

# Are You a Mind Reader, Design-Builder?

## Observations on Employers' Behaviors to Variations in Public Projects

Anna Yuh-Ming Yan

**Abstract**—Design-Build(D&B) contracts, compared with traditional Design-Bid-Build(D-B-B) contracts, are regarded as a total accountability style of contracting, with everybody on the same team. For public projects, D&B is a kind of relatively low risk procurement option for the employer, in terms of cost and time. As the stages of design and build can be carried out in parallel by the same party, the liability of design errors has been casted on the contractor. Therefore it is found the entitlements of variations in D&B projects are less than D-B-B projects.

In this paper, the D&B projects completed between January 2010 and March 2015 were explored. There were 402 D&B projects among 7,082 civil engineering contracts in this period of time. It revealed that the main factors of variations of D&B projects in the past 5 years in Taiwan may be grouped as the changes of the employers' requirements in design phase and the change orders in construction phases.

The analysis of the factors of variation indicated the importance of the management of variation through the well preparation of employers. It is found it could be a risk related to design and quality, particularly if the employer's requirements were not properly gathered and if the design criteria were not properly established.

By reviewing the recent D&B projects, this paper is devoted to develop the knowledge of the trends, pros and cons of the practices in Taiwan. It is hoped the lessons learned bring the attentions to the importance of well preparation of employers in D&B projects.

**Keywords**—Design-Build (D&B), variation, employer's requirement, change order

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To understand the past, to observe the present and to predict the future will provide higher chances of achieving goals by generating better plans based on proper estimates. Prevention is better than cure, and, 'Good management is the preventive medicine of dispute.'(Hellard 1988 [2]). However, whether small or large, construction projects inevitably depart from the original tender design. Variations come from many small influences and yield a range of values on a particular activity. Variations may include alterations to the design, alterations to quantities, alterations to quality, alterations to working conditions, alterations to the sequence of work, and variations may also be deemed to occur if the contract documents do not properly present the works actually required.

Design-Build(D&B) contracts, compared with traditional Design-Bid-Build(D-B-B) contracts, are regarded as a total accountability style of contracting with everybody in the same team. For public projects, D&B is a kind of relatively low risk procurement option for the employer in terms of cost and time. As the stages of design and build can be carried out in parallel by the same party, the liability of design errors has been casted on the contractor. Therefore it is found the entitlements of variations in D&B projects are less than D-B-B projects.

D&B projects can vary depending on the extent of the contractor's design responsibility and how much initial design is included in the employer's requirements. Nevertheless, the level of design responsibility and input from the contractor is much greater on D&B projects than a D-B-B contract with a contractor's designed portion.

In D&B projects, variations with extension of time and/or cost plus reasonable profit may be rooted from the events caused by employers and/or changed conditions. However, if the employer's requirements from which the contractor prepares the design have ambiguities or omissions, the need to change the design to accommodate new or clarified employer's requirements may result in alterations. Could these alterations be entitled variations according to the contract? It is a frequent dispute between parties while surprisingly few studies have so far been made.

In this paper, current practices of public D&B projects in Taiwan were observed. The analysis of the factors of variation indicated the importance of the management of variation through the well preparation of employers.

## I. Introduction

*'If we could first know where we are,  
then whither we are tending,  
we could then better judge what to do and how to do  
it.'*

Abraham Lincoln [1] said.

## II. Observation

In this paper, the D&B projects completed between January 2010 and March 2015 were explored. There were 402 D&B projects among 7,082 civil engineering contracts in this period of time according to the data of PCMIS. Within 402 D&B projects, there were 183 projects experienced variation procedures and therefore accounted for 410 variations in total. It was found the projects employed by the state-owned enterprise Taiwan Power Company ranked as the highest frequent government agency, with 92 projects experiencing variation process. There were 226 variations for the 92 projects employed by Taiwan Power Company; rating more than half in terms of the numbers projects with variations. Majority (72 projects, with which were 185 variations) were occurred in electricity transmission projects. Regarding the factors, 71 variations were for change orders in construction phases, 12 variations were initiated by the contractors for the adjustments of the drawings according to the site, 9 variations were for the changes of the employers' requirements, and some for other events.

On the other hand, when reviewing the 410 variations among the 402 D&B projects, it was found 95 variations (presenting 23%) were occurred for the changes of the employers' requirements, 89 variations (21%) were conducted by the changes orders in construction phases, and 37 variations (9%) were initiated by the contractors for the adjustments of the drawings according to the site. It revealed that the main factors of variations of D&B projects in the past 5 years in Taiwan may be grouped as the changes of the employers' requirements and change orders in construction phases.

In terms of the adjustments of contract prices and time, it was found the amounts of payments and the periods of time were topped up and extended for all of the 402 D&B projects. The average percentage of the adjustments of contract prices for all these projects was 7.5%, while the average percentage of the extension of time was 24.6%. As the figures may indicate, if focusing on management of the changes of the employers' requirements and change orders in construction phases, the project team could plan for and monitor the resulting variations in expense and time. It is likely to minimize the impacts of the variations of design & build projects could be.

