at minimum cost. Ideally, it follows VM, and takes a look at the efficiency of the building process, in the light of what VM has made apparent.

Where VE becomes disconnected from VM (most often, because the VM process has been skipped) then VE can amount to little more than cost cutting.
4.8 Recommendations

4.8.1 The DDM should master the use of programming software in some depth, and have the ability to cope with actions like forward and backwards pass and master the workings of ‘lead’ and ‘lag’, so that he or she can not only arrive at a critical path but also manipulate activities in time, in response to contingencies.

4.8.2 The DDM should understand the human aspect of managing in terms of Belbin’s types, or another form of analysis, and work to the strengths of those within the team. The DDM should be prepared to identify where there are weaknesses, or gaps in the group abilities, and manage tasks and responsibilities accordingly.

4.8.3 The DDM should be proactive in trying to spot delays early, so that the response can begin at the earliest moment and the damage caused can be limited.

4.8.4 The DDM should be proactive in identifying and monitoring risk, and devising control and mitigation measures.

4.8.5 The DDM should establish transparent and easy-to-use systems for change control, and discuss and agree well in advance any ‘design freeze’ that may be implemented.

4.8.6 The DDM should make sure the client understands both the approval process, and what s/he is being asked to approve. They should work closely with the PM (if separate from the DDM) and the designers on this.

4.8.7 The DDM should facilitate cost control and VM processes by aiding communication and the timely provision of information.
5 ‘Soft’ skills and the art of design team management

The DDM is not only working with a process, but also with people, who are all unique and need to be handled in different ways. So the role of DDM is not entirely reducible to a set of actions, but also involves people skills. These are not merely intuitive but are understood within project management and enumerated (for instance, within the RICS APC competencies and the APM Body of Knowledge). For that reason, the DDM is recommended to have project management training in both ‘hard’ and ‘soft’ techniques (Cornick & Mather 1999), particularly as the time pressure inherent in construction projects means that there are big advantages in getting people matters ‘right first time’.

The DDM will also occasionally have the job of expanding the vision of some designers who may be blinkered within their own discipline, and showing them how to be more generally project-minded. This includes reinforcing an awareness of the ultimate goals of the project, as they are related to the client’s need. The articulation of this need, as expressed in the evolving brief, is something that the DDM may need to repeat and to call project team members back to, should they stray from it.

5.1 Understanding construction teams

The chemistry of a team depends on a feeling of belonging. Team members who feel, or begin to feel, distanced, or that the team spirit, its systems or the way it speaks to people is alien to them, are diminished by the experience and the team is therefore also diminished. The team members who facilitate communication are the leaders (Senge 1998), and the leadership group includes the DDM, who is the manager of an information exchange involving a category of communication vital to the project: the design output of the team.

Teams normally come together to undertake projects. They are therefore usually short term and ad hoc in nature. Where there is a series of projects (a ‘programme of projects’), there may be standing teams which move from project to project. The construction industry is practiced at developing teams at short notice and disbanding them when a project is complete.

Within a project, team members may come and go throughout the project life, and their role may change as the project moves from phase to phase. The order in which members of the team are appointed is variable. Logically, it should be the project manager first, though often it is the architect. The DDM might not be appointed in the formative stages, but only later. When this is the case, the DDM is at a disadvantage, at least temporarily, because he or she will not have had the opportunity to participate in how the team came together, or witness and influence a process of adjustment.

Project teams are not virtual teams, but they do have some of the characteristics and problems of virtual teams. The team members usually work from their own individual firms’ offices (with exceptions like a site engineer), and they bring to the project the systems and culture of the environment of their firm. Clearly, if the team members are to work together effectively, and if the systems they bring with them are not adequately compatible when they arrive, then adjustment needs to take place so that within the pattern of systems of that project, there is a genuine resolution and inter-operability.

It is useful for the DDM to be around during the initial phase, as he or she may well have input to make on how the team communicates and stores information. That is not to say that the DDM will have different ideas on such matters than other team members, but the DDM is the specialist who carries particular responsibility in that area, and it is right that his/her voice should be heard at the formative stage of the discussion. Indeed, an experienced DDM will have a significant contribution to make to that discussion. If the DDM is only appointed later (as is not uncommon) then this possibility will be lost.

