

**BHARAT INSTITUTE OF ENGINEERING AND TECHNOLOGY**

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**LECTURE NOTES**

**ON**

**ESTIMATING AND COST EVALUATION-II**

**CIVIL, 5<sup>TH</sup> SEMESTER**

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## Method of Execution of Works :-

### Departmentally:-

In case of emergency/urgent nature of work, the department can execute the work by arranging labours & materials under their own supervision.

### Through Contractor:-

Normally the works are executed through contractors who procure materials & engage the required labour under the supervision of departmental engineering.

### 5. Piece Work Agreement:-

It is the agreement for doing the work at the agreed rates, without reference to the total quantity of work or time, such works are piece works upto Rs 2000/- are got done through the contractors by piece work agreement.

### 8. Work Order:-

This method of getting the work done is employed for doing small works upto Rs 5000/- This is a type of contract & is done without calling quotations or tenders. The work order is done on the prescribed terms & conditions of the department. Every department has printed work order books for doing such works.

### Contract:-

Contract is an undertaking by a person or firm to do any work under certain terms & conditions. The work may be for the construction or maintenance & repairs for the supply of materials, for the supply of labour, for the transport of materials etc.

### ① Item Rate Contract:-

The contract is based on units put in place rather than single price. The contractor quotes rate of individual items involved in a particular project. The payment is calculated at the specific quoted rate of individual item after taking measurement of the quantities executed by the contractor. This type of contract is normally utilized where the quantity of work cannot be established such as Civil Engg. construction projects where excavation of soil & rock are involved. The contractor is paid based on the units that have been put in place & verified by the owner. Unit cost contracts provide more flexibility in discrepancies in field quantities ~~and~~ & because of this it is always used in heavy & high

### 2. LUMP SUM CONTRACT:- (Unbalanced Contract)

In a lump sum contract an owner agrees to pay a contractor a specified lump sum after the completion of work without a cost breakdown. After work no detailed measurement is required.

### 3. LABOUR CONTRACT:-

In this type of contract, the contractor quotes the rate for supplying labour only for execution of the work & gets payment for the labour actually engaged.

### 4. DAILY LABOUR (OR) MUSTOR ROLL SYSTEM:-

When the work is carried out by the department directly by employing the daily labour, as masons, beldars, carpenters, coolies, blacksmiths, plumbers etc. It is known as daily labour or muster roll system. All the material required for the construction are issued from stores or purchased directly chargeable to the concerned work.

### 6. Schedule Contract:-

It is like lump sum contract. Here the complete work as per plan & specifications is carried out by contractor for certain fixed amount as per agreement. The owner

provides required information & contractor charges certain amount. The contract is suitable when the no. of items is limited or when it is possible to work out exact quantities of work to be executed. The detailed specifications of all items of work, plans & all drawings, security deposit, penalty, progress & other cond<sup>n</sup> of contract are included in agreement. Though it is lump sum & scheduled contractor, Contractor will be paid at regular interval of 2-3 months as per progress of work on the basis of certificate issued by Engg. in charge. A schedule of rate is included in agreement for making payment of extra items.

#### 7. COST-PLUS PERCENTAGE CONTRACT:-

In this contract, the owner pays greater than 100% of the documented cost, usually requiring detailed expense accounting. In this type of contract, contractor is paid the actual cost of work plus certain % as profit. Various contract documents, drawing, specifications are not necessary at the time of signing the agreement. Contractor has to keep all the records for cost of material & labour & contractor will paid accordingly to Engg. in charge. This type of contract is suitable for emergency work like difficulties in foundation, cond<sup>n</sup> construction of expensive str. etc.

## Explanation of Various Terms:-

### 1. ADMINISTRATIVE APPROVAL:-

This is an approval given by the competent authority of the parent department whose construction project work is to be taken up by the P.W.D department. The parent department after ascertaining the funds position, technical feasibility of the project usually gives the approval. After getting the administrative approval the executing department proceeds for preparing detail drawings & estimates for actual execution.

