

A Study on the Practice of Implementation of Quality Assurance Plan in Nepal: A case study in Department of Roads

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Abstract

This research work mainly presents the current practice of implementation of Quality Assurance Plan (QAP) in construction projects in Department of Roads. In any construction work, the Quality Control (QC) which is a part of QAP is the most important and unavoidable part of the project to achieve the quality product. But in Nepal, practices of QAP and QC are very low because of which the quality of project is degrading day by day. So a very precise study on QAP current practice and its impact in absence of its practice effectively is necessary. This paper gives inside status of how effectively QAP has been implemented in the projects run by Department of Roads (DOR).

The main objective of this research is to find out the effective implementation of QAP in construction project of Nepal. DOR projects were taken for the case study, and about 81 bridge projects were looked in detail from the point view of submission of QAP. The study finds out that most of the contractor have knowledge that they should submit QAP document for the approval of construction work but they do not have detail idea on the necessary points to include in it. Most of the contractors submit only "list of quality control test" as a point to include in QAP beside there a lot parameters to include in it. The study also include questionnaires data with the contractors to get their view on the current QAP practices, the difficulty they are facing to follow the current QAP. Finally some of the SNRTP project were also observed in detail from point view of submission of QAP to make comparative study between project of DOR and SNRTP project. This analysis philosophy can serve as a tool for planning and policy making to increase in Quality Assurance of DOR project.

Keywords

QAP – QC – DOR – Contractor – SNRTP

1. Introduction

Once the civil works contract is awarded, the main objective of the contract administrator or contract management team is to administer the contract and ensure that the works are constructed in accordance with the design intentions, Specification and Contract Condition". One of the measures considered in the contract is submission of the "Program for the Works" within the stipulated time in the Particular Condition of the Contract (PCC), which is generally within 30 days from the date of the Letter of Acceptance. It generally includes showing the general methods, arrangement, order, and timing for all the activities in the Works (CoC, PPMO 2010). The Program for the Works demands the Contractor to propose the implementation

of the Quality Assurance Plan also (Section 116, SS 2014) in order to achieve the desired quality of the works constructed.

Similarly in context of Nepal especially in road and bridge project huge amount of money is invested in the maintenance. The maintenance could be saved if proper quality control measures were taken at the time of preconstruction, construction and post construction phase. The concept of Quality Assurance was initially introduced in World War II when munitions were inspected and tested for defects after they were made. Today's quality assurance systems emphasize identifying defects before they get into the final product. Quality assurance (QA) is a way of preventing mistakes or defects in manufactured products and avoiding

problems when delivering solutions or services to customers; which ISO 9000 defines as “part of quality management focused on providing confidence that quality requirements will be fulfilled”. This defect prevention in quality assurance differs subtly from defect detection and rejection in quality control, and has been referred to as a shift left as it focuses on quality earlier in the process. In construction industry, a quality assurance plan is a document prepared by the Contractor and agreed up-on with the Client, meant to ensure the final product of works are of desired quality. It comprises a set of documented activities meant to ensure that Client get satisfied in advance that the works will be completed as per specification specified in the Contract of Documents. Quality assurance in construction addresses the overall problem of obtaining the quality of the facility to be built in the most efficient, economical, and satisfactory manner possible. Within this broad context, quality assurance involves continued evaluation of the activities of planning, design, development of plans and specifications, advertising and awarding of contracts, construction, and maintenance, and the interactions of these activities.

Construction industry in Nepal is in developing stage. Technically, managerially and institutionally, Nepalese construction industries in evolving stage. The Contractors are still unaware of acquiring technical capability. They do not like to spend money in engaging engineers to enhance their capacity. So they are weak in developing workable quality assurance plan as envisaged by the Standard Specification. Similarly on the other hand, the Client has also not adequate strength for formulating and preparing workable quality assurance plan. Virtually both sides are weak in implementing quality assurance plan. The research will carry out detail study on how the Contractors are preparing and presenting the QAP for their contracts and how the Client is responding to implement the QAP and identify the main issues of the QAP preparation and implementation.

