



DETAILED ESTIMATION OF MULTI-STOREY COMMERCIAL BUILDING

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Abstract-

This paper mainly focuses on Estimating the substructure of the building and is entitled as “cost and estimation”. This paper is prepared as per the estimation for a multi-storey building made in Uttarakhand. This paper includes the works related to the technique of calculating and computing the various quantities and expected expenditure to be incurred on a particular project. For all engineering works, it is required to know beforehand the probable cost of construction known as estimated cost. Costs of material’s properties are assumed as per the common practice. New concepts updating every year have proven to be highly adaptable and technological advances arising more frequent each year. To accommodate this rapid evolution this manual was designed to be easily updated with the latest information on computing and calculation. The design of this estimation is done by detail estimation process which is economical, safe and reliable. This process can be done from respective architectural and structural drawing. So IS code is not required for estimation process but with common practice. But there is IS 1200, which provides guidelines for doing the measurement and preparation of bills in a proper manner.

Keywords-Introduction, types of estimates, estimation for different components of building, results.

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DOI: 10.48047/ecb/2023.12.si10.00180

1. Introduction:

As per the title this Paper towards comprehensive and efficient method of estimating the cost off residential building . It provides a great idea and knowledge for the large, complex projects. Without a methodology in place to accurately estimate the costs of a project, it is impossible to budget for paper or manage costs as the project unfolds. The theoretical and calculative knowledge that we acquire during these four years of civil Engineering course is practically used in this paper.

This paper surely helps us to design the safe, economic, stable and efficient estimation. The paper uses plain, lucid language to explain fundamentals of this subject. The book provides logical method of explaining various complicated concepts and stepwise methods to explain the important estimation paper. This paper work also helped to develop co-operation and coordination for the long term work and getting through the problems effectively. To reduce the volume of the report sample calculations are provided in detail Reference to the appropriate clauses standard codes of practice have been made whatever necessary. Estimation is the scientific way of finding out the approximate cost of an engineering project before starting of the work. It is different from calculation of the actual cost after completion of the paper.

Estimation requires a overall knowledge of the construction procedures and cost of materials and labor in addition to the skill, experience, foresight and good judgment [2].

In previous research paper many authors work on the estimation through much software. Frame analysis was by STAAD-Pro. Slab, Beams, Footing and stair-case were design as per the IS Code 456-2000 by LSM. The properties such as share deflection torsion, development length is with the IS code provisions. Design of column and footing were done as per the IS 456-2000 along with the SP-16 design charts. Dunnala Lakshmi Anuja, et.al (2019) [1].

2. Experimental details

Types of estimates

There are two main types of estimates:

1. Rough cost estimate.
2. Detailed estimate.

Depending upon the purpose of estimate, some types of detailed estimate are as follows: -

- a) Contractor's estimate
- b) Engineer's estimate
- c) Progress estimate

Detailed estimate

- Detailed estimates are prepared by carefully and separately calculating in detail the costs of various items of the work that constitute the whole project from the detailed working drawings after the design has been finalized.
- The mistakes, if any, in the rough cost estimate are eliminated in the detailed estimate.
- Detailed estimates are submitted to the competent authorities for obtaining technical sanction.

2.1 Classification depending upon purpose of detailed estimate

1. Contractor estimate

It is made by the contractor for determining the price or prices to be bid. It is usually a carefully prepared detailed estimate.

2. Engineer's estimate

This type of estimate is made by the Engineer (Consultant) usually for the purposes of financing the work and for checking bids and running bills submitted by contractors.

1. Besides drawings and details of measurements and calculation of quantities (Bill of Quantities), the following documents are also usually submitted with the detailed estimate for obtaining Technical Sanction. A report explaining History, necessity, scope and main features of the project, its design, and estimate, etc.
2. Specifications lying down the nature and class of work and material to be used in various parts of the work.
3. The abstract of cost (priced Bill of Quantities) showing the total quantities under each sub-head, rate per unit of measurement, and cost.
4. Calculation sheets showing calculations for important parts of the structure. In fact, in estimating the art and skill lies only in the computation of details without any omissions, of all parts of the building or work.
5. Progress estimates
 - These are made by the Engineer at regular intervals for the completed parts of the project during the progress of the work for determining the amounts of partial payments to be made to the contractor.
 - On large contracts, such estimates are commonly made each month and, hence, are frequently called monthly estimates.

2.2 Unforeseen items in detailed estimate

While preparing a detailed estimate, one had to be very careful to see that all items of the work are incorporated.

- It is likely that a few Items, though unimportant

in nature, might have been overlooked and which may result in raising the estimate of the project.

- There may be also certain unforeseen circumstances affecting the project.
- Hence, a certain allowance usually 5 to 10% of the total cost, is made in the estimation which will take care of all these items that are unforeseen or are overlooked and are known as "Contingencies".

The test performed are given below-

1. Fineness = 0.03%
2. Compressive strength =
3. Initial setting time test = 38 min
4. Final setting time = 10 hrs
5. Consistency test = 15 mm
6. Soundness test = 8mm

performed below-

1. Impact test = 22 .032%
2. Crushing test value=22.2%
3. Abrasion = 26.2%
4. Water absorption= 0.578%
5. Flakiness = 38.48%

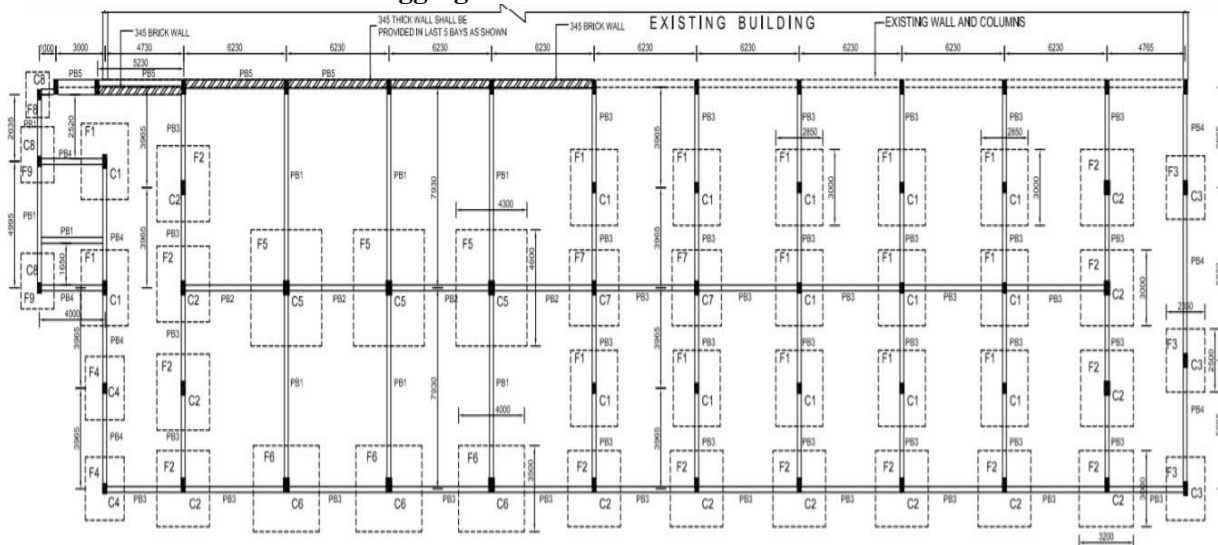
BRICK

The various test of brick performed are given below-

1. Color = Cherry
2. Water absorption= 10.03%
3. Dimension= 21.93*10.08*6.65
4. Efflorescence = Nil
5. Impact test = 60% (good)
6. Sound test = metallic ringing
7. Compressive strength=108.35 kg/cm²

2.3 Coarse Aggregate

The various test of course aggregate are



PLAN SHOWING DETAILS OF COLUMNS AND FOUNDATION
Fig-1Plan showing of columns and foundation

2.4 Work progress chart

1. Excavation of trench is completed.
2. PCC work is completed in all trench.
3. Footing working is completed in trench all trench except 11 and 12 trench. Also footing and column reinforcement are placed in trench 11 and 12 footings.
4. brick work is done in trench 1to7 and 13

trench.

