Abstract

Work by a group set up by the NCC Standing Committee on Computing and Data Co-ordination to examine project information, is described. The communication problems occurring at the interface between the design team and the contractor are examined, and proposals are made concerning the content and structure of drawings, specifications and bills of quantities. A Code of Practice for drawings is one of a number of recommendations made. April 1979

CIT Keywords

Bills of quantities
Communications
Data co-ordination
Drawings
Project documentation
Specifications

Department of the Environment

NCC Standing Committee on Computing & Data Co-ordination

PROJECT INFORMATION

its content and arrangement

A report and proposals on the way forward

PROJECT INFORMATION GROUP

Contents

INTRODUCTION

Early in its life the Standing Committee on Computing and Data Co-ordination commissioned the National Building Agency (NBA) to survey the progress made in co-ordinating information since the Working Party on Data Co-ordination produced its final report in 1971[(1)]. The survey pin-pointed project information as a priority area for attention. The Working Party had produced a separate report "Structuring Project Information" [(2)] but the NBA survey showed that its proposals, in the main, were still to be implemented by the industry. Accordingly the Standing Committee arranged for the major interested institutions to discuss the feasibility of putting further effort into the subject and in particular to achieving greater co-ordination between bills of quantities, specifications and drawings and improving their content. The institutions considered this was an opportune time and we were appointed as a Project Information Group to investigate the problems with the following terms of reference:

a. To examine current developments in the project information field and determine how these can best contribute to making the design and building process more effective. The examination should take into account the recommendations contained in the report prepared in 1972 for the Working Party on Data Co-ordination – "Structuring Project Information"' [(2)] – which dealt with the arrangement and presentation of information for building projects.
b. To identify obstacles preventing the improvement of methods of information flow in the design and construction process and indicate how these can be overcome with the emphasis on developing established conventions.
c. To determine which elements of project information should be co-ordinated into standards and codes of practice.
d. To bear in mind the requirements for British work overseas.
e. To initiate such action as is necessary to meet the above requirement.

Our objective has been to seek improvements to the process concerning the preparation of drawings, specifications and bills of quantities in relation to the design, tendering and construction stages of, a building project. We have concentrated on the interface between the designer and the contractor, for it is at this stage that the designer must prepare documents some of which are contractually binding. We recognise that in the future, contract procedures might not always take the traditional form with the growing use of "design and construct contracts", package deals offered by contractors, direct labour etc. However, we feel that the traditional competitive tender will continue to be used for the foreseeable future and our recommendations have been made against this background. Prior to the tender stage communication is made easier by personal contact. At the tender stage written and drawn information becomes the principal form of contact and unless it is expressed clearly there is a danger of a breakdown in communication between those involved. To examine this stage it has been necessary to take into account the effect and relationship of the whole life of a project and the information leading to and from it. Our energies have been mainly devoted to aspects of the building industry rather than Civil Engineering, but in order that the relationship

between the two industries was taken into account, the Institution of Civil Engineers has been represented on our Group. Details of membership and an outline of our programme of work are given in Appendix A.

For the purpose of our work, we defined Project Information as:

> "that information concerning a specific building project (e.g. the survey of the site, the proposed design solution and the information required to carry out the construction phase) which passes between members of the design team and other bodies, in particular the client, statutory bodies and contractors. It does not include General Information (e.g. byelaws, regulations, manufacturers' catalogues etc)" common to many projects".

1. THE NEED FOR BETTER PROJECT INFORMATION

1.1 Reports over the years have pointed to the benefit which improved communication in the building industry can bring. Evidence that such improvements in project documents are needed can plainly be seen from an analysis of the amount of site queries which result from information prepared for communication from designers to site which is:

a. unco-ordinated – conflicting information from different sources

b. of poor quality – insufficient detail and explanation

c. incorrect – errors in the items of information

d. missing – accidental omission of information

e. not distributed – information available but not sent to site.

Work by the Building Research Establishment (BRE)(3) has shown that a high proportion of site supervision time is spent in sorting out technical problems due to unreliable and incomplete information; this can result in the site staff becoming frustrated and a consequent reduction in the quality of the work and a general disinterest in the project.

