UNIT - IV.

Inspection and Quality Control :-

Need for inspection and quality Control :-

* The objective of inspection and quality control is to achieve sound construction work which results in structures of good quality at reasonable cost.
* Inspection and quality control are required on all construction projects to ensure that the work is done in accordance with plans, specifications and good practice and to avoid effects.
* Careful inspection and quality control is therefore as important as preliminary investigation and design. As it very difficult and expensive to rectify a structure after it constructed
* The objectives to be achieved through inspection should be determined before commencement of construction so that proper arrangements can be done at site
* while carrying out inspection for quality, those are compared with standards which specify the limits of permissible variability and the purpose of inspection is to find by observation and or testing, whether the quality of work, materials or products lies within the acceptable limits of variability or not. ⇒ Inspection need to carried out at various stages of the work in order to achieve the desired quality.
* Generally inspection of construction work at various stages, include
  (i) Sampling, identification, examination and field testing of materials,
  (ii) Measurement and proportioning of construction materials
  (iii) Examination of layout; form work, foundations etc.
  (iv) Testing specimens in the laboratory
  (v) observation of construction equipment and plant

(vi) * Preparation of Records and reports.

* Quality control ensures that work proceeds in accordance with the specifications laid down and inspection is the tool through which it is practised.

Principles of Inspection:-

* On large jobs, a seperate inspection agency is generally provided to ensure effective inspection and quality control.
* This inspection agency plays an important role in the execution of works and has diverse duties and responsibilities.
* For this purpose, the inspector is a professional having knowledge of the Principles and methods involved in the execution of works.
* He should also have the requisite competence, skill, personality and confidence to get the work done according to the plans and specifications.
* An inspector is generally authorised to stop any work which is not carried out according to plans and specifications.
* Thus, in order to avoid faulty construction and delays, inspections should be made at regular intervals and inspection recommendations implemented immediately.
* The inspector is authorised to stop use of materials and equipment which do not comply with the specifications and sound engineering practice
* The inspector should report ~~immediately~~ immediately to superiors about his observations and actions.

Enforcement of specifications :—

* Specifications consists of instructions for the guidance of construction and inspection staff in order to construct sound and stable structures.
* specification requirement may be divided into the following two groups.
  (a) Requirements which are definite
  (b) Requirements which are laid down by the engineer incharge.
* specification requirements in the latter case are necessary where precise requirements cannot be laid down due to insufficient investigations (or) where difficult or new situations may arise.
* In case of earth work, specification requirements may be further grouped based on performance or procedure.
* At the time of execution of works, differences may arise b/n contractor and inspection regarding interpretation of certain requirements. So, it is essential that specifications are framed in clear terms indicating precisely the specific requirement along with allowable variations.
* Proposals for any modification of ~~requirements~~ specifications require careful examination of design requirements, site conditions and financial implications etc.
* All such modifications are to be approved by the chief engineer or other competent authority before putting these into practice.

Stages of Inspection and Quality Control:-

* In construction works, there are certain stages in which individual items are required to be inspected so as to avoid dismantling of completed work.
* The cutting, bending and fixing of reinforcement, erection of formwork, embedded materials, placement of concrete etc.. call for careful planning and co-ordination b/n construction and inspection teams.
* The important items required to be inspected during construction are
  (a) Earth work → layout → trenches protected based on soil, depth of excavations → distance from trenches → check for slope / level as per drawings
  (b) Masonary
  (c) RCC → PCC → avoid settlement → compaction check → soil type → method of compaction → specifications.
  (d) Sanitary and water supply services
  (e) Electrical services.

(a) Earth work:-

* Earth work in excavation should be carried out after proper layout.
* The trenches in excavation should be protected suitably depending on the type of soil and the depth of excavation.
* The excavated earth should be stacked at a suitable distance from edge of trenches.
* The base of trenches should be checked for slope / level as per drawings
* Proper earthwork in filling should be checked for compaction in layers so as to avoid settlement at a large stage.
* Compaction should be checked with reference to the type of soil, method of compaction and the specifications.

(b) Masonary :-

* All masonary works should be inspected for type of masonary, materials, bond, alignment and verticality etc..
* Any defect detected in alighment or verticality should be promptly corrected.
* verticality can be checked by using a plumb bob.
* Another point to be checked during inspection is proper filling of joints with mortar.
* The proportion of mortar is checked ~~for~~ before mixing.
* The strength of bricks is checked by a compression test.
* Curing of masonary by a suitable method should be checked and ensured.

(C) R.C.C :-

(i) Reinforcement :-

* The inspector should check the correctness of reinforcement at the time of installation.
* splicing of reinforcement should be avoided at the points of maximum stress.
* splices for bars of 20mm dia and above may be welded as per specifications
* Too much welding is avoided and proper cover is maintained.
* The steel should not be bent (or) straightened in a manner that would effect the material.
* checking for correctness of reinforcement and its measurement must be done before commencing concreting.

(ii) P.C.C :-

* Careful inspection and control are required to ensure proper mix design, proper correcting practices.
* The selection of suitable concrete for job involves proportioning of the available aggregates, cement, water and air containing agent if required.

* Proper batching, uniform mixing, careful handling and transportation of concrete is essential.
* The correctness of layout, dimensions, stability and cleanliness of the formwork should be ensured before placing the concrete
* The joints are kept moist and any pools of standing water are removed before placing of concrete.

(d) Sanitary and water supply services:-

* In modern construction most of the sewage and water supply lines are embedded and concealed under floors and walls.
* All sewage lines are checked for slope, alignment, leakproofing of joints and stability of base.
* Both water supply and seepage lines should be tested for leakage by filling water at appropriate pressure.
* Covers of manholes and inspection chambers should be checked for strength.
* Suitable arrangement of roof drainage in all buildings should be checked and ensured during construction.
* Improper roof drainage, it may result in dampness of roof and walls ~~drainage~~ ~~facilitates~~ and ultimately loss of durability of structure.
* Complete layout of all these servies should be shown in the as-built drawings for future reference.

(e) Electrical services:-

* For providing domestic electrical services, cables, switches, panels and meters should be provided as per specifications and design.

* The cable layout should be designed and indicated on the drawings.
* cables and conduits should be inspected and tested before embedding.
* The entire system of electrical power supply should be tested for its faultless service.
* Effectiveness of earthing should be checked to ensure safety against electric hazards.
* position of lights, fans and switches should be ensured at appropriate heights and locations free from dampness.