2.5 Excavation

Rate of excavation = Rs. 750 per hour
Excavation time = 55 hrs
Total cost = (Rate of excavation * Excavation time)
= 750*55 = Rs41250

PCC WORK

ITEM NO	DESCRIPTION OF ITEM OF WORK	NO	DIMENSION			QUANTITIES OR CONTENT
			length	breadth	height	
1	Pcc in trench 1 in foundation 1	1	2.44	2.26	0.101	0.5569544
2	Pcc in trench 1 in foundation 2	1	2.44	2.44	0.101	0.6013136
3	Pcc in trench 1 in foundation 3	1	2.44	2.44	0.101	0.6013136
4	Pcc in trench 1 in foundation 1	1	16.7	4	0.152	10.1536
5	Pcc in trench 3 in foundation 1	1	3.2	3	0.152	1.4592
6	Pcc in trench 3 in foundation 2	1	2.85	3	0.152	1.2996

7	Pcc in trench 3 in foundation 3	1	2.85	3	0.152	1.2996
8	Pcc in trench 3 in foundation 4	1	2.85	3	0.152	1.2996
9	Pcc in trench 4 in foundation 1	1	16.7	4.1	0.152	10.40744
10	Pcc in trench 5 in foundation 1	1	16.7	3.35	0.152	8.50364
11	Pcc in trench 6 in foundation 1	1	16.7	4	0.152	10.1536
12	Pcc in trench 7 in foundation 1	1	16.7	3.8	0.152	9.64592
13	Pcc in trench 8 in foundation 1	1	2.2	2.25	0.152	0.7524
14	Pcc in trench 8 in foundation 2	1	2.75	2.25	0.152	0.9405
15	Pcc in trench 9 in foundation 1	1	2.5	2.1	0.152	0.798
16	Pcc in trench 9 in foundation 2	1	2.75	2.1	0.152	0.8778
17	Pcc in trench 10 in foundation 1	1	2.5	2.1	0.152	0.798
18	Pcc in trench 10 in foundation 2	1	2.75	2.1	0.152	0.8778
19	Pcc in trench 11 in foundation 1	1	16.7	3.2	0.152	8.12288
20	Pcc in trench 12 in foundation 1	1	16.7	3	0.152	7.6152
21	Pcc in trench 13 in foundation 1	1	16.7	3.5	0.152	8.8844

Calculation of pcc work

Volume of PCC = 85.6487616

PCC Ratio = 1:2:4

Wet volume of PCC = 85.6487616

Dry volume of PCC = total wet volume * 1.54 = 131.8989

Ratio grade for PCC = 1:2:4 Total ratio sum = 1+2+4 = 7

Calculation of cement

Volume of cement = dry vol of PCC * cement ratio / ratio sum = 131.8989 * 1/7 = 18.8427 cum

Weight of cement = vol of cement * density = 18.8427 * 1440 = 27133.508 kg

No. of bags of cement = weight of cement / 50 = 542 bags

Volume of fine aggregate = dry volume of PCC * sand ratio / Volume = 131.8989

Weight of Fine aggregate = vol of fine aggregate * density = 54643.25 kg

Volume of coarse aggregate = dry volume of PCC * (ratio / sum) = 131.8989 * (4/7) = 75.370 cum

Weight of coarse aggregate = vol of coarse aggregate * density = 214806.78 kg

Brickwork

ITEM NO	DESCRIPTION OF ITEM OF WORK	NO	DIMENSION			QUANTITIES OR CONTENT
			length	breadth	height	
1	Excavation trench (1) brick work (1) in offset 1	1	0.95	1.05	0.15	0.149625
2	Excavation trench (1) brick work (1) in offset 2	1	0.95	0.9	0.15	0.12825
3	Excavation trench (1) brick work (1) in offset 3	1	1.7	0.75	0.15	0.19125
4	Excavation trench (1) brick work (1) in offset 4	1	2.45	0.6	0.15	0.2205
5	Excavation trench (1) brick work (1) in offset 5	1	3.4	0.45	0.15	0.2295
6	Excavation trench (1) brick work (1) in offset 6	1	3.4	0.3	0.25	0.255
7	Excavation trench (1) brick work (1) in offset 7	1	3.4	0.23	0.68	0.53176
8	Excavation trench (1) brick work (2) in offset 1	1	4	1.05	0.15	0.63
9	Excavation trench (1) brick work (2) in offset 2	1	4	0.9	0.15	0.54
10	Excavation trench (1) brick work (2) in offset 3	1	4.64	0.75	0.15	0.522
11	Excavation trench (1) brick work (2) in offset 4	1	5.4	0.6	0.15	0.486
12	Excavation trench (1) brick work (2) in offset 5	1	6.25	0.45	0.15	0.421875
13	Excavation trench (1) brick work (2) in offset 6	1	6.25	0.3	0.25	0.46875
14	Excavation trench (1) brick work (2) in offset 7	1	6.25	0.23	0.68	0.9775
15	Excavation trench (1) brick work (3) in offset 1	1	2.25	1.05	0.15	0.354375

16	Excavation trench (1) brick work (3) in offset 2	1	2.25	0.9	0.15	0.30375
17	Excavation trench (1) brick work (3) in offset 3	1	2.89	0.75	0.15	0.325125
18	Excavation trench (1) brick work (3) in offset 4	1	3.65	0.6	0.15	0.3285
19	Excavation trench (1) brick work (3) in offset 5	1	4.5	0.45	0.15	0.30375
20	Excavation trench (1) brick work (3) in offset 6	1	4.5	0.3	0.25	0.3375
21	Excavation trench (1) brick work (3) in offset 7	1	4.5	0.23	0.68	0.7038

