

# Quality Assurance and Quality Control for Project Effectiveness in Construction and Management

Mr. Sahil Sanjeev Salvi<sup>1</sup>, Ms. Samiksha Shridhar Kerkar

<sup>1</sup>Assistant Professor, School of Construction Engineering and Infrastructure Management, Symbiosis Skills and Open University, Pune, India

<sup>2</sup>Lecturer, Department of Civil Engineering, Sou.Venutai Chavan Polytechnic, Pune, India

**Abstract:** The development industry has been scuffling with quality issues for several years, and therefore the cost to our economy is dramatic. The price could potentially be reduced significantly if the industry were to embrace the concept of quality assurance that has been used with great success by many other sectors of the economy. Building owners also have to be compelled to be educated on what's quality assurance so they'll begin using their voice to encourage adaptation of this approach to guard their investments and reduce the price of construction. Internal control (QC) and Quality Assurance (QA) represent increasingly important concerns for project managers. Defects or failures in constructed facilities may result in very large costs. Even with minor defects, re-construction is also required and facility operations impaired. Increased costs and delays are the result. Quality Assurance and internal control is an important part of any construction process to boost the standard and uniformity of the project. The requirement for QA and QC in construction projects has increased considerably in recent times because of significant changes, advancements in technology and high expectation of the users. The QA and QC maintain uniformity in construction process and ensure more economical utilization of materials leading to significant reduction in cost to the users. The extra cost involved in QA and QC is directly proportional to the advantages. A technique has been developed for QA and QC in housing industry. The methodology accomplishes the required quality in construction process. Ultimately the presence of quality is vital. So generally we are able to define the standard in several ways as follows, Quality is conformance to requirements or specifications. Quality is fitness to be used. Quality is that the degree to which a collection of inherent characteristics fulfills requirements.

**Keywords:** Quality Assurance, Quality Control

## I. INTRODUCTION

The construction industry has been scuffling with quality issues for several years, and therefore the cost to our economy is dramatic. The price could potentially be reduced significantly if the industry were to embrace the concept of quality assurance that has been used with great success by many other sectors of the economy. The development industry is exclusive, and so, the applying of quality assurance requires an approach that meets the requirements of the industry. Building owners also got to be educated on what's quality assurance in order that they'll begin using their voice to encourage adaptation of

this approach to guard their investments and reduce the price of construction. The quality assurance and internal control has broad meaning as per as various sectors are concerned. Normally to grasp this idea of quality, we formulate four questions as follows,

1. What's mean by Quality?
2. How it's achieved?
3. What's Quality Assurance?
4. What's Quality Control?

When we are talking about quality about anything, either its service or any product; one word should be available in mind as response i.e YES or NO. There shouldn't be any response to differentiate quality viz; fair quality, moderate quality, quite poor or quite good quality. Ultimately the presence of quality is very important. So normally we are able to define the standard in several ways as follows,

- Quality is conformance to requirements or specifications.
- Quality is fitness to be used.
- Quality is that the degree to which a collection of inherent characteristics fulfills requirements.

## II. LITERATURE REVIEW

### A. QUALITY ASSURANCE IN CONSTRUCTION

Within the construction industry it is recognized that an increasing amount of time is being spent in the preparation or examination of contractual claims. A key to this is the increased sophistication of clients in applying the requirements of the standard forms of building contract. These contracts clearly place the burden of proof on the contractor. The task of providing this proof, often in the form of documentary evidence, is frequently complicated by a lack of pertinent records. Therefore to make things worse economic loss is often accompanied by loss of good will Examination of project records shows that questions have not been asked when they should have been, problems are not seen until after they have occurred. It is typically not the case that the individuals involved lack expertise or initiative. It is more often the case that they are pressed for time by other concerns resulting in them giving these issues scant attention.

A further difficulty arises where an individual's lack of experience limits their personal horizon and dims their

perspective of the problems ahead. Crises caused by poor quality have often overtaken contracts that appeared to be proceeding successfully, with the resulting delay and cost, undoing the supposed benefits that had been accrued.