1.2 Better project documentation would bring other benefits. A clearer method of arranging drawn information would bring about more efficient working between members of the design teams and enable more positive communication with the client. By providing the contractor with project documents subject to less of the deficiencies in (a) to (e) above, the designers and quantity surveyors would find themselves freed of many of the time consuming disruptions whilst errors and omissions were dealt with.

1.3 Finally, claims and variations cannot be regarded as symbols of an efficient industry. While some are caused by factors outside the construction industry's control, for example clients' changes of mind, the present level of claims has in no small measure resulted from inadequate or unreliable project information, particularly at the tender

stage. Improvement in project information can only lead to a reversal of the trend to set up claims organisations. We feel that some positive means should be found to reduce the amount of claims being made by contractors.

1.4 The study “Action on the Banwell report"[4] identified a number of causes of variations. Variations are often the result of the lack of adequate communication between the parties concerned; they are costly to the industry and a contractor seldom gets full reimbursement for the cost of variations. It would be desirable to create a situation where the well planned job can be clearly distinguished and contractors reflect this in their tender prices; clients will then see that proper planning pays off and this creates incentives for greater efficiency in the industry.

2. THE CURRENT POSITION

2.1 The industry uses three main inter-related documents in the tendering and construction process: drawings (together with schedules), specifications and bills of quantities. The fragmentary nature of the industry has led it to tolerate defects in this information process, for its structure induces a natural reluctance to change, and the need for individual organisations to be competitive has led in turn to a passive attitude to these shortcomings. One thing which impedes action in this area, and which was pointed out by the BRE Current Paper 60/76, "Co-ordinating Working Drawings"[5], is that the present Conditions of Engagement and fee structures of certain professional bodies do not allow for consultants to undertake as a matter of course the necessary co-ordinating work that would be required in addition to their normal tasks. Whenever a recommendation is made which involves changes in the tasks or in the amount of work of the different professions, then often this is related in people's minds with the implications to their respective fee scales. Greater efficiency may well lead to lower contract prices and consequently a reduction in professional fees, but the increase in efficiency arising from better documentation within the professional practice itself should be reflected in increased profit margins.

2.2 The "Structuring Project Information" report[2] said that "if today's best practice in the traditional presentation of information could become the norm within the next five years, this would effect an immense improvement in the performance of the industry as a whole". Our first task was to examine the current position and endorse good practices, rather than start from new concepts. It will come as no surprise to find that a number of our recommendations are already in use and some already accepted as traditional practice.

DRAWINGS

Generally

2.3 Our examination of drawings concentrated on their use for tendering and construction purposes. Working drawings prepared in the traditional manner have been the subject of criticism arising from a lack of content, in both quality and completeness of information, inconsistency of format and absence of structure. They tend to follow

traditions of individual offices and there has been little conscious effort to produce a set of drawings which meets the criticisms or integrates the efforts of the various members of the design team. Little consideration is given to the best way of presenting the information to the person who has to seek out and use the items contained in the documents. The various users of this information, ranging from members of the design team to contractors' site staff, differ in their information needs. For example, within a contractor's organisation the needs of the estimator and the construction planner are not the same. However, there is a common need for complete sets of fully integrated drawings, structured to facilitate the search for information, to be available at the time the bills of quantities are prepared. It is important to recognise the value of controlling the issue of drawings to ensure proper distribution to the user who needs them; also the need for a more effective control over amendments to drawings.

2.4 An important contribution to research in this subject was made by the BRE with examination of the use of working drawings from the point of view of the user. This work[3] led it to conclude that a systematic structuring of drawings would provide a solution to many of the current problems of information searches. At the same time it was found that highly structured drawings tended to lead to too much fragmentation and the total concept of a building could then be lost. Any variations would require many drawings to be changed, some of which might well be overlooked. The problem of breaking away from any traditional technique was that time was needed for staff to learn the new way and time was not always available.

