CONSTRUCTION MANAGEMENT

CIV 305

July – December 23 -24

Objectives and Functions of Construction Management

V.Rathinakumar
SASTRA Deemed to be University

Project Life Cycle (PLC)

Market demands

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Conceptual planning and Feasibility study

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Design and Engineering

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Procurement and construction

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Start up for occupancy

↓

Operation and Maintenance

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Disposal of facility

Unique features of construction Project

- One time activity
- Complexity
- High cost and time for execution
- High risk of failure
- Difficulty in defining quality standards
- Uniqueness in people relationship
- Feedback mechanism

OBJECTIVES OF CONSTRUCTION ANAGEMENT

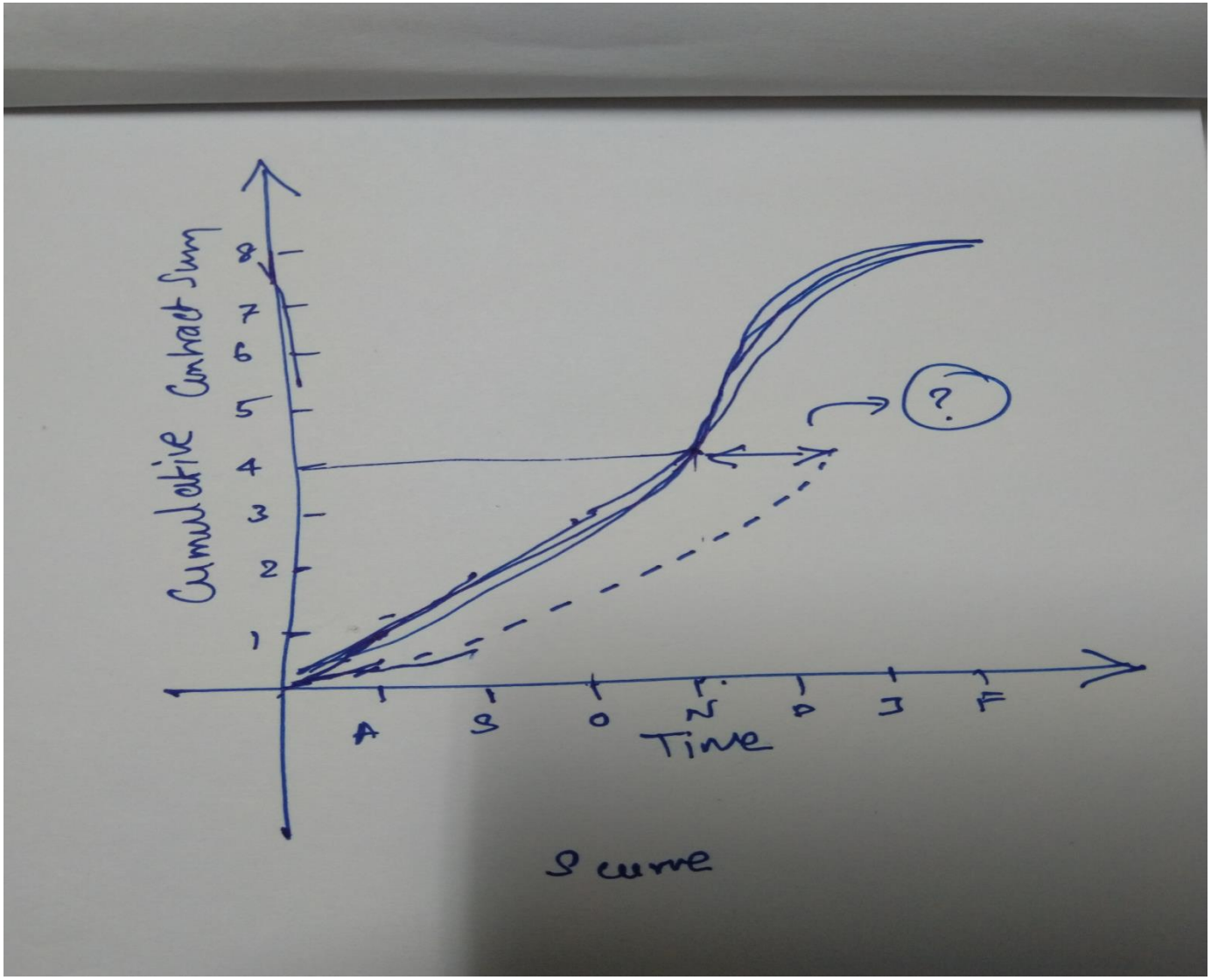
To complete the work within estimated budget and specified time.

Cost control :

- Accepted cost estimate (ACE)
- Observe the cost expended for each item
- Compare it available standards
- Compute the variance.

- S- Curve can be used to monitor the cost of construction project ., slow progress at the beginning and rapid progress towards the middle and slow progress at the end.

S CURVE



OBJECTIVES OF CM

- High Quality Workman ship

- Favourable workman condition
- Proper training for jobs
- Knowledge of objectives and achievements
- Fair wages
- Supply of tools, equipment and materials
- Appreciation of good work by incentives
- Participation in management at appropriate levels
- Sympathetic and receptive management attitude of management

OBJECTIVES OF CM

Providing safe and satisfactory working condition

- Medical facilities
- Housing and Transportation
- Crèches and Nurseries
- Safety training and precautions
- Stores
- Financial aid
- Recreational facility
- Insurance

OBJECTIVES OF CM

- Taking sound decisions at the lowest practical management levels.
- Director level,
- President level
- Construction management level

Procurement manager
Operation manager
Chief estimator
Division engineer
Labour relation manager
Public relation manager