Therefore, it is advisable for project managers, project leaders and design team leaders to take
steps to ensure that the DDM is in post early in the life of the project team and at the formative stage when the project definition is in the process of being agreed. This is sometimes referred to as the ‘project charter’, though not always formalised as such. The definition process should document the project aims and the benefits sought, the project scope, the constraints to which the project is subject, and a number of high-level management issues which inform the work of the team and set its basic direction: cost, spending authority, risk management plan, communication arrangements, stakeholder identification, and authorizations. For example, this could be in the form of a project team away day or team building event in order to ensure individual and corporate objectives are aligned. A DDM who is involved in this from its formative stage will be much more likely to understand these fundamentals and align his or her work accurately with them.

5.2 Sharing knowledge

One problem which has previously been a factor in design teams is that some team members issue information on what they perceive to be a ‘need to know’ basis. In other words, what they do not do is to discuss issues and the problems they have with much openness. Part of the reason for this may be caution in a litigious environment, and the feeling that giving away information unnecessarily is simply giving people who may turn out to be hostile ammunition for some future persecution.

Being guarded with information is not generally helpful in a design team situation, where the sharing of difficulties encountered can often lead to their quicker resolution and the avoidance of delays.

The willingness to share information is, above all, a cultural matter, and can be greatly encouraged by the attitude of the leaders and managers of the team, including the DDM. In other words, this is an area where the DDM and other managers (project manager, design team leader) have an opportunity to shape the culture of the project to enable a freer exchange of information. Steps to be taken to achieve this might include:

- active team-building approaches that facilitate mutual understanding and helpfulness
- a ‘can do’ atmosphere within the project team, based upon an understanding of the aims of the project, the resources and the skills necessary to succeed

- encouragement of team members to be frank about problems, air them in meetings and for everyone to co-operate in resolving them, so far as they can. This does not take blame out of such situations necessarily, but it does much to avoid the debilitating effects of a blame culture.

Example 2

The Heathrow tunnel collapse occurred in 1994 during the construction of a tunnel for the Heathrow Express Rail Link. It caused a huge crater to appear between the airport’s two main runways and also caused damage to car parks and buildings. It took months to clear up the damage. However, although Balfour Beatty and Geoconsult were fined heavily for cutting corners and failing seriously short of approved standards, the recovery process that followed the collapse has won considerable praise due to the co-operation between the parties involved.

Balfour Beatty commented: ‘It was apparent that a major geotechnical solution would be required and that piling or diaphragm walling could play a major part. The parties involved in the original works recognised that the most effective way to deliver a recovery solution would be to work together setting aside anything which had gone before. The team comprised the client, BAA, the insurance loss adjuster, Brocklehurst and their consulting engineer, Ove Arup, the main contractor, Balfour Beatty (BB), and the project’s principal design consultant, Mott MacDonald’.

5.3 Leading and managing the design team

There is a strong element of project-mindedness and team-mindedness required in successful design delivery.

It is significant that BS 1192-2:1987 refers to the collaborative production of construction information. Without the need for collaboration, there would not be all that much for a DDM to do beyond organising a single stream of information from one source to its destination. Immediately that stream of information has more than one source, which is the case in most construction projects.
of more than minimal size, ensuring collaboration becomes a matter of prime importance, in order to achieve:

- co-ordinated, consistent information, which truly fits together and is mutually explanatory
- performance on the part of the design team, which is mutually-supportive and committed to solving problems that they do not own individually.

While achieving these two aims requires sound, well-adapted management processes, it also depends on effective leadership.

**5.4 Recommendations**

5.4.1 It is advisable for the DDM to develop an understanding of construction teams.

5.4.2 It would be particularly useful for the DDM to learn the skills of leadership.

5.4.3 The DDM should be able to articulate the project vision. This will require an understanding of the project aims, objectives and the design responses to them, which can the DDM can communicate.

5.4.4 The DDM should encourage and facilitate good team working, including the willingness to share knowledge and be frank about problems.

5.4.5 The DDM, by being supportive to the team, may be able to encourage valuable mutual supportiveness within the team.
6 Information exchange

6.1 Procedures

It is the DDM’s responsibility to define and implement procedures that protect the quality of project information. ‘Quality’ here indicates the fitness for purpose of the information (without any comment on the fitness for purpose of the design, which is another subject). It includes considerations of whether the information is full and complete, timely and accurate.