2.5 But in our view, important though it is to have some easy means of finding information on drawings, it is even more .important to ensure that the content of those drawings in respect of quality and completeness of information meets certain criteria, clearly distinguishes between firm and provisional information and is of a sufficiently high standard. The BRE Current Paper 18/73 "Working Drawings in Use"[3] contains many examples of the lack of content and suggests that an improvement in the technical quality of drawings could be made, but this would be dependent on the quality of drawing office control.

Building Services

2.6 We have paid some attention to the problems of the relationship of building services with the rest of the design process, for in our view this is a factor of major significance to the flow and quality of project information. Differences in the conditions of engagement and fee structures are a significant obstacle to achieving fully co-ordinated drawings between the different members of the design team. There is the added difficulty that working drawings have different meanings to services engineers and architects and are prepared at different times. Current Paper 60/76[5] points out, "the architect is envisaged as completing working drawings before the tender stage, the structural engineer some time after the tender stage while for the services engineer detailed drawings, co-ordination drawings and builder's work drawings are not included in the normal service for which additional fees may be claimed". Furthermore, the Royal Institute of British Architects (RIBA) Conditions of Engagement[6] place responsibility on the architect to integrate the specialist drawings whereas the Association of Consulting Engineers (ACE) Conditions of Engagement[7] do not require the specialist to co-operate

in this. This difficulty is further increased by the division at the design stage between the outline design and the performance specification prepared by the consultant engineers and detail design decisions and selection of equipment which are left to the installation contractors; this lack of firm information at the design stage makes it difficult for other members of the design team to make adequate provision for engineering services.

2.7 Another difficulty is the difference in the nature of the working drawings prepared by architects and building services contractors; services drawings are generally schematic in nature, lacking detailed information, and the size of the project has an influence on whether they are produced or not. There are different requirements for information in the different sectors of services engineering and these result in different methods of presentation thereby creating problems in cross communication. The BRE studies identified the conflicts between the drawings prepared by different designers both in the requirements for space allocation and the conflict between services and the structure of the building in respect of availability of space and requirements for holes and fixings etc. The BRE recommended the development of the combined services drawing technique whereby a single copy negative is circulated between all designers so each could add their own work to it. The resulting composite drawing forms the basis of a co-ordination meeting where conflicts are mutually agreed. But to effect real changes in this area will not be easy and even partial solutions would require willingness and concerted effort by all the parties concerned. In the short term, improvements could be made to avoid the conflict of information from these different sectors and we endorse the conclusions and recommendations of the BRE Current Paper 60/76[5] which deals with the above issues.

Standards

2.8 We considered the relevance of our work with the current "Building Drawing Practice" Standard, BS1192[8]. This standard, now under revision, is concerned with drawing office practice (e.g. drawing sizes, grids, scales, symbol, etc.). At the same time the International Standards Organisation (ISO) is increasingly aware of the need for a universal standard drawing practice, one which amalgamates established drafting practices into a common technical drawing standard for all disciplines. It is important that this revision work and such implementation as might result from our report should be closely co-ordinated. It might be possible to either augment the BS 1192 work or use it as one of the ways of implementing our recommendations. However, the two fields might well complement each other and require separate directives.

2.9 In building services there is an absence of standards for the structuring of drawings and documentation and little involvement with data co-ordination, but for services engineering to fit into a system of co-ordinated building communication these matters must be considered. The Building Services Research and Information Association (BSRIA) has made a detailed study of working drawing production for engineering services and its Application Guide 7/76[9] is aimed at those responsible for preparing drawings. Whilst it gives much useful guidance it does not discuss the problems of co-ordinating services drawings with those of other designers.

Conclusion

2.10 After considering the various problems associated with drawings and how best they

could be dealt with, the solution we favour is to establish a set of guidelines for the design team in the preparation of drawings. They could provide criteria on not only how drawings could be structured (thus making it easier to find information) but also showing how to present the information needed in a set of drawings for construction purposes.