2. Literature Review

The Contractor is responsible for the quality of the works in the entire construction within the contract. The Contractor has to provide, use and maintain on the Site, throughout the period of execution of the contract, a

laboratory with adequate laboratory equipment operated by competent staff for carrying out tests required for the selection and control of the quality of materials and for the control of workmanship in accordance with these Specifications. The list of laboratory equipment to be procured and laboratory facilities to be provided has to get approval from the Engineer. The Contractor is responsible to carry out quality control tests on the materials and work to the frequency stipulated in subsequent paragraphs The Contractor is responsible for submission of a Quality Assurance Plan (QAP) to the Engineer for his approval. The Quality Assurance Plan (QAP) has to be based on the detailed Program of the Works, and process oriented focus on defect prevention.

The Quality Assurance Plan should include Quality Assurance Schedule which comprises, the recapitulative test schedule and testing program detailing the list of tests for compliance, laboratory trials, site trials and trials sections, construction control tests and their frequencies, tests for acceptance of the completed works with their dates, recapitulative list of “critical” acceptance testing procedures for equipment or parts of the works which corresponds to the tasks on the Critical Path according to the construction Program, number of tests to be carried out, list and number of appropriate equipment to conduct them, list of tests to be conducted outside the site laboratory, identification of the outside laboratory where proposed to carry out the test, list of staff assigned to the laboratory, their position and responsibilities in the quality control procedures, their qualification and experience, general description and detailed organization of the laboratory activities, the list of sources of materials and/or of manufactured articles, their main characteristics, their identification mode as provided by the supplier when required; the program of supply and procurement of material and/or manufactured articles in accordance with the Program pursuant to Clause 115. The QAP document should also include the list of tests and quality control procedures to be implemented by the Subcontractors, if any, pointing out the “critical” acceptance testing procedures relating to the Sub-contracted works, which correspond to the tasks on the Critical Path included in the Sub-contracted works. The Contractor has to implement the Quality Control in compliance with the approved QAP. The Contractor has to monitor and update the QAP on the basis of the decisions taken at the periodic review

meetings or as directed by the Engineer and in accordance with the program of the works as per Clause 115 and the Conditions of Contract [1]

World Bank Consultants in 2012 make study to identify the practices and deficiencies within the DOR Quality Assurance procedures and to make recommendations to strengthen these as required. The Study focuses specifically on the materials testing procedures within the existing DOR laboratories at both the Central and Divisional levels, in terms of facilities, practices and responsibilities. The study will also facilitate delivery of the BIMP under preparation through knowledge management and capacity building of DOR. From the study they came with the conclusion that the existing Quality Assurance procedures as practiced within the DOR are not effective. It would appear that adequate and appropriate directives, specifications, rules and regulations are in place, but that these are not rigorously or effectually enforced. It is necessary to amend the relevant legislation to ensure that the procedures are followed and that payment cannot be made without the satisfactory completion of the specified testing regime. They also have made some specific recommendation.[2]

Thus the DoR policies and strategies on quality management was made in 2014 with the main objective “Departmental Policy on quality management is to deliver the desired quality output in all construction and maintenance works for supporting the DOR objective of providing safe, reliable, efficient and cost effective road transport facility to all districts and hence to reduce the poverty and support socio-economic development of the country.” Similarly in the quality policy document different quality control mechanism were proposed like change in the organization set up, in the responsibilities of the different level of offices, in the Job description of different personnel involved in the quality management system, in the setup of different level of Laboratories as well as frequent field visit of higher level of authorities for the sake of quality of works.[3]

The World Bank Consultants list out the detail points that are to be considered while preparing QAP by the Contractor. In addition to the points mentioned in the clause of standard specification the World Bank QAP provides the list to be mentioned in tabular form, chart for quality control of different items of work, the organizational staff chart and working procedure for

different items of work.[4]

