
CONSTRUCTION MANAGEMENT

6. Construction Management

6 marks

- 6.1 Construction scheduling and planning: network techniques (CPM, PERT) and bar charts
- 6.2 Contractual procedure and management: types of contract, tender and tender notice, preparation of bidding (tender) document, contractors pre-qualification, evaluation of tenders and selection of contractor, contract acceptance, condition of contract; quotation and direct order, classifications of contractors; dispute resolution; muster roll
- 6.3 Material management: procurement procedures and materials handling
- 6.4 Cost control and quality control
- 6.5 Project maintenance
- 6.6 Occupational health and safety
- 6.7 Project monitoring and evaluation
- 6.8 Quality assurance plan
- 6.9 Variation, alteration and omissions

6.1 Construction scheduling and planning: network techniques (CPM, PERT) and bar charts

Construction Planning

Planning is process by which managers set objectives, assess the future and develop courses of actions to accomplish these goals. It is predetermination to achieve the goals. Alternatively, it is deciding in advance about what to do, how to do, when to do and who is to do.

It is associated with development of project as roadmap for, identification of task accomplishment to have objectives, detailed engineering, scheduling and allocation of resources.

Purposes of Planning

- To eliminate the uncertainty of future activities.
- To improve the efficiency of operations without loss of efforts and confusion.
- To obtain the better understanding of objectives so that every efforts are targeted towards goal achievement.
- To provide base for monitoring and control during implementation of plans.

Elements of operational planning

- | | | |
|-------------|-------------|----------------|
| • Objective | • Program | • Schedule |
| • Budget | • Forecast | • Organization |
| • Policy | • Procedure | • Standard |

Steps and stages of project planning

- | | |
|---|--------------------------------------|
| • Estimate of work. | • Task or capacity of doing work. |
| • Information of locally available resources. | • Financing or allocating resources. |

Tasks in project planning

- Feasibility study
- Appraisal: it is process of evaluation of projects ability to succeed and done after feasibility.
- Design: preparation of detailed engineering design, drawings and specifications as well as detailed plans like work schedule, cost estimate, resource allocation etc.

Planning (scheduling) tools

Network Analysis

It is technique of planning, scheduling and controlling of a large and complicated project consisting of various activities.

Construction time scheduling

Planning is a preparation of schedules. Schedules are the laying out activities of a work over the time available for completing it. The following can be the steps for preparation of schedule:

- Breakdown of work or job to smaller parts using work break down structure.
- Prioritization of activities.
- Determination of start date of work.
- Tabular presentation of various jobs.

Every construction works consume various resources like materials, machines, time and manpower of different skills, kind and sizes. All of these resources required for a particular job cost a lot and also may not available at required time instantly, hence scheduling is necessary to make available the resource. Hiring, borrowing and employing scarce resources for its requirement in work require scheduling so that on the time of requirement, it can made available at the site. Also, it gives the precautionary indication of ordering, inspecting and moving to site of required resources and estimates accordingly can be made to acquire total budget. *There are various techniques of scheduling of activities of a project among them Bar-chart, CPM and PERT are important ones in practices.*

Purpose

- To predict project completion and activities completion time.
- To control financing and payment.
- To support delay claim.
- To manage change and uncertainties.

Methods

- Bar chart
- CPM
- PERT

Bar chart / Gantt chart

It was developed by **Henry Gantt in 1900 A.D.** It is pictorial representation of activities drawn in a thick horizontal bar (line) against a calendar date or time scale. It represents the start and end date of proposed activities drawn across time scales. It is preliminary tools.

Advantages

- Easily understood and prepared.
- Status of project can be identified through the Bar chart without the detailing.
- Useful for reporting who are not involving the day to day management
- Progress of each item
- Useful for small and medium sized projects.

Disadvantages

- If too many activities are shown in Bar chart, it becomes meshed up and hence, it is not suitable for large and complicated project.
- It does not shows the interdependency among the various activities.
- Each activities receive consideration with no indication where management attraction should focus.
- It cannot be used as controlled device for project.
- Critical activities are difficult to be identified and float is unknown.

Linked Bar-chart

It is a modified form to overcome some of limitation of bar chart. It shows the link between an activity and preceding activity which have to be completed before this activity can start and succeeding activity dependent to this activity.

Critical Path Method (CPM)

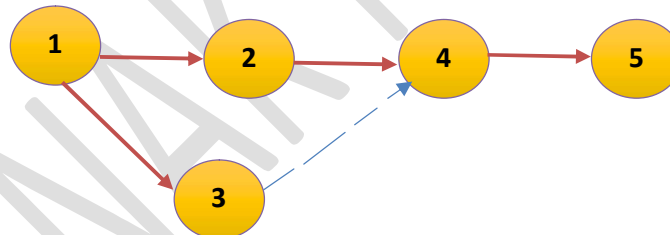
- It is an **activity oriented deterministic network** diagram showing the interdependency and relationship between various activities. It was developed by **Margon R. Walker in 1957A.D.**
- Advantages of CPM
 - Different activities of large & complex projects.
 - Interrelationships and inter-dependencies
 - Floats and critical activities
 - powerful technique of planning and controlling engineering projects
- The path along which project takes the maximum time from the start to end is called **critical path**. It is the **longest path** in a network diagram and gives the total time taken to complete that project. Any delay along that path delays the project.
- A critical path may consist of less no of activities than non-critical path.
- There may be more than one critical path in network.

In this method, **time is related with cost**. It is used for **repetitive projects**.

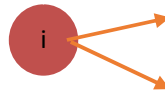
Activity: It is part of diagram that consumes resource.

Event: It is instant of time represented by circle, triangle, ellipse etc.

Dummy activity / Redundant activity: The hypothetical activity shown in diagram as dotted arrow in a network diagram indicating the dependency of one activity to another is called **dummy activity**. It does not consume time and resources. It maintains **logic and grammaticality**.



Tail event/Burst: Since, first event lies on tail of arrow in a network diagram and hence, it is called tail event. Tail event represents beginning of a project. There is only one tail event in a network.



Head event/merge: It represents the end of project. There is only one head event in a network diagram of project.



Dual role event: All the intermediate events are dual events.

Project duration: It is sum of the time along the critical path of network diagram.

Float / slack: It represents the time range within which fluctuation of work schedule may allow.

Total float: It is difference between the latest start time (LST) and earliest start time (EST) or latest finish time (LFT) and earliest start time (EST).

Free float: it is total float minus slack of head event. It affects only **preceding activities**.

Independent float: It is difference between the free float and tail event slack. It affects **particular activity**.

Interfering float: It is equal to total float and free float. Also mathematically, equals to slack of head event.

Program Evaluation Review Technique (PERT)

It is **probabilistic approach** for estimating the duration of activity and event oriented network diagram. It is completely based on **new project such as research development**, new industrial product design where there may not be record of past experience. There are **three time estimates** in PERT. It is **event oriented**. **Time and cost are not related in PERT.**

In PERT, there time estimate is made

- The most optimistic time (T_o):** This is shortest possible time in which activity can be completed. It is assessed considering that there is no any constraints and everything go all right as planned.
- The most pessimistic time (T_p):** This is maximum possible time that could be required to complete the activity. It gives the idea about the maximum time, the activity can prolonged due to bad weather, low productivity, changes in design etc.
- The most probable time(T_m):** In between, T_o and T_p , there lies most reliable time. This is the time required to complete an activity if normal condition is provided.

The most expected time or PERT average time (T_e) = $\frac{T_o + 4 \times T_m + T_p}{6}$

Standard deviation (σ) = $\frac{T_o - T_p}{6}$

Variance = σ^2

Key points

- Resource aggregation or resource loading is the summation of the resources required to complete all activities based on the resource allocation carried out in previous stage.
- Resource leveling is the process that ensures resource demand doesnot exceed resource availability (i.e. attempt to reduce peak resources requirement and smooth out)
- Resource smoothing is part of the resource leveling that determine the resource requirement is smooth (no peak and trough)
- Slack time refers to an event.
- Milestone chart is improvement over the bar chart in which events are in chronological order but not in logical sequence. It was developed in 1940 A.D.
- Updating: it is incorporation of changes of resource of project.
- Dangling: it is non-merging phenomenon in a network diagram.
- Looping: it is reverse of dangling. It is merging of path of activities of network

6.2 Contractual procedure and management: types of contract, tender and tender notice, preparation of bidding (tender) document, contractors pre-qualification, evaluation of tenders and selection of contractor, contract acceptance, condition of contract; quotation and direct order, classifications of contractors; dispute resolution; muster roll

Procurement

It means acquisition of goods, consulting services or carrying out the construction work by any organization/public entity

Prior to the procurement a public entity should prepared the specification, cost estimate, design, drawings, bid document preparation etc.

Background Information

- Every public entity is required to establish a Procurement Unit (खरिद इकाई) for the purpose of public procurement.
- Rate Fixation Committee (दररेट निर्धारण समिति): In every district, pursuant to Rule 148 (PPR-64), under the **Chair of the Chief District Officer (CDO)** for determining the rates of construction materials and labour rates. The committee consists of **seven members** and members' secretary (सदस्य सचिव) of the committee shall be technical person nominated by CDO.
- Article (दफा) भन्नाले ऐन (Act) संग सम्बन्धीत हुन्छ भने Rule (नियम) भन्नाले नियमावली (Regulation) संग सम्बन्धीत हुन्छ।
- Tender/Bid Evaluation Committee (मूल्याङ्कन समिति): This committee is to be constituted as necessary by the public entity for the examination and evaluation of prequalification proposals, tenders, letters of intent, or proposals for consultancy service or sealed quotations, pursuant to Article 71 and Rule 147. The committee consists of **five members** as:
 1. The Chief of the Public Entity or a Senior Officer designated by the Chief (a technical staff member, as far as practicable) - **Chairperson**
 2. Chief of the Financial Administration Section of the concerned Public Entity -**Member**
 3. Technical Expert concerned with the subject (Officer level, as far as possible) -**Member**
 4. Legal Officer of the concerned Public Entity (where such position exists) -**Member**
 5. Chief of the Procurement Unit – **Secretary**
- Public Procurement Review Committee (पूनावलोकन समिति): (3 members) constituted, pursuant to Article 48, in case of complaints filed by the bidders for procurement exceeding **NRs.20** million (as per Rule 101-8th amendment) and the bidders should submit cash amount or bank guarantee having validity period at least of ninety days equivalent to **1%** amount of the amount quoted in his/her bid or proposal.