- Project management level
- Functional management level

OBJECTIVES OF CM

Motivating people to give their best within their capacities

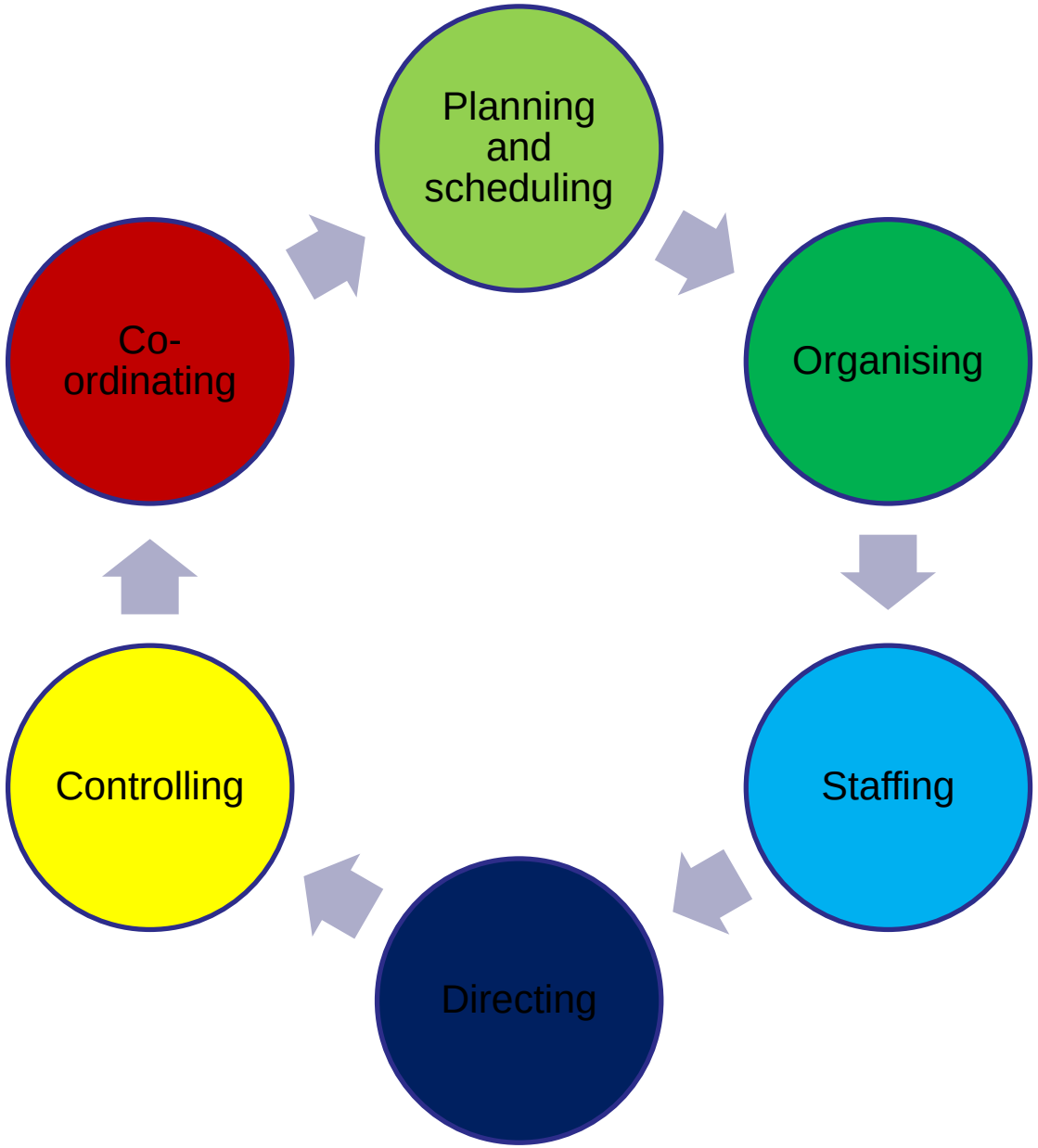
- Pre appointment training
- To establish mentor system
- Careful selection of team
- Career path requirement at the early stage
- Key skills to foster (FACES)

Creating an organisation that works as a team

Team building skills

- Concern for conciliation
- Concern for other ego
- Understanding human psychology
- Ability to look logically at a technical situation
- Technical knowledge of the subject (Innovation and Integration)
- Resource utilization skills

Functions of CM



Planning and Scheduling

- Crystallizing objectives
- Collecting and synthesizing information
- Developing alternatives within specified constraints
- Comparing alternatives in terms of objective feasibility and consequences
- Selecting optimum course of action
- Establishing policies, methods, systems, standards and budgets for objectives

ORGANIZING

- Dividing the work into component activities
- Designing job structures
- Defining targets and responsibilities
- Allocating resources and delegating specific tasks to individuals
- Identification of interdependencies within activities
- Establishing organizational chart for better coordination

STAFFING

- Recruiting the right people for the activity
- Appointing the requisite number of personnel in fulfilling the responsibilities laid down by organization
- Training courses for staffs
- Proper staff assessment

DIRECTING

- Providing effective leadership
- Motivating participants behaviour
- Communicating instructions and orders
- Providing suitable ambience for subordinate's development.
- Creating efforts in achieving specified objectives.

CONTROLLING

- Specifying the factors to be controlled
- Monitoring the performance in terms of progress, quality and cost
- Comparing actual and planned performance
- Analysis of shortfalls and implementation of suitable remedial measures
- Quick and accurate flow of information

CO - ORDINATION

- Bringing together and coordinating the work of various departments .
- Efficient system of communication
- Regular departmental/section head meetings with top management.
- Plans , problems and remedies should be discussed for better results
- Team building skills should be analysed.

