

Quality Management In Construction: A Review

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Abstract- In this paper , we will explore what is quality management in construction, how construction quality is determined, what may interfere with a quality program, and the processes that you can implement to guarantee that every job is built with utmost quality, the author discusses about the quality management in construction. Definitions of Quality. The practices adopted on site for quality management. Laboratory methods of quality determination. Concepts of Total Quality Management, Construction Productivity, Factors Affecting Productivity of Labor, Suggestions to improve the overall productivity and quality assurance.

Keywords – Construction Techniques ; Quality ; Quality Control ; Quality Management ; Quality Assurance; Quality Standards and Procedures; TQM.

Highlights: In this paper, we are going to discuss the aspects of quality with respect to different stakeholders. Quality management in construction projects. Methods of quality control. Quality assurance

I. INTRODUCTION

We will explore what is quality management in construction, how construction quality is determined, what may interfere with a quality program, and the processes that you can implement to guarantee that every job is built with utmost quality.

The structure for an example of quality management processes as in Fig.1 , which could become a basis for managing the quality of a project's delivery process in any construction company. One of the mainstays of the project delivery process is managing quality in the products or services provided by the construction company.

Quality Management in Construction involves the establishment of policies, processes, and procedures for improving methods of approaches and methods for providing a desired quality and meeting required standards, and, for any firm, establishing the principles and guidelines, both internally and externally, that lead to quality.

The quality of construction is one of the matters of great concern with most civil engineering constructions. Collins (1996) while describing quality as the world's oldest documented profession reports that poor quality can have far-reaching consequences. If construction companies of a country start neglecting the quality aspects in their projects, there is reflection on the reputation of the country worldwide.

Construction quality has not got enough attention also due to the policy of awarding the project on bid price alone (lowest bidder system) the detailed drawings specifications are followed, but the contractor tries to cut the price somehow, that results in poor quality and quality compromises.



Fig.1 - Quality Management Principles

II. LITERATURE REVIEW

Quality Management in the Design and Construction Phase: NAFEES AHMED MEMON, QAZI MUHAMMAD MOINUDDIN ABRO, AND FARIDA MUGHERI studied about the practices of consultants and contractors and suggested proactive measures in order to improve the quality in the design and execution phase of construction projects.

A Study on Quality Management in Construction Projects at Amravati. Mr. Prayesh Pramod Rawale., Prof. P.S.Mahatme discussed about the Satisfaction of all stakeholders in the industry. Better understanding on quality control procedure. Satisfaction of Client etc.

Tan Chin-Keng et. al. investigates preliminary quality management techniques, management commitment to quality management, and quality management implementation issues in building projects in the context of the Malaysian construction sector The study used a semi-structured interview technique with twelve project management practitioners. The study's findings show that the condition of quality management in Malaysian construction projects has to be reinforced, and there are issues with quality management implementation that demand attention and more investigation. The document gives information on the level of quality management in Malaysian building projects.

K. N. Jha, the reasons for poor quality in Indian construction projects are studied to suggest possible areas of activity. A preliminary investigation revealed that the signs of responsible influence on the quality of the project. A statistical study of the questionnaire responses was done, while also revealing which factors generate two distinct sets of success and failure for this instrument. Following a separate investigation of various sets of success and failure traits, they were classified into a limited number of essential success and failure criteria. Project management competency, leadership support, monitoring and feedback from project participants, contact between project participants, owners, and skills have all emerged as critical success criteria. Factors that had a negative impact on the quality of project implementation were: conflict between project participants; adverse socioeconomic and climatic conditions; ineptitude and lack of understanding, improper project conception; fierce competitiveness in the competition The analysis also found that the sum of the contributions of various components to the success rate varies depending on the present project performance rating. After significantly contributing to the project's quality and efficiency, the project manager receives expert knowledge and high-level technical help. According to the report, management is crucial to the success of building projects, just as it is in the manufacturing business.

III. CONSTRUCTION QUALITY

The Construction Quality Control Manager drives a program for attaining the goal of quality management through all phases of a project. Construction quality control is the management system that strives to make sure that final products conform to standards and guidelines established by the customer. The elements of quality control determine how a contractor is expected to handle quality requirements for the design, as defined in the specifications. The contractor's quality control plan is the written document that defines the contractor's processes, practices, and procedures that are intended to ensure that project quality requirements are met or exceeded. At the very heart, quality in construction means completing the project according to defined guidelines as outlined in the scope of work. In construction, quality is the measurement of perfection, of how well the completed building meets the needs and requirements of its owner and end users. Whether you are a building owner, architect, contractor, or project manager, quality is a paramount objective in every building project that you take on.

3.1 Definition of Quality

The term 'quality' has many connotations when used by different stakeholders. Some of the ways in which 'quality' has been defined can be as follows. (Kumar Neeraj Jha)

- It is fitness for a certain goal.
- It complies with the specifications.
- It is about satisfying or surpassing the customer's demands.
- It provides good value for money.
- It is client satisfaction/delight.
- It is doing things correctly the first time and every time.
- It is a decrease in variability.

