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Project Quality Plan (PQP) Implementation during Site Inspection

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Abstract: Malaysian construction industry has been undergoing radical change driven by Malaysian government's quality policy. The main issue is synonym with construction project which is namely quality. Quality in construction projects can be defined as a compliance with specification and requirement. The well-established Project Quality Plan (PQP) is a part of quality control techniques used especially during site inspection. The implementation that helps in managing and controlling the quality of construction projects has been specified. Although, PQP is part of quality control technique and it requires for construction project, there are some parties that are not well acquainted with implementation of PQP during site inspection. The objective of this study was to investigate the implementation of PQP during site inspection. A semi-structured interview was conducted for the exposure regarding PQP during site inspection among experience contractors. In this survey, questionnaires were distributed among G5-G7 Malaysian contractors and 82 useable questionnaires were collected and analysed. The result illustrated different agreement and perception between respondent's current position and years of experience in construction projects for the implementation of PQP during site inspection. These studies contributed in identifying the significance of PQP's implementation during site inspection.

Key words: Construction projects, project quality plan, site inspection, undergoing radical change, Malaysia

INTRODUCTION

Construction industry in Malaysia is acknowledged as an industry associated with numerous standards and requirements before being turned into a complete end product (Wahab *et al*., 2014). In addition, the processes in Malaysian construction industry dealt with multiple parties as well as different construction works.

However, due to the expansion of construction projects make it challenging to handle (Bryde *et al*., 2013). Furthermore, the customer's high demands are part of the difficulty in construction projects. Research carried out indicated that poor quality of construction projects are the main problems of project success (Bayazita and Karpak, 2007). Numerous researchers have established the clear meaning of quality in construction project namely; to fulfill customer's expectation and specification as well as to complete within approved specification, time and budget (Hart, 1994; Jha and Iyer, 2006).

Constructions specifications and processes must be outlined systematically to ensure the required quality is explained thoroughly during construction works (Boukamp and Akinci, 2007). This illustrated the communication between customer's demands with contractors in the form of written plan. Due to customer's expectations, numerous quality controls are established and implemented. One method that plays significant role in quality control is site inspection.

Inspection is the process of observation at construction site that outlines the diverse components based on the materials specifications, tests and techniques implemented (Building Inspection Guideline, 2012). Furthermore, activity that ensures the construction specification complied is by doing physical scrutiny called inspection (Tamaki, 2014). This study aims to elaborate the PQP implementation during site inspection for quality control in Malaysian construction project.

Project Quality Plan (PQP): Project Quality Plan (PQP) is a scheduled set of construction activities that helps in controlling the project quality during site inspection. PQP was designed and established to ensure the quality

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control is implemented successfully. Prior to the commencement of construction works, this plan must be developed and it requires an approval from the engineer (Noel, 2015).

The necessity of clear statements in the PQP is to assure the information is deliverable for everyone as well as smooth progression of the project. PQP can be developed by both individual for each party in project team or for all parties. The essential elements in PQP vary depending on the nature of construction projects. Nevertheless, there are some elements found mostly in all quality plans. Some of the elements for PQP are namely (Kamaruddin *et al*., 2013).

Element 1: Responsibilities for each top management to ensure the PQP implementation is successful.

Element 2: Outline the appropriate method in handling the documents required for construction projects.

Element 3: Correct requirement are listed.

Element 4: Reviewed and documented each design change requested by customers.

Element 5: Identification of any defects occurrence and outlining the corrective action for the defects.

Element 6: Increase project team awareness in quality control policy and purposes by giving suitable training. Furthermore, since PQP is a set of construction activities, there are 11 documents to be included, namely; method statement, progress report, schedule planning, manpower record, quality manual, material quality plan, mobilization plan, technical report, drawing list, non-conformance report and corrective action request.

PQP must be explained and outlined sufficiently to achieve the targeted standard. It is not only to explain in details but also to elaborate all the procedures or steps in conducting the quality control taken to ensure that the standards are met.

MATERIALS AND METHODS

The semi-structure interview was conducted to obtain the documents inside of PQP among experienced contractors. Later, the questionnaire was developed to investigate if the documents inside PQP were implemented or otherwise. The survey was distributed by hand and email to G5-G7 contractors in Malaysia construction projects. The targeted respondents are project manager, QA and QC manager, site engineer, site supervisor and construction manager.

