



# UNIVERSITY OF RUHUNA

## Faculty of Engineering

End-Semester 3 Examination in Engineering: July 2016

Module Number: CE3301

Module Name: Building Planning and Cost Estimating

[Three Hours]

[Answer all questions]

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[You may refer separately provided City of Colombo Development Plan when answering for Q1 and Q2]

- Q1. Assume that you are employed in a company undertaking land and housing development projects. The company has given an assignment to prepare a land sub-division plan for residential purpose. Company's requirements regarding extend of lots are as follows.
- Minimum five lots with land area between eight parch (8.0 p) to ten parch (10.0 p) and those should be away from the main road.
  - Minimum four lots with more than fifteen parch (15.0 p) but less than twenty parch (20.0 p) and those should be closer to the main road.
  - Few number of lots having land area between ten parch (10.0 p) to fifteen parch (15.0 p).
  - The land for proposed sub-division is shown in Figure Q1
- a) Sketch the sub-divided land according to the company's requirements and planning regulations stipulated in the City of Colombo Development Plan. [5.0 Marks]
- b) List three documents that the company should provide to relevant authorities to get the approval for your plan? [3.0 Marks]
- c) According to the City of Colombo Development Plan, which lands can be used for sub-division purposes? [2.0 Marks]
- Q2. a) Explain the importance of following concepts mentioned under the building regulations.
- i Street line
  - ii Building line
  - ii Preliminary Planning Clearance
- [6.0 Marks]
- b) What are the duties of a qualified person employed to prepare plans, to supervise building works, or any other development activities? [2.0 Marks]
- c) Explain the procedure to resume work after changing a qualified person of a building work or any other development activity. [2.0 Marks]

Q3. a) Explain the use of following standard documents for BOQ preparation.

- i Standard Method of Measurements
- ii Building Schedule of Rates

[4.0 Marks]

b) Carry out following calculations based on the information provided in Figures Q3 (a) to (d). Any assumptions you made should be clearly stated.

- i Centerline dimensions
- ii Take-off quantities of excavation work in foundation
- iii Take-off quantities of plinth plaster
- iv Take-off quantities of roof covering
- v Take-off quantities of eave gutters

[11.0 Marks]

Q4. a) Explain the following terms by giving two examples for each term.

- i General overheads
- ii Job overheads

[4.0 Marks]

b) Calculate the unit rates for the following work norms. You may use the price data given in the Table Q4.

i 9" thick brick wall cement sand 1:5 in ground floor

Per square

Materials

1090 bricks

Add 5% for wastage

3.00 cwt cement (50 kg bags)

0.20 cubes sand

Water (115 gals)

Labour

2 ¼ days mason

3 ¾ days U/Sk labours

Scaffolding - Add 3%

ii 16mm thick plastering to wall in cement sand 1: 3 including cement floating

Per square

Materials

1.40 cwt cement (50 kg bags)

0.06cubes sand

Water (10 gals)

Labour

1 day mason

1 ½ days U/Sk labours

Scaffolding - Add 3%

iii Painting walls with emulsion paint (2 coats)

Per square

1<sup>st</sup> coat - 0.6 lts emulsion paint

2<sup>nd</sup> coat - 0.5 lts emulsion paint

6" brush

0.10 gals water

Labour

1  $\frac{3}{4}$  days painter

Scaffolding - Add 3%

[6.0 Marks]

- c) Assume that already constructed large lecture hall to be divided into two equal parts using a brick wall. Internal dimension of the lecture hall is 25 m x 10 m. Partition wall is parallel to the width of the hall. Expected height of the wall is 4 m. The partition wall should be plastered and painted. Calculate the total cost to construct the partition wall. You may use the unit rates derived in part (b).