Principles/Aims of Public Procurement

- To render the working procedures, process, and decisions related to procurement more open, transparent, and credible
- To promote competition, clarity (non-discrimination), integrity, accountability, and credibility;
- To obtain the maximum output from public expenditure in a cost effective and judicious manner
- To enhance the capacity for procurement management
- To ensure that suppliers/procurement providers have equal opportunity for participation without discrimination
- To make felt the dispensation of good governance

Procurement Planning

- Procuring entities are required to prepare a Procurement Plan so that procurement is done within the available financial resources, within other applicable limitations, at the most favourable time
- A Procurement Plan comprises a Master Procurement Plan (बहुवर्षिय खरिद गुरुयोजना) (MPP) and an Annual Procurement Plan (वार्षिक खरिद योजना) (APP)

Preparation for Procurement Works

- Preparing Procurement Details-Specifications, maps, designs, etc.
- Requisition request for procurement (आदेश लिएर मात्र खरिद प्रकृया प्रारम्भ गर्नु पर्ने)
- Budgetary Provision
- Procurement Plan
- Procurement Master Plan, Annual Procurement Plan
- Cost Estimation

Cost Estimation

- Cost Estimate for Procurement -cost estimate shall be prepared for any procurement in excess of a maximum of NRs. 25,000.
- While preparing the cost estimate the following matters shall be taken into account:
 - The actual cost incurred for procurement of the same nature made in the current or previous years.
 - Prevailing rate in the local market
 - The rate issued by the Chamber of Industry and Commerce
 - Use of approved norms for the rate analysis.
- During cost estimates of works, work chart staff cost- 2 percentage & Other small cost- 2 is added
- The total cost estimate of work is found by adding **ten percent** for price adjustment contingency (मूल्य समायोजन कन्टिन्जेन्सी), by **ten percent** for physical contingency (फिजिकल कन्टिन्जेन्सी) and the value added tax, for management of budget.
- During evaluation of price bid (बोलपत्र अङ्क) of work all the contingencies and VAT are excluded.
- For the approval of cost estimate and selection of procurement method of works all the contingencies and VAT are included. (लागत अनुमान स्वीकृति र खरिद विधि छनौट गर्ने प्रयोजनाको लागि भ्याट र कन्टिन्जेन्सीहरू समावेश गर्नु पर्दछ)
- Cost estimates for consultancy service includes remuneration, out of pocket expenses and reimbursable amounts.
- Approval/Updating of Cost Estimate for procurement of work, goods and services

S.N	Amount, in NRs	Position of Approving officer	Rank: Gazetted Class
A. Estimates Approval of works, goods & other services			
1	Upto 5 Crore	Office Chief	III
2	Upto 10 Crore	Office Chief	II
3	Upto 20 Crore	Office Chief	I
4	Above 20 Crore	Department Head	
B. Estimate Approval – Consulting Services			
5	Upto 20 Lakhs	Office Chief	III
6	Upto 50 Lakhs	Office Chief	II
7	Upto 1 Crore	Office Chief	I
7	Above 1 Crore	Department Head	

- The secretary or administrative chief of a constitutional organ or body, ministry, secretariat and other offices of similar nature may approve the cost estimate of any amount.

Methods of Procurement of construction works/goods

1. Open Competitive (Advertised) Bidding – Single Stage (Technical and Financial Proposals) – International Competitive Bidding (ICB)/ National Competitive Bidding (NCB)

2. Open Competitive (Advertised) Bidding – Two Stage: Pre-Qualification Process (for complex works) – then Technical and Financial Proposals from shortlisted Bidders (ICB/NCB)
3. Sealed Quotation
4. Direct Procurement/Purchase
5. Force Account/Amanat
6. Work Through Users Committee
7. Lump sum piece rate
8. Catalogues Shopping
9. Limited Tendering
10. Buy Back Method

Procurement of consultancy service:

- By requesting competitive proposals,
- Through direct negotiations.

S. N	Descriptions/Procurement Method	Limit of Procurement Amount
A.	Procurement of goods, works, and other services	
1	Open Tender -NCB with or without Pre-qualification	Above 20 Lakhs (2 Million) (Rule 31) upto 1 Arabs.
2	Open Tender -ICB with or without Pre-qualification	Above 5 Arabs.(5000 Million)
3	Sealed Quotation	below 20 Lakhs (2 Million) (Rule 84)
4	Direct Purchase	10 Lakhs (1 Million) (Rule 85)
5	Procurement by other modes	Design Procurement through competition (Rule 87)
6	Lump sum piece rate	Upto 2 crore (20 Million)
7	Catalogues Shopping	Upto 60 Lakhs (Including VAT)
B.	Procurement of Consulting Services	
8	Invitation for competitive proposals: Shortlisting on the basis of open Letter of Intent/ Expression of Interest	<ul style="list-style-type: none"> • above 20 Lakhs (2 Million) (Rule 70) to 15 Crores –NCB • above 15 Crores-ICB (Rule 70)
9	Preparing a Standing List as per Rule 18	below 20 Lakhs (2 Million) (Rule 70)
10	Direct Negotiation	5 Lakhs (0.5 Million) (Rule 85)
11	Other modes of procurement	Appointment based on Qualifications (Rule 83)
C.	Circumstance Specific (Civil works)	
12	Force Account	1 Lakhs (0.1 Million) (Rule 98)
13	Participation of Users' Committees or Beneficiary Groups	1 Crores (10 Million) (Rule 97)

- A Public Entity shall have to procure Nepali goods even if the price of such goods produced in Nepal is higher by up to **15%** (as per the 8th amendment of PPR) than the foreign goods.

Types of Contract

Contract

It is the agreement between two or more parties for performing or not to performing the specified works/consulting services within specified time obeying the specified specifications or terms of references that is enforceable by laws.

Contract=Agreement+Legality

All contracts are agreement but all Agreements are not the Contract.

Agreement is just acceptance of proposal or offer by a party from other without the terms and conditions and may not legality. The main objective of entering into the contract is to seek the legal action or remedy if any party breached the contract.

Elements of Contract

- | | |
|------------------------------|----------------------|
| • Offer and acceptance | • Consideration |
| • Capacity to contract | • Lawful purpose |
| • Possibility of performance | • Free consent |
| • Certainty/uncertainty | • Legal relationship |
| • Written Agreement | • Competent party |

Types of contract

Contracts for Construction Works (Rule 22, Schedule 4)

1. **Unit rate contract/item rate contract/BOQ Contract/admeasurable Contract**
 - This type of contract based on the estimated BOQ of items of works and corresponding unit price/rate.
 - If the quantity of to be done is not ascertained during the finalization of procurement works, this type of contract is more suitable.
 - The payment to contractor during work progress shall be done based on the actual work carried out by contractor.
 - This is more suitable to those work /assignment which can be easily measurable.
 - The risk goes to both parties.
2. **Lump sum contract**
 - If measurement of items of work is difficult like installation of pipe line, construction of bridge, house gate, sanitary fittings etc. such type of contract is suitable.
 - The contractor is assigned to do work to specified amount within specified time frame under agreed tems of conditions or specifications.
 - The risk goes to the contractor only.
3. **Design and build contract**
 - This contract is concluded in order to have design and construction of work by same organization.
4. **Turnkey contract**
 - This type of contract is concluded by mentioning the performance capacity of task/plant/work etc.
5. **EPC contract**
 - EPC stands for Engineering Procurement Construction.
 - In such type of contract, contractor design the project and construct it either itself or by contracting or subcontracting.
 - The cost of work is negotiated and payment procedure, installment will be as per contract.
6. **Reimbursement contract**
 - If the construction works of complex and difficult nature, such type of contract is suited.
 - The payment to construction entrepreneur is paid as the actual cost of works and additional agreed profit.
7. **Management contract**

- If same construction work is carried out by number of sub-contractors then the overall monitoring, maintaining contractual specification, supervision etc. is done by another party on agreed amount which is called management contract.

8. Build Own Operate Transfer (BOOT) contract

- It is modern form of project financing of long term nature. In such contract, a private entity receives the concession from governmental or private entity to finance, design, construct, own, operate and finally transfer to the same entity as per the concession contract.
- This type of contract releases the burden to public budget in infrastructure development and technology transfer.
- Hydropower sector of Nepal, government has been adopting BOOT system. Similarly reputed institution/organizations like Word Trade Centre, Tripuresor, Kathmandu Engineering College, Kalimati etc are built under BOOT contract.

9. Piece work contract

- In order to carry out a construction work related to small scale maintenance and repair which requires to be carried out frequently as and when required, a piece- work contract may

10. Performance based maintenance or management contract:

- A performance based maintenance or management contract may be concluded in order to carry out a construction work without mentioning the equipment required to maintain and manage a construction work and item wise work and by mentioning only the final performance.

11. Design, supply and erection/installation contract

12. Labor contract

13. Cost plus contract

Contracts for Consultancy services

1. Lump sum contract

Consultancy services for a work clearly identified, having low risk to the consultant and the quality of which can be easily measured such as feasibility study, project design, preparing bidding documents, a lump sum contract may be used.

2. Time-based contract

If the period of consultancy service such as supervision of construction works, management of large professional organization or design of complex structure such as dam, tunnel cannot be predicted, a time- based contract may be used.

3. Performance-based fee paying contract

A percentage based contract may be concluded to procure such service as inspection of goods, architect's services, supervision or monitoring service or other services of similar nature

4. Indefinite service period contract

Consultant required from time to time to bring a construction work into operation, a adjudicator or arbitrator of a dispute relating to procurement contract is procured through this type of contract.

Bid & Bid Notice

Tender (Bid)

Tender is the written offer by the tenderer to execute some specified task at specified amount with specified time frame under stipulated condition of agreement.

- Tendering is the first step of formulation of a contract.

Bid Notice/Tender Notice/Invitation for Bid (IFB)

A notice on invitation for bid shall contain the following matters

- ❖ A Public Entity may, in order to provide information relating to bidding documents, technical specifications, construction site and the like matters, organize a meeting of **bidders (Pre-Bid Meeting)** in the case of NCB **at least ten days before** and in the case of a ICB, at least fifteen days before the deadline for submission of bid.
- ❖ A bidder shall have to submit a **bid security (earnest money, bid bond)(बोलपत्र जमानत)** of at least 2.5 percent of the **quoted amount** of his/her bid in cash or the bid security issued by a commercial bank equivalent to that amount. The public entity should calculate the the bid security money of **2-3% of estimated amount**.
- ❖ No experience is needed for the bidders for participation in bidding process up to the amount of **20 million**.
- ❖ The validity period of bid security should be 30 days beyond the bid validity period (**बोलपत्र मान्य अबधि**) ।
- ❖ Except a bid security liable to forfeited, the Public Entity shall have to return bid security to the concerned bidders within three days of **contract agreement**. (**ठेक्का सम्झौता भए पश्चात ठेक्का नपर्ने बोलपत्रदाहरुको बोलपत्र जमानत फिर्ता गर्नु पर्नेछ**)
- ❖ Bid validity period (**बोलपत्र मान्य अबधि**)

For a bid or proposal of consultancy service with cost estimate of up to one hundred million Rupees	90 Days
For a bid or proposal of a consultancy service with cost estimate whatsoever above one hundred million Rupees	120 Days

✓ Authority to Approve the Bid (Rule 67)

Up to 100 million Rupees	Gazetted Third Class
Up to 200 million Rupees	Gazetted Second Class
Up to 500 million Rupees	Gazetted First Class
More than 500 million Rupees	Chief of Department

Standard Bidding Document (SBD)

