ISSUES IN SUBMISSION AND CERTIFICATION OF VARIATIONS

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ABSTRACT

The valuation of variation is a critical aspect in the post contract stage. The Contractor has to carry out the works according to issued variation order or on the instructions given by the Engineer even without having the approval. The Contractor might be paid a percentage on the submitted price until cost proposal is certified by the Engineer. The submission and certification process is delayed on most of the projects and this will lead the Contractor to suffer losses from the project.

The researcher attempted to review the time gap between variation submission and certification, using a documentary survey of completed building projects. Content analysis of the documents exposed delay in certification period of several variations, those had generated payment delay to Contractor, and identified the loss of opportunity cost as the ultimate effect. Further, the author identified the issues which caused delays in submission and certification of cost variations, and probable solutions to mitigate those issues. In order to achieve above facts, interview survey was carried out with professionals, who had experience in variation management of building construction field. The issues of delay in variation submission and certification procedure in Sri Lankan industry, and solutions for those issues were derived via analysis of the content of conducted interviews. Finally "Variation Procedure Guideline" was proposed and validated with the participation of experts.

Author recommended that a proper variation procedure is required to control and certify the value of variation according to the proposed guideline to manage the situation without conflicts. Further, maintain the positive relationship between project stakeholders and contribution of government as the regulatory body will be essential to overcome from mentioned issues.

Keywords: *Certification; Conflicts; Submission; Variation Management; Variation Procedure.*

1. INTRODUCTION

Construction industry is one of the important contributors to growth of national economy in any country and a significant supplier to national economy (Ocal *et al*., 2007). Arditi and Mochtar (2000) contented that, "The output of the construction industry constitutes one-half of the gross capital and is 3% - 8% of the Gross Domestic Product (GDP) in most countries" (p.15). Moreover Ocal *et al.* (2007) explained that, construction industry directly affects about 200 other sectors in a country, which also provide essential support to growth of economy.

Zhao *et al.* (2010) summarised that complexity and dynamic nature of construction projects lead to uncertainties and risks. "Changes in projects are common and may be deleterious or beneficial" (Ibbs *et al.*, 2001, p.159). The authors defined, that change in projects as, any additions, deletions or revision to project goals and scope. According to Baloi and Price (2003) there are various factors, those significantly influence construction cost from the estimating stage to project completion stage. Furthermore, Love *et al.* (2002) stated, both internal and external environments of construction projects are dynamic and relatively unstable. Therefore changes those are occurred during a project may have significant and often unpredictable effects on its organisation and management. Thus disputes over variation orders are inevitable in all construction projects (Cox, 1997).

Jayalath (2013) illustrated that a variation in a construction project is a change in form, character, kind, quality, quantity, line, level, position, alignment, or dimension of existing work or an additional work that

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is necessary, appropriate or desirable to complete works. Correspondingly, Turner (1984) elucidated that variations are 'changes within a contract' and not 'changes of the contract'. The latter will require that the contract be rescinded in favour of writing another one if both parties are still interested. Furthermore, the author stated that variations relate to firstly, changes to the work itself and secondly, to the means of getting the work done. Similarly, Baxendale and Schofield (1986) defined variation simply as any change to the basis on which the contract was signed. This includes not only changes to the work or matters relating to the work in accordance with the provision of the contract, but also changes to the working conditions themselves. In the condition of the contract in Standard Bidding Document (SBD) by Institute for Construction Training and Development (ICTAD) in Sri Lanka, Joint Contract Tribunal (JCT), Federation Internationale des Ingenieurs Consils (FIDIC) and other bidding documents define variations and variation procedure for variation orders. All those definitions explain that a variation is an addition, omission, substitutions to the original work agreed in a contract. This can be an alteration of design, quality, quantity and kind or standard of material.

Ibbs *et al.* (2001) discovered that project changes affect to the cost, the scheduling and the duration of projects. This can be direct or indirect effect. Moreover, Jayalath (2013) stated that contractor cannot be compelled without an express provision allowing for those alterations and those must be additional works. Furthermore, the author demonstrated several methods of valuing variations such as using existing bill rates as long as they are suitable, using contract rates and prices as the basis for preparing new rates and prices and using new rates and prices with the settlement between both of the contractor and the employer. Turner (1983) identified that preparing new rates is the available option for additional works where neither bill rates nor adjusted bill rates can be applied. The author recognised this is termed as “fair rates and prices” by the contract, which would appear to mean a level of pricing that affords at least some profit margin. According to Jayalath (2013), engineer can prepare a new rate by breaking down the quoted rates into the elements of plant, materials, labour and overheads, or by using notional build up using any contemporary records.