[5.0 Marks]

- Q5. a) Following three categories of items will be generally considered as non-adjustable element in civil engineering contracts. Discuss the reasons of considering them as non-adjustable elements giving an example for each category.

i Most of the preliminary items

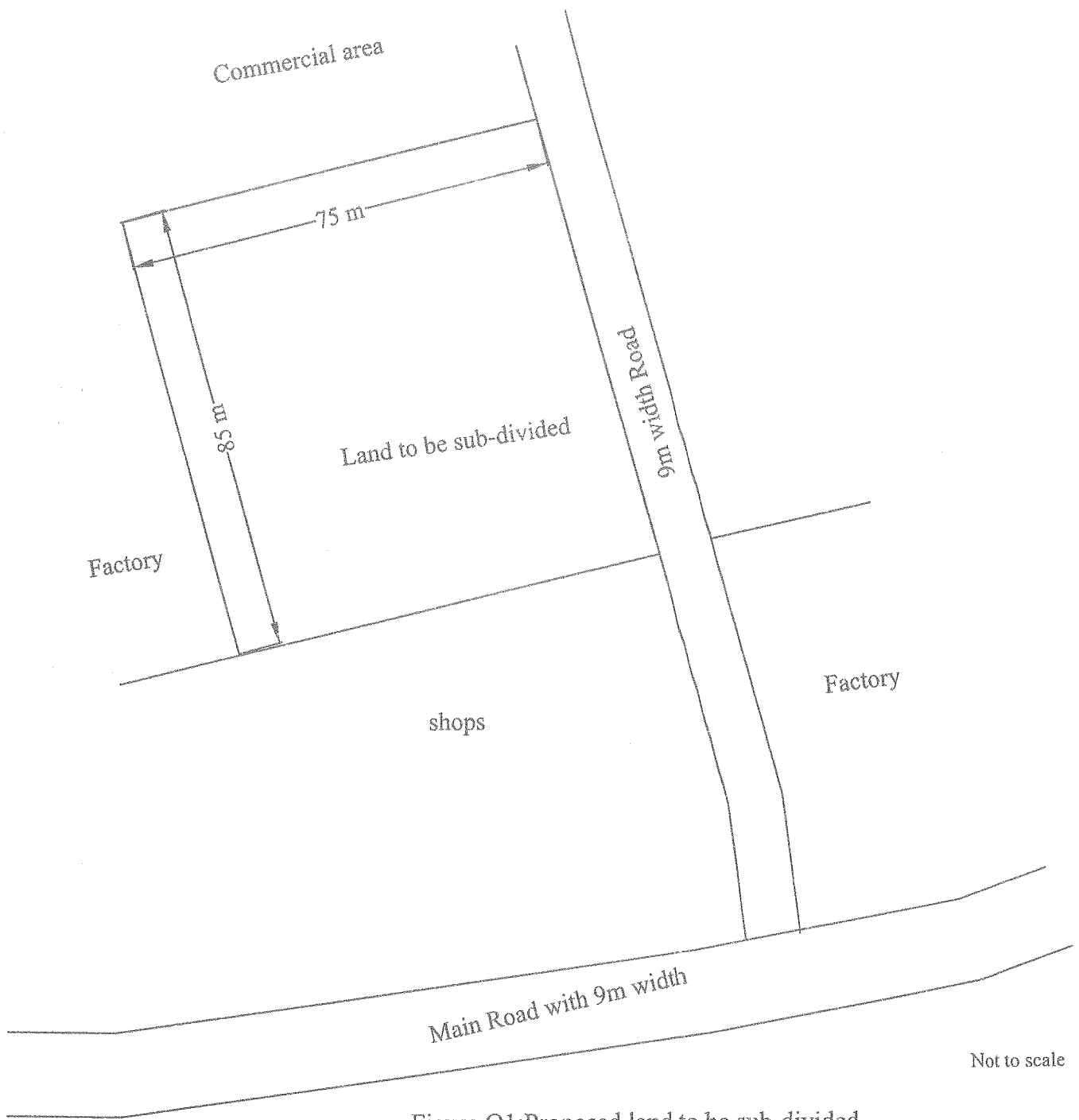
ii Provisional sum items

iii Extra works

[3.0 Marks]

