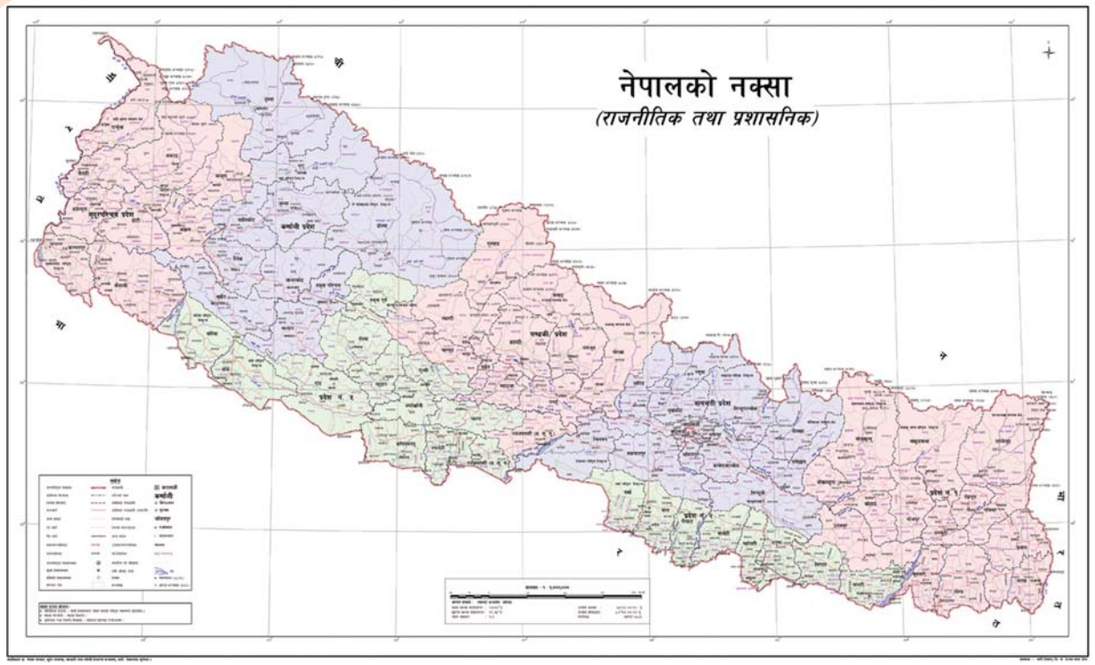

Estimating, Costing and Supervision

Government of Nepal
Ministry of Education, Science and Technology
Curriculum Development Centre
Sanothimi, Bhaktapur
Phone : 5639122/6634373/6635046/6630088
Website : www.moecdc.gov.np

Feedback Copy

Technical and Vocational Stream
Learning Resource Material

Estimating, Consting and Supervision
(Grade 10)

Secondary Level
Civil Engineering

Government of Nepal
Ministry of Education, Science and Technology
Curriculum Development Centre
Sanothimi, Bhaktapur

Publisher: **Government of Nepal**
Ministry of Education
Curriculum Development Centre
Sanothimi, Bhaktapur

Layout by Khados Sunuwar

Preface

The curriculum and curricular materials have been developed and revised on a regular basis with the aim of making education objective-oriented, practical, relevant and job oriented. It is necessary to instill the feelings of nationalism, national integrity and democratic spirit in students and equip them with morality, discipline and self-reliance, creativity and thoughtfulness. It is essential to develop in them the linguistic and mathematical skills, knowledge of science, information and communication technology, environment, health and population and life skills. it is also necessary to bring in them the feeling of preserving and promoting arts and aesthetics, humanistic norms, values and ideals. It has become the need of the present time to make them aware of respect for ethnicity, gender, disabilities, languages, religions, cultures, regional diversity, human rights and social values so as to make them capable of playing the role of responsible citizens with applied technical and vocational knowledge and skills. This Learning Resource Material for Civil Engineering has been developed in line with the Secondary Level Civil Engineering Curriculum with an aim to facilitate the students in their study and learning on the subject by incorporating the recommendations and feedback obtained from various schools, workshops and seminars, interaction programs attended by teachers, students and parents.

In bringing out the learning resource material in this form, the contribution of the Director General of CDC Dr. Lekhnath Poudel, Dr. Jagatkumar Shrestha, Dr. Kamal Thapa, Dr. Bharat Mandal, Jagadishchandra Karki, Achyut Neupane, Santosh Achrya, Geeta Lamichhane is highly acknowledged. The book is written by Kedar Dahal and the subject matter of the book was edited by Badrinath Timalsina and Khilanath Dhamala. CDC extends sincere thanks to all those who have contributed in developing this book in this form.

This book is a supplimentary learning resource material for students and teachrs. In addition they have to make use of other relevnt materials to ensure all the learning outcomes set in the curriculum. The teachers, students and all other stakeholders are expected to make constructive comments and suggestions to make it a more useful learning resource material.

2076 BS

Ministry of Education, Science and Technology
Curriculum Development Centre

Table of Contents

Unit 1
Definition of estimating

1. Objective:

- To familiar the estimate
- to list out the types of estimate
- to compare the item of works and unit of measurement
- to familiar the system of measurement
- to convert the unit
- to prepare rough estimate of the building

2. Content

Definition of estimate

Estimate is the calculation of the quantity of required material, number of labor required for the completion of any construction or project. Estimating means to find out the required materials quantity for any construction either detail or roughly.

Importance of estimate

Following are the importance of the estimate:

- The estimate is necessary for fixing the budget for the project.
- It is necessary for calculating the required quantities of materials & numbers of labours for the project.
- It is necessary to draw up a work schedule.
- It is necessary to fix up a completion period for the proposed project.
- It is also useful to check the work done by contractors during and after the execution.
- It is required for the preparing tenders for the project.
- It is necessary for valuation of lands and building.

