

DESIGN AND BUILD PROCUREMENT SYSTEM – CONTRACTOR SELECTION

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One of the contract awarding systems in public sector in Poland is the Design & Build system. In this system, a client concludes a contract agreement with only one company, a contractor, in order to carry out both design and construction of works. While deciding on this form of delivery of a public project, the client is obliged to conduct a single proceeding aiming to select the contractor. In this paper, public works contracts awarded in the D&B system in Poland are analysed, whilst attention was put on the contracting modes and assessment criteria. The results are assessed against the experience of other countries and recommended methods for selection of the Design and Build contractor.

Key words: Design and Build system, public projects, contractor selection.

1. INTRODUCTION

There are two primary stages of delivery of the construction project. The first one is to design a structure, whilst the second one involves the construction works based on the design. In the traditional system, these two stages are separated and represent the so-called Design-Bid-Build system. First the design is commissioned, and once the client knows the final shape of the project, he starts looking for the contractor. There is yet another system, which involves commissioning of both design and construction to one entity. This system is called Design and Build.

Design and Build system is widely used in many countries. The first recorded case of D&B use in the United States was in 1968, and involved delivery of a number of school projects in the American Midwest. Then it became more and more popular in the public sector, to reach the highest level in 1990s, Molenaar et al. [1]. The advantage of this system is a comprehensive project delivery, in which the whole responsibility is taken up by the general contractor. This solution is particularly beneficial for the

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clients who do not have enough experience nor necessary expertise to perform carry out projects on their own, since the contractor is obliged to prepare the project documentation, announce the works, and obtain legal building permits for such projects. This system reduces the risk associated with the design and possible claims for defective, incomplete or ineffective solutions in the documentation drawn-up by the client. It gives the opportunity to design particular disciplines for a particular supplier or to use construction and installation solutions, the contractor has mastered best, and has appropriate equipment to deliver the project, thus reducing the project budget. Out of many reasons why clients choose the Design and Build system, the most important one is the possibility to reduce the time for project completion. The system has also a potential to reduce the overall costs of design and construction, Molenaar and Gransberg [2]. Before all documents are submitted, the contract has already been signed.

Ojo et al. [3] compared the traditional method with Design and Build based on client surveys carried out in Nigeria. 53 projects completed in the traditional system and 15 in Design and Build were subject to survey. Analyses showed that the average cost overrun for the traditional system was 42.6%, whilst only 21.4% for Design and Build. The average time extension for traditional projects was 135.6% while for Design and Build it was only 36.8%. In 78% of Design and Build projects clients were satisfied with quality, whilst in case of the traditional system, the number was only 51%. It should be noted, however, that the use of Design and Build is beneficial provided it is used at certain conditions.

Some specific rules were formulated to determine when Design and Build is an appropriate delivery system. The research shows that it is favoured when there is a well-defined project scope, the design is standard or slightly complex, completion time is important, the quality is standard or slightly higher, the cost is very important, and there is a low or medium project risk, Potter and Sanvido [4].

It is worth noticing, that the method has some disadvantages, too. The most important includes the inability to influence the project in which the client has the best opportunity to specify in details the quality requirements in relation to the construction works. In the case of Design & Build the client depends entirely on the contractor. The functional and utility program, where the client specifies the requirements, in particular, in case of more complex projects, does not allow for an extensive definition of the client's expectations. The risk is high in terms of the quality of deliverables of both the design documentation and construction works. Frequently, the structure of the contractor lacks competitiveness, which results in accepting the first solution at the design stage that meets the minimum requirements of the client. The contractor's actions when developing the design might be limited to the solutions familiar to him and comfortable to carry out.

In a single public procurement procedure, a general contractor is selected. According to Ojo et al. [3]: the Design and Build system integrates all aspects of the project, with the responsibility taken up by only one entity. Ireland [5] describes D&B "as a single financial transaction under which one person or organization designs and builds

to the firm order of the customer. The contract is signed before the building has been defined by full documents”.

This article aims to provide the analysis of the public procurement procedures related to construction works in the Design and Build system in Poland, addressing the experience of other countries.