Avlonitis and Indounas (2005) discovered that out of different pricing methods, cost plus method and pricing according to the market’s average prices are the most popular methods. According to Levin (1998) contractor is entitled to a reasonable allowance for overhead and profit, in addition to the direct cost of performing the extra work.

Giving approval for variation order can be done by the employer, architect or project manager (Hao *et al*., 2008). FIDIC (1999) and ICTAD (2007) forms of contracts state approval must be given as soon as practicable time period after receiving the cost proposal from the contractor. But neither of contract forms state certain time period to give approval for the variation except determining a provisional rate or price for Interim Payment Certificates (IPC) until approving cost and time for the variation.

Forms of contract do not allocate specific time period to give approval to contractor’s cost proposal of variation. Consequently the party, who gives approval to the cost proposal is not bounded to do it within a certain period. Thus in most of projects cost proposals may not approved on time and this leads to delay payment for the contractor for works, which he already completed. Delaying payments for completed works create an opportunity cost for the contractor. Nevertheless contractor is not eligible to claim for that opportunity cost according to standard contract forms for this situation.

Contractor is not entitled to suffer loss for that type of circumstances unless variation is arouse because of his fault. Also there is not any provision to claim this kind of cost and contractor has to suffer.

The aim of the research is to identify the issues and probable solutions to delay in variation submission and certification procedure and to develop a guideline to finalise the variation management procedure within specific time period for an identified variation. The paper provides a comprehensive literature review to identify the prevailing knowledge about variation management. Then findings of documentary survey and interview survey are presented and further subjected to discussion. Finally conclusions are drawn from the findings.

2. VARIATION MANAGEMENT IN CONSTRUCTION PROJECTS

2.1. VARIATIONS

Variation or change is any type of deviation from a work, which is agreed upon, well defined scope or scheduled (Keane *et al*., 2010). According to Hao *et al.* (2008) change orders are common in most projects and it is growing more while the project is getting larger. Those have to be negotiated separately and require a common agreement among all the stakeholders of the project. Anees *et al.* (2013) stated that written approval is the only way to proceed with the change order.

Jayalath (2013) clarified a variation in a construction project is a change in form, character, kind, quality, quantity, line, level, position, alignment, or dimension of existing work or an additional work that is necessary, appropriate or desirable to complete works. According to ICTAD (2007) and FIDIC (1999) variation may aroused in following situations as change to quantity of any item of work, quality and other characteristics of any item of work, levels, positions and dimensions of any part of work or omission of any agreed work, additional work except agreed as in the contract or changes to the sequence or timing of the execution of the works. Ramus and Birchall (1996) stated variation arises when architect needs to modify the design or specification, when a conflict is discovered between two or more of contract documents, when a conflict is discovered between any statutory requirement and any of the contract documents, when an error in or omission from the contract bills is discovered and/or when the description of a provisional sum for defined work in the contract bills does not provide the necessary information.

2.2. CAUSES OF VARIATION

Employer and the consultant are the first and second major contributors to changes in a project (Anees *et al*., 2013). Furthermore authors stated that major causes to the changes are lack of coordination between contractor and consultant, errors and omissions in the design, value engineering exercises, changes of the design and change of plans by the owner. Moreover, Hao *et al.* (2008) clarified that change orders are results of unanticipated causes such as scope changes by the employer, design or technological changes from the architect, cost and/or time changes caused because of supplier problems, design errors, material and operational failures, unsatisfactory site conditions. Also Isaac and Navon (2008) discovered the primary causes of change orders are employer initiated changes and designer's or consultant's errors and omissions. Most frequent and most costly changes are design changes and design errors (Isaac and Navon, 2008).