The DDM monitors how the design information is being developed and assembled, and detects problems early, so that solutions can be implemented to any problems without slippage from the agreed schedule. In addition to his or her own overview, the DDM will usually cause the team to monitor its activities, with their skills employed in noticing when the state of information is incomplete, inaccurate or in danger of causing a delay. The role of the cost management/quantity surveyor (QS), economist or cost consultant is also a vital one in this process, as timely acceptance or rejection of design information, because of its effect on cost, may make a considerable difference to the cost-certainty of the job and help avoid rounds of cost cutting or value engineering, which may leave scars on the design.

Where a bill of quantities is used (now increasingly rarely), the QS is in an excellent position to act as a co-ordinator of information during the detailed measurement process. In the absence of this shaping force, something else is needed to fulfill that part of the design team function and complete and co-ordinate the project information. The DDM is in a position to check and co-ordinate information, and should do so, if delays, wasted effort and the resulting claims arising from incomplete and conflicting information are to be avoided.

Notice the importance of timeliness here. This involves planning to leave sufficient time for cost checks and the design revisions that may follow upon them; the DDM may not be managing the design, but he or she does have the responsibility of planning a process that involves the disruptions of adjustments to the design.

It is advisable, therefore, for the DDM to establish iterative processes that are flexible enough to adapt to situations of pressure, and robust enough in operation to hold up under pressure. It is not acceptable to short-circuit the process and thus to by-pass review or cost control stages, and it may be important for the DDM to exert discipline in this. The structure can be fairly simple, as indicated in Figure 7.

*Figure 7: Structure of a design stage with review procedure*

It can prove valuable to involve those who have the perspective of the documents’ intended users. So, tender documents should ideally be reviewed by people who deal in procurement and construction documents by constructors. This can be difficult to arrange, particularly under traditional procurement, where the final constructors are not selected until all design and tender processes are complete. That will mean, normally, that the expertise of a contractor is not represented in the team and therefore not available to it. Where that expertise can be brought in, there are benefits in it, and it will be worth arranging for an overview of the documents even if it involves employing a proxy, or engaging in an OGC Gateway Review. It should be noted that some clients will be inclined to resist the extra expenditure involved in this.

These are the points a DDM should consider when forming a programme:
(1) The team may be operating in differing locations.
(2) The team, perhaps as a consequence of (1), might be using differing systems and software.
(3) The essential timeliness of information issue.
(4) The appropriateness of the information to the right person (or role).

6.2 Document management and formats

At the most basic level, a transparent system is needed for the categorization of documents, which clearly arranges them according to their generation in the process of development. It is advisable to articulate and agree a concept of structure with the team at an early stage.

The individual documents developed for a project should also be subject to controls or discipline relating to a number of aspects of format. These include:

- how documents are named
- how documents are numbered
- the interoperability of documents within IT systems in use within the team
- the codes and descriptions used to define revisions
- the purposes of documents, such as ‘for construction’, or ‘for information’
- templates such as drawing title blocks
- subdivisions of the project into sub-projects or zones
- the grid to be used to define position on all drawings
- the selection of drawing scales to be used
- standard page sizes.

These are conventions within a project. They may be developed on a bespoke basis, or a standard system can be followed, for example, *Project Information: a code of procedure for the construction industry* (CPIC 2003). It is important that any conventions to be followed are established right at the beginning of the project, before any other formats are used and have become habitual.

6.3 Facilitation, co-ordination and anticipation

Co-ordination of information within the project team is something we have already covered, but co-ordination with bodies external to the team may also be a part of the DDM’s remit. This has three aspects.

Firstly, the DDM serves project needs and helps the designers by establishing relationships with statutory authorities, such as planning and building control, by ascertaining their requirements for information, and providing that knowledge to the designers. In other words, the DDM becomes manager of that external relationship.

Secondly, the DDM acts between the design team and the contractor to recognise requirements for information in the timeliest way, and even to anticipate the request. This form of management can extend down into the contracting team through awareness of the plans and activities of package contractors and subcontractors, and requires a close relationship with the contracting team and a degree of study of their statements and documents, in order to make anticipation possible.

Thirdly, the DDM will ensure that all information is co-ordinated in that it can not only be read by the software in use by team members, but also is issued in a form in which they can interact with it if necessary.

By the same token, the DDM through close liaison with the client and client team may be able to anticipate the likelihood of variations, and have design resources in place to meet them.

6.4 Project information systems

Electronic project information systems have made a gradual entry over the last ten years or so, and are now widespread. They now exist at several different levels of sophistication:

(a) Simple, secure websites, onto which project information is uploaded, indexed using a generic Microsoft® Windows (or similar) system and made available to the project team.