Whatever definition we choose for quality, putting it into practice becomes extremely difficult. Quality is generally associated with price, lower the price poorer the quality, but it is not always true. The majority of works in 'quality' are reported from the manufacturing business, with very few reported in the context of construction quality.

How do we define construction quality? Is it the quality of building materials, the quality of craftsmanship, or the fulfillment of the end user's final requirements?

Schexnayder and Mayo (2004) extend the definition of construction quality beyond just 'supplying the right materials' and add that construction quality also refers to the project being completed safely, on schedule, within budget, and without disputes or litigation.

According to International Organization for Standardization (ISO), quality is an inherent characteristic. Some of these characteristics are obtained from the stated, implied, or obligatory needs. Total quality in the construction industry can be defined as a measurable process of continuous improvement that is focused on the needs and expectations of the customer. Success requires a partnership characterized by input, involvement, commitment and action from owners, contractors, architects, engineers, subcontractors and suppliers (Deffenbaugh 1993).

IV. INSPECTION, QUALITY CONTROL AND QUALITY ASSURANCE IN PROJECTS

4.1 Inspection is the process of comparing the physical appearance of an object to what is required. Measurement, examination, testing, and gauging of one or more product features or service and comparing this with specified requirements are part of inspection. Generally, a qualitative non-destructive observation such as comparing performance to descriptive criteria.

4.2 Quality Control- Oakland (1995) defines 'quality control' as essentially the activities and techniques employed to achieve and maintain the quality of a product, process, or service. It involves a monitoring activity, but also concerns finding and eliminating causes of quality problems so that the requirements of the customer are continuously met. According to ISO, quality control is defined as a set of activities or techniques whose purpose is to ensure that all quality

requirements are being met. In order to achieve this purpose, processes are monitored and performance problems are solved.

Contractors, professional consultants such as consulting engineers or testing laboratories are in charge of quality control. Building quality control comprises inspecting, testing, measuring, and documenting the construction materials and techniques to examine, verify, and rectify their quality. The primary goals of construction quality control are to create a structure that is safe, dependable, and long-lasting.

V. TOTAL QUALITY MANAGEMENT

According to Oakland (1995), TQM is a method of planning, organizing, and comprehending each task that is dependent on each individual at each level. Continuous learning principles, when combined with TQM concepts like as empowerment and collaboration, suggest that a shift in behavior and culture is essential if construction businesses are to become learning organizations. TQM's philosophy is one of prevention rather than fault identification.

According to Pheng and Teo (2004), TQM is a style of thinking about objectives, organizations, processes, and people in order to achieve the right thing the first time. It is a strategy for increasing the whole organization's competitiveness, effectiveness, and adaptability. The essential elements of TQM are:

- Management
- Involvement of Supplier
- Commitment and leadership
- Training
- Teamwork
- Statistical methods
- Cost of quality

A contractor should have a solid quality management program, because it is crucial for overall construction project success. Quality management is a bedrock for building projects, and plays a major role in determining if the project is successful or not. Quality management in construction projects has become an integral part of contemporary construction practices, which incorporates the principles and initiatives of quality management into their activities

Construction, unlike manufacturing and other sectors, has several specific issues that impede TQM implementation. Among the significant issues noted are:

Poor communication.

Lack of teamwork.

Inadequate planning and scheduling.

The causes identified for the above problems are:

1. No team-building exercises at the inception of projects.
2. Lack of understanding of team members expectations.
3. Little or no team-oriented planning and scheduling.

Cost of Quality

Construction projects are capital-intensive and cost of quality acquires a great significance. According to Juran, the cost of quality can be considered in terms of economics of the conformance quality. The quality cost breakdown based on the work of Feigenbaum (1983), who first described the concept in 1956.

Quality costs = Quality control costs + Failure costs

Where, quality control costs = Prevention costs + Appraisal costs

And failure costs + internal failure costs + external failure costs

Construction Productivity

Productivity is defined as the quantum of production of any work within the estimated cost, with an acceptable quality standard under the defined duration with respect to nature of work. In construction industry, the following factors govern productivity:

1. Well-planned work: work done through the thought process covering all aspects of planning.
2. Skilled manpower: If suitable and skilled manpower is deployed, we stand to save substantially in labor and material. Material wastage, rework and rectification can be avoided. Proper screening of labor should be done before they are actually pressed into service.
3. Good and suitable equipment: We should use equipment of good condition. Also, periodic maintenance of the equipment enhances productivity.
4. Defined methodology: Prior to starting any new activity, it is preferable to work out a step by-step method of working and foresee the possible pitfalls in the process. This will enable trouble-free accomplishment of any task.
5. Right type of hand tools: The workers must be provided with the right type of tools to carry out any work
6. Neat and tidy workplace: A good housekeeping habit can make this happen. If the workplace is easily accessible, the worker will not have any problem in carrying out his task. A site that is scattered with materials will result in accidents, material wastage, etc.
7. Staff productivity: The staff and supervisory personnel must be proactive. The usage of modern methods and equipment leads to better quality and productivity.
 - Optimum usage of inputs, effective utilization of construction materials, and recycling the shuttering items lead to economy in expenditure resulting in boosting up the normal productivity norms.
 - Awareness of, and in-house training programmes in, the latest versions in construction industry can prove to be the best method to increase productivity.
 - Motivation and moral support to the needy at workplace can boost the capability of an individual, resulting in higher productivity.
 - Coordination with interrelated disciplines can help to execute a task without delay.
 - Advanced communication networks aid in speedy transfer of requisite inputs/documents required to complete a target well in time, resulting in better productivity.
 - Curtailing unnecessary overheads can bring down production cost against sales price, resulting in profit.