ITEM NO	DESCRIPTION OF ITEM OF WORK	NO	DIMENSION			QUANTITIES OR CONTENT
			length	breadth	height	
1	Excavation trench (2) brick work (1) in offset 1	1	1	1.05	0.15	0.1575
2	Excavation trench (2) brick work (1) in offset 2	1	1.1	0.9	0.15	0.1485
3	Excavation trench (2) brick work (1) in offset 3	1	1.74	0.75	0.15	0.19575
4	Excavation trench (2) brick work (1) in offset 4	1	2.5	0.6	0.15	0.225
5	Excavation trench (2) brick work (1) in offset 5	1	3.35	0.45	0.15	0.226125
6	Excavation trench (2) brick work (1) in offset 6	1	3.35	0.3	0.25	0.25125
7	Excavation trench (2) brick work (1) in offset 7	1	3.35	0.23	0.68	0.52394
8	Excavation trench (2) brick work (2) in offset 1	1	1	1.05	0.15	0.1575
9	Excavation trench (2) brick work (2) in offset 2	1	1.1	0.9	0.15	0.1485
10	Excavation trench (2) brick work (2) in offset 3	1	1.74	0.75	0.15	0.19575
11	Excavation trench (2) brick work (2) in offset 4	1	2.54	0.6	0.15	0.2286
12	Excavation trench (2) brick work (2) in offset 5	1	3.35	0.45	0.15	0.226125
13	Excavation trench (2) brick work (2) in offset 6	1	3.35	0.3	0.25	0.25125
14	Excavation trench (2) brick work (2) in offset 7	1	3.35	0.23	0.68	0.52394
15	Excavation trench (3) brick work (3) in offset 1	1	0.95	1.05	0.15	0.149625
16	Excavation trench (3) brick work (3) in offset 2	1	0.95	0.9	0.15	0.12825
17	Excavation trench (3) brick work (3) in offset 3	1	1.7	0.75	0.15	0.19125
18	Excavation trench (3) brick work (3) in offset 4	1	2.45	0.6	0.15	0.2205
19	Excavation trench (3) brick work (3) in offset 5	1	3.4	0.45	0.15	0.2295
20	Excavation trench (3) brick work (3) in offset 6	1	3.4	0.3	0.25	0.255
21	Excavation trench (3) brick work (3) in offset 7	1	3.4	0.23	0.68	0.53176
22	Excavation trench (3) brick work (4) in offset 1	1	1	1.05	0.15	0.1575
23	Excavation trench (3) brick work (4) in offset 2	1	1.1	0.9	0.15	0.1485
24	Excavation trench (3) brick work (4) in offset 3	1	1.74	0.75	0.15	0.19575
25	Excavation trench (3) brick work (4) in offset 4	1	2.5	0.6	0.15	0.225

26	Excavation trench (3) brick work (4) in offset 5	1	3.35	0.45	0.15	0.226125
27	Excavation trench (3) brick work (4) in offset 6	1	3.35	0.3	0.25	0.25125

ITEM NO	DESCRIPTION OF ITEM OF WORK	NO	DIMENSION			QUANTITIES OR CONTENT
			length	breadth	height	
1	Excavation trench (3) brick work (1) in offset 1	1	1	1.05	0.17	0.1785
2	Excavation trench (3) brick work (1) in offset 2	1	1	0.9	0.19	0.171
3	Excavation trench (3) brick work (1) in offset 3	1	1.65	0.75	0.17	0.210375
4	Excavation trench (3) brick work (1) in offset 4	1	2.1	0.6	0.17	0.2142
5	Excavation trench (3) brick work (1) in offset 5	1	3.15	0.45	0.17	0.240975
6	Excavation trench (3) brick work (1) in offset 6	1	3.45	0.3	0.26	0.2691
7	Excavation trench (3) brick work (1) in offset 7	1	3.45	0.23	0.8	0.6348
8	Excavation trench (3) brick work (2) in offset 1	1	0.8	1.05	0.17	0.1428
9	Excavation trench (3) brick work (2) in offset 2	1	1	0.9	0.17	0.153
10	Excavation trench (3) brick work (2) in offset 3	1	1	0.75	0.17	0.1275
11	Excavation trench (3) brick work (2) in offset 4	1	1.5	0.6	0.17	0.153
12	Excavation trench (3) brick work (2) in offset 5	1	2.45	0.45	0.17	0.187425
13	Excavation trench (3) brick work (2) in offset 6	1	3.55	0.3	0.25	0.26625
14	Excavation trench (3) brick work (2) in offset 7	1	3.55	0.23	0.85	0.694025
15	Excavation trench (3) brick work (3) in offset 1	1	0.7	1.05	0.17	0.12495
16	Excavation trench (3) brick work (3) in offset 2	1	0.9	0.9	0.17	0.1377
17	Excavation trench (3) brick work (3) in offset 3	1	0.9	0.75	0.17	0.11475
18	Excavation trench (3) brick work (3) in offset 4	1	1.4	0.6	0.17	0.1428
19	Excavation trench (3) brick work (3) in offset 5	1	2.35	0.45	0.17	0.179775
20	Excavation trench (3) brick work (3) in offset 6	1	3.45	0.3	0.25	0.25875
21	Excavation trench (3) brick work (3) in offset 7	1	3.45	0.23	0.85	0.674475

ITEM NO	DESCRIPTION OF ITEM OF WORK	NO	DIMENSION			QUANTITIES OR CONTENT
			length	breadth	height	
1	Excavation trench (4) brick work (1) in offset 1	1	0.95	1.05	0.15	0.149625
2	Excavation trench (4) brick work (1) in offset 2	1	0.95	0.9	0.15	0.12825
3	Excavation trench (4) brick work (1) in offset 3	1	1.4	0.75	0.15	0.1575
4	Excavation trench (4) brick work (1) in offset 4	1	2.1	0.6	0.15	0.189
5	Excavation trench (4) brick work (1) in offset 5	1	3	0.45	0.16	0.216
6	Excavation trench (4) brick work (1) in offset 6	1	3.4	0.3	0.24	0.2448
7	Excavation trench (4) brick work (1) in offset 7	1	3.4	0.23	0.74	0.57868
8	Excavation trench (4) brick work (2) in offset 1	1	0.96	1.05	0.15	0.1512
9	Excavation trench (4) brick work (2) in offset 2	1	1	0.9	0.15	0.135
10	Excavation trench (4) brick work (2) in offset 3	1	1.65	0.75	0.15	0.185625
11	Excavation trench (4) brick work (2) in offset 4	1	2.4	0.6	0.17	0.2448
12	Excavation trench (4) brick work (2) in offset 5	1	3.45	0.45	0.18	0.27945
13	Excavation trench (4) brick work (2) in offset 6	1	3.45	0.3	0.25	0.25875
14	Excavation trench (4) brick work (2) in offset 7	1	3.45	0.23	0.62	0.49197
15	Excavation trench (4) brick work (3) in offset 1	1	0.95	1.05	0.15	0.149625
16	Excavation trench (4) brick work (3) in offset 2	1	0.95	0.9	0.15	0.12825
17	Excavation trench (4) brick work (3) in offset 3	1	1.6	0.75	0.15	0.18

18	Excavation trench (4) brick work (3) in offset 4	1	2.4	0.6	0.15	0.216
19	Excavation trench (4) brick work (3) in offset 5	1	3.4	0.45	0.18	0.2754
20	Excavation trench (4) brick work (3) in offset 6	1	3.5	0.3	0.25	0.2625
21	Excavation trench (4) brick work (3) in offset 7	1	3.5	0.23	0.64	0.5152
22	Excavation trench (4) brick work (4) in offset 1	1	0.65	1.05	0.15	0.102375
23	Excavation trench (4) brick work (4) in offset 2	1	0.65	0.9	0.15	0.08775
24	Excavation trench (4) brick work (4) in offset 3	1	1.1	0.75	0.17	0.14025
25	Excavation trench (4) brick work (4) in offset 4	1	2	0.6	0.19	0.228
26	Excavation trench (4) brick work (4) in offset 5	1	3	0.45	0.17	0.2295
27	Excavation trench (4) brick work (4) in offset 6	1	3.4	0.3	0.25	0.255
28	Excavation trench (4) brick work (4) in offset 7	1	3.4	0.23	0.59	0.46138