2. PUBLIC PROCUREMENT PROCEDURES RELATED TO CONSTRUCTION WORKS IN THE DESIGN & BUILD SYSTEM IN POLAND

The Polish public client who wants to carry out a public construction project is required to comply with the Public Procurement Law (Public Procurement Law of 29 January 2004, as amended) [6]. Article 2 of the Law defines the contract for construction works as the construction or the design and construction as stated in the Law of 7 July 1994 – Construction Law (Journal of Laws of 2006 No. 156, item. 1118, as amended) [7]. Accordingly, the client may carry out the project in two ways: either in the traditional way or in the Design and Build system. The former requires the client to award two separate contracts: a service contract which includes development of design documentation, and a contract for construction works. In the latter, one contractor is entrusted both with development of the design and execution of works.

The Polish Public Procurement Law distinguishes seven different modes of awarding contracts for construction works: the basic procedures for awarding contracts are of open tendering and restricted tendering. The client may award contracts by negotiated procedure with publication, competitive dialogue, negotiated procedure without publication, single-source procurement procedure, or by electronic bidding procedure, under the circumstances specified in the PPL. The public procurement procedure is the procedure which may result in concluding the contract agreement for construction works. Selection of the procedure depends solely on the prerequisites and limitations specified in the said Law, and these do not address the project delivery system. In case the client chooses the Design and Build system, the Law does not distinguish any special modes for selection of a contractor.

The analyses of data on awarded contracts provided by the Public Procurement Bulletin [8] show, that in the public procurement market in Poland, 57 368 contracts were awarded in 2010. The vast majority of contracts were the contracts for construction works – as many as 56 810, whilst the contracts for Design and Build amounted to 554 which is less than 1% (0.97%) of all contracts awarded (Fig. 1).

The percentage of the use of the Design & Build system in 2010 in the Polish public sector is insignificant. It was even less in the previous years; in 2008 – 0.54%, in 2009 – 0.70% (Fig. 2). It should be emphasised though, that although the share of D&B is minor, it gradually increases (Fig. 2).

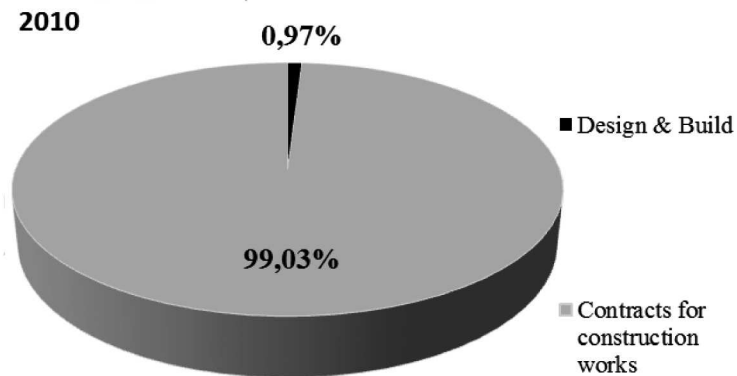


Fig. 1. A share of Design & Build in construction contracts in Poland, 2010.

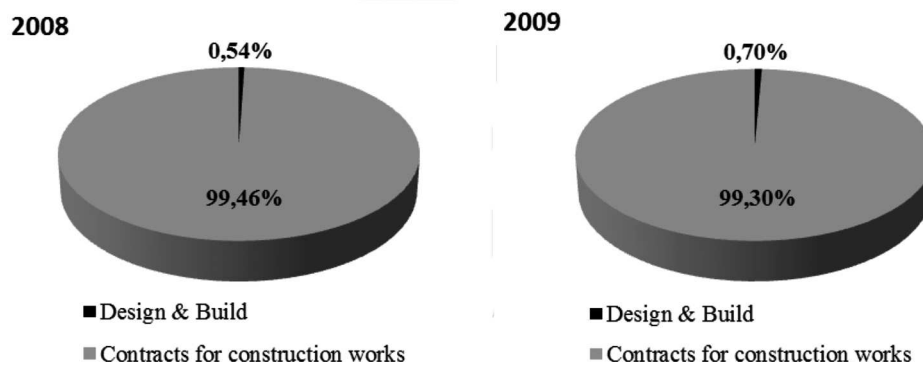


Fig. 2. A share of Design & Build in construction contracts in Poland, 2008 and 2009 respectively.