- ❖ Following are the part of SBD
 - Instructions to Bidders (ITB)
 - Bid Data Sheet (BDS)
 - Evaluation and Eligibility Criteria (EEC)
 - Bidding Forms (BDF)
 - Works Requirements (WRQ)
 - Bill of Quantities (BOQ)
 - General Conditions of Contract (GCC)
 - Special Conditions of Contract (SCC)
 - Contract Forms (COF)
 - Performance security form
 - Advance payment guarantee form

- ❖ **Tender notice (Invitation for Bid)** is not part of bidding document
- ❖ The Bidder can visit and examine the Site of Works and its surroundings at own expense before submitting the bid.
- ❖ At any time prior to the deadline for submission of bids, the Employer may amend the Bidding Document by issuing agenda.
- ❖ Some terms used in bidding process
 - **Corrupt practice** means the offering, giving, receiving, or soliciting, directly or indirectly, anything of value to influence improperly the actions of another party.
 - **Fraudulent practice** means any act or omission, including a misrepresentation, that knowingly or recklessly misleads, or attempts to mislead, a party to obtain a financial or other benefit or to avoid an obligation;
 - **Coercive practice** means impairing or harming, or threatening to impair or harm, directly or indirectly, any party or the property of the party to influence improperly the actions of a party;
 - **Collusive practice** means an arrangement between two or more parties designed to achieve an improper purpose, including influencing improperly the actions of another party.
 - **Obstructive practice** means destroying, falsifying, altering, or concealing of evidence material to an investigation; (b) making false statements to investigators in order to materially impede an investigation.
 - **Centra preferentum rules of interpretation**- Some times word or term to be interpreted may has of two different meaning, in that situation has ambiguity will be resolved in favor of the party that did not draft the document.
 - **Incoterms**-Incoterm rules of international commercial terms are series of predefined terms published by International Chamber of Commerce (**ICC**)
 - **FIDIC**- Federation Internationale Des Ingenieurs Conseils) is the international federation of consulting engineers, known by its France acronym.
 - FoB- Free on Board
 - CFR-Cost and Freight
 - CIF- Cost, Insurance and Freight
 - EXW- Ex works

Evaluation of Tender and selection of Tender

- ✓ Information relating to the examination, evaluation, comparison, and post-qualification of bids and recommendation of Contract award, shall not be **disclosed** to Bidders or any other persons not officially concerned with such process until information on Contract award is communicated to all Bidders.
- ✓ If there is a discrepancy between the unit price and the total price that is obtained by multiplying the unit price and quantity, the **unit price** shall prevail and the total price shall be corrected and if there is discrepancy between words and figures, the **words shall prevail**.
- ✓ The bid evaluation committee shall have to evaluate the bids included in the evaluation in accordance the methods and criteria set forth in the bidding document assigning the due weightage of technical, financial and commercial aspects of construction entrepreneur.

- ✓ While evaluating, if arithmetical error exist, public entity will correct this error ,in making the correction ,their exist the discrepancy between the unit rate and total amount, the unit rate shall prevail and the amount will shall be corrected as per the rate.
- ✓ Where there is discrepancy between the word and figure in submitted bid, the amount in figure shall prevail.
- ✓ Historical Financial Performance (net worth), Average Annual Construction Turnover (AACT), Average Annual Construction Turnover, Financial Resources (working capital) & bid capacity is used to determine the financial situation of the contractor.
- ✓ Bid Evaluation is evaluation of
 - a. Technical evaluation (Rule 62)
 - b. Commercial aspects evaluation (Rule 63)
 - Time for completion of project
 - Payment Condition
 - Bidder Responsibility
 - c. Evaluation of Financial aspects (आर्थिक अवस्था) (Rule 64)
 - Historical Financial Performance
 - Average Annual Construction Turnover
 - Required Bid Capacity
 - Financial Resources
- ✓ Evaluation and Qualification Criteria (Technical Proposal)
 - **Adequacy of Technical Proposal**
 - Evaluation of the Bidder's Technical Proposal will include an assessment of the Bidder's technical capacity, to mobilize key equipment and personnel for the contract consistent with its proposal regarding work methods, scheduling, and material sourcing in sufficient detail and fully in accordance with the requirements.
 - **Qualification**
 - Nationality
 - Conflict of Interest
 - Government/ DP Eligibility
 - Bidder's Running Contracts (**Bidder's Running Contracts not more than five -5**)
 - Other Eligibility (Firm Registration, Business Registration,VAT and PAN Registration, Tax Clearance Certificate)
 - Pending Litigation
 - **Financial Situation**
 - Historical Financial Performance-Last there to five years
 - Average Annual Construction Turnover (within best three years out of last ten fiscal years).
 - Financial Resources (Working Capital)
 - Required Bid Capacity
 - **Experience**
 - General Construction Experience
 - Specific Construction Experience ((a) Contracts of Similar Size and Nature, Construction Experience in Key Activities)

- ✓ Line of credit is issued by the bank for the bidders, which increase the bidder's working capital.
- ✓ In cases of national level open bidding, **any three years maximum average turnover out of ten years** transaction shall be taken as criteria for the evaluation of the contractor.
- ✓ Historical Financial Performance = Bidder's **net worth** calculated as the difference between total assets and total liabilities should be positive.
- ✓ The bidding capacity of the bidder is taken as the **five times** of maximum annual construction turnover.
- ✓ The public entity should select the **Lowest Evaluated Substantially Responsive Bidder**.
- ✓ **Within 7 days** of selection of successful bidder, the public entity serves the notice of Intent of Acceptance of his/her to concerned bidder.
- ✓ **Front loading-** quotation of high rate by the bidder for the work that to be carried out at the preliminary stage

Award of Contract

- The Employer shall award the Contract to the Bidder whose offer has been determined to be the **lowest evaluated bid and is substantially responsive** to the Bidding Document.
- **Letter of Intent (LoI) to Award the Contract/Notification of Award** (बोलपत्र स्वीकृत गर्ने आशयको सुचना): The Employer shall notify the concerned Bidder whose bid has been selected, in writing that the Employer has intention to accept its bid and to all the bidders who submit the bid (ठेक्का पाउने बोलपत्रदाता र नपाउने सबैलाई यो सुचना दिईन्छ)
- Letter of Acceptance (LoA) - The Employer shall issue the LoA to the selected contractor, if no bidder file and application. (LoI को सुचना प्रकाशन भएको सात दिन भित्र कुनै बोलपत्रदाताले बोलपत्रको मुल्याङ्कन सम्बन्धमा पुनरावलोकनको लागि निवेदन नदिएमा LOI ठेक्का पाउने बोलपत्रदातालाई मात्र दिईन्छ)
- LOI सम्म Bidders शब्द प्रयोग गरिन्छ भने LOA पश्चात Contractor, त्यसकारण LOA लाई Contract Document को part को रूपमा लिईन्छ भने LOI part of contract document होईन ।
- Within Fifteen (15) days of the receipt of Letter of Acceptance from the Employer, the successful Bidder(Contractor) shall furnish the performance security (Performance Bond) as under mentioned from Commercial Bank or Financial Institution eligible to issue Bank Guarantee.
- If bid price of the selected bidder is up to 15 (fifteen) percent below the approved cost estimate, the performance security amount shall be 5 (five) percent of the bid price.
- For the bid price of the bidder selected for acceptance is more than 15 (fifteen) percent below of the cost estimate, the performance security amount shall be determined as

$$\text{Performance Security Amount} = [(0.85 \times \text{Cost Estimate} - \text{Bid Price}) \times 0.5] + 5\% \text{ of Bid Price.}$$
- The validity period of performance guarantee **is 30 days** beyond the DLP period.

Contract Acceptance

- The employer issued the LoA to the lowest evaluated substantially responsive bidders as contract acceptance and request to come for the contract agreement.
- **Letter of Acceptance (LoA)** means the formal acceptance by the Employer of the Bid and denotes the formation of the contract at the date of acceptance.

- The following documents are part of Contract and shall be interpreted in the following order of priority:
 - (a) Contract Agreement,
 - (b) Letter of Acceptance,
 - (c) Letter of Bid,
 - (d) Special Conditions of Contract,
 - (e) General Conditions of Contract,
 - (f) Specifications,
 - (g) Drawings,
 - (h) Bill of Quantities (or Schedules of Prices for lump sum contracts), and
 - (i) Any other document listed in the SCC as forming part of the Contract.
- SCC means Special Conditions of Contract (can be edit by the public entity)
- **GCC** means general Conditions of Contract (cannot be edit by the public entity)
- **Start Date** is the latest date when the Contractor shall commence execution of the Works. It does not necessarily coincide with any of the **Site Possession Dates**. The contract period is calculated from the **start date**.
- The **Defects Liability Period (365 days)** is the period calculated from the Completion Date where the Contractor remains responsible for remedying defects.
- The contractor can start the works after receiving the **work order letter/notice to proceed/notice to commence the work**.
- The Contractor shall provide insurance in the joint names of the Employer and the Contractor from the **Start Date to the end of the Defects Liability Period**
- Anything of historical or other interest or of significant value unexpectedly discovered on the Site shall be the property of the **Employer**
- Force Majeure means an exceptional event or circumstance: which is beyond a Party's (employer & contractor) control.

Procurement of Consulting Services/Recruitment of Consultants

Consulting services includes the design, drafting, study report preparation, supervision, monitoring, intellectual and advisories work. The consulting works can be procured one of the following methods:

- | | |
|--|---------------------------------------|
| 1. Quality and Cost Based Selection (QCBS) | 2. Quality Based Selection (QBS) |
| 3. Least Cost Selection (LCS) | 4. Fixed Budget Based Selection (FBS) |
| 5. Single Source Selection (SSS) | |

Methodology/Sequence of Procurement of Consulting Services

- Preparation of Terms of Reference (TOR) (Rule 69)
- Open Letter of Intent/Expression of Interest (National/International)
 - EOI is the process of shortlisting of consulting firms based on their profile, human resource, experience and other capabilities
 - Short-listing of Consultants/Firms
- Invitation to Proposal (Request for Proposal-RFP)
 - RFP is invitation of detailed proposal from short listed firms to select the best one and award the task to successful firm.
 - Public Entity shall have to invite request for proposal from the short listed consultants/Firms by sending them the documents relating to proposal by post, courier

or an individual by providing **15 days'** period for estimate upto 2 million and **30 days** above **2 million**.

- Details to be mentioned while inviting Proposals
 - ✓ Name and Address of Public Entity/Client
 - ✓ Nature of consulting services, time period, Terms of Reference, Assignment to be completed with Expected Outputs
 - ✓ Format of Technical/Financial Proposals and mode of submission, stages/phases of the Assignment, whether pre-bid meeting will be held, etc.

