

LECTURE NOTE
ON
ESTIMATING AND COST EVALUATION-II
(TH.5)

5TH SEMESTER IN CIVIL ENGG.



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07

2022

SAT • MAY

PWD Accounts
WORKS

05	M	T	W	T	F	S	S	M	T	W	T	F	S	S
M	30	31												1
A	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Y	16	17	18	19	20	21	22	23	24	25	26	27	28	29

WORKS :-

① Original Work: It includes all new construction whether of entirely new works or of additions and alterations to existing works which increase the capital cost of a building or work. Repairs to newly purchased or previously abandoned buildings required to render them useable are also original works.

② Repairs Work: It includes all operations required to maintain in proper condition buildings & works in ordinary use.

③ Petty Work, Minor Work & Major Work :-

A petty work is one the cost of which does not exceed Rs. 50,000, a minor work is one the cost of which exceeds Rs. 50,000, but does not exceed Rs. 1,00,000 and a major work is one the cost of which exceeds Rs. 1,00,000.

Repair Work :-

The repair works are classified in under mentioned categories:

- 1) Day to day repairs / service facilities
- 2) Annual repairs
- 3) Special repairs.

Note:- According to the PWD Account Code, the work costing more than Rs. 75,000.00 is termed as Major work & Major estimate, and the work costing upto Rs. 75,000.00 is termed as Minor work or minor estimate.

"Time is the wisest of all things that are, for it brings everything to light."

1) Day to Day Repairs :- It carried out by CPWD in all the buildings under maintenance. The works such as removing chokeage of drainage pipes, man holes, restoration of water supply, replacement of blown fuses, repairs to faulty switches, watering of plants, lawn mowing, hedge cutting, sweeping of leaf falls, etc. are attended under day to day service facilities.

2) Annual Repairs :- The works of periodical nature like white washing, colour washing, distempereing, painting, etc. are called annual repair works and these are generally undertaken, through system of contracts.

3) Special Repair :- As the building ages, there is deterioration to the various parts of the building and services. Major repairs and replacement of elements become inevitable. The following works in general are undertaken under special repairs:

I White washing, colour washing, distempereing, etc. after completely scrapping the existing finish and preparing the surface afresh.

II Painting after removing the existing old paint from various members.

III Provision of water proofing treatment to the roofs. All the existing treatments known are supposed to last satisfactorily only for a period of about ten years.

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Quadrennial Repair Work! -

- 08 Besides annual repair work of white washing and colour washing, every fourth year special
- 09 repair works are done for thorough repair as repainting of doors and windows, patch repair
- 10 of plastering etc. Special repair works every fourth year is known as Quadrennial Repair.

11

Method of Execution of Works through contractors:-

- 12 Contract & Agreement:- when two or more persons have common intention communicated to each other
- 01 to create some obligation between them there is said to be an agreement. An agreement
- 02 which is enforceable by law is a "contract".

- According to section-10 of Indian contract Act 1872
- 03 only those agreements are enforceable by law which are made by the free consent of parties competent to
- 04 contract, for a lawful consideration and with a lawful object and, are not expressly declared to be void.
- 05 This is subject to any special law according to which a contract should be in writing and attested by
- 06 witnesses. The following are the essential ingredients of a contract.

- a) Offer made by one person called the "Promisor".
- b) Acceptance of an offer made by the other person called the "Promisee".
- c) Doing of an act or abstinence from doing a

"Aspire to inspire before we expire."

particular act by promiser for promisee called
 Consideration.

d) The offer and acceptance should relate to something which is not prohibited by law.

e) Offer & acceptance constitute an agreement, which when enforceable by law, become a contract.

f) In order to make a valid and binding agreement, the party entering into such an agreement should be competent to make such agreement.

Work Order :-

Small work up to Rs. 20000.00 may be carried by work order. This is a contract and specifies the approximate quantities of different items of work, details specification of each item of work, time for completion of whole work, penalty that will be imposed for not fulfilling the terms and conditions, etc.

Contractors are usually selected by taking quotation. C.P.W. Agreement is used in PWD & work order is used in Irrigation Department.

Item rate contract :-

It is also known as Unit-price contract or Schedule contract. For item rate contracts, contractors are required to quote rates for individual item of work on the basis of schedule of quantities furnished by the department. This schedule

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indicates full nomenclature of the item as per
 08 sanctioned estimate, estimated quantities and
 therein. This type of contract is followed by
 09 Railway Department.

