

# A Study on Performance Analyses of Korea's Bidding and Contract Systems for Public Construction Projects

Beak, Seung-Ho<sup>1</sup> and Kang, Tai-Kyung<sup>2</sup>, Park, Wonyoung<sup>3</sup>, Lee, Yoo-Sub<sup>4\*</sup>

**Abstract:** *Bidding and contract systems are used for public construction projects to select contractors following fair competition principles and to execute national budgets effectively. Many challenges have arisen due to a lack of transparency and fairness and because bidding practices have been luck-based. Few comprehensive or comparative analyses have been conducted on the performance and limitations of bidding and contract systems, and empirical analyses designed to improve policies on and the practice of such systems are lacking. This study empirically analyzed current bidding and contract systems to seek ways of improving them. The study proposes several alternatives to resolve the problems with and irrationalities of the current system: 1) improving bidding and selection systems by changing them from a luck-based price competition into a technical merit- and value-based competition; 2) improving the assessment criteria to meet the current market level of bid and winning prices; 3) adjusting contractual responsibilities and sharing structures to meet the current trend; and 4) strengthening the competitiveness and expanding the social responsibility-based procurement systems of construction companies.*

**Keywords:** *bidding and selection system, contract system, delivery method, public construction project*

## I. INTRODUCTION

### A. Background

The most important tasks in public building projects are ensuring planning quality and performance while providing public facilities efficiently within a given budget and schedule. Public building project managers must undertake thorough project planning and follow a variety of bidding methods and contract procedures in accordance with the size and characteristics of the facilities involved. In particular, construction is an industry that features many unique manufacturing methods. Thus, public building projects must clearly define the roles and responsibilities of stakeholders and select contractors with strong technological and business performance capabilities, while providing objective and transparent bidding and contract procedures as well as detailed operational standards. The procedures, methods, and standards used are collectively called a "delivery system" [6]. Since the 1951 National Finance Act and the Act on Contracts to which the State is a Party (hereafter the "State Contract Law") were established, the

bidding and contract systems have been revised in accordance with economic circumstances, social changes, and relationships between industries. Some schemes, such as the selection criteria for successful bidders, have been revised too often to provide temporary solutions to problems or timely responses to industry requests, creating a vicious cycle [11].

The current bidding and contract system for public building projects selects contractors based on the criteria of a qualification examination and a lowest-bid system. However, this system has been criticized for not ensuring fair competition. Thus, the government is searching for a best value-based comprehensive assessment system by which successful bidders may be selected based on their technological merits and past project performance as well as their bidding price in order to restore public trust in the project ordering and bidding systems for public building projects [4].

### B. Scope and objectives

This study analyzes the problems with existing bidding and contract systems through an awareness survey on the lowest-bid and qualification examination systems, which have been criticized for reducing profitability due to unreasonably low bidding prices and poor construction quality, and provides a better alternative.

Few studies have provided comprehensive and comparative analyses of project performance and the limitations of project delivery methods, including the lack of the empirical data needed for system and policy improvements to the bidding system. Therefore, this study aims to 1) identify the problems with the lowest-bid and qualification examination systems based on empirical data on operational performance and limitations and 2) seek ways to improve the bidding and contract system by comparing and analyzing overseas case studies.

<sup>1</sup>Managing Director, Future Engineering Consultants Co., Ltd, Bangkok, Thailand, apai\_future@yahoo.com

<sup>2</sup>Associate Professor, Construction Engineering and Management Division, Civil Engineering Department, Khon Kaen University, Thailand, narongl.fec@gmail.com/lnarong@kku.ac.th

<sup>3</sup>Project Coordinator, Future Engineering Consultants Co., Ltd, Bangkok, Thailand, minvuthea@gmail.com (\*Corresponding Author)

II. CURRENT STATUS OF THE BIDDING AND CONTRACT SYSTEM FOR PUBLIC BUILDING PROJECTS

A. HISTORY OF THE NATIONAL BIDDING AND CONTRACT SYSTEM

Korea’s bidding and contract system for government projects has been run under the National Finance Act enacted in September 1951. Prior to this act, it was run according to the old accounting law imposed by the Japanese colonial empire as well as the accounting systems used by the US military administration that governed Korea. As the National Finance Act was based on both the Japanese accounting law and US accounting systems, it has been criticized as being unsuitable for the Korean context and construction industry [10].

Since then, a number of trial-and-error efforts have been made to find a bidding and contract system appropriate for Korean circumstances. In December 19, 1961, the National Finance Act was replaced by the Budget Accounting Act, and the State Contract Law was enacted according to the government procurement agreement signed with the WTO in January 5, 1995, which made the contract system independent. Since the National Finance Act, a number of related acts and regulations have been established and revised to improve bidding- and contract-related regulations for government owned projects in an effort to establish systems appropriate for the Korean context. The history of Korea’s national contract systems since the National Finance Act is summarized in Table I.

