

## **Responsibility of Design for “Buildability” of Construction Projects**

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### **Abstract**

The construction industry has been familiar with the allocation of design responsibility among the parties with the contractual arrangement of the traditional procurement method. However, many clients are seeking other methods of procurement, such as Design-build (D&B) to meet their more exacting needs. One of the major advantages of the D&B method is the improvement of “buildability”. With the mixed roles of tradesman and design consultant under the D&B system, this contractual arrangement is drastically different to the concept in the traditional procurement method. Indeed it tends to reverse the risk and the role of team members in a development project. This paper examines the development on “buildability” and critically reviews the issue of design responsibility relating to “buildability” of a construction project under the traditional procurement method and the D&B procurement method. It focuses on the current issues experienced in Hong Kong and Singapore. It identifies the important issues and provides the groundwork for in-depth research on the issues related to this topic.

### **Keywords**

Professional liability, buildability, traditional procurement, Design-build procurement, design

### **1. Introduction**

Under the traditional procurement method and current building control system, the construction industry is familiar with the design liabilities that are imposed on them in discharging their duties. “Buildability” is one of the inherent problems of conventional procurement methods. In this study, “buildability” refers to the extent to which a design facilitates efficient use of construction resources and enhances ease and safety of construction on site whilst the client's requirements are met. Innovative procurement systems are pursued and the industry started to adopt D&B system. Nevertheless, the gains may likely be offset by the concomitant risks because the legal rules fail to cope with the changes brought about by this fairly new procurement system. D&B contractor's dominated position also causes clients' concern about scarifying their interests due to the lack of a check and balance mechanism in the D&B system. By introducing the system, notwithstanding whether “buildability” problems could be solved, the risk and the role of team members in a development project are drastically different, including conflict of interest for architect and D&B contractor, joint liability, duty of due care, fitness for purpose and statutory role in the function of building control. This paper examines the development on “buildability” and critically reviews the issue of design responsibility relating to “buildability” of a construction project under the traditional

procurement method and the D&B procurement method. It focuses on the current issues experienced in Hong Kong and Singapore and identifies the important issues, as well as provides the groundwork for further in-depth research on the issues related to this topic.

## **2. The Concept of Professional Liability**

Construction professionals such as architects, engineers, construction managers and surveyors are specialists and it is reasonable for laymen to entirely rely on them for construction process. They are expected to perform in good faith to the best interests of clients. If a person who carries out professional works does not act with due care which eventually causes detriments to his client's interests, damages have to be paid for his/her negligent acts, either intentionally or unintentionally. The concept of professional liability is imposed on every professional. In the field of construction, Windeyer J., in an Australian case *Voli v. Inglewood Shire Council (1963)* stated that '*[a]n architect undertaking any work in the way of his profession accepts the ordinary liabilities of any man who follows a skilled calling. He is bound to exercise due care, skill and diligence. He is not required to have an extraordinary degree of skill or the highest professional attainments. But he must bring to the task he undertakes the competence and skill that is usual among architects practising their profession*'. Professional liability covers wide-range risks arising mainly from contract and tort. Contractual liabilities are defined by the parties of contracts which are intended to be legally binding. A tort is a civil wrong and is the infringement of rights which the law recognizes as applying generally to all individuals. In particular, professional negligence is the most important source of liabilities among all the categories of tortious liability. As far as buildability is concerned, it is still arguable if a design lacking in buildability would render the architect or engineer liable under tort. Views are put forward in this paper as to the situations under which the pendulum of liability will swing.

## **3. Design for “Buildability” under the Traditional Procurement System**

The traditional procurement method of construction projects is characterised with the separation of design and construction functions, in which multi-disciplined experts join together at various stages focusing on their respective tasks.