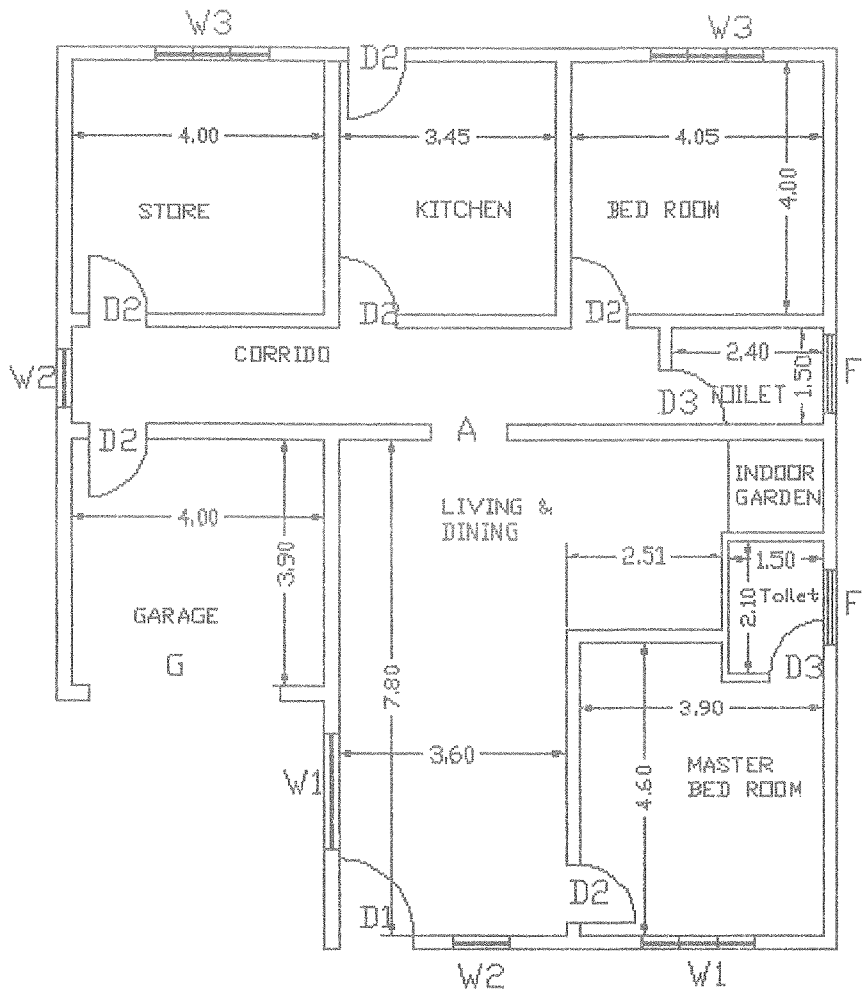
- b) Data sheet 1 in pages 8 and 9 shows a part of a BOQ prepared for a proposed shopping complex for ABC (Pvt) Company. The total contract sum of the project is Rs. 123,520,650.00. Bid submission for this project was ended on 15<sup>th</sup> February, 2016. Project was started on 15<sup>th</sup> May, 2016. Contractor put his first claim for the activities given in the BOQ under categories A, B and C on 7<sup>th</sup> July, 2016. By this date, contractor's material storage is having materials worth of Rs. 125,000.00. Calculate the price adjustment for this claim. Input percentages and price indices for the price adjustment are shown in Table Q5.

[7.0 Marks]