TABLE I  
History of the National Contract System

Applied period	Description	Note
Jan. 1962–Dec. 1971	· Lowest-bid system	· Introduction of the lowest-bid system
Jan. 1972–Dec. 1975	· Limited average bidding price system (successful bidder is the one closest to the average bidding price among bidders who bid 80% or higher of the reserve price)	※ The first oil shock
Jan. 1976–Feb. 1981	· Lowest-bid system	※ Construction boom in mid-east Asia
Mar. 1981–Mar. 1983	· Limited average bidding price system (revised from 80% of reserve price to 85%)	※ The second oil shock
Apr. 1983–Mar. 1990	· Lowest-bid system + Low price examination system (if bid is less than direct building cost, project manager examines construction qualifications of the bidder) · Limited average bidding price system (for small projects) July 1983–Mar. 1984: less than KRW 3 billion Apr. 1984–Mar. 1985: less than KRW 2 billion Apr. 1985–Mar. 1990: less than KRW 1 billion	· Introduction of low price examination · Limited average bidding price system applied for small projects
Mar.	· Lowest-bid system + Low price	· Abolition of the

1990–Feb. 1993	examination system	limited average bidding price system and enforcement of the lowest-bid system
July 1995–Dec. 1996	· Qualification examination bidding system: over KRW 10 billion · Limited lowest-bid system (85% of reserve price to 88%): less than KRW 10 billion	· Introduction of qualification examination ※ Collapse of Sungsu Bridge
Jan. 1997–Feb. 1999	· Qualification examination bidding system: Notice price * or higher * Price of eligible overseas companies according to GPA: KRW 5.8 billion · Limited lowest-bid system: Below the notice price	· Expansion of qualification examination
Feb. 1999–Sep. 1999	· Qualification examination bidding system: over KRW 3 billion □ Limited lowest-bid system: less than KRW 3 billion	· Expansion of qualification examination
Sep. 1999–Dec. 2000	· Qualification examination bidding system	· Qualification examination enforced for all bids · Abolition of the lowest-bid system
Jan. 2001–Dec. 2003	· Lowest-bid system: PQ construction over KRW 100 billion · Qualification examination system: Construction projects other than lowest-bid system category	· Re-introduction of the lowest-bid system · Reduction in qualification examination
Dec. 2003–May 2006	· Lowest-bid system + Low price examination system: PQ construction over KRW 50 billion · Qualification examination system: Construction projects other than lowest-bid system category	· Expansion of the lowest-bid system · Introduction of low price examination system
May 2006–Present	· Lowest-bid system + Low price examination system: all construction projects over KRW 30 billion · Qualification examination system: Construction projects other than lowest-bid system category	· Expansion of the lowest-bid system · Improvement of the low price examination system (two-step examination system introduced)

B. CURRENT STATUS

Fig. 1 shows the project delivery method used for public construction projects, dividing the method into the design–bid–build system (or “DBB,” a staged approach), the design and build system (or “DB,” an integrated and holistic approach), and the bridge system (a cooperative approach), which requires technological alternatives for the designing and building processes.

The DBB is a building project delivery method in which the project manager creates and provides design documents and material quantity details and then selects a bidder through a price competition such as a lowest-bid system (including a low price examination system) or a qualification examination. The DB is a building project delivery method in which the contractors conduct both design and building based on the project manager’s project plan.

The bridge system is a building project delivery method in which the project manager provides design documents and bidders propose technological alternatives to address performance, quality, building project cost,

schedule, and building technologies. This system includes the technical proposal method and the alternative method. Having established the project delivery method, selection procedure, and building method, the project managers run a bidding participation pre-qualification examination (PQ) to screen the bidding companies according to the project type and size. In the staged approach, a bidder is selected via a qualification examination for projects of less than KRW 30 billion, while a bidder is selected via the lowest-bid system and a low price examination (to determine the appropriateness of the bid price) for projects over KRW 30 billion. Detailed construction types and material quantiles applied to the bid are divided into a lump sum bid and unit price contract in the DBB according to documents the project leader supplies. As an extension of the lump sum bid, a material quantity modification method within the lowest-bid system can be used; the so-called "pure unit price contract," in which the bidder supplies the required material quantities and quotations, can also be used.

In the technical proposal and alternative methods, the project manager evaluates the technologies and design alternatives proposed by the bidders and selects a winning bid using the lowest-bid method, price adjustment scheme, technology adjustment scheme, and technology and price weight scheme after considering all the bids that qualify by having met a series of score levels. In the DB, the successful bidder can also be selected via the best design and fixed amount methods.

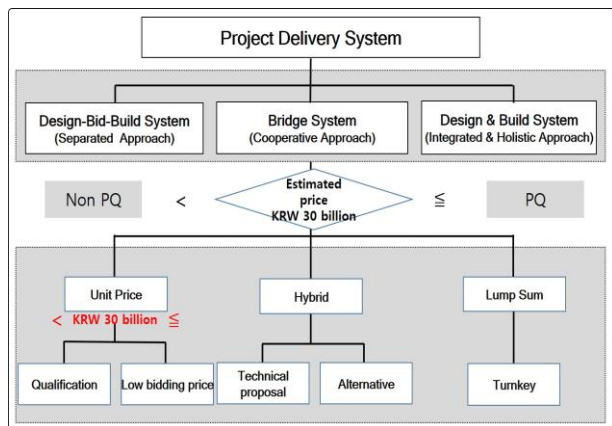


Figure 1  
Current status of the bidding and contract systems for public building projects

### III. OPERATIONAL PERFORMANCE AND ISSUES IN BUILDING PROJECT ORDERING METHODS

#### A. ANALYSIS OF PREVIOUS STUDIES

The public building project ordering and bidding systems have been through a considerable transition, reflecting changing trends and social requirements, but remain inferior to the ordering systems and bidding schemes used in advanced nations [11]. The trends in the research on Korea's ordering and bidding methods are described below.

TABLE II  
Literature review

Author	Year	Summary
Kim et al.[8]	2014	Issue raised about ambiguity and duplication of bidding and selection system for building projects
Ryu et al.[3]	2013	Analysis on application of the lowest-bid system for road projects and proposal for improvement
Yu and Kim[1]	2008	Analysis on efficiency of bidding system for large public building projects and proposal of selection model for bidding systems
Park et al.[5]	2007	Analysis of the effects of the expansion of the lowest price bidding system on the construction industry
Kim et al.[7]	2004	Performance analysis on turnkey and alternative bidding projects and proposal for improvements

Many studies on bidding and contract systems for building projects have been conducted, but most have focused on specific projects or on either the lowest-bid or turnkey-based bidding system. Few studies have comprehensively compared among bidding and contract systems or examined the empirical data in order to improve the practice of and policies on bidding and selection systems for building projects.