### **3.1 Design for “Buildability”**

Nevertheless, owing to the strictly sequential path it follows the traditional procurement system separates different stages or even isolates each of them from others, leading to a lot of problems and one of which is “buildability” (Masterman, 2002). Back in the 1960s, the United Kingdom had started a study for integration of design and construction. As time goes by, “buildability” has interested many who look for certainty in the course of construction and increase in productivity. “Buildability” was defined by the Construction Industry Research and Information Association (CIRIA) in 1983 as '*...the extent to which the design of a building facilitates ease of construction, subject to the overall requirements for the completed building*'.

The problem of “buildability” arises in the traditional approach of producing designs by professionals who are not the ones actually work on site. The lack of knowledge and understandings of practical site constraints during design may result in tremendous suffering in terms of time, cost, quality and safety etc. Judge Newey Q.C had described “buildability” in *Equitable Debenture Assets Corp. Ltd. v. William Moss Group Ltd. (1984)*: '*I think that if implementation of part of a design requires work to be carried out on site, the designer should ensure that the work can be performed by those likely to be employed to do it, in the conditions which can be foreseen, by the exercise of the care and skill ordinarily to be expected by them. If the work would demand exceptional skill, and particularly if it would have to be performed partly from scaffolding and often in windy condition, then the design will lack what the experts in evidence described as “buildability”*'. Therefore, “buildability” was a

reasonable and foreseeable factor of considerations that should be allowed for in design (Powell and Stewart, 2002).

### **3.2 Design Responsibility for “Buildability” - Architect / Engineer (A/E)**

From the very beginning when a property developer wishes to develop a property, Architect / Engineer (A/E) is most likely the first professional to be employed. In Hong Kong, A/E’s professional practice is also subject to the statutes, which is mainly the Building Ordinance (BO). It imposes on professionals the statutory liabilities of design and construction supervision (Wong and Chan, 1997). Specifically, A/E acting as a designer is under a duty to perform conceptual and detailed design. He inevitably exposes himself to the liabilities relating to any incompetent designs leading to “buildability” problem. These include the unworkable engineering design to which others follow (Pheng and Chan, 2001). Some of the potential liabilities of design for “buildability” are discussed below.

#### **3.2.1 Selection of site**

“Buildability” is significantly affected by the site conditions and the extent of building assembly to be carried out (Ferguson, 1989). Before performing the design work, a site should be chosen which is suitable for the proposed works. Case law has established that a designer owes a duty for ensuring the suitability of sites including (Powell and Stewart, 2002):

- measuring the site
- ascertaining the nature and properties of the ground below the site
- considering the likely effects of the proposed works on the ground conditions
- considering the effects of non-physical constraints on building, such as planning requirements

#### **3.2.2 Selection of materials**

The suitability of materials would affect the ease of construction. Designers should use suitable materials and plant which are needed normal site assembly methods and sequences (Adams, 1989). Likewise, as an implied warranty of building contract, materials and products to be employed should be appropriate for the project’s purposes and be of good quality.

#### **3.2.3 Novel design**

Novel design refers to untried or experimental design where only little experience has been gained in the profession. Liabilities would arise due to uncertainty in the practicability and “buildability” of new concept (Powell and Stewart, 2002). In *IBA v. EMI & BICC (1980)*, the designers were held negligent because of their wrong design assumption leading to the collapse of a cylindrical television mast. It was held that as the designer had clearly been briefed of the requirements and relied on, the prudence was required even for pioneering design ‘which was at and beyond the frontiers of professional knowledge’ (Hodgin, 1999).

#### **3.2.4 Continuing duty of care**

A designer is required to review his design when situations occur, e.g. deficiency of design found. It is also the architect’s duty to check if the designs do work in practice. As such, if a designer, after inspecting works, discovered that his design would no longer be buildable, he/she should correct it accordingly and the duty should continue until the stage of practical completion.

#### **3.2.5 Delegation of design**

Contractual obligation may be transferred to others in 3 ways: by assigning the benefit of the contractor, by novation of the contract or by sub-contracting (Hodgin, 1999). Yet, liabilities of negligence would not be absolved simply by the fact that the design had been delegated to other specialists if there are no express provisions for so doing in the engagement contract with the client (Powell and Stewart, 2002). Therefore, A/E should not delegate any major area of the design which had been expected to be done by him.