### **B. QUALITY CONTROL IN CONSTRUCTION**

Quality can be defined as the degree to which product is likely to meet the desired specification & limits given by the construction agency. This control ensures that the work done must be of required quality and durability. This can be achieved by conducting inspection from the source of supply of material up to the finished production. Major items of control before and during construction are verifications of soil characteristics, drawings and designs, structural safety, durability, checking the quality of materials, specifications, testing of materials and inspection of equipment.

The field of quality control is multi-directional like testing of materials to be incorporated, field and laboratory tests on mixed materials, proper knowledge of methods/techniques to executive staff/contractor. Precautions to be taken and periodicity of various tests. Firstly, materials to be incorporated in works should be confirming to specifications required. The important step towards improving the quality of work is to ensure that all materials and fittings incorporated in the work are up to the standards laid down in the contract and (Bureau of Indian Standards) BIS specifications mentioned therein. As far as possible materials approved by BIS should be incorporated in works. If BIS standards do not exist for a particular material, the same should be purchased from some standard manufacturer and got tested from approved test laboratories.

### **C. REQUIREMENTS FOR QUALITY CONTROL**

The Quality Control process includes quality planning, training, providing clear decisions and directions, constant supervision, immediate review of completed activities for accuracy and completeness, and documenting all decisions, assumptions and recommendations.

In the construction plan development process, it is the clear responsibility of the designer to ensure all project elements are economical, accurate, properly prepared, coordinated, checked, and completed. In order for the project to consistently meet the needs and expectations of our citizens, quality must be as important as the schedule and budget.

Design personnel shall follow established design policies, procedures, standards and guidelines in the preparation and review of all design products.

Design consultants are agents for the project with the primary responsibility for preparation of construction plans. Consultants must ensure quality and adhere to established design policies.

### **III. OBJECTIVES**

The objectives of the study are as follows:

- To identify the prerequisites for QA and QC and develop the concepts and procedures,
- To understand the concept of QA and QC specifications and apply to building construction.

- To understand the general process of performance related specifications and testing procedures for construction materials.
- To develop checklist for onsite inspection for appraising the QA and QC data periodically.
- To provide 'Project Quality Plan' is to define activities / tasks that focus on achieving customer's quality expectations.

These activities / tasks are defined on the basis of the quality standards set by the organization delivering the product.

### **PROJECT QUALITY CONTROL REQUIREMENTS**

The methods and processes defined in this manual will serve as the Project Quality Control Plan (PQCP) for each project. Every set of construction plans prepared by or for project are required to follow this process.

The Project Quality Control Plan details the proposed methods or processes of providing quality control for all work products. This plan will be kept current with the work requirements. The plan shall include, but is not limited to, the following areas:

- Organization
- Quality Control Reviews

Proposed method of documentation of comments, coordination responses and quality assurance records.

Quality Assurance Certification Plans prepared by consultants for project must, at a minimum, follow the procedures set forth in the manual. Consultants may prepare their own Project Quality Control Plan to be submitted to the PM for approval.

### **IV. ROLE OF ISO-9000 IN CONSTRUCTION**

ISO (International Organization for Standardization) 9000 facilitates the implementation of standards, activities, systems, responsibilities etc. The advantage of ISO-9000 are, it improves quality image of the company. It gives marketing advantage. It improves efficiency, reduces wastage. It ensures customer satisfaction.

What is ISO-9000? ISO-9000 is a series of international standards for quality management and quality assurance system. ISO-9000 is a series which are continuously updated. ISO-9000 Quality Management and Quality Assurance Standards- Selection and Uses. This standard provides a guideline for selecting the appropriate standard from ISO 9001 and 9002 as follows,

ISO-9001- Model for quality assurance in design/development, production, installation and servicing.  
ISO-9002- Model for quality assurance in production and installation.

The difference between ISO-9001 and 9002 is essentially of design. If the organization designs buildings as per customer's requirements, then the organization can go in for ISO 9001.