#### B. PERFORMANCE OF BUILDING PROJECTS ACCORDING TO BIDDING SYSTEM

Building projects are performed via a contract between project managers and builders. The building process varies depending on the bidding system used and how it is used, as various bidding systems can be employed according to contract details, methods, responsibilities, and scopes. According to a US study that compared procurement methods in CII [9], the DB showed better project performance than either the DBB or "construction manager at risk" (CM@R) in terms of both cost and construction schedule. Furthermore, J.D. Fernane[2] pointed out that cost and building schedule performance can vary depending on the bidding system used and operation type followed (such as the DB or DBB) during project procurement.

Based on the abovementioned research, this study compares and analyzes project cost, schedule, and quality among the bidding and selection methods used for public building projects in Korea.

TABLE III

Case studies on performance analyses according to bidding systems used in the US [9]

	Unit cost	Construction speed	Procurement speed	Cost increase rate	Schedule increase rate
DB vs. DBB	6.1% DB<DBB	12% DB>DBB	33.5% DB>DBB	5.2% DB<DBB	11.4% DB<DBB
DB vs. CM@R	4.5% DB<CM	7% DB>CM	23.5% DB>CM	12.6% DB<CM	2.2% DB<CM

1) BIDDING AND SELECTION SYSTEMS AND DISTRIBUTION OF SUCCESSFUL BID RATE

The distribution of the successful bid rate for public building projects showed that the success rate is clustered according to the bidding and selection method used. There were 223 successful bids (168 through the lowest price system and 55 through qualification examinations) between 2010 and 2012; the average successful bid rate relative to the reserve price in the qualification examination system was 80.6%, while that in the lowest-bid system was 71.51%, with most bid prices clustered within a narrow range (a ratio within  $\pm 2\%$ ; 75.6% in the lowest-bid system and 100% in the qualification examination system).

In the qualification examination and lowest-bid systems, reserve prices were used as an absolute criterion, reflecting a pattern of reserve price-based customized price competition. In the qualification examination system, successful bidders were chosen via an examination of their implementation capability in the order of lowest bid price above the lower bid-price limit (without a PQ examination); 80 to 87% of the lower limits were set according to project size. In the lowest-bid system, successful bidders were those who entered the lowest bid after a PQ examination; this system featured the structural limitation by which most bidders had to bid a price that was around 70% of the reserve price.

The qualification examination system's use of a lower limit prevents dumping, protects small and medium-sized enterprises, and ensures appropriate project costs; however, it can also lead to luck-based bidding since no technological merit is required under the provision of guaranteed bidding success. Meanwhile, the lowest-bid system is regarded as unrealistic, as the lowest-price criterion is seen to create a vicious cycle. In the current bidding and selection process, bidders tend to bid based on luck, using strategic prices that meet the examination criterion, rather than on an understanding of the project characteristics, a construction planning review, or construction cost quotations. If this bidding trend continues, the gap between bid prices and projects' actual input prices will continue to widen.

Using foundational data to compare construction periods and performance among various project delivery methods, the KICT [12] conducted a study together with the MLTMA involving 885 contracts and building completion data on 94 turnkey construction projects, 19 alternative bidding projects, and another 772 projects (329 using the qualification examination system and 443 using the lowest-bid system).

Furthermore, project managers collected construction assessment data on 151 public building projects completed from August 2010 to December 2012 (86 cases using the lowest-bid method, 55 using the qualification examination system, and 10 using the turnkey and alternative systems) pursuant to the Construction and Technology Management Act in order to compare the project delivery methods in terms of their suitability (e.g., the quality and safety of the building sites).



FIGURE III  
Distribution of successful bid rate according to bidding and selection system

2) CONSTRUCTION COST

Construction costs were compared based on the contracted construction costs set when the contracts were signed, the expected construction costs, and the final construction costs at project completion for each building delivery method. Fig. III summarizes the comparison results.

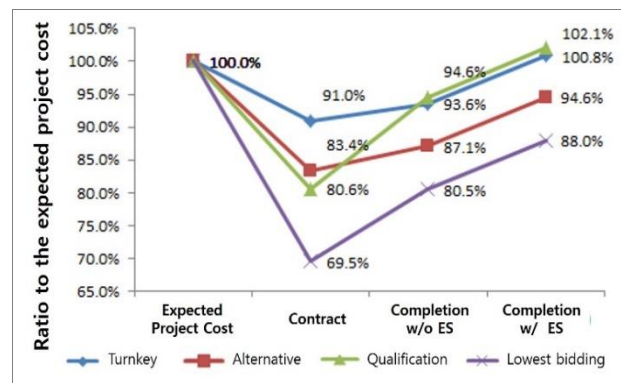


FIGURE IV VVI  
Comparison of project costs between contract signing and completion according to project delivery method

As shown in the figure, lowest-bid system projects had the lowest contract prices relative to expected project costs, followed by 80.6% of qualification examination projects, 83.4% of alternative bidding projects, and 91.0% of turnkey bidding projects (the highest). The difference between the contract prices of lowest-bid and turnkey projects was 21.5% in terms of expected project costs, explaining the criticism of turnkey bidding projects' high contract prices. The comparison of project completion costs and expected costs showed that qualification examination projects had the highest proportion (94.6%), followed by 93.6% for turnkey projects, 87.1% for alternative projects, and 80.5% for lowest-bid projects. The results for project cost increases due to design changes from contract signing to project completion showed only a 2.6% increase over expected project costs for turnkey projects but an 11.0% increase for lowest-bid projects, almost four times the turnkey rate.

