

A STUDY ON THE INTRODUCTION OF THE PAY ADJUSTMENT SYSTEM FOR THE VOLUNTARY ASSURANCE OF QUALITY BY THE CONTRACTORS

Byung-Ok Noh¹, Sang-Beom Lee² and Jai-Dong Koo³

¹ Doctorate Course, Department of Architectural Engineering, Dong-Eui University, Busan, Korea

² Professor, Department of Architectural Engineering, Dong-Eui University, Busan, Korea

³ Research Fellow, Korea Institute of Construction Technology

Correspond to lsb929@deu.ac.kr

ABSTRACT: Although the Korean construction industry has risen rapidly, the quality of the buildings is not met with the industry standard compared to the potential of the technology development and the cost of maintenance has been increased. The user's request for quality have been increased, but in the current building construction, the contractors only follow the specifications of design, material and technology, and their main concern is whether they are in right track with the specification or not. Thus, the necessity of developing technology has been ignored and sufficient opportunities for the development have not been provided as well. In the developed countries, in contrast, the quality assurance and the payment regulation system has been utilized for the active response to the changes of users' request. As a result of this, the maintenance cost has been decreased and the development of construction technology has been improved. Therefore the pay adjustment system is needed to create the improvement of the quality of the buildings by the contractors' earnest building construction. In order to introduce the pay adjustment system suitable to the Korean construction industry, this study presented the logical method of adjusting the construction cost and making payment with the pay adjustment index that is created based on the result of the performance test, after making a set of the indicators of the building performance standard and applied them to the targeted building.

Keywords: Quality assurance; Pay regulations; Payment at Completion; Pay adjustment

1. INTRODUCTION

1.1 Research Background and Purpose

As today's Korean construction industry become manhattanized, specialized and bigger, swift development has been achieved with applying the quality materials and the enhancement of the construction technology, but the quality of the buildings is not met with the industry standard compared to the potential of the technology development and the cost of maintenance has been increased. The users' request for quality have been increased due to their constant interests in the quality of building, but in the current building construction, the contractors only follows the specifications of design, material and technology, and their main concern is

whether they are in right track with the specification or not, the necessity of the technology development has been ignored and sufficient opportunities for the development have not been provided as well. The effort for improving the domestic bidding system have been in place, but the changing the regulation without setting clear directions causes new problems.

In the developed countries, in contrast, the owner uses the pay adjustment system that the owner could adjust the payment according to the performance result of the building. In this way, the maintenance cost has been decreased and the development of construction technology has been improved.

Therefore, the need of the introduction of the pay adjustment system is immense but there is still a lack of the logic that construction payment could be adjusted according to the result of the building performance test.

In order to introduce the pay adjustment system suitable to the Korean construction industry, this study presented the logical method of adjusting the construction cost and making payment with the pay adjustment index that is created based on the result of the performance test, after making a set of the indicators of the building

¹ This paper is a part of the research results that are funded by 'The Construction and Transportation R&D Policy and Infrastructure Project' of The Ministry of Land, Transport and Maritime Affairs which is 'The Study of the Standardization on Performance Oriented Construction Technology ('06-'11)'. The support for this research is appreciated.

performance standard and applied them to the targeted building.

1.2 Research Scope and Method

The pay adjustment system has differences in various areas with current construction contract system that has been operated in Korean construction industry, as a new contract system that could be introduced in the Korean construction industry for the first time.

Therefore it has been focused on the voluntary quality assurance by the contractors with the pay adjustment system. The research scope and methods are as below.

First, analyze practical field materials, in order to suggest the contract and working process that are suitable to the way of implementing projects in the Korean construction industry with the findings of the characteristics of the pay adjustment system.

Second, analyze the method of the performance measurement and the process of applying the pay adjustment index that are possible in the voluntary quality assurance by the contractors.

And lastly, suggest a payment model for construction cost as a method of adjusting the payment with pay adjustment system and make a recommendation of a method that are suitable to the Korean industry through the expert interviews.