TYPES OF CONSTRUCTION

- Residential
  - ✓ Row houses, townships, apartments, single family homes
  - ✓ Owners may be development companies or individual owners
  - ✓ Fairly low tech
- Commercial Projects
  - ✓ Office buildings, large apartment buildings, shopping malls, theaters
  - ✓ Dependent on economy
  - ✓ Designed by architects with engineering support

TYPES OF CONSTRUCTION

- Heavy Construction
  - ✓ Roads, bridges, dams, tunnels, water & waste water systems
  - ✓ Designed by engineers
  - ✓ Usually public projects
- Industrial Projects
  - ✓ Steel mills, petroleum refineries, chemical processing plants, auto production facilities
  - ✓ Specialized design and construction
  - ✓ Limited companies do this work
- Customer satisfaction, Infrastructure, Profit margin, complexity and Project risk

RESOURCES

- Materials
- Manpower
- Machinery
- Time
- Fund
- Working environment and facility

CONSTRUCTION TEAM / PARTICIPANTS

- Owner
- Architect
- Engineer
- Constructor
- Consultants
- Material Management
- Lawyer, insurer and financial consultants

OWNER

- Providing financing for the project.
- Person or organisation that will manage the facilities
- Warranting the plans and specifications.
- Judge the use of funds to execute the project
- Acting on clarifications and changes.
- Selecting all professionals on the project
- Interacting with various governmental bodies.
- Cooperating with the contractor.

ARCHITECT

- Discuss project goals and basic feasibility.
- Design options that incorporate the client's goals.
- Narrow down the options based on client's feedback into one final option.
- Draw 3D views to help clients understand
- Seek bids from builders and help clients compare
- Prepare drawings to submit to the building department to obtain a building permit

ENGINEER

- Structural Engineer: Structural design of structures and to prepare working drawings based on architect's plan
- Electrical Engineer: Design and preparation of working drawing for electrical power and distribution systems during and after the construction
- Mechanical Engineer: Heating, Ventilation air conditioning and other mechanical services
- Quantity surveyors: BOQ preparation, assess the extra costs due to special features, prepare cash flow statement.

CONTRACTOR

- Plan important project development and implementation in advance.
- Determine legal and regulatory requirements
- Making sure that health and safety specifications are followed.
- Anticipation of any potential modification in the project
- Submit bills based on terms of contract documents.
- Fixing sub contractors
- Manage generated waste
- Practice economic construction techniques
- Provide safety awareness to workers.
- Review, modify, and update the project programme.

CONSULTANTS

- Soil investigations
- Surveying
- Co-ordination in design
- Site developments
- Environmental safe construction
- Energy saving methodologies
- Material testing
- Workshop for equipments

MATERIAL MANAGEMENT

- Materials Requirements for Planning (MRP)
- Purchasing
- Inventory Planning and Control (The sum of the value of raw materials, fuel and lubricants, spare parts, maintenance consumables at any given point of time.)
- Ascertaining the Flow and supply of materials
- Quality Control of Materials
- Departmental Efficiency
- Make and Buy Decisions
- Coding and Classification of Materials

OTHERS

- Financial consultants
- Insurance
- Taxation
- Environmental clearance
- Safety consultants
- Health consultants

Phases of construction project

Pre project phase

Project phase

Post project phase

Pre project phase

- Idea or Initiation phase
- Project concept phase
- Feasibility phase

Tasks for pre project phase

- Preliminary studies
- User requirements
- Technical specifications and conditions
- Funds to finance the project
- Estimation of the project
- Approval of project cost
- Safety and health of the community and environment
- Milestone for the project
- Responsibilities and authority of the project

Project Phase

- Basic design phase
- Detailed design phase
- Tendering phase
- Execution
- Closure phase

Design related Tasks :

- Arranging the documents of the construction contract
- Design professionals/ Design team
- Negotiating with professionals
- Monitoring, Evaluating, updating and review the design
- Design quality

Tendering and construction related tasks

- Pre qualifying contractors
- Pre bid conference.
- Negotiating contract price with qualified contractor
- Interpreting and clarifying ambiguities
- Taking necessary precaution to prevent the loss
- Monitoring and controlling implementation methods
- Enforcing quality and safety principles
- Establishing and enforcing quality assurance plans
- Regular visit to site
- Receiving record

Post project phase

- Utilisation phase: Operation and Maintenance at regular intervals

- Close down phase: Dismantled and disposed.

TYPES OF CONSTRUCTION DRAWINGS

Assembly, manufacture, or construction of a building.
Communication

<u>Civil engineering drawings</u>

- Tender drawings
- Contract drawings
- Working drawing
- Completion drawings

TENDER DRAWING

- Every drawing communicates to its phase within the building project, from start (tender) to finish. The difference between every drawing could also be neglectful or essential betting on the specific project.

- equipped early in the building method,
- used by contractors for developing bids.
- details the project scheme to the contractor
- he or she can price the construction work accordingly.

CONTRACT DRAWINGS

- The engineer can bring on with a more detailed design only after the completion of tender drawings and the bidding process.
- the essential modifications based on the planned constructional methods and budget.
- For some projects, if tendering has been clear-cut and without any alternate offers, the contract drawings can be the same as tender drawings.
- Contract drawings are printed on good fineness paper and given a cloth backing, and are meant to endure long-term storage.

WORKING DRAWING

- Working drawings are normally more full than tender and contract drawings
- It fills the gaps in constructional details not reflected in tender drawings
- these plans tell the actual work and manufacture of a building or other project, and represent the engineer's final decisions regarding an assortment of details.
- They are often complemented by finer design and construction details in the form of notes and additional written instructions.

COMPLETION DRAWINGS

- Conclusion drawings are the final set of drawings made in a building project, and their reason is to record the project as it was built.
- During any given scheme, ad hoc changes are likely to have been made that deviate from the working drawings.
- these variations, additions, and alterations may be due to unexpected site conditions or budgetary concerns.
- Even the smallest disparity, it should be recorded in completed drawings , It is also known as record or as-built drawings.

MANAGEMENT LEVEL

- Management level can be defined as a position in management that is differentiable in terms of power, authority , responsibility and accountability over resources required to achieve defined objectives.
- DIRECTOR LEVEL
- PRESIDENT LEVEL
- CONSTRUCTION MANAGEMENT LEVEL
- PROJECT MANAGEMENT LEVEL
- FUNCTIONAL MANAGEMENT LEVEL

DIRECTOR LEVEL

- Setting plans
- Formulating objectives
- Action plan
- Environmental information
- Competitive information
- Budget information

PRESIDENT LEVEL

- Acquiring business and formulating the company's immediate objective in line with board's plan and strategies.
- Detailed and departmental information
- Progress reports that summarize for each project
- Schedule performance and its problems
- Current and future cost

CONSTRUCTION MANAGEMENT LEVEL

- Monitoring work for the company
- Clear and straightforward summary format of information on general progress.
- General progress, financial schedule , procurement status and engineering status.

