

# **"DESIGN AND BUILD" IN COMPARISON WITH THE TRADITIONAL PROCUREMENT METHOD AND THE POSSIBILITY OF ITS APPLICATION IN THE CROATIAN CONSTRUCTION INDUSTRY**

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## **Abstract**

A considerable part of construction projects in developed countries are executed by method of procurement known as "*design and build*" which is the main member of the integrated procurement systems.

These methods of procurement appeared as an alternative to traditional, separated methods where the client endeavours to ensure the single-point responsibility for the design and construction of the project. The direct contact between the two contracting parties, enabling misunderstandings to be minimised and procedures to be simplified, is considered as one of the main advantages of "*design and build*".

Research carried out at the end of the year 2007 indicates a low development of the Croatian construction industry regarding the implementation of modern, alternative procurement methods, emphasising the need for improvement of this area of project management.

The paper describes the basic characteristics, the project phases and the possibility of implementing *buildability/constructability* concept in projects being conducted by "*design and build*" procurement method.

The possibility of application of "*design and build*" method in the Croatian construction industry is explored.

**Keywords:** *design and build*, traditional procurement method, procurement, buildability, constructability.

## **Introduction**

A considerable body of opinion within the construction industry has suggested over many years that the traditional separation of the design and production functions within the construction process has been primarily responsible for a general lack of consideration given to the necessary and vital integration between project phases. Too often the propensity for improvement is lost because construction is thought of as little

more than a routine production function almost deliberately separated from project planning and design. Fundamentally, the philosophy, systems and approaches traditionally in use do not lend themselves to the consideration of alternative design, construction and managerial procedures (Griffith and Sidwell, 1995).

Many of today's construction and engineering projects are very costly and highly complex, employing new materials and technologically advanced construction methods. Typically, demands are being made upon the construction process not just in terms of time, cost and quality, but also in those of project organisation, management and procurement. Prior to the mid-1980s the mainstream of the construction industry in developed countries has followed traditional methods of procurement. Many clients today, however, are increasingly dissatisfied with the traditional approach and its operational characteristics and actively seek alternative methods of procurement, organisation and management to meet their increasingly complex demands.

One consequence of the above has been the global development of new, alternative procurement methods, which can be categorized, by the way in which the interaction between the design and construction of the project is managed, to integrated procurement systems, management-oriented procurement systems and, in more recent times, partnering.

### **Main characteristics of *design and build* procurement model**

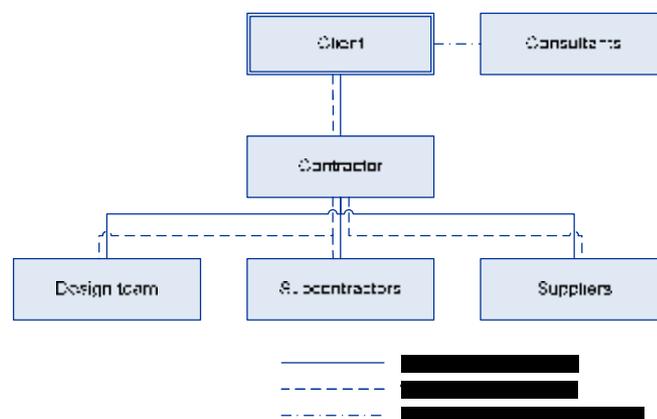
The category of integrated procurement systems incorporates all of those methods of managing the design and construction of a project where these two basic elements are integrated and become the responsibility of one organisation, mostly, but not always a contractor.

The *design and build* procurement system is the main number of the group. The principal variants are *novated design and build*, *package deal*, *develop and construct* and *turnkey* methods of procurement.

We can define the *design and build* procurement method as:

*"An arrangement where one contracting organisation takes sole responsibility, normally on a lump sum fixed price basis, for the bespoke design and construction of a client's project."* (Masterman, 2002)

The project organisation structure for *design and build* is shown in Figure 1.