2. PAY ADJUSTMENT SYSTEM

2.1 The Concept of Pay Adjustment System

The Pay adjustment system is a way of making a payment after adjusting the construction cost according to the result of the performance test, and is a system that induces good quality construction through the contractors' construction technology development and quality assurance. In other words, after measuring performance factors of a completed targeted building and deciding that the contractor reached the standards or not, the owner make pay adjustment to the contractor that is specified in the contract with the standard of pay adjustment limits.

Pay adjustment has a purpose of not cutting the construction cost, but inducing the quality construction b the contractor with responsibility, and stimulating the contractor to implement a construction project with quality.

2.2 The Method of Project Implementation with Pay Adjustment System

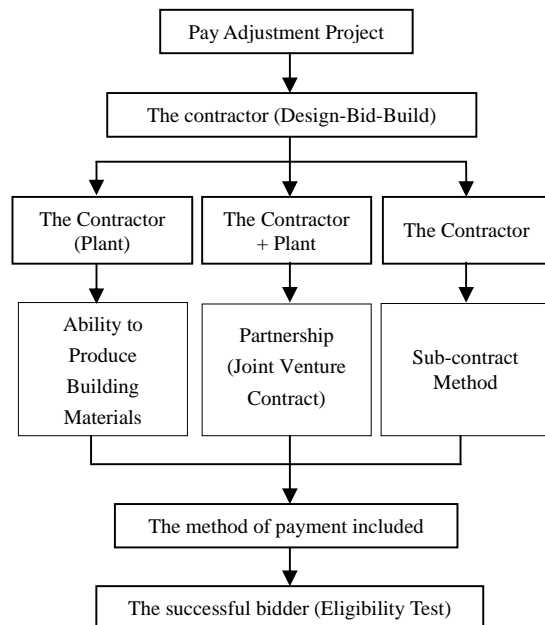
The project with pay adjustment will be placed an order as a Design-Bid-Build delivery method including the pre-qualification (PQ) test that is easy to adjust the contract amount with the contractor and has strong assurance of high degree of certainty of quality and functionality.

The methods of making a contract are **the contractor method** that contractor has ability to produce building

materials by itself, **the joint-venture contract** that the contractor make a partnership with a plant to deliver the building materials and **the sub-contract types** that contractor make a sub-contract with a plant to provide the building materials. However, the number of contractors is significantly bigger than the number of the plant, so there are some worries for plants about violating the monopoly and fair trade regulation, and it is believed that the contractors are not easy to control the plant. Therefore, in this study, the contractor method and the joint-venture contract are considered.

The selection process for a successful bidder will be decided on screening test and the special contract that mentions ways of payment will be included.

The working process of the pay adjustment will be described in the table as below.



[Table 1] The Project Process of Pay Adjustment System

2.3 The Working Process of Pay Adjustment System

In the preparation stage to place an order, the eligibility that the pay adjustment system could be applied and responsibility and duty between the owner and the contractor will be described. The owner specifies the standard of design, the standard of construction technology and so on in the specification.

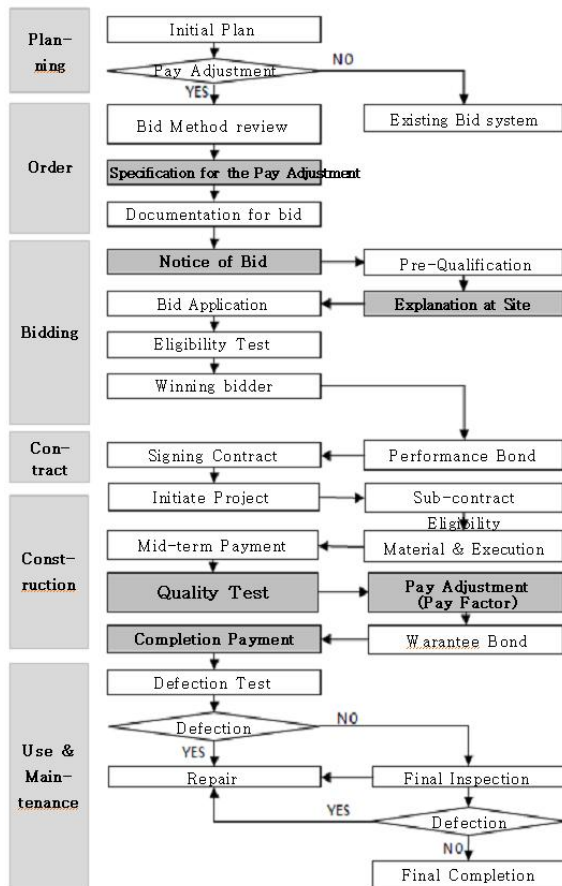
In the stage of preparing documents, the standard of performance, the method of measurement, the payment tendering, and sub-contract will be mentioned.