Then, in relation to the Design and Build contracts awarded in 2010, a list was prepared of the contractor's selection modes applied by the clients. The results are shown in Fig. 3.

Figure 3 shows that the dominant mode of awarding contracts in the Design & Build system is open tendering. In 2010 it was applied in 485 contracts (87%). This is the type of contract awarding, in which, following a public contract notice, all interested contractors may submit their tenders (Article 39 of the PPL). This mode is a one-step competitive mode. The selection of the contractor is usually based on the price criterion (the lowest price). Such a selection criterion was applied in 92% of cases. It is worth noticing that this mode is generally the most popular in awarding public contracts for construction works in Poland regardless of the system of the project performance. The analysis of data from the Public Procurement Bulletins indicates that in 2010 open

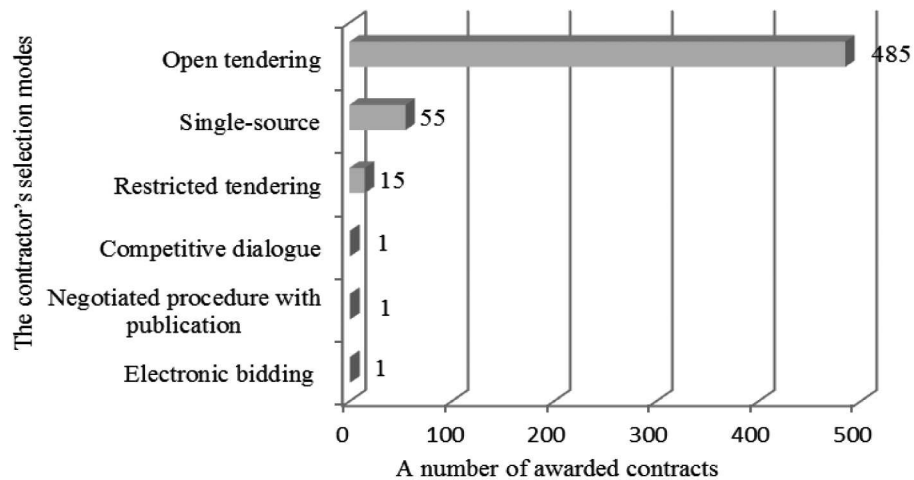


Fig. 3. Contractor's selection modes in Design & Build.

tendering procedures were applied in 84% of all contracts awarded, and the lowest price was used in 91% of all proceedings.

Open tendering and restricted tendering are the basic modes for awarding public contracts for construction works in Poland. The law does not provide for any conditions necessary to make use of these modes, which means they can be applied in any case. However, restricted tendering was applied only in 15 cases, representing less than 3% of all contracts. In this mode (Article 47 of the PPL) following a public contract notice, the contractors submit requests to participate in a contract awarding procedure, and tenders may be submitted by the contractors invited to submit their tenders. It is therefore a competitive two-step mode. Restricted tendering enables assessment of competence of the team that will deliver the project, and only out of the assessed bidders, the one is chosen who presented the best conditions, including the price. Pursuant to Article 51 of the PPL, in order to ensure competition for the second stage, the client shall invite not less than 5 and not more than 20 bidders. The review of these 15 cases referred to the above showed that the number of contractors admitted for tendering was usually limited to a minimum, i.e. five. Only in one case, the maximum number of twenty contractors was admitted. The assessment of contractors authorized to submit a tender should be based primarily on the assessment of competence. In all 15 tendering procedures, the experience constituted the basic criterion for selection of the contractors invited to tender. It was applied as the only criterion in 70% of cases. In the remaining cases, additional criteria such as potential of the staff, third party liability insurance, revenues and financial assets of the contractor were applied. Only up to three assessment criteria were used. In the second stage - the assessment of tenders involved mainly the price criterion. The contractor was selected due to the lowest price in 11 procedures (80%). Only in three procedures additional criteria were used: the deadline

of project completion and technical assessment of proposed solutions, whilst the lowest price was the dominant criterion (the most important). These data are shown in Fig. 4.