Types of estimate

Following are the types of estimate:

1. Preliminary or Approximate or Rough estimate.
    a. Unit rate –Hospital: per bed
       School: per seat
    b. Water tank: per liter.
    c. Plinth area (occupied by wall).
    d. Cubic rate: same as plinth area, multiplied by height of the building.
    e. Carpet area: area of room (reduce are of wall, toilet, bathroom)

i. Detailed estimate (item rate estimate)
    a. Earthwork
    b. Brick work
    c. Concrete work
    d. Wood work etc.

ii. Supplementary estimate
    Additional work for the detailed estimate.

iii. Revised estimate

- If quantity & rate changed
- Changed quantity, 10% rate change

iv. Annual repair estimate:

- Not exceed 1.5% of total
- For cracks, paintings, patches, etc.

v. Extension and improvement estimate:

- For landscape, garden, road widening, etc.

vi. Complete estimate:

- Add for consultancy fee & government tax.

Different items of works and their units of measurement

S.No.	Items of works	Units of measurement
1	Earthwork	m^3
2	Brick work	m^3
3	Concrete work	m^3
4	Re-bar work	kg/ton

5	Plaster	m^2
6	Formwork	m^2

System of measurement

Length: Meter, feet, inch etc.

Mass: kg, ton etc.

Volume: m3, ft3, cm3 etc.

Conversion of systems of units

Convert of a unit into other units like meter to centimeter, kg to gram etc.

3. Learning process and support materials

Following are the learning process of this unit:

- group work
- presentation
- calculations

4. Assessment

A. Very short answer question

1. Define estimate?
2. Convert the 100 inch into feet?
3. Write any one of the system of measurement of length?

B. Short answer question

1. Write about preliminary estimate?
2. Which method of estimate is accurate with reason?
3. Write unit of measurement of plaster and form works?

C. Long answer question

1. Prepare a preliminary estimate of a multistoried building having a carpet area of 2200 sq. m. 22% of the built up area will be taken up by corridors, verandah, staircase etc. and 14% of built up area will be occupied by walls.

Assume the plinth area rate Rs. 16,000/- per sq. m. and provide for water supply and sanitary fitting and electrical installation, contingencies and other services.

2. What are the importances of estimate?

Glossary:

Budget= total cost of the project

Corridors =Hall, a passageway whose purpose is to provide access between rooms inside a building.

Verandah =A veranda or verandah is a roofed, open-air gallery or porch. A veranda is often partly enclosed by a railing and frequently extends across the front and sides of the structure.

Reference materials

Suggested texts and references

Davis,H.E. The testing and Inspection of Engineering Materials

Adhikari, R.P. Construction management

Bhattarai, Dipak. Construction Management

Pnmia, B.C. CPM and PERT

गलामी, टक बहादुर, लागतअनुमान, मूल्यनिर्धारण तथा सुपरिबेक्षण, प्रा.शि.तथाव्या. ता.परिषद्

Nepal Building Code, DUDBC

Various Contract and Tender Documents.

A test book of estimating, costing, valuation and supervision-B.N. Dutta

Unit 2
Area and volume calculation

1. Objective

- to familiar sectional area of the trench
- to familiar the area and volume
- to compare between regular trench and irregular trench
- to calculate the area and volume of the regular and irregular trenches

2. content

Sectional area of regular trenches

Trenches:A trench is a type of excavation or depression in the ground that is generally deeper than it is wide (as opposed to a wider gully, or ditch), and narrow compared with its length (as opposed to a simple hole).

Regular trenches: Regular trenches is arranged in or constituting a constant or definite pattern, especially with the same space between individual instances.

Sectional area of regular trench can be calculate by use of the simple formula like area =length x breadth, area= length x height etc.

Sectional areas of irregular trenches

Irregular trench is a trench that does not follow the expected pattern of trench, so sectional area of irregular trenches cannot be calculated by simple formula or methods. Area can be calculated by dividing different triangular area.

Calculation of regular and irregular simple volumes

Volume can be calculated by multiplying sectional area and height.

3. Learning process and support materials

Following are the learning process of this unit:

-group work
-presentation

-calculations

4. Assessment

A. Very short answer question

1. Define trench?
2. Write the formula to calculate regular trapezoidal?

B. Short answer question

1. What is irregular trench?
2. Which method of estimate is accurate with reason?
3. Write unit of measurement of plaster and form works?

C. Long answer question

1. What are the procedure to calculate the area and volume of the irregular trench?

Glossary:

Trench= a long, narrow ditch.

Reference materials

Suggested texts and references

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Unit 3
Earthwork calculation

1. Objectives

- to familiar to the earthwork calculation
- to familiar to the estimating format
- to compare between the methods of earthwork calculation.

2. Content

Earthwork calculation

Calculation of the quantity of volume of cutting and filling of earth. Calculation of earth required for the cutting or filling is called earthwork calculation.

Estimating format

Item No.	No.	Dimension			Quantity	Remarks
		Length(L)	Breadth (B)	Height (H)		
1						
2						
3						
4						
5						
6						
7						

Method of entering numbers dimensions and quantities

Enter the value of each dimension (length, breadth and depth/height) and multiply for the quantity.

Methods of earthwork calculation

i. Average area method
ii. Average cross section area or mean sectional or end area method
iii. Prismoidal method

i. Average area method

Quantity of earthwork

= area of mid sectional area X length

Sectional for banking or cutting=

Bxdm + 2(1/2xsdmxdm)=Bdm+sdm2

=volume of earthwork=(Bdm+sdm2)xL

Let d1 & d2 be the height of bank at two ends of the embankment.

B=formation weight

S:1 (H:V)= side slope of filling

Average depth =$(\frac{d1+d2}{2})$=dm

ii. Average cross section area or mean sectional or end area method

A_1= ($Bd_1+sd_1^2$) = Area of one end of section.