### **3.2.6 Seeking advice on construction**

Even though the overlapping of design and construction does not appear in traditional procurement system, seeking advice during design stage from those who are knowledgeable about site operations will definitely be helpful and useful. The practice could enhance the “buildability” of design so as to escape the liabilities. In any case, an A/E cannot argue too far with the fact he has no practical knowledge in construction.

### **3.3 Design Responsibilities for “Buildability” – Contractor**

Traditionally, contractor merely plays the role of constructor to build in accordance with the design documents provided by the project design team. The A/E has long been considered accountable for the problematic issue of “buildability”. Yet, would the constructors transforming design concept into reality escape from such responsibility?

#### **3.3.1 Duty to warn**

In the *Equitable Debenture Assets* (1984) case, the contractor was held owing a duty to inform the architect of the obvious design defects or matter of “buildability”, as implied in contract and in tort. The liabilities of builders are of a wider scope in that a contractor was once found owing a duty to warn his house owner of the bad design. To discharge the duty to warn, the contractor should give significant warning enough to draw attention of the person being warned and allow him to make the decision.

#### **3.3.2 Fitness for purpose and Reliance on others**

Generally, it is an implied term that the works of contractors, not the design, should be carried out to fit for the purpose of a building. In addition, a contractor cannot entirely rely on tender documents to carry out his works, as the House of Lords had once held that the plans and specifications prepared by the client’s engineer did not warrant that the project (a bridge) could be built (Cornes, 1994).

## **4. Design-build Procurement System**

Design-build (D&B) procurement system is a method which integrates design and construction and as defined by Masterman (2002): *‘an arrangement where one contracting organization takes sole responsibility, normally on a lump sum fixed price basis, for the bespoke design and construction of the client’s project’*. The contractor in D&B system is no longer in charge of construction only. Instead, it takes over all the management, design as well as actual site works of the project. As the traditional roles of architect fade out, the lines of responsibilities and accountability are made clearer because the design and construction are undertaken by one party, highly buildable design can be certain.

### **4.1 Benefits of “Buildability”**

Chan and Chan (2001) had confirmed the most significant benefits and drawbacks of D&B system. On the issue of “buildability”, contractors’ responses in the survey conducted in Hong Kong are that contractors considered D&B projects provided a chance for them to learn from architect’s experience in design and improve their capabilities to bridge over design and construction. Traditional procurement system does not provide any opportunity for contractors to gain design expertise.

### **4.2 Some Legal Observations**

#### **4.2.1 Duty of due care or guarantee for a result**

A constructor is required to construct a building fit for the purpose intended for. By the same token, under a D&B contract, the contractor even though he is also responsible for the role of the designer, should have the same implied obligation as a constructor does to satisfy the expectation of “fit for purposes”, if no express obligations were made to the contrary (Cornes, 1999). However, upon

request and protest from Hong Kong contractors, the liability of “fit for purposes” was reduced to the standard of ‘exercise reasonable skill and care’ as required of design consultants.

#### **4.2.2 Certification by architect**

When it comes to the end of the project, it is the architect who issues Final Certificate under a building contract. The Certificate under the Joint Contract Tribunal (JCT) standard form of building contract represents a conclusive evidence of the architect’s satisfaction of works according to contract requirements in respect of only those specifically reserved for the architect’s opinion. The court ruled in an English case *Crown Estate Commissioners v. John Mowlern and Co. (1994)* that the Final Certificate issued under the JCT80 building contract has much wider implications. The Certificate signifies the architect’s total satisfaction with all the works in compliance with contract requirements as to quality of materials and workmanship, including those not specifically reserved for the architect’s opinion (Chan and Chan, 2000). Under the D&B system which blurs the responsibilities of designer and constructor, the design liabilities shared by the architect and constructor are not clear. With the architect and contractor under one roof in D&B system, if self-certification by the Architect does not worry the developer or employer, consumers should have the right to query the reliability (Chan and Chan, 2000).