Keane *et al.* (2010) categorised three types of variation according to the contracting parties in the project. Those are owner related variations, consultant related variations and contractor related variations. Additionally authors added another type of variation as other variations for variations those are arouse by the influences of other parties. According to the author, owner related variations are emerged because of changes of the scope, owner's financial difficulties, inadequate project objectives, changes of materials and working procedures, conflicts arising of sudden decision making process, change the design by the owner and change the specifications by the owner. Consultant related variations are changes to the design by the consultant, errors or omissions in design, conflicts arise in contract documents, changes in the technology, value engineering exercises, lack of coordination between other parties, complexity of design, insufficient details of working drawings, less awareness of available material and equipment, shortage of required data for consultant, ambiguous design details and specification changes which are done by the consultant. Authors identified contractor related variations as lack of involvement with the design, unavailability of plants and equipment, unavailability of skills, financial difficulties of contractor, expected profit of the contractor, variance of site conditions, less workmanship, unfamiliarity with local conditions, fast track construction processes without organised system, poor procurement process, lack of communication with other parties, procurement delays, complexity of design and technology, poor planning process. Other variations are identified such as adverse weather conditions, noncompliance with health and safety regulations, changes in economic conditions, social factors and unforeseen problems.

2.3. EFFECTS OF VARIATION

Variations can be effected to a project by project delay, cost overruns, defects and it may cause to project failure also (Hao *et al*., 2008). Anees *et al*. (2013) identified that the top effects of change orders as cost overrun, time overrun, disputes among the stakeholders of project, enhance quality standards and complaints of one or more parties to the contract. Arain and Pheng (2007) stated that variation in a project is one of the most important causes to project delay. Table 1 explains the effect of change orders to stakeholders of a project.

Table 1: Effects of Change Orders

Effects	Developer	Consultant	Contractor
Increase in project cost	x		
Additional payment for contractor	x		
Progress is affected but without any delay			x
Completion schedule delay	x		x
Increase in overhead expenses		x	x
Rework and demolition		x	x

Source: Arain and Pheng (2007)

2.4. VALUING VARIATIONS

The most significant section of a change order is cost (Anees *et al*., 2013). Also authors stated one of the most important factors for successive change order implementation is discussion of change order calculations.

FIDIC (1999) and ICTAD (2007) defined the methods of valuing variations as,

- When there is a price specified in the contract for a work with similar character and executed under similar conditions, use it as the unit rate,
- When there is a price specified in the contract for a work with similar character and is not executed under similar condition, that price can be used to derive the new rate of variation,
- When the item of work has not a similar character, or is not executed under similar conditions, as any item in the contract, prepare a new rate or price for the variation item,
- For a work of a minor or incidental nature, work can be valued accordance with the daywork schedule.

Pricing of change orders is barely considered on the indirect effects and generally the methods of work break down structure or any other technique is used to track the cost changes (Anees *et al*, 2013). Furthermore ICTAD (2007) and FIDIC (1999) explained that prepared of new rate must be included with a reasonable cost of executing the work and reasonable profit. Additionally, Saunders (1996) summarised that the cost of changes is comprised with direct cost and mark-up.

2.5. VARIATION MANAGEMENT PROCESS

Managing change orders is a huge burden in project management and people in construction industry do not wish to face such processes (Hao *et al*., 2008). Arain and Pheng (2007) introduced a process oriented model for managing variations, which is based on principles of effectiveness, decision making and controls. Those are identify variation, recognise variation, diagnose variation, implement variation, implementation of controlling strategies and learn from past experience.

Engineer can initiate variations at any time before issuing the “Taking-Over Certificate” to the contactor (ICTAD, 2007; FIDIC 1999). Furthermore the documents mention that initiation can be done by either an instruction or request for the contractor to submit a proposal. ICTAD (2007) stated that engineer has the authority to do minor changes to the design if it is necessary or expedient. Engineer will have to get the approval from the client for modification of the design and cost of the relevant work, if it is a major

variation. In spite of approval, engineer would have permission issue instruction for major variations without approval of the client if the variation required immediate action.

2.6. PROCESS OF EVALUATION

According to Hao *et al.* (2008) authorisation of finalising change orders is kept with the either owner, his delegated architect or project manager. Additionally, authors explained that change order become a part of the contract after it is submitted and approved. ICTAD (2007) and FIDIC (1999) stated the documents which must be submitted to get approval for variation order as, a description of proposed work and a programme of it execution, contractor's proposal for any necessary modification to the construction programme and contractor's cost proposal for evaluation. Process of variation application and approval according to ICTAD (2007) and FIDIC (1999) is shown in Figure 1.