A_2=($Bd_2+sd_2^2$) = Area of other end of section.

L= length of section

Mean sectional area =$(\frac{A1+A2}{2})$=Am

Quantity of earthwork=A_mxL

iii. Prismoidal method

It is more accurate.

A1=area of one end of section.

A2=area of other end of section.

A3=mid sectional area =(Bdm+sdm2)

dm=$(\frac{d1+d2}{2})$

Quantity of earthwork =1/6(A1+A2+A3)

Method of reading drawing and specification.

The method of reading drawing depends upon the types of drawing. The following points should be read to know the drawing:

- Dimension of the drawing
- Unit of the drawing dimension
- Symbol of the drawing
- Scale of the drawing

- Orientation of the drawing
- Nature and location of the prepared drawing, etc.

Specification describes the nature and the class of the work, materials to be used in the work, workmanship, etc. and is very important for the execution of work. The cost of the work depends on the specification.

3. Learning process and support materials

Following are the learning process of this unit:

- group work
- presentation
- calculations

4. Assessment

A. Very short answer question

1. Define earthwork?

B. Short answer question

2. Prepare estimating format?

C. Long answer question

1. Calculate the quantity of the earthwork?

Glossary

Earthwork= a large artificial bank of soil, especially one made as a defence in ancient times.

Reference materials

Suggested texts and references

Davis,H.E. The testing and Inspection of Engineering Materials

Adhikari, R.P. Construction management

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Unit 4

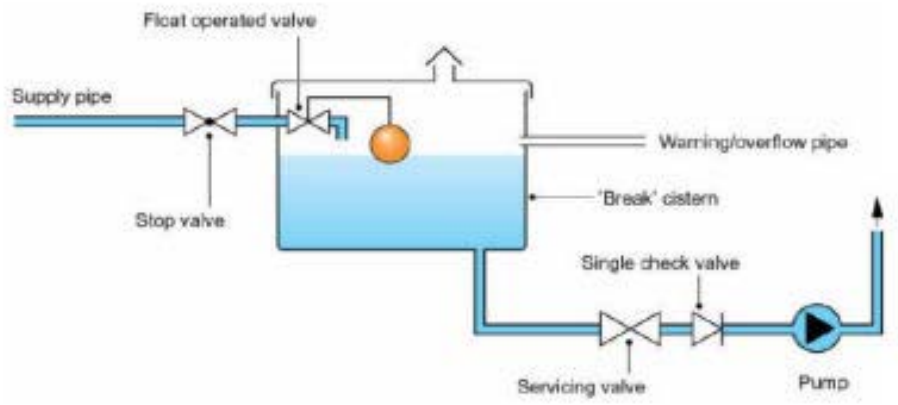
Estimating of break pressure tank

1. Objectives

- To familiar to the break pressure tank
- To understand the estimate of the break pressure tank

2. Contents

Drawing and specification of break pressure tank



Estimate of a simple break pressure tank

A break pressure tank is the most reliable method of breaking pressure in bulk and reticulation water supply networks. They are generally used in rural areas where little or no maintenance is carried out.

Assessment

A. Very short answer question

1. Define break pressure tank?
2. Write the full form of BPT?

B. Short answer question

1. Writ the main function of the BPT?

C. Long answer question

1. How can we calculate the area of the BPT?

Unit 5

Estimating of tap stand

1. Objectives

- To familiar of the tap
- Calculate the quantity calculation of the tap stand

2. Content

- Drawing of tap stand
- Estimate of tap stand
- A public standpost or tapstand distributes water from one or more taps to many users.
- A public tap stand is a water outlet (one or more taps) where residents can fetch water free of charge.

2. Learning process and support materials

Following are the learning process of this unit:

-group work
-presentation
-calculations

3. Assessment

A. Very short answer question

1. Define tap?

B. Short answer question

1. Write the function of the public tap?

C. Long answer question

1. Calculate the quantity of items of works of the public tap?

Glossary

Public= of or concerning the people as a whole.

Reference materials

Suggested texts and references

Davis,H.E. The testing and Inspection of Engineering Materials

Adhikari, R.P. Construction management

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Nepal Building Code, DUDBC

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Unit 6
Estimating of road pavements

1. Objective

- To familiar with the estimate of the road pavements
- To calculate the quantity of materials used in the road pavement

