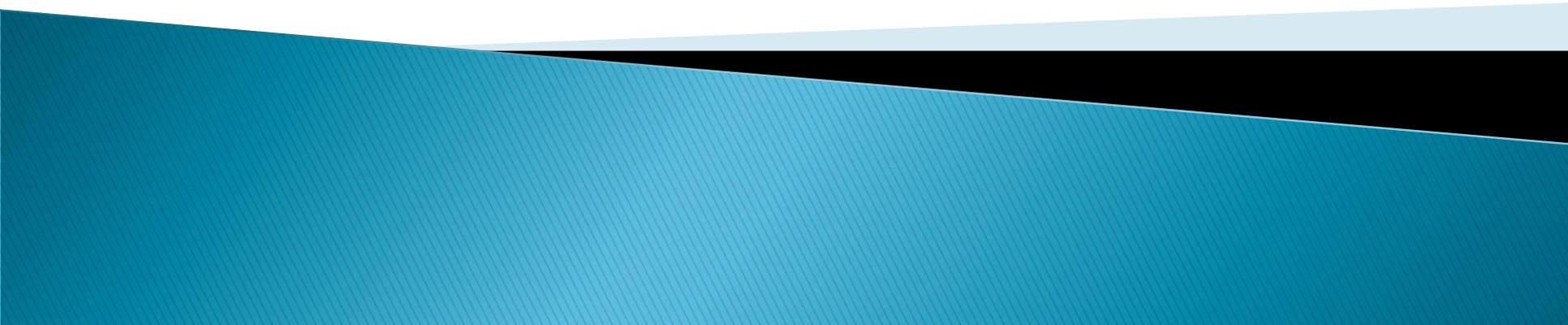


# THE SEARCH FOR QUALITY IN CONSTRUCTION INSPECTION

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# Introduction

Construction Management is a holistic approach to quality management system within the realm of project delivery. Irrespective of the procurement process put in place the issue of quality has become very critical and determines to a large extent the skill component requirement for

Construction Management



# Introduction.....

- ▶ The rising number of cases of construction infrastructure collapse during and after completion justifies need for Construction, Engineering and Public Works Inspection.
  - ▶ Discussion has been ongoing among professionals on project failures such as:
    - ▶ Project or infrastructure defects
    - ▶ Rising cost
    - ▶ Poor performance
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# ..... .. Introduction continued

- ▶ Construction clients are becoming more knowledgeable and demanding quality
- ▶ As such consensus exists on need for improvement of performance in the industry by investing efforts to produce the desired standards of work at first attempt
- ▶ These efforts cover both the planning and design and execution stages
- ▶ Key design decisions affecting quality include component configuration, material specification and functional performance are decided

# .... The concept of quality in construction

- ▶ As far back as 1700BC, King Hammurabi of Babylon introduced the concept of quality in construction when he declared that, “If the building falls into pieces and the owner killed, then the builder shall also be put to death...”
- ▶ During the Middle Ages, construction quality was essentially ensured by the long periods of training required by the guilds. Training instilled competencies and a sense of pride in workers

# .....The concept of quality in construction .....ctd

- ▶ Evidences abound in the pre-industrial revolution era to show how craftsmen superintended over building production with the proverbial dexterity of mat weavers and painstaking devotion of authentic artistes. In the process, the craftsmen trained apprentices who equally contributed to the quality and standard of work
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# .....The concept of quality in construction .....ctd

- ▶ Specialization predicts higher productivity, but the worker no longer produced an entire product; only part of it. There were unfortunately marked decline in workmanship
- ▶ The craftsmen became the inspectors and standards emerged. Because most products produced were not very complicated, quality was not greatly affected; indeed, the increase in productivity gave rise to lower customer expectations

# .....The concept of quality in construction .....ctd

- ▶ Concept on quality emerged from the manufacturing industry
  - ▶ As products became more complicated and jobs specialized, it became necessary to inspect products after manufacture. The manufacturing industry thus came to rely on the use of inspectors to ensure the quality of the product leaving the factory
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# The hierarchy of quality concepts

Inspection

Quality control

Quality assurance

Total quality management



# Understanding the hierarchy of .....quality concepts

- ▶ **Inspection** - involves using or deploying people in order to establish a basic level of quality. It involves the specific measuring or testing of materials or components against specific criteria
- ▶ **Quality control** - Is a process that encompasses the operational and control techniques and activities which are used to fulfill the requirements for quality