ITEM NO	DESCRIPTION OF ITEM OF WORK	NO	DIMENSION			QUANTITIES OR CONTENT
			length	breadth	height	
1	Excavation trench (5) brick work (1) in offset1	1	1	1.05	0.15	0.1575
2	Excavation trench (5) brick work (1) in offset2	1	1.05	0.9	0.15	0.14175
3	Excavation trench (5) brick work (1) in offset3	1	1.7	0.75	0.15	0.19125
4	Excavation trench (5) brick work (1) in offset4	1	2.4	0.6	0.15	0.216
5	Excavation trench (5) brick work (1) in offset5	1	3.45	0.45	0.15	0.232875
6	Excavation trench (5) brick work (1) in offset6	1	3.45	0.3	0.25	0.25875
7	Excavation trench (5) brick work (1) in offset7	1	3.45	0.23	0.78	0.61893
8	Excavation trench (5) brick work (2) in offset1	1	1	1.05	0.17	0.1785
9	Excavation trench (5) brick work (2) in offset2	1	1.05	0.9	0.168	0.15876
10	Excavation trench (5) brick work (2) in offset3	1	2	0.75	0.18	0.27
11	Excavation trench (5) brick work (2) in offset4	1	2.75	0.6	0.17	0.2805
12	Excavation trench (5) brick work (2) in offset5	1	3.49	0.45	0.182	0.285831
13	Excavation trench (5) brick work (2) in offset6	1	3.48	0.3	0.25	0.261
14	Excavation trench (5) brick work (2) in offset7	1	3.5	0.23	0.71	0.57155
15	Excavation trench (5) brick work (3) in offset1	1	1	1.05	0.17	0.1785
16	Excavation trench (5) brick work (3) in offset2	1	1.05	0.9	0.168	0.15876
17	Excavation trench (5) brick work (3) in offset3	1	1.9	0.75	0.18	0.2565
18	Excavation trench (5) brick work (3) in offset4	1	2.65	0.6	0.17	0.2703
19	Excavation trench (5) brick work (3) in offset5	1	3.39	0.45	0.182	0.277641
20	Excavation trench (5) brick work (3) in offset6	1	3.38	0.3	0.25	0.2535
21	Excavation trench (5) brick work (3) in offset7	1	3.4	0.23	0.71	0.55522

ITEM NO	DESCRIPTION OF ITEM OF WORK	NO	DIMENSION			QUANTITIES OR CONTENT
			length	breadth	height	
1	Excavation trench (6) brick work (1) in offset 1	1	1	1.05	0.15	0.1575
2	Excavation trench (6) brick work (1) in offset 2	1	1	0.9	0.15	0.135
3	Excavation trench (6) brick work (1) in offset 3	1	1.55	0.75	0.15	0.174375
4	Excavation trench (6) brick work (1) in offset 4	1	2.25	0.6	0.15	0.2025
5	Excavation trench (6) brick work (1) in offset 5	1	2.9	0.45	0.15	0.19575
6	Excavation trench (6) brick work (1) in offset 6	1	3.43	0.3	0.25	0.25725
7	Excavation trench (6) brick work (1) in offset 7	1	3.43	0.23	0.68	0.536452
8	Excavation trench (6) brick work (2) in offset 1	1	0.95	1.05	0.15	0.149625

9	Excavation trench (6) brick work (2) in offset 2	1	0.95	0.9	0.15	0.12825
10	Excavation trench (6) brick work (2) in offset 3	1	1.7	0.75	0.15	0.19125
11	Excavation trench (6) brick work (2) in offset 4	1	2.45	0.6	0.15	0.2205
12	Excavation trench (6) brick work (2) in offset 5	1	3.4	0.45	0.15	0.2295
13	Excavation trench (6) brick work (2) in offset 6	1	3.4	0.3	0.24	0.2448
14	Excavation trench (6) brick work (2) in offset 7	1	3.4	0.23	0.58	0.45356
15	Excavation trench (6) brick work (3) in offset 1	1	0.78	1.05	0.15	0.12285
16	Excavation trench (6) brick work (3) in offset 2	1	0.78	0.9	0.15	0.1053
17	Excavation trench (6) brick work (3) in offset 3	1	1.4	0.75	0.15	0.1575
18	Excavation trench (6) brick work (3) in offset 4	1	2.25	0.6	0.15	0.2025
19	Excavation trench (6) brick work (3) in offset 5	1	3.15	0.45	0.15	0.212625
20	Excavation trench (6) brick work (3) in offset 6	1	3.4	0.3	0.24	0.2448
21	Excavation trench (6) brick work (3) in offset 7	1	3.4	0.23	0.68	0.53176
22	Excavation trench (6) brick work (4) in offset 1	1	0.74	1.05	0.15	0.11655
23	Excavation trench (6) brick work (4) in offset 2	1	0.74	0.9	0.15	0.0999
24	Excavation trench (6) brick work (4) in offset 3	1	1.45	0.75	0.15	0.163125
25	Excavation trench (6) brick work (4) in offset 4	1	2.1	0.6	0.15	0.189
26	Excavation trench (6) brick work (4) in offset 5	1	2.7	0.45	0.15	0.18225
27	Excavation trench (6) brick work (4) in offset 6	1	3.45	0.3	0.24	0.2484
28	Excavation trench (6) brick work (4) in offset 7	1	3.45	0.23	0.66	0.52371
ITEM NO	DESCRIPTION OF ITEM OF WORK	NO	DIMENSION			QUANTITIES OR CONTENT
			Length	breadth	height	
1	Excavation trench (7) brick work (1) in offset 1	1	1	1.05	0.15	0.1575
2	Excavation trench (7) brick work (1) in offset 2	1	1.6	0.9	0.15	0.216
3	Excavation trench (7) brick work (1) in offset 3	1	1.75	0.75	0.15	0.196875
4	Excavation trench (7) brick work (1) in offset 4	1	2.56	0.6	0.15	0.2304
5	Excavation trench (7) brick work (1) in offset 5	1	3.45	0.45	0.15	0.232875
6	Excavation trench (7) brick work (1) in offset 6	1	3.45	0.3	0.25	0.25875
7	Excavation trench (7) brick work (1) in offset 7	1	3.45	0.23	0.75	0.595125
8	Excavation trench (7) brick work (2) in offset 1	1	1	1.05	0.15	0.1575

