Concrete Works

The concrete for a project may be either ready mixed or mixed on the job.

When estimating footings, columns, beams, and slabs, their volume is determined by taking the linear dimension of each item times its cross-sectional area.

The procedure that should be used to estimate the concrete on a project is as follows:

1. Review the specifications to determine the requirements for each area in which concrete is used separately (such as footings, floor slabs, and walkways) and list the following:

    (a) Type of concrete

    (b) Strength of concrete

    (c) Color of concrete

    (d) Any special curing or testing

2. Review the drawings to be certain that all concrete items shown on the drawings are covered in the specifications.

3. List each of the concrete items required on the project.

4. Determine the quantities required from the **working drawings**. Footing sizes are checked on the wall sections and foundation plans. Watch for different size footings under different walls.

Examples

Use the following building plan and cross-sections to calculate the concrete contained in the following items:

a. Blinding

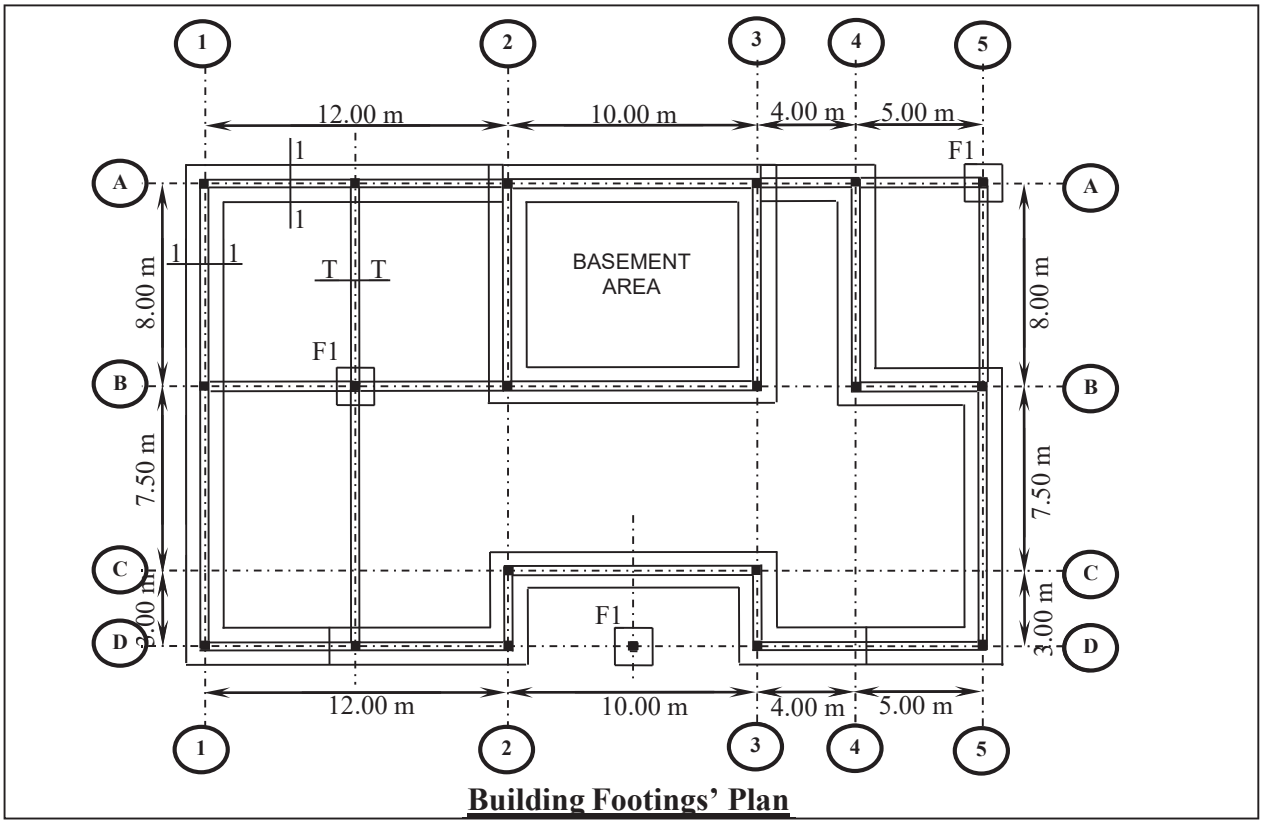
b. Continuous and Spread Footings, and Grade Beams