**Figure 1** Project organisation structure for the *design and build* procurement system

Research has suggested that *design and build* contractors organise their activities in three different ways (Rowlinson, 1987):

- Pure *design and build* - here, the contractor strives for a complete and self-contained approach where all the necessary design and construction expertise resides within one organisation that has sufficient resources to complete any task that arises. In such organisations, all aspects of design and construction have the capacity to be highly integrated.
- Integrated *design and build* - in this form, a core of designers and project managers exists within the organisation, but this type of contractor is prepared to buy in design expertise whenever necessary. Although more effort is needed to integrate the internal and external members of the *design and build* team, in-house project managers are employed to co-ordinate these functions.
- Fragmented *design and build* - many contractors, both large and small, and including national builders, operate a fragmented approach to *design and build* projects, whereby external design consultants are appointed and co-ordinated by in-house project managers whose other main task is to take and refine client briefs. Under this regime, many of the integration and co-ordination problems of traditional approach are likely to manifest themselves along with some role ambiguity among the professions as they come to terms with the builder as leader of the design and construction team.

## **Advantages and disadvantages of the method**

### **Advantages**

1. The single point of the contract between the client and the contractor means that the client has the advantage of dealing with one single organisation that is responsible for all aspects of the project. Accordingly, the need to commit resources and time to contracting with designers and contractors separately is significantly reduced.
2. Provided that the client's requirements are accurately specified, certainty of final project costs can be achieved and this cost is usually less than when using other types of procurement systems.
3. The use of integrated procurement systems enables design and construction to be overlapped and should result in improved communications being established between client and contractor. These two characteristics enable shorter overall project periods to be achieved and project management efficiency to be improved.
4. The strategy enables an integrated contractor contribution to the design and project planning. Traditional procurement has often been criticised for its inability to integrate the separate design and construction functions and impossibility of the contractor becoming involved sufficiently early in the procurement process to make any significant contribution. *Design and build* provides the necessary multi-disciplinary approach and integration because it forms designer-contractor team at early stage in the process, bringing all the participants onto the same side.

### **Disadvantages**

1. Difficulties can be experienced by clients in preparing an adequate and sufficiently comprehensive brief. As a result of insufficiently defined client's

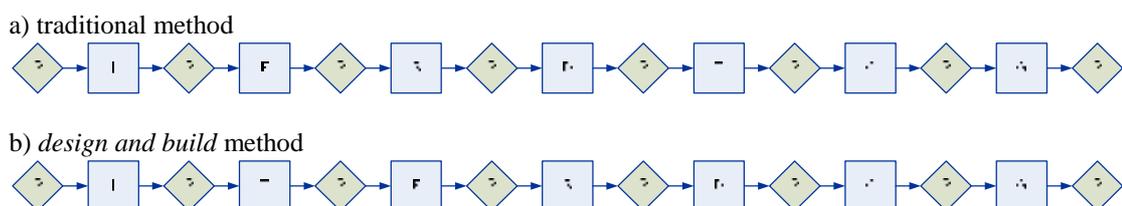
- brief which does not communicate his precise wishes to the contractor, great difficulty can be experienced in evaluating proposals and tender submissions.
2. The client is required to commit to a concept design at an early stage and often before the detailed designs are completed.
  3. The absence of a bill of quantities makes the valuations of variations extremely difficult and restricts the freedom of clients to make changes to the design of the project during the post-contract period. Bids are difficult to compare since each design will be different, the project programme will vary between bidders and prices for the project will be different for each different design.
  4. Relatively fewer firms offer the *design and build* service so there is less real competition. The performance of *design and build* contractors is subject to considerable variation dependent upon whether they are pure, integrated or fragmented organisations.
  5. Although well-designed and aesthetically pleasing buildings can be obtained using this method, the client's control over this aspect of the project is less than when using other methods of procurement.

### ***Design and build project phases***

The project life cycle defines the phases that connect the beginning of a project to its end. In the literature we can find different approaches to the project life cycle model. On the basis of a comparative analysis of seven different approaches to project life cycle models, W. Hughes (Hughes, 1991) has made the suggestion of dividing the project into seven phases which are differentiated by separate decision points:

1. Inception stage (Label I)
2. Feasibility stage (Label F)
3. Scheme design (Label S)
4. Detail design stage (Label D)
5. Contract stage (Label T)
6. Construction stage (Label C)
7. Commissioning stage (Label G)

The specificity of Hughes's identification phases in terms of carrying out the project is that it is possible to implement them in a different sequence, depending on the project procurement method. The sequence of the phases in construction projects using traditional and *design and build* procurement methods is shown in Figure 2. The basic difference between these two procurement methods is that in the *design and build* method the contractor is chosen earlier. In this case, the documentation used for selecting the contractor is very different. The phases are divided decisions in the project which present the results of individual phases.



