METHOD II

Centre Line Method. — In this method known as centre line method sum-total length of centre lines of walls, long and short, has to be found out. Find the total length of centre lines of walls, of same type, long and short having same type of foundations and footings and then find the quantities by multiplying the total centre length by the respective breadth and the height. In this method, the length will remain same for excavation in foundation, for concrete in foundation, for all footings and for superstructure (with slight difference when there are cross walls or number of junctions). This method is quick but requires special attention and consideration at the junctions, meeting points of partition or cross walls, etc.

For rectangular, circular polygonal (hexagonal, octagonal, etc.) buildings having no inter or cross walls, this method is quite simple. For buildings having cross or partition walls, for every junction of partition or cross walls with main walls, special consideration shall have to be made to find the correct quantity. For each junction half breadth of the respective item or footing is to be deducted from the total centre length. Thus in the case of a building with one partition wall or cross wall having two junctions, for earthwork in foundation trench and foundation concrete deduct one breadth of trench or concrete from the total centre length (half breadth for one junction and one breadth ($2 \times \frac{1}{2}$ = one for two junctions). For footings, similary deduct one breadth of footing for two junctions from the total centre length, and so on. If two walls come from opposite direction and meet a wall at the same point, then there will be two junctions.

For building having different types of walls, each set of walls shall have to be dealt separately. Find the total centre length of all walls of one type and proceed in the same manner as described above. Similarly find the total centre length of walls of second type and deal this separately, and so on.

In the case of a building having different type of walls, suppose the outer (main) walls are of A type and inter cross walls are of B type, then all A type walls shall be taken jointly first, and then all B type walls shall be taken together separately. In such cases no deduction of any kind need be made for A type walls, but when B type walls are taken, for each junction deduction of half breadth of A type wall (main wall) shall have to be made from the total centre length of walls.

It may be noted that at corners of the building where two walls are meeting no substraction or addition is required.

When there are number of footings, the length of the first footing is to be determined by deducting half breadth of footing per junction from the total centre line length and then the length of the subsequent footing can be obtained simply by adding one offset of footing i.e. 5 cm for every junction to the length of the previous footing.

The examples 3(a), 4(a) and 5(a) which have been solved by method I in the previous pages have been solved again under examples 3(b), 4(b) and 5(b) in the following pages, by method II to illustrate this method. These illustrations will make this method quite clear.

Note. — *Student should practice method I first and when they have become sufficiently acquainted with method I, then only they should take up the method II.*

Example 3(b). — Estimate by *centre line method* the quantities of the following items of a single room building Fig. 2-3 of example 3a (page 31)—(1) Earthwork in excavation in foundation (2) Concrete in foundation, (3) Brickwork in foundation and plinth, and (4) Brickwork in superstructure.

Total centre length of walls = AB + BC + CD + DA = 5.30 + 4.30 + 5.30 + 4.30 = 19.20 m
Fig. 2-8 represents the foundation trench plan.

If the total centre length is multiplied by the breadth and the depth we get the quantity of earthwork in excavation. By doing so we take certain portion twice and leave an equal portion but this does not affect the quantity.

The quantity of excavation = AB × 90 cm × 90 cm + BC × 90 cm × 90 cm + CD × 90 cm × 90 cm + DA × 90 cm × 90 cm. It may be noticed that the portions P,Q,R and S marked with double hatch lines come twice while the portions K,L,M,N left blank do not come at all, but these portions being equal in magnitude, we get the correct quantity.

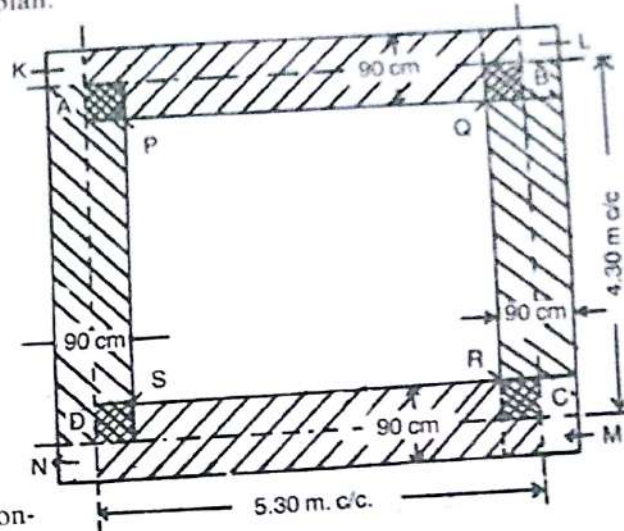The same principle applies to foundation concrete, footings, plinth wall and superstructue wall.