Project Management Level

- Managing day to day operations of all aspects of a project
- Watching closely the development of the project as a group
- Field costs
- Construction schedule (reporting)
- Critical and non-critical items in work
- Detailed predictions of future accomplishment
- Cash flow summaries and current working estimates

Organisation of PWD

- Engineer in chief
- Superintending engineer
- Divisional engineer
- Sub divisional engineer
- Junior engineer

Duties of Chief Engineer

- Either a whole state or three to four districts
- To sanction the purchase of live stock, & purchase, manufacture and repair of articles.
- To accord administrative approval to proposals for works other than residential buildings up to Rs.2,00,000 for building and communication works.
- To accord to technical sanction
- To accept tender for the execution of work by contract
- To execute deposit works

Superintending Engineer

- He is the administrative and professional head of a circle. He is responsible to the chief engineer in term of both professional and administration.
- He is empowered to sanction up to 25% over the sanctioned permanent limit of any division
- Administrative approval for 1,00,000
- Technical sanction to detailed estimated of original works
- To sanction estimates for the purchase or materials

Divisional Engineer

- To inspect each sub divisional office under his division
- To see the instructions for keeping MB by SDO
- To inspect the machinery used by their departments
- To keep the tools and plant (T and P) in working order and arrange to protect surplus stock from deterioration.
- To check the reasonable quantity of work measured by his sub ordinates

SDO or Assistant Engineer

- To arrange and supervise the actual execution of all the works in the subdivision in accordance with the sanctioned estimates.
- To upkeep all buildings and roads in his charge
- To check the muster roll with respect to labour employed
- To maintain all initial accounts for expenditure in respect of works in his charge and to so submit to XEN
- To exercise proper care over safe custody of government properties

JUNIOR ENGINEER

- Petty requisitions on plans and estimates
- Carry out survey work to be done in his section
- Supervise the execution of the work
- To arrange labour at reasonable rates
- To maintain accounts of all stock T and P
- To take measurement of all works to record them in MB also to assist his SDO and EE to check it

JUNIOR ENGINEER

- Vigilant control over expenditure and progress of site
- Check and supervise the regular gangs
- To check that government land is free from encouragement
- To check each half yearly of all the stores
- To submit survey report for all unservicable stock
- To keep up to date account of the impreset
- To carry out annual inspection of buildings and report the result to the SDO

ESTABLISHMENT IN PWD

- Primary establishment
- Temporary establishment
- Work charged establishment
- Contingent establishment
- Labour establishment

STORES

Stock : Different kinds of materials required for various works.

Articles of daily use are ready available and execution should not suffer

Materials of good quality should be used.

Suspense head and Suspense account – when final head is not known

Reserve stock Limit – Maximum limit of amount up to which materials can be kept in the stock of a division.

Subheads of stock:

- Small stores, Building materials, Timber, Metal, Fuel, Painter house, House fittings, Miscellaneous, Kiln, Manufacture and Storage

SOURCES

- From materials or contractors
- Transfer from other department, division and sub divisions
- Directly from manufacturer
- From work in progress or after they completed

Indent : Triplicate
Counter foil. Indent and invoice.

Stock and T & P

Stock	Tools and Plant
Consumable	Useable articles
Suspense head of account	Final head of tools and plant
Quantity and value account are kept	Quantity account is maintained
Register of stock closed each 30 sept and 31 st march	30 th September
Miscellaneous public work advances	Register
Surplus materials - Revenue	Entered in receipts
Losses of stock estimate is prepared for damaged materials	Survey report is prepared for un serviceable articles

MEASUREMENT BOOK

- Measurement Book is a measure of work done of contracts. It maintains the accounts of work.It is the basis of all accounts of quantities of work done and it must contain such a complete record of facts as to be conclusive evidence in court of law. All payments against the work done or material/equipment purchased are maintained in this system.

The following statements are prepared in MB :

- Abstract details of Measurement
- Abstract details of Cost – Running Bill / First & Final Bill / Supplementary Bill including all deductions and recovery
- Material Consumption Statement
- Advance Payments Details

FUNCTIONAL MANAGEMENT LEVEL

- Organising
- Supervision
- Co-ordination
- Estimating costing and scheduling purposes
- Performance and productivity information

TRAITS OF PROJECT MANAGER

- Human skills
- Conceptual skills
- Technical skills
- Attitude
- Common sense
- Open mind-ness
- Adaptability
- Inventiveness
- Prudent risk taker
- Fairness
- Commitment
- Conflict resolution

TRAITS OF PROJECT MANAGER

- He should have comprehensive education
- Ability to participate in interdisciplinary discussion
- Develop and promote sustainability ethics
- Uphold and enhance the honour integrity and dignity
- Should not make excessive design or excessive cost cutting at the cost of safety
- He should not damage the prestige of profession
- Should be honest and impartial and should not behave suspiciously
- Should not associate with any dubious work
- Performance only in the areas of their competence.

TRAITS OF PROJECT MANAGERS

- Should work development of technology
- Professional development in research field
- Practical utilization
- Evaluate of his works
- Should support his professional and technical societies
- Should issue public statements only in an objective and truthful manner.
- He should have social, ecological and economic responsibilities
- To conserve limited natural resources and reduce harmful pollutants

SUMMARY

- Contribute to the development of the nation and the promotion of human welfare through professional knowledge.
- He should honour human life without discriminating against cast, creed, social position and religion.
- He should not have any intention adverse to the national development and welfare
- He should hold paramount the safety health and welfare of the public in the performance of their professional duties.

