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Design and Build Contracts: Design Management and the Ways Forward

Edwin H. W. Chan
Associate Professor, Department of Building and Real Estate
The Hong Kong Polytechnic University, Hung Hom, Kowloon, Hong Kong

Ann T. W. Yu
Research Associate, Department of Building and Real Estate
The Hong Kong Polytechnic University Hung Hom, Kowloon, Hong Kong

L. Y. Shen
Professor, Department of Building and Real Estate
The Hong Kong Polytechnic University, Hung Hom, Kowloon, Hong Kong

Abstract
The design management process is an important part of project management in Design and Build Contracts. Under this procurement system, the team members, including client's representative, D&B contractor and designer, have to adopt the changed roles and responsibilities to cope with the increasing complexities, demands and scale of modern practice for large-scale projects. The design responsibility is transferred from the client's organisation to that of the D&B contactor who is responsible for the design management of the projects. Research indicates the management of design is one of the major concerns in D&B projects. This paper presents a study carried out in Hong Kong, which reviews the concerns in design management of D&B contracts. It highlighted the concerns of three groups of project participants: clients, D&B contractors and designers. Results of the study indicated that briefing, experience of client, client change, time for design proposals and coordination of drawings are the major design concerns in management of D&B Contracts.

Keywords
D&B Contract, project management, design management, design responsibility, concerns

1. Introduction

Design and Build (D&B) is a popular procurement method for large and complex projects to deal with the unsatisfactory performance of the traditional method in the last decade. The client relies on the D&B contractor for the overall delivery of design and construction. The design-builder may employ architects or engineers either as the design-builder's staff or as contracted consultants to carry out the design. He will have to adopt an active role in design management. Design management in this study means effective management of design process, proper allocation of design liability, cost effective in design process, etc. The Design and Build procurement system is not free from problems in design management. This study aims to find out the major problems in design management that are causing concern to the project team members in a D&B project and the ways forward.

2. Problems in Design Management and their Characteristics

2.1 Problems associated with design management

Literature review has identified the following specific problems associated with design management in the D&B system:

- Client has difficulties in preparing an adequate brief (Yu, 1998; Bubshait *et al*., 1999);
- Client has less control over the design aspect of the project (Yu, 1998; Bubshait *et al*., 1999);
- Mis-interpretation by the Client on contractor's design proposal (Chan and Chan, 2001; Ng and Skitmore, 2002);
- Separation of design roles and overall design management (Chan and Chan, 2001; Love et al 1998);
- Separation of design and site supervision (Chan and Chan, 2000; Chan & Chan 2001; Love et al 1998);
- Insufficient time for thorough design and detailing at the tender stage which is normally allowed 8 to 10 weeks only (HKIA, 1998);
- Conflicts of interest in the architect's/engineer's role under the D&B contract and in his duties under the Buildings Ordinance (HKIA, 1998);
- As far as the bear minimum standards stipulated in the Employer's Requirements could be met, to save cost and time, the contractor is reluctant to further improve on design and detailing, even there may have some deficiencies in the design submitted at tender stage. (HKIA, 1998)
- The client has less say on the materials/workmanship standards so long as the contractor could meet the bear minimum standards as stipulated in the Employer's Requirements. (HKIA, 1998)
- There are limited numbers of companies with proven records in both designing and construction to compete in the D&B market. (Yu, 1998; Chan, 2000)
- Difficulties encountered in the coordination of various designers (Baldwin et al, 1999)
- Difficulties encountered in planning and scheduling design information production (Baldwin et al, 1999)
- Dispute on design responsibility (Chan and Chan, 2000; Ng and Skitmore, 2002)
- Inheritance of design errors (Ng and Skitmore, 2002)
- Client changes (Yu, 1998; Bubshait *et al*., 1999)

Further literature review on design management and D&B procurement system provides a rich source of data on some of the concerns more commonly observed. The following sections discuss in detail the characteristics of some of the major problems.

2.2 Inexperience of the D&B contractor

In Design and Build Procurement System, the D&B contractor has to adopt changed roles and responsibilities. The D&B contractor is now responsible for the overall delivery of design and construction. He has to adopt an active role in the management of design process. The design-builder should make sure the design information is available for client's approval on time and to meet the needs of the different critical construction stages. The experience and competency of the D&B contractor with the new role directly affect the effectiveness in the design management of D&B system. However, there are limited D&B contractors who have the experience and resources to perform both design and construction in Hong Kong (Yu, 1998; Chan, 2000). Clients felt that D&B contractors generally were in experienced in running the design process and the system worked best when the architect's leading role was properly acknowledged (HKIA, 1998). The generally weak design capability of D&B contractors limits wide use of D&B system (Tam, 2000).