#### **4.1.3 Statutory roles under existing building control system**

In Hong Kong, a property owner planning for any building project shall appoint an Authorized Person (AP) who can be an architect/engineer/surveyor registered under a professional licensing system known as ‘Registration of Authorised Persons and Structural Engineers’ under the BO. Being a client representative as usual, the AP is concurrently a ‘legal agent’ of BA to oversee the project from submission of plans to completion certification to ensure the developments fall within the requirements of relevant regulations. Under Section 4 of BO, an AP is required to: (1) supervise the carrying out of building works; (2) notify the BA of any contravention of regulations in carrying out the works approved; and (3) comply generally with BO.

In view of these statutory duties imposed on the AP, it is found that some of their roles (for example site supervision) are coincided with those of contractor’s. With a D&B contract, no doubt, together they will resolve any design problem relating to “buildability”. However, contradictions would become apparent because the responsibilities that are entailed in their jobs could not be clear cut from each other. Further, as A/E is under the employment of D&B contractor, it is hard for him to discharge his statutory duties as a ‘statutory agent’ of the BA (Chan, 1998). Dilemma situations would include (Chan and Chan, 2000):

- during negotiations to obtain approval for the building plan with government, the AP may be forced to compromise the user-client’s requirements; and
- when work is carried out on site, the AP’s statutory duty to report to BD of the contractor’s breach of regulations will have conflicts with his duty to his employer (i.e. the contractor) .

## **5. Control System on “Buildability”**

### **5.1 Singapore Experience**

Singapore is the first country to formulate guidelines for quantifying “buildability” and make it mandatory for building developments under its Buildable Design Appraisal System (BDAS). Under the regulations, Building Plans submitted to the Building Construction Authority (BCA) should have fulfilled the minimum “buildability” requirement, i.e. the Buildability Score of the proposed development had been achieved, before grant of approval. It is the Building Control (Buildable Design) Regulations of the Building Control Act which govern the implementation of the “buildability” in Singapore (Lam, 2002). The substantial impacts on developers and various professionals include shifting of liabilities resulting from the obligatory requirements that must be fulfilled before building plans are approved. Under the Act, statutory duties of the involved parties are of wider extent. For the client, he has to submit Buildability Score details with endorsements and declarations of all the Qualified Persons (QP) to the Commissioner of Building Control together with

the proposed building plans; and submit as-built Buildability Score within a time limit upon completion of building. It is the client who is to ensure the compliance with the minimum score (Pheng and Chan, 2001). Apart from assessing the applicability of the legal requirements, the QP is also required to declare and submit application form with Buildability Score calculated for the proposed building works and structural works. Upon completion, the QP should submit the as-built Buildability Score within a time limit. Although contractor does not directly involve in design, it is suggested that he still owes a duty to warn the architect and employer to fulfil the Buildability Score requirements.

## 6. Conclusions

This paper has investigated the design responsibilities of Architect / Engineer and contractor under the traditional procurement method and D&B system. In particular, the concept of “buildability” is discussed together with the design liability the parties involved in a construction project. Being the first country that quantified design “buildability” and developed assessment system i.e. Buildable Design Appraisal System (BDAS) for statutory enforcement, Singapore has provided one model to represent the abstract idea of “buildability” and increase their incentive for ease and efficiency of construction. The paper has also studied the legal issues that could arise from the D&B system, including conflicting duty to warn for architect and D&B contractor, duty of due care and skill or fitness for purpose and unsatisfactory statutory control in Hong Kong and Singapore. In view of the unsettled problems, further in-depth analysis on the legal issues and management approaches is required for resolving the concerns with responsibility of design for “buildability” in the D&B procurement method.

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