9	Excavation trench (7) brick work (2) in offset 2	1	1.8	0.9	0.15	0.243
10	Excavation trench (7) brick work (2) in offset 3	1	2.3	0.75	0.15	0.25875
11	Excavation trench (7) brick work (2) in offset 4	1	2.9	0.6	0.15	0.261
12	Excavation trench (7) brick work (2) in offset 5	1	3.5	0.45	0.15	0.23625
13	Excavation trench (7) brick work (2) in offset 6	1	3.5	0.3	0.25	0.2625
14	Excavation trench (7) brick work (2) in offset 7	1	3.5	0.23	0.75	0.60375
15	Excavation trench (7) brick work (3) in offset 1	1	1	1.05	0.15	0.1575
16	Excavation trench (7) brick work (3) in offset 2	1	1.7	0.9	0.15	0.2295
17	Excavation trench (7) brick work (3) in offset 3	1	2.2	0.75	0.15	0.2475
18	Excavation trench (7) brick work (3) in offset 4	1	2.8	0.6	0.15	0.252
19	Excavation trench (7) brick work (3) in offset 5	1	3.4	0.45	0.15	0.2295
20	Excavation trench (7) brick work (3) in offset 6	1	3.4	0.3	0.25	0.255
21	Excavation trench (7) brick work (3) in offset 7	1	3.4	0.23	0.75	0.5865

ITEM NO	DESCRIPTION OF ITEM OF WORK	NO	DIMENSION			QUANTITIES OR CONTENT
			length	breadth	height	
1	Excavation trench (8) brick work (1) in offset 1	1	1	1.05	0.15	0.1575
2	Excavation trench (8) brick work (1) in offset 2	1	1	0.9	0.15	0.135
3	Excavation trench (8) brick work (1) in offset 3	1	1.55	0.75	0.15	0.174375
4	Excavation trench (8) brick work (1) in offset 4	1	2.25	0.6	0.15	0.2025
5	Excavation trench (8) brick work (1) in offset 5	1	2.9	0.45	0.15	0.19575
6	Excavation trench (8) brick work (1) in offset 6	1	3.43	0.3	0.25	0.25725
7	Excavation trench (8) brick work (1) in offset 7	1	3.43	0.23	0.68	0.536452
8	Excavation trench (8) brick work (2) in offset 1	1	0.95	1.05	0.15	0.149625
9	Excavation trench (8) brick work (2) in offset 2	1	0.95	0.9	0.15	0.12825
10	Excavation trench (8) brick work (2) in offset 3	1	1.7	0.75	0.15	0.19125
11	Excavation trench (8) brick work (2) in offset 4	1	2.45	0.6	0.15	0.2205
12	Excavation trench (8) brick work (2) in offset 5	1	3.4	0.45	0.15	0.2295
13	Excavation trench (8) brick work (2) in offset 6	1	3.4	0.3	0.24	0.2448
14	Excavation trench (8) brick work (2) in offset 7	1	3.4	0.23	0.58	0.45356
15	Excavation trench (8) brick work (3) in offset 1	1	0.78	1.05	0.15	0.12285
	Excavation trench (8) brick work					

16	(3) in offset 2	1	0.78	0.9	0.15	0.1053
17	Excavation trench (8) brick work (3) in offset 3	1	1.4	0.75	0.15	0.1575
18	Excavation trench (8) brick work (3) in offset 4	1	2.25	0.6	0.15	0.2025
19	Excavation trench (8) brick work (3) in offset 5	1	3.15	0.45	0.15	0.212625
20	Excavation trench (8) brick work (3) in offset 6	1	3.4	0.3	0.24	0.2448
21	Excavation trench (8) brick work (3) in offset 7	1	3.4	0.23	0.68	0.53176
22	Excavation trench (8) brick work (4) in offset 1	1	0.74	1.05	0.15	0.11655
23	Excavation trench (8) brick work (4) in offset 2	1	0.74	0.9	0.15	0.0999
24	Excavation trench (8) brick work (4) in offset 3	1	1.45	0.75	0.15	0.163125
25	Excavation trench (8) brick work (4) in offset 4	1	2.1	0.6	0.15	0.189
26	Excavation trench (8) brick work (4) in offset 5	1	2.7	0.45	0.15	0.18225
27	Excavation trench (8) brick work (4) in offset 6	1	3.45	0.3	0.24	0.2484
28	Excavation trench (8) brick work (4) in offset 7	1	3.45	0.23	0.66	0.52371

ITEM NO	DESCRIPTION OF ITEM OF WORK	NO	DIMENSION			QUANTITIES OR CONTENT
			length	breadth	height	
1	Excavation trench (9) brick work (1) in offset 1	1	1	1.05	0.15	0.1575
2	Excavation trench (9) brick work (1) in offset 2	1	1.6	0.9	0.15	0.216
3	Excavation trench (9) brick work (1) in offset 3	1	1.75	0.75	0.15	0.196875
4	Excavation trench (9) brick work (1) in offset 4	1	2.56	0.6	0.15	0.2304
5	Excavation trench (9) brick work (1) in offset 5	1	3.45	0.45	0.15	0.232875
6	Excavation trench (9) brick work (1) in offset 6	1	3.45	0.3	0.25	0.25875
7	Excavation trench (9) brick work (1) in offset 7	1	3.45	0.23	0.75	0.595125
8	Excavation trench (9) brick work (2) in offset 1	1	1	1.05	0.15	0.1575
9	Excavation trench (9) brick work (2) in offset 2	1	1.8	0.9	0.15	0.243
10	Excavation trench (9) brick work (2) in offset 3	1	2.3	0.75	0.15	0.25875
11	Excavation trench (9) brick work (2) in offset 4	1	2.9	0.6	0.15	0.261
12	Excavation trench (9) brick work (2) in offset 5	1	3.5	0.45	0.15	0.23625
13	Excavation trench (9) brick work (2) in offset 6	1	3.5	0.3	0.25	0.2625
14	Excavation trench (9) brick work (2) in offset 7	1	3.5	0.23	0.75	0.60375
15	Excavation trench (9) brick work (3) in offset 1	1	1	1.05	0.15	0.1575
16	Excavation trench (9) brick work (3) in offset 2	1	1.7	0.9	0.15	0.2295
17	Excavation trench (9) brick work (3) in offset 3	1	2.2	0.75	0.15	0.2475
18	Excavation trench (9) brick work (3) in offset 4	1	2.8	0.6	0.15	0.252
19	Excavation trench (9) brick work (3) in offset 5	1	3.4	0.45	0.15	0.2295
	Excavation trench (9) brick work					

20	(3) in offset 6	1	3.4	0.3	0.25	0.255
21	Excavation trench (9) brick work (3) in offset 7	1	3.4	0.23	0.75	0.5865