➤ Weights to be assigned to Technical and Financial Proposal for evaluation

Selection Method	Technical Score	Financial Score	Total Score
QCBS	70-90	30-10	100
QBS	100	-	100
LCS	-	100	100
FBS	-	100	100

➤ Opening and evaluation of Technical Proposal

- The evaluation committee shall not open the financial proposal until the evaluation of the technical proposal is completed.
- After completion of evaluation of technical proposal at least seven days notice is given in the case of a national level proposal and at least fifteen days in the case of an international level proposal regarding opening of financial proposal.
- The financial proposal of the consultant failing to obtain the pass marks shall be returned to him/her with a notice containing the grounds of failure of his/ her technical proposal

➤ Opening and evaluation of financial Proposal

- If discrepancy is finding in the unit rate and the total amount, the unit rate shall prevail.
- If any discrepancy is found in number and words in the amount quoted by the proponent, the amount quoted in words shall prevail

➤ Selection of Consultants

- Under QCBS, the Evaluation Committee shall conduct a joint evaluation of the Technical and Financial Proposals and select the Proposer with the highest score.
- Under QBS, the Proposer with the highest score is selected. If the Proposer's financial bid amount is deemed to be high, it may be reduced through negotiation
- Under FBS, Proposals with a bid amount higher than the fixed budget is to be rejected. The proposal obtaining the highest technical score with a bid amount within the fixed budget is to be selected.
- Under LCS, the Proposer with the lowest bid amount from among those who have passed by obtaining the minimum pass score in the Technical Proposal is to be selected
- **Within 7 days** of selection of successful bidder, the public entity serve the notice of Intent of Acceptance (IoA) to concerned bidder

➤ Negotiation with Proposer

- Negotiations may be held with the selected Proposer over the proposed TOR, progress reports, facilities to be provided by the Client, and reimbursable expenses

- Approval of proposal

Upto 2 Million	III Class
Upto 10 Million	II Class
Upto 50 Million	I Class
Above 50 Million	Department head

Classification of contractor

- निर्माण व्यवसायी ऐन, २०५५ ले निर्माण व्यवसायीलाई चार समुह (क, ख, ग र घ) मा बाढेको छ।
- Construction Business Act, 2055 classified contractor into 4 categories viz class A, class B, class C and class D depending upon their capability.
- The contractor should renew their license yearly
- निर्माण व्यवसायीबाट गराउन सकिने निर्माण कार्य
 - दुई करोड भन्दा माथिको कार्य- 'क' वर्गको व्यवसायीबाट
 - साठि लाख देखि तिन करोड भन्दा माथिको कार्य- 'ख' वर्गको व्यवसायीबाट
 - २० लाख देखि एक करोड भन्दा माथिको कार्य- 'ग' वर्गको व्यवसायीबाट
 - तिस लाख सम्मको कार्य- 'घ' वर्गको व्यवसायीबाट

Some Terminologies related to Tender

- **E-Bidding/Online Bidding/Electronic Bidding**
 - In such bidding process, the buyers/client post their requirements on their website and also allows the service providers/suppliers/contractors to submit bid on the same website.
 - This has substantially reduces the cartels, ringing and collusions during the procurement process.
 - This type of bidding process becomes more beneficial in country like in Nepal as it allows the optimization of procurement management, efficient utilization of government's resource and release of burden of undue political pressure to influence the procurement process.
 - E-GP Operational Guidelines, 2017: (Clause 35)
 - Only e-GP system may be used for the procurement of any amount,
 - E-GP system should also be used for the procurement of works for the procurement of above NRs. 6 million.
 - Only E-GP system should be used for the procurement of works of above NRs. 20 million, goods of above 6 million NRs and consulting services of above 2 million NRs.
- **Instructions to Bidders (ITB)**
 - This provides relevant information to help the Bidders to prepare their Bids. Information is also provided on the submission, opening, and evaluation of Bids and on the award of Contract.
- **Bid Data Sheet (BDS)**
 - The Bid Data Sheet (BDS) contains information and provisions that are specific to each bidding process. The Employer must specify in the BDS provisions that supplement the information and requirements specified in Instructions to Bidders.
- **Evaluation and Qualification Criteria (EQC)**

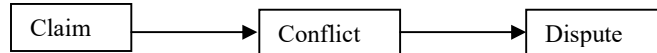
- The purpose of the Evaluation and Qualification Criteria (EQC) is to specify the criteria that determine the **lowest evaluated substantially responsive bid** and the qualifications of the Bidder to perform the contract.
- The Procuring Entity shall prepare the EQC by taking into account the nature, quantity and or amount of the procurement and include it as a part of the Bidding Document. In determining the Evaluation and Qualification Criteria.
- **The EQC is not a part of the Contract document.**
- **Documents Comprising the Bid**
- **Technical Bid** (Letter of Technical Bid, Bid Security, written confirmation authorizing the signatory of the Bid to commit the Bidder, documentary evidence establishing the Bidder's qualifications to perform the contract) & **Price Bid** (Letter of Price Bid, completed Bill of Quantities(BoQ).
- **Force Majeure**
- It means an exceptional event or circumstance: which is beyond a Party's control; which such Party could not reasonably have provided against before entering into the Contract; which, having arisen, such Party could not reasonably have avoided or overcome; and, which is not substantially attributable to the other Party.
- **Letter of Acceptance** means the formal acceptance by the Employer of the Bid and denotes the formation of the contract at the date of acceptance.

Contract Management (ठेका व्यवस्थापन वा करार व्यवस्थापन)

- निर्माण व्यवसायी र कार्यालय बिच ठेका वा करार सम्झौता भए पश्चात सम्झौता अनुरूप कार्य गर्न गराउन अपनाईने विभिन्न विधि, सम्झौता अनुसार निर्वाह गर्नु पर्ने भूमिका लगायतलाई ठेका व्यवस्थापन भनिन्छ।
- **Insurance**
 - The Contractor shall provide insurance in the joint names of the Employer and the Contractor from the **Start Date to the end of the Defects Liability Period**.
 - It is mandatory to provide the insurance if the contract amount exceed more than **2M**.
 - The minimum cover for loss of or damage to the Works, Plant and Materials is **115% of the Contract Amount**.
 - The minimum cover for loss or damage to immovable Equipment/plants is **100 % (i.e Replacement Cost)**।
- **Work order/Letter to proceed**
 - It is the formal letter provided to the contract to execute the contract.
 - The work order date may be same date as contract day or few time later than contract date.
 - The Employer shall give possession of all parts of the Site to the Contractor during issuing of work order to contractor.
- **Discoveries**
 - Anything of historical or other interest or of significant value unexpectedly discovered on the Site shall be the property of the employer.
 - The Contractor shall notify the Project Manager of such discoveries and carry out the Project Manager's instructions for dealing with them.
- **Forced Labor/Child Labor**

- The Contractor shall not employ children in a manner that is economically exploitative, or is likely to be hazardous, or to interfere with, the child's education, or to be harmful to the child's health or physical, mental, spiritual, moral, or social development.
- Children below the age of 18 years shall not be employed in dangerous work.
- The Contractor shall not employ forced labor, which consists of any work or service, not voluntarily performed, that is exacted from an individual under threat of force or penalty

➤ **Dispute resolution**



- Dispute is an assertion of right, claim or demand on one side.
- Methods of resolution of dispute:
 - Amicable settlement/mediation
 - Adjudication (now day this method is not used in Nepal)
 - Dispute Resolution Board (DRB)/Dispute Board (DB)
 - Arbitration
 - Court (Litigation).
- The Employer and the Contractor shall attempt to settle amicably by direct negotiation any disagreement or dispute arising between them.
- Any dispute between the Parties which cannot be settled amicably within thirty (30) days after receipt by one Party of the other Party's request for such amicable settlement may be referred to Arbitration within 30 days after the expiration of amicable settlement period.
- The arbitration shall be conducted in accordance with the arbitration procedures published by the Nepal Council of Arbitration (NEPCA).
- The ultimate method of dispute resolution is litigation.

➤ **Mobilization Fund/Advance Payment**

- It is amount given to contractor after contract award to prepare all the necessary matters to start up the work.
- In Nepal, this amount should not exceed 20% of contract amount. (Provided in two installments).
- Deductions of advance payment from Payment Certificates will commence in the first certificate in which the value of works executed exceeds 30% of the Contract Price.
- Advance payment shall be completely repaid prior to the end of 80 % of the approved contract price.

➤ **Liquidated (delay) damages**

- It is penalty employed to contractor or service provider if failed to complete the assigned work within time frame specified in contract.
- It is generally 0.05% of contract amount per day but not exceeding 10% of the contract amount.

➤ **Variation order**

- Approval of variation order

Upto 5% of Contract Amount	Gazzeted II Class
Upto 10% of Contract Amount	Gazzeted I Class
Upto 15% of Contract Amount	Department Head

Above 15% to 25 % of Contract Amount	Secretary of the Ministry
Above 25%	Cabinet

➤ **Price Adjustment (मूल्य समायोजन)**

- Price adjustment is done in procurement contract having duration exceeding **12 months**
- The maximum amount of price adjustment shall not, generally, be more than **twenty five percent** of the initial contract prices.
- If price of any construction materials is increased or decreased unexpectedly by more than ten percent of the previous price, then price adjustment on the construction material is done.
- Adjustment Formulae :

$$pn = A + b \frac{Ln}{Lo} + c \frac{Mn}{Mo} + d \frac{En}{Eo} + etc.$$

L is labor element, M is material element, and E is equipment usage.

- The base cost indices or prices shall be those prevailing on the day **30** days prior to the latest date for submission of bids.
 - Current indices or prices shall be those prevailing on the day **30** days prior to the last day of the period to which a particular Interim Payment Certificate is related.
- **Defect Liability Period/Maintenance Period-365 days**
- The period during which the contractor is liable to maintain and repair for any damages and defects occurred on work due to unsatisfactory performance.
- **Sub-contractor/Petti-contractor**
- Petti contractor is the third party who is assigned part of work under contract by main contractor.
 - Maximum 25% of contract amount can be done through sub contracting.
- **Joint Venture (JV)**
- It is a business arrangement in which two or more parties agree to pool their available resources for successful completion of the specified task assigned to them.
 - Maximum number of JV partner is **3**.
 - If the Contractor is a joint venture of two or more entities, all such entities shall be **jointly and severally liable** to the Employer for the fulfillment of the provisions of the Contract.
- **Extension of Contract Period**
- The Project Manager shall extend the Intended Completion Date if a **Compensation Event occurs or a Variation** is issued which makes it impossible for Completion to be achieved by the Intended Completion Date.
 - For extension of time, stating reasons, the contractor should inform concerned Public Entity at least **21 days** before the time of such contract expires.
 - The chief of public entity who approved bidding document can extend the time upto any period based on the analysis of situation.
- **Payment Certificates:**
- The employer shall check the Contractor's monthly statement and certify the amount to be paid to the Contractor within **30 days** of submission by contractor.
 - If the Employer makes a late payment, the Contractor shall be paid interest.
 - The bill paid to contractor before the final bill is called Interim Payment Certificate (**IPC**).

