

# **CONSTRUCTION MANAGEMENT & SAFETY ENGINEERING**

**(SUBJECT CODE : 5012)**



**Department of Civil Engineering  
Government Polytechnic College Manjeri**

**NISHMA M NAIR**

**Lecturer in Civil dept. GPTCM**

# MODULE 2-CONTENTS

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**Contract:** – conditions for validity of contract - Types of contract – Item rate contract – Percentage contract – Cost plus percentage contract – Lump sum contract –Piece work system - Departmental execution of works - Comparison of different types of contract – Execution of agreement – Conditions of agreement - Work order.

**Quality control:** – Need and objectives of quality control – Role of specification, supervision, check lists, inspection and sampling & testing of materials in quality control.

**Measurement of works:** – Rules for taking measurement – M-book – Rules for recording in M-book – contractors acceptance of measurement – Arithmetic check – Preparation of bill – Types of bill – F&F bill – Part bill – Part & Final bill, Final bill – Recoveries from bill – Mode of payment – Hand receipt - Contractors ledger – Imprest money

# TENDER

- Tender is an offer to do a job or a service based on certain terms and conditions in turn for Remuneration
- A Tender notice is an open invitation to participate in tender process

## OBJECTIVES

- To get the work / service done at most competitive rate
- To provide a legal cover for the contract through an agreement
- To ensure equal opportunities for all eligible contractors
- To ensure quality through the specification given in the agreement
- to ensure transparency in Public work
- It gives a realistic picture about the amount involved for a project
- It gives publicity for the project being carried out
- Helps in public audit

## A TENDER NOTICE CONTAINS

- Name of the department or organization inviting tender
- Tender notice reference and date
- Name of the work
- A brief description of the work or service
- Completion period
- Special conditions
- Last date and time for closure of selling tender form and accepting it
- Date, time and venue of opening the tender
- The details of the designating officer inviting and opening the tender
- **PAC** - Probable Amount of Contract
- **EMD** - Earnest Money Deposit

# PAC - PROBABLE AMOUNT OF CONTRACT

- It is the expected total cost of the projet as per the departmental rates based on the design and drawing
- To give preliminary information to the tenderer about the magnitude of the work to be done

# EMD- EARNEST MONEY DEPOSIT

- It is collected along with the tender to ensure the earnestness of the contractor in participating in the tender process
- **2.5 % of PAC**
- Collected as DDs and Government security bonds
- Returned immediately for the unselected contractors
- It is converted to **security deposit** in the case of selected contractors

**SECURITY DEPOSIT** - Amount withheld from the contractor as warranty for the works carried out , Released after warranty period, **10 % of the bill amount**

# TENDER DOCUMENT

- Tender form
- Tender schedule and rates
- Terms and conditions
- Preliminary agreement
- Copy of tender notice
- Particulars about contractor's details

# PROCEDURE FOR OPENING A TENDER

1. Opened only by the designated officer at the venue and time specified in tender notice
2. All tenders must be serially numbered on the cover
3. Openend only in the presence of contractors
4. Should be opened without damaging the seal of the cover
5. After opening the amount quoted should be read loud aall corrections should be endorsed at the bottom of each page
6. After opening all tender, a tender tabulation statement is prepared
7. So that the contractor quoted low amount can be easily pick up
8. **Negotiations** are then held with the contractors if required and permissible



## NEGOTIATION

- It is the official discussion held with the contractors by the designated officers if some clarifications are required , or the rate quoted them are very high or differ only marginally from others.
- The contractors have the liberty to reduce the rates based on the negotiation, and such reduced rates arrived upon known as negotiated rates

9. Contractor quoted lowest amount fulfilling the tender conditions will be intimated in writing by registered post about their selection within the **firm period** through a selection notice requesting them to execute the agreement in the proper format within the specified period

**FIRM PERIOD** - Period stipulated for intimating the selection of contractor

# TYPES OF TENDER

- **Based on Objectives of Tender**
  - ✓ Tender for execution of project work
  - ✓ Tender for supplying of materials, goods or equipments
  - ✓ Tender for executing services
- **Depending up on Scope, Nature and Period**
  - Prequalification tender
  - Global tender
  - Regular tender
  - Short tender

# CONTRACT

A contract is a legally valid written document to do a job/service or supply items at a specified cost based on certain terms and conditions laid down in the contract

## CONDITIONS FOR VALIDITY OF A CONTRACT

- Should be on a lawful subject matter
- Should not violate the law of land
- Should be between consenting parties
- Terms and conditions, including those of payment, should be explicitly specified
- Unrealistic or Unachievable conditions should not be made as the part of contract
- The contract should be signed between legally valid persons with sound mental conditions
- The contract should be unbiased, abiding by the constitution of the country