c. Retaining and Bearing Walls, and Columns

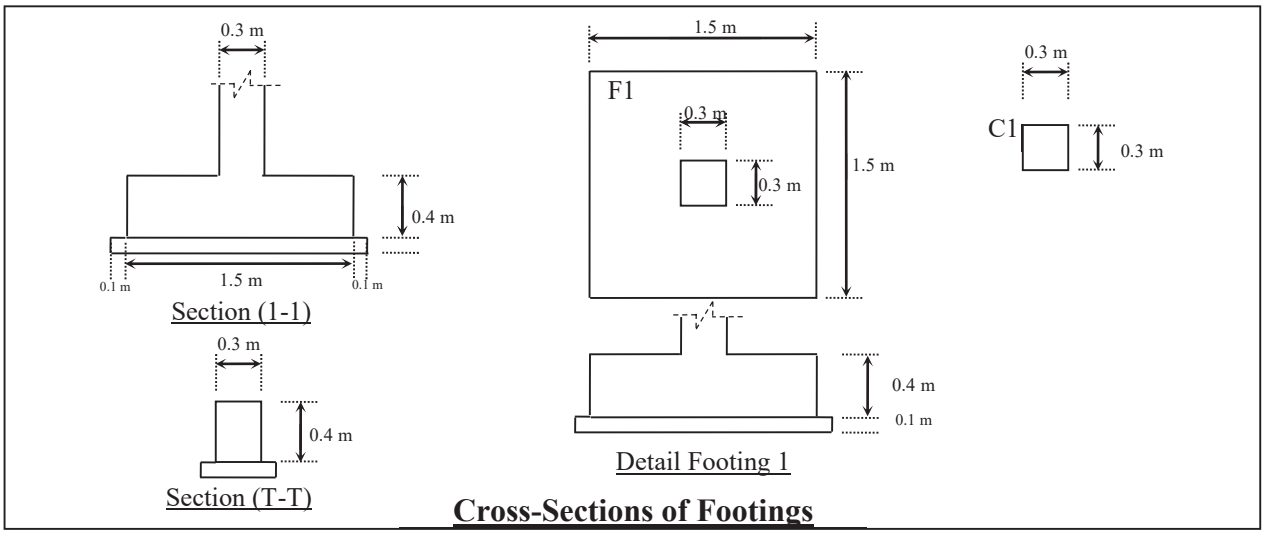
d. Basement and Ground Floorings

e. Staircases

f. Solid and Ribbed Slabs



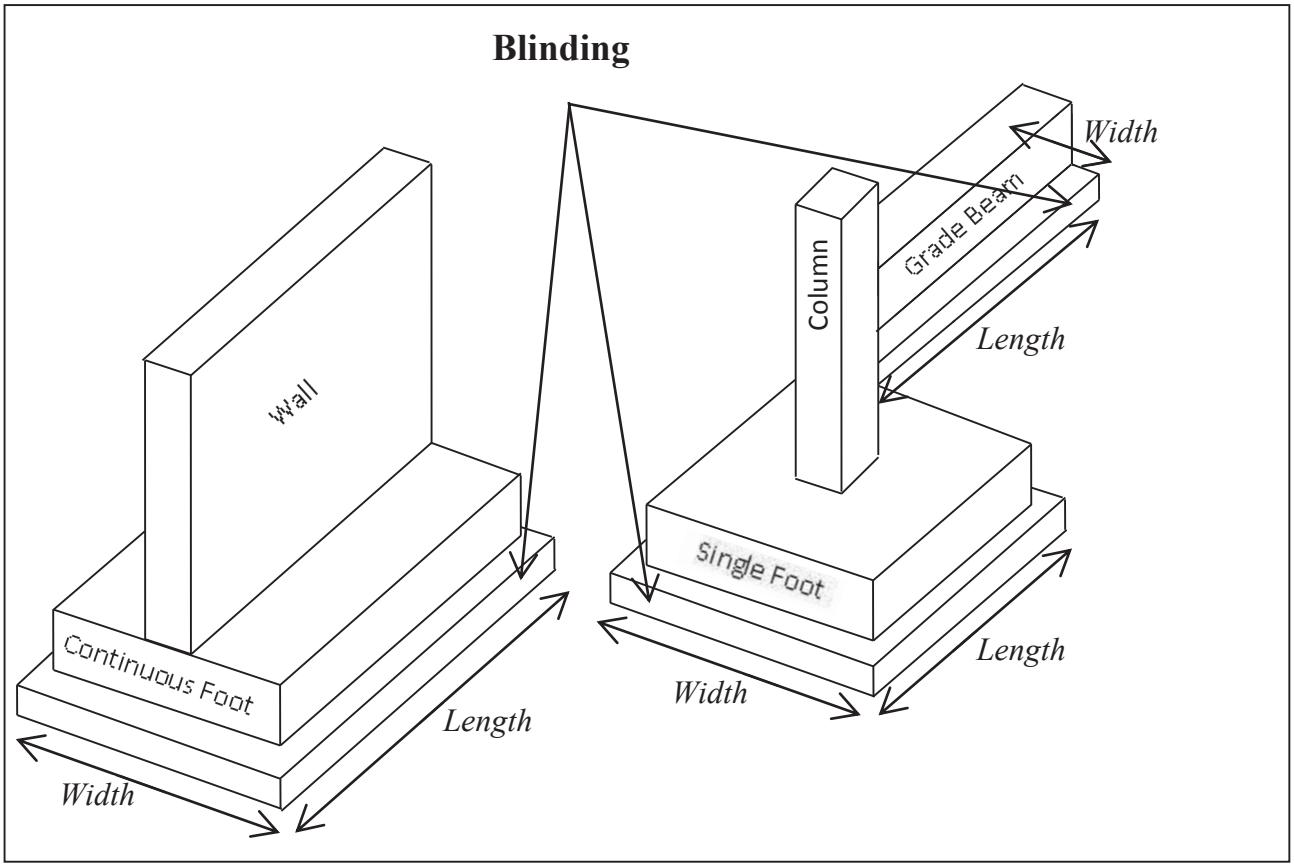
Building Footings' Plan



Cross-Sections of Footings

Blinding

Measured in m^2



$Blinding\ of\ continuous\ Footing\ (1-1) = Width\ \times Length$

$= 1.7 \times (12 + 10 + 4 + 8 + 5 + 7.5 + 3 + 5 + 4 + 3 + 10 + 3 + 12 + 18.5 + 8 + 10 + 8 - 1.7)$