SPECIFICATION

2.11 A finished design relies for its success upon its practical execution employing good workmanship and the right materials. Since the first standard form of contract in 1909, the specification of quality of materials and workmanship has been assumed largely by the bill of quantities, particularly in the private sector. But the way specifications are currently written, irrespective of who prepares them, leaves room for considerable improvement. Current specifications vary widely in technical content and are often unnecessarily elaborate, with the result that they become discredited by the builders' estimating and site staff, sub-contractors and suppliers who need to use them. Often the specification documents seem to be little more than a collection of protection clauses, such as "to the best quality", in order to absolve the designer from making more specific decisions. Specifications should be up to date, relevant, constructive and comprehensive. The situation exists whereby architects are responsible, as required of them in the Clause 2-11 of the RIBA Conditions of Engagement[6], but the task of writing the specification is often left to the quantity surveyor who has to ask for whatever information he thinks is needed; if he does not ask the right questions some essential item could be omitted by mistake. Specification preambles to a bill of quantities often tend to be a last minute effort, and therefore decisions on what quality and type of material to specify are often not of the best. They are unlikely to be improved unless the specification is prepared by the architect at the same time as the drawings are prepared. Decisions about the design must take into account the materials available and the way the work is to be constructed; to consider them early in the detail design stage will avoid the necessity of taking hurried decisions when time is short and there is a risk of overlooking important information or making a wrong decision. Experience has shown it it better that details and specification information be determined before the preparation of bills of quantities. But this can be done most effectively if the architect takes full responsibility for specification and, if the architect is to manage his specification proficiently, a practical way would be for this information to be contained in a separate document.

2.12 Whereas individual architectural or quantity surveying practices who prepare their own sets of standard clauses often find updating both difficult and laborious a national source for specification clauses ensures that individual project specifications will be consistently quoting the latest standards and reflecting the most recent technical advances as well as incorporating feedback from the experiences of past projects from throughout the country. NBS Ltd provides for this by publishing the National Building Specification (NBS)[10] on a subscription basis. The document is loose-leafed and updating is maintained at regular intervals as part of the subscription. For these reasons, we advocate the adoption of the NBS as the source document, being not a standard specification but a library of standard clauses which allows the individual to select, modify and add in order to fulfill the needs of a particular job. It also provides a

consistent language from job to job throughout the industry. At the same time it does not take away any of the individual designer's decision making, but allows him to concentrate on the important decisions which concern that particular job, knowing that the essential technical details, terminology, etc. are basically correct. The designer is recommended to prepare the working drawings and specification at the same time.

2.13 Services engineers produce a large amount of specification to define qualities of material and workmanship rather than preparing detailed drawings. The Chartered Institute of Building Services (CIBS) in conjunction with the Building Services Research and Information Association (BSRIA) are investigating the possibility of preparing a library of specification clauses for building services similar to the National Building Specification and it is hoped that the CIBS and NBS Ltd will work closely together in this development.

BILLS OF QUANTITIES

Their Purpose

2.14 At present the contract documents under the Joint Contracts Tribunal (JCT) form of contract consist of the drawings and the bills of quantities (except for contracts without quantities where the specification is a contract document). The bills serve the function of setting out "the quality and quantity of work" (clause 12(1) Standard form of Building Contract[11]) and should "fully describe and accurately represent the work to be done" (Clause A1, Standard Method of Measurement (SMM)[12]). The description of the construction work which the bill of quantities provides is intended to be presented in a manner which is helpful to its users. This is primarily to enable the contractor to estimate the costs of constructing the project and generally to assist in the financial administration of the contract. In addition, when bills of quantities have been priced by the contractor they will provide the quantity surveyor with a breakdown that allows variations to be valued and generally assists in financial administration. The Standard Method of Measurement is the normal and agreed method of providing a uniform basis for measuring and describing the work. It standardises the content of the bills of quantities by identifying which features should be measured, by defining how the construction work is to be measured, and by stating what information should be provided.

Shortcomings

2.15 In practice, however, bills all too often do not fully describe the quality and detail of the work. Often they are based on incomplete design information; often detailed drawings and essential specification items are issued after the tender and invariably have consequences which are cost significant. The joint Royal Institution of Chartered Surveyors (RICS)/National Federation of Building Trades Employers (NFBTE) Joint Working Party on Measurement Conventions in their report[13] said: "We consider it essential to discourage by some practical means the practice of representing tentative or provisional data in an ostensibly firm presentation. This gives rise to variations to the contract and consequent problems of valuation. Much valuable time is spent, both by the client's advisers and the contractors' staff, in negotiating an equitable valuation of the

varied work, usually with an unhappy compromise as being the only alternative to arbitration".