In this study, the analysis used was content analysis for semi-structured interview and kruskall-wallis Test for questionnaire survey. The goal of the content analysis is to provide knowledge and understanding of the phenomenon under study (List, 2012). Additionally, it contributes in the identification of the main findings by classifying the obtained data (Denscombe, 2010).

A study was conducted and it declared that a stronger method to differentiate the mean and usually used to identify whether the opinion of diverse groups is statistically different known as kruskall-wallis test. Therefore, this test has been used to determine the mean difference on the respondents experience in the construction projects on the implementation of PQP during site inspection.

RESULTS AND DISCUSSION

The presented analysis is a combination of mixed method between quantitative and qualitative data. The distributed questionnaires were specified for Malaysian contractors who have numerous years of experience in the construction projects.

A face-to-face interview was conducted with 6 respondents who had experience in construction projects. The position of interviewees were among the two groups, namely project manager and 4 engineers as shown in (Table 1). The interview duration was between 30-90 min. In addition, to increase the validity of this data, the construction companies where the respondents work must be registered under Construction Industry Development Board Malaysia (CIDB, 2006) in Selangor and the ideal years of respondent's experience are above 5 years. Most interviewees agreed the importance of PQP for construction projects as stated: "It is a must for all construction projects to have PQP since it outlines the component related to quality that need to follow. Later, it includes the defect rectification such as honey comb and how to discard it".

The interviewee indicated that PQP is something that all construction projects have and it contributes in controlling the projects quality. Further, it was agreed by other interviewees and as follow: "Before commencement of construction works, ensure the PQP is establish and present. It is to make sure the clients objective is meet".

Table 1: List of interviewee

Interviewee	Position	Year of experience
1	Project manager	15
2	Engineer	10
3	Engineer	10
4	Engineer	6
5	Project manager	18
6	Engineer	11

Table 2: Years of experience below 10 years

	Mean	
Documents in PQP	<10 years	Rank
Method statement	4.250	8
Progress report	4.593	1
Schedule planning	4.438	4
Manpower record	4.188	9
Quality manual	4.000	11
Material quality plan	4.469	3
Mobilization plan	4.313	7
Technical report	4.438	5
Drawing list	4.063	10
Non-conformance record	4.500	2
Corrective action request	4.438	6

Table 3: Years of experience between 10-20 years

	Mean	
Documents in PQP	<10 years	Rank
Method statement	4.353	5
Progress report	4.471	3
Schedule planning	4.529	2
Manpower record	4.059	9
Quality manual	4.265	7
Material quality plan	4.206	8
Mobilization plan	4.059	10
Technical report	4.353	6
Drawing list	3.706	11
Record	4.382	4
Corrective action request	4.559	1

The statement above was in line with that is to assure the information is deliverable for everyone as well as a brief explanation in PQP is crucial. PQP is a guideline established to ensure the quality of the projects is elaborated specifically and systematically.

Questionnaires were distributed and 82 useable questionnaires were obtained. The results for PQP implementation were computed and listed accordingly to respondent's years of experience as well as the mean values for each document in PQP. This was conducted to determine the level of implementation for PQP during site inspection. In addition, this has helped to determine whether the implementation of PQP document's during site inspection was executed has been ordered or parts of document that has been needed existed for the sake of requirement. Table 2 describes the ranking according to respondent's year of experience <10 years. The mean values ranging from 4.593-4.000 indicated the most implemented PQP's document during site inspection. Table 3 presents the ranking for respondent's year of experience between 10-20 years. The mean values ranging from 4.559 (most implemented) to 3.706 (implemented). Meanwhile, The ranking for respondent's year of experience above 20 years. The mean values ranging from 4.688 (most implemented) to 3.875 (implemented).