Not to scale

Figure Q1: Proposed land to be sub-divided



All dimensions are in meters

Figure Q3 (a): Floor Plan

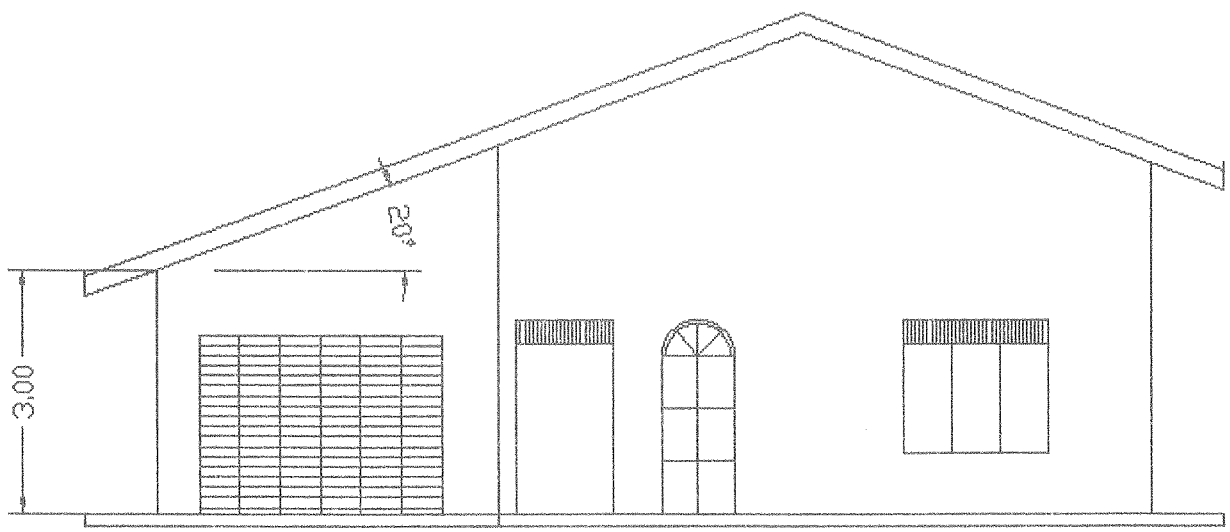


Figure Q3 (b): Front Elevation

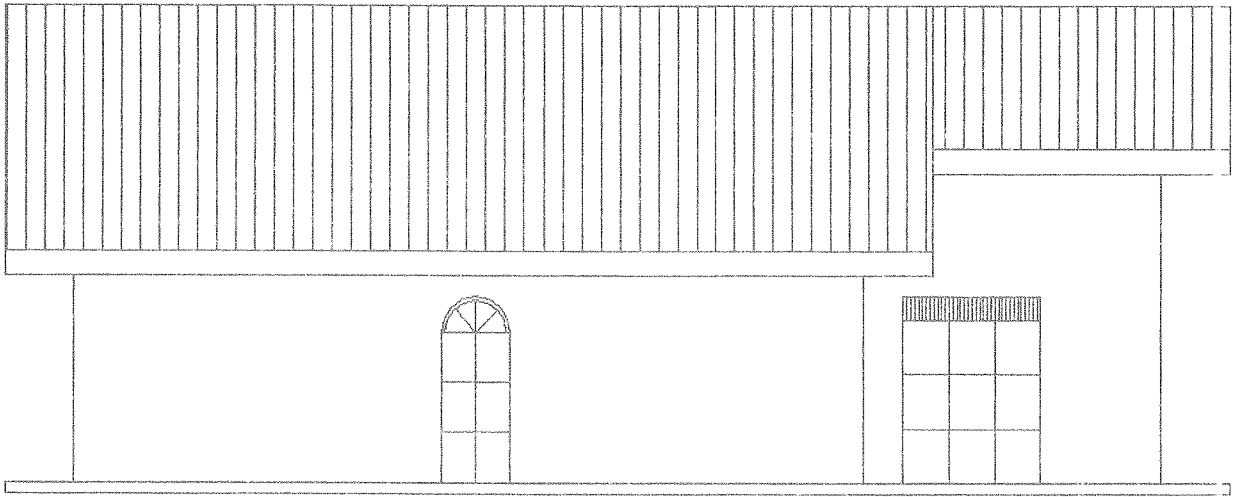
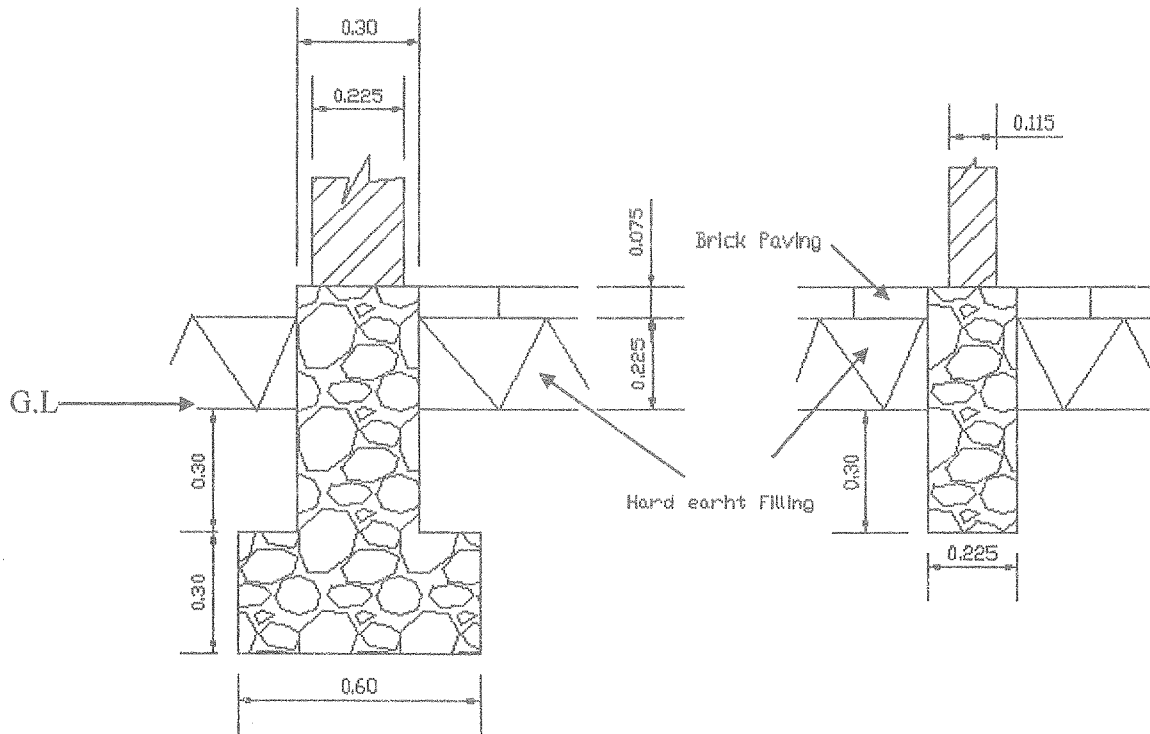