No significant meaning can be drawn concerning the cost increases due to design changes because every project is different in terms of site conditions, complaints

from local residents, and design quality. However, turnkey and alternative projects, using what are regarded as exceptional bidding systems for large projects, clearly have the lowest cost increases in the later stages, implying that differences in responsibility and sharing structures among project delivery methods can influence cost increases between the contract signing and project completion. In a report [2] comparing cost increases due to design changes between the DBB and DB, a similar result was found. For facility projects at US universities, projects conducted under the DB system, which is similar to the Korean turnkey system, saw a project cost increase of 3.1% on average, whereas projects conducted under the DBB system, which is similar to Korea's lowest-bid and qualification examination systems, saw an average increase of 8.1%.

In these results, design changes under the turnkey bidding system cost the least not because turnkey-based construction companies completed the designs and then did not increase material quantities but because of the turnkey bidding structure, by which the builders carried all the responsibilities, and project managers did not need to be involved in contract changes. As a result, contractors under the turnkey bidding system have to add a risk premium to turnkey-based projects during the bidding process since their responsibilities will grow over time. Accordingly, the costs of turnkey-based projects at contract-signing time are higher than are those of lowest-bid projects, but this difference is reduced considerably by the completion date.

TABLE I  
Increase in building schedule according to facility and bidding system  
(contract schedule : actual schedule)

	National roads	Railways	Highways
Total	54.0% (1,299 : 1,955)	36.1% (2,048 : 2,697)	6.5% (1,617 : 1,689)
Alternative	35.9% (1,994 : 2,679)	24.4% (1,855 : 2,288)	0.0% (1,500 : 1,500)
Qualified	55.8% (1,211 : 1,875)	35.6% (2,127 : 2,665)	9.2% (1,397 : 1,507)
Lowest price	54.3% (1,371 : 2,007)	34.1% (1,888 : 2,413)	5.2% (1,728 : 1,780)
Turnkey	39.8% (1,279 : 1,994)	42.3% (2,216 : 3,205)	11.2% (1,320 : 1,468)

Concerning project cost variations due to choice of project delivery method, increased project costs due to design changes may lead to inefficient budgetary spending, but design changes are unavoidable in building projects. Thus, increases in project costs due to design changes should not be seen as entirely negative; this is not a balanced view. For large earthwork, it is nearly impossible to predict ground and excavation conditions perfectly accurately before construction starts and prevent increases in materials in an earthwork detail estimate sheet.

### 3) Project period

Turnkey and lowest-bid projects have longer public building project periods than do alternative bidding and

qualification examination projects, but that does not necessarily mean that the project delivery method can significantly increase the construction period. The strongest factor affecting public construction project periods is the budget spending method (i.e., continuous long-term construction work or continuing expenditure construction work). For example, national road and railway projects, which have a high proportion of continuous long-term construction work, see higher increases in project periods than do highway projects, which have a high proportion of continuing expenditure construction work (Table IV)

### 4) CONSTRUCTION QUALITY

The government conducts a construction assessment scheme to evaluate public construction projects as part of its policy of ensuring project quality at project sites. The construction assessment evaluates the appropriateness of six project site items: quality control, process control, construction control, safety management, environmental management, and project completeness. The evaluation targets construction projects costing over KRW 10 billion and begins when 90% of the construction schedule is complete and ends in the February of the completion year. For each project, a committee composed of internal and external experts assesses the appropriateness of the project's quality and safety during construction. This assessment can be used as an index for comparing among project sites' performance of construction quality.

The construction assessment consists of quality control (four items, 22 points), process control (two items, six points), construction control (13 items, 45 points), safety management (four items, 18 points), environmental management (four items, seven points), project completeness (two points), additional points (three points), and deducted points (minus three points), all given and totaled according to specific criteria. Table 5. shows the point distribution of each assessment item according to project delivery method.

The construction assessment evaluates quality, process, construction, safety, and environmental management for each bidding and selection system. Their scores are 89.81 for lowest bid projects, 89.84 for qualification examination projects, and 93.80 for turnkey and alternative projects. The lowest-bid projects had the lowest assessment score. Although this result is not statistically significant, the bidding and selection system seems to influence the construction assessments.

TABLE II  
Average score of construction assessment for each item

	Total score	Quality (22)	Process (6)	Construction (45)	Safety (18)	Environment (7)
1	89.81	19.44	5.65	39.03	16.67	6.64
2	89.94	19.68	5.75	38.80	16.85	6.66
3	93.80	19.58	5.64	41.44	17.31	6.86
4	90.12	19.54	5.69	39.11	16.78	6.66

1: Lowest price  
3: Turnkey / Alternative  
2: Qualified  
4: Average

C. Survey on the awareness of bidding and selection systems

The bidding and contract system for construction projects has changed constantly, in both small and significant ways. This issue is highly sensitive and controversial due to differences in views among stakeholders. Therefore, it is important to survey stakeholders about the bidding and contract systems as well as future operational directions. To this end, focus group interviews (FGIs) and a survey were conducted simultaneously with construction-related government/owner, general contractor, subcontractor, engineering companies, and research institute/college.

Using the FGI method, a survey on the awareness of the overall construction industry was conducted with experts from the construction sectors and research institutions of all areas. A questionnaire survey was conducted involving 700 stakeholders and 500 experts.

1) Survey on the awareness of problems facing the construction industry

The biggest problem facing the construction industry(Fig. IV) was identified as the “decreasing number of new projects” (45.3%), followed by “irrational bidding and selection systems” (29.2%) and the “excessive supply of construction by companies and the proliferation of unqualified companies” (19.1%).