(b) More developed web-based software (such as Autodesk® Buzzsaw®, Sword CTSpace, Business Collaborator, the Collaborative Business Platform (CBP), Autodesk®
Constructware®, Project Talk, Microsoft® Office Project Server, Oracle® Project Collaboration and Rave Build). These can vary in their sophistication, at an extreme being able to support a Building Information Modelling (BIM) workforce to some extent. Some, such as Buzzsaw®, are available as ‘software as a service’ (SaaS). Generally, they help facilitate the centralising and exchange of project information and underpin team collaboration through creating favourable conditions.

(c) Building Information Modelling (BIM), which is a sophisticated system that can represent digitally a facility’s physical and functional characteristics. It is therefore a top-level design management tool enabling superior building performance to be achieved, as well as a device for managing information and solving problems. Not only does it render designs in 3D, but additional ‘dimensions’ can be added to the design by way of additional information. These additional dimensions might, for instance, be a fourth dimension of scheduling and sequencing, a fifth dimension of cost estimation, etc.

In public sector procurement and construction BIM will have a major influence on design delivery due to the government stipulation in the delivery process that any design delivery plan will need to accommodate the specific client decision-making points specified by the project sponsor. This is an evolving process in terms of government research and implementation but will be an important emerging consideration.

6.5 eTendering

Electronic tendering solutions are now promoted by government in the UK as something which ‘facilitates the complete tendering process from the advertising of the requirement through to the placing of the contract. This includes the exchange of all relevant documents in electronic format’ (www.idea.gov.uk). Benefits are said to include reduced tender time, fast and accurate pre-qualification and evaluation, fast response to questions and points of clarification, reduction in labour-intensive tasks of document management, and improved audit trail, higher tender specification and supplier response, and provision of quality management information.

There is an obvious need for the DDM to check that any system to be used within a project is compatible with the software in use by the team. This should not be overlooked.

RICS offers an eTendering service on a fee basis (www.ricsetendering.com). It claims a reduction in tendering process time of up to 29 per cent a result of using this service, and minimal technological requirements. The process can be accessed on the web using ordinary office software. A number of other commercial organisations also offer an eTendering service.

The eTendering process allows team members to cooperate online to create ITT (invitation to tender) documents. Such tendering systems can be used on a stand-alone basis, or be integrated with other eProcurement systems, so that purchase orders are issued automatically.

eTendering systems, like project information systems, vary widely in sophistication. They can involve the use of be a secure but simple site on which project information is collected and available for download. Of course, this can be the same site, or part of the same site as that used for the development of project information during the design process.

eTendering systems can involve workflow functionality which sends information to people and organisations appropriately, and keeps people and organisation who are registered to the system informed of what is happening. Again, there are similarities to project information systems here.

The DDM may wonder whether eTendering is an extra burden she or he is expected to shoulder, or whether it actually makes his/her job easier. The second is likely to be the case if the eTendering process is considered from the start, and the format of the project information system arranged accordingly.

6.6 Recommendations

6.6.1 It is advisable to start at the outset of the project to develop the procedures that will be needed for managing the design delivery. Be prepared to adapt standard procedures to fit with the particular needs of the project, as these become apparent.
6.6.2 It can prove valuable to ensure that the process for design review and document issue is understood and signed up to by the design team members.

6.6.3 It is recommended that the DDM take control of document management and formatting.

6.6.4 It is often helpful to integrate any intended eTendering system from an early stage, and ensure that the integrated process is a comfortable fit with other systems within the project, so that conflicting systems and extra work is avoided so far as possible.
The choice of procurement route has a profound effect on how the design delivery is managed. While traditional procurement still often leaves the design team as a discrete unit without any members who are constructors, other forms of procurement do not, including construction management, design and build, and the related elements of partnering approaches. While these forms can be much more complex, and lead to teams which change their composition as the job moves forward, they also offer considerable scope for testing the design against expert views of its buildability and cost in use. The DDM therefore has a route to plot through a changing landscape, but the rewards of this in terms of an enhanced project can be great. However, this is not to say that a decision by the client to novate the designers to a design and build contractor will not prove disruptive, particularly if it has not been planned for.

There are three generic types of procurement route:

- traditional
- construction management and management contracting (as variants of one type – there are important differences between them, however, and that is why both are mentioned)
- design and build.