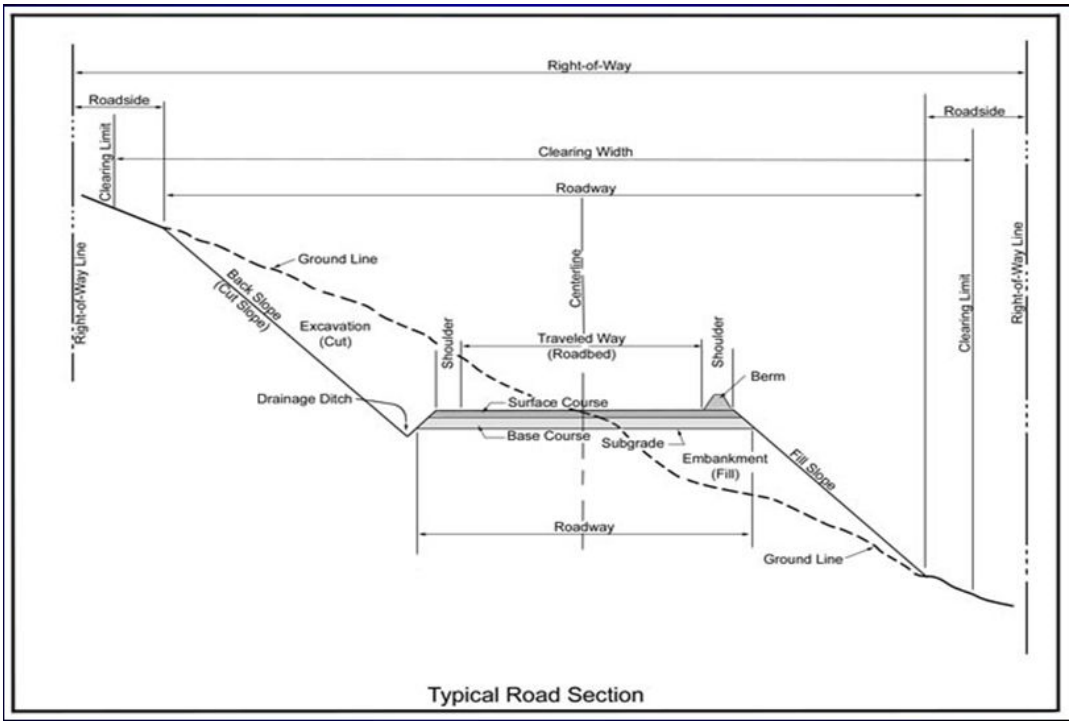
2. Content

Drawing of longitudinal and cross section of road

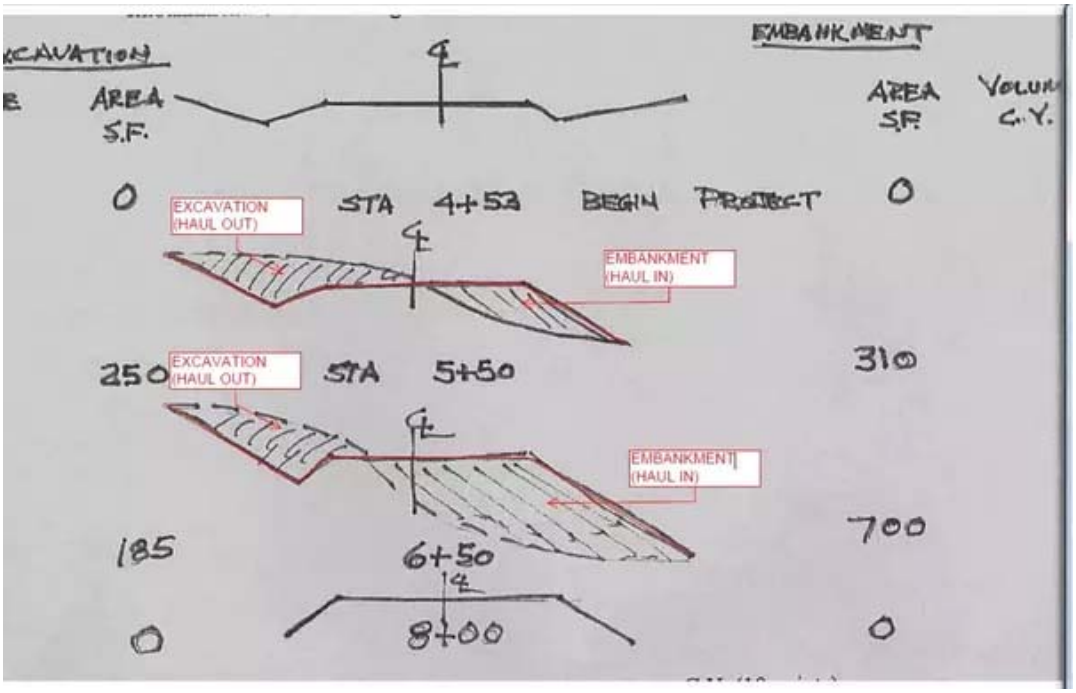
Longitudinal Sections- Also known as Long Sections, these are a section through the longest length of the subject land.

Cross Sections – These are section across the narrowest length of the subject land or works.

These definitions derive from there primary use in civil works in particular in road design and construction. A Longitudinal Section is a section along the direction of the road. A Cross Section being a section across the road.



Estimate earth volume in cutting and filling



3. Learning process and support materials

Following are the learning process of this unit:

- group work
- presentation
- calculations

4. Assessment

A. Very short answer question

1. Define road pavement?

B. Short answer question

1. Write earth cutting and filling?

C. Long answer question

1. Calculate the quantity of the earthwork in road construction?

Glossary

road= A road is a thoroughfare, route, or way on land between two places that has been paved or otherwise improved to allow travel by foot or some form of conveyance, including a motor vehicle, cart, bicycle, or horse.

Reference materials

Suggested texts and references

Davis,H.E. The testing and Inspection of Engineering Materials

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Unit 7
Estimating of culverts

1 drawing and specification of slab and arch culvert

A culvert is a structure that allows water to flow under a road, railroad, trail, or similar obstruction from one side to the other side. Typically embedded so as to be surrounded by soil, a culvert may be made from a pipe, reinforced concrete or other material.

Slab culvert, also known as bridge culverts, can be three-sided,or simply a deck slab embedded in the soil on either side, providing a bridge over the distance. It provides a crossing over small streams and physical obstructions.

Source:http://www.theindependentbd.com

Arch Culvert

An arch culvert is made up of metal, stone masonry, concrete, RCC etc. Construction does not take a lot of time and unlike box culvert, water diversion is not necessary, as it can be installed without disturbing the water current. Thus, it can be termed as a Low Profile Culvert. This type of culvert maintains the natural integrity of the wash bed.

Arch culvert. Source: http://www.visitgrey.ca

Advantages of Arch Culvert

The advantages of using arch culverts over traditional box culverts and pipe culverts are as follows:

- Cost savings
- Accelerated construction schedule
- Greater hydraulic efficiency
- Pleasing aesthetics
- Design-build advantage

2. Estimate of abutment, wing and curtain wall

Abutment refers to the substructure at the ends of a culvert/ bridge span or dam whereon the structure's superstructure rests.