**Figure 2** *The sequence of the phases in construction projects using a) traditional method, b) design and build method (Hughes, 1991)*

## Implementation of *buildability/constructability* concept

*Constructability* (term used in USA) or *buildability* (term used in GB) are terms specific to the construction industry and they represent a management concept which has been developed by the construction industry in the past 30 years.

Construction Industry Institute Australia defines "*constructability*" as:

*"a system for achieving optimum integration of construction knowledge in the building process and balancing the various project and environmental constraints to achieve maximisation of project goals and building performance"*  
(Griffith and Sidwell, 1995).

It is clear that the method of procurement has a profound influence upon the potential for constructability in modern construction projects. It is frequently suggested that bringing the whole construction process under a single point of control that is directly responsible to the client can achieve greater overall effectiveness and integration as well as better constructability. *Design and build* is one form of procurement directed explicitly towards this objective.

From the client's viewpoint, constructability, in practical terms, is concerned with reducing project uncertainty and risk through increasing efficiency in the design and construction processes, simplifying contractual arrangements and improving project organisation and management. Constructability, as a concept throughout the total building or engineering process, has a number of functional aims and *design and build* procurement has the functional ability to fulfil some of them (Table 1). Viewed from this perspective, *design and build* procurement can certainly make a positive contribution towards improving constructability (Griffith and Sidwell, 1995).

**Table 1**      *Design and build: functional ability to fulfil aims of constructability*  
(Griffith and Sidwell, 1995)

| <b>Constructability:<br/>functional aims</b> | <b><i>Design and build:</i><br/>functional ability</b>   |
|--|--|
| <b>Simplified contractual arrangements</b>   | Simplifies contractual arrangements: the contract is between the client and the contractor, with total responsibility given to the contractor; and the contractor is responsible for all subcontractors and suppliers. |
| <b>Integrated design and construction</b>    | Promotes an integrated design and construction team in the form of the main contractor. Encourages professionals to work towards the real interests of the client.   |
| <b>Improve communication</b>                 | Client-contractor single link and integration of design and construction improve communication between building or engineering team members.   |
| <b>Increased operational efficiency</b>      | Client knows at any time who to contact, i.e. the contractor. Contractor can respond quickly to client needs.  |
| <b>Reduced project duration</b>              | Significant savings in project time are possible through overlapping design and construction aspects. Pre-construction procurement time greatly reduced and earlier start on site is possible.                         |
| <b>Reduced cost</b>                          | Client knows, within a reasonable degree of accuracy, the total financial commitment before commencing work on site. More rapid procurement also makes cost saving.  |
| <b>Increased performance</b>                 | Detailed brief (employer's requirements) and contractor's proposals set out the detailed specification for design workmanship, materials and performance.  |
| <b>Minimal project changes</b>               | Detailed brief reduces likelihood of project changes. If variations occur, contractor can respond quickly and directly to client.  |

## **The application of the construction project procurement methods in the Republic of Croatia**

The Croatian construction industry also faces a similar problem of there not being enough connection between the different project phases. Traditional methods (*design–bid–build*) are mainly used when negotiating construction projects and the contractor is usually not involved in the design phase. This results in their specialist knowledge and experience not being used as much as it could be. The weak integration of the main stakeholders and project phases has a negative influence on the successful outcome of the project.

Research which was carried out in 1996 in the Republic of Croatia on a sample of 150 construction projects demonstrated that 66% of the projects went over the planned deadline, and 17% went over the starting budget (Radujković, 1997). Further research in 1998 did not show any improvement – on the basis of a sample of 333 construction projects, it was noted that in 78% of the projects an average went over the deadline for 60%, and that in 81% of the projects an average went over the budget for 32% and this solely in the construction phase (Burcar, 2005).

