2307/305
MEASUREMENT, ESTIMATING AND COSTING
Oct./Nov. 2011
Time: 3 hours

THE KENYA NATIONAL EXAMINATIONS COUNCIL

DIPLOMA IN CIVIL ENGINEERING

MEASUREMENT, ESTIMATING AND COSTING

3 hours

INSTRUCTIONS TO CANDIDATES

You should have the following for this examination:

Answer booklet;
Dimension papers;
Pocket calculator;
A copy of the standard method of measurement for building works and associated civil works for Eastern Africa (SMM);
A copy of the civil engineering standard method of measurement (CESMM)

*This paper consists of **SIX** questions in **TWO** sections; **A** and **B**.*
*Answer any **TWO** questions from each section.*
*Questions in section **A** carry 30 marks each while those in section **B** carry 20 marks each.*
Maximum marks for each part of a question are indicated.

This paper consists of 7 printed pages.

Candidates should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing.

Turn over

SECTION A: MEASUREMENT

*Answer any **TWO** questions in this section.*

1. Take off quantities for the substructure works shown on drawing No.01 upto and including the damp proof course (Use SMM). (30 marks)

2. Take off all quantities for external works shown on drawing No.02 (Use CESMM). (30 marks)

3. (a) Explain the following claims which may arise in a contract:

   (i) ex-gratia;
   (ii) contractual. (6 marks)

   (b) Outline:

   (i) **five** circumstances that may necessitate a contractor to claim for disturbance of works.

   (ii) **three** reasons for provision of extension of time in a building contract. (8 marks)

   (c) Explain the following terms used in measurement giving three examples in each case:

   (i) provisional sum;
   (ii) prime cost sum. (7 marks)

   (d) Describe any **three** contract documents used in civil engineering contracts. (9 marks)

SECTION B: ESTIMATING AND COSTING

*Answer any **TWO** questions from this section.*

4. (a) State **four** sources of cost information to an estimator. (2 marks)

   (b) Outline **six** reasons why the rates quoted for concrete works for the Thika Super Highway will differ from those of the proposed Great Lake Dam by the same contractor. (9 marks)

   (c) Explain the following terms as used in estimating:

   (i) unit rate;

   (ii) all in labour rate. (3 marks)

(d) Briefly explain **four** factors to consider when costing concrete works. (6 marks)

Use data given in Appendix 'A' for question 5 and 6.

5. Build up a unit rate for vibrated reinforced concrete (1:2:4) in foundation trench, per M^3. (20 marks)

6. Build up unit rates for each of the following items:

(a) 16mm diameter mild steel reinforcement, including tying, bending, distance blocks and all as necessary works, per Kg. (10 marks)

(b) excavation ancillaries; disposal of excavated material; top soil (measured in accordance with CESMM). (10 marks)

APPENDIX A

GENERAL

Skilled labour per hour	Kshs 75.00
Unskilled labour per hour	Kshs 40.00
Overheads and profits	25%
Cost of materials include transport to site.	
Assume any necessary information not given.	

CONCRETE WORKS

Cement per 50kg bag	Kshs 800
Sand per tonne	Kshs 900
Ballast per tonne	Kshs 1200
Density of cement	1440 kg/m^3
Density of sand	1600 kg/m^3
Density of ballast	1700 kg/m^3
Purchase price of 200 litre mixer	Kshs 450,000
Resale value after 4 years	Kshs 65,000
Interest on investment	30% of purchase price
Insurance per annum	4% of purchase price
Haulage from site per annum	Kshs 50,000
Hours worked in a year	1800
Diesel consumption	Kshs 520 per day
Cycle time	*3 minutes*
Efficiency	90%
Assume 5 labourers and one operator	
Hire rate for vibrator	Kshs 5,000 per day.