ITEM NO	DESCRIPTION OF ITEM OF WORK	NO	DIMENSION			QUANTITIES OR CONTENT
			length	breadth	height	
1	Excavation trench (10) brick work (1) in offset 1	1	1	1.05	0.15	0.1575
2	Excavation trench (10) brick work (1) in offset 2	1	1	0.9	0.15	0.135
3	Excavation trench (10) brick work (1) in offset 3	1	1.55	0.75	0.15	0.174375
4	Excavation trench (10) brick work (1) in offset 4	1	2.25	0.6	0.15	0.2025
5	Excavation trench (10) brick work (1) in offset 5	1	2.9	0.45	0.15	0.19575
6	Excavation trench (10) brick work (1) in offset 6	1	3.43	0.3	0.25	0.25725
7	Excavation trench (10) brick work (1) in offset 7	1	3.43	0.23	0.68	0.536452
8	Excavation trench (10) brick work (2) in offset 1	1	0.95	1.05	0.15	0.149625
9	Excavation trench (10) brick work (2) in offset 2	1	0.95	0.9	0.15	0.12825
10	Excavation trench (10) brick work (2) in offset 3	1	1.7	0.75	0.15	0.19125
11	Excavation trench (10) brick work (2) in offset 4	1	2.45	0.6	0.15	0.2205
12	Excavation trench (10) brick work (2) in offset 5	1	3.4	0.45	0.15	0.2295
13	Excavation trench (10) brick work (2) in offset 6	1	3.4	0.3	0.24	0.2448
14	Excavation trench (10) brick work (2) in offset 7	1	3.4	0.23	0.58	0.45356
15	Excavation trench (10) brick work (3) in offset 1	1	0.78	1.05	0.15	0.12285
16	Excavation trench (10) brick work (3) in offset 2	1	0.78	0.9	0.15	0.1053
17	Excavation trench (10) brick work (3) in offset 3	1	1.4	0.75	0.15	0.1575
18	Excavation trench (10) brick work (3) in offset 4	1	2.25	0.6	0.15	0.2025
19	Excavation trench (10) brick work (3) in offset 5	1	3.15	0.45	0.15	0.212625
20	Excavation trench (10) brick work (3) in offset 6	1	3.4	0.3	0.24	0.2448
21	Excavation trench (10) brick work (3) in offset 7	1	3.4	0.23	0.68	0.531760
22	Excavation trench (10) brick work (4) in offset 1	1	0.74	1.05	0.15	0.11655
23	Excavation trench (10) brick work (4) in offset 2	1	0.74	0.9	0.15	0.0999
24	Excavation trench (10) brick work (4) in offset 3	1	1.45	0.75	0.15	0.163125
25	Excavation trench (10) brick work (4) in offset 4	1	2.1	0.6	0.15	0.189
26	Excavation trench (10) brick work (4) in offset 5	1	2.7	0.45	0.15	0.18225
27	Excavation trench (10) brick work (4) in offset 6	1	3.45	0.3	0.24	0.2484
28	Excavation trench (10) brick work (4) in offset 7	1	3.45	0.23	0.66	0.52371

ITEM NO	DESCRIPTION OF ITEM OF WORK	NO	DIMENSION			QUANTITIES OR CONTENT
			length	breadth	height	
1	Excavation trench (11) brick work (1) in offset 1	1	1	1.05	0.15	0.1575
2	Excavation trench (11) brick work (1) in offset 2	1	1	0.9	0.15	0.135
3	Excavation trench (11) brick work (1) in offset 3	1	1.55	0.75	0.15	0.174375
4	Excavation trench (11) brick work (1) in offset 4	1	2.25	0.6	0.15	0.2025
5	Excavation trench (11) brick work (1) in offset 5	1	2.9	0.45	0.15	0.19575
6	Excavation trench (11) brick work (1) in offset 6	1	3.43	0.3	0.25	0.25725
7	Excavation trench (11) brick work (1) in offset 7	1	3.43	0.23	0.68	0.536452
8	Excavation trench (11) brick work (2) in offset 1	1	0.95	1.05	0.15	0.149625
9	Excavation trench (11) brick work (2) in offset 2	1	0.95	0.9	0.15	0.12825
10	Excavation trench (11) brick work (2) in offset 3	1	1.7	0.75	0.15	0.19125
11	Excavation trench (11) brick work (2) in offset 4	1	2.45	0.6	0.15	0.2205
12	Excavation trench (11) brick work (2) in offset 5	1	3.4	0.45	0.15	0.2295
13	Excavation trench (11) brick work (2) in offset 6	1	3.4	0.3	0.24	0.2448
14	Excavation trench (11) brick work (2) in offset 7	1	3.4	0.23	0.58	0.45356
15	Excavation trench (11) brick work (3) in offset 1	1	0.78	1.05	0.15	0.12285
16	Excavation trench (11) brick work (3) in offset 2	1	0.78	0.9	0.15	0.1053
17	Excavation trench (11) brick work (3) in offset 3	1	1.4	0.75	0.15	0.1575
18	Excavation trench (11) brick work (3) in offset 4	1	2.25	0.6	0.15	0.2025
19	Excavation trench (11) brick work (3) in offset 5	1	3.15	0.45	0.15	0.212625
20	Excavation trench (11) brick work (3) in offset 6	1	3.4	0.3	0.24	0.2448
21	Excavation trench (11) brick work (3) in offset 7	1	3.4	0.23	0.68	0.53176
22	Excavation trench (11) brick work (4) in offset 1	1	0.74	1.05	0.15	0.11655
23	Excavation trench (11) brick work (4) in offset 2	1	0.74	0.9	0.15	0.0999
24	Excavation trench (11) brick work (4) in offset 3	1	1.45	0.75	0.15	0.163125
25	Excavation trench (11) brick work (4) in offset 4	1	2.1	0.6	0.15	0.189
26	Excavation trench (11) brick work (4) in offset 5	1	2.7	0.45	0.15	0.18225
27	Excavation trench (11) brick work (4) in offset 6	1	3.45	0.3	0.24	0.2484
28	Excavation trench (11) brick work (4) in offset 7	1	3.45	0.23	0.66	0.52371

ITEM NO	DESCRIPTION OF ITEM OF WORK	NO	DIMENSION			QUANTITIES OR CONTENT
			length	breadth	height	
1	Excavation trench (12) brick work (1) in offset 1	1	1	1.05	0.15	0.1575
2	Excavation trench (12) brick work (1) in offset 2	1	1.6	0.9	0.15	0.216

3	Excavation trench (12) brick work (1) in offset 3	1	1.75	0.75	0.15	0.196875
4	Excavation trench (12) brick work (1) in offset 4	1	2.56	0.6	0.15	0.2304
5	Excavation trench (12) brick work (1) in offset 5	1	3.45	0.45	0.15	0.232875
6	Excavation trench (12) brick work (1) in offset 6	1	3.45	0.3	0.25	0.25875
7	Excavation trench (12) brick work (1) in offset 7	1	3.45	0.23	0.75	0.595125
8	Excavation trench (12) brick work (2) in offset 1	1	1	1.05	0.15	0.1575
9	Excavation trench (12) brick work (2) in offset 2	1	1.8	0.9	0.15	0.243
10	Excavation trench (12) brick work (2) in offset 3	1	2.3	0.75	0.15	0.25875
11	Excavation trench (12) brick work (2) in offset 4	1	2.9	0.6	0.15	0.261
12	Excavation trench (12) brick work (2) in offset 5	1	3.5	0.45	0.15	0.23625
13	Excavation trench (12) brick work (2) in offset 6	1	3.5	0.3	0.25	0.2625
14	Excavation trench (12) brick work (2) in offset 7	1	3.5	0.23	0.75	0.60375
15	Excavation trench (12) brick work (3) in offset 1	1	1	1.05	0.15	0.1575
16	Excavation trench (12) brick work (3) in offset 2	1	1.7	0.9	0.15	0.2295
17	Excavation trench (12) brick work (3) in offset 3	1	2.2	0.75	0.15	0.2475
18	Excavation trench (12) brick work (3) in offset 4	1	2.8	0.6	0.15	0.252
19	Excavation trench (12) brick work (3) in offset 5	1	3.4	0.45	0.15	0.2295
20	Excavation trench (12) brick work (3) in offset 6	1	3.4	0.3	0.25	0.255
21	Excavation trench (12) brick work (3) in offset 7	1	3.4	0.23	0.75	0.5865