➤ **Compensation Events (क्षतिपूर्ति)**

- If a Compensation Event would cause additional cost or would prevent the work being completed before the Intended Completion Date, the **Contract Price shall be increased and/or the Intended Completion Date shall be extended** (निर्माण व्यवसायीलाई क्षतिपूर्ति गर्नु पर्ने अवस्थामा क्षतिपूर्ति वापत थप रकम वा म्याद थप गरिदिएर गर्न सकिन्छ ।)
- The following shall be Compensation Events (क्षतिपूर्ति योग्य घटनाहरू):
 - (a) The Employer does not give access to a part of the Site by the Site Possession Date.
 - (b) The Employer modifies the Schedule of Other Contractors in a way that affects the work of the Contractor under the Contract.
 - (c) The Project Manager orders a delay or does not issue Drawings, Specifications, or instructions required for execution of the Works on time.
 - (d) The Project Manager instructs the Contractor to uncover or to carry out additional tests upon work, which is then found to have no Defects.
 - (e) The Project Manager unreasonably does not approve a subcontract to be let.
 - (f) Ground conditions are substantially more adverse than could reasonably have been assumed before issuance of the Letter of Acceptance from the information issued to bidders (including the Site Investigation Reports), from information available publicly and from a visual inspection of the Site.
 - (g) The Project Manager gives an instruction for dealing with an unforeseen condition, caused by the Employer, or additional work required for safety or other reasons.
 - (h) Other contractors, public authorities, utilities, or the Employer does not work within the dates and other constraints stated in the Contract, and they cause delay or extra cost to the Contractor.
 - (i) The advance payment is delayed.
 - (j) The effects on the Contractor of any of the Employer's Risks.
 - (k) The Project Manager unreasonably delays issuing a Certificate of Completion.

➤ **Force Majeure**

- "Force Majeure" means an exceptional event or circumstance
 - (a) which is beyond a Party's control
 - (b) which such Party could not reasonably have provided against before entering into the Contract
 - (c) which, having arisen, such Party could not reasonably have avoided or overcome; and
 - (d) which is not substantially attributable to the other Party
- Force Majeure may include, but is not limited to, exceptional events or circumstances of the kind listed below, so long as conditions (a) to (d) above are satisfied:
 - (a) war, hostilities (whether war be declared or not), invasion, act of foreign enemies
 - (b) rebellion, terrorism, sabotage by persons other than the Contractor's Personnel, revolution, insurrection, military or usurped power, or civil war
 - (c) riot, commotion, disorder, strike or lockout by persons other than the Contractor's Personnel
 - (d) munitions of war, explosive materials, ionizing radiation or contamination by radio-activity, except as may be attributable to the Contractor's use of such munitions, explosives, radiation or radio-activity, and

(e) natural catastrophes such as earthquake, hurricane, typhoon or volcanic activity.

➤ **Black Listing (कालो सूची)**

- Public Procurement Monitoring Office (PPMO), on the recommendation of procuring entity, may blacklist a Bidder for its conduct for a period of one (1) to three (3) years |

➤ **Finishing of the contract**

- Defects Liability Period (DLP) begins after issuance of taking over certificate (कार्य स्वीकार प्रतिवेदन).
- Issue the Taking-Over Certificate to the Contractor if physical progress of works is at least ninety (90) percent in accordance with the Contract except for any minor outstanding work and defects (as listed in the Taking-Over Certificate) which will not substantially affect the use of the Works or Section for their intended purpose.
- Work Completion Report is issued after the completion of DLP.
- Before issuing the work completion report Employer shall verify and assure that works are within the set objective, quality and appropriate to operate and use.

➤ **Quality Assurance Plan**

- Prepared and submitted by contractor to the employer.
- Quality assurance are all those planned or systematic actions necessary to provide confidence that a product or service will satisfy given needs

Few Points

- House Rent Fixation Committee consisting of 5 Members and chief of the committee is the CDO.
- PPMO, on the recommendation of the Procuring Entity may blacklist a Bidder for a period of one (1) to three (3) years
- Retention money is equal to **5% of bill amount**, and 50 % of retention money is refund after the the DLP period and remaining 50% after the tax clearance.
- Reward May be given to the contractor if work is completed prior to time. Maximum amount of reward is ten percent of the contract amount.
- Taking over certificate is provided after the completion of work where as work completion report is provided after the completion of DLP.

Muster roll

- It is used for the keeping the record of labor on daily basis.
- The roll commonly used to make payment to labor engaged on daily wages.

Few Points

- House Rent Fixation Committee consisting of 5 Members and chief of the committee is the CDO.
- PPMO, on the recommendation of the Procuring Entity may blacklist a Bidder for a period of one **(1) to three (3) years**
- Retention money is equal to 5% of bill amount, and 50 % of retention money is refund after the the DLP period and remaining 50% after the tax clearance.
- Reward May be given to the contractor if work is completed prior to time. Maximum amount of reward is **ten percent** of the contract amount.

6.3 Material management: procurement procedures and materials handling

- A material management system includes the major functions of identifying, acquiring, distributing, and disposing of materials on a construction site
- Materials management is the function responsible for the coordination of planning sourcing, purchasing, moving, storing, and controlling materials in an optimum manner so as to provide a pre-decided services to the customer at a minimum cost

Scope of Materials Management

- Scope of materials management consists of materials planning and control, purchasing, stores and inventory control.
- *Materials planning and control* is based on the forecast and production plan.
- *Purchasing* is based on the sources of supply, purchasing terms, order placement, follow-up, payment, and feedback for future purchase.
- *Stores and inventory control* include physical control, stocking and handling, recording, and physical verification.

Advantages of Materials Management

- Better accountability.
- Better coordination.
- Better performance.
- Efficient use of IT.
- Specialized function and cadre.
- Career development opportunity.
- Better motivation and team spirit.

Classification of Materials

- Bulky, onetime purchase, repetitive use and minor materials.
- Vital, essential, and desirable materials.
- *Indigenous* and imported materials.
- High priced, medium priced, and low priced materials.
- High usage value, medium usage value, and low usage value materials.

ABC classification of construction material

ABC analysis is known as 'always better control' or alphabetical approach. It is a basic analytical tool which enables the top management to place the effort where results will be more.

'A' – items are the highest priority, tightest control, close follow up and accurate record. 10 % of the 'A' items volume accounts for 70% of the total inventory value.

'B' – items are priority when low or out of stock. Normal control is used and good records are maintained. 70 % of the 'A' items volume accounts for 10% of the total inventory value.

'C' – items are lowest priority. Simplest method of control. 70 % of the 'A' items volume accounts for 10% of the total inventory value

Purpose of ABC Analysis

S. N.	'A' Items High consumption value	'B' Items Moderate consumption value	'C' Items Low consumption value
1	Very strict control	Moderate control	Low control

2	No safety stocks (or very low)	Low safety stocks	High safety stocks
3	Frequent ordering or weekly deliveries	Once in three months	Bulk ordering once in 6 months
4	Weekly control statements	Monthly control reports	Quarterly control reports
5	Maximum follow-up	Periodic follow-up	Very low except in exceptional cases
6	Rigorous value analysis	Moderate value analysis	Low value analysis
7	Accurate forecast in material planning	Estimates based on past data	Rough Estimates
8	Minimization of waste, obsolete & surplus (review in 15 days)	Quarterly control over surplus and obsolete items	Annual review over surplus and obsolete items
9	Central purchasing and storage		Decentralized purchasing
10	Maximum effort to reduce lead time		Clerical level effort
11	Handled by senior officer	Handled by middle level officer	Delegated authority

Methodology of material procurement

- Need of material collection.
- Grouping as per specification.
- Cross check the type and quantity.
- Check the available stock.
- Decide time frame of delivery of each material.
- Decide ways either tendering, direct purchase, shopping and so on.
- For tender, prepare specification including quality, testing, inspection etc.

Material handling

It is process of preparation, placing, positioning and moving materials with ease, speed, economy and safety. It facilitates the storage, preservation and movement.

Inventory management

It is technique to maintain the optimal level of stock of goods.

Types of inventory

- a. Raw material b. Work in progress c. Finished goods

Types of inventory cost

a. Order cost

It is cost associated to placing and receiving an order and charged as per change. It includes communication cost, custom and duty, labour cost and transportation cost.

Total ordering cost (TOC) = no. of order (N) × ordering cost per order (O)

Where, $N = \frac{\text{Total requirement (A)}}{\text{Ordering quantity (Q)}}$

b. Carrying cost

It is cost of holding the unit of inventory. It is charged in per unit.

Total carrying cost (TCC) = average quantity \times carrying cost per unit = $\frac{Q \times C}{2}$

c. Total inventory cost

Total inventory cost (TIC) = TOC + TIC

For economic order quantity (EOQ), TOC = TCC, so, $Q = \sqrt{\frac{2 \times A \times O}{C}}$, $TIC = \sqrt{2 \times A \times O \times C}$

6.4 Cost, quality and time control

Project cost control

The cost control of project means the process of controlling the expenditure in a project at all stages from its inception to its development. Cost control is not only monitoring of cost and recording perhaps the massive quantity of data but also analysis of data in order to take corrective actions before it too late. Cost control involves prompt cost management including the cost estimating, accounting, direct labour costing, overhead rate and others (bonus, allowance, penalties etc.).

Cost control techniques are:

- Material control
- Labor control.
- Overhead control.
- Budgetary control

Method of cost control

i. Short term planning and control

- Overall profit / loss account
- Unit costing

(ii) Accounting method of control

- Profit / loss on valuation date

ii. Earned value analysis method

- **Earned value** of task is the approved budget allocated to perform the task when the task is completed, the budget has been earned. Therefore, the completed task that has the budget approved earns a value known as earned value.
- **Variance** is defined as any scheduled technical performance or cost deviation from specific planned. Variance is used by all levels of management to verify the budgeting system. There are three basic variances for budgeting and actual cost for work scheduled and performed are:
 - **Budgeted cost for work scheduled (BCWS):** The budgeted amount of cost for work scheduled to be accomplished plus amount of level of efforts in a given time.
 - **Budgeted cost for work performed (BCWP):** The value of work done at point of time.
 - **Actual cost of work performed (ACWP):** Amount reported as actually expended in completing the work accomplished within a given time period.
 - **Cost variance (C_v) = BCWP - ACWP**
If $C_v = 0$ right on budget, $C_v = -ve$ over budget, $C_v = +ve$ under budget
 - **Schedule variance (S_v) = BCWP - ACWS**
If $S_v = 0$ right on budget, $S_v = -ve$ (over budget), $S_v = +ve$ under budget

- **Cost performance index (CPI)** = $\frac{BCWF}{ACWP}$
If CPI=1, right on budget, CPI<1, cost overrun, CPI >1, underbudget
- **Scheduled performance index (SPI)** = $\frac{BCWF}{BCWS}$
If SPI=1, right on Schedule, SPI<1, ahead overrun, SPI>1, behindSchedule

Components Related to Cost Control (According to Standard Bidding Document)