2.3 Changed roles of designers

The design professionals are now directly responsibility to the D&B contractor, not the client. With reference to the responsibilities and detailed requirements in the Buildings Ordinance in Hong Kong, the

Authorized Person (architect/surveyor/engineer registered under the Buildings Ordinance) and the Registered Contractors are sharing many responsibilities together to comply with statutory requirements (Chan, Mok & Scott, 2001). Some of their roles, particularly on site supervision, are overlapping and are difficult to be differentiated. The legal responsibility of parties in the building control system is based on the traditional project procurement method. One of the major roles of the Authorized Person is to supervise the works of contractor and to check or sanction the contractor's work for compliance with the Buildings Ordinance (Chan and Chan, 1999). Under D&B procurement system, the architect/engineer employed by the D&B contractor may find it difficult to discharge his statutory duties as a "statutory agent" of the Buildings Authority (HKIA, 1998; Chan 1998).

2.4 Lack of experience in briefing

Briefing is the first and most important step in the design process, where client requirements for a building project are defined and the major commitment of resources is made. The briefing process is critical to the successful delivery of a project (McGeorge Palmer, 2002). It requires a shared understanding and commitment among a group of stakeholders of the project, including the client, the end users, and the designers. It is of a complex and iterative nature, which must integrate business strategy with building requirements. Chan (1999) indicated that the D&B system depends on how clear the Client's Requirement is. The Client's Requirement is a source of reference as well as audit document for the subsequent design and construction. It is the base for the D&B contractor to prepare their Contractor Proposal. However, it was found that Client has difficulties in preparing an adequate brief (Latham, 1994; Yu, 1998; Bubshait *et al*., 1999).

2.5 Insufficient time for design development at the tender stage

The tender stage is normally 8 to 10 weeks in D&B projects. Within this period, the architect has to complete the outline schematic design, preliminary General Building Plans, a considerable amount of preliminary detailed drawings including co-ordination with designers of other professional disciplines and the D&B contractor has to compile a presentable Technical Proposal and sufficient information for the client to assess the Tender. There is insufficient time for thorough design and detailing processes within such a short period of time. As far as the bear minimum standards in the Employer's Requirements could be met, the D&B contractor may not be able to make improvement on design and detailing and there may have some deficiencies in the design submitted at the tender stage (HKIA, 1998).

2.6 Design change

Design changes are inevitable in construction projects, especially in large and complex projects with compressed time schedule in D&B projects. Change of circumstances, emergence of new technology and method, clients changing their mind, and other varied reasons may account for design changes. Design change can affect all element of a project such as the scope, time, cost, construction methodology, project-associated risk, and the quality or operational arrangement of its facility (Lazarus and Clifton, 2001). Ineffective management of change is one of the most significant contributors to unsatisfactory project performance. Therefore, it is crucial that the proper procedures for managing design changes should be followed, so that only the correct design documents are used for the project (Bubshait *et al*., 1999).

3. Empirical Research

3.1 Research Methodology

The research study was carried out in 2002 to investigate issues concerning design management in D&B contracts. The study included questionnaire survey to collect opinions from a sample size of about 250 construction professionals, including clients, designers, contractors and subcontractors, who are key personnel in firms and companies known to have experience with D&B projects.

Subsequent to the questionnaire survey, structured interviews were conducted with 15 project participants including clients, designers and builders to have detailed discussions on the preliminary findings of the questionnaire to collect qualitative data for the study. In the current study, qualitative data were collected through structured interviews to support the quantitative research results of questionnaire through "triangulation" (Jick 1979). By applying both the quantitative and qualitative methods as a triangulating strategy, data of one research method (qualitative in this case) helps generalization of the findings based on another research method (quantitative in this case) for the same topic. Three cases D&B projects are also identified to verify the results of questionnaire survey and structural interviews. These cases serve as a preliminary corroborating test to find out whether the contractual arrangements of previous projects with close resemblance to our proposed contractual arrangement has any reference to project success. This paper presents some of the results of the questionnaire survey and structured interviews

3.2 Key Findings on the Problems of design management in D&B system

The survey analyses the major problems encountered by the respondents in design management of D&B projects. The prime concern for the project team relating to design management is "client change" and "limited nos. of companies with proven records in both designing and construction". Not surprising, issues related to dispute are not the prime concern of the project team because there is only single point responsibility for design and construction in D&B system. However, it is surprising to note that "Mis-interpretation of design proposal by the Client" is one of the less problematic areas. It may be that the contractors have normally done a good job for the tendering biding exercise.