Considering that construction projects are carried out in the Republic of Croatia mainly according to the traditional method, we can relate these aforementioned results to this particular procurement method. According to research that has been carried out on risk sources in the Republic of Croatia, it is visible that dominant part of the internal construction project risks make those related to management, design documentation, human factors, supply and logistics and contracts (Radujković, 1999, Car-Pušić 2004). A possible way of responding to these risks is the proper choice of procurement methods in construction projects.

At the end of 2007, academic research in the form of a case study about construction project procurement methods was carried out in the Republic of Croatia. Research was carried out on five construction projects, which were elaborated in detail through the carrying out of interviews with all the main stakeholders involved in the construction – the client, the designer, the main contractor and the supervising engineer. The method of semi-structured interviews was used. The questions were aimed at providing an account of project development throughout the phases, with a special focus on the relationships and problems associated with the aforementioned participants.

One of the main results of this research and qualitative analysis was the conclusion that the dominant procurement method used in construction projects is the traditional method. This demonstrates the tardiness of the Croatian construction industry in terms of implementing new, contemporary procurement method which would positively influence the integration of the phases and participants in the project. It would also result in the possibility of realisation of the *buildability/constructability* concept, as has been suggested by global research and practice.

However, in recent times investors have an increasingly visible need for changes to be made to the traditional method, and also that a part of the risk, responsibility and especially the organisational work and financing of the design is taken on by the

contractor. This is one of the main features of the *design and build* procurement method.

At the moment, this mainly involves the contractors taking on the burden of financing and communications with the designers, whilst responsibility for the design and determining the conditions for the design contract remains a question that is solved directly between the client and the designer. Nevertheless, it is visible that clients have become aware of the advantages of a greater connection between the client and designer in the construction phases, thus enabling them a reduction in their work-loads as well as easier communications.

As an initial step towards the use of an alternative procurement method, the improved traditional method in two variants is suggested (for private or for public clients). Afterwards the general improvement measures are also suggested. These measures would have the aim of influencing the wider environment in order to improve procurement procedures.

One of the suggested general improvement measures that relates to the *design and build* method includes making changes to the existing legal regulations, and the development of autonomous regulations that would create a legal framework for the application of new procurement models. These measures would arise from key element of the tender documentation - a form of contract. Globally, a number of systematic autonomous regulations have been developed that proscribe the standardised forms of contract, whose use has become normal practice. In the Republic of Croatia autonomous regulations in the field of construction are very weakly developed, which presents one of the hurdles that are faced in the successful use of different procurement methods.

Changes to the legal regulations relate to the restriction of the use of a pure type of *design and build* model according to the new *Spatial Planning and Construction Act* (in Croatian: "*Zakon o prostornom uređenju i građenju*", NN 76/07). In article 179, item 3 it writes that "*the designer cannot be an employee of the person who is the contractor in the same construction.*" It is suggested that this legal regulation is changed in order to enable the implementation of the project according to a pure *design and build* method.

The results of the research suggest the weak development of the Croatian construction industry in terms of using contemporary, alternative procurement methods and the need for this area of project management to be developed. Research into a sample of selected construction projects in the Republic of Croatia has confirmed the significant influence that the choice of procurement method can have on the integration of the phases and the participants, and as a result, on the ultimate success of the project (Turina, 2008).

## Conclusion

This article has outlined the *design and build* procurement method, which has become a popular alternative to traditional procurement methods in developed countries thanks to its significant advantages. A comparison of the life cycle of *design and build* method with traditional method has been carried out, as well as an evaluation of the possibility of implementing the constructability concept.

It then continues by questioning the possibility of applying this method in the context of Croatian construction industry, based on the conclusions from research about procurement methods in the Republic of Croatia.

Whilst in developed countries significant experience has already been gained in the realisation of construction projects using alternative procurement methods, and these areas are further developing in the direction of implementing new philosophies such as partnership, Croatian construction remains in the phase of almost exclusively using traditional methods.

However, the trend of the faster development of the Croatian construction industry in terms of increasingly complex projects, and the search for quicker and cheaper solutions and achievement of value for money will influence the need for new organisational and management methods. This will have a positive influence in terms of the integration of main project stakeholders and phases, as well as the ultimate success of the entire construction project.

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