# TYPES OF CONTRACT

- A. ITEM RATE CONTRACT**
- B. PERCENTAGE CONTRACT**
- C. COST PLUS PERCENTAGE CONTRACT**
- D. LUMP SUM CONTRACT**
- E. PIECE WORK CONTRACT**

## A. ITEM RATE CONTRACT

- Contractor has to quote the rates for each item of work
- The total amount is worked out by multiplying the rates quoted with the estimated quantity of respective item
- Work is awarded to the contractor who has quoted the lowest total amount
- Usually adopted in CPWD

## ADVANTAGES

- Contractor gets the liberty to quote for each item according to his convenience, Hence there is every chance to get the work done at the lowest possible rate
- Chances of conflicts among contractors will be less

## DISADVANTAGES

- When the actual quantities vary from those shown in the schedule, the lowest tender need not be always the lowest
- The tender tabulation will be difficult

## B. PERCENTAGE CONTRACT

- Here the contractor is given 3 options
  - a) To carry out the work in departmental rates
  - b) At certain percentage below departmental rate
  - c) At certain percentage above departmental rate
- Percentage claimed above or below the departmental rate is applicable to all the items
- Here the lowest tender will always be the lowest even if the quantity vary
- Contract also protects the owner from price escalation



## ADVANTAGES

- Simplicity in filling the tender form and easiness in preparing tabulation

## DISADVANTAGES

- Contractor has no freedom to quote a lower rate for any particular item and due to that chance of work done at higher rate
- Chance of malpractices by the contractors during the hours of closing the tender (Nowdays it can be eliminated bt e-tendering)

## C. COST PLUS PERCENTAGE CONTRACT

- Here the contractor claims a certain percentage of profit above the actual cost of construction
- Contractor will produce the actual bills and will claim the profit percentage based on the total cost of such bills of material and labour
- Usually adopted in private sector

## ADVANTAGES

- Overcharging of the contractor fearing price escalation can be avoided

## DISADVANTAGES

- Price escalation will affect the owner and the contractor will take least effort over cost control

## D. LUMP SUM CONTRACT

- Here the contract is given for a lumpsum amount for the entire work based on the detailed design,drawing and specifications
- Usually undertaken by contractors of residential buildings
- Payments are made based on cmpletion certifciate or stage certificate from the engineer in charge

## ADVANTAGES

- Owner gets a clear idea about the type and quality of work and is relieved from price escalation
- The final cost remains the same

## DISADVANTAGES

- Deviation during construction will create disputes between the contractor and the owner

## E. PIECE WORK CONTRACT

- It is a sub-contracting system adopted for minor works in Major projects
- So that the main contractor can concentrate on major activities
- It is also adopted for supply of materials by major industries
- This is a form of outsourcing work
- Generally not adopted in government projects

# DEPARTMENTAL EXECUTION OF WORK

- This is adopted by the engineering dept. of govt. under following circumstances
  - i. To execute works of urgent nature like canal breach, flood relief work etc
  - ii. When no contractor turns up to take up the work
  - iii. When all the contractors quote exorbitant rates
- Rarely occurs

# EXECUTION OF AGREEMENT

- The selected contractor will be intimated in writing by registered post asking them to execute the agreement in proper format in the stamp paper
- The agreement will be signed by the contractor and the designated engineer (usually the executive engineer)
- Work order will be issued as a permission to start the work
- Site is handed over to the contractor by the section engineer (AE)
- After completion the site will be handed over by the contractor to the AE or the concerned department



# CONDITIONS OF THE AGREEMENT

- The completion period
- Agreed tender rates
- Rate of departmentally supplied materials or hire charge of equipment
- Penalty or bonus clauses
- Statutory charges
- Special conditions if any

# QUALITY CONTROL

- Customer satisfaction capability of a product or service
- It refers to meeting the servicability requirements
- Specification of materials and method of construction are the means to achieve quality in construction

## NEED/OBJECTIVE OF QUALITY CONTROL IN CONSTRUCTION PROJECT

- To ensure that the specification in the contract are met with
- To ensure safety, servicability and durability
- To check malpractises in construction industry
- Not only material quality it checks the quality of workmanship also

# ROLE OF **SPECIFICATION** IN QUALITY CONTROL

- Technical details or description about a material, work or service
- Also includes references to standards and accepted practices
- It serves as a guideline in the selection of material, workmanship, and method of execution of work
- A good specification should be
  - ✓ specific
  - ✓ free from ambiguity
  - ✓ conform to standards
  - ✓ must be achievable and realistic
  - ✓ meet servicability and durability conditions
  - ✓ meeting customer requirements and expectations