2.16 The change in construction methods since the publication of the 5th edition of the SMM has been another major factor in urging the need for the SMM to be revised. Over the years the increasing use of mechanical plant and specialist labour and more constrictive labour employment conditions, have reduced some of the flexibility of building operations. As a result, the timing of activities has become an increasingly important factor in the cost of building. Significant costs arise for example by bringing large items of plant to site and setting them up for work and from the time they stay on site, and need not relate to the quantity of work actually done. At present bills contain, in the main, only items of finished work but it would be helpful if such items whose cost is proportional to time and those whose cost is fixed were separately identified in the bills of quantities. The lack of this identifying information causes many problems in cost feedback; where there are variations difficulties arise in valuation and it is not easy to assess their impact on the contractor's method of organising and resourcing the project.

2.17 An element of the current procedure which militates against effective construction planning is the absence at the tender stage of detailed information. This is in part due to a lack of decision regarding nominated sub-contracts which prevents effective pre-tender planning, an essential pre-requisite to estimating the cost of the work as a whole. So a somewhat illogical situation occurs whereby on the one hand a relatively minor item can be measured in great detail while the impact of nominated sub-contract works on the planning and running of main contracts may be ignored. More information needs to be given about the nominated sub-contracts at the time of tendering if projects are to be properly planned.

2.18 There has also been criticism that bills of quantities are not easily related to site operations, that the order does not help for establishing effective estimates of costs, that the structure and content is not predictable, and that there is no clear indication of the firmness of information contained in them. As a result of their studies the Joint Working Party on Measurement Conventions[13] concluded that the existing method was out of date. They produced specific recommendations and suggested the establishment of the SMM Development Unit which accordingly was set up in 1973 under 'the authority of the Standing Joint Committee of the RICS and NFBTE. This Unit has proposed a short term revision of the 5th edition of the SMM, mainly in response to a call from specialist contractors to revise the content of certain work sections. The Development Units longer term proposal is to produce a 7th edition which will be the result of a more comprehensive study of the way the content and arrangement of measurement information could better serve the needs of all involved, and be more closely compatible with the rest of the project information.

The 7th Edition of the Standard Method of Measurement

2.19 In preparing for a 7th edition of the SMM, to be finalised and published some five years hence, the Development Unit has been trying to find ways in which the present work sections could be improved to reflect the kind of work currently prevalent in the

industry and it considers that the categories in the variation of price adjustment formulae for building contracts[14] could form a good basis on which to work. The Development Unit has seen a need to organise the information in bills of quantities to meet three main requirements. The first is to adopt "work sections" reflecting the present structure of specialist trades and contractors. The second is to take account of the approach adopted in the "Structuring of Project Information" report[2] on the arrangement and presentation of information for building projects. This is to separate units of work where this is likely to influence the contractors' choice of construction method or the sequence of work. These units have been termed Construction Planning Units (CPUS)[15]. The third factor was that of the location of a particular part in the building which might cause the work to be operationally distinct. The group of bill items structured in this way would be presented in a predictable and consistent manner so the contractor could choose how he wished to relate them to his own construction programme.

2.20 We conclude that the ongoing work of the SMM Development Unit provides, in respect of bills of quantities, the sort of detailed work needed to ensure adequate project information. We are concerned that given the importance of this work to project information the consultation should be wider.

Building Services

2.21 Traditionally building services have not formed part of the bill of quantities, other than by inclusion of a prime cost sum. Services engineers normally prepare their own schedules of labour and materials and deal with variations and claims. Under the present method of working, the lack of detailed design at an early enough stage does not enable the inclusion of building services in a bill of quantities. This method of working has been evolved as being appropriate to the nature of the work of the building services industry. But, from the co-ordination point of view, it would be more effective to have a common system for all sectors. There is also a need to reconcile the method of working by services engineers with the need for cost data for the client. We consider that long term aims would be helped by establishing more formal links between the CIBS and the RICS.