Table 4: Kruskall-wallis result

	Kruskall-wallis	
Documents in PQP	χ^2	Sig.
Method statement	2.751	0.253
Progress report	1.048	0.592
Schedule planning	0.586	0.746
Manpower record	0.105	0.949
Quality manual	4.477	0.107
Material quality plan	5.390	0.068
Mobilization plan	2.703	0.259
Technical report	0.380	0.827
Drawing list	3.419	0.181
Non-conformance record	1.897	0.387
Corrective action request	1.919	0.383

Table 5: Mean value for project managers

	Position	
Documents in PQP	Project manager	Rank
Method statement	4.600	1
Progress report	4.500	2
Schedule planning	4.500	3
Manpower record	4.200	9
Quality manual	4.200	8
Material quality plan	4.250	7
Mobilization plan	4.100	10
Technical report	4.250	6
Drawing list	4.450	5
Non-conformance record	4.100	11
Corrective action request	4.500	4

Furthermore, the outputs from kruskall-wallis test showed that documents in PQP had no significant mean difference proven by sig. value >0.05 as listed in (Table 4). This means that based on the respondent's year of experience in construction industry has the same opinion about the implementation of documents in PQP during site inspection. Nevertheless, if comparing the mean, most of the value is above 4.000 but there are 2 with the mean below 4.000.

Respondent's with 10-20 years and above 20 years obtained mean value of 3.706 and 3.875 respectively for drawing List. The overall result expressed the respondents to unanimously agree this implementation as parts of quality control for construction projects. Next, (Table 5) shown the mean ranking for project manager position. The mean values ranging from 4.600 (most implemented) to 4.100 (most implemented). The mean value was above 4.000 for all documents in PQP. This result is described from perspectives of project manager, all documents in PQP were implemented during site inspection.

Table 6: Mean value for QA and QC manager

	Position	
Documents in PQP	QA and QC manager	Rank
Method statement	4.000	8
Progress report	4.583	2
Schedule planning	4.333	4
Manpower record	3.667	10
Quality manual	4.167	5
Material quality plan	4.083	7
Mobilization plan	4.000	9
Technical report	4.667	1
Drawing list	3.583	11
Non-conformance record	4.167	6
Corrective action request	4.500	3

Table 7: Kruskall-wallis result for respondent's position

	Kruskall-wall	
Documents in PQP	χ^2	Sig.
Method statement	8.7740	0.067
Progress report	2.9300	0.570
Schedule planning	0.6160	0.961
Manpower record	13.360	0.101
Quality manual	4.6310	0.327
Material quality plan	4.5810	0.333
Mobilization plan	5.3190	0.256
Technical report	5.6230	0.229
Drawing list	18.944	0.001
Non-conformance record	13.573	0.009
Corrective action request	9.0550	0.060

Comparing with QA and QC Managers, the mean values ranking from 4.667 (most implement) to 3.583 (implement) as listed in Table 6. In addition, there were two documents namely manpower record and rawing List.

Different position has different perception about PQP's implementation. As such comparing the mean of project manager responded with all documents in PQP with value above 4.00. QA and QC managers on the other hand have different responses with manpower record (3.667) and drawing list (3.583).

The results from kruskall-wallis indicated the statistically significant mean difference on drawing list and non-conformance record with Sig. value 0.001 and 0.009 respectively as listed in (Table 7). Meanwhile, other documents indicated that there was no significant mean difference proved by Sig. value >0.05. This showed that respondent's among project manager and QA and QC manager has different opinion about the implementation of documents in PQP site inspection obtained mean value of 3.667 and 3.583, respectively. The overall result showed each perception from each individual differs although there has been the same longer period in construction projects. Furthermore, the implementation of PQP was known and acknowledged by these experience respondents. By testing the data from the survey questionnaire, the pattern of the respondent's responses were analysed. The reason of using Kruskall-Wallis is to determine the perception of respondents based on their years of experience and position in the construction industry. This helps to gain deeper insights about the implementation of PQP during site inspection that acts as part of quality control tools.

CONCLUSTION

A construction project which deals with complexity requires a continuous site inspection. The identified quality control techniques used during site inspection such as Project Quality Plan (PQP) consists of numerous documents needed and required consistency and commitment from involved parties to implement it. In addition, this documentation has been established to provide a guideline to do work correctly and orderly. It requires massive effort and cooperation from all personnel. Thus, the involved personnel should be trained and educated about the necessity of quality control. The knowledge obtained would help them to understand and increase the awareness of quality control purposed for construction projects.

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