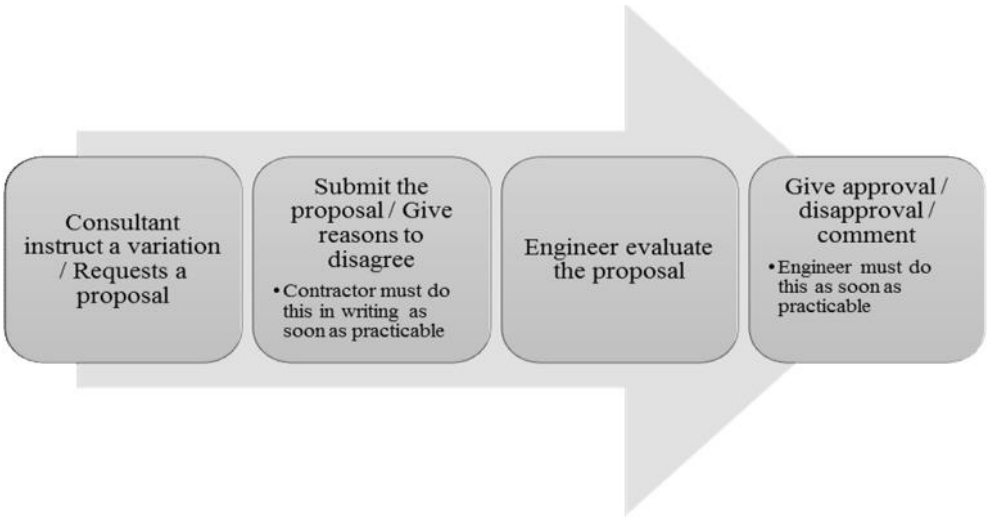

Figure 1: Variation Procedure
Source: FIDIC (1999); ICTAD (2007)

2.7. TIME ALLOCATION TO EVALUATE VARIATIONS

Engineer must respond to the submitted proposal of variation in either the manner of approval, disapproval or comments as soon as practicable (ICTAD, 2007; FIDIC, 1999). But the necessity of approving the change order in certain time period is not considered in the change order handling procedure (Anees *et al*., 2013).

2.8. PAYMENT FOR COMPLETED WORKS

Contractor is paid by the employer in three situations except advance payment as described in ICTAD (2007) and FIDIC (1999). Payment application and certification procedure is summarised in Table 2.

Table 2: Summary of Payment Methods to Contractor

Payment Certificate	ICTAD 2007 Provisions			FIDIC 1999 Provisions		
	Application by Contractor	Certified by Engineer	Payment by Employer	Application by Contractor	Certified by Engineer	Payment by Employer
Interim Payment Certificate	End of each month	Within 21 days after receiving the statement	Within 14 days after the employer receives certificate	End of each month	Within 28 days after engineer receives statement	Within 56 days after engineer receives statement
Statement at Completion	Within 84 days after receiving Taking Over Certificate	Within 21 days after receiving the statement	Within 14 days after the employer receives certificate	Within 84 days after receiving Taking Over Certificate	Within 28 days after engineer receives statement	Within 56 days after engineer receives statement
Final Payment Certificate	Within 56 days after receiving Performance certificate	Within 28 days after receiving final statement	Within 56 days after the employer receives certificate	Within 56 days after receiving Performance certificate	Within 28 days after receiving final statement	Within 56 days after employer receives the certificate

Source: FIDIC (1999) and ICTAD (2007)

2.9. DELAYED PAYMENTS

Mohamad, Nekooie and Kamaruddin (2012) identified miscommunication on variation leads to disagreement on valuation and finally the payment to the contractor will be delayed. Furthermore, misrepresentation of client's requirement of variation order and disagreement between the parties on payment amount, generate conflicts among the project stakeholders (Rahman *et al*., 2009). Subsequently the author mentioned that those conflicts also effect to the delay of payment to the contractor.

Contractor will be entitled to demand for interest payment if he is not received certified payments until specified date (ICTAD, 2007; FIDIC, 1999). However, the payment must be certified for demanding the interest claim.

3. RESEARCH METHODOLOGY

Survey approach was used to achieve the aims and objectives of the research. Literature survey was carried out to acquire definitions and procedures related to variations in construction industry. Documentary review was adopted for collecting data on, duration those had spent to approve variation applications and variation valuation methods in current practice. Semi-structured face to face interviews were conducted with professionals who had experience on variations in building construction projects. Content analysis was used as the technique of data analysis to analyse collected data. Finally validity and reliability of the research design is ensured by following proper measures.