- **Contract Price:** In the case of a Unit Rate contract(**also called as admeasurable contract**), the Bill of Quantities shall contain priced items for the Works to be performed by the Contractor. The Bill of Quantities is used to calculate the Contract Price
- **Changes in the Contract Price:** If the final quantity of the work done differs from the quantity in the Bill of Quantities for the particular item by more than 25 percent, provided the change exceeds 2 percent of the Initial Contract Price, the rate shall adjust to allow for the change.
- **Variations**
- **Payment Certificates:** The employer shall check the Contractor's monthly statement and certify the amount to be paid to the Contractor **within 30 days** of submission by contractor.
- **Compensation Events** If a Compensation Event would cause additional cost or would prevent the work being completed before the Intended Completion Date, the Contract Price shall be increased and/or the Intended Completion Date shall be extended.
- **Price Adjustment**
- **Retention**
- **Liquidated Damages**
- **Bonus**-Maximum amount of bonus paid to contractor is 10% of contract amount
- **Advance Payment**
- **Securities**

Quality control

- Quality control is the operational techniques and the activities which sustain a quality of product or service that will satisfy given needs; also the use of such techniques and activities
- Quality control is the part of quality management, focused on fulfilling quality requirements
- Quality control deals with the detection of error and verification of conformity.
- The cornerstone of quality control is the specification. Control consists of observing actual performance, comparing actual performance with some standard, and then taking corrective action if the observed actual performance is significantly different from the standard.
- Quality is not grade
- Quality standards does not demand the best quality, they establish the minimum requirements to be achieved

Elements of quality

- **Quality characteristics:** it refers to properties that define nature of product for quality control purpose. These include dimension, strength, temperature, colour etc. Taking common material, such as concrete, compressive strength, slump, size of aggregate, water-cement ratio, surface finish, colour etc. are important characteristics to be checked frequently for structural purpose.
- **Design quality:** There is no design which can produce absolute perfect result. Hence, the desired standards for characteristics that define a product such as dimension or strength and also the tolerances for acceptable variations from standards are specified.
- **Quality conformance:** whatever the design quality has been specified, the degree to which it is achieved in the actual construction work is the quality conformance.As in case of design, quality,

the degree to which the quality is to be enforced in the field has to be considered along with cost necessary for quality control procedures.

Quality control process

- Inspect, test and identify in accordance with the quality plan/procedures.
- Establish conformance to specified requirements.
- Hold until test results have been verified.

Factors affecting Quality

1. Design.
2. Drawings.
3. Specifications.
4. Bid document.
5. Selection of a contractor.
6. Socioeconomic factors.
7. Environmental factors

Components Related to Cost Control (According to Standard Bidding Document)

- **Identifying Defects:** The Employer shall check the Contractor's work and notify the Contractor of any Defects that are found.
- **Tests**
- **Correction of Defects**
- **Uncorrected Defects**

Time Control

1. Program(कार्य तालिका)
 - After the date of the Letter of Acceptance, the Contractor shall submit to the employer for approval a Program showing the general methods, arrangements, order, and timing for all the activities in the Works
2. Extension of the intended (EoT) completion date (म्याद थप)
3. Acceleration
4. Delays ordered by the project manager
5. Management meetings
6. Early warning
 - The Contractor shall early warn the employer at the earliest as possible of likely future events or circumstances that may adversely affect the quality of the work, increase the Contract Price, or delay the execution of the Works

Cost Optimization

Project cost

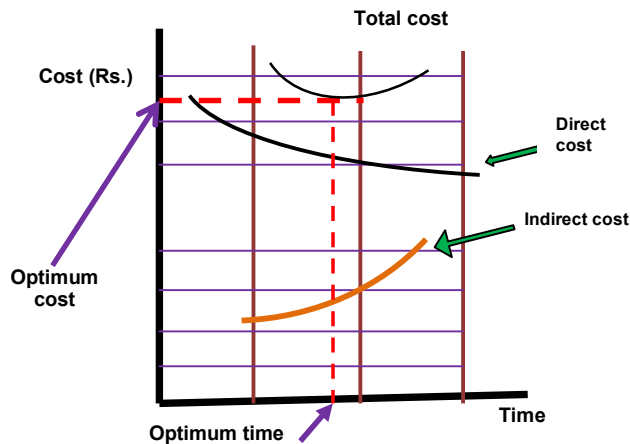
- Direct cost - labor, material, and equipment costs.
- Indirect cost - insurance charge, administration charges etc.

Time cost trade-off

When cost is reduced, certainly time will increase and vice-versa. Both of these two resources cannot be reduced simultaneously. In some cases, client may wish to shorten the time compromising the cost and in some cases, client may wish to reduce cost whatsoever the time will be taken up.

Variation of direct cost with time

- In any project, it is seen that *direct cost that decreases with time increase while indirect cost increases with time increase.*



- Normal time: performing an activity with the normally available resources.
- Normal cost: minimum direct cost; while performing in normal time duration.
- Crash time: minimum time in which activity can be performed.
- Crash cost: direct cost corresponding to the crash time.
- The shape of curve of the total cost(Direct cost+Indirect cost) is "U" shape
- Crashing is start with cost with **least slope**.
- The annual maintenance and repair cost of structure is about **0.5-1.5%**.

6.5 Project Management

- The art of directing and coordinating human and material resources throughout the life of a project by using modern management techniques to achieve predetermined objectives of scope, cost, time, quality and participant satisfaction.
- Every project is planned, budgeted, scheduled, and controlled as a unique task.
- Unlike non-projects, projects are often multidisciplinary and usually have considerable need to cross departmental boundaries for technology, information, resources, and personnel.
- Project Management Process
 - Planning – What are we aiming for and why?
 - Organizing – What is involved and why?
 - Motivation - What motivates people to do their best work?
 - Directing – Who decides what and when?
 - Control – Who judges results and by what standards
- Characteristics of Project
 - Specific objectives, Life span, Constraints, Unique, Team work, Flexibility, Resource integration, Planning and control, Contracting and subcontracting, Specific beneficiaries
- Phases of Project Life Cycle
 - Project Formulation Phase
 - Project identification
 - Project formulation
 - Statement of work (Project charter)

- Project proposal – Technical and Financial; Pre-feasibility study
- Project Planning (Development) Phase
 - Feasibility study - Technical, Financial, Management, Marketing, Economic, Environment analysis
 - Project appraisal – Appraisal and Approval
 - Detailed design – Detailed design, Implementation Plan and Work Schedule
- Project Implementation Phase
 - Mobilization
 - Implementation (Execution)
 - Monitoring and control
- Project Termination Phase
 - Project Evaluation
 - Project Operation and Maintenance Plan/Manual
 - Project Hand over
- Benefits of Project Management
 - Change Management
 - Environmental adaptation
 - Result-orientation
 - Coordination
 - Team development
 - Temporary organization structure

6.6 Occupational health and safety

- International Labor Organization (ILO) and the World Health Organization (WHO) defines as "Occupational health" should aim at the promotion and maintenance of the highest degree of physical, mental and social well-being of workers in all occupations; the prevention amongst workers of departures from health caused by their working conditions; the protection of workers in their employment from risks resulting from factors adverse to health; the placing and maintenance of the worker in an occupational environment adapted to his physiological and psychological capabilities; and, to summarize, the adaptation of work to man and of each man to his job".
- Safety: The protection of employees from injuries caused by work-related accidents.
- Health: An employee's freedom from physical or emotional illness
- Goal of Occupational Health & Safety
 - ✓ Foster a safe work environment.
 - ✓ Protect co-workers, family members, employers, customers, suppliers, nearby communities, and other members of the public who are impacted by the workplace environment.
 - ✓ Interactions among many subject areas, including occupational medicine, occupational (or industrial) hygiene, public health, safety engineering, chemistry, health physics.

Safety requirement

There are several sources of legal requirements regarding the safety as applicable to construction industry. These include:

- Safety standards by bureau of Nepal standards.
- Statutory provisions formed under the different labor laws.
- Contract conditions as agreed with client.

- Decision and award given by judiciary.

The ISI / Nepal standard has published a numbers of codes related to safety of construction work sites.

Safety rules

Some of the safety rules which may be serve as the guide lines to worker and supervisors are:

- Smoking is strictly prohibited, particularly near chemical or flammable materials.
- Power should be switched off before the repair of machinery parts.
- Personal protective devices like safety goggles, aprons, shoes etc. must always used depending upon the type of operations involved.
- High voltage equipment and other machines which cannot be properly guarded should be fenced.
- Wire mesh and safety guards must be provided on all rotating parts such as pulleys, gear boxes etc.
- Electrical connection and insulation should be checked at regular intervals.
- Mischievous acts should never be tolerated and defaulter should be punished.
- Material handling equipment should have unobstructed path for their movements.
- Flammable material must be stored separately and away from the general stories.
- Defective tools such as hammer, spanner should not be used.
- Duly authorized employees should operate the equipment.
- Fire extinguisher should be kept in proper conditions and at key places etc.

Important points regarding safety

- In Nepal, **Labour Act 2048** has included various occupational health and safety provisions.
- Few highlights of Labour Act 2048 are:
 - Provisions of use of disinfectants accordance to need.
 - Adequate ventilation and lightening arrangement provision.
 - Essentiality of provision of personal protective equipment.
 - Arrangement of hygienic drinking water.
 - Adequate space arrangement (*15 m³ space per worker, height being 4 m*)
 - Provisions of annual medical checkup compulsorily.
 - Provisions regarding fire.
 - Protection of eye.
- Special safety measures should be ascertained during excavation, drilling, blasting, scaffolding and formwork as recommended by the safety guidelines and codal provisions.
- For excavation having depth of excavation greater *than 1.2 m or 4 feet*, it is highly recommended to use supports like wooden planks or sheet piles etc.
- Maximum working hours in a weeks is **48 Hours**
- Workers are not allowed to work continuously more than **5 Hours**.

6.7 Project monitoring and evaluation

Project monitoring and evaluation

Monitoring

- Monitoring is the process of keeping track of progress on a continuous and/or periodic basis by management at different levels of an institutional hierarchy, or the individual or agency entrusted by the management to scrutinize whether the inputs and resources meant for the implementation of plans, policies, programmes and projects are being properly delivered.
- The role of monitoring is to verify whether the project activities are being implemented and whether or not the intended outputs are being achieved in accordance with the plan.

Evaluation:

- Evaluation is a systematic and purposeful undertaking carried out by internal or external evaluators to appraise **relevance, effectiveness, efficiency, impacts as well as sustainability** generated by the policies, plans, programmes, and projects under/after implementation.