10 Lump sum Contract:

As its name indicates, is used for work in which
 11 Contractors are required to quote a lump-sum
 figure for completing the work in accordance
 12 with the given designs, drawings, specification
 and functional requirements as the case may be.
 01 Lump-sum tender can be either for only
 executing the work as per given drawing,
 02 And specification or it may include element
 of design design work and preparation of
 03 structural drawings as well which shall be in
 keeping with the given functional, structural,
 04 and architectural parameters and subject to
 approval by the competent authority before hand.

05

Labour Contract :-

06 In labour contract, the labour contractors
 undertakes contract for the labour portion. All
 material for the construction are arranged and
 supplied at the site of work by the department
 or owner, the labour contract engages labour portion
 and gets the work done according to specification.

"Time is what we want most, but what we use worst."

The contract is on item rate basis for labour portion only and contractor is paid for the quantities of work done on measurement of different item of work at the stipulated rate in the contract agreement. Contractor uses his own tools for working, but plants & machineries are arranged by the dept. or owner. An agreement with all conditions of contract, rates bill of quantities (BOR) etc is prepared before the work is given out to the contractor. This system of contract is not generally adopted in the Govt. Dept. Private buildings are however by labour contract system which is less troublesome.

03 Daily Labour :-

Work may be executed by departmentally by employing daily labour as masons, coolies, bhisties, carpenters, etc. The materials required for the construction as bricks, cement, sand lime, timber, steel, etc. and tools & plants required for the operation are, got issued from the store by indent or purchased directly chargeable to the authorised agent as work supervisor, misty, mate, etc. The attendance of labour is checked and initially by Assistant Engineer or sub-Divisional Engineer frequently during their inspections. The labour are

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paid weekly, fortnightly, monthly or at the
 08 completion of work according to the
 requirement.

10 Piece work agreement (P.W.A) :-

11 P.W.A is that where only rates are agreed
 upon without reference to the total quantity of work
 12 or time, and that involves payment of work done
 at the stipulated rate. Small work or piece-work
 13 upto Rs. 2000.00 may be carried out through
 contractors by piece work agreement. The PWA
 14 contains only the descriptions of different items
 of works to be done and the rate to be paid
 15 fore but does not provide the quantities of
 different items to be executed nor the time
 within which the work is to be completed.

ACCOUNTS OF WORKS

Administrative Approval :-

For any work or project required by a department,
 an approval or sanction of the competent authority
 of the department, w.o.t the cost and work is
 necessary at the first instance. The approval authorises
 the engineering department to take
 up the work. Administrative approval denotes the
 formal acceptance by the department concern
 of the proposal, and after the administrative is

"Who controls the past, controls the future: who controls the present controls the past."

given the engineer department (P.W.D) take up the work and prepare detailed designs, plans and estimates and then executes the work. The engineering department prepares approximate estimate and preliminary plans and submits to the department concerned for administrative approval.

Technical sanction :

After receipt of administrative approval and expenditure sanction, detailed estimates are required to be prepared for ~~technical~~ technical sanction. As its name indicates, it amounts to no more than a guarantee that the proposals are structurally sound and that the estimates are accurately calculated and based on adequate data.

Contingency Budget :-

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

In deterministic methods, contingency is estimated as a predetermined percentage of base cost depending on the project phase. In this

Example 1. — Prepare a detailed estimate of a slab culvert of 1.50 metre span and 4.00 metre roadway from the given drawing (Fig. 8.5). The general specifications are as follows :—

Foundation concrete shall be of cement concrete 1 : 3 : 6 with stone ballast and coarse sand. Masonry shall be of first class brickwork in 1 : 4 cement coarse sand mortar. Slab shall be of R.C.C. 1 : 2 : 4 with reinforcement as per drawing. Exposed surface of brick masonry shall be cement pointed 1 : 2. Road shall be provided with 10 cm thick wearing coat of 1 : 2 : 4 cement concrete. Assume suitable rates.