Success variables

- Supportive top management
- Acquiring proper and adequate equipments for construction
- Up to date technology
- Availability of resourceful project manager
- Effectiveness in project management
- Team working approach
- Implementing an effective quality assurance
- Clarity of customer requirements
- Achievement of goals
- Training to staff

Factors influencing the choice

- Availability of capital
- Cost of formation
- Ease of formation
- Transfer of ownership
- Managerial skills
- Regulation
- Continuity
- Flexibility
- Liability
- Taxation

SOLE PROPRIETORSHIP

- Sole proprietorship refers to a form of business organisation which is owned, managed and controlled by an individual who is the recipient of all profits and bearer of all risks.

Important features :

- Formation and closure
- unlimited liability
- Sole risk bearer and profit recipient
- Control
- No separate entity
- Lack of business continuity

SOLE PROPRIETORSHIP

Advantages:

- Quick decision making
- Confidentiality of information
- Direct incentive
- Sense of accomplishment
- Ease of formation and closure

PARTNERSHIP

- The Indian Partnership Act, 1932 defines partnership as "the relation between persons who have agreed to share the profit of the business carried on by all or any one of them acting for all."

Features:

- Formation: Business must be lawful and run with the motive of profit. Two people coming together for charitable purposes will not constitute a partnership.
- Un Limited Liability: all the partners are responsible for the debts and they contribute in proportion to their share in business and as such are liable to that extent
- Risk bearing: The partners bear the risks involved in running a business as a team.
- Decision making and control: Mutual consent

PARTNERSHIP

- Continuity: lack of continuity of business since the death, retirement, insolvency or insanity of any partner can bring an end to the business.
- Number of Partners: According to section 464 of the Companies Act 2013, maximum number can be 100,. As per Rule .10 of The Companies (miscellaneous) Rules 2014, members can be 50.
- Mutual agency: carried by all or any one of the partners acting for all.

PARTNERSHIP

Merits

- Ease of formation and closure:
- Balanced decision making
- More funds
- Sharing of risks
- Secrecy

Demerits :

- Unlimited liability
- Limited resources
- Limited resources
- Lack of continuity
- Lack of public confidence

TYPE OF PARTNERS

- Active partner
- Sleeping partner (or) dormant partner
- Secret partner
- Nominal partner
- Partner by estoppel
- Partner by holding out

COOPERATIVE SOCIETY

The word cooperative means working together and with others for a common purpose.

- Voluntary membership:Membership is open to all, irrespective of their religion, caste, and gender.
- Legal status: Registration of a cooperative society is compulsory.
- Limited liability:limited to the extent of the amount contributed by them as capital.
- Control: In a cooperative society, the power to take decisions lies in the hands of an elected managing committee

Co-operative society

- Service motive: The cooperative society through its purpose lays emphasis on the values of mutual help and welfare.

Merits:

- Equality in voting status
- Limited liability
- Stable existence
- Economy in operations
- Support from government
- Ease of formation

Demerits:

- Limited resources:
- Inefficiency in management
- Lack of secrecy
- Government control
- Differences of opinion
- Amul, & Indian Farmers Fertiliser Cooperative (IFFCO

COMPANY

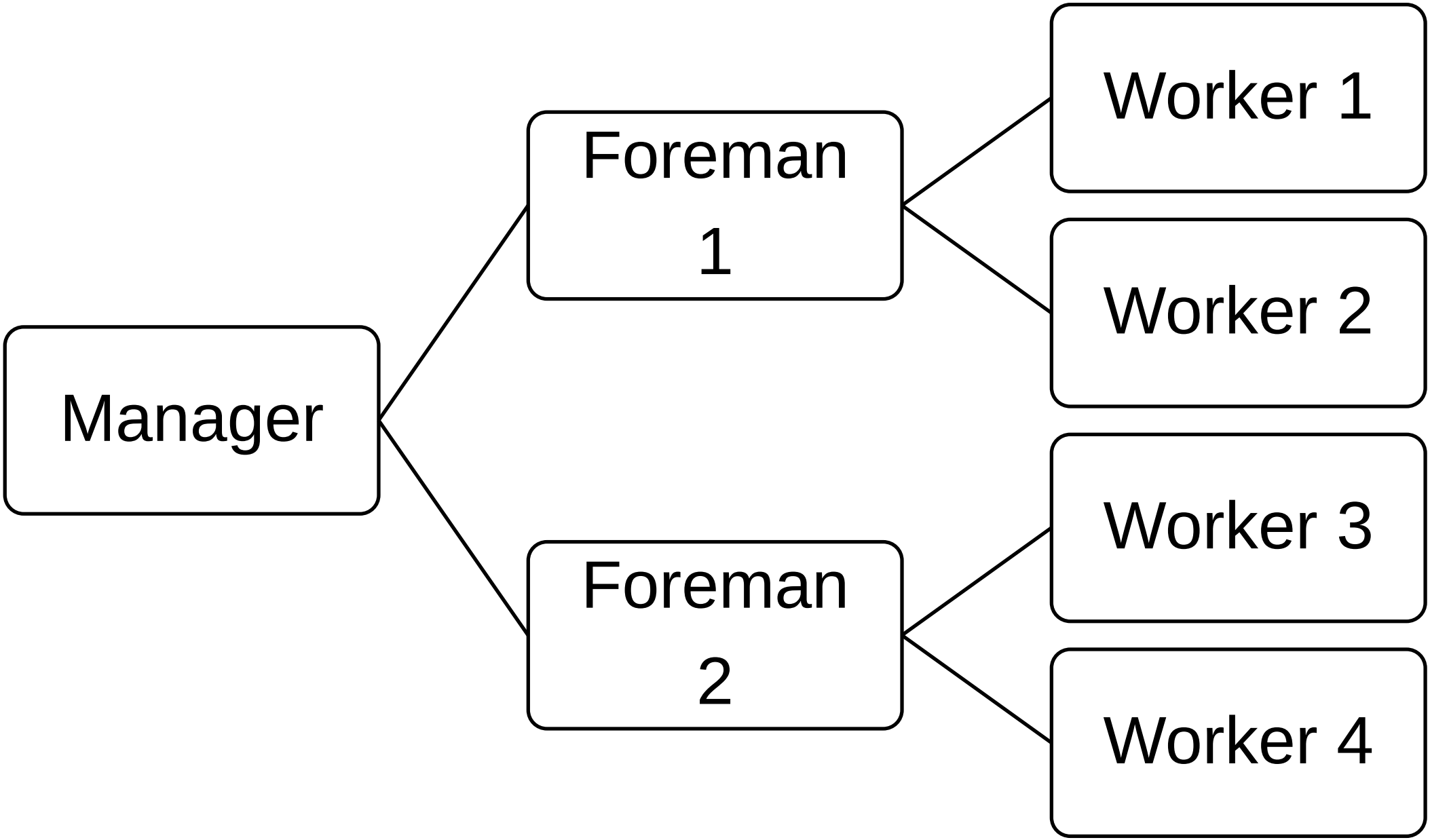
- A company is an association of persons formed for carrying out business activities and has a legal status independent of its members.
- The shareholders are the owners of the company while the Board of Directors is the chief managing body elected by the shareholders.
- Artificial person
- Separate legal entity
- Formation
- Perpetual succession
- Control
- Liability
- Common seal
- Risk bearing