Fig. 2-8

DETAILS OF MEASUREMENT AND CALCULATION OF QUANTITIES (Ex. 3b)

Item No.	Description of Items	No.	Length	Breadth	Height or Depth	Quantity	Explanatory notes
1.	Earthwork in excavation in foundation ...	1	19.20 m	.90 m	.90 m	15.55 cu m	Total centre length of all walls = 19.20 m
2.	Concrete in foundation ...	1	19.20 m	.90 m	.30 m	5.18 cu m	
3.	Brickwork in foundation and plinth						
	1st footing ...	1	19.20 m	.60 m	.30 m	3.46	
	2nd footing ...	1	19.20 m	.50 m	.30 m	2.88	
	Plinth wall ...	1	19.20 m	.40 m	.60 m	4.61	
					Total	10.95 cu m	
4.	Brickwork in super-structure ...	1	19.20 m	.30 m	3.50 m	20.16 cu m	Door and window openings, lintels, etc. to be deducted.

Note.— The above may be compared with the solution by method I given in page 33.

Example 4(b). — Estimate by *centre line method* the quantities of the following items of a two roomed building Fig. 2-6 Example 4a (page 35)—

(1) Earthwork in excavation in foundation, (2) Lime concrete in foundation, (3) 1st class brickwork in cement mortar 1:6 in foundation and plinth, (4) 2.5 cm c.c. damp proof course, and (5) 1st class brickwork in lime mortar in superstructure.

In this problem there are two junctions of the inter wall with the main wall.

Total centre length of wall = 2 × c. to. c. of long wall + 3 × c. to c. of short wall.
= 2 × 10.60 + 3 × 6.30 = 40.10 m
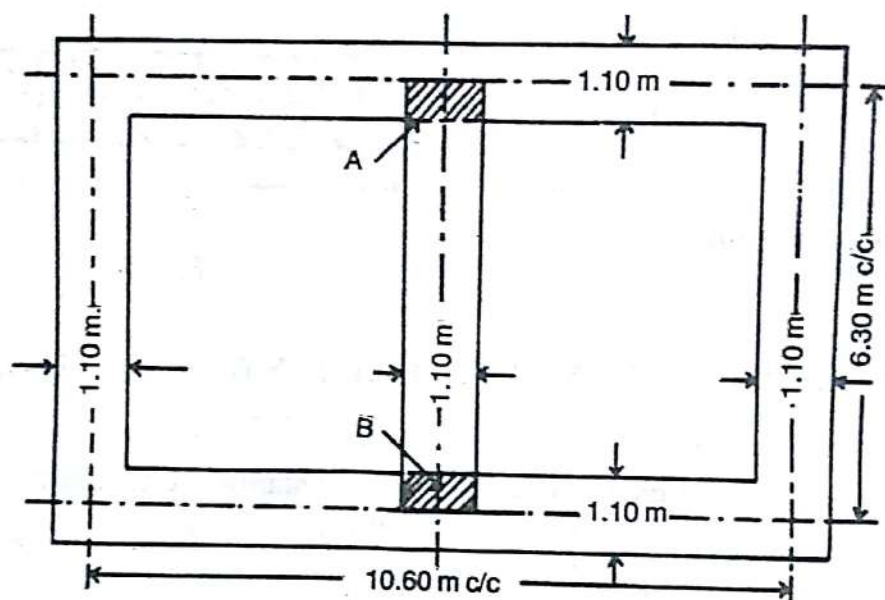
Fig. 2-9 represents the foundation trench plan.

Fig. 2-9

If the total centre length is multiplied by the breadth and depth, at the junction the portions A and B shown by hatch lines in Fig. 2-9 come twice, and we get the quantity in excess by these portions, and these excesses shall have to be deducted. The deduction may be effected reducing the centre length by half breadth for each junction.

Thus the quantity of earthwork in excavation —

= [Total centre length — (2 × ½ breadth)] × breadth × depth.