R.C.C. SLAB CULVERT 1.50 m SPAN with standard modular bricks

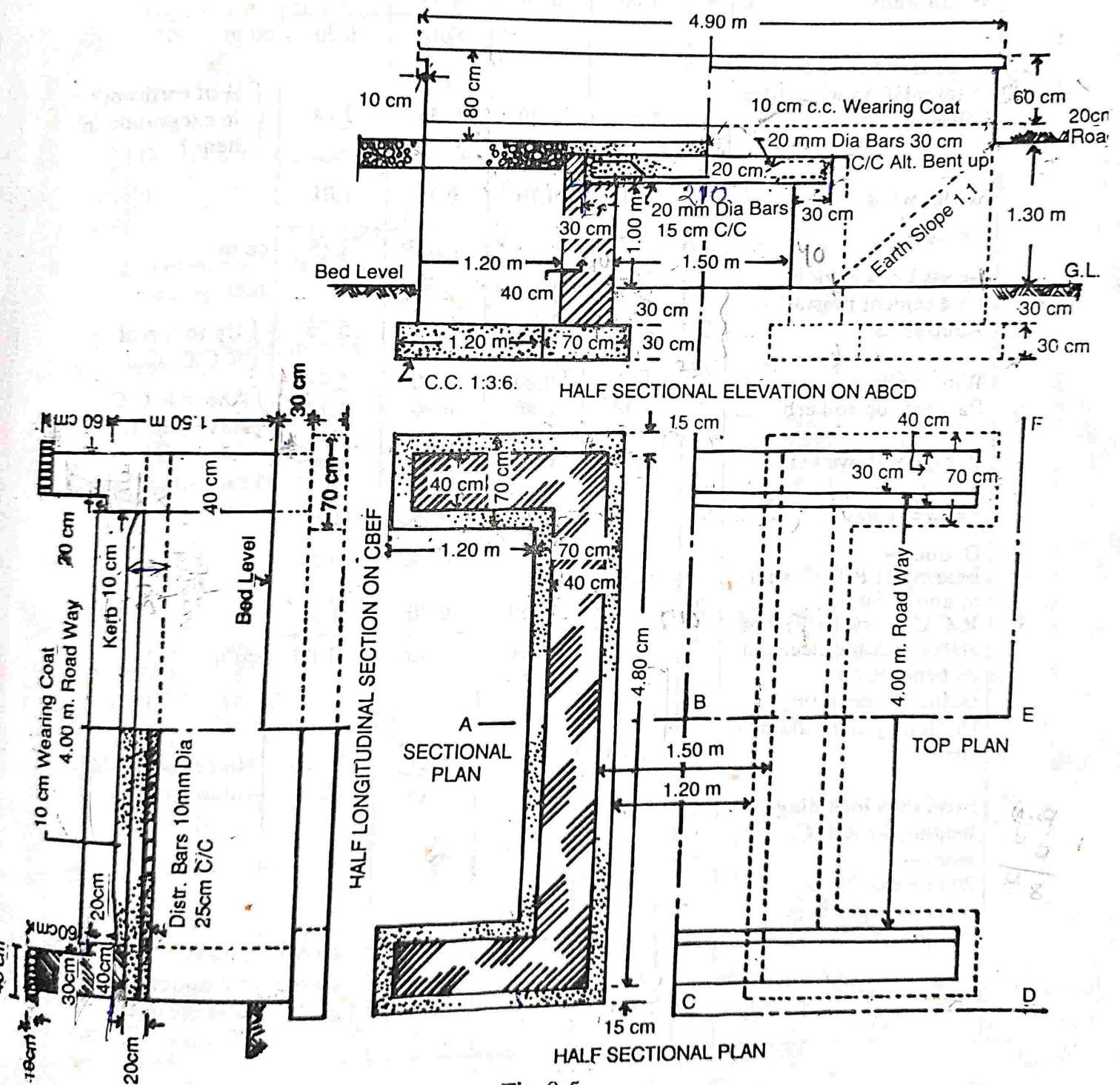


Fig. 8-5

Details of Measurement and Calculation of Quantities (Ex. 1)