### 2. Technical Sanction:-

This is a sanction usually accorded by the competent authority of the executing department i.e. PWD after proper verification of detail estimate, detailed drawing & specification of the project. After getting technical sanction the executing authority of the department calls for tender process.

### 3. Contingency BUDGET:-

A contingency budget is money set aside to cover unexpected costs during the construction process. This money is on reserve & not allocated to one area of the work & simply "insurance" against other costs.

### 4. TENDER:-

It is an offer in writing to execute some specified works or to supply some specified articles subject to certain terms & conditions like rates, time limits etc. Depending upon the type of contract, the tender may be lump-sum tender, Item-rate tender, cost-plus tender, labour tender, demolition tender, etc. Tenders which is always sealed in manner should be invited in the most open & public manner possible by advertisements in news papers or notices posted in public.

places. The tenders after receiving date & time is over are opened at the fixed time & date by the authorized officer in the presence of the intending contractors or their agents.

### Preparation of Notice inviting Tenders:-

Tender notice is issued in the prescribed form for calling tenders for the construction works or supply works etc. in the prescribed form of the department.

Following particulars are given in the tender notice.

- a. Name of the authority dept. inviting tender
- b. Name of the work & its location
- c. Estimated cost
- d. Time of completion.
- e. Cost of tender forms & condition of contracts
- f. Date, place & time of receiving & opening of tenders.
- g. Earnest Money & Security money
- h. Validity of tender etc.

### Earnest Money Deposit (EMD):-

It is the amount which accompanies the tender form while submitting it, which is usually 1% to 2% of the total estimated cost of work. The main objective of collecting the EMD with the tender are as follows.

(a) Restriction of unnecessary competition:

If no EMD is collected, unnecessary competition will start.

Those contractors who do not have any sound financial position to complete the work will submit their tenders at low rates, which may cause difficulties in completing the work.

## SECURITY DEPOSIT:-

After calling the tenders, they are scrutinized & the department accepts the reasonable tender usually the lowest. After accepting the tender the contractor whose tender accepted is asked to deposit the SD which is usually 2.5 to 10% of the total estimated cost of the work.

The main objective of SD are as follows.

### a. Deposit for Loans:-

The SD serves as security against the materials of the plants & machineries supplied by the Dept. to the contractor on loan.

### b. Punishment:-

In case the contractor does not complete the work in time, uses inferior quality materials & has left the work incomplete the SD amount is forfeited as punishment to the contractor as well as in view of getting compensation of the damages done by the contractor to the department.

When the ~~department~~ contractor complete the work as per drawing, specifications & direction of the department within specified time, the SD is refunded to the contractor. Normally it is refunded after the maintenance period which is usually 6 months after completion & handing over the work.

## 9. ADVANCED PAYMENT:-

Advances for the contractor are as a rule prohibited but in exceptional cases it is permitted. Cases in which a contractor whose contract is for finished work require an advance on the security of materials brought to site, Divisional officers may, in such case make advances

upto an amount not exceeding 25% of the current value of the materials, provided that they are of an imperishable nature. But the Dept. people should be very sure that this advance amount will not put the Dept. in trouble if the contractor leaves the work in between.

### On Account Payment:-

It may be done to the contractor as per actual measurements done in the field for the completed portion of the work, as per the norms of the contract.

### INTERMEDIATE PAYMENT:-

Intermediato payments may be done to the contractor as per the terms & conditions of the contract basing on actual measurements in the field against the works done by the contractor. But it should not be the whole amount measured rather less percentage of actual measurement calculated. This type of payment is done subject to prepare of running bills.

### FINAL PAYMENT:-

Final payment is usually done to contractor after successful completion of the work done & full measurements taken & checked by the competent authorities of the department & subject to preparation of final bill.

### RUNNING BILL:-

This is otherwise known as running account bill which is used for all running & final payments to contractors & suppliers including cases where advance payments & are proposed to be made or are already outstanding in respect the same work against the contractor.