## III. From Variations to Claims

### A. Three categories of claims

According to Bramble and West, [3] there are three claims that design-build teams generally level against the government. First, the government may be liable to the team for active interference in its effort to complete the project. In *Pitt-Des Moines, Inc.*, ASBCA 42838,96-1#BCA para. 27, 941 (1995), the contractor prevailed on its differing site conditions claim because the actual wall thickness of the building differed from what the contractor gleaned from government-supplied drawings. It is held that the specific risk shifts to the government when it provides information that it intends the contractor to rely on.

A second type of claim for which the government may be liable to the project team is for delayed, withheld, or restrictive approvals. The factual situation typically occurs when the project employer is forced to make decisions regarding the course of construction and is unable to, refuses to, or makes decisions that hinder the design-builder's ability to complete the project. This is the further point which needs to be clarify later in this paper.

Finally, the government may be liable to the design-build team for damages resulting from any warranties the government makes regarding the project. Under the Spearin doctrine, the government is deemed to warrant the design information that it provides as accurate and suitable for use. Spearin doctrine, *United States v. Spearin*, 248 U.S. 132 (1918), indicates that a contractor is not responsible for defects in the plans and specifications furnished by the employer. In essence, the employer impliedly warrants that the plans and specifications are accurate and that the employer may be liable to the contractor for any damages resulting from the defective plans and specifications. In *M.A. Mortenson Co.*, ASBCA 39978, 93-3#BCA para. 26, 189 (1993), the board found that because the government had made certain warranties, the contractor should not shoulder the design risk all on its own.

### B. Variations

Variation comes from many small influences and yields a range of values on a particular activity. Geant and Wieliczko[4] agree that the contractor's money and time entitlement in respect of a variation will be particularly appropriate under a design and build contract, where the nature and impact of an instructed variation can be particular uncertain.

To manage variations, Meyer *et al.* suggested that a better approach is to account for variation during project planning and build in buffers at strategic points in the project—for example, increased capacity or budget reserves. Top management must respect those buffers and avoid treating them as bargaining chips to be negotiated away. [5] That is why in this paper would like to explore the factors contribute variations of D&B projects specifically.

### 1) The changes of the employers' requirements

Design and Build is a relatively low risk procurement option for the employer, in terms of cost and time. There can be a risk related to design and quality, particularly if the employer's requirements were not properly gathered and if insufficient time went into examining the contractor's proposal.

D&B projects can vary depending on the extent of the contractor's design responsibility and how much initial design is included in the employer's requirements. Nevertheless, the level of design responsibility and input from the contractor is much greater on design and build projects than a traditional contract with a contractor's designed portion.

One of the most controversial aspects of design-build is the quality and performance of the design and construction,

according to the scope-of-work clause in the contract. It is said, majority of the employer want as much work as possible for the payment, whereas the design builders want to do as little as possible for their own interests. Therefore it is often to see the employers try to define the scope as broadly as possible; in contrast, the design-builders seek to define specific tasks, with everything else being an "extra". [6] An employer who feels that a design-builder over-sold and under-delivered is likely going to be unsympathetic to explanations about how certain costs and work were outside the scope of the guaranteed maximum price and require additional compensation. [7] Once the employer trying to alter his needs, the question whether the employers' requirement has been changed is raised.

Without the employer's input, there is nothing to initiate the design-build process. The owner must first identify its needs. This description, typically called "design criteria". This design criteria and information essentially forms the scope of the design-builder's contract. The design criteria must establish, in performance terms, what the employer is seeking to achieve through the project. In preparing the design criteria, the employer must balance between conveying an accurate understanding of what it wants to achieve and avoiding giving so much detail or restrictions that the potential advantages of the flexibility and creativity by the prospective design-builders is unnecessarily limited.

An issue that raises concerns in this area is which changes are within the scope of the design-build contract, particularly if the scope itself is vaguely defined.

There are two controversial judicial cases in Taiwan; the argument lasts until today. The first one is a D&B building project dated in 1992 (Taiwan High Court Kaohsiung Branch Court 1999 First Remanded Appeal No. 6), the court hold that the contractor and employer entered the contract with mutual understanding that the residential building was expected to be able to provide regular functions for living, including the facilities should with the functions to keep the resident safety; according to the interpretation of the court. Therefore the court said even if there was no statement in the employer's requirement or contract document requesting the contractor to provide certain facilities, it was not deemed to variation if the employer claim to set up safety facilities. The scope of work was not regarded as changed if the employer claim these facilities other than employer's requirement.

The second case is Taiwan High Court 2002 Appeal No.21, which was a electricity subcontract in Bali Refuse Incineration Plant. The court hold that the contractor was liable to provide electricity facilities with compatibility with other equipment, also with proper function to meet safety requirements. Even though there was not listed in employer's requirement, it should be regarded as no "extra", that is, the employer's claim was considered within the scope of work according to the court.