Wing wall

In a culvert/bridge, the wing walls are adjacent to the abutments and act as retaining walls. They are generally constructed of the same material as those of abutments. The wing walls can either be attached to the abutment or be independent of it. Wing walls are provided at both ends of the abutments to retain the earth filling of the

approaches.

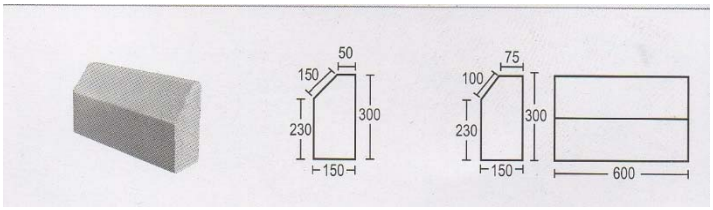
A curtain wall system is an outer covering of a building in which the outer walls are non-structural, utilized to keep the weather out and the occupants in.

3. Estimate slab reinforcement

Estimate of slab reinforcement can be estimated according to drawing.

4. Estimate road way, kerb and parapet

A curb or kerb, is the edge where a raised sidewalk or road median/central reservation meets a street or other roadway.



A parapet is a barrier which is an extension of the wall at the edge of a roof, terrace, balcony, walkway or other structure.

Unit 8
Rate analysis for earthwork in excavation

1. NG norms and current district rate

2. Define overhead, water charge, tools and plants, profit and vat.

Overhead or overhead expense refers to an ongoing expense of operating a business. Overheads are the expenditure which cannot be conveniently traced to or identified with any particular cost unit, unlike operating expenses such as raw material and labor. Employee salary, office equipment and supplies, travel and entertainment costs etc. are the examples of the overhead cost.

3. Man and material consumption

Unit 9

Rate analysis for PCC works

1. Ratios of PCC in practice

The Minimum grade of concrete for Plain Cement Concrete (PCC) is M15. It's mostly used as a base for footings or the base for ground floor. The Mixing ratio depends upon the grade that you want. PCC is mostly M-15, so the ratio would be1:2:4. One part of cement, two parts of sand and four parts of Aggregate.

2. Calculation of dry volume and wet volume of ingredients.

3. Norms and current district rates

Group	Concrete Grade	Mix Ratio	Characteristic Compressive Strength (N/mm2)
Ordinary Concrete	M5	1 : 5 : 10	5 N/mm^2
	M7.5	1 : 4 : 8	7.5 N/mm^2
	M10	1 : 3 : 6	10 N/mm^2
	M15	1 : 2 : 4	15 N/mm^2
	M20	1 : 1.5 : 3	20 N/mm^2
Standard Concrete	M25	1 : 1 : 2	25 N/mm^2
	M30	Design Mix	30 N/mm^2
	M35	Design Mix	35 N/mm^2
	M40	Design Mix	40 N/mm^2
	M45	Design Mix	45 N/mm^2
	M50	Design Mix	50 N/mm^2

High Strength Concrete	M55	Design Mix	55 N/mm^2
	M60	Design Mix	60 N/mm^2
	M65	Design Mix	65 N/mm^2
	M70	Design Mix	70 N/mm^2

Unit 10
Rate analysis for steel reinforcement works

1. Drawing and specification

2. Cutting, bending, placing and binding of reinforcement

For analysis of rate you have to calculate under following :-

1. Materials
2. Labours
3. Overhead
4. Profit

Lets clear it with an example…

Considering 1MT of reinforcement work,

A) Materials

1. Cost of TMT Bars - 1.03MT at the rate of Rs.48,000/MT = Rs.49440/-
2. Cost of Binding Wire - 7Kg at the rate of Rs.54/Kg = Rs.378/-

Note: 3% extra is considered for laps & wastage for TMT bars

Total cost of materials (A) = Rs.49818.00

B) Labours (Considering 8hrs/day)

1. **Bar-bender-** 3.33 days at the wage of Rs.400/day = Rs.1333.34
2. **Helpers (Unskilled)-** 6.66 days at the wage of Rs.328/day = Rs.2184.48

Total cost for labours (B) = Rs.3517.813

Note: Considering 1Bar-Bender with 2 unskilled helpers can cut, bend, transport, fix 300Kg/day

C) Overhead (C) = 8% on (A+B) (It may vary)=Rs. 4,266.865

D) Contractor's Profit (D) - 10% on (A+B+C) (It may vary) = Rs.5,760.268

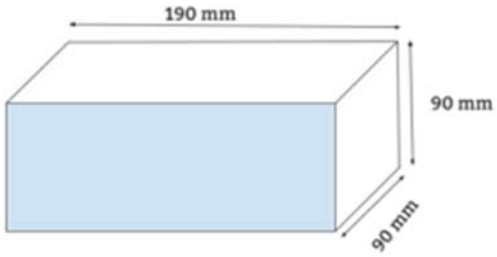
The total cost incurred for 1MT of Re-Bar work = A+B+C+D= Rs. 63362.94/ = Rs.63,363/

Note - The unit rates and the components considered here may vary state to state, project to project and as per working conditions. During rate analysis of a single item overhead and profit may not be considered, they may be considered in total cost of the project.

Unit 11
Rate analysis for brick work

1. Calculation of brick for cubic meter work

Brickwork Calculation & Formula



- The size of the modular brick is 190 X 90 X 90 (refer the picture)

Any brick walls consist of bricks and cement mortar.

So, first of all, we are going to find the volume of bricks with mortar thickness and then volume of bricks alone.