Item No.	Particulars of items of works	No.	Length m	Breadth m	Height or Depth m	Quantity	Explanatory notes
1.	Earthwork in excavation in foundation —						
✓	Abutments ...	2	5.10	0.70	0.60	4.28	4.8 + 1.5 + 1.5 cu m
	Wings walls ...	4	1.20	0.70	0.60	2.02	
					Total	6.30	
2.	Cement concrete 1:3:6 in foundation with stone ballast—						{ 1/2 of earthwork in excavation in item 1.
✓	Abutments ...	2	5.10	0.70	0.30	2.14	
	Wings walls ...	4	1.20	0.70	0.30	1.01	
					Total	3.15	
3.	I-class brickwork in 1 : 4 cement mortar—						{ Up to top of R.C.C. slab. Above R.C.C. slab up to kerb. Above kerb excluding coping.
✓	Abutments ...	2	4.80	0.40	1.50	5.76	
	Wing walls ...	4	1.20	0.40	1.50	2.88	
	Parapets up to kerb ...	2	4.70	0.40	0.30	1.13	
	Parapets above kerb ...	2	4.70	0.30	0.50	1.41	
	Parapet coping ...	2	4.90	0.40	0.10	0.39	
					Total	11.57	
	Deduct—						
	Bearing of R.C.C. slab in abutment	2	4.80	0.30	0.20	0.57	
4.	R.C.C. work 1 : 2 : 4 in slab excluding steel and its bending but including centering shuttering and binding steel			Net	Total	11.00	cu m
		1	4.80	2.10	0.20	2.016	No deduction for volume of steel.
						cu m	
5.	Steel bars including bending in R.C.C. work—						
	20 mm dia. bars—						
	Main straight bars						
	30 cm c/c ...	17	2.38	—	—	40.46	L=2.10—2 side covers + 2 hooks = 2.10—
	(No. = $\frac{4.80}{.30} + 1 = 17$)					cu m	(2×4 cm)+(18×20 mm) = 2.38 m

20-4 = 160 m

= 16

Particulars of items of works	No.	Length m	Breadth m	Height or Depth m	Quantity	Explanatory notes
Main bent up bars 30 cm c/c (No. = $\frac{4.80}{.30} = 16$)	16	2.54	—	—	40.64 m	Adding one depth, 16 cm for two bent ups
10 mm Dia. bars— Distributing bottom bars 25 cm c/c	9	4.90	—	—	44.10 m	$L = 2.38 + 16 = 2.54$ m $L = 4.80 - 2 \text{ end covers} + 3 \text{ hooks} = 4.80 - (2 \times 4 \text{ cm}) + (18 \times 10 \text{ mm}) = 4.90$ m
Distributing top bars	4	4.90	—	—	19.60 m	
Total	39	63.70 m	@ .62 kg	=	39.49 kg	
6. Cement concrete 1:2:4 wearing coat	1	4.00	2.30	0.10	0.92 cu m	2.398 quintal In between parapets
7. Cement pointing 1:2 in walls— Face wall from 10 cm below G.L. up to bottom of coping	2	4.70	—	2.10	19.74	
Inner side of parapet excluding coping	2	4.70	—	0.80	7.52	Ht. = (20 + 10 + 50) = 0.80 m
Coping (inner edge, top, outer edge and outer and side)	2	4.90	0.70	—	6.86	B = (10 + 40 + 10 + 10) cm = 0.70 m
Ends of parapet	4	—	0.40	0.20	0.32	Up to kerb.
Ends of parapet	4	—	0.30	0.50	0.60	Above kerb.
Ends of coping	4	—	0.40	0.20	0.32	Edge and under side.
Total					35.36	
Deduct— Rectangular opening	2	1.50		1.30	3.90	Including 10 cm below G.L. and edge of R.C.C. slab.
Triangular portion below earth slope	2	$(\frac{1}{2} \times 1.30 \times 1.30)$			1.69	
Total of deduction					5.59	
Net Total					29.77	sq m

effective depth

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SLAB CULVERT

ABSTRACT OF ESTIMATED COST (Ex. 1)

Item No.	Particulars of items of work	Quantity	Unit	Rate		Per	Amount	
				Rs.	P.		Rs.	P.
1.	Earthwork in excavation in foundation ...	6.30	cu m	350.00		% cu m	22.05	
2.	Cement concrete 1 : 3 : 6 in foundation with stone ballast ..	3.15	cu m	400.00		cu m	1260.00	
3.	I-class brickwork in 1 : 4 cement mortar	11.00	cu m	365.00		cu m	4015.00	
4.	R.C.C. work 1 : 2 : 4 in slab excluding steel and its bending but including centering, shuttering and binding steel ...	2.016	cu m	775.00		cu m	1562.40	
5.	Steel bars including bending in R.C.C. work ...	2.398	quintal	515.00		quintal	1234.97	
6.	Cement concrete 1 : 2 : 4 in wearing coat	0.92	cu m	450.00		cu m	414.00	
7.	Cement pointing 1 : 2 in wall ...	29.77	sq m	5.60		sq m	166.71	
Total ...							8675.13	
Add 5%-(3% for Contingencies and 2% for Workcharged Establishment) ...							433.75	
Grand Total ...							9108.88	

$$\text{Rate per running metre of span} = \frac{\text{Total Cost}}{\text{span}} = \frac{9108.88}{1.5} = \text{Rs. 6072.58 per metre.}$$