## 2) Employer's Design Input, Review, and Approval in Design Development

The employer's input, review and approval during design development must always be coordinated with employer's

requirement, the employer's budget limitations, and the design-builder's contract price.

Many D&B contracts require the contractor to submit its designs to the employer for review or approval. It is a procedure that the employer may point out where the designs fall short of the employer's requirement, and the adjustments shall be applied. However, the employer's power to insist on alterations to drawings via this process is limited to ensuring, according to Geant and Wieliczko[4], that the contractor has followed the contractual requirements in respect of the design that the contractor was, in any event, required to follow. To the extent the employer seeks to insist that the contractor changes the drawings, in a way that involves an alteration outside of the criteria set down in the employer's requirements, then this will amount to a variation.

There is a case in Taiwan High Court (2004 Jong-Appeal No.411), the court hold that the employer provided the basic design and drawings in tender stage for the bidders of D&B project as the basis of evaluation and quotation. The awarded contractor utilized and developed detailed design in accordance with these information the employer provided. The contractor placed orders to purchase materials and equipment accordingly too. However, the detailed drawings and the material purchased were not able to obtain employer's approval for the employer insisted that the contract clause said, 'The contractor may commence work only when the drawings obtaining approval from the employer. If the employer thinks the drawings are not able to meet the requirement of employer, employer is entitled to do alteration. The contractor shall follow the alteration and do adjustments accordingly unconditionally.' It is hold that the words of 'are not able to meet the requirement of employer' indicated the information provided in tender stage. Any alteration done by the employer to fulfill the needs yet override the basic design and drawings in tender stage shall be deemed as variation.

## 3) The changes orders in construction phases

According to design-build proponents, change orders on design-build contracts should be minimal. Some people have further thought that the variations employers instruct should be limited to the change of employer's requirement only. It could be not consistent to the nature of D&B if any employer instructs change order directly. However in practice, the employer does it quite often.

Since the change to the employer's requirements will normally involve only an alteration to the project criteria, rather than a direct instruction to change the described works, it will not necessarily require the contractor to alter the design[4]. If the design provided by the contractor fulfills the altered criteria then there is no need to change its design. However during construction phase it is often to see the employers to instruct to alter what the contractors have done in order to change to what the employers prefer. That could be the reason why Issac and Navon [8] says primary causes of change orders are employer-initiated changes and the errors and omissions in design.

In practice, change order refers to changes that are generated by unanticipated causes, for example, scope changes from the employer, design/technological changes

requested from the employer, design errors, material and operational failures, or by unsatisfactory site conditions. Change orders are common to most projects, and very common with large projects. The employer or its delegated project manager has the authority to finalize change orders. Once a change orders is submitted and approved, it generally serves to alter the original contract such that the change order now becomes part of the contract.[9] It is considered that not all the change orders are liable by employer and caused extra payment to contractors. A construction change directive (CCD) is a kind of change order issued by an employer or its designate requesting a change in the contract scope when there is no agreement on cost.

Often, liability cast on the data provided for the design defect is unclear. In these situations, liability may ultimately be allocated on the basis of which party had superior knowledge or was in a position to resolve or avoid a conflict. Extra risks borne by the design-builder are now frequently being transferred to the contractor in design & build projects where the silver book(for EPC projects) is not suitable. a D&B contract should not be a guarantee that an employer complete immunity for liability to the design-builder for defective design. The information the employer provides to the design-builder at the outset of the design-build process may itself create liability for the erroneous information results in defective design. The employer must provide accurate information on existing conditions and preliminary design data.

#### iv. Conclusion: Variation Management

Variation management is a part of project management and enterprise management systems, but it can also stand alone as an independent system or as part of an integrated system with its focus on the life cycle of project itself.

Quite often the problems in the employer's requirements are due to the lack of project preparation before the launch of tenders and the resulting lack of precision of the employer's requirements. Instead of tackling this issue by improving the quality of the project documentation, sometimes employers have simply chosen to adopt the regime of design responsibility of the silver book by allocating that risk to the Contractor. The problem is that they did so without allowing sufficient time at tender stage for the Contractor to scrutinize the employer's requirement and certainly without accepting the cost premium attached to this significant risk. The better practice of design-build is clearly articulate its requirements in some performance terms or criteria.

In addition to the performance requirements, it is extremely important to document limitations on costs, the use and condition of the site, and time as these are some of the most fundamental aspects of the transaction.

People always think construction projects are with complexity and many unforeseen uncertainties. That is true especially in D&B projects. In this paper, from the observations of previous cases it found the primary factors of variations rooted from three sources: (1)The changes of

the employers' requirements; (2) Employer's design Input, review and approval in design development; and (3) The changes orders in construction phases. The finding is interesting because all of them are concerning employers' behaviors and the liabilities/entitlements of the parties drawing from the contract document. Therefore, the well-preparation of employers and contractors before entering contracts is vital. The best allocation of risks between parties and the concept of partnership are important too. It is hoped that the lessons learned regarding well preparation substantially may bring the attentions to all D&B projects participants.

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About Author (s):



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