# The hierarchy of quality concepts

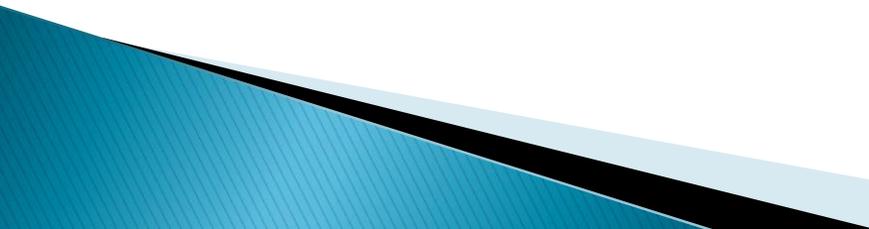
.....ctd

- ▶ **Quality assurance** - Includes the totality of preplanned and systematic actions necessary to provide adequate confidence that a product or service will satisfy given requirement for quality
- ▶ **Total quality management** - is that aspect of overall management function that determines and implements quality policy

# Perspectives of quality control

- ▶ Quality control is that aspect of quality management system which operates through sampling and testing in order to ensure that a service or product meets the required standard. This requires decisions to be made about the scope of inspection required for different aspects of a project

# .....Perspectives of quality control .....ctd

- ▶ The primary objectives of quality control assessments are to ensure avoidance of duplication of efforts, clear delineation of objectives, effective documentation of materials, installations and tests
  - ▶ According to Kabir, Keftin and Adamu (2012) at inception, quality control requires an effective process of brief management to clearly establish the client's intentions
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# .....Perspectives of quality control .....ctd

- ▶ b. At design stage, quality control involves a system of enhancing design quality and costs, free of errors and misrepresentation
- ▶ c. At tendering stage, emphasis is placed on the evaluation of production information for adequacy of scope and consistency
- ▶ d. At construction stage, quality control requires that materials and components be inspected, tested, and that the entire project conforms to designed specifications and the client's expectations

# .....Perspectives of quality control .....ctd

- ▶ Conformance quality should be related to standards specified by the design team which in turn derives from a juxtapositioning of client requirements and relevant industry standards
- ▶ At post – construction, quality control emphasizes the safety of the entire project for habitation. The entire project must be maintained and continually inspected for possible signs of stress that could lead to failure or fire outbreaks

# Construction inspection process

- ▶ 1. Internal inspection by project manager to check on sub-contractors' work and skills of craftsmen.
- ▶ 2. Inspection by the professional team employed by the client e.g. structural engineer inspects structural works and assesses test reports on structural systems.
- ▶ 3. In Nigeria, the National Building Code requires that the resident registered Builder has the responsibility of production management on building sites.

# Construction inspection process

.....ctd

This means that he/she is constantly on inspection on site to ensure conformity with material and component quality specifications and workmanship quality

- ▶ 4. Resident inspection by the Client's/Architect's representative, called clerk of works
- ▶ Inspection by third parties such as building inspectors or code enforcement officers

# The Construction works inspector

- ▶ The work inspector performs a variety of construction inspection work on public works and private improvement projects in order to assess compliance with applicable laws, ordinances, standards, plans and specifications
  - ▶ Traditionally, public works inspectors are employed by an agency of government to undertake periodic inspection on the totality of a project
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# ....Building permit and inspection processes in the Nigerian National Building Code

- ▶ Building Development permits are required by the code. There exists a penalty for starting work before a permit is issued
- ▶ The code enforcement division may issue a stop order or discontinue use of such building if upon inspection it is discovered that a building permit was not sought or granted

# .....building permit and inspection processes .....ctd

- ▶ The application for building permit typically provides such information as:
  - Job address
  - Owner's name, address and telephone number
  - Contractors name, address and active state license number (if any)
  - Architect's or engineer's name
  - Legal description of the property (lot, block, track)

# .....building permit and inspection processes .....ctd

- Brief description of the job, including type of construction, floor area, and number of stories
  - A plan showing all the buildings and the set back from the street
  - Occupation classification
  - Zone
  - Fire district
  - Estimated value of work
- 

# .....building permit and inspection processes .....ctd

## **Inspection**

- ▶ The NBC requires that “All construction works for which an approval is required shall be subjected to inspection by the code enforcement division”
- ▶ This is required to verify that the structure is located in accordance with approved plan