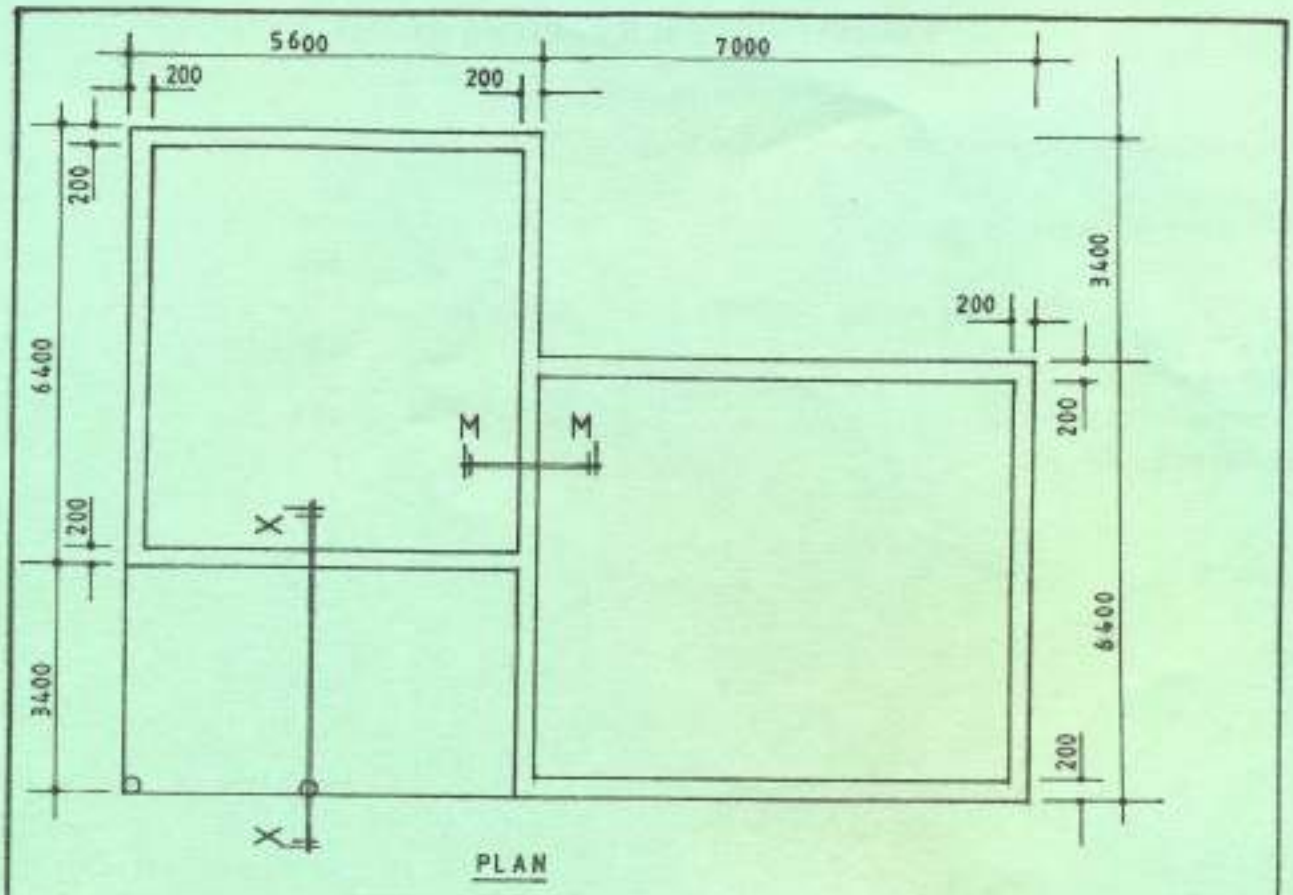
REINFORCEMENTS

Consider 500 kg of reinforcement

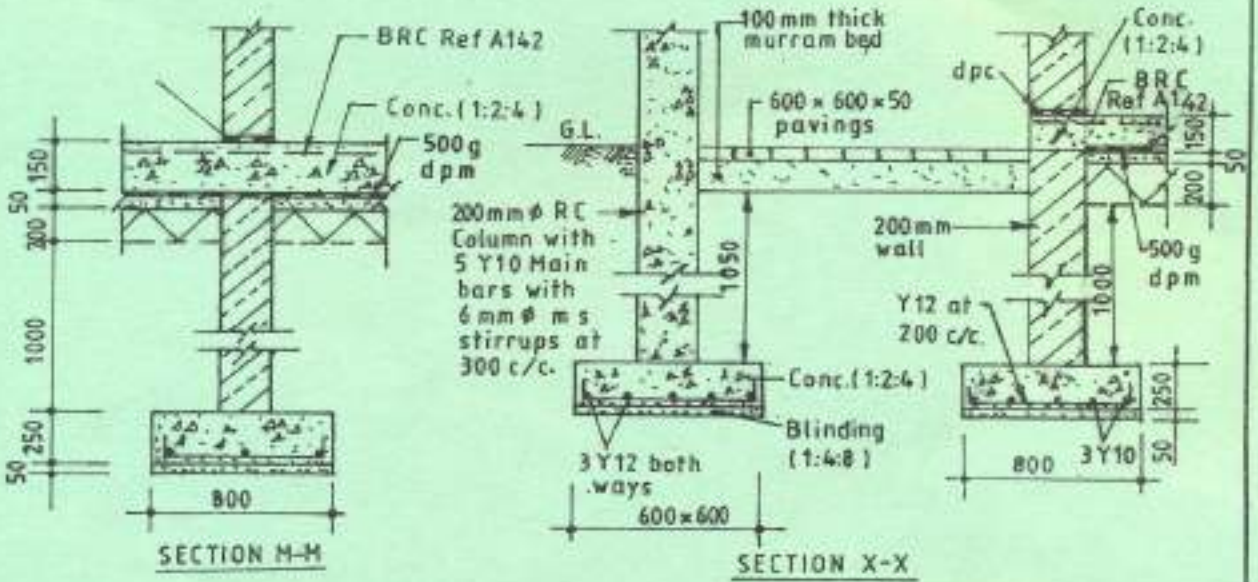
16mm diameter reinforcement bar full length costs	Kshs 1150
16mm diameter reinforcement bars weighs	1.58 kg/m
Assume 500kg of reinforcement is fixed in 90 hours.	
Unloading and packing takes 6 hours per 500 kg.	