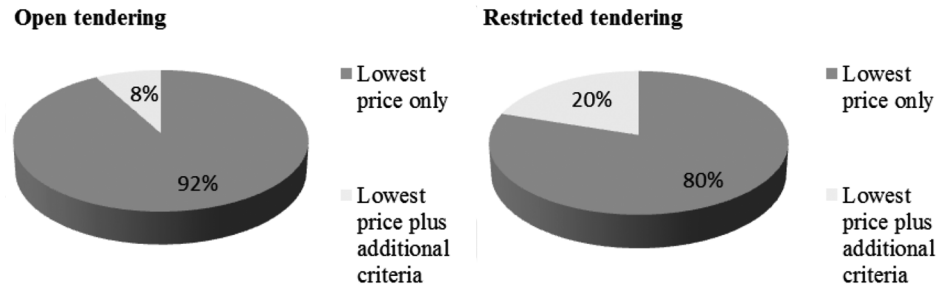


Fig. 4. Contractor's selection criteria in Design & Build system.

3. METHODS OF SELECTING THE CONTRACTOR FOR DESIGN & BUILD USED IN OTHER COUNTRIES

3.1. TYPES OF DESIGN & BUILD PROCUREMENT METHODS

In the countries where the Design and Build system has been successfully used since many years, selection of the best team to carry out the project is particularly important. Because the team is chosen to carry out both the design and construction works, the method of selecting the contractor has a huge influence on the final results. Many authors agree that the selection of the contractor with the lowest price is not a good solution in this case. A multi-criteria assessment of contractors increases the chances for successful completion of the project.

Table 1 shows the basic types of Design and Build procurement methods.

Table 1

Types of Design & Build procurement methods.

Types of procurement methods	Price-Based Procurement	Best Value Procurement	Subjective and Qualitative Procurement
Selection Factors	Mainly tender price	Cost, Qualitative and Quantitative	Subjective and qualitative
Procurement Methods Examples	Open tendering	Restricted tendering prequalification	Sole source procurement procedure Qualification-based selection

The first group of methods is based primarily on the selection of the contractor with the lowest price. The example here can be the widely used open tendering in the Polish legal conditions. In this case, the contractors must meet only the minimum requirements of the client, assessment of their competence shall be made at the same stage as the assessment of tenders and it is zero-one. When selecting the right tender, criteria other than price can be applied; however, as shown by the results, the clients rarely use this option. According to experience of many countries, this method is not recommended for the Design and Build system, MOLENAAR and SONGER [9].

The group of methods based on the criteria of both price and quality, include prequalification tender procedure. Many countries have developed different methods of prequalification, some of which are adapted and intended strictly for the Design and Build system. Prequalification is to some extent the equivalent of restricted tendering, where the first stage is the selection of the contractors, based on their competence.

The last group of methods is based on assessment of the contractor's competence only; this assessment is largely subjective and the price is not the criterion.

3.2. PREQUALIFICATION

Prequalification is a pre-tendering procedure enabling the selection of the most suitable candidates out of those who declare their willingness to participate in the tender procedures – PLEBANKIEWICZ [10].

In practice, there are two types of pre-qualification. Prequalification can mean grouping of the most suitable contractors to perform certain types of projects. Eventually, the so-called standing list is drawn-up. In this case, only the approved contractors can apply to a specific type of project. Such lists are drawn-up in many countries by various government organizations, big companies, but also by private business - Plebankiewicz [10]. The official lists of approved contractors, or their certification by public or private certification bodies, are also provided for in the EU directives. Unfortunately, Poland does not use this procedure. Prequalification may also mean selecting the most appropriate group of contractors to apply for a specific project; the so-called "per project" pre-qualification.

Prequalification, in various forms mentioned above, is particularly recommended in case of Design and Build project delivery. In addition to the standard criteria used in the Prequalification procedures, related mainly to the financial position, technical capabilities, organizational skills, reputation, the clients often apply the criteria specific to this type of contract.