In the stage of bidding, the notice of bid should be acknowledged and if not, the contractor should bear the responsibility, and one who attends explanation at site will be qualified to enter the bid.

On the completion of the construction project, there will be quality test on the building and construction cost will be adjusted and paid accordingly.

The time of making payment and other details should be followed by the contract between the owner and the contractor and the construction related legislation.

Table 2 shows the overall working process of the pay adjustment system.



[Table 2] The Working Process of Pay Adjustment System

3. THE PAYMENT METHOD OF CONSTRUCTION COST

3.1 The Make a Payment by the Korean Regulation

The contractor's ultimate purpose is to have payment through the implementation of a contract. Initially, in the bid and contracting period, the bidder should provide 'bid bond' on the condition of signing a contract and this will be replaced with 'performance bond', once signing the contract. In the period of construction, advance payments, mid-term payment and completed payment should be paid according to the payment condition of construction cost, and before making payment of the completed payment, the warranty deposit or warranty deed will be submitted.

The contract should be signed with mutual understanding between the owner and the contractor, and

both parties should have in good faith and trust to fulfill the contract.

The completed payment is on the line of mid-term payment, should be paid excluding advance payment and mid-term payment after the completion of construction, and also includes the adjustment with the changes of the contract amount, such as the adjustment with the actual material spent, the payment of unpaid mid-term payment and so on

In term of changing design, before the changing design, the mid-term payment is postponed, so if the design change completed in the completing construction period, the completion payment includes the mid-term payment. If there is a company that has so many changes on design in the construction project, it could give bad financial influence for the company.

In the law 「General legislation of building contract」, the article 40 「the payment for the construction cost」 says that “the public servant who is in charge of the contract should make payment within 5 days upon the receipt of invoice from the contractor, once the passed the test abided by the article 27 after the completion of the construction, and despite the 5 days payment period, if the owner should not hesitate to make payment unless they are in financial difficulties. But the special payment contract that they are able to postpone the payment period within 5 days payment period, could be made between parties with the mutual understanding.”

In 「the law that the contract is related to the government that is the main party」, based on the article 15 (the payment for the construction cost), the payment should be paid after the completion test, the process should be completed within 14 days upon the receipt of the completion notice and after the completion of the test the payment should be paid within 5 days upon the receipt of the invoice from the contractor.

In 「the law of fair sub-contract」 says that once the contractor received the completion payment from the owner for completion of providing service or production, repair, construction and so on, they should make completion payment, or if the contractor received the mid-term payment for the progress of produce, repair, construction and so on, they should make payment to the subcontractors for the their parts, within 15 days (if the payment due date to the subcontractor is prior to this period, then it should be paid on the due date) to the subcontractors.

3.2 The Make a Payment by the Overseas Regulations

FDIC (The Federal Internationale des Ingenieurs Conseils, in English: International Federation of Consulting Engineers) was established in 1913, announced 'the standard contract terms' that is applicable to the international construction contract, and nowadays

in 60 countries around the world recognize its applicability. FIDIC is consisted of Conditions of Contract for EPC Trunkey Project, Conditions of Contract for Plant and Design-Build, Conditions of Contract for Construction and Short Form of Contract.

In FIDIC Standard Contract Term, in article 9.1(the contractor's duty) says "the contractor should submit the document abided by the (d) clause and they should take a completion test abided by the same clause and the article 7.4 (Test)."

And "construction inspector should recognize the impact of the construction usage by the owner on making a judgment for the test. Once the contractor passed the completion test or partial completion test, they should submit the result document to the inspector immediately", which is the duty of the contractor for the completion test.