ISO-9000 quality system standard describes what the requirement of quality oriented system is. It does not set out special requirements.

Whether a company employs 10 or 10000 people, the principle of ISO-9000 can be applied. ISO-9000 in simple word means "DO WHAT YOU SAY AND WHAT YOU DO."

## V. QUALITY ASSURANCE AND QUALITY CONTROL

### A. IMPLEMENTATION IN CONSTRUCTION SECTOR - QUALITY ASSURANCE

The Surveillance function will generally include:

- a) Monitoring laboratory and field testing of construction material and completed works. Reviewing contractor's compliance with specifications, requirement for construction methods and personals.
- b) Monitoring or performing pre-operational tests or both.
- c) Preparing and maintaining quality assurance manuals.

The administrative functions will include:

- a) Initiating, analyzing and approving design clarification or changes in contract documents.
- b) Documenting all project related tests, inspection and visits by official visitors.
- c) Maintain photographs of construction progress and other relevant construction events.
- d) Maintain record of job oriented communication like telephonic conversation memorandum and letters etc.

### B. IMPLEMENTATION IN CONSTRUCTION SECTOR - QUALITY CONTROL

Quality control can be maintained by the utilization of sound engineering practice, professional attitudes, good construction practices and quality. In the context of engineering structures. It may be understood as a function of making men, materials, machines and methods operate at the standards calculated to ensure that the end result of the construction conforms to the prescribed specifications as well as meets the owner/users requirement.

Quality control is a management activity applied to the construction processes to set purposes. Purpose in this case being achievement of prescribed standard of performance and cost. To achieve optimum quality at minimum cost, we have to consider all the factors that help to build quality into a product or service.

In the construction industry where majority of works are executed by the contractor the responsibility of quality control is in the hands of the contractor and he is responsible to the designer and the owner for this.

The main problems facing the development of construction projects and structures are the technological advancement of their fabrication, the improvement of their quality, reliability and factory finishing- These problems can be solved by developing and applying efficient and continuous quality control at each stage of production and by testing products and structures using the latest instruments and machines. In the present day competitive market of construction industry if a contractor has to survive, he should be able to meet the quality requirement of the owner/user and satisfy his needs as well as meet the conformance standards. The various process involved to be able to meet the above requirement should be cost effective.

## VI. CONCLUSION

The process of implementing Quality Assurance and Quality Control System is clearly understood that quality doesn't happen by chance, it has to be managed at every stage of the product. A quality system is a mechanism by which a company can organize and manage its resources to achieve, sustain and improve quality economically. Quality Systems are analogous to financial control systems, information technology systems and personnel management systems.

It is after all the time and effort expands in producing the initial system that a dangerous point is reached. The danger is that once the system is complete it will become a neatly packaged inviolate document. This is the very thing that must be avoided and positive action must be taken to prevent it. A well directed quality auditing programme should be focused upon making upon the procedures more effective in terms of both Total Quality and company's aims.

To conclude therefore it may be therefore it may be helpful to abstract the key point brought out in the previous chapters.

The key points are listed below,

Better quality of work can be achieved by proper QC process at a minor cost when compared with the total cost of the project.

QA can be achieved at the site by exact compliance to the construction specification standards. This can be achieved with a properly organized well equipped field laboratory at the site and centrally located at office.

Quality Assurance is not an optional extra but, Philosophy that management must be committed to.

A Quality Assurance System to have any credibility must comply with ISO 9000 and ISO 14000.

The construction specification in similar project to be executed in future should be modified based on lessons learnt during quality control exercised on previous projects.

Quality of work largely depends upon the quality of materials to be used and workmanship. The relevant specification in respect of materials/ workmanship given in various IS codes be strictly adhered to for accomplishment of QA/QC.

QC should be exercised at different levels such as pre-construction, during construction and post-construction.

As far as possible use of materials for structural members fabricated under controlled condition and strict supervision should be encouraged. Finally remember our Quality Assurance and Quality Control System is a live thing that must encourage a two-way flow of information, as it must change to improve.

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