Volume of bricks with mortar

Volume of 1 brick with mortar = 200 × 100 × 100 (10 mm mortar thickness on all sides)

= 0.2 × 0.1 X 0.1

Volume of brick with mortar = 0.002 Cum (m^3)

Therefore, Number of bricks required for 1 cubic metre = 1/0.002 = 500 No.s

Volume of bricks without mortar

Volume of 1 brick without mortar = 190 × 90 × 90

= 0.19 × 0.09 × 0.09

Volume of 1 brick without mortar = 0.001539 Cum (m^3)

Volume of 500 bricks without mortar = 500 × 0.001539 Cum

Volume of bricks without mortar for 1 cum = 0.7695 Cum (m^3)

Therefore,

Required amount of cement mortar = 1 Cum – Volume of bricks without mortar

= 1 – 0.7695

Required amount of cement mortar = 0.2305 Cum (m^3) (Wet Condition)

Note – The above volume is in a wet condition that means we need 0.2305 cement mortar in mixed condition (after adding water). In order to find the dry volume, we need to multiply 33 % as bulkage of sand.

Dry volume of a mortar = 0.2305 cum X 1.33 = 0.306565 cum

We know the mortar ratio is 1:6 (1 part Cement & 6 Part Sand = 7 Part)

Required amount Cement quantity in brickwork = 0.306565 X 1/7 X 1440 kg

Density of cement = 1440 kg. The reason to multiply this density is, the above multiplication will give us only required amount of cement quantity in brickwork as a cubic metre. But we need cement in Kg. Therefore we are multiplying the 1440 kg density of cement to calculate the cement quantity.

Required amount Cement quantity = 63 Kg = 1.26 bags (50 Kg bag)

Required amount of Sand = 0.306565 × 6/7 = 0.26277 Cubic metre (m^3)

Therefore, For 1 cum of brickwork, we need

- 500 Numbers of bricks
- 63 kg of cement
- 0.263 m^3 of sand.

2. Ratios of mortars

Cement mortar ratio should be **1:6 for 9**" Brickwork and **1:4 41/2**" (4.5") brickwork.

Mortar thickness should not be more than 10 mm between the courses and sides of the bricks.

Ensure you are using good quality of cement and sand.

3. Norms and current district rates

4. Rate analysis for brick work in 1 : 6 cement sand mortar.

Unit 12
Quotation and tender documents

1. Define quotation and tender

Quotation

Quotation is a formal statement of the estimated cost for particular job or service.

Tender

Tender is a formal offer to contract goods or services at a special cost or rate.

Usually construction of large and complicated projects where cost of the construction will be high is not subjected to be executed by the department directly. Governments rule and regulation will limit the execution of such type of work by department. Execution of such types of work by contracting and for this is called contract.

“Tender is the written offer presented by the owner o department in order to perform the specified work within the specified time under the agreed obligations”.

“It is also defined as offer by one party usually written although it may be oral, partly and partly written.

2. Quotation and tender forms

It is a form submitted by the concerned party. It includes the following:

1. Name and address of the contractor or supplier.
2. Experience of work.
3. Manpower list and experience.
4. J/V (Joint venture) partners information if available.
5. Quantity and rates.
6. Payment method and detailed.
7. Date
8. Stamp and signature.

3. Quotation and tender notification

4. Quotation and tender documents

5. Conditions of contract

Construction involves owner, contractor and consultant (Engineer/Architect). Thus in the agreement, there must be clauses or conditions which shall define the duties and responsibilities of the owner, contractor and consultants.

Conditions of contract depend upon the nature of work, type of contract and situations. Special type of work or special situation usually demands special demands. Some of the common conditions of the contracts are given below:

1. Definition of the term used
2. Contract duration
3. Engineers duties and authority
4. Payment procedure
5. Security deposit
6. Defective work
7. Addition and alterations
8. Price escalation, etc.

6. Types of contract

Construction work can be executed through following contract:

1. Cost plus percentage contract

Under this procedure contractor is paid for the actual work performed and an agreed percentage or a fixed sum or a fluctuating fee for the contractor.

It has advantages of early completion of work, work of good quality, elimination of disputes arising due to extra work.

2. Equipment contract

In this type of contract, contract is given for the supply and management of equipment required for. For other conditions, agreement will prevail.

3. Item rate contract

In this type of contract, contractor agrees to execute the work on the item rate or unit price basis. Work is divided into several activities and rate is fixed for

each unit of such activities. Contractor is paid for the total quantity of work done by him. This type of contract is considered suitable for the works that are unsuitable for the works that can be broken down into several activities and measurements of quantities are possible.

4. Lump-sum contract

In this type of contract, work is carried out as per as drawing and specification given by a client within a specified time in a fixed amount. I this type of contract, detailed estimate is not necessary. Similarly, on the completion of the works whose cost can be guessed with reasonable accuracy. It is considered unsuitable for the work such as difficulty foundation, emergency project, likely to have addition and alterations, etc.

5. Labour contract

It is a type of contract in which contract is given for labour only. The owner (or the department) provides all the other required materials, plants, etc. to the contractor. Usually along with the labour, contractor provides simple tools. Most of the residential buildings are seen constructed on this basis. The contractor is usually paid on item rate or on the lump-sum contract.

6. Material contract

In this type, contract is given for the supply of materials required for works. For other condition, agreement will prevail.

7. Target contract

In this type, first a target of cost for execution of the work is fixed. Then if the work is completed as per the target, contractor is paid the target amount and an agreed percentage. In addition to this, contractor receives a percentage plus or minus on saving on extra expenditure than the target value.

7. Contract award procedure

For the execution of any work, different kinds of contractor are required based on the volume of works. For this prequalification of contractor are required if the number of contractor are much more. First of all, bidding documents are prepared, published through national or international paper to inform the contractors, based

on the specified criteria contractors are prequalified. These contractors are only eligible to purchase the tender documents and submit within the time bond specified by the client. After receiving the tender the tender form different contractors, a comparative chart is prepared based on the financial value, technical value, equipment value and experience value gained in past specified years. The contractor having lowest value is selected to perform the specified work.