Quality Assurance

We definitely have quality control at the material level of our supply chain, where we put in quality assurance programs to make sure that materials and components we are using throughout a projects construction are free from defects. For developers and builders in both single-family and multifamily, a strong quality assurance (QA) program helps them meet their quality standards and manage their risk of a building defects lawsuit. QA on a construction project crafts procedures to allow management and labor teams to identify appropriately qualified suppliers. Whereas quality assurance defines a methodology to define how and when to meet building standards, quality control makes sure that the worksite, operators, and management are responding appropriately to specified quality assurance standards.

The QA staff must check all plans to ensure they meet business standards, including labor practices, materials, and finished works. The quality assurance process also would outline the requirements of the inspection, timeframe, and method of reporting, and who is responsible for the reporting. As a result, we will be able to identify if every individual involved in a building process has full awareness of the quality protocols. Every organization should have a quality assurance team on staff, and their primary focus should be to make sure that each individual involved in a project is keeping the standards in mind.

VI. DISCUSSION

Most construction companies are not timely and complete in performing essential inspections on their works, absent a quality control and quality assurance management system. Everything that we do, quality assurance and quality control are integral parts of the way construction runs in projects. When implemented properly, and imposed through ongoing inspections, assessments, data gathering, feedback, and tracing deficiencies, our quality control processes remove the hazard of misunderstandings and assure the continued completion of projects according to schedule.

The whole point, every quality control process in construction is going to need some method to check for quality at each step, to identify and mitigate potential problems, to check for and document all outcomes, as well as evaluate effectiveness of the quality goals. A more structured approach is to develop a quality management plan, develop a quality management process, train supervisors in that process, put in place a monitoring system, assign specific accountability, and audit the effectiveness and results. Moving toward a more structured management process helps to increase quality at construction sites, as well as decrease time and money spent on rework

When we deliver advance planning and establish quality standards at an early stage, we mitigate the risk of making costly mistakes after construction begins. By setting an expected quality standard at the beginning of the project, we are able to keep these expectations in line throughout post-construction. Quality management systems like ISO 9000 Series standards call for continuous surveillance over construction processes.

VII. CONCLUSION

1. The term quality is not just about the price associated with the material, in fact it is a combination of skills applied, use of appropriate material, material knowledge and the process associated.
2. It is observed that the project contractor project consultants knows the importance of quality management but due to lack of standard procedures in design and construction phase of a project the quality gets affected.
3. The design phase is the most important phase in quality management, if error is not rectified in design phase, then it may exponentially reflect in the construction/execution of project.
4. The cost of project may be compromised with poor quality materials during construction phase also the contractor enjoys the benefits but in long term the owner shall pay, as the poor construction requires continuous maintenance after a few years of completion.
5. Every quality control process in construction needs some method to check for quality at each step.
6. Quality assurance is the key of project or a organizations success in long term.

VIII. SUGGESTIONS

During the design stage of a project, consultants/designers should pay more attention to quality. Contractors' primary purpose should be to achieve quality requirements based on client demands in order to meet organizational goals.

The contractors should have materials tested by certified laboratories (IS Certified laboratories)

Consultants and contractors should solicit feedback from their clients in order to assess their level of design and construction service. The comments will give the required information for improving the design and construction quality.

In order to improve quality management during the design and execution phases of construction projects, consultants and contractors should establish quality management systems. The implemented system should be upgraded & updated in accordance with present industry standards.

Employees are the organization's internal customers. It is difficult to achieve correct quality of work and satisfy external consumers if employees are dissatisfied with the advantages and facilities offered by the company. As a result, firms must pay close attention to their employees' requirements and happiness.

REFERENCES

- [1] Kumar Neeraj Jha Construction Project Management
- [2] A Study on Quality Management in Construction Projects at Amravati. Mr. Prayesh Pramod Rawale , Prof. P.S.Mahatme
- [3] Tan Chin-Keng, "Study of Quality Management in Construction Projects" July 2011
- [4] K. N. Jha, "Critical Factors Affecting Quality Performance in Construction Projects" 2006
- [5] Tam, C.M., Deng, Z.M., Zeng, S.X., and Ho, C.S., "Performance Assessment Scoring System of Public Housing
- [6] Construction for Quality Improvement in Hong Kong", International Journal of Quality and Reliability Management, Volume.17, No. 4/5, 2000
- [7] Burati, J., Farrington, J., and Ledbetter, W., "Causes of Quality Deviation in Design and Construction", Journal of Construction Engineering and Management, ASCE Volume 118, No. 1, pp. 34-4