Figure Q3 (c): Side Elevation



All dimensions are in meters

Figure Q3 (d): Foundation Details

**Table Q4: Cost Data for Unit Rate Analysis (transport included)**

Resource	Price (Rs.)
Cement bag (50 kg)	920.00
Sand 1 cube	5500.00
Clay brick 1 No	16.00
Emulsion Paints (1 liter)	280.00
Brush (1 No)	1450.00
Water	Free of charge
Mason 8 hour day	1200.00
Pinter 8 hour day	1200.00
Unskilled labour 8 hour day	1000.00

**Table Q5: Input Percentages and Price Indices**

Input	Input %	Price indices in 2016						
		Jan	Feb	Mar	Apr	May	Jun	Jul
Cement	12.82	525.3	525.3	515.5	490.8	490.8	490.8	490.8
Rubble	3.76	639.6	639.6	639.6	639.6	647.6	647.6	647.6
Metal	1.79	361.9	361.9	361.9	361.9	363.3	363.3	363.3
Sand	6.20	2371.7	2470.2	2478.1	2478.1	2537.2	2537.2	2537.2
Brick	9.56	416.2	421.2	421.2	421.2	421.2	421.2	428.0
R/f steel	4.26	558.0	558.0	558.0	558.0	558.0	558.0	558.0
Asbestos roof	4.98	460.3	461.5	461.5	460.3	462.8	462.8	463.0
PVC pipe	2.00	778.0	778.0	778.0	778.0	778.0	778.0	778.0
Wall paint	3.34	661.5	661.5	661.5	661.5	665.5	665.5	660.0
Floor tile	2.05	231.7	231.7	233.2	233.2	233.2	235.4	235.4
Wall tile	1.35	944.8	944.8	945.1	945.1	945.1	947.2	947.2
Electrical fittings	3.43	212.3	212.3	214.4	214.4	214.4	214.4	214.4
Skilled Labour	18.57	445.9	462.9	481.7	481.7	481.7	486.4	486.4
Unskilled labour	15.88	494.6	513.9	542.8	542.8	542.8	550.0	550.0

**ICTAD Price Fluctuation Formulas**

$$F = \frac{0.966(V - V_{na})}{100} * \sum \frac{P_x(I_{xc} - I_{xb})}{I_{xb}} \quad \text{for contracts exceeding Rs. 10 million}$$

All the parameters are with their usual notations.