STRUCTURE OF CONSTRUCTION ORGANISATION

- To facilitate communication barriers at organisational interfaces.
- Organisational structure indicates the divisions of different departments . The arrangement has a bearing on the response time for delivering discussions.

- Line type organisation
- Line and staff organisation
- Departmental organisation

Military


Manager
Foreman 1
Foreman 2
Worker 1
Worker 2
Worker 3
Worker 4

Line Type

Advantages

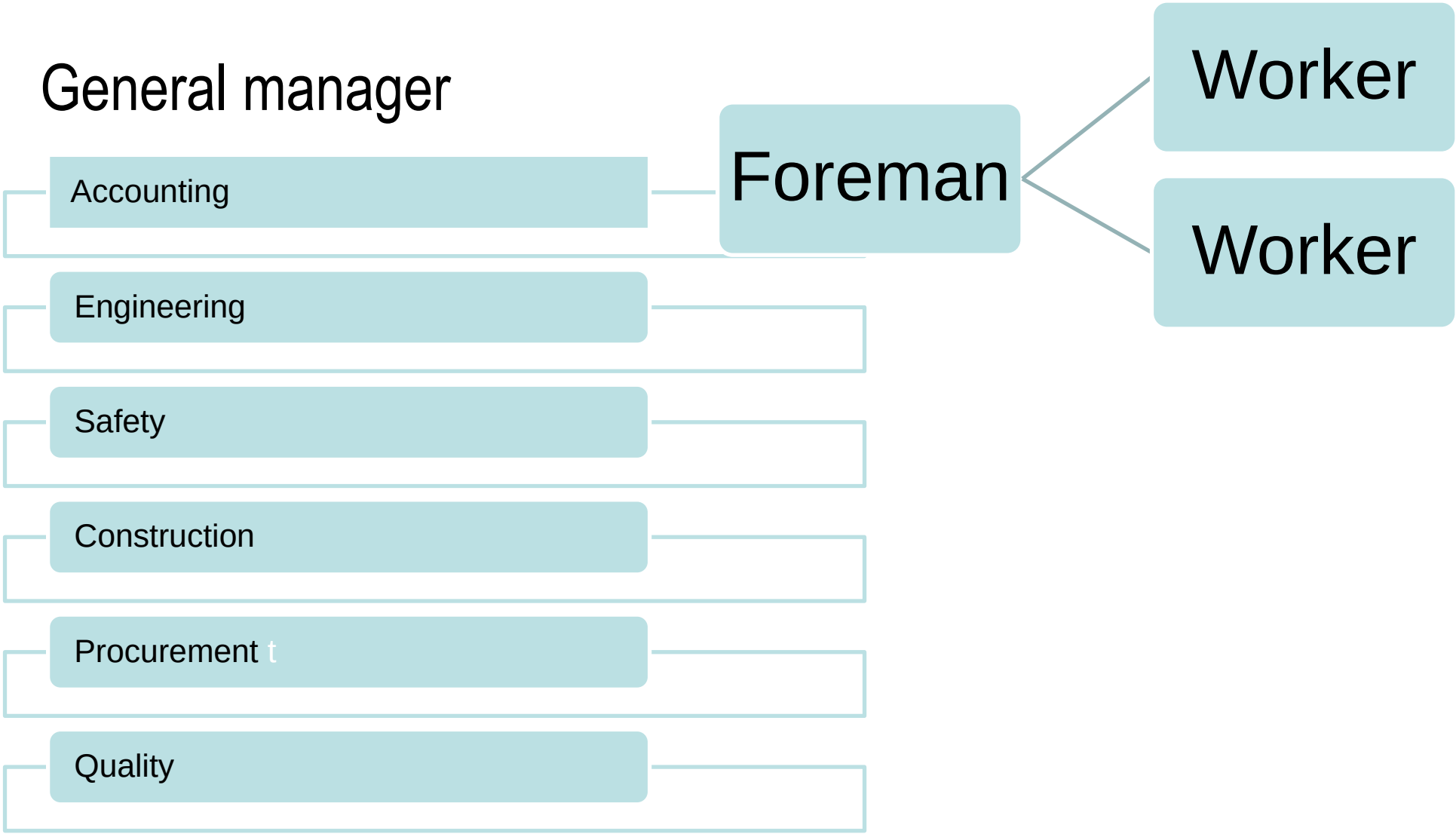
- Easy to establish
- Simplest to explain
- There is a unity of control
- Sense of discipline
- Assigned with role and responsibility
- Quick decisions

Disadvantages

- Expectation holding the authority
- Lower hierarchy may be ignored
- Structure suffers from skills of experts