Regarding the payment, in the article 14.7 (Payment), "(a)the owner should make payment to the contractor within 42 days on the receipt of the notice of a successful bidder, or within 21 days after the document submitted abided by the article 4.2 (Performance Bond) and the article 14.2 (Advance Payment), among whichever comes late, **the first payment** from the advance payment, (b) within 56 days after the inspector submitted the specification and relative document, **the amount that is confirmed by the potential completion report**, (c) within 56 days after the owner submitted the completion report, **the amount that is confirmed by the completion report**.

4. THE PAYMENT ADJUSTMENT METHOD OF THE PAY ADJUSTMENT SYSTEM

In the current quality standard of Korean construction project, design, material, construction technology and so on are implemented on the construction by the specification that is already decided, and if the average of measurement of samples are within the permissible range, it is passed the quality standard and the payment should be paid to the contract parties. Well execution according to the specification is only decided, therefore there is no needs and opportunities to develop the new technology for the construction. But in the pay adjustment system, the pay factors are extracted from the factors that could give big impact on the targeted building, are measured with the performance related items with the consideration of the average of the measurement and deviation are calculated. But in Korean construction industry, there is no legislation that the payment could be modified by the pay adjustment. Therefore, it is necessary to develop a new logical method for being in place of the pay adjustment system in domestic industry.

4.1 Pay Factor created by the Performance & Quality Test

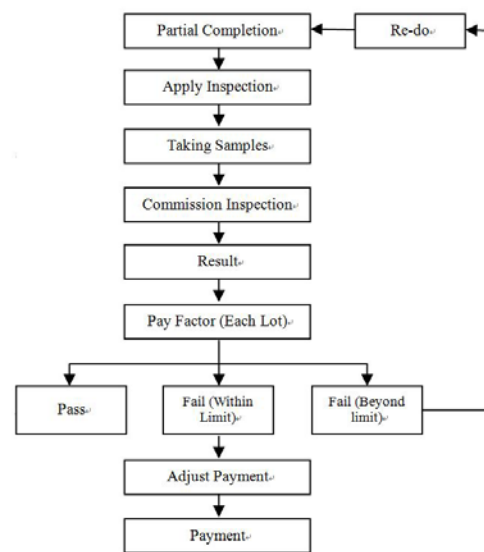
Before the signing the contract, the owner specifies the standard of performance in the specification, based on the standard of design, the standard of technology and so on.

It is important that amicable operation of the payment legislation by providing the performance standard and the regulation of deduction of the construction cost in the contract and the specification among the designs.

On the completion or partial completion of the pay adjustment project, the owner and the contractor commission a third party to inspect the performance test that is in the pay adjustment legislation. Especially when deciding a third party, the owner and the contractor should decide with mutual agreement and take samples on their presence. The performance test could be executed on their presence as well. Therefore, even if one party is not satisfactory with the result and makes a claim, the claim will be ignored.

The owner calculates the pay factor using the calculation method that is in the specification based on the report of quality test. The calculation method is that permissible limit should be set, and according to the percentages of the measurement of samples within the permissible limit, PWL (Percent Within Limits) is used to create pay factor.

If the Pay factor is in the permissible limit, the construction payment will be paid according to the deviation, and if the pay factor is out of the permissible limit, then the contractor should do the construction project all over again.