COST PLANNING AND COST ANALYSIS

2.22 Of the other sources of information which relate to the three main project documents discussed so far, cost analyses relate closely to the creation of the cost information contained in the bill but must also be related to the designer's method of presenting information. The structure of the cost analysis is, of course, directly related to the preparation of the cost plan at the early stage. The RICS through its Building Cost Information Service (BCIS) publishes a standard form for the structure of cost analyses and we support this as the basis for structuring cost plans and cost analyses. It must be recognised, however, that all cost planning information derives from priced bills of quantities. Until bills of quantities better reflect the ways in which work costs are incurred by the contractor and therefore can be priced realistically, cost analysis and planning must allow for variability of the basic data. The structure of drawings at the early design stage was not studied by us in great detail, but it is important that the early design

drawings are arranged in a form which assists early design team working (including cost planning) and they should be capable of translation into production documents with minimum of effort.

3. RECOMMENDATIONS AND THEIR IMPLEMENTATION

3.1 The implementation of the following recommendations is considered to be essential if the project information process is to be made more efficient from the viewpoint of both quality and flow of information.

Recommendations

Drawings

3.2 To improve the value of drawings as a means of communication between the designers and those on site responsible for construction, we recommend that a Code of Practice be prepared. It should set down guidelines for the designer in the preparation of drawings, so providing the contractor with a clear indication of what drawings he might expect under various conditions.

3.3 The Code should cover the following main items:

a. A recommended structure for sets of drawings to facilitate the search for information and to make amendments easier to carry out.
b. Guidance on the content of information for both individual drawings and sets of drawings.
c. Co-ordination of drawing information from the various sources.
d. Drawing office techniques to assist the preparation of improved information.

The Code should also take note of the relevant work undertaken by the Building Research Establishment, Royal Institute of British Architects, the British Standards Institution, Institution of Structural Engineers, the Concrete Society and the Building Services Research and Information Association in order to cover drawings produced by all disciplines. The application of the Code should be varied to suit the nature and size of the project and the resources of the design office.

3.4 We also recommend that a designer's technical education should include the techniques required to plan a set of drawings and a basic knowledge of information management and practice.

Specification

3.5 We recommend that ways should be found of ensuring that the basic data for specification of quality of workmanship and materials are prepared wholly by the architect and other designers. This responsibility should not only be recognised in the various Conditions of Engagement but be put into practice. We deplore the practice of the Quantity Surveyor preparing specifications without adequate information from the designer. Specifications should be written at the same time as the drawings are

prepared. To encourage designers to undertake their responsibilities for specifying it would be helpful if the specification information was to be contained in a document in its own right. Bills of quantities would then be simplified to allow them to concentrate on their primary function of obtaining tenders and the efficient and equitable financial administration of contracts.

3.6 We recommend that the principal source for building specifications should be the National Building Specification, and that its drafting principles be used for all specification work. We have, however, initiated work concerning the categories and structures of the NBS and bills of quantities based on the SMM Work Sections for if the specification is separated from the bills of quantities and not repeated in them, as we recommend, it will be of the utmost importance that the information in each document is presented in a consistent manner. Para 3.10 describes arrangements we have made to ensure that there is compatibility. NBS should also be developed to meet more fully the requirements of structural and services engineering. In doing this it would benefit from a broader management involving the various professions.

3.7 When sufficient evidence that designers are seen to be putting our recommendation at para 3.5 into practice, and a consistent structure of work categories for the NBS and SMM work sections has been determined, it would seem sensib1e that the RICS/NFBTE and the Joint Contracts Tribunal should consider the question of the specification of quality and workmanship being treated as a separate contract document.

