QUALITY ASSURANCE IN COMMERCIAL BUILDINGS

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Abstract - Quality assurance (QA) in commercial buildings plays a pivotal role in ensuring optimal performance, occupant satisfaction, and long-term sustainability. This involves systematic processes and methodologies to maintain standards in design, construction, operation, and maintenance. QA encompasses the evaluation of materials, construction practices, building systems, and compliance with regulatory and safety standards. It aims to minimize defects, reduce operational costs, and enhance energy efficiency while meeting environmental goals. Advanced tools such as Building Information Modelling (BIM), automated monitoring systems, and predictive analytics are increasingly integrated into QA processes. Additionally, stakeholder collaboration among architects, engineers, contractors, and facility managers ensures comprehensive oversight and continuous improvement throughout the building lifecycle.

1. Introduction

Quality assurance encompasses systematic processes aimed at monitoring and verifying that every phase of construction from design to project completion adheres to established benchmarks for materials, workmanship, and compliance. Unlike quality control, which focuses on detecting and fixing defects, QA emphasizes prevention through robust planning, effective communication, and comprehensive documentation.

In commercial construction, the stakes are particularly high, as these buildings often serve as spaces for businesses, public services, or critical infrastructure. Poor quality management can result in increased project costs, delays, legal disputes, and compromised safety. By integrating QA practices such as regular inspections, standardized procedures, and stakeholder engagement, construction firms can enhance reliability, customer satisfaction, and long-term sustainability.

2. Construction quality management

Quality control (QC) management in the construction of commercial buildings involves implementing systematic procedures to ensure that the project meets specified standards and requirements. Ensuring project deliverables meet design specifications, safety standards, and client expectations. Benefits for owners, contractors, and end-users by reducing rework, enhancing safety, and improving durability.

2.1 Quality Control (QC)

This is the regularity process of measuring the actual quality performance, compared to the requirements of the specifications and the difference acted upon.

Organization is required to establish a QC system specific to the project requirements specified in the Technical Specifications to provide a means to regulate, test and inspect all phases of construction in order that compliance with all the requirements.

Organization regularity procedures are in accordance with all contractual requirements. i.e.:

- Agreement
- General Obligations
- Job specifications
- Design Documents

Standard QC Plan helps to check:

- The Adequacy of the construction procedures adopted by Organization.
- The Quality of workmanship
- The Quality of selected materials and equipment
- Safety Management

2.2 Quality Assurance (QA)

Quality assurance is defined as establishing criteria and their assessing the confidence that the quality control performed for any specific work is adequate for the required level. The purpose of quality assurance plan is to:

Verify, correct and impose Organization's QC function for its program. Ensure that the result of each completed work complies with the project requirements.

2.3 QA/QC Interface

To achieve an effective construction quality management, Organization's QC representative and Construction Manager QA interface is established.

1.QC inspection action will be marked on the form before submission to Construction Manager.

2.Construction Manager will verify / vet the Adequacy of Organization's QC Inspection Plan.

Inspection action is checked by Construction Manager prior to commencement of work.

3. Major control points for civil items

3.1 Earthwork & Excavation

Recording of the actual characteristics of the meeting strata during excavation at suitable intervals and comparing with soil investigation report and field bore logs. Constructing small brick masonry pillars for marking levels and for enabling setting-up of theodolite over them. Making and preserving all bench marks, centre lines, tangent points, demarcation and other field stones as established. Retention of the excavated sides from collapse and using appropriate methods like strutting and shoring, side slope cutting etc. Removal of excavated material away from the edges and stacking of usable material in proper manner. No excess accumulation of water in excavated area, hence provision of sump and monitoring dewatering activity.

3.2 Backfilling & Filling

Checking the quality of fill material **-** Filling shall be permitted after removing vegetation, trees, roots etc. and after excavating up to specified level. Approved soil till consisting of ordinary soil, murum, etc. shall be deposited in layers of 300 mm. All clods of earth are broken down to a size not larger than 100mm. Every layer shall be power rolled with 8–10-ton vibro-roller to achieve 95% of Proctor density. Empty Gypsum bags, Construction Wastes, broken tiles or blocks will not be allowed to use for back-filling purpose in any case. Checking moisture content - The moisture content to be used where proctor density or modified.