**Data Sheet 1**  
**Construction of shopping complex for ABC (Pvt) Company**  
**BILL OF QUANTITIES**

Item	Description	Qty	Unit	Rate	Amount
	<b><u>A-Demolition</u></b>				
A1	Demolition of existing building and removal it from the site as directed(Provided as an Item)		Item	Pro. Sum	456,893.00
	Total carried to summary				456,893.00
	<b><u>B-Preliminaries</u></b>				
B1	Providing an advance payment		Item	Pro. Sum	100,000.00
B2	Construction and maintenance of site office for contractor		Item	Pro. Sum	35,000.00
B3	Construction and maintenance of site office for Engineer		Item	Pro. Sum	35,000.00
B4	Allow sanitary facilitate for workers and staff		Item	Pro. Sum	30,000.00
B5	Provide construction management services	12	months	25,000.00	300,000.00
	Total carried to summary				500,000.00
	<b><u>C-Excavation and Earth Work</u></b>				
C1	Site clearing and preparation of the site including removal of top soil up to a depth of 150mm for the entire site area	1990	m <sup>2</sup>	100.00	199,000.00
C2	Excavate trenches to receive foundations commencing at foundation level, maximum depth not exceed 1.5m.	601	m <sup>3</sup>	1,500.00	901,500.00
C3	Filling to excavations with materials arising from the excavations deposited and compacted in 150mm thick layers.	908	m <sup>3</sup>	827.00	750,916.00
C4	Removal of surplus excavated materials as directed.	526	m <sup>3</sup>	250.00	131,500.00
C5	Approved hard earth filling under floors well rammed and consolidated in layers not exceeding 150mm.	172	m <sup>3</sup>	827.00	142,244.00
	Total carried to summary				2,125,160.00



	<b>D-Concrete Work</b>				
D1	Reinforced concrete 1:2:4 (20mm) in raft foundations poured into trenches against faces of excavation.	574	m <sup>3</sup>	15,606.00	8,957,844.00
D2	Reinforced concrete 1:2:4 (20mm) in slabs	2199	m <sup>3</sup>	15,606.00	34,317,594.00
D3	Reinforced concrete 1:2:4 (20mm) in columns.	32	m <sup>3</sup>	16,670.00	533,440.00
D4	Reinforced concrete 1:2:4 (20mm) in beams	144	m <sup>3</sup>	16,670.00	2,400,480.00
D5	High yield steel reinforcement	12500	kg	200.00	2,500,000.00
	Total carried to summary				43,275,438.00
	<b>E-Masonry Work</b>				
E1	Random rubble masonry in foundation in cement and sand mortar 1:8 mix up to D.P.C.level.	6	m <sup>3</sup>	3,980.00	23,880.00
E2	230mm brick walls in 1:5 cement sand mortar, flush pointed on both side.	451	m <sup>2</sup>	2,100.00	947,100.00
E3	115mm brick walls in 1:5 cement sand mortar, flush pointed on both side.	178	m <sup>2</sup>	1,100.00	195,800.00
E4	100mm block work in 1:5 cement sand mortar flush pointed on both sides	13	m <sup>2</sup>	1,398.00	18,174.00
E5	Cement and sand 1:3 mix in 15mm thick Damp Proof Course laid over foundation walls including applying two coats of hot bitumen and fine sand	2.4	m <sup>2</sup>	2,300.00	5,520.00
	Total carried to summary				1,190,474.00
	<b>F-Roof work</b>				
F1	Zink Aluminium Sheet	349	m <sup>2</sup>	2,145.00	748,605.00
F2	Roof Truss	1966	m	1,424.00	2,799,584.00
F3	GI pipes	497	m	1,424.00	707,728.00
F6	Zink Aluminium valance board	8.8	m <sup>2</sup>	1,400.00	12,320.00
	Total carried to summary				4,268,237.00