4. DATA ANALYSIS

Based on the findings of documentary survey, researcher identified all the projects, those had delays in certification variations as per Figures 2, 3 and 4. Average period of time which consumes to certify variations, were varied according to particular characteristics of the project. The delays in certification of variations affect to delays in certification of statement at completion. Thus, payments of completed works of contractor was also delayed without providing a claim for opportunity cost. There were three methods which are used to determine the price of each variation as using a rate of similar item in BOQ, using pro-rata basis for an existing rate in BOQ and calculating a new rate from rate breakdowns. All the methods were used in a projects where in appropriate situation and the portion of each method is also varied according to the characteristics of the project. There are number of reasons for the extensive processing time of variations as, caused by faults from contractor, engineer and employer, errors on proceedings which are practiced, and characteristics of each project. Necessary steps to be taken to mitigate those

issues were also identified using the comments those had been gained from interviews. Moreover the most optimum duration for evaluating variations is identified as 14 days as per the Figure 5. Furthermore, the variation procedure guideline was prepared according to the collected data and validated through interviews from professionals who had experience in variations. Finally, the variation procedure guideline was modified according to the comments from validation interviews, to be more feasible to the construction industry and procedures.

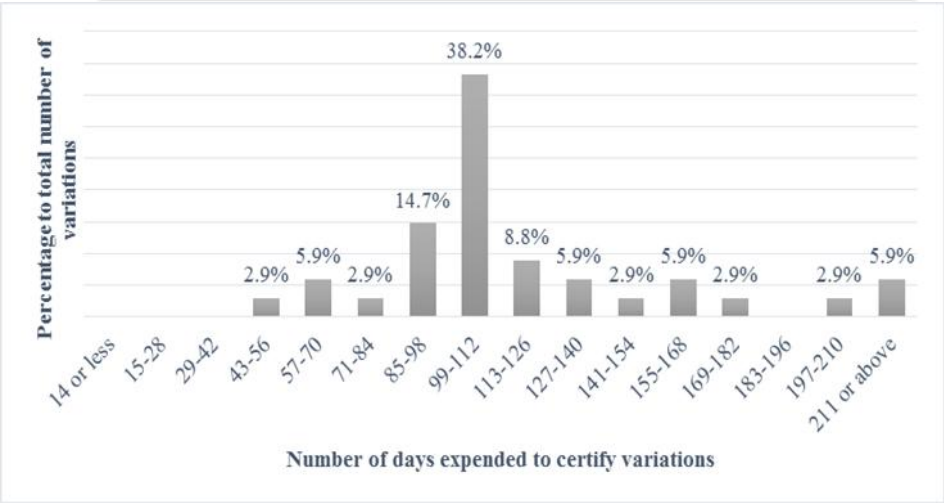

Figure 2: Durations Taken to Certify Cost Proposal of Project A

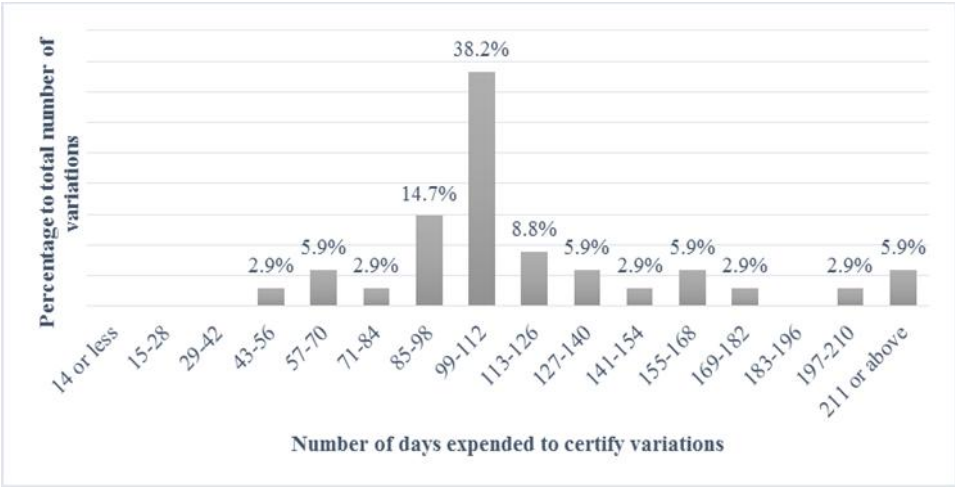

Figure 3: Durations Taken to Certify Cost Proposal of Project B

Figure 4: Durations Taken to Certify Cost Proposal of Project C

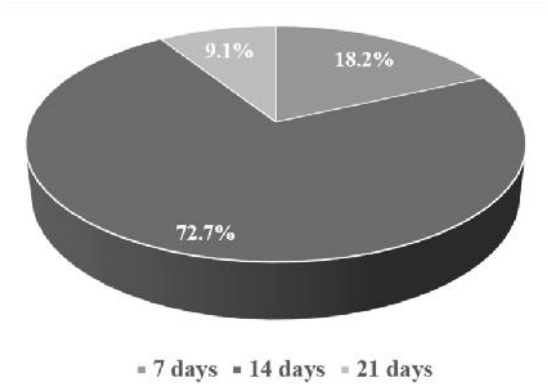

Figure 5: Optimum Duration for Evaluating Variations

5. CONCLUSION

Changes in construction projects are inevitable due to unique characteristics as uncertainties and risks. There are number of divergent construction changes, those occurred in several stages until the completion and alter the project. Proper change management procedure must be followed to approach and implement the change in an efficient manner.

Variation is one of the major type of changes in construction projects, which presents significant influences to the cost until the completion. Variation can arise in numerous ways and can be categorised, according to the relating party to each type of variation. Furthermore, each variation effects to either one or more direct stakeholders of the project. Valuing a variation is one of the major elements in variation management process. Evaluation and certification of the value of variation may create critical and conflict circumstances in the variation management process and generate payment delay to contractor, despite of included provisions in standard documents and contracts.

Documentary survey discovered that the projects had experienced delay in certification of variations in spite of the contract document, payment method and scope of the project. Furthermore, the identified delays had affected as delay the payments to the contractor and had created a loss to the contractor. Three important methods of valuing variations were exposed through the information of the analysed projects.