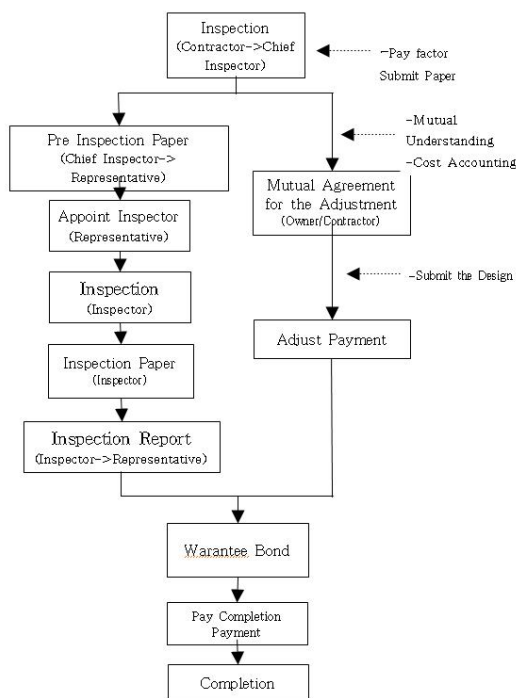


[Table 3] Payment Adjusting Process through Quality Test

4.2 The Payment Adjustment Method of Pay Adjustment System

In terms of the introduction of the pay adjustment system for the completion payment in the domestic construction industry, the method of adjustment could be made in bulk using the construction cost accounting that is available in the industry as a method of adjusting the construction payment. Regarding the mid-term payment and the completion payment, it is possible to make adjusted payment without changing the amount of

materials, using the pay adjustment system by the quality and performance factors in the construction cost accounting. In order to do this, it is necessary to provide the sound basis in the contract and the notice of bid exclusively. In the application of the pay adjustment system, it is best solution to have common understandings with the bidders and there should be enough explanation in notice of bid and explanation at site. And the contents should be included in the contract. It is recommended that extract the pay factor, apply it to the construction cost accounting, adjust the payment in bulk using the pay factor, and pay the adjusted payment to the contractor with the mutual agreement with the contractor.



[Table 4] Inspection and Payment of The Pay Adjustment Project

To summarize above, it is best considered that pay adjustment system abided by the process in the contract should be applied to the method of adjusted payment using the construction cost accounting, in order to assure the quality of the construction for the owner.

5. CONCLUSIONS

The pay adjustment system is not in place in the Korean construction industry and is a new contract system as the way of voluntary assuring the quality of the building, and shows the differences with other contract systems. The pay factor is calculated through the quality and performance test, and it is necessary to have acceptable logic that the owner and the contractor have mutual understanding to adjust the construction payment.

In this study, a logical method of the process of the adjusting payment for applying the pay adjustment system is suggested. The summaries are as below.

First, a legal logic is analyzed to introduce the pay adjustment system in the domestic construction industry smoothly, based on the domestic and overseas case studies.

Second, the construction working process is suggested in order to apply the pay adjustment system.

Third, the adjusted payment method in bulk is recommended using the construction cost accounting by the pay factor. Once decided the pay factor according to the quality and performance test, the payment should be paid to the contractor with the mutual understanding without the changes of building materials. In the process of construction, to prevent any possible claims regarding to the adjusting payment, new legislation with relative clauses needs to be made, and explanation at site and the contract should include the relative clauses as well.

The pay adjustment system, at present, is applied to the limited pilot projects in Korea and improvement on the pay adjustment system with the enhanced standard, in order for the contractors to induce the improved quality of buildings.

REFERENCES

1. "General Term of the Construction Contract", Accounting Standard 2200.04-104-18, 2008.12.29
2. Jun-Gi Park, "The Theory of Construction Responsibility", Gigongsa, 1997
3. Sang-Beom Lee, "The Study on the Method of Adjusting Payment With the Introduction of the Pay Adjustment System", Korea Institute of Building Construction, Research Report vol.10 no.1, 2010
4. Tae-Shik Lee, "The Comparison Study between FIDIC Articles and the Domestic legislation related to Contract", Korea Society of Civil Engineering, Research Report, 2001.03
5. Seok-Geon Lee et al, "The Study on the development of logic of the Pay Adjustment System of Asphalt Pavement", Korean Society of Road Engineers, 2007
6. Korea Institute of construction & Transportation Technology Evaluation and Planning, "the Standardization of the construction Standard focused on the Performance", 3rd Research Report, 2009
7. Korea Institute of construction & Transportation Technology Evaluation and Planning, "the Standardization of the construction Standard focused on the Performance", 3rd Research Report, 2010
8. International Federation of Consulting Engineers, Conditions of Contract for Construction, 2006
9. Federal Highway Administration, Evaluation of Procedures for Quality Assurance Specifications, Federal Highway Administration, 2004.