Bills of Quantities

3.8 The premise that the bills of quantities should be based on a standard method of measurement which has as one of its principal aims the production of simpler bills is welcomed, as is the attempt to improve the content of work sections so they reflect more adequately current practices and changes in techniques within the industry. The aim of achieving a clearer definition of the status of information being presented and the extent to which it is firm or provisional is to be commended. In view of the likely development in computerisation, there should be, wherever possible, a more standardised approach to descriptions. The intention to change the format of bills of quantities so as to provide a better link with contractors' costings systems is also welcomed, as this is seen as leading to a closer relationship between cost and price and a flow of better cost data to design teams. We recognise that there is no current requirement for bills of quantities to be presented in any particular format, the SMM being only concerned with the item descriptions. The fact that the SMM order is followed as a basis for the order of the information in the bills is rather more a matter of convenience than a requirement. Therefore, we welcome the Unit's intention to produce a Code of Practice for use with the 7th edition of the SMM which would, for the first time, recommend the format of the bill of quantities, in addition to the format of the items as presented by the SMM. Such consistency in the presentation of information is fundamental to the effective co-ordination of project information.

A Common Structure

3.9 Co-ordination of project information concerns both the integrated working of all the members of the design team from an early stage, thus avoiding the production of conflicting information, and the structuring and the inter-relationship of the various documents so that there is an identifiable and co-ordinated set for passing on to the builder. It is this which has been the crux of our work, and it is here where we make our major recommendation.

3.10 As has been said in para 3.7, we have concluded that there is a need to present the information contained in bills of quantities and the specification in a consistent manner. With the object of establishing a suitable structure for both bills of quantities and specification we set up a special sub-group (see Appendix B). Their report, which we endorse, recommended that a pilot study be made to investigate a work section approach which takes into account the SMM work sections and the CI/SfB Table 2 work sections used by the NBS. The study would see to what extent the categories developed for price adjustment formulae could be accommodated in the structure of both documents. We recommend that steps should be taken immediately to start work on the pilot study.

3.11 For drawings, a structure which identifies the main parts of a building is thought to be the most useful approach. Whether this should be Table 1 of CI/SfB, the use of Construction Planning Units as recommended in the "Structuring Project Information" report[2] or some alternative system is still a matter to be resolved. The BRE report[3] exampled Ci/SfB Table 1 as an acceptable systematic way of structuring drawings. Clearly more testing of the Construction Planning Unit approach is needed before a firm decision on their suitability can be made.

3.12 We have considered the desirability of broadening the steering arrangements for the SMM and the NBS to involve other institutions and organisations concerned with the design process. We have concluded that the present arrangements provide a satisfactory means of executing the detail of work with the proviso that full consultation takes place with the professional institutions and representative organisations concerned and that those involved could maintain contact in both fields of work through the continuation of the mechanism such as our own Project Information Group.

Co-ordination

3.13 We conclude that the following action provides the best means of achieving co-ordination:

a. Drawings – arranged by functional parts (eg CI/SfB Table 1: elements). If tests of the Construction Planning Unit approach prove positive then these could be considered as an alternative method of arrangement.
b. Specifications – arranged by the categories being developed as part of the pilot study (paras 3.10 and 3.18).
c. Bills of Quantities – arranged by the same categories as for the specification; a sub-division of these work sections arranged by Construction Planning Units would be recommended if tests prove positive.

Because drawings would be structured differently from bills of quantities and specifications, cross-referencing from the drawings to the specification would be an important feature. The bill items and the specification clauses would be automatically cross-referenced since they would both use the same arrangement categories.

3.14 We recommend the preparation of a promotional leaflet in order that there should be an overall co-ordinating document explaining the philosophy of project information and showing how the documents are correlated. This would enable those in the industry to become aware of the work undertaken in this field. It would aim to link together the advice and approaches contained in the Code of Practice for Drawings, the Code of Practice for the format of bills of quantities and the National Building Specification.

Responsibility

3.15 We recommend that responsibility for the co-ordination of project information should be clearly determined at the beginning of the project.

Fee Scales

As we have pointed out, and BRE researches have shown, the scope and effects of poor co-ordination are highlighted in the problems created by differing conditions of engagement and fee structures. However, we recognise that to change professional responsibilities and fee structures involves prolonged consultation with the various institutions; but much could be done in the short term by implementing BRE's general recommendations[3]&[5] aimed at improving efficiency in an attempt to avoid additional contract costs and delays. The question of fee structure in building services was further examined by BSRIA. BSRIA Technical Note 3/77 "Co-ordination of Building Services"[16] reached the conclusion that all decisions relating to co-ordination should be based upon cost effectiveness. Additional costs incurred in the design and construction stage by co-ordination should be offset by savings through reduced contract delays, reduced extra costs or reduced eventual tender values. Where the client was required to contribute the additional fee, it must be cost effective to him.