Interviews verified the delay in current procedure of variations, identified loss of opportunity cost to the contractor due to the delay, and revealed number of reasons for the extensive processing time of variations. The issues were categorised by way of aroused due to negligence of direct stakeholders of the project, errors of standard proceedings and unique characteristics of the projects as shown in Appendix A.

Necessary steps those must be taken to mitigate those issues were recognised in the interview survey. All the solutions were arranged in to four groups by considering the engaging party to each solution as Contractor, Engineer, Employer and government authorities. Next step was preparation of the "Variation Procedure Guideline" using the arranged responsibilities, identified additional solutions and received recommendations of guideline. Guideline was included with three sections such as allocation of responsibility to each stakeholder, variation procedure and cost proposal checklist. Finally the guideline was validated with the positive responses from experts in variation management and thereafter the prepared guideline was modified according to the comments those had given in the validation interviews. Thus the full guideline can be considered as defects free document. This attempt achieved the forth objective of this research.

6. RECOMMENDATIONS

The analysis of the interview survey derived essential recommendations for the variation procedure and documentation process for Sri Lankan construction industry. The author recommends that the "Variation Procedure Guideline" must practice for variation management procedure to improve the efficiency of procedures.

Further, attitude of the stakeholders of the project must be improved to finish the project in a win-win situation. All the parties must maintain a good relationship between each other and arguments of each party must be reasonable to other partners where in a conflict situation, especially in valuation of variations.

Additionally, both Contractor and Engineer must prepare databases for the cost of each item and those must be updated periodically. This will lead the determination process of value to be efficient.

Moreover, new technology must use in presentation and documentation methods. Using new technology to presentation and documentation procedure will diminish most of conflicts in construction industry, because of the efficiency and realism of those methods are more convenient than traditional methods.

Government authorities must publish standard documents of BSR and variation procedure. Consequently, each party in a construction project can refer those documents to get clarifications in a conflict and justify the decision to other parties in a reasonable way, because of government is considered as the regulatory body for construction standards in Sri Lanka.

In conclusion it is necessary to emphasise that, "Variation Procedure Guideline" must be used in Sri Lankan construction industry to diminish the conflicts and achieve benefit in a win-win situation to the project stakeholders.

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