Following are the contract procedure for awarding any types of work to the contractor:

1. Preparation of bidding documents
2. Preparation of the prequalification documents
3. Prequalification of the bidders
4. Obtaining of bids
5. Opening of bids
6. Evaluating of bids
7. Award of bids

Unit 13
Supervision works

1. Definition of supervision and supervisor

Supervision is defined as guiding the activities of people who perform the work. It includes planning, organizing, directing and controlling the work and the activities of subordinates or employees.

Supervisor is a person who supervises a person or an activity.

2. Duties of supervisor

3. Interrelationship among client, consultant and contractors

Unit 14
Prepare log book

Prepare log book

A **log book** is a systematic daily or hourly record of activities, events and occurrences. Log books are often used in the workplace, especially by truck drivers and pilots, to log hours and distances covered.

Truck drivers use log books to ensure that they are keeping up with various transportation laws. Truck drivers are required to keep a detailed 24-hour log of their location and time spent off and on duty because they are only allowed to drive for a certain number of consecutive hours.

Vehicle Log Book

lometer reading (at start of period): 3457 Period: to Number Plate:

Date	Journey		Odometer reading			Reason for trip	Driver's signature
	From	To	Start	Finish	Dist.(km)		
September 23, 20	Michigan	Lansing	56764	56870	106	Business Trip	

Uses of log book

1. To calculate the distance travelled by vehicle
2. To calculate the time taken by the vehicle
3. To evaluation of the work done by vehicle

4. To payment to the contractor

Site order book

This book is to be maintained in civil construction works as per prescribed format and should be available every time at all sites.

Site order book is used for recording instructions by the executive engineers.

Unit 15
Basic principle of construction management

Objectives of Construction Management:

The main objectives of construction management are,

- Completing the work within estimated budget and specified time.
- Maintaining a reputation for high quality workmanship
- Taking sound decisions and delegation of authority
- Developing an organization that works as a team.

Functions of Construction Management:

The functions of construction Management are

(a) Planning
(b) Scheduling
(c) Organizing
(d) Staffing
(e) Directing
(f) Controlling
(g) Coordinating

(a) Planning in Construction Management:

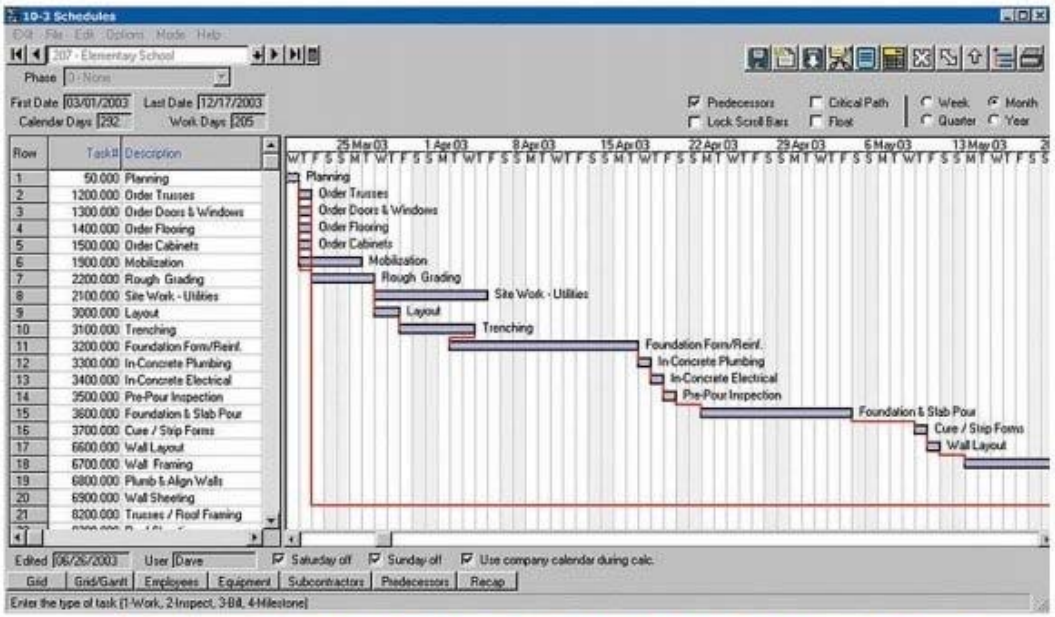
It is the process of selecting a particular method and the order of work to be adopted for a project from all the possible ways and sequences in which it could be done. It essentially covers the aspects of 'What to do' and 'How to do it'.

Importance of construction project planning

- Planning helps to minimize the cost by optimum utilization of available resources.
- Planning reduces irrational approaches, duplication of works and inter departmental conflicts.
- Planning encourages innovation and creativity among the construction managers.
- Planning imparts competitive strength to the enterprise.

b) Scheduling in Construction Management:

Scheduling is the fitting of the final work plan to a time scale. It shows the duration and order of various construction activities. It deals with the aspect of 'when to do it'.



Visual representation of the schedule lets you quickly see where you're ahead—or behind—on each project.

Importance of construction project scheduling:

Scheduling of the programming, planning and construction process is a vital tool in both the daily management and reporting of the project progress.

c) Organizing

Organizing is concerned with decision of the total construction work into manageable departments/sections and systematically managing various operations by delegating specific tasks to individuals.

d) Staffing

Staffing is the provision of right people to each section / department created for successful completion of a construction project.

e) Directing

It is concerned with training sub ordinates to carryout assigned tasks, supervising their work and guiding their efforts. It also involves motivating staff to achieve desired results.

f) Controlling

It involves a constant review of the work plan to check on actual achievements and to discover and rectify deviation through appropriate corrective measures.

g) Coordinating

It involves bringing together and coordinating the work of various departments and sections so as to have good communication. It is necessary for each section to aware of its role and the assistance to be expected from others.