The highest-priority tasks for the construction sector(Fig. V) are the “expansion of new public projects” (34.8%), “improvements in the bidding and selection system” (32.4%), and “removing unqualified companies and

strengthening bidding discrimination” (26.4%). Overall, the results were consistent with those concerning the current status of the system.

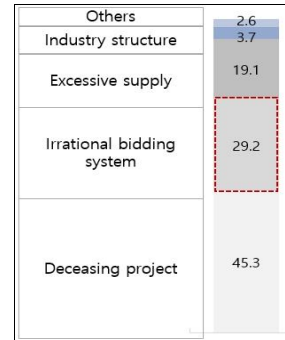


FIGURE VII  
Awareness of current issues facing construction sector

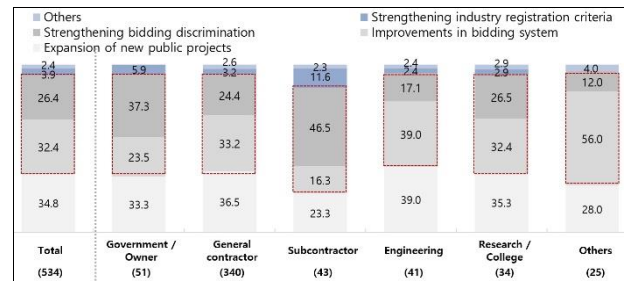


FIGURE VIII  
Awareness of tasks to be resolved in construction sector by respondent group

TABLE III  
Overall assessment of the national bidding and contract system

Category	Total Score (100 point)	Institution					
		Government / Owner	General construction corporation	Specialized construction corporation	Engineering company	University and research center	Others
① Reserve price system	49.5	50.0	49.8	52.3	48.8	46.3	45.0
② Pre-qualification examination system	53.5	62.7	50.3	52.3	56.7	66.9	56.0
③ Qualification examination system	59.4	56.9	59.6	60.5	56.7	63.2	59.0
④ Lowest-bid system	20.7	19.6	19.0	26.7	27.4	22.1	23.0
⑤ Unit price bidding system	48.8	55.4	45.6	54.7	53.7	56.6	50.0
⑥ Low price examination system	34.1	49.0	29.8	37.8	39.6	41.9	37.0
⑦ Project-related warranty system	52.6	66.7	47.7	59.3	59.8	64.0	51.0
⑧ Design change system	58.4	63.7	58.5	59.9	60.4	54.4	46.0
⑨ Supervision system	51.5	68.1	46.1	50.6	70.1	61.0	49.0
⑩ Bidding participation restriction system	56.4	57.4	57.5	61.6	43.3	58.1	50.0

2) Survey on the awareness of bidding and contract systems

The priority values cited in the national contract system (Fig. VI) were “ensuring appropriate construction quality” (33.7%), followed by “economic efficiency” (28.5%), “strengthening transparency and fairness during the contract process” (20.4%), and the “prevention of dumping” (15.5%).

For government/owners, “ensuring appropriate construction quality” (51%) was selected as the highest-priority value, whereas subcontractors chose “strengthening transparency and fairness” during the contract process (39.5%).

The survey results concerning satisfaction with the components of the bidding and contract system for Korea's public construction projects (Table. VI) showed that the qualification examination system (47.2%, 59.4 points) was system (47.2%, 59.4 points) was the preferred system, followed by the design change system (45.1%, 58.4 points), and the bidding participation restriction system (44.2%, 56.4 points). By contrast, the lowest-bid system (4.7%, 20.7 points) and the low price examination system (16.3%, 34.1 points) were the two least-favored systems.

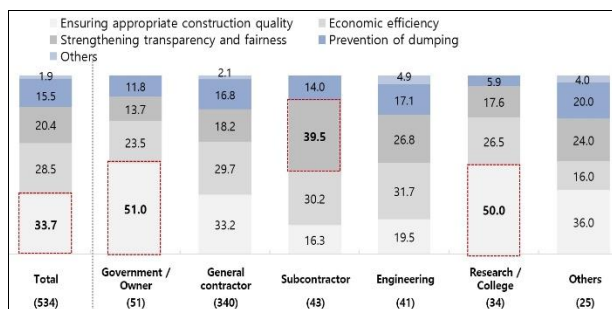


FIGURE IX

Awareness of response groups about priority values in national contract systems

Among methods of choosing successful bidders (Fig. VII), a “balanced overall assessment between price and factors other than price” was most highly preferred, followed by “overall assessment of factors her than price,” and “price-oriented overall assessment.”

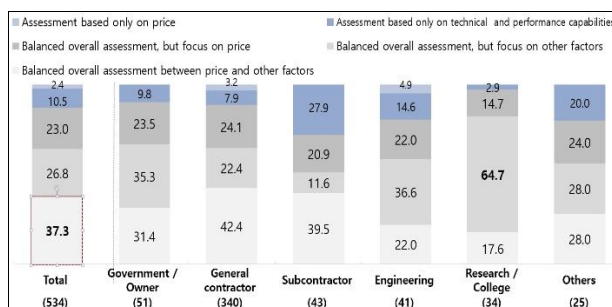


FIGURE X

Difference in awareness of determination method for successful bidder by respondent group

General contractors preferred the balanced overall assessment, but their second choice was price-oriented assessment. On the other hand, government/owners preferred the overall assessment of factors other than price. Interestingly, contractors rated ensuring assessment discrimination negatively, while owners rated low price bidding negatively.