Having said that, hybrids of the three generic forms are now increasingly the order of the day.

The three basic types have their own individual advantages and disadvantages, which can be summarized as follows:

- **Traditional**: Benefits in COST and QUALITY at the expense of TIME
- **Construction management**: Benefits in TIME and QUALITY at the expense of COST & management contracting
- **Design and build**: Benefits in COST and TIME at the expense of QUALITY

(\textit{Cox & Clamp 1999})

Note: The term ‘quality’ is used here in the general sense of suitability to needs, as well as that of grade.

Figure 8 shows differences in the pattern of appointments within various forms of procurement. It is notable that duties and loyalties are likely to flow, or seem to flow, from who is the appointing party; the time at which the appointment is made may have ramifications for the quality of the service that can be delivered. For instance, there are advantages in having inputs from the contractor available during the design stage.

\begin{figure}
\centering
\begin{tabular}{|l|l|l|}
\hline
 & Designers & Cost consultant & Sub-contractors \\
\hline
Traditional procurement & Appointed by client throughout & Appointed by client throughout & Appointed by main contractor \\
\hline
Construction management & Appointed by client. Contractor not active during design stage & Appointed by client. Contractor not active during design stage & Appointed by client but managed by contractor \\
\hline
Management contracting & Appointed by client. Contractor active during design stage & Appointed by client. Contractor active during design stage & Contractor responsible for specialist subcontractors \\
\hline
Design and build & Appointed by or novated to main contractor & Appointed by or novated to main contractor & Appointed by main contractor \\
\hline
\end{tabular}
\caption{Appointments under various forms of procurement}
\end{figure}
Of the three methods, design and build requires the least involvement of the client, and construction management/management contracting the most.

The government procurement task group and government strategy assume collaborative integrated procurement, which requires a separate approach to the four forms described above. For example, very early contractor involvement at the end of the outline business case is a recommended approach.

7.1 Traditional procurement

Traditional procurement gives priority to setting in place a professional team which, if well-chosen, will have the expertise to tease out the client’s requirements and preferences, and incorporate them in design and other documents for a contractor to implement at a late stage.

7.2 Design and build

Design and build represents the opposite end of the spectrum. It is a desirable route to take, particularly when the buildings to be produced are either very specialised and the contractor is an expert in that specialty (such as a specific type of laboratory or test facility), or when they are generic (such as undifferentiated industrial units). It tends to be much less appropriate when a specific response to a site is involved, and when the client has detailed requirements which cannot be met through a standardised process. Nevertheless, it is used increasingly frequently for many kinds of project, apparently in order to transfer a greater share of the project risk to the contractor.

7.3 Construction management

Construction management increases the possibilities for involving specialist trade contractors in the strategy and making use of their ability to provide critique to the design at a formative stage. It also gives greater flexibility and control of the process. This can be carried a stage further if partnering is employed. However, management contracts are now a rarity outside very large projects and for fast tracking.

There are a number of hybrids arising from combinations of these three basic types. In particular, design and build has been elaborated into distinct forms, including: build own (BO), build own operate (BOO), build own operate transfer (BOOT), and design build fund operate (DBFO). These methods have gained a great deal of currency in recent years, and are much encouraged by government adoption of the private finance initiative and prime contracting.

7.4 International forms

The International Federation of Consulting Engineers (FIDIC) has its own forms of contract and these are in use widely (FIDIC 1987-1999). They include the Red Book (payment monthly for work done), Yellow Book (lump sum on milestones), the Orange Book, which covers design and build and turnkey, and the Silver Book and Green Book, which cover circumstances where an employer’s representative is appointed. The difference between these books arises largely from which contractual party is responsible for the design, and who bears the risk for changes in quantities. EPC (engineer, procure and construct) approaches are catered for in the Silver Book, which provides for the contractor taking almost all risks in a turnkey operation. This, of course, bears some resemblance to hybrid forms arising out of design and build, which was referred to in 7.2. The short form (Green Book) provides a simpler form of contract.

Therefore, in the FIDIC forms there is an underlying approach, which is made available so as to suit various types of procurement; the same is true of the Engineering and Construction Contract/New Engineering Contract (NEC3) in the UK. The forms promote ethical commitments of a non-confrontational kind, and buying into that commitment may tend to influence the choice of procurement route.