In context of requirements for QAP submission in international practice, the US department of transportation have included the necessary points as process control testing(List the material to be tested, tests to be conducted, the location of sampling, and the frequency of testing), inspection/control procedures, Description of Records, personnel Qualifications. Similarly the Indian department of transportation have listed the necessary points in QAP submission which is quite similar with the points mentioned by us department of transportation.[5, 6]

3. Methodology

The major study area of the research is to find-out issues related with effective implementation of Quality Assurance Plan in the construction projects of Nepal particularly in bridges maintenance and new construction of the bridges. For this, different bridge projects of DOR are observed on the basis of preparation of QAP, its approval and implementation.

This study is based on both primary and secondary data. The secondary information relating to QAP will be obtained from literature review of different available documents in DOR. The documents available include Standard Specification for Road and Bridge, Quality Policy by DOR, Quality Assessment study conducted by the World Bank Consultants etc. This research will also review the literature available from the International practices. The primary data are collected by observing QAP document of different DOR project. The DOR QAP document were check whether it include all the necessary parameters according standard specification or not and also to check whether those QAP's are properly approved by the Client or not. This will give status of practices of QAP and there consistency in implementation of QAP.

With the collected these data a questionnaire will be developed in order to assess the understanding of QAP by the contractors. The key stakeholders of the implementation of QAP are the Clients and the Contractors. If both the stakeholders are not clear about the requirements of the QAP in implementation as per the requirements of the Specification, then there will be confusion in its implementation. This questionnaire will

Table 1: Analysis by SPSS

S.N	Description	Mean	N	Std. Deviation	Std. Error Mean
1	QAP document	1.72	81	0.965	0.107
2	Project Organization Chart	2.68	81	0.739	0.082
3	Recapitulative Testing Schedule and Testing Program for compliance, lab trials and site trials	3	81	0	0
4	List of equipment needed in the lab.	2.62	81	0.751	0.083
5	Quality control test	1.67	81	0.084	0.758
6	List of Test to be conducted at outside lab.	2.58	81	0.086	0.772
7	List of quarry for stone/aggregate and list of manufacture test certificate for manufactured product.	2.67	81	0.57	0.063
8	Work methodology	2.83	81	0.519	0.058
9	Non-conformance process	3	81	0	0
10	List of test formats.	3	81	0	0
11	For subcontract work	3	81	0	0
12	Update of QAP	3	81	0	0

assess the level of understanding of QAP by contractor to the requirements of Specification in Condition of Contract.

4. Analysis, Result and Discussion

4.1 Required parameters for Analysis

From literature review 12 parameter were found necessary for the submission of QAP, which are QAP document Project, Organization Chart Recapitulative, Testing Schedule and Testing Program for compliance, lab trials and site trials, List of equipment needed in the lab, Quality control test, List of Test to be conducted at outside lab, List of quarry for stone/aggregate and list of manufacture test certificate for manufactured product, Work methodology, Non-conformance process, List of test formats, For subcontract work and Update of QAP.

4.2 Analysis based on SPSS

Data on the current QAP practice are collected and then SPSS was used to analyze the data. So the collected data were later transform into data suitable for the SPSS model. For those who have completely submitted the necessary documents are given value 1 and for those who haven't included necessary documents are given value 3. Value 2 was given for those who have partially included the necessary points. A value of 2 is taken as the average mean. When the mean value obtained for the particular point is less than 2, the documents mentioned in the QAP are satisfactory whereas if the mean is greater than 2, the documents included are unsatisfactory. The results are as follows which shows that for most of the parameter of QAP submission in DOR project the mean is above 2 i.e the results are unsatisfactory. Results are attached in table 1.