The client in the process of the contractor's selection evaluates design qualities and conditions of its physical implementation. Design and construction should be combined into a single, well-functioning contract. In relation to the companies offering design and construction, considering the quality of the whole contract, three categories of the companies can be distinguished – KOSECKI [11]. Category I – all actions related to the design and construction, highly integrated, are performed exclusively within

the contractor's resources. Category II – within the contractor's resources there is a team of leading designers and construction managers. If necessary, the contractor hires professional designers or managers ensuring an adequate co-ordination of their works. Category III – the client's requirements are interpreted within the contractor's resources, while outside designers are hired, and their work co-ordinated with the specific construction needs. Therefore, one of the essential criteria for Prequalification in the Design & Build system is usually a clearly described category of the company. It is generally accepted that the higher the rating, the lower the risk of failure of the project (in terms of deviations from assumed time, cost and quality results); but the overall offered price is higher at the same time. And the other way round. Category I is assumed to be the highest, KOSECKI and PLEBANKIEWICZ [12].

Another important factor affecting the selection process may be the availability of already constructed and physically completed projects. The client may assess the values of thus built structures. By contracting the design and construction, the client may achieve a relatively short time of project completion due to “overlapping” of design and construction phases. To a large extent it depends on a good co-ordination of design and construction, which in turn depends on the organizational skills and experience of the personnel involved in the project; the leading designers and construction managers. Yet another Prequalification criterion should therefore include people who will be in charge of the project; in other words: the quality of staff.

The criteria the client may apply in selecting of the contractors for delivery of Design and Build projects were proposed, among others, by PALANESWARAN and KUMARASWAMY [13]. In addition to the generally applicable criteria, the authors propose additional criteria related to the specifics of the contract agreement. They are related primarily to the experience in delivery of the particular type of projects and the personnel involved. Both the design team and the construction team are assessed, as well as the elements of co-operation between the two teams.

In the countries where Prequalification is commonly used (e.g. United States, Australia), in many cases there are different rules for the Design & Build system, including assessment of all the entities carrying out the project (designers, contractors). An example here might be the rules developed by the Department of Industrial Relations (DIR) in California [14, 15]. The rules concern for example Prequalification to Design & Build for the contractors, who want to bid on school and community college facilities, or on transit projects, etc.

A sample set of rules for such contractors, who want to bid on community college and school facilities is as follows:

1. DIR's Prequalification questionnaire is sent to the contractors. The questionnaire aims to collect information about the contractors, architects and engineers, who are members of the Design & Build team, as well as other subcontractors involved.
2. Suggested questions about the past projects that the representatives of the Community College and School Districts may ask the former clients of the contractor, as well as suggested procedures of the reference interviews.

3. A sample request for Prequalification of Design and Build contractors.
4. A suggested rating system for the responses provided by the Design and Build contractors and their references.
5. A list of sources of information for verification of the accuracy of the responses to the questions in the Prequalification questionnaire, that can be viewed by a Community College or School District.

Carrying out Prequalification “per project” is generally supported by various mathematical models. Most of them are however intended for the traditional system of design-bid-build – PLEBANKIEWICZ [16]. The models adapted to the Design and Build system, were developed by PALANESWARAN and KUMARASWAMY [17]. Prequalification framework is based on a four-way clustering methodology, which is as follows:

1. “Cluster-1” groups together the directly measurable quantitative subcriteria.
2. “Cluster-2” is established for those qualitative subcriteria, which could be directly measured by matching definitions of equivalent benchmarked datum value.
3. In the “Cluster-3” grouping of qualitative subcriteria, a number of binary “yes/no” type questions will be used to evaluate each qualitative subcriterion.

Thus in “Cluster-3” subcriterion score

$$(3.1) \quad S_s = \left(\frac{TM}{E} \right) x f$$

in which TM=total mark for that subcriterion; E =number of evaluation questions; and f =scale factor (in this proposed model, the scale factor is 5).

4. In the “Cluster-4” approach for evaluating the qualitative subcriteria, each subcriterion is deemed to be measured by a number of evaluation parameters.

The following steps have to be pursued to determine the prequalification scores PS:

1. The model envisages that all the relevant information provided by the interested bidders must be assessed against the corresponding (“identified”) prequalification subcriteria.

Each subcriterion will be assessed in the corresponding clustered evaluation strategy to derive the respective subcriterion score (S_s).