### FINAL BILL:-

This is also known as first & final bill which is used for making payments both to contractors for work & suppliers, when a single payment is made for a job contract on its completion. A single form may be used for making payments to several payees. If they relate to the same work & are billed same time.

### REGULAR & TEMPORARY ESTABLISHMENT:-

All the regular staff of the department are known as regular establishment & the staff assigned to a specific project for completion of the project is known as temporary establishment.

### MEASUREMENT BOOK (MB) :-

Payments to contractors & suppliers for all the work done by them which requires measurement are done on the basis of measurements recorded in a book known as Measurement Book (MB) in accordance with the. It is a very important account of record.

Particulars	Detail of Actual Measurement			Quantity
	No	L	B	

Usually JE (Junior Engineer) who is actually assigned to supervise the quality & progress of the work is authorized to make the entry of detailed measurement of the work. He records all the measurements after completion of the work or interim as required & puts his dated signature in the book. The same is being checked measured by his superior authorities time.

time & they also put their dated signature in it. When the bill is prepared (running/final) the measurements are taken from this book.

### STANDARD MEASUREMENT BOOK:- (SMB)

A set of measurement books which is used to maintain Standard measurements-books of building in order to facilitate the preparations of estimates for periodical repairs are known as SMB. Where such SMB are maintained. It is also permissible to utilize them for the purpose of preparing for contractors bill for such repairs. So that it may not be necessary to take detailed measurements on each occasion.

### MUSTER ROLL:-

The attendance of the labourers is maintained in a muster roll. The presence of each labourer in muster roll should be marked by the proper Officer at the starting hour of the day. Periodic inspections by the higher authority are done to check the actual labourers working.

On the basis of muster roll payment is made to the labourers weekly, monthly or fortnightly or at the completion of the work according to the requirement. In the muster roll names of the workers, designation, date of attendance, rate of wages, total amount due to each worker, signature of person taking the attendance, signature of the officer checking, making payment etc. are entered.

## ACQUITTANCE ROLL:-

The workmen actually paid the due charges after signing in the acquittance roll. In this roll the name of the workmen, no. of days worked, rate of wages, total amount received, signature or acquittance of the workmen are recorded. This is used as a paid voucher or bill, in department for official record of payments to the workmen & is supported by the muster roll.

## TEMPORARY ADVANCE:-

While a disbursing officer makes a remittance to a subordinate officer to enable him to make a no. of specific petty payments on a muster roll or other voucher which has already been passed for payment, the amount remitted is known as temporary advance & accounted for as imprest. This account should be closed as soon as possible.

## CASH:-

The term 'Cash' as defined in the CPWD code includes legal coins, notes, cheques, deposit-at call receipts of scheduled banks, drafts & payments on demand.

Cash charges on works consists of payments to:

- Labourers & members of the work-charged establishment of their wages
- Contractors & others for work done or other services rendered.

## MAJOR & SUBHEAD of ACCOUNTS:-

All the expenditure related to a work are known as major head of accounts. Further these expenditures are divided into different subheads as applicable.

Ex:- Major Head of Accounts

Construction of a building

Subhead of Accounts

Material Cost, labour Cost,  
rent of tools & plants,  
Supervision charges etc.

## Supervision Charges:-

It is the amount kept in the estimate to meet the expense towards supervision of the project work. Usually 5% amount on the cost of estimate is kept for this purpose.

### DEBIT:-

Expenses made in executing the work is known as Debit.

### CREDIT:-

Payment received for expense towards work is known as Credit.

## STORE

Classification of Store:

The PWD classify the stores into the following types

1. Stock
2. Machinery & ~~equipment~~ equipment
3. Road metal
4. Materials charged to works

### (I) STOCK:-

Items of common use in construction work, such as bricks, aggregates, cement, steel etc. are kept in the stock of a division and are issued as & when required for the execution of works.