3.3 Soiling

The rubble stones shall be sound, hard and durable. They shall have at least one dimension equal to the thickness of rubble packing and shall in any case, not be less than 150 mm in any direction. The stones shall be carefully hand packed the longest side of each stone placed to be vertical with the smaller face of the two ends at the top side. All interstices between stones shall be filled in solid with well driven stone chips and the surface shall be made uniform with sand. The rubble soling surface shall be finished with murum or sand.

3.4 Shuttering and Form work

Density of form work:

The formwork shall be so constructed that it is rigid enough to remain free from any bulging, sagging or any movement during the placing of the concrete, and can be subsequently without damaging concrete.

Quality Material:

In general, all shuttering and formwork to be used shall be wrought, unless otherwise stipulated. The formwork used for work shall be wooden formwork lined with plywood or metal plates.

3.5 Concrete Work

As for as possible and practicable, all materials of specified brand types and grades shall be obtained from single source throughout the works. Delivery of materials like cement and steel shall be accompanied with Manufacturer's test certificates and checked for compliance.

Concreting shall not be started unless adequate numbers of vibrators, including reserve vibrators, are on hand. Concrete shall be placed in layers. Concrete shall be placed in its last position before the cement reaches its initial stage and concrete shall normally be compacted in its final position. Concrete once started shall be carried out as a continuous operation until the placing of the section is completed.

3.6 Masonry and Plastering

• **Concrete blocks** shall be mechanically cast and cured under controlled condition. Testing for compression and dimensional check shall be carried out before taking works in hand. The average crushing strength shall be determined as per I.S 2185 and shall be of Load bearing wall density of block shall be not less than 1500 kg /m.3

• **Stone masonry** Stone shall be sound, durable, and free from: pyrites, spalls, cracks, open seams, holes, inclusions, pits, clay or mica seams, or other defects that are likely to impair its structural integrity, durability, or detract from carved features and general appearance.

3.7 Flooring, Tiling and Dado

For Materials

• As per approved sample inspection for colour, dimensions, flatness and damage. Sorting of colour variations lots for use in isolated areas. Keeping inventory and checking on wastage percentage for the limit.

4. Major control points for material testing

4.1 Cement

a) Manufacturer's Test Certificate

b) Compressive Strength

c) Initial & Final Setting time

4.2 Aggregates

Sieve analysis for grading

Check Presence of deleterious material

Silt content

4.3 Reinforcement Steel

General construction details and workmanship relative to reinforcement including bar bends, lap splices and installation shall be in accordance with IS:2502-1963 code of Practice for Bonding and Fixing of Bars of concrete reinforcement as well as the detailing of reinforcement given in IS:456

4.4 Bricks and concrete blocks

- Dimensional check
- Compressive strength

Hollow and solid concrete block shall conform to the requirement of I.S 2185. Hollow concrete block shall be sound, free from broken edges; free from cracks, honeycombing and other defects, which may give a defective work, impaired the required strength.

• Water used for mixing and curing shall be clean, reasonably clear and free from excessive quantities of silt, oils, alkalis, acids, salts.

• pH Value between 6-8 Potable water is generally satisfactory but it shall be tested as per IS: 456 prior to use in the works.

5. Conclusion

Quality Assurance (QA) in commercial buildings is essential for ensuring that the construction process meets both the required standards and expectations of safety, durability, and performance. As the commercial construction industry continues to evolve, implementing robust quality assurance processes becomes increasingly critical to prevent cost overruns, construction delays, and safety hazards, while enhancing the longevity and sustainability of buildings.

The seminar has highlighted that quality assurance in commercial buildings involves a comprehensive approach, incorporating pre-construction planning, design, material selection, and construction execution. By adhering to established industry standards, such as the National Building Code (NBC) in India and ISO 9001 for quality management, construction teams can ensure compliance with safety, structural integrity, and environmental regulations.

Moreover, training and skill development for workers and engineers, along with a strong project management framework, are crucial for maintaining high-quality standards throughout the project lifecycle. This is particularly relevant in commercial buildings, which often involve complex designs, multiple stakeholders, and high-performance expectations.

Finally, sustainability has become a key aspect of quality assurance in commercial buildings. Incorporating green building materials, energy-efficient systems, and eco-friendly designs are becoming integral to quality standards, ensuring that the buildings are not only safe and durable but also environmentally responsible.

In summary, quality assurance is not a one-time task but an ongoing commitment that requires collaboration, adherence to best practices, and continuous improvement. By prioritizing quality at every stage of construction, commercial buildings can achieve not only structural excellence but also long-term value and sustainability for their owners and occupants.

6. References

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