From this short description, it will be immediately apparent that the choice of procurement route has a profound effect on how design delivery is managed, because depending on which choice is made, the party in control may be client or contractor. The discussion is therefore one that needs to be had early in the process, and the DDM should make it his/her business to see that this happens, as the circumstances under which the design is carried out and the delivery of the design may be profoundly affected.

The motivation of the parties in the design team may also be different, and the expertise
represented within the team may also differ. For instance, issues of buildability may be less completely understood within the team under traditional procurement than they are under management contracting or design and build, for the simple reason that in the first case the constructors are not represented. That fact alone is an advantage in managing the design delivery, because the more complete range of expertise would tend to improve the chances of getting it right, and complete, first time.

It should be noted that although simple statements can be made about where design liability lies in each case (see Figure 8), there are more subtle effects implied. Attitudes to risk in a contractor, say, might be quite different in an element of construction requiring an unusual method if the contractor carries design liability, than if the client has it, and has to pay for time spent resolving unforeseen problems. For that reason, design within design and build projects has a tendency to be more conservative and straightforward.

### 7.5 Partnering

There is another route available, in the form of partnering. This is not a form of procurement in itself; it is an ethos and way of working involving attitudes to sharing risk, and normally is found in conjunction with a form of construction management. However, some hold that traditional procurement is not precluded from partnering, but that combination is results from hybrid thinking, which involves a vehicle which is a ‘partnership’ not including the employer, but related to him via a single contract. Partnering is an important aspect of contemporary construction, with ramifications for procurement method, and for attitudes to teamwork.

### 7.6 Novation and its consequences

The novation of consultants presents several challenges in managing the design delivery. The culture of the project may change quite markedly as the designers are passed from client to contractor. This change can be unsettling in a practical sense, because new ways of working may suddenly be imposed on a team which has got used to a certain way of doing things. It can also be disorientating in terms of the ‘soft’ side of culture: ethics, values, the way that people deal with each other. But the change is not necessarily for the worse; the point is that things become different. The DDM needs to be sensitive to impending change, flexible and willing to work in the new ways that are called for.

Novation may also bring about closer involvement of management in the process. Some clients are hands off, and may be represented officially by a client’s agent, or with less formality by the project manager or the lead designer. In such circumstances, the project team are accountable to the team itself in day-to-day matters. But a proactive contractor in a design and build situation might be much more active in making demands on team members and such interventions might impinge on expectations for design delivery. Of course, this is only a generalised comment on what might happen. Things are not always like that. However, the DDM will need the flexibility to cope with this sort of change.

Novation sometimes brings a realisation that previously assumed priorities may have been reversed, and this can affect the way that the design is detailed, and, at an extreme, what its governing priorities become. Such a shift will almost certainly be beyond the control of the DDM, and may be very disruptive for all involved in the creation of project information.

The DDM may occasionally be able to anticipate some of these changes and provide for the possibility of them before the change actually arises. However, the truth of the matter is that frequently novation has a profound effect, which needs experience, intuition and skill to manage smoothly.

### 7.7 Recommendations

7.7.1 Though the DDM may have little say in the choice of procurement route, he/she should be well-informed on the matter, aware of the consequences of that choice and able to give advice accordingly.
Feedback from practitioners highlights some of the notable problems affecting DDM:

- Problems of inadequate briefing and poor consultation on needs and requirements.
- Naïveté on timescales.
- Poor use of the project execution plan (PEP), or a poor PEP; project information not coordinated according to a PEP, and the PEP not used as basis for reporting.
- The often unrecognised importance of bringing in trainers at team formation stage, resulting in teams which do not gel or do not communicate successfully enough.

This may sound as though good DDM depends on good project management on a larger scale, since in larger projects at least, these areas may be under the control not of the DDM, but of a project manager who is senior to the DDM and, crucially, appointed at an earlier stage. However, as we have seen, the DDM is an integrator. It is possible to view these problems as critical areas for reinforcement in the DDM process:

- briefing
- core controls of information, timing, reporting and the PEP, and
- team formation.

So, if the DDM is aware of the dangers in a way that his or her colleagues are not, then in order to avoid the pitfalls, leadership may have to be exercised from the DDM’s position within the team, rather than from the vanguard.

That is a tall order in a situation in which the DDM, as one of the managers, takes a share of the task of making apparent to the client and the team what the design process requires. That includes an understanding of their own roles and responsibilities and the boundaries to them, and of the process in which all are involved. For instance, the DDM from a position among the managers, needs to show that it is unacceptable to allow the client to embark on an approval process without explaining what is required, what the limits of the requirement are, and the time constraints.