### (II) Machinery & Equipment:-

The machinery equipment, vehicles, furniture & instruments required for use in construction works are known as Machinery & equipment. The machinery & equipment are of two kinds.

#### a. General machinery & equipment:-

These are used/required for general use in the division.

#### b. Special machinery & equipment:-

These are not required for general use in the division, but are procured for used in specified work.

(iii) A record of Road metal is kept in measurement book. Claims for payment examined on the basis of the recorded measurements. Road metal is often kept by the road side before use & an account of its quantity in the sub-divisional office in Form of statement of issues & balance of road metal. Copies of these statements are submitted to the sub-divisional office.

#### (iv) Materials charged to Works: -

In addition to charges falling under the main classes namely, cash & stock, there are other transactions affecting the cost of work. They may be charges incurred in other divisions or departments, materials received from them or services rendered by them or there may be cash receipts that are taken in reduction of expenditure in accordance with the rules.

#### Issues of Stores Material:

Materials are issued from stock for the following purposes.

- For use on works either by contractors or departmentally
- For dispatch to other subdivisions or departments
- For sale to contractors, employees & other outside parties.

#### BIN CARD:

This is the card, which is attached to each Bin, or the container for stores a record of all materials entering or leaving the bin & the balance of materials in hand is kept in this card.

## VERIFICATION OF STOCK, SHORTAGE & EXCESS :-

The stock is verified by competent authority at least once in a year & physical position of the materials are checked with the stock register & bin card. Then the articles found in shortage & or excess are recorded properly.

## RERA ACT 2017

### Real Estate Regulatory Authority (RERA)

- RERA act was 1<sup>st</sup> introduced in the year 2016 but it has been come into force in 2017.
- Under this act regulatory body is formed & this body governs the real estate sector.

### Objective :-

The objective of this Act is to provide fair deal between the real estate employers & the buyers.

### Features :-

- Under this act the real estate company have to upload their projects, buildings price etc.
- Due to this act, the ~~contract~~ project is being completed on time & deliver to the buyers.
- Due to this act, penalty for real estate employers is same as for the buyers.
- Due to this act real estate owner's can't buy other property from the money given by the buyers for a specific property.
- Due to this Act, 70% of the money which is given by buyers to the real estate is kept in a special Account which is being governed by the RERA.
- They can withdrawal the money equal to the % of work completed.
- If they want to change something in the building plan then they can change only if 67% of buyers are agree for change.



S.L Description No L (M) B (M) H (M) Quantity Remark

1. castwork in excavation

a. abutment

b. wing wall

2 5.3 0.8 0.75 6.36 cum  
4 1.4 0.8 0.75 3.36 cum

2. Cement concrete in form

a. abutment

b. wing wall

2 5.3 0.8 0.3 2.544 cum  
4 1.4 0.8 0.3 1.344 cum

3. 1st class b/w in cement  
mortar :-

a) abutment

b) wing wall

c) Parapet 50 cm layer

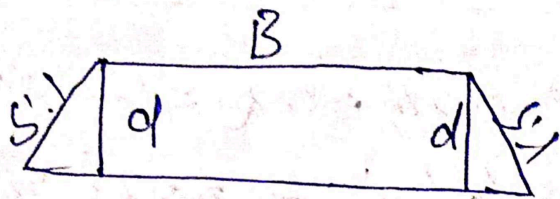
d) Parapet 10 cm layer

2 5.0 0.50 1.57 7.85 cum  
4 1.40 0.50 1.57 4.39 cum  
2 5.30 0.50 0.3 1.59 cum  
2 5.30 0.40 0.14 1.696 cum  
15.526 cum