# .....building permit and inspection processes .....ctd

- ▶ a) To ensure that excavations for footings and foundation works are according to dimensions both in depth and width; whether timbering to trenches are required, the treatment given to the ground, thickness of building concrete, the reinforcement placing, the quality of the concrete for foundation, sizes of foundation walls, how the backfilling is compacted and rammed, materials used for the filling and hard core

# .....inspection and code requirements

- ▶ b). It shall be the duty of the person carrying out the work to notify the code enforcement division that such work is ready for inspection
  - ▶ c). Every request must be filed at least one working day before inspection is desired
  - ▶ d). There must be access to or means for proper inspection of such work
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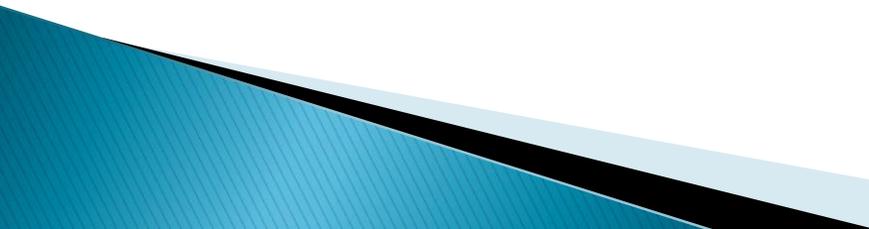
# ....inspection and code requirements

- ▶ e). Work requiring a building permit shall not be commenced until the permit holder or his agent has posted an inspection record card to allow code enforcement division to make entries. The card must be maintained until certificate of use and habitation has been issued

# .....inspection and code requirements

- ▶ The permit holder shall give 3 days notice in writing to code enforcement division indicating the part of the building that would be ready for inspection. If the code enforcement division does not inspect or cause to be inspected, the works indicated within 7 days, the work shall proceed as if such inspection had been done”

# Building elements that require inspection.

- ▶ Reinforcing steel or structural framework of any part of any building or structure Current scale uses the sliding scale
  - ▶ Foundation inspection shall be made after excavation for footings are complete and any required re-enforcing steel is place. For concrete foundations, any required forms shall be in place prior to inspection
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# .....areas requiring inspection

- ▶ Concrete slab or under-floor inspection, shall be made after all in – slab or under-slab or under-floor building services are in place but certainly before any concrete is placed
- ▶ Frame inspection shall be made after the structural frame at each floor level, fire blocking and tracing are in place and all pipes, chimneys and vents are complete and the first fix electrical mechanical (plumbing, heating wires, pipes and ducts) are approved

## .....areas requiring inspection ..ctd

- ▶ Final inspection is required after finish grading and the building is completed and ready for occupation
- ▶ Building service equipment inspection shall be made by code enforcement division
- ▶ Special inspections for specialized activities such as pneumatic concrete, pre-stressing concrete, high-strength bolting, structural masonry, insulation concrete fill, spray applied fire – proofing, piling

# .....Prospects and challenges facing inspectors

- ▶ The incidences of building and infrastructure collapse and the increase in poor performance of construction and infrastructure projects have provided great potentials for inspection practitioners to excel in their essential duties which include:
  - Inspection of contract and work permit for compliance with stipulated provisions
  - Maintenance of accurate records on work progress, work quality and change orders

# .....Prospects and challenges facing inspectors

- Provision of general information on public works department policies and operations.
- Monitoring and performance of field test for assurance including soil compaction, water pressure, chlorine bacteria and concrete compliance tests
- Review application for public improvement permits and approval issues of permits
- Plan the checking of public/civil works construction drawings; review various types of revision to ongoing construction projects

# The challenges ahead

- ▶ Challenges to public works inspection include:
    - Education
    - Training
    - Skill deficiency
    - Backing up the code with enabling laws
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# We can overcome the challenges

- ▶ Actions required of other developing nations, whose inspectorate systems are not yet developed should include the enacting of statutory vehicles for enforcing technical and quality criteria for construction developments

# ....We can overcome

- ▶ In these times of high environmental awareness, the inclusion of clauses which would enforce sustainability of the environment, as given in the development Green Building Charters and Principles is advisable

# Conclusion

- ▶ There are matters arising from the subject matter of public works inspection
  - ▶ There is silver lining on the sky if we do things right and integrate sustainability concepts into our infrastructure procurement
  - ▶ Hope is not lost
  - ▶ Our generation can make a difference
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**Thanks**

**Thank you for listening**