Table 2: Analysis percentage

S.N	Description	Positive percentage	Partly positive (percentage)	Negative percentage
1	QAP document	64.19	0	35.81
2	Project Organization Chart	16.04	0	83.96
3	Recapitulative Testing Schedule and Testing Program for compliance, lab trials and site trials	0	0	100
4	List of equipment needed in the lab.	16.04	6.17	77.77
5	Quality control test	50.61	32.09	17.28
6	List of Test to be conducted at outside lab.	17.28	7.4	75.3
7	List of quarry for stone/aggregate and list of manufacture test certificate for manufactured product.	3.7	22.22	74.04
8	Work methodology	6.17	4.93	88.88
9	Non-conformance process	0	0	100
10	List of test formats.	0	0	100
11	For subcontract work	0	0	100
12	Update of QAP	0	0	100

4.3 Analysis showing Percentage wise

The analysis is shown in Table 2.

4.4 Comparisons on the practice of QAP submission in SNRTP project and in DOR project.

During the course of thesis I have also gone through the sample observation of some of SNRTP QAP submission data. While observing at that those data the QAP submission of SNRTP project are found a lot satisfactory. They have included almost all the points which are found necessary according to literature review. They have made the standard format of QAP due to which it makes easier for the contractor to follow it. Comparison is shown in Table 3.

4.5 Results of Questionnaires with the contractor.

Contractors have no details idea on all the necessary points that should be submitted in QAP. They don't think that the list of test formats should be submitted in QAP. Very few contractors have knowledge on the necessity of submitting "work methodology, update of QAP and list of equipment needed at lab, which might be the reason of not including this point in QAP. Contractors are ready to follow the SNRTP QAP format.

5. Conclusion recommendation and further research

5.1 Conclusion

The main objective of this research is to find out the effective implementation of QAP in construction project

Table 3: Comparison of QAP submission in DOR and SNRTP project.

S.N	Description	DOR project	SNRTP project.
1	QAP document.	Satisfactory	Satisfactory
2	Project Organization Chart	Not satisfactory	Satisfactory
3	Recapitulative Testing Schedule and Testing Program for compliance, lab trials and site trials	Not satisfactory	Satisfactory
4	List of equipment needed in the lab.	Not satisfactory	Satisfactory
5	Quality control test	Satisfactory	Satisfactory
6	List of Test to be conducted at outside lab.	Not satisfactory	Satisfactory
7	List of quarry for stone/aggregate and list of manufacture test certificate for manufactured product.	Not satisfactory	Satisfactory
8	Work methodology	Not satisfactory	Satisfactory
9	Non-conformance process	Not satisfactory	Satisfactory
10	List of test formats.	Not satisfactory	Not Satisfactory
11	For subcontract work	Not satisfactory	Not Satisfactory
12	Update of QAP		

of Nepal. DOR projects were taken for the case study, and about 81 bridge projects were looked in detail from the point view of submission of QAP. After the data were analyzed, a set of questionnaires were made to the contractors to know their difficulty in making proper QAP and also to proposed new QAP. The study draws the following conclusions.

- QAP is not being effectively implemented in DOR projects.
- Contractors have general knowledge of preparing QAP but they don't know the details list of points to include in it. Most of the contractor submit list of Quality control test only as a QAP.
- Clients are not making contractors for the

compulsion of Submitting proper QAP and its approval before the construction work start.

- Quality control in the projects are not being guaranteed as proper QAP is not submitted

5.2 Recommendation

The recommendations that have emerged from this study are as follows

- Proper training should be given to contractor on the QAP preparation.
- The approval of QAP by the client (DOR) should be done properly so that it include all the necessary parameters and no construction work

shall be started before the QAP is approved.

- The QAP which is being successfully implemented in SNRTP project is also proposed for the DOR project as it contain all the necessary points required for the QAP submission and also can be easily follow by the contractors.

5.3 Further research

The contractors are in difficulty maintaining frequency of test for quality control test as mentioned in “Standard Specifications for Road and Bridge works” so a study can be made whether the frequency is appropriate or some deductions can be made in test frequency.

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