Implementation

Detailed Work

The following detailed work is already being undertaken:

a. Standard Method of Measurement; preparation of 7th edition by the SMM Development Unit, jointly sponsored by the RICS and the NFBTE.
b. National Building Specification; ongoing development, revision and updating service provided by NBS Ltd.

We have initiated a Pilot Study to examine three works sections in detail and to confirm or otherwise that it would be possible and worthwhile for a common structure for bills of quantities (based on SMM work sections) and specification (based on NBS) to be derived which would form the basis of future bills of quantities and specifications. Depending on the outcome, this work could then be continued to cover all works

categories.

The following work will need to be undertaken:

a. Code of Practice for the content and arrangement of Drawings
b. Code of Practice for the format of Bills of Quantities
c. The promotional leaflet for the co-ordination of Project Information.

We note that the RICS/NFBTE propose to carry out the work at (b) as part of the revised 7th edition of the SMM. As regards the organisation of item (a) we feel that this work should follow the example of the SMM Development Unit (where RICS/NFBTE have set up joint arrangements for funding and revision of work). We suggest that the RIBA and the NFBTE should form a joint group in collaboration with the BRE and the engineering institutions.

A Co-ordinating Committee on Project Information

In order to ensure that these pieces of work do not diverge from one another, there is a need for a Group representing the major institutions to meet at intervals to monitor progress on new developments and to ensure that co-ordination is continuing. There is advantage in the Group having the same membership as our own so that the knowledge which has been gained so far in this Group would not be lost.

We have considered possible sponsors of this new Group and we have noted the recommendations of the Standing Committee on Computing and Data Co-ordination that the National Consultative Council for the Building and Civil Engineering Industries (NCC) of the Department of the Environment should make arrangements to deal with matters of communication. We feel the NCC to be the best parent body for this work, giving wide representation and consultation which is so important to good co-ordination.

Appendix D

REFERENCES

1. "An Information System for the Construction Industry – Final report of the Working Party on Data Co-ordination". HMSO 1971.
2. "Structuring Project Information – a report on the arrangement and presentation of information for building projects". HMSO 1972.
3. "Working Drawings in Use" – Current Paper 18/73-a study of working drawings identifying the symptoms and causes of failure in communications between the producers of information and the site. Building Research Establishment 1973.
4. "Action on the Banwell Report" – an Economic Development Council report. HMSO 1967.
5. "Co-ordinating Working Drawings" – Current Paper 60/76 – a study and report of the causes and effects of poorly co-ordinated drawings. Building Research Establishment 1976.
6. "Conditions of Engagement" – October 1977 edition. Royal Institute of British Architects 1977.
7. "ACE Conditions of Engagement". Association of Consulting Engineers 1970.
8. "BS1192: 1969 Building Drawing Practice". British Standard Institution 1969.
9. "Working Drawing Production" – Application Guide 1/76. Building Services Research and Information Association 1976.
10. "National Building Specification Subscription Service". NBS Ltd.
11. "Standard Form of Building Contract" – July 1976 revision – Joint Contracts Tribunal for the Standard Form of Building Contract. RIBA publications Ltd 1976.
12. "Standard Method of Measurement of Building Works". Royal Institution of Chartered Surveyors/National Federation of Building Trades Employers 1968.
13. "Report of the Joint Working Party on Measurement Conventions". Royal Institution of Chartered Surveyors/National Federation of Building Trades Employers 1972.
14. "Price Adjustment Formulae for Building Contracts (Series 2)" – prepared by the Property Services Agency for the National Consultative Council Standing Committee on Indices for Building Contracts. HMSO 1977.
15. "Construction Planning Units – A Method of Structuring Production Information in Building Projects". PSA 1978.
16. "Co-ordination of Building Services" –- Technical Note 3/77. Building Services Research and Information Association 1977.