Importance of Construction Management

- Construction management practices invariably lead to "maximum production at least cost". A good construction management, results in completion of a construction project with in the stipulated budget.
- Construction management provides importance for optimum utilization of resources. In other words, it results in completion of a construction project with judicious use of available resources.
- Construction management provides necessary leadership, motivates employees to complete the difficult tasks well in time and extracts potential talents of its employees.
- Construction management is beneficial to society as the effective and efficient management of construction projects will avoid, escalation of costs, time overrun, wastage of resources, unlawful exploitation of labor and pollution of environment.

Unit 16
Scheduling of task

1. Importance of task scheduling

The Importance of task Scheduling is the art of planning your activities so that you can achieve your goals and priorities in the time you have available. When it's done effectively, it helps you:

Following are the importance of task scheduling:

i. Understand what you can realistically achieve with your time.
ii. Make sure you have enough time for essential tasks.
iii. Add contingency time for "the unexpected."
iv. Avoid taking on more than you can handle.
v. Work steadily toward your personal and career goals.
vi. Have enough time for family and friends, exercise and hobbies.
vii. Achieve a good work-life balance.

2. Method of preparing task schedule.

Following are the main methods of task schedule:

1. Bar chart
2. Critical path method

Unit 17
Layout work

LAYOUT

Layout of a building or a structure shows the plan of its foundation on the ground surface according to its drawings, so that excavation can be carried out exactly where required and position and orientation of the building is exactly specified. It is set out according to foundation plan drawings and specifications provided by the engineer or an architect. In order to understand layout or setting out of a building we must understand some of the technical terms related to this job which are described below.

1. Procedure for the layout of the building

A building is set out in order to clearly define the outline of the excavation and the centre line of the walls, so that construction can be carried out exactly according to the plan. The centre line method of setting out is generally preferred and adopted.

Following are the Procedure for Setting Out a Building Plan on Ground

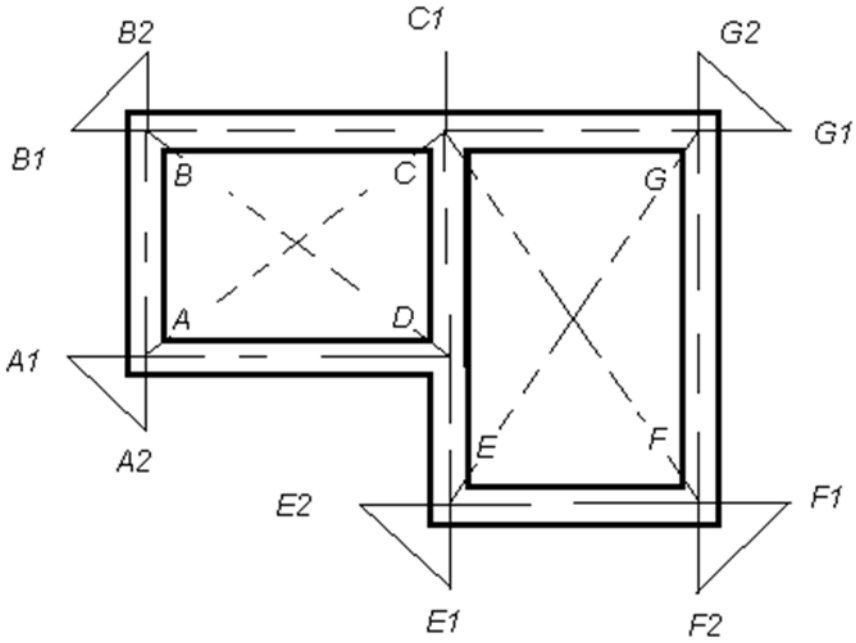


Fig.1: Example plan to be set out on the ground

1. From the plan (fig 1), the centre line of the walls are calculated. Then the centre lines of the rooms are set out by setting perpendiculars in the ratio 3:4:5. Suppose the corner points are a, b, c, d, e, f and g which are marked by pegs with nails on top.
2. The setting of the corner point is checked according to diagonals ac, bd, cf and eg.
3. During excavation, the centre points a, b, c, d, e, f, g may be removed. Therefore the centre lines are extended and the centre points are marked about 2m away from the outer edge of excavation.

   Thus the points A1, A2, B1, B2 and likewise, are marked outside the trench. Centre lines are shown clearly by stretching thread or rope. The centre points fixed 2m away from the excavation are marked with sit out pegs.
4. From the plan details, the width of excavation to be done is also marked by thread with pegs at appropriate positions.
5. The excavation width is then marked by lime or by with furrow with spade.
6. If the plan is much to complicate and follows a zigzag pattern, then the centre pegs are kept at suitable positions according to site conditions.

2. Equipments required for the layout

Materials used during Setting up of Layout

1. Leveling Instrument
2. Long peg
3. Long Nails
4. Hammer
5. Right Angle(Guniya)
6. Steel Tape
7. Thin Cotton Thread
8. Bricks
9. Cement
10. Screen Sand
11. Lime Powder
12. Theodolite

3. prepare before layout

Following are the points to be carried out before layout :

Temporary Bench Mark (TBM): The TBM is a fixed point on a site to which all levels are related and should be established at an early stage. Where possible the TBM should relate to an ordnance bench mark. On the site, it could relate to any permanent fixture, such as a manhole cover or firmly-driven post.

Baseline: Typically the first layout task is establishing a baseline to which all the setting out can be related. The baseline is a straight reference line in respect to which the building's corners are located on the ground. It often coincides with the 'building line', which is the boundary of the area, or the outer boundary of a road or curb, often demarcated by the local authority.

Horizontal controls: These are the points that have known coordinates with respect to a specific point. Other points such as layout corners can then be located. Plenty of control points should be used so that each point of the plan can be precisely located on the ground.

Vertical controls: These enable design points to be positioned at their correct levels. The vertical control points are established relative to specified vertical datum – often a timber post set in concrete. Horizontal and vertical controls are generally established during the leveling phase using a theodolite or similar instrument. For more information, see surveying instruments.