Sr	Description	No	L(N)	B(N)	H(N)	Quantity	Remark
	<u>Deduction:-</u> R.C.C Slab bearing	2	5.00	0.3	0.22	0.66 cum	
					Total	14.866 cum	
4.	Cement pointing to exposed surfaces of b/w: a) inner face of abutments b) face wall c) inner side and top of parapet d) ends of parapet	2 2 2	5.00 5.30 5.30	— — —	1.05 1.89 1.12	10.5 sqm 20.034 11.872	15 + 90 + 22 + 8 + 22 + 32 = 189. H
	<u>Deduction</u> a) Rectangular portion b) Triangular portion of face wall hidden beneath	2x2 2x2 2	0.50 0.40 1.50	— — 1.05	0.30 0.40 —	0.6 0.6 3.15	
		4x1/2	1.40	1.40	—	3.9	
					Total	26.556 sqm	

## Road estimate:



Sectional area =

Rectangular area + 2 triangular area  
Area:  $Bd + 2 \left( \frac{1}{2} \times s \times d \right)$

$$A = Bd + sd^2$$

lift = vertical 1.5

lead = horizontal 30 meters

if lead shall be a horizontal distance through which the earth can be carried or transported from the sources to the place of spreading or not necessary the route actually taken

lift shall be measured from ground level excavation up to 1.5 meter depth below ground and depositing or eroded matter material on the ground shall be included in the item

graph for various standard soil  
volume of earth work

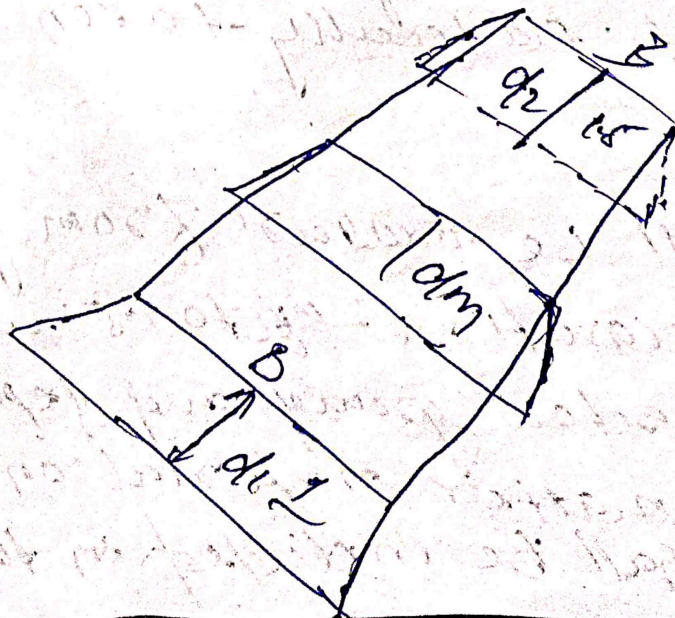
The volume of earth work  $= V = \frac{1}{2} B d A d$   
Can be calculated by three methods

- 1) mid sectional method
- 2) Mean sectional method / Trapezoidal method
- 3) prismatic formula

Volume formula

$$V = (B d m + S d m^2) \alpha L$$

$$d m = \frac{d_1 + d_2}{2}$$



Stations or chainage	Depth or height	Mean depth or height of	Area of central portion (B <sub>0</sub> )	Area of slopes (S <sub>0</sub> ) <sup>2</sup>	Total section area (B <sub>0</sub> +S <sub>0</sub> )	Length between stake (L)	Quantity (B <sub>0</sub> +S <sub>0</sub> )L Baracing cutting
10	2	<del>1.6</del>	—	—	—	—	—
11	1.2	1.6	1.6	5.12	21.12	30	633.6
12	1.16	1.18	11.8	2.78	14.58	30	487.4
13	0.5	0.83	8.3	1.038	9.68	30	290.4
14	0.78	0.64	6.4	0.82	7.22	30	216.6
15	1.06	1.09	11.9	2.83	14.73	30	441.9
16	0.6	1.01	11	2.42	13.42	30	402.6
17	1.2	0.9	9	1.62	10.62	30	318.6
18	0.38	0.79	7.9	1.25	9.15	30	274.5
19	0.7	0.54	5.4	0.58	5.98	30	179.4
20	1.1	0.9	9	1.62	10.62	30	138.6
Σ = 3513.6							