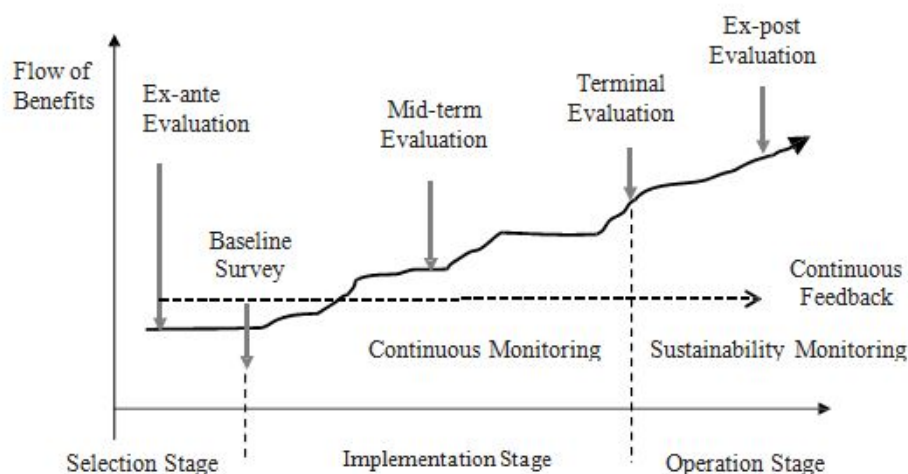
Criteria of Evaluation

Criteria of Evaluation	Definition
Relevance	To ascertain the extent to which the goals of a given plan, policy, programme, or project are suited to the needs and priorities of target groups, and aligned to the national/sectoral development policies and goals, as well as to the policies of the donor agencies.
Effectiveness	To assess and ascertain the extent to which a given plan, policy, programme or project has attained or is likely to attain its objectives.
Efficiency	To measure the outputs in relation to the inputs so as to assess whether output is proportional to the input. To ascertain whether or to what extent the plan, policy, programme, or projects are achieving desired results by using the least possible inputs and most efficient process.
Impact	To measure the direct and indirect, positive and negative, intended and unintended changes, and impacts produced by a plan, policy, programme or project.

Types of Monitoring and Evaluation

Types of Monitoring and Evaluation	Objective
Continuous Monitoring	To track performance against predetermined input, activity, process and output indicators during the formative phase of a programme/project.
Sustainability Monitoring	To ensure necessary resources and provisions needed for sustainability throughout a programmes pre-determined lifecycle. It is conducted after the completion of the formative phase of programme/project.
Ex-ante Evaluation	<ul style="list-style-type: none">•The act of carrying out appraisal before making investment in a project or programme so as to ensure its relevance and need.•To determine the needs and assurances of programme/project continuity.•To define indicators and clearly articulate the details of a given programme.
On-going Evaluation	<ul style="list-style-type: none">•An assessment undertaken during the implementation phase of a programme/project to analyze the continued relevance, effectiveness, efficiency, impact and sustainability of the programme/project so as to improve or reorient its design and implementation if necessary.•To review progress of programme/project.•To revisit and improve pre-determined action plan and/or make necessary changes in operational modalities.
Terminal Evaluation	<ul style="list-style-type: none">•A study conducted at the end of an intervention (or at the end of a phase of that intervention) to analyze and determine its efficiency, impact and

Types of Monitoring and Evaluation	Objective
	<p>sustainability to obtain inputs or suggestions for future courses of action.</p> <ul style="list-style-type: none"> •To carry out review of capacity, effectiveness, and sustainability of programme/project. •To determine whether additional follow up is necessary after the completion of a programme/project.
Impact Evaluation	<ul style="list-style-type: none"> •A type of outcome evaluation carried out a few years after the completion of a programme or project to analyze and evaluate its impacts and sustainability so as to obtain feedback for the formulation of similar programme or project in future.



Difference between Monitoring and Evaluation

Monitoring	Evaluation
Monitoring is the systematic and routine collection of information about the programs/projects activities.	Evaluation is the periodic assessment of the programs/projects activities.
It is ongoing process which is done to see if things/activities are going on track or not i.e. it regularly tracks the program.	It is done on a periodic basis to measure the success against the objective i.e. it is an in-depth assessment of the program.
Monitoring is done usually by the internal members of the team.	Evaluation is done mainly done by the external members.
Monitoring provides information about the current status and thus helps to take immediate remedial actions, if necessary.	Evaluation provides recommendations, information for long term planning and lessons for organizational growth and success.
Monitoring process includes regular meetings, interview, monthly and quarterly reviews etc. Usually quantitative data.	valuation process includes intense data collection, both qualitative and quantitative

Helps to improve project design and functioning of current project.	Helps to improve project design of future projects.
It compares the current progress with the planned progress.	It looks at the achievement of the programs along with both positive/negative, intended/unintended effects.
It focuses on input, activities and output.	It focuses on outcomes, impacts and overall goal

Tool for Monitoring and Evaluation

- **Logical framework (Log Frame) approach:** Log Frame is a planning and management tool that summarizes goals, objectives, outputs, and activities of a programme or project along with their causal linkages.
- **Management Information System(MIS)**

Existing System of Monitoring and Evaluation

Level	What?	Who?	When?	How?
National	Policy	OPMCM, NPC and concerned ministries	Policy implementation phase	Third party evaluation
	Periodic Plan	NPC	Entire plan period	Continuous monitoring and Third party evaluation
	Priority One (P1) Programme and Projects	OPMCM, NPC, MoF and concerned ministries	As per requirement	Joint monitoring, Sustainable Monitoring, Third party evaluation
Regional	Programme/ Project	Departments, Regional Offices	As per requirement	Continuous monitoring and Third party monitoring
District/ Programme/ Project	Programme/ Project	Line agencies, Offices, Provinces Local Levels	As per requirement	Continuous monitoring and Third party monitoring

NPC: National Planning Commission, MoF: Ministry of Finance, OPMCM: Office of Prime Minister and Council of Ministers.

Some Terminologies

Output (प्रतिफल): The products, goods, and services that result from the inputs invested in development programmes or projects. तत्काल मापन गरिन सक्ने वा देखिने नतिजा, उदाहरणको लागि १० कि.मि सडक निर्माण कार्यसम्पन्न।

Outcome (असर): An outcome is the change or effect in development conditions produced by the project. केही समय पश्चात देखिन सक्ने वा देखिने नतिजा, उदाहरणको लागि १० कि.मि सडक स्तरोन्नति भई सहज यातायात विस्तार हुने।

Impact (प्रभाव): The actual or intended changes brought about in the life and wellbeing of targeted beneficiaries by the outputs of a plan, policy, programme, or project. दीर्घकालसम्म पार्ने समग्र प्रभाव, उदाहरणको लागि १० कि.मि. सडक स्तरोन्नति भई मानिसको सामाजिक आर्थिक अवस्थामा आउने परिवर्तनहरू।

Participatory Monitoring: The monitoring carried out by the beneficiaries and representatives of agencies and stakeholders related to the programme or project.

Results-based Monitoring & Evaluation: Logical frameworks, result matrices, sources of information, management information systems (MIS), and monitoring and evaluation plans (among others) can be regarded as the bases for undertaking results-based monitoring and evaluation of plans, policies, programmes, or projects.

Technical Audit: The process of assessing the performance of infrastructure projects so as to see whether they are constructed in compliance with the predetermined design, technology, cost estimate, and materials.

Social Audit: Social audit is a process in which all of the activities and performances of a service delivery agency are examined, assessed and analyzed with direct involvement and participation of a wide range of stakeholders to determine the extent to which the implementation of given plan, policy, programme or project has contributed to overall socio-economic development.

Public Audit: Public audit is an event organized to inform the stakeholders about the goals, objectives, and budget, as well as the results, outputs, and expenditure associated with plans, policies, programmes, and projects executed by public agencies.

Controlling

- Project control is a “project management function that involves comparing actual performance with planned performance and taking appropriate corrective action (or directing others to take this action) that will yield the desired outcome in the project when significant differences exist.”
- Project controls are a series of tools that help keep a project on schedule, quality and cost.
- Controlling Process Steps in Project Management:
 - Set Performance Standards
 - Measure Performance
 - Compare Actual Performance with Standards
 - Analyze Deviations
 - Take Corrective Actions
- Type of project controlling: Cost, quality and time control

Project cost control

The cost control of project means the process of controlling the expenditure in a project at all stages from its inception to its development. Cost control is not only monitoring of cost and recording perhaps the massive quantity of data but also analysis of data in order to take corrective actions before it too late. Cost control involves prompt cost management including the cost estimating, accounting, direct labour costing, overhead rate and others (bonus, allowance, penalties etc.).

Cost control techniques are:

- Material control
- Labor control.
- Overhead control.
- Budgetary control

Method of cost control

i) Short term planning and control

- Overall profit / loss account
- Unit costing

(ii) Accounting method of control

- Profit / loss on valuation date

iii) Earned value analysis method

- **Earned value** of task is the approved budget allocated to perform the task when the task is completed, the budget has been earned. Therefore, the completed task that has the budget approved earns a value known as earned value.
- **Variance** is defined as any scheduled technical performance or cost deviation from specific planned. Variance is used by all levels of management to verify the budgeting system. There are three basic variances for budgeting and actual cost for work scheduled and performed are:
- **Budgeted cost for work scheduled (BCWS):** The budgeted amount of cost for work scheduled to be accomplished plus amount of level of efforts in a given time.
- **Budgeted cost for work performed (BCWP):** The value of work done at point of time.
- **Actual cost of work performed (ACWP):** Amount reported as actually expended in completing the work accomplished within a given time period.
- **Cost variance (C_v)** = $BCWP - ACWP$
If $C_v = 0$ right on budget, $C_v = -ve$ over budget, $C_v = +ve$ under budget
- **Schedule variance (S_v)** = $BCWP - ACWS$
If $S_v = 0$ right on budget, $S_v = -ve$ (over budget), $S_v = +ve$ under budget
- **Cost performance index (CPI)** = $\frac{BCWP}{ACWP}$
If $CPI = 1$, right on budget, $CPI < 1$, cost overrun, $CPI > 1$, underbudget
- **Scheduled performance index (SPI)** = $\frac{BCWP}{BCWS}$
If $SPI = 1$, right on Schedule, $SPI < 1$, ahead overrun, $SPI > 1$, behindSchedule

Components Related to Cost Control (According to Standard Bidding Document)

- **Contract Price:** In the case of a Unit Rate contract (also called as admeasurable contract), the Bill of Quantities shall contain priced items for the Works to be performed by the Contractor. The Bill of Quantities is used to calculate the Contract Price

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- **Payment Certificates:** The employer shall check the Contractor's monthly statement and certify the amount to be paid to the Contractor **within 30 days** of submission by contractor.
- **Compensation Events** If a Compensation Event would cause additional cost or would prevent the work being completed before the Intended Completion Date, the Contract Price shall be increased and/or the Intended Completion Date shall be extended.
- **Price Adjustment**
- **Retention**
- **Liquidated Damages**
- **Bonus**-Maximum amount of bonus paid to contractor is 10% of contract amount
- **Advance Payment**
- **Securities**
- **Value Engineering**-optimization of function, quality and cost to get the best value

Quality control

- Quality control is the operational techniques and the activities which sustain a quality of product or service that will satisfy given needs; also the use of such techniques and activities
- Quality control is the part of quality management, focused on fulfilling quality requirements
- Quality control deals with the detection of error and verification of conformity.
- The cornerstone of quality control is the specification. Control consists of observing actual performance, comparing actual performance with some standard, and then taking corrective action if the observed actual performance is significantly different from the standard.
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- **Quality conformance:** whatever the design quality has been specified, the degree to which it is achieved in the actual construction work is the quality conformance. As in case of design, quality, the degree to which the quality is to be enforced in the field has to be considered along with cost necessary for quality control procedures.