2. The weighted prequalification criterion scores are determined using the following formula:

$$(3.2) \quad (P_c) = \left(\frac{1}{f} \right) \left(\sum_{s=1}^m W_s x S_s \right)$$

In this equation: m = number of subcriteria for the prequalification criterion; W_s = weight of prequalification subcriterion (with weights of all; subcriteria for that prequalification criterion totaling 100); S_s = score of prequalification subcriterion (in a scale of 0-5); and f 5scale factor (in this model, f =5).

3. Then the PS has to be determined for every design-builder using the following formula:

$$(3.3) \quad (PS) = \left(\frac{1}{100} \right) \left(\sum_{c=1}^n W_c \cdot P_c \right)$$

In this equation: n =number of prequalification criteria; W_c = weight for the prequalification criterion; and P_c = prequalification criterion score.

The methodology and implementation of selecting a contracting firm for design-build project was described by Al-Reshaid and Kartman [18]. The pre-qualification process went through three stages:

1. The first stage – grading of general contractors. The general pre-qualification criteria were used: Volume of previous Public Works, Financial Credentials
2. The second stage was carried out by the owner. In this stage, the specific needs and priorities of owner were considered in the two main parts of the process: Technical Evaluation and Financial Evaluation.
3. The third stage of pre-qualification focused on project requirements – experience in design-build projects, experience in the type of project, joint venturing of design and construction capabilities, project control methods used.

3.3. QUALIFICATION-BASED SELECTION (QBS)

With traditional methods of selecting the contractor, it is assumed that all bidders have the same qualifications and are able to complete the project in the same time and quality, which often appears to be not true. The QBS procedures may differ in detail, but the main assumption is that the qualifications of the contractor are assessed in the first place. This is particularly important in case of the Design and Build contracts.

In the United States the federal law enacted the use of QBS in 1972. It was stated that QBS is required to select an architect and engineer. In the United States more than 40 states adapted QBS. When using a two-stage competitive process of the contractor's selection for a Design & Build project launched by the government in accordance with the Federal Acquisition Reform Act of 1996 (Pub. L.104-106), the American Society of Civil Engineers (ASCE) recommends the application of QBS criteria [20, 21].

According to Manoliadis et al. [22] the most frequently used QBS criteria include:

- Professional qualification: education, training, professional licences, relevant experience, and duration of the employment within the company of the key management and technical staff.
- Experience and technical expertise: experience on similar projects and the technical capabilities of the main contractor and subcontractors or subconsultants.
- Capacity: the experience of the company on projects of comparable size and available capacity of key disciplines of the main contractor or the project team to perform the work as scheduled.

- Knowing the location of the construction site.
- Close proximity of the contractor’s offices and staff to the site, in term of response, efficiency and cost.
- Participation of small-to-medium enterprise (SME)
- Other criteria, specific to the project.

There are a number of benefits of the Qualification Based Selection when selecting the project team simultaneously with the design team. The experience of the clients, designers, and contractors provided the characteristics of the team selected in accordance with QBS and helped to identify associated advantages:

- The best team is selected to carry out the project. QBS allows the clients to specify their objectives and selection criteria to be able to select the most qualified team in an open, objective and fair procurement process, thus being transparent in their decisions. The clients say that the lack of a price criterion helps them to control the selection process and to concentrate more on qualifications. Therefore, the clients are able, due to the QBS, to choose the most qualified companies to deliver their projects with high quality designers and contractors. Another advantage is that both the client and the designer take part in selecting the subcontractors.
- Adversarial relations are replaced by co-operation. QBS is an option for clients, designers and contractors to work together for a common goal for the benefit of all parties involved and the project. Transparency makes all actions clear and fair, whilst the alignment of professional services focuses on service and relationships.
- Lower costs of design and construction and higher quality of work. Assembling the team at an early stage provides better predictability of price, schedule, and quality and does not require submitting the design or interim documentation. This continuity from design, through preconstruction, implementation to post construction without submitting the documentation during various phases provides a faster and more comprehensive delivery of the project. Knowing the budget of the project from the very beginning, the project can develop a cost model before the design, and then design based on the cost model. With QBS the client changes the mentality focused on the lowest price, which facilitates the optimal designing and enhances the value within the budget, resulting in the highest quality at the lowest price. This method of “designing to budget” also allows the team to assess alternative solutions or the client’s requirements while keeping the budget.