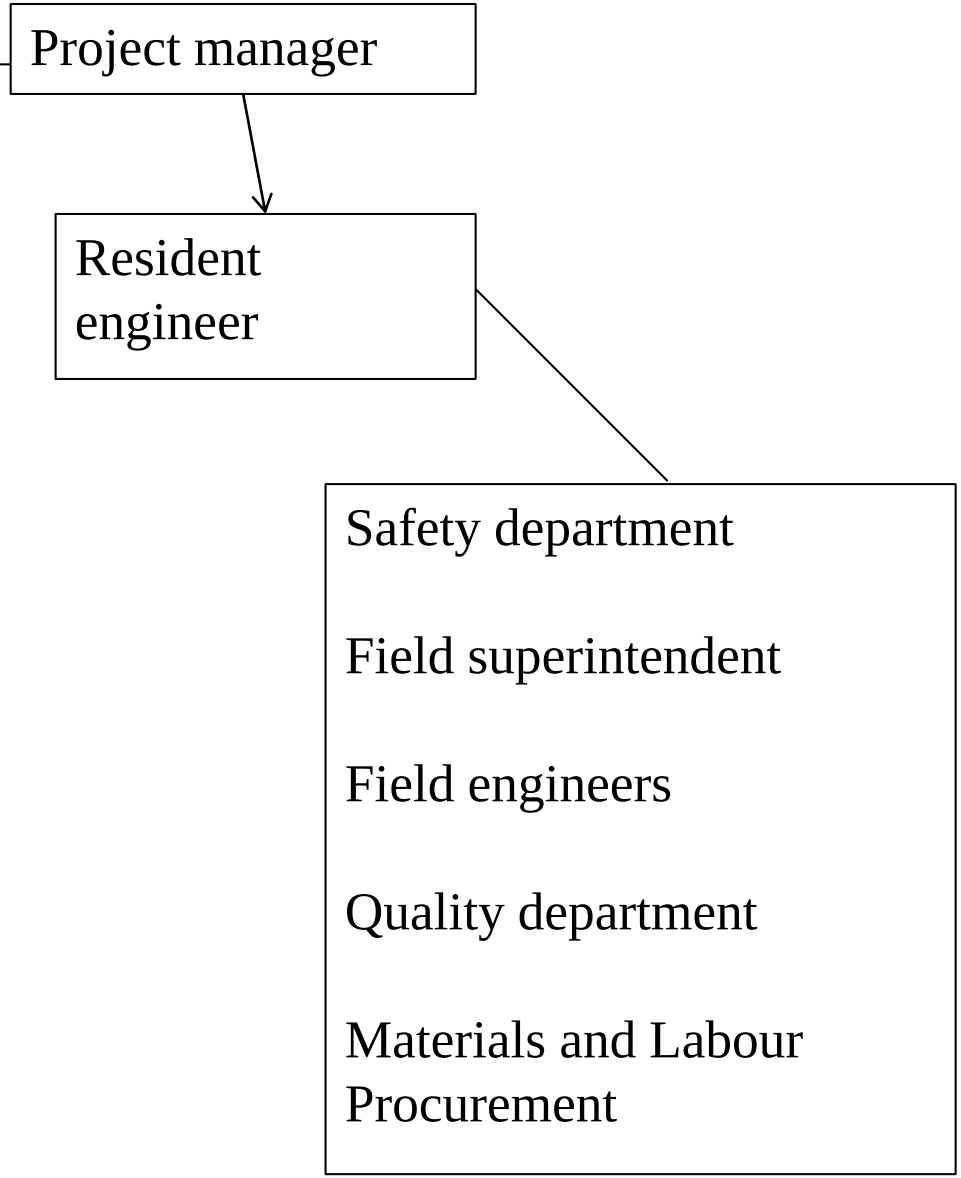
Line and Staff

- Owner
- General manager



Departmental organization

- Contract department
- Engineering department
- Planning development
- Materials department
- Finance department



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GENERAL INSTRUCTIONS

In case of bills for work done

- Full name of the work
- Progress of work
- Name of the contractor
- No and date of his agreement
- Date of written order to commence work
- Date of completion of work
- Date of measurement

In case of bills for supply of materials

- Supply of materials
- Name and supplier
- Date of agreement or order
- Purpose of supply
- Date of order to commence supplies
- Date of measurement

MEASUREMENT BOOK

- Person making the measurement must close each set of measurements with dated initials.
- Neatly recorded.
- Highly objectionable to record measurement in a record book
- MB will be produced as an evidence in a court of law, all interpolations and over writings should be avoided.
- The pages of MB are machine numbered and are certified by counting and checking.
- The entries should be made in ink as far as possible
- The measurement should indicate type of bill
- The index of the MB should be updated
- While writing no line should be left blank nor any blank space should be left at the end of pages.

MEASUREMENT BOOK

- The index page should be signature by contractor
- Total quantities of each item of work is to be prepared
- It is followed by the abstract of cost allotted for each work
- The rate should be filled by SDO after he is satisfied with the entries made in the MB
- SDO will issue an order to clerk to prepare bill
- After checking the bill will be issued to contractor
- Loss of MB is a serious matter.
- On the day of measurement to be taken prior notice may be given to the contractor.

TYPES of MB

Ordinary measurement book

Standardard measurement book

Check measurement book

BILL AND VOUCHER

Bill: Bill is the account of work done or supply of materials made and includes the particulars and quantities of work done or material supplied and amount due.

Reference to the agreement number, order number are also given in the bill.

Voucher: Voucher is a written document with details which is kept in record as a proof of payment. For any payment, a bill is prepared and payment is made on the bill, duly checked and acknowledged by the payee, by signature or revenue stamp as required and after payment is made, bill becomes voucher which is kept in record

TYPES OF BILL

- The various standard forms of bills and vouchers are used for payment, according to the nature of works. White forms are used for running bills and yellow forms are used for final bills. The following are the different types of bills.
- First and Final bill
- Running account Bill – form A
- Running account Bill – form c
- Lump sum contract Bill
- Hand receipt

First and Final Bill:

- This form is used for making payment to the contractor both for works and suppliers, when a single payment is to be made on the completion of the whole work or supply as final payment.
- This type of bill is generally adopted for petty works or split up works in projects.
- One time Payment
- Annual maintenance charges
- Loading and Unloading materials
- Electric and Plumbing maintenance charges

Running Account Bill – Form A

- This form is used for advance payment without any measurement.
- It may be used for running bill payment for advance for unmeasured work only or combination of unmeasured work and measured work or
- if ‘on account’ payment is to be made but an advance payment already made for the same work is outstanding.