Although results by groupings of clients, consultants and contractors are slightly different on the subject matter, they share the common view on the major problems of design management in D&B projects. At least two of the three major problems chosen by each group are related to the client. These problems are:

- The client has difficulties in preparing an adequate brief.
- The client has less control over the design aspect of the project.
- The client initiates variation on the design.

This result is supported by the follow-up structural interviews of clients, designers and contractors. The three groups of interviewees agreed that the experience of the client is one of the critical success factors in the D&B projects. The client should employ in-house project team or external consultants to prepare a clear and comprehensive brief to set out the client's requirements and to give advice on the contractor's design and to manage any design change.

3.3 Who benefit most from proper design management

Who will benefit the most in a proper design management process in D&B project procurement? Most of the respondents agreed that the client would benefit the most with a proper design management process in D&B procurement. The survey result is shown in Figure 1.

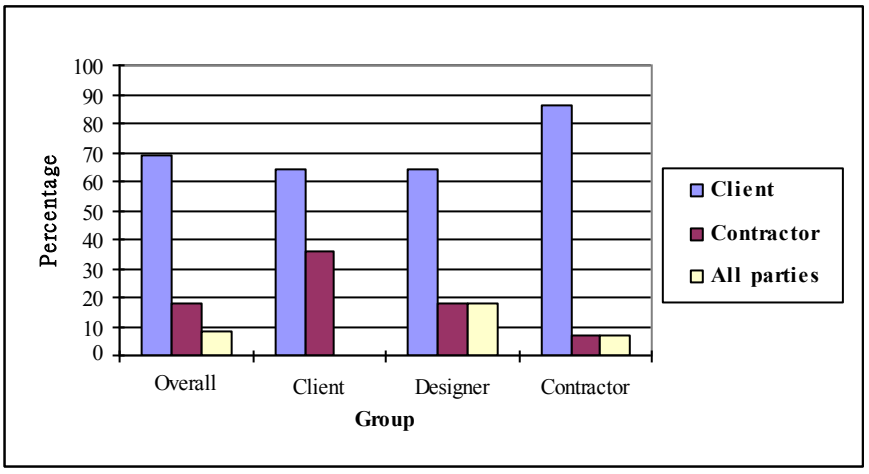

Figure 1: Who will benefit most in a proper Design Management process in D&B project procurement?

4. Observations and Conclusions

4.1 Role of the client

The client would benefit the most with a proper design management process in D&B procurement and the success of Design and Build projects depends heavily on the experience of the client. Hence, the problems in design management of D&B project should be alleviated by the clients. The most important role of the client is setting out his requirement during the briefing stage. The client should employ in-house project team or external consultants to prepare a clear and comprehensive brief and to give advice on the contractor's design and to manage any design changes. A longer tendering period should be allowed for contractor to design and prepare the Technical Proposal, with due consideration of the size and complexity of the project.

4.2 Design Review

In order to coordinate design drawings and control design changes, a more formal system as required by ISO 9004, which requires that design reviews be carried out at the conclusion of each phase of design development by conducting 'a formal, documented, systematic and critical review' of the design results, is advocated (Cornick, 1990). The reviews should 'identify and anticipate problem area s and inadequacies and initiate corrective actions to ensure that the final design and supporting data meet client requirements' (Gray and Hughes, 2001).

4.3. Conclusions

In Design and Build contract, the project participants have to adopt the changed roles and responsibilities. The changed roles and responsibilities of the client, designers and D&B contractor create problems in design management of D&B system. The study reviews the issues concerning the design management process and design responsibilities involved in Design and Build procurement system. Results of the study indicated that briefing, experience of client, client change, time for design proposals and coordination of drawings are the major design concerns in management of D&B Contracts. It is in the best interest of the client to prepare a clear and comprehensive brief for tendering. It is suggested that the client should employ in-house project team or external consultants to set out his requirements in the briefing stage. The tendering period should be allowed in accordance with the size and complexity of the project for thorough design and detailing processes. In order to coordinate drawings and control design changes, a more formal system as required by ISO 9004 to conduct design reviews is advocated.

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