The DDM cannot be an expert in all the fields of activity he or she supervises. Nor can the DDM be an arbiter or decision-maker in areas outside his or her own area of responsibility. However, the DDM can raise awareness through being a good communicator, and by being master of systems which deliver timely checks and reminders. Under these circumstances, the framework of activities and supporting documents which the DDM generates may be very important indeed.

The DDM’s key skill therefore brings to bear processes and controls; it is a matter of personal decision and judgement of a particular situation as to whether this should involve imposing a complete system of standardised procedures and related documents. The more experienced DDM may relax somewhat on this, recognising that sometimes to cut across the established procedures of team members’ firms is not helpful, and is better avoided, so long as the project system which assembles the team members’ work is transparent and coherent.

Therefore, DDM involves an incisive understanding of certain key aspects of construction project management, and an adept use of systems which although not complex in themselves, must be applied judiciously, and may need to be tailored to project situations in an imaginative way. A process diagram is shown in Figure 9 and indicates key decision points at which the DDM needs to provide guidance and information to fellow team members.
### Figure 9: PEP, DDM documents and DDM actions

<table>
<thead>
<tr>
<th>PEP</th>
<th>DDM documents</th>
<th>DDM actions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project definition &amp; brief</td>
<td>Design management plan</td>
<td>All systems designed to support this</td>
</tr>
<tr>
<td></td>
<td>Design programme</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Design information standard</td>
<td>Develop, implement and maintain</td>
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<tr>
<td></td>
<td>Schedule of deliverables</td>
<td></td>
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<tr>
<td>Method statement for design development</td>
<td>Design brief</td>
<td>Design team structure and procedures</td>
</tr>
<tr>
<td>Development strategy &amp; procurement route</td>
<td>Design information standard</td>
<td>Instigate, operate and modify information systems as required</td>
</tr>
<tr>
<td>Feasibility and value analysis</td>
<td>Design review meeting minutes</td>
<td>Contribute to definition of plan and implement it</td>
</tr>
<tr>
<td>Functional &amp; aesthetic brief</td>
<td>Project quality plan</td>
<td>Reconciled concept design &amp; budget</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Plan for designated procurement route</td>
</tr>
<tr>
<td>Management of information systems</td>
<td>Project execution plan</td>
<td>Note deviations and report</td>
</tr>
<tr>
<td>Quality assurance</td>
<td>Design management plan</td>
<td></td>
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<tr>
<td></td>
<td>Design review meeting minutes</td>
<td>Develop, implement and maintain</td>
</tr>
<tr>
<td>Development strategy &amp; procurement route</td>
<td></td>
<td>Design review meeting minutes</td>
</tr>
<tr>
<td>Reconciled concept design &amp; budget</td>
<td></td>
<td>Compile and issue chart</td>
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<tr>
<td>Project planning &amp; phasing</td>
<td></td>
<td>Agree in advance</td>
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<tr>
<td>Design review against business plan</td>
<td></td>
<td>Obtain and incorporate</td>
</tr>
<tr>
<td>Organisation chart</td>
<td></td>
<td>Obtain definition of the approvals</td>
</tr>
<tr>
<td>Limits of authority</td>
<td></td>
<td>Contribute to definition of plan and implement it</td>
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<tr>
<td>Financial procedures</td>
<td></td>
<td>Join with others in post-project evaluation</td>
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<tr>
<td>Statutory approvals</td>
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<tr>
<td>Work breakdown structure</td>
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<tr>
<td>Post-project evaluation</td>
<td></td>
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</tbody>
</table>
9 References

9.1 Standards, services and reference documents

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**British Standards Institution**

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### 9.2 Selected bibliography

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Managing the design delivery
1st edition, guidance note

The guidance examines design delivery management (DDM) in the particular context of construction projects, situating it as a key process that connects the various aspects of the construction value chain. DDM is explained as an essential link between response to the client's needs and the construction process, which brings that response into reality as a building, structure or facility.

Some of the key topics covered in this guidance note include:

- Who manages the design delivery and how best practice is defined
- Reference, project definition and design management documentation
- Roles and responsibilities
- Hard skills and the actions of management
- Soft skills and the art of design team management
- Information exchange, and
- Choice of procurement route.