## ROLE OF **SUPERVISION** IN QUALITY CONTROL

- To give directions during construction
- Check malpractices and aberrations in construction
- Effective communication during supervision can clarify the doubts of the contractor / worker during ongoing construction activity
- It ensures quality

## ROLE OF **INSPECTION** IN QUALITY CONTROL

- Carried out by higher officers to ensure quality and to check the bad practices
- Technical auditing

## ROLE OF **CHECKLISTS** IN QUALITY CONTROL

- It includes points to be verified during an inspection or supervision
- It is guideline to the worker and supervisor and quality control inspection
- Reminder to everyone to ensure that quality is maintained

## ROLE OF **SAMPLING AND TESTING OF MATERIAL** IN QUALITY CONTROL

- It is done to ensure the quality of materials to be used as well as the works executed
- Samples selected should be random
- No. of samples taken should also be sufficient to ensure total quality

# MEASUREMENT OF WORK

- Taking the measurement of work and recording it is important for bill preparation and making payment
- Rules for measurement of each work has given in PWD data book (least count and method of taking measurement)
- Measurement is taken after completion
- But in some cases prior to the completion measurement is taken  
Eg - Measurement of clearing the site, demolishing of structure, Reinforcement of RCC

# M-book (Measurement Book)

- It is the book in which the official measurement of works is recorded by the AE
- Also checked by AEE and EE
- M-book should be certified by a competent authority (usually EE) regarding the number of pages before issuing and using it
- Each page will be machine numbered serially
- Title portion to record the details of the work
- Tabulation column to record the measurements

# RULES FOR RECORDING M-BOOK

1. The measurements should be recorded in the M-book in the AE's own handwriting directly from the site
2. Measurements should be recorded in the presence of a contractor/his nominee and their acceptance of the measurements should be recorded on the last page with the certificate 'I accept measurements'
3. Measurements should be recorded with permanent ink
4. No erasing or over writing is permitted
5. In the event of an error it shall be cancelled with a single stroke and with the initial of the AE



6. No line or page should be left blank. If it happens it shall be cancelled by striking off with the initial of AE
7. The details of work such as name of work, details of agreement, and the date of recording measurements shall be recorded on the top of the page
8. Check measurements by AEE and EE shall be marked **with ink of different colour**
9. After making the payment of a work all the relevant pages of the M-book should be scored with double lines and stamped as **PAID** in order to avoid duplicating payments.

# BILLS

- The bill of the work done is the statement of the amount due to the contractor
- It is prepared based on the measurement from the M-book and the rate agreed in the agreement
- Before payment the calculation of the measurement should be double checked to avoid arithmetical mistakes
- The office copy of the bill is prepared in the M-book and the fair copy is prepared in proper bill form
- All aspects of the bill should be crosschecked by the drawing dept. in subdivision before making payment

- The payment will be made in the form of cheque (Nowdays e-banking)
- The cheque will be prepared by the divisional accountant from the respective head of account and will be signed by the EE
- It is recorded in contractor's ledger kept at divisional office

## **TYPES OF BILL**

- 1. FIRST AND FINAL BILL (F&F)**
- 2. PART BILLS**
- 3. FINAL BILL**

## **1. FIRST AND FINAL BILL (F&F)**

- When duration and amount involved is small the payment is made as a single instalment after the completion of the work
- preparing the first and final bill after the whole work

## **2. PART BILLS**

- When duration and amount involved is large, the contractor will be paid interim payments in the form of part bills

### 3. FINAL BILL

- After completion of the work in all respect a bill will be prepared for the entire work
- This bill is known as final bill
- From the final bill the part payments are deducted
- Some times the final bill contains the last part of the work carried out
- In such case the bill is known as **PART AND FINAL BILL**

# RECOVERIES / DEDUCTIBLES MADE FROM BILL

- These are the amounts recovered or withheld from the bill
- It includes
  - All part payments
  - Amount towards security deposit
  - Cost of departmentally supplied materials
  - Hire charges of department equipment and machinery
  - Statutory payments like income tax TDS, GST, labour welfare fund
  - Penalties if any

# HAND RECEIPT

- For petty payments at site, Bills in proper form may not be available
- For making such payments, stamped hand receipt will be obtained from the receiver narrating the details for which the payment is made and the amount involved
- The full address details of the receiver should be furnished
- There is a statutory limit on the amount for making such payments

# IMPREST MONEY

- It refers to the fixed cash advance given to the site engineer to meet the petty and urgent payments needed at site.
- The project engineer make such payments from imprest money and get it reimbursed periodically by submitting the bills
- some times it is referred to as petty cash



THANK YOU