ITEM NO	DESCRIPTION OF ITEM OF WORK	NO	DIMENSION			QUANTITIES OR CONTENT
			length	breadth	height	
1	Excavation trench (13) brick work (1) in offset 1	1	0.95	1.05	0.15	0.149625
2	Excavation trench (13) brick work (1) in offset 2	1	0.95	0.9	0.15	0.12825
3	Excavation trench (13) brick work (1) in offset 3	1	1.7	0.75	0.15	0.19125
4	Excavation trench (13) brick work (1) in offset 4	1	2.45	0.6	0.15	0.2205
5	Excavation trench (13) brick work (1) in offset 5	1	3.4	0.45	0.15	0.2295
6	Excavation trench (13) brick work (1) in offset 6	1	3.4	0.3	0.25	0.255
7	Excavation trench (13) brick work (1) in offset 7	1	3.4	0.23	0.68	0.53176
8	Excavation trench (13) brick work (2) in offset 1	1	4	1.05	0.15	0.63
9	Excavation trench (13) brick work (2) in offset 2	1	4	0.9	0.15	0.54

10	Excavation trench (13) brick work (2) in offset 3	1	4.64	0.75	0.15	0.522
11	Excavation trench (13) brick work (2) in offset 4	1	5.4	0.6	0.15	0.486
12	Excavation trench (13) brick work (2) in offset 5	1	6.25	0.45	0.15	0.421875
13	Excavation trench (13) brick work (2) in offset 6	1	6.25	0.3	0.25	0.46875
14	Excavation trench (13) brick work (2) in offset 7	1	6.25	0.23	0.68	0.9775
15	Excavation trench (13) brick work (3) in offset 1	1	2.25	1.05	0.15	0.354375
16	Excavation trench (13) brick work (3) in offset 2	1	2.25	0.9	0.15	0.30375
17	Excavation trench (13) brick work (3) in offset 3	1	2.89	0.75	0.15	0.325125
18	Excavation trench (13) brick work (3) in offset 4	1	3.65	0.6	0.15	0.3285
19	Excavation trench (13) brick work (3) in offset 5	1	4.5	0.45	0.15	0.30375
20	Excavation trench (13) brick work (3) in offset 6	1	4.5	0.3	0.25	0.3375
21	Excavation trench (13) brick work (3) in offset 7	1	4.5	0.23	0.68	0.7038

3. Realistic Design Constraints

3.1 Calculation of brick work

Volume of brick work in trench 1 = 8.40881 cum
 Volume of brick work in trench 2 = 6.89368 cum
 Volume of brick work in trench 3 = 5.27615 cum
 Volume of brick work in trench 4 = 6.64188 cum
 Volume of brick work in trench 5 = 5.773617 cum
 Volume of brick work in trench 6 = 6.376582 cum
 Volume of brick work in trench 7 = 5.867775 cum
 Volume of brick work in trench 8 = 6.376528 cum
 Volume of brick work in trench 9 = 5.773617 cum
 Volume of brick work in trench 10 = 6.376528 cum
 Volume of brick work in trench 11 = 6.9368 cum
 Volume of brick work in trench 12 = 5.32619 cum
 Volume of brick work in trench 13 = 7.886912 cum

Total volume of brick work = 83.915069 cumec
 Volume of brick = $21.93\text{cm} \times 10.08\text{cm} \times 6.65\text{cm} = 0.00147\text{cumec}$
 Vol of 1 brick with mortar = $22.93\text{cm} \times 11.08\text{cm} \times 7.65\text{cm} = 1943.592\text{ cm}^3 = 0.001943\text{ m}^3$
 No. of brick required = (total volume of wall) / (vol. of brick of mortar) = $83.915069 / 0.001943 = 43188.404\text{nos}$

3.2 Cost Of Brick = Rs 237536.22

Volume of mortar = volume of wall – (volume of price without mortar * number of brickrequired)
 $= 83.915 - (0.00147 \times 43189) = 83.915 - 63.487 = 20.428$
 Percentage of mortar = $(20.428 / 83.915069) \times 100 = 24.34\%$
 Ratio of 1:4 Mortar quantity in wet condition = 20.428
 Dry vol. of mortar = $1.33 \times 20.428 = 27.1624\text{ m}^3$

3.3 Cement calculation

Volume of cement = dry vol. of mortar * (ratio of cement / sum of ratio)
 $= 27.16924 \times (1 / (1+4)) = 27.16924 / 5 = 5.4338$
 Mass of cement = $5.4338 \times 1440 = 7824.74\text{ kg}$
 No. of bag of cement = $7824.74 / 50 = 156.49\text{ bags}$

3.4 Fine aggregate calculation

Vol. of Fine Aggregate = vol of mortar * (ratio of FA / sum of ratio)
 $= 27.16924 \times (4 / 5) = 21.735392$
 Mass of Fine Aggregate = Vol of FA * Density = 31517.084 kg
 No. of brick required = (total volume of wall) / (vol. of = 20.428)
 Percentage of mortar = $(20.428 / 83.915069) \times 100 = 24.34\%$

3.5 Calculation of Labour Cost

Time period Required for Project = 4 months
 Number of Unskilled Labour = 10
 Wages rate of Unskilled Labour = Rs350

Cost of Unskilled Labour = Number of Unskilled Labour *Wages rate of Unskilled Labour*Days
 $= 10*350*120=420000$

Number of Semi-Skilled Labour =3

Wages rate of semi-skilled Labour =Rs 450

Cost of semi-skilled Labour = Number of semi-skilled Labour *Wages rate of semi-skilled Labour*Days
 $=3*450*120=162000$

Number of Skilled Labour= 5 Wages of Skilled Labour =Rs 550

Cost of skilled Labour = Number of skilled Labour *Wages rate of skilled Labour*Days
 $=5*550*120 = 330000$

Total cost of Labour =420000+162000+330000=912000

3.6 Calculation of footing

Volume of A = L*B*H

Volume of B = $1/3*[A1+A2+(A1*A2)^{(1/2)}]*h$

Volume of C = L*B*H

Total volume = vol. of A +vol. of B + vol of C

Net vol. of concrete = Total Volume – Vol of Reinforcement

3.7 Calculation of reinforced in column

Length of one main (vertical bar) = height of column – end cover for footing – 2* dia of footing + 120
 main bar length of one ties = $2* [(side - 2* cover - 2* dia of bar) + (side - 2*cover - 2* dia of bar)] + 16$ dia of stirrup
 No of ties = (actual length / spacing) + 1