Running Account Bill – Form C:

- This form is used for contracts both for works executed on piece work system and for supplies received.

- This form is widely used specially for medium sized works executed through contract or split up works or projects entrusted on nomination to a number of contractors.

Lump Sum Contract Bill

In the L.S. contract methods, a number of intermediate payments are made in L.S. contract running account bill form before final payment is made.

Intermediate payment is made for

(i) value of measure up items of work executed forming part of the contract.

(ii) value of authorized extra work done on account of additions or modifications in the work executed supported by details in either case.

Hand Receipt

- Hand receipt is a simple form of voucher intended to be used for small miscellaneous payments and advances for which none of the above forms is suitable.

- The purpose of payment and the designation of the officer making payment duly supported by measurement book entry should be furnished on the hand receipt.

- No agreement is necessary for payments made through Hand receipt form

TYPES OF PAYMENT

- First and Final Payment
- Running on Interim or ‘on account’ payment.
- Final payment
- Advance payment
- **Secured Advance payment**

CONTRACTOR LEDGER

- Contractor's ledger is a personal account of a contractor where all transactions regarding the particular contractor are entered.
- It is maintained in the divisional officer in a prescribed form.
- All payments recoveries of adjustments etc. are taken in the ledger.
- Recoveries of debit balance of the ledger should be made from the contractor regularly at the first available chance to avoid accumulation of arrears.
- For every contractor a separate ledger is maintained and each contractor's ledger is closed and balanced monthly.

COMPLETION REPORT

- When a work is completed and the accounts have been settled a note below the final entries is made in ink.
- Work completed on ……20 ….. and this note is signed by the divisional officer.
- If the total expenditure is in excess of the sanctioned estimate, and if the excess is within the power of the divisional officer, it is passed by him and the certificate to the effect that “effect passed by me” is recorded.
- A completion plan should accompany a completion report.

COMPLETION CERTIFICATE

- After completion of the work of construction of other department, a certificate for satisfactory completion should be prepared in a prescribed form and got signed by a local head of the department.
- The completion certificate will read as Certified that works and repairs were completed on ……20 ….. and that it is in good satisfactory order.
- The completion certificate is signed by the Assistant executive Engineer and Executive Engineer and then got accepted and signed by the local head of the department, for whom the construction was carried out

Preparation of Bills

- The bills for payment shall be prepared with respect to the measurements recorded in the measurement book.
- All entries in the measurement book with regard to the description and quantities of work or supplies made are checked.
- Arithmetical calculations of the contents or area are verified.
- When, the bill is on running account then it is compared with the quantities etc. with the previous bill.

Deductions

It is checked whether deduction in respect of the following have been properly made.

- Recovery for advance payment
- Recovery in respect of departmental materials issued to the contractors.
- Hire charges for departmental materials issued to the contractors.
- Amount to be withheld towards security deposit.
- Recovery towards penalty for slow progress, non return of empty gunny bags etc.

Payment

- In case of final bills the field officers should certify about the due fulfilment of contract and satisfactory completion of work. The memorandum of payment is then made.
- The competent officer records a formal pay order specifying both in words and figures the net amount payable.
- However the contractor is required to acknowledge the gross amount payable inclusive of recoveries proposes in the bill. When the bill is passed for payment, every page containing the detailed measurement will be scored out by a diagonal red ink line. The number and date of the voucher for payment will be entered in the measurement book.

REFUND OF DEPOSITS

- The deposits of the contractor and refunded after six months from the date of satisfactory completion of the works or on the expiry of one rainy season.
- During this period of observation, the contractor is responsible for any defects or mishaps in the works.
- He shall have to make good all such defects and damages.

CASH BOOK

- The transactions relating to the actual receipts and payment of cash are recorded in a register known as cash book. The cash book is one of the most important records of the office.

CASH BOOK MAINTENANCE

- Entries should be made continuously and no line should be left blank. If any line is left blank due to the fact that the other side of the folio has been completely written up, a diagonal line should be drawn to cancel the blank space.
- Interpolation of entries, or over writings must be avoided but, if unavoidable, these must be initiated and dated by the disbursing officer. Erasure of entries is strictly prohibited.
- Transactions should be entered as soon as they occur in the order of occurrence.
- If the cash transaction of private cheques received is too many, these may first be entered in a "Register of cheques received and adjusted" and only the totals of daily receipts and remittances entered in the cash book.

CASH BOOK MAINTENANCE

- Every entry must be concise. The date, number of voucher and the name of the work together with a brief description to clearly indicate the nature of transaction must be entered against each item.
- No receipt other than cash should be entered in the book.
- When a cheque is drawn to replenish the chest, its number and amount to be entered.
- When an impreset is given, it should be noted in red ink in the cash book.
- When amount of unspent imprest is received back, it is shown on the receipt side in red ink.
- The disbursement of salary of regular establishment is recorded in a separate cash book known as subsidiary cash book.
- Bills paid and entered in the cash book are known as vouchers. Vouchers are allotted serial numbers in a continuous series each month.
- It is advisable to check that the cash balance is counted every time a balance is struck or at convenient intervals.

UNIT - 1

- Definition, objectives and functions of construction management, Types of construction, Resources for the Construction Industry, stages in construction, Construction Team, Classification of Civil Engineering drawings and their importance. Accounts and Stores - Measurement of work – Measurement book - mode of payment – Types of bills – preparation, examination and payment of bills completion reports and certificates Project Organization, Forms of Business Organization, Structure of construction organization, Management levels, Traits of project manager