Quality control process/System

- a) Compliant testing for materials including Laboratory trials,

- b) Compliant testing for methods and equipment prior to the commencement of the work, including site trials or trials sections,
- c) Control testing during construction,
- d) Acceptant testing on completed works or parts of the works.

Factors affecting Quality

- 1. Design.
- 2. Drawings.
- 3. Specifications.
- 4. Bid document.
- 5. Selection of a contractor.
- 6. Socioeconomic factors.
- 7. Environmental factors

Components Related to Cost Control (According to Standard Bidding Document)

- Identifying Defects: The Employer shall check the Contractor's work and notify the Contractor of any Defects that are found.
- **Tests**
- **Correction of Defects**
- **Uncorrected Defects**

Quality Assurance Plan- The Contractor shall prepare and submit QAP to the Employer for his approval.

Contractor Responsible For the Quality of the Works: All materials incorporated and all workmanship performed shall be strictly in **conformity** with the requirements of the Specifications and the Contractor shall be responsible for the quality of the works in the entire construction within the contract.

Time Control

- 2. Program (कार्य तालिका)
 - After the date of the Letter of Acceptance, the Contractor shall submit to the employer for approval a Program showing the general methods, arrangements, order, and timing for all the activities in the Works
- 2. Extension of the intended (EoT) completion date (म्याद थप)
- 3. Acceleration
- 4. Delays ordered by the project manager
- 5. Management meetings
- 6. Early warning
 - The Contractor shall early warn the employer at the earliest as possible of likely future events or circumstances that may adversely affect the quality of the work, increase the Contract Price, or delay the execution of the Works

6.8 Quality Assurance Plan

- Prepared and submitted by contractor to the employer.
- Quality assurance are all those planned or systematic actions necessary to provide confidence that a product or service will satisfy given needs

- Objectives of Quality Assurance
 - Fit for purpose: The product should be suitable for the intended purpose.
 - Right first time: Mistakes should be eliminated.

6.9 Variation, alternation and omissions

- Deviation is a departure from the requirements specified in the Bidding Document;
- Reservation is the setting of limiting conditions or withholding from complete acceptance of the requirements specified in the Bidding Document

Variation

- A variation (sometimes referred to as a variation instruction, variation order (VO) or change order), is an alteration to the scope of works in a construction contract in the form of an addition, substitution or omission from the original scope of works..
- Variations may include:
 - ✓ Alterations to the design.
 - ✓ Alterations to quantities.
 - ✓ Alterations to quality.
 - ✓ Alterations to working conditions.
 - ✓ Alterations to the sequence of work.
- Variations may give rise to additions or deductions from the contract sum.

Alternation

- Change made during the construction is called alternation. It may not affect duration and cost.

Omission

- It is the removing of some items from the construction. Due to omission project cost as well as duration may reduce.

Objective Questions: Construction Management

1. On the bar chart, the various activities of a project are shown by

a. shaded area	b. horizontal lines
c. vertical lines	d. dot marks
2. Bar charts are considered suitable for

a. Major projects	b. Minor project
c. Large project	d. All
3. Which type of network was first developed for planning of any project?

a. bar chart	b. mile stone	c. CPM	d. PERT
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4. Jobs going ahead of schedule are conveniently shown in

a. Gnatt chart	b. milestone chart	c. Pi chart	d. none
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5. The upper portion of horizontal bars in a bar chart indicates

a. Total duration of completion of activity	b. Progress of work in specified time
c. Due duration for completion of an activity.	d. All
6. The limitations of bar charts are

a. Interdependencies of activities	b. Project progress
c. Uncertainties	d. All

7. The weakness of bar chart is
 a. Various activities are interdependent b. Uncertainty in duration of various activities
 c. The sequence of activities is not clear **d. All**
8. The amount of time required performing the event in case of PERT should be.....CPM.
 a. less than b. greater than c. equal to **d. all**
9. The PERT technique of network analysis is used for
 a. small project b. large project
c. research and development d. all
10. The salient features of functional organization is
 a. Strict adherence to specification
 b. Separation of planning and design part
 c. Each individual maintains functional efficiency.
 d. Work is properly planned and distributed.
e. All
11. Critical path method
 a. Is an improvement upon the bar chart method
 b. Provides a realistic approach to daily problems
 c. Avoids delays which are very common in bar chart.
 d. Was invented by Morgan R. Walker of Dupont and James E. Kalley or Remington U.S.A.
e. All
12. CPM is
 a. Synthesizing in concepts b. Is built of activities oriented programme
 c. Is based on time estimate d. Is used for repetitive works
e. All
13. Critical path
a. is always longest b. is always shortest c. may longest d. may be shortest.
14. Critical path lies along the activities having total float
 a. positive b. negative **c. zero** d. same
15. Which of following node does not represent the activity?
a. Site located b. Foundation is being dug
 c. The office area is being cleaned d. The invitations are being sent
16. Critical activity has
a. zero float b. minimum float
 c. maximum float d. all
17. For completion of project, the critical path of network represents
a. minimum time b. maximum time
 c. maximum cost d. minimum cost
18. The project maintenance remains as a contractual obligation of project contractor until the expiry of
 a. construction period **b. defect liability period**
 c. project period d. project handover period

[PSC-Highway, 2072]

19. If the cost of construction project varies with time, then the cost slope is expressed as
- $\frac{\text{crashcost-normalcost}}{\text{crashtime}}$
 - $\frac{\text{crashcost-normalcost}}{\text{normaltime}}$
 - $\frac{\text{crashcost-normalcost}}{\text{normaltime-crashtime}}$
 - $\frac{\text{crashcost-normalcost}}{\text{crashtime-normaltime}}$
20. The process of incorporating the changes and rescheduling for re-planning is called
- resource leveling
 - resource smoothening
 - updating**
 - critical path scheduling
21. Updating may result in
- change of critical path
 - decrease of project completion time
 - increase of project completion time
 - all of the above**
22. Whose is responsible for delay providing the design, drawings and instructions?
- contractor
 - consultant**
 - both
 - employer
23. Prequalification of contractor is required for
- big work
 - small works
 - medium works
 - major and specified works**
24. The report prepared at the end of finishing the construction job is called
- audit report
 - finalization report
 - approved report
 - completion report**
25. The document announcing to the prospective bidders that owner is ready to receive the bids is called
- Instruction To Bidders (ITB)
 - notice to bidders**
 - bill of quantities
 - intention to acceptance
26. In sealed quotation, the successful bidder should deliver the performance security (5% of bid amount) withindays of receipt of letter of acceptance.
- 15 days
 - 7 days**
 - 10 days
 - 5 days
27. The Bidder may be required to provide additional Performance Security if the Employer determines that the rate quoted by the Bidder in the Bill of Quantities, are too low for execution of the contract. In such case, the Employer shall instruct the Bidder to provide additional.....% security for signing of the Contract Agreement.
- 8**
 - 10
 - 2.5
 - 5
28. Who is responsible for blacklisting of bidders disobeying the code of conduct of bidders during procurement process?
- Public procurement monitoring office (PPMO)**
 - National vigilance Centre (NVC)
 - Commission for investigation of abuse of authority (CIAA)
 - All
29. The meaning of term "INCOTERM " used in contract is
- International commercial term**
 - International trade terms
 - International procurement term
 - None
30. Which of following is not a bid document?

- a. condition of contract
c. performance security form
b. specification
d. letter of acceptance
31. The purpose of bid evaluation is to evaluate
a. Lowest bidder
c. Substantially responsive bidder
b. Responsive bidder.
d. Lowest evaluated substantially responsive bidder
32. All the daily activities during the construction of any civil engineering project should be recorded in a
a. measurement book
b. note book
c. muster roll
d. daily diary
33. Systematic reporting of work progress is the main objective of
a. operation process chart
b. man machine chart
c. flow process chart
d. two hand process chart
34. A written offer submitted by contractors to execute certain work at certain rates within the fixed time is called
a. measurement book
b. contract
c. specification
d. tender
35. During excavation of earth work supports are necessarily required if the depth of excavation more than
a. 2 ft
b. 5 ft
c. 4 ft
d. 7 ft.
36. Monitoring and supervision is done for
a. Meeting required strength.
b. Reducing the wastage.
c. Meeting the required quality.
d. All
37. If variation occurs , what happens
a. price decreases
b. price increases
c. project time increases
d. all
38. Land acquisition for any civil engineering construction work is done
a. after tender
b. at the time of tender
c. before tender
d. at any time
39. In the LIB type of contract management ,the acronym stands for
a. Local institutional bidding
b. **Limited International bidding**
c. Legitimate International bidding
d. Limited institutional bidding
[PSC Exam, Highway-2071]
40. Which part of contract document describes the process of performing any item's of requirements?
a. drawing
b. general condition of contract
c. information to bidders
d. specifications
[PSC Exam, General-2071]
41. 'Force Majeure' in a contract is of
a. occurrence of an act beyond the control of both contracting parties
b. preventing both parties to perform the respective obligation agreed
c. both of the above
d. None of the above
[PSC Exam, Hydropower-2071]
42. The construction of Chatara bridge is not completed on time as per contract due to the devastating Gorkha earthquake occurred on 12 th Baisak 2072, the condition in contractual language is referred as.....

- | | | | | |
|-----|---|--------------------|----------------------------------|-----------------------------|
| | a. Force majeure | b. contract breach | c. disaster | d. Variation |
| 43. | Bid bond is% of quoted amount | | | |
| | a.5% | b.2.5% | c. depends on project | d.10 |
| 44. | The dispute resolution method in any contract is | | | |
| | a. Amicable settlement | | b. Dispute adjudication board | |
| | c. Arbitration | | d. all | |
| | | | | [PSC Exam, Irrigation-2068] |
| 45. | The type of the contract when the payment shall be done for the actual work done at site is | | | |
| | a. BOOT contract | | b. Item rate contract | |
| | c. Turnkey Contract | | d. all | |
| 46. | The fixed stipulated sum of penalty payable by a contractor having no relation with real damage is known as | | | |
| | a. fixed penalty | | b. damage charge | |
| | c. Liquidated damage | | d. compensatory payment | |
| | | | | [PSC Exam, Irrigation-2070] |
| 47. | Consultant mediates between | | | |
| | a. public and contractor | | b. contractor and client | |
| | c. client and public | | d. none | |
| | | | | [PSC Exam, Irrigation-2070] |
| 48. | The earnest money deposited by unsuccessful bidder is returned after | | | |
| | a. DLP | | b. Bid validity period | |
| | c. Contract Award to successful bidder | | c. Issuance of work order | |
| 49. | The number members in Dispute Resolution Board is | | | |
| | a.1 | b.2 | c.3 | d. both a and c |
| 50. | Which of followings is the ultimate method of dispute resolution in any contract | | | |
| | a. Arbitration | | b. Adjudication | |
| | c. Dispute Resolution Board | | d. Litigation (Court) | |
| 51. | The Project Technical Audit is generally done | | | |
| | a. After project completion | | b. during project implementation | |
| | c. After DLP | | d. all | |

[PSC Exam, Irrigation-2070]