EXCAVATIONS ANCILLARIES (CESMM)

Owning and operating cost for tipper lorry per hour	Kshs 1930
Efficiency of lorry	80%
Haul distance	5km
Average empty haul of lorry	60km/hr
Tipping time	1 minute
Bulking of soil	25%
Working hours per week	45 hours
Loading cost per m^3	Kshs 300



PLAN



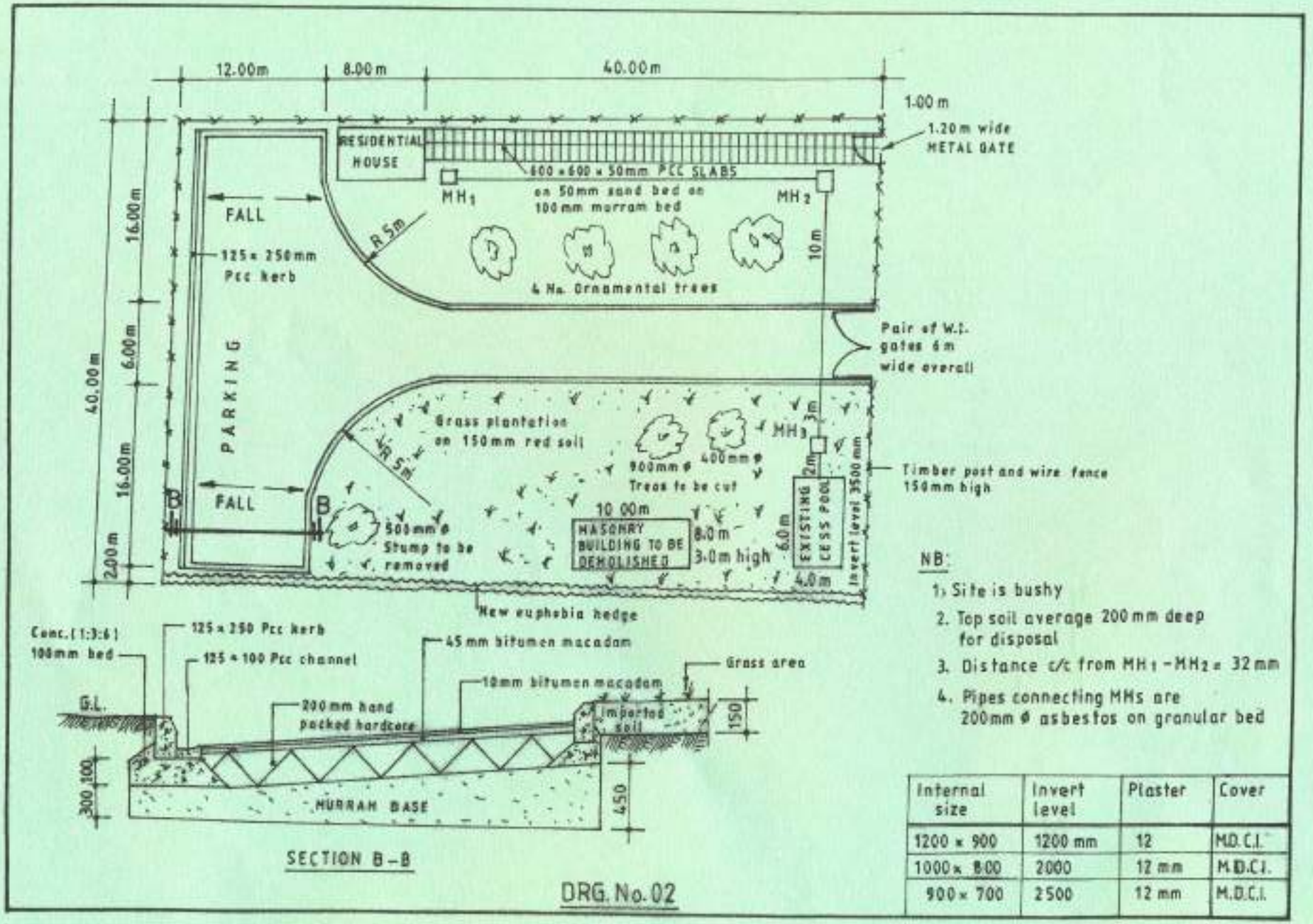
SECTION M-M

SECTION X-X

NOTE:

1. Vegetable soil av 150 to be preserved on site
2. Ignore reinforcement
3. Rock commence at 600 deep below ground level

DRG. No. 01



Internal size	Invert level	Plaster	Cover
1200 x 900	1200 mm	12	M.D.C.I.
1000 x 800	2000	12 mm	M.D.C.I.
900 x 700	2500	12 mm	M.D.C.I.

DRG. No. 02