IV. OVERSEAS BIDDING SYSTEMS AND SELECTION OF SUCCESSFUL BIDDERS

Although the US, the UK, and Japan follow different reform processes and timing for public project bidding systems, they have all been revising and improving their systems. The design-build, technical proposal, and competitive negotiation systems have been widely employed since 1900. Price competition has been used in bidding and selection systems in principle, but so-called “best value” bidding and selection, in which factors other than price are also considered as selection criteria, has also been used. For example, the US and the UK have adopted best value bidding and selection. In 1999, Japan's Ministry of Land, Infrastructure and Transport began using the comprehensive assessment bidding and selection system, a Japanese version of the best value system; in 2005, it adopted the system in earnest. Thus, bidding and contract systems and the operation of public construction projects in foreign nations have focused not only on bid prices but also on other factors that improve value.

A. THE US

According to the US Code and Federal Acquisition Regulation (FAR), a “fully open competition” is applied in general and “(1) general competition bidding based on price competitiveness” is applied to project contracts in principle. If this requirement cannot be satisfied, a “(2) competitive negotiation system” or “(3) combined bidding system” is used.

According to the US Code and FAR, “(1) general competition bidding based on price competitiveness” is applied in principle, but a “(2) competitive negotiation system” is being employed more frequently due to the increasing size and complexity of projects. For example, the competitive negotiation system accounts for more than half of all bids for new building projects conducted by the federal government on the basis of project cost according to the Office of Federal Procurement Policy (OFPP). The General Services Administration (GSA), one of the authorities for new building projects, has also adopted the competitive negotiation system for large building projects and renovation projects. The competitive negotiation system now accounts for approximately two thirds of all construction deliveries.

The Simplified Acquisition Procedure, Part 13 of the FAR, has also been applied to projects that cost less than the limit amount of the simplified acquisition, while Sealed Bidding is a general bidding and selection system specified in Part 14 of the FAR. Once the tender application and documents are submitted, bidding is begun and conducted in an open place, and the lowest

bidder is selected. The Competitive Negotiated Proposals are specified in Part 15 of the FAR to compensate for the drawbacks of sealed bidding and pursue the best value. The Competitive Negotiated Proposals are applied i) when meeting a project schedule is important, ii) when the successful bidder is chosen based on factors other than price, and iii) when there is room for negotiation with bidders.

In the US, the term “best value contract system” is interpreted broadly. The best value concept is the opposite of the lowest-bid concept: both price and non-price factors are assessed. Among the documents required for project bidding, not only a price proposal but also a technical proposal is required, so that the project manager may assess them comprehensively. The bidder who submits the best value is selected, even when not also the lowest.

The best value bidding system typically employs three assessment methods. First, criteria for a PQ examination are prepared based on the characteristics of the building project, and bidding eligibility is conferred on those who pass the PQ. The bidder who meets the technical criteria and has submitted a low bid or low cost is then selected. Second, technical merit and price are comprehensively assessed through a weighted average or cost-technical trade-off method. Third, a bidder is selected based on an assessment of non-price factors such as building history and achievements as well as technical proposals based on the fixed price. This method is used most often for DB build system projects.

The weighted average method determines the best value based on price and non-price assessment items (e.g., innovation, achievements, project management plan, project performance organization, quality control planning, facility and equipment, process control planning).

#### B. UK

The UK is a member of the European Union (EU). Thus, projects and services conducted by central or local governments and public corporations or institutions over a certain volume must follow the bidding and contract system mandated by Public Contracts Regulation 2006 based on EU Directive 2004/18/EC). This system can be divided into open competitive, limited competitive, nominated competitive, and negotiated methods (i.e., competitive and non-competitive dialogue).

The Pre-Qualification Questionnaire (PQQ) is used to list qualified bidding participants in limited competition, nominated competition, and competitive dialogue methods, except for open competition. The PQQ reduces the number of bidders to a reasonable bidder list.

The criteria for the successful bidder are specified as two conditions: “only the lowest price” and the “most economically advantage tender (MEAT)” in accordance with Article 53 of EU Directive 2004/18/EC.

The “only the lowest price” condition is applied in a relatively simple acquisition procedure that determines the successful bidder by simply choosing the lowest price for products or services that are clearly standardized. However, it cannot be used in the competitive dialogue

method. When the lowest price is used as a selection criterion, the bidder who submits the lowest price is selected. However, the project manager may request detailed price information from a successful bidder who submitted an unreasonably low bid in order to review the price according to Article 53.

The “MEAT” determines the successful bidder based on not only price but also various other factors, such as quality, technical merit, aesthetic and functional features, the environment, operational cost, cost effectiveness, post-management and technical support, and lead time. In this method, the project manager sets the criteria and their weights based on the objectives and characteristics of the public building project, which is open to the public.

If the selection criteria for eligible bidders are designed to assess whether the bidders can satisfy the contractual requirements, the award criterion is that the bidder is the most economically advantageous (in terms of price and non-price factors).

#### C. JAPAN

Japan uses the lowest-bid system in principle. Assessments based on factors other than price, such as technical merit, are rare. For public projects, the general competition bidding method is used for large projects that comply with the WTO Government Procurement Agreement, while the nominated competition bidding method is used for other projects. Under the accounting law, general competition bidding, nominated competition bidding, and private contract are applied for public projects. Since 1999, competitive bidding has used a comprehensive assessment, in which not only price but also technical merit and quality are also assessed. Under the accounting law, public projects delivered by the state should not use a negotiation method, but it has been used by the Water Resources Authority, Urban Revitalization Corporation, and Central Japan International Airport Co., Ltd, which are independent public corporations.

The comprehensive assessment method used in Japan considers the price and quality of technical proposals when companies are selected for construction projects based on the Public Project Quality Ensuring and Promotion Act. The method considers not only cost-effectiveness but also factors other than price when procuring public construction projects, deviating from the existing price competition method to select a contractor whose price and quality are superior and thereby changing public construction project delivery methods to ensure project quality and improve social benefits.