1) Calculate the quantity of <sup>earth</sup> depth-well for 200m length for portion of road in an uniform ground the height of banks are the 1m and 1.6 meters the formation with 10 side 2:1 (horizontal) : (vertical)

Given data

$$d_m = \frac{d_1 + d_2}{2} = \frac{1 + 1.6}{2} = 1.3$$

formation width =  $B = 10\text{m}$

side slope =  $S = 2$

length = 200m

Quantity / volume

$$Q = (Bd_m + (d_m^2) \times S) \times L$$

$$= (10 \times 1.3 + 2 \times 1.3^2) \times 200$$

$$= 3276 \text{ cm}$$

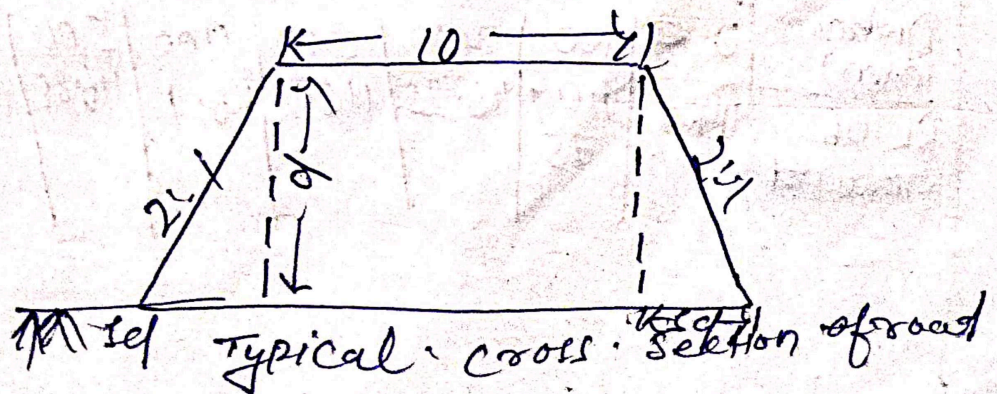
2) reduce method of ground along center line of a proposed road from changes 10 to 20 are given below the formation level are the strength channels No. 107 and the road is in down 0.51 unit for the road beam

up to the chainage 40 and then the gradient chainage 40.1 in 100 down  
 word the formation width road is  
 10 meter and side slope of banking  
 2:1 length of chain is 30 meter  
 throw longitudinal section of road  
 and difficult cross section and prepa-  
 re estimate earthwork at the rate  
 of 275 ₹ per cum

Chainage	10	11	12	13	14	15	16
Rt of Ground	105	105.6	105.44	105.9	105.42	104.3	100.5
Rt of formation level	107						

Chainage	17	18	19	20
Rt of Ground	104.1	104.62	104	103.3
Rt of formation level				



Distance in meter chainess

10	11	12	13	14	15	16	17	18	19	20
300	330	360	390	420	450	480	510	540	570	600

RL of ground

105	105.6	106 44	105.9	105.42	104.3	105	104.1	104.82	104	103.3
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~~Height / depth of bank~~

RL of formation

107	106.8	106.8	106.4	106.2	105.9	105.6	105.3	105	104.7	104.4
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height / depth of bank

2	1.2	1.16	0.5	0.78	1.6	0.1	1.2	0.8	0.7	1.1
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\* prepare a detail estimate for earthwork for a position of a road from the following data & distance

Distance in (m)	0-100	100	200	300	400	500	600	700	800
RL of ground	114.5	114.75	115.25	115.2	116.1	116.85	118	118.25	118.1

900	1000	1100	1200
117.8	117.75	117.9	117.5

\* increase of formation 115 up ward  
up to 600 meter ~~down~~ 1200 down  
wood - gorse etc

\* formation road with 18.10m side  
slw 2:1 banking and  $1\frac{1}{5}$  in cutting