C1 bar

Length of 20mm dia bar = 1.691 m

Volume of bar in C1 = $531.24*10^{(-6)}$ cum

Length of 1 ties = 1.44 m

No. of ties = 11

Volume of Ties = $796.005 *10^{(-6)}$ cum

C2 bar

Length of 25mm bar = 1.715 m Length of 20mm ties = 1.691m

Volume of bar in C2 = $841.689*10^{(-6)}$ cum + $531.143*10^{(-6)}$ cum= $1372.8321*10^{(-6)}$ cum

Length of ties=1.720m NOS of ties 16

Vol of ties = $1383.045*10^{(-6)}$ cum

C3 bar

Length of 16mm bar = 1.643m Length of 20mm ties = 1.691m

Volume of bar in C3 = $330.282*10^{(-6)}$ cum + $531.143*10^{(-6)}$ cum
 $= 834.425*10^{(-6)}$ cum

Length of ties = 1.672m No. of ties = 11

Vol of ties = $924.308*10^{(-6)}$ cum

C4 bar

Length of 20mm ties = 1.691m

Volume of bar in C4 = $531.143*10^{(-6)}$ cum

Length of ties = 1.372m

No. of ties = 11

Vol of ties = $758.463*10^{(-6)}$ cum

C5 bar

Length of 25mm bar = 1.751m

Volume of bar in C5 = $841.689*10^{(-6)}$ cum

Length of ties = 1.920m

No of ties = 11

Vol of ties = $1153.658*10^{(-6)}$ cum

C6 bar

Length of 25mm bar = 1.751m Length of 20mm ties = 1.691m

Volume of bar in C6 = $841.689*10^{(-6)}$ cum + $531.143*10^{(-6)}$ cum= $1372.832*10^{(-6)}$ cum

length of the=1.72 Nos of ties=16

Vol of ties = $1383.045*10^{(-6)}$ cum

7 bar

Length of 20mm ties = 1.691m

Volume of bar in C7 = $531.24*10^{(-6)}$ cum

Length of ties = 1.372m

No of ties = 11 Vol of ties = $758.463*10^{(-6)}$ cum

C8 bar

Length of 16mm ties = 1.643m

Volume of bar in C8 = $330.282*10^{(-6)}$ cum

Length of ties = 1.672m

No of ties = 11 Vol of ties = $924.308*10^{(-6)}$ cum

C9 bar

Length of 16mm ties = 1.643m

Volume of bar in C9 = $330.282*10^{(-6)}$ cum

Length of ties = 1.672m

No of ties = 11 Vol of ties = $924.308*10^{(-6)}$ cum

Total volume of Reinforcement = Volume of Ties

+ Volume of main Bars= $9005.603*10^{(-6)}$ cum +

$6675.965*10^{(-6)}$ cum= $15681.5681*10^{(-6)}$ cum

Weight of 8mm dia bar = Volume of Ties * density= $9005.603*10^{(-6)}$ cum * $7850\text{kg/m}^3=$
 70.693 kg

cost of 8mm dia bar = weight of 8mm dia bar * rate= Rs 3029.1950

Weight of 16mm dia bar = Volume of Ties * density= $990.846*10^{(-6)}$ cum* $7850\text{kg/m}^3=$
 7.778 kg

cost of 16mm dia bar = weight of 16mm dia bar * rate= Rs 323.9848

Weight of 20mm dia bar = Volume of Ties * density= $3187.44*10^{(-6)}$ cum* $7850\text{kg/m}^3=$
 25.021 kg

cost of 20mm dia bar = weight of 20mm dia bar * rate= Rs 1038.671

Weight of 25mm dia bar = Volume of Ties * density = $2525.067 * 10^{(-6)} \text{cum} * 7850 \text{kg/m}^3 =$

19.82 kg cost of 25mm dia bar = weight of 25mm dia bar * rate = RS 820.548

4. Result and discussion-

The results and discussion of the present paper are mention below.

S.N.	Description of items	QTY.	Unit	Rate(Rs)	Amount(Rs)
1.	Cost of brick	1	No.	Rs 5.50	Rs237536.22
2.	COST OF JCB	1	Per hourper Day	RS 750	Rs41250
3.	COST OF FINE AGGREGATE	1	KG	RS 400	Rs424257.408
4.	COST OF COARSEAGGREGATE	1	KG	RS 80	Rs 234440.04
5.	COST OF CEMENT	1	PER BAG	RS 295	Rs283801.8
6.	➤ COST OF UNSKILLED LABOUR ➤ COST OF SEMI SKILLED LABOUR ➤ COST OF SKILLED LABOUR	1	PER HEAD	➤ RS 350 ➤ RS 450 ➤ RS 550	Rs 912000
7.	COST OF TMT BAR ➤ 8MM DIA BAR ➤ 10MM DIA BAR ➤ 12MM DIA BAR ➤ 16MM DIA BAR ➤ 20MM DIA BAR ➤ 25MM DIA BAR	1	KG	➤ RS 42.85 ➤ RS42.834 ➤ RS41.064 ➤ RS41.654 ➤ RS 41.512 ➤ RS 41.40	Rs 30113.09
8.	COST OF BINDING WIRE	1	KG	RS 66	Rs 482.191

The Total cost of The project is **Rs 2163879.22**

Detailed estimates are prepared by carefully and separately calculating in detail the costs of various items of the work that constitute the whole project from the detailed working drawings after the design has been finalized. The mistakes, if any, in the rough cost estimate are eliminated in the detailed estimate. Detailed estimates are submitted to the competent authorities for obtaining technical sanction. The whole project is subdivided into different items of work or activities. The quantity for each item is then calculated separately from the drawings as accurately as possible. The procedure is known as "taking out of quantities". The quantities for each item may be estimated and shown in the pattern which is called Bill of quantities. "The unit, in which each item of the work is to be calculated, should be according to the prevailing practice as followed in various departments of the country.

Each item of the work is then multiplied by its estimated current rate calculated by a fixed procedure to find out cost of the item.

At the end, a total of all items of the work are made to get the total estimated cost.

The rates are usually as per Schedule of Rates for the locality plus a premium to allow for rise in labor and material rates over and above the schedule of rates.

A percentage, usually 5% is also provided on the total estimated cost for the work to allow for the possible contingencies due to unforeseen items or expenditure or other causes, besides 2% establishment charges.

5. Conclusion-

Estimation is the scientific way of finding out the approximate cost of an engineering project before starting of the work. It is different from calculation of the actual cost after completion of the project.

Estimation requires a overall knowledge of the construction procedures and cost of materials and labor in addition to the skill, experience, foresight and good judgment.

An estimate of the cost of a construction work is the probable cost of that work as computed from plans and specifications.

For a good estimate, the actual cost of actual project work must not vary more than 5 to 10 % from its approximate cost estimate, provided there are no unusual, unforeseen circumstances.

6. Scope of Future work-

The various need of estimation are given below:-

It helps to work out the approximate cost of the project in order to decide its feasibility with respect to the cost and to ensure the financial resources, if the proposal is approved.

Requirements of controlled materials, such as cement and steel can be estimated for making applications to the controlling authorities.

It is used for framing the tenders for the works and to check contractor's work during and after its execution for the purpose of making payments to the contractor. From quantities of different items of work calculated in detailed estimation,

resources are allocated to different activities of the project and ultimately their durations and whole planning and scheduling of the project is carried out.

7. References-

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