#### V. IMPROVEMENTS TO THE BIDDING AND CONTRACT SYSTEM

Ensuring technological merit and competitiveness and making the construction industry more productive require advanced public project bidding and contract systems.

As mentioned, Korea’s bidding and contract system has been revised in an ad-hoc manner through bidding success rate adjustments such as with the limited lowest price method as a way to solve the problem of low price



bidding due to the contraction of the construction market and excessive competition, creating a vicious cycle that promotes gambling rather than the restructuring of the construction industry or productivity and quality improvements. Accordingly, the public project delivery system must change into value-based bidding and selection systems that balance quality and price while upholding the principle of market competition. Fig. IIIV shows the basic framework for improving Korea's bidding and contract system.

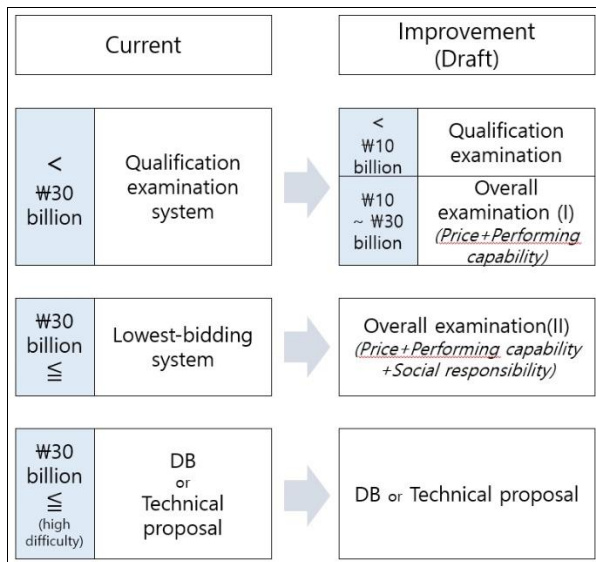


FIGURE XI  
Improvements to bidding and contract system

A. QUALIFICATION EXAMINATION SYSTEM

The basic idea of the qualification examination system is value-oriented bidding and selection that assesses the lowest bidder based not only on price but also on project-performance capabilities in order to select the best value-providing company. This system is appropriate for procurement projects in which the budget is executed using a grading restriction, limited competition system, or a detailed verification procedure such as the PQ that determines when bidders' performing capabilities are insufficient. However, if the criteria for project-performance capabilities and the price assessment are inappropriate, the objectives of the qualification examination system cannot be achieved, as the bidding will be based on luck.

Therefore, the current qualification examination system is applied in principle to projects costing less than KRW 10 billion to maintain current construction market conditions and the predictability of government policies, while the limitations of and problems with the qualification examination system unique to Korea continue to be addressed.

- Adjusting the assessment method used for performance capabilities in accordance with changing social demands;
- Minimizing luck-based bidding through step-by-step system improvements

B. COMPREHENSIVE ASSESSMENT SYSTEM

A comprehensive assessment system is a selection method that assesses bidders based on price, building capabilities, and technical merit. The qualification examination system determines the suitability of bidders' project-performance capabilities in terms of the lowest price, whereas the comprehensive assessment system determines the highest scorer by considering both price and project-performance capabilities. This method considers not only price but also factors other than price, thereby selecting not just the lowest bidder but the one with the best project-performance capabilities. The comprehensive assessment system can take either of the two types below according to the construction project type and technical characteristics.

1) COMPREHENSIVE ASSESSMENT SYSTEM (I)

The comprehensive assessment system (I) selects the winning bidder by assessing project-performance capabilities and price (unlike the current qualification examination system). It is an assessment method that evaluates project construction capabilities by assessing bidding price as well as project-performance capabilities through factors such as project participation experience, participating engineer capability, number of qualified engineers, and past project assessment scores. This method is, in principle, applied to projects where site conditions are good and technical difficulties are low. Project performing capabilities are assessed based on general and basic information such as past construction history, the capabilities of the participating engineers, project achievements, and specialized engineer capabilities relevant to the project. It focuses on evaluating companies with specialties relevant to the projects rather than a small number of large, well-known companies and also excludes unqualified companies.

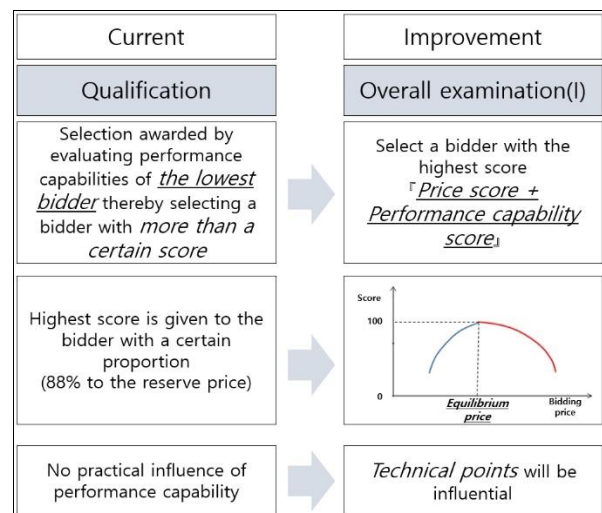


FIGURE XII  
Operation direction of comprehensive assessment system (I)

2) COMPREHENSIVE ASSESSMENT SYSTEM (II)

In the comprehensive assessment system (II), bidding

companies participate through a PQ. Companies that are socially vulnerable or implement corporate social responsibility are given public project acquisition or procurement incentives, which expands socially responsible procurement systems to create a virtuous cycle in national finance (unlike with the comprehensive assessment system I). The bidder is responsible for quoting the required materials based on designs provided by the project manager and enters into contractual obligations concerning materials supply. Unlike the current practice, design changes caused by materials increases or decreases or a newly introduced work type are not generally accepted unless the original designs or site circumstances have changed.