But the opponents of this method emphasise some disadvantages:

- QBS is based on subjective criteria, and therefore the assessment is not accurate, whilst in turn, subjectivity can result in disputes, appeals and trials;
- The price is by definition not a criterion for final decision, hence the client may not be offered the best price and the contractor may charge additional costs;
- It limits the number of contractors and favours the companies with extensive experience, making it difficult for the new ones to access;
- New companies, with great potential, but little experience do not have a chance to acquire experience, because QBS prevents them access the contracts.

3.4. SINGLE-SOURCE PROCEDURE

The method often considered to be effective in the case of the Design & Build contracts is a single-source procurement. A single-source procurement is a non-competitive process, which involves negotiating with only one contractor. The client contracting the design and construction to the selected contractor depends mostly on criteria such as past performance, technical qualifications and relations in previous projects. Carrying out the project in the Design & Build system, the client is often unable to specify the final shape of the project. Therefore, contracting the design and construction to a trusted, proven contractor, can guarantee that the project will meet the client's expectations. Also in the case of additional works or untypical project, the client may delegate the task to the selected contractor, who has the required resources and capabilities to deliver it properly.

The most frequently mentioned advantages of this selection method, include:

1. time saving, i.e. reduced time required to award contracts;
2. reduced costs of administration, i.e. procurement process reduced to a minimum;
3. the price reflects the highest value.

A single-source procurement is a non-competitive mode of contracting, based on the client's subjective judgment. Thus, its application in the public procurement is very limited.

3.5. THE RESULTS OF THE APPLICATION OF THE SELECTION METHODS FOR THE CONTRACTOR IN THE DESIGN & BUILD SYSTEM

In the countries where the Design & Build system has been used for many years numerous studies have been conducted on the selection methods for the contractor in the Design & Build system and their effectiveness. MOLENAAR and SONGER [9] examined 122 case studies of Design & Build projects among the public clients. There are three categories of the D&B contractor's selection according to the study: (1) price-only; (2) qualification-only; or (3) a combination of price and qualifications. The results show that clients' expectations are best met when contractors are selected in accordance with the third category.

MOLENAAR et al. [1] have analysed 104 completed projects in the public sector in the D&B system. According to the results, the public sector selection of contractors is carried out mainly (67%) through a combination of price and qualifications. Prequalification is yet another key issue in the selection. It was applied in 55% of the cases studied. The fact that 43% of the contracts are awarded in a negotiated manner is due to a lower level of timely completion of the design.

WARDANI et al. [23] studied the impact of procurement method on the project success. Studies were conducted for both Low-Complexity Projects (43 projects – Light Industrial, Multistory Dwelling, Simple Office) as well as High-Complexity Projects (27 projects – Complex Office, Heavy Industrial, High Technology). Procurement

methods were subject to study, such as a single-source, QBS, best value, low price. For Low-Complexity Projects QBS and best value methods seem to be the most beneficial in terms of the price, whilst best value method allows for keeping to schedule. For High-Complexity Projects QBS method results in the lowest cost growth, a single-source selection appears to be resulting in the least schedule growth. For all projects and for all procurement methods performed the quality is similar.

4. CONCLUSIONS

Design & Build system widely used in many countries is very advantageous and highly efficient. The basic condition for its effectiveness is the selection of the best suited project delivery team. The results of the research presented in the article show that public clients in Poland rarely use this type of contracting, and they employ the same procedures that are used for the Design-Bid-Build contracts when selecting the contractor for Design & Build. In 2010, the Polish public clients used a restricted tendering procedure in 87% of cases, whilst in 92% of cases, the only selection criterion was the price. The results of the research and the experience of the countries using the D&B system (e.g. United States) indicate that these are not the appropriate methods. The article briefly discusses the methods deemed most effective and recommended for use in the Design & Build contracts. These methods can be successfully applied in Poland for selecting the contractor in the D&B system, but only by private clients. The Polish public procurement law does not provide for the methods such as QBS or pre-qualification. The alternative for public clients may be the use of restricted tendering, with some kind of Prequalification of contractors. However, this type of awarding contracts in the D&B system, even though it is primary, is not particularly popular in Poland, as shown by the research. It should be emphasised that in case of the D&B system it is appropriate to use other criteria than price, which could definitely improve its efficiency.

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