= (40.10 – 2 × ½ × 1.10) × 1.10 × 1.00 = 39.00 × 1.10 × 1.00 = 42.90 cu m.

The same principle applies to foundation concrete, to footings, plinth wall and superstructure wall. At every stage deduction of half breadth of the main wall at that particular level shall have to be made per junction (*i.e.* one breadth for two junctions) from the total centre length, and this net centre length after deduction shall be multiplied by the respective breadth and the height or depth to get quantities.

The estimate of the quantities of this Example 4(b) is as follows:—

DETAILS OF MEASUREMENT AND CALCULATION OF QUANTITIES (Ex. 4b)

Item No.	Particulars of Items	No.	Length	Breadth	Height or Depth	Quantity	Explanatory notes
1.	Earthwork in excavation in foundation ...	1	39.00 m	1.10 m	1.00 m	42.90 cu m	Total centre length = 40.10 m $L = 40.10 - 2 \times \dfrac{1.10}{2}$ $= 39.00$ m
2.	Lime concrete in foundation ...	1	39.00 m	1.10 m	.30 m	12.87 cu m	L same as above.
3.	1st class brick-work in 1:6 cement mortar in foundation and plinth —						
	1st footing ...	1	39.30 m	.80 m	.20 m	6.29	$L = 40.10 - 2 \times \dfrac{.80}{2} = 39.30$m
	2nd footing ...	1	39.40 m	.70 m	.10 m	2.76	$L = 40.10 - 2 \times \dfrac{.70}{2} = 39.40$m
	3rd footing ...	1	39.50 m	.60 m	.10 m	2.37	$L = 40.10 - 2 \times \dfrac{.60}{2} = 39.50$m
	4th footing ...	1.	39.60 m	.50 m	.10 m	1.98	$L = 40.10 - 2 \times \dfrac{.50}{2} = 39.60$m
	Plinth wall above footing ...	1	39.70 m	.40 m	.80 m	12.70	$L = 40.10 - 2 \times \dfrac{40}{2} = 39.70$m
					Total	26.10 cu m	
4.	Damp proof course 2.5 cm c.c. ...	1	39.70 m	.40 m	—	15.88	$L = 40.10 - 2 \times \dfrac{40}{2} = 39.70$m
	Deduct door sill ...	2	1.20 m	.40 m	—	0.96	
					Net	14.92 cu m	
5.	1st class brick-work in lime mortar in superstructure ... Deduct door, window, shelve openings and lintels ...	1	39.80 m	.30 m	4.20 m	50.15	$L = 40.10 - 2 \times \dfrac{30}{2} = 39.80$m
		1	Same page 37	as per	detail in	4.40	Deduction to be made as usual.
					Net	45.75 cu m	

Note.— *The length of 2nd footing can be obtained simply by adding 10 cm (i.e. 2 × 5 cm) to the length of the 1st footing, the length of 3rd footing by adding 10 cm to the length of the 2nd footing and so on.*

This may be compared with the solution by method I worked out in pages 36-37.

Example 5(b).—Estimate by *centre line method* the quantities of the following items of residential building, Fig. 2-7 of Example 5a (page 38).

(1) Earthwork in excavation in foundation, (2) Lime concrete in foundation, (3) First class brickwork in 1 : 6 cement sand mortar in foundation and plinth, (4) Damp proof course and (5) First class brickwork in lime mortar in superstructure.

Total centre length of all 30 cm walls (same type) of main rooms
= Total centre length of walls of drawing and left side bed room + Total centre length of walls of bed rooms right side
= (2 × c. to c. length of long wall + 3 × c. to c. length of short wall)
+ (2 × c. to c. length of long wall + 2 × c. to c. length of short wall)
= (2 × 10.60 + 3 × 5.30) + (2 × 9.60 + 2 × 4.80)
= 37.10 + 28.80 = 65.90 m.

Number of junctions for these walls is 6 marked 'x' in the plan Fig. 2-7, page 38 and all these junctions are with main walls of 30 cm.

Total centre length of all 20 cm walls (same type) of front verandah, back verandah and bath room

= (c. to c. length of front wall + c. to c. length of side wall) + (c. to c. length of back verandah long wall including bath + 2 × c. to c. length of cross walls of bath room)
= (9.65 + 2.25) + (9.65 + 2 × 2.75) = 11.90 + 15.15 = 27.05 m.