This method is designed to foster builders' quoting capabilities and technical systems through the submission of competitive bidding prices, as bidders establish the most appropriate construction methods and temporary construction plans based on site conditions, project period, quality, and site safety on the basis of their technologies, construction experience, and site work knowhow. This is the most typical bidding and contract system type used in the DBB system, in which bidders take responsibility for construction based on their technical merit and price competitiveness. It can also minimize luck-based bids by companies whose technical merit and performance are not up to requirements but who win bids inappropriately, creating a serious risk. The comprehensive assessment system (II) is effective in PQ-based projects where project conditions are good, conventional techniques are applied, and project efficiency can be expected given the operational method, temporary construction method, and the equipment and device operational skills at the projects site.

Among its many advantages is its consideration of social responsibility scores and quotation and risk sharing ability, as well as the cost-effectiveness of the bidding companies. It also minimizes administrative burdens such as unnecessary paperwork by scrapping the low price examination system, which lacks objective criteria. It may cause bidding construction companies to take a longer time and more effort and spend more to prepare bidding quotes than usual, but this can improve the firms' technical merit and competitiveness through improvements in quotation capabilities as a tradeoff. In particular, when project managers provide designs as well as bills for materials as references, the burden of preparing the required materials will be reduced significantly.

### C. Technical proposal bid system

The technical proposal bid system is a bidding and contract system where technical alternatives are required to propose the construction cost, life cycle cost, and construction quality based on designs provided by the project manager. Alternative construction methods are required due to the technical characteristics of the structures and site conditions; the project schedule must be shortened, or frequent design changes are expected.

The project manager selects a bidder after scoring the technical proposals, project-performance capabilities, and prices submitted by bidders. Projects that are difficult due to unstructured structures, urban areas, and weak ground foundations or that require a high level of construction quality management use this system to find safer and more socially beneficial construction alternatives, thereby increasing the efficiency of the construction projects.

To operate the technical proposal bid system efficiently, the following problems with the technical proposal bid system must be resolved:

- Technical proposal scopes and contents should be limited to specific areas according to the technical characteristics of each project, thereby inducing more concrete and effective technical proposals.
- The appropriateness of each technical proposal is scored. Unless disqualified for quality, performance, or safety issues, proposals are accepted in principle, but unqualified proposals are also accepted as specified in the proposals; increases in project costs are not accepted, however, making clear the project's scope and accountability.
- To practice discriminating assessments of technical proposals, the assessment criteria must be improved.

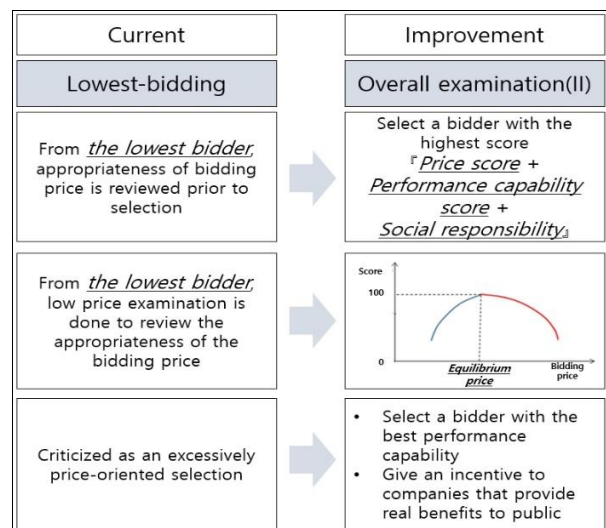


FIGURE XIII  
Operation direction of comprehensive assessment system (II)

## VI. CONCLUSION

When construction projects are planned and executed, operation types and procedures as well as the bidding and contract systems used play important roles in overall project efficiency. Although no perfect bidding and contract system for construction project delivery is possible, the effects and project performance of bidding and contract systems can vary depending on the project managers' capability and the operational infrastructures involved [6].

The objectivity and transparency of bidding and contract procedures as well as the award, technology, and price assessment criteria are all important in construction projects. Also important are the ability, capacity, and

social awareness level of the project manager, who must understand the characteristics and apply the mechanisms of the contract system.

Various bidding and contract systems have been adopted for public construction projects to select contractors in accordance with fair competition principles and plan and execute national budgets effectively. Nevertheless, many challenges for bidding and contract systems have arisen due to a lack of transparency and fairness and because bidding practices have been based on luck.

The ultimate objective of the national contract system is to select a contractor with excellent technologies and project-performance capabilities to supply public facilities most efficiently and economically. To achieve this goal, most nations run bidding and contract systems that are suited to their market environment and circumstances.

Even if bidding and contract systems are perfect, their effects may differ depending on the characteristics and operational environments of different nations, project managers, and construction projects. The most important task of a bidding and contract system is ensuring the selection of the bidder who can provide the lowest price among all the companies that can meet the contract requirements as specified in Article 10 of the National Contract Act. The assessment criteria and procedure must be revised based on that principle.

Thus, this study used an empirical analysis of the current bidding and contract systems to seek improvements that comply with the basic principle of the National Contract Act and eliminate the problems with and irrationality in current practices. Accordingly, this study proposes the following:

- Improving bidding and selection systems by changing them from a luck-based price competition into a technical merit- and value-based competition
- Improving the assessment criteria to meet the current market level of bid and winning prices
- Meeting a realistic level of contractual responsibility-sharing
- Strengthening the competitiveness and expanding the social responsibility-based procurement systems of construction companies

#### ACKNOWLEDGMENT

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