Number of junctions of these wall is 5 is marked '+' and one is marked '−' in the plan Fig. 2-7, page 38.

Five junctions are with main walls of 30 cm and one junction with similar wall of 20 cm.

See page 39 for centre length of different walls.

The estimate of the different items by centre line method is as follows—

Item No.	Particulars of Items	No.	Length	Breadth	Height or Depth	Quantity	Explanatory notes
1.	Earthwork in excavation in foundation — Wall of main room (six junctions) ...	1	63.20m	.90 m	1.00 m	56.88	$L = 65.90 - 6 \times \frac{90}{2} = 63.20m$
	Walls of verandahs including bath (five and one junctions) ...	1	24.50 m	.60 m	.50 m	7.35	$L = 27.05 - 5 \times \frac{90}{2} - 1 \times \frac{60}{2}$ $= 24.50$ m
					Total	64.23 cu m	
2.	Lime concrete in foundation — Walls of main rooms ...	1	63.20 m	.90 m	.30 m	17.06	L same as above.
	Walls of verandah and bath ...	1	25.50 m	.60 m	.20 m	3.06	$L = 27.05 - 5 \times \frac{50}{2} - 1 \times \frac{60}{2}$ $= 25.50$ m (*Minus half breadth per junction at the same level*)
					Total	20.12 cu m	
3.	1st class brick-work in foundation and plinth in 1 : 6 cement mortar — Walls of main rooms —						
	1st footing ...	1	64.10 m	.60 m	.20 m	7.69	$L = 65.90 - 6 \times \frac{60}{2} = 64.10$m
	2nd footing ...	1	64.40 m	.50 m	.20 m	6.44	$L = 65.90 - 6 \times \frac{50}{2} = 64.40$m
	Plinth wall above footing ...	1	64.70 m	.40 m	.90 m	23.29	$L = 65.90 \ldots 64.70$m (*Length of subsequent footing after first can be obtained by adding 6 × 5 = 30 cm to the previous footing*).
	Walls of verandah and bath — Footing ...	1	25.85 m	.40 m	.20 m	2.07	$L = 27.05 - 5 \times \frac{40}{2} - 1 \times \frac{40}{2}$ $= 25.85$ m
	Plinth wall above footing	1	25.90 m	.30 m	.70 m	5.44	$L = 27.05 - 5 \times \frac{40}{2} - 1 \times \frac{30}{2}$ $= 25.90$ m
					Total	44.93 cu m	

Item No.	Particulars of Items	No.	Length	Breadth	Height or Depth	Quantity	Explanatory notes
4.	2.5 cm Damp proof course						
	Walls of main rooms ...	1	64.70 m	.40 m	—	25.88	L same as for plinth wall
	Verandah pillars ...	4	0.50 m	.30 m	—	0.60	
	Bath room (total of 3 walls) ...	1	7.30 m	.30 m	—	2.19	L = (2.20 + 2 × .15) + 2
					Total	28.67	$(2.75 - \frac{.40}{2} - \frac{.30}{2}) = 7.30$
	Deduct door sills ...		Same page	as per 43	detail in	3.91	Details of deduction as u
				Net	Total	24.76 sq m	
5.	1st class brick-work in superstructure in lime mortar—						
	Walls of main rooms ...	1	65.00 m	.30 m	4.00 m	78.00	$L=65.90 - 6 \times \frac{.30}{2} = 65.00$
	Walls of verandah and bath (as solid)	1	26.20 m	.20 m	3.05 m	15.98	$L=27.05 - 5 \times \frac{.30}{2} - 1 \times \frac{2}{2}$ $= 26.20$ m
					Total	93.98	
	Deduct openings and lintels ...		Same pages	as per 44-45	detail in	27.40	Details of deduction as usual.
				Net	Total	66.58 cu m	

Note.—This solution may be compared with that of by method I worked out in pages 40-

Method I, 'Long wall and Short wall" method as explained in pages 29 to 45 is general followed in the Engineering Department. The measurement of the work done, is taken separate for each wall for preparing bill for payment and the quantity for each wall as per measurement m be compared with the estimated quantity.