$= 219.81\ m^2$

$Blinding\ of\ Single\ Footings\ (F_1) = Width\ \times Length \times Number$

$= 1.7 \times 1.7 \times 3 = 8.67\ m^2$

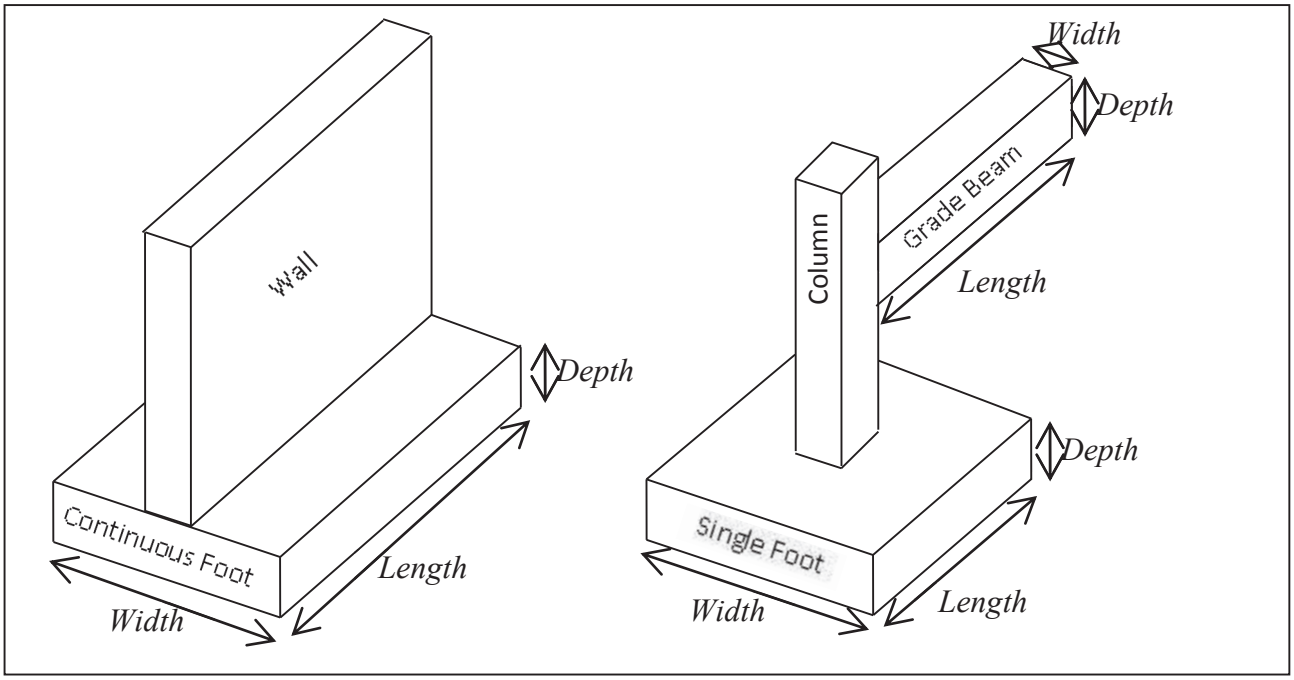
$Blinding\ of\ Grade\ Beam\ (T-T) = Width\ \times Length$

$= 0.5 \times (7.7 + 10.2 + 11.4 + 4.7 + 7.7) = 20.85\ m^2$

$\boldsymbol{Total\ Blinding\ Area} = 219.81 + 8.67 + 20.85 = 249.33\ m^2$

Concrete of Footings

Measured in m^3



$Continuous\ Footing\ (1-\ 1) = Width \times Depth \times Lenght$

$= 1.5 \times 0.4 \times (12 + 10 + 4 + 8 + 5\ + 7.5 + 3 + 5 + 4 + 3 + 10 + 3 + 12 +\ 18.5 + 8 + 10 + 8 - 1.5)$

$= 78.42\ m^3$

$Single\ Footing\ (F1) = Width \times Depth \times Lenght \times Number$

$= 1.5 \times 0.4 \times 1.5 \times 3 =\ \ m^3$

$Grade\ Beam\ (T-T) = Width \times Depth \times Lenght$

$= 0.3 \times 0.4 \times (7.7 + 10.2 + 5.7 + 5.7 + 4.7 + 7.7) =\ \ m^3$

*When ordering concrete to the project site, add 5% to the calculated volumes for waste and round off.

Concrete of Walls and Columns: Measured in m^3

a. Retaining Walls of the Basement

b. Bearing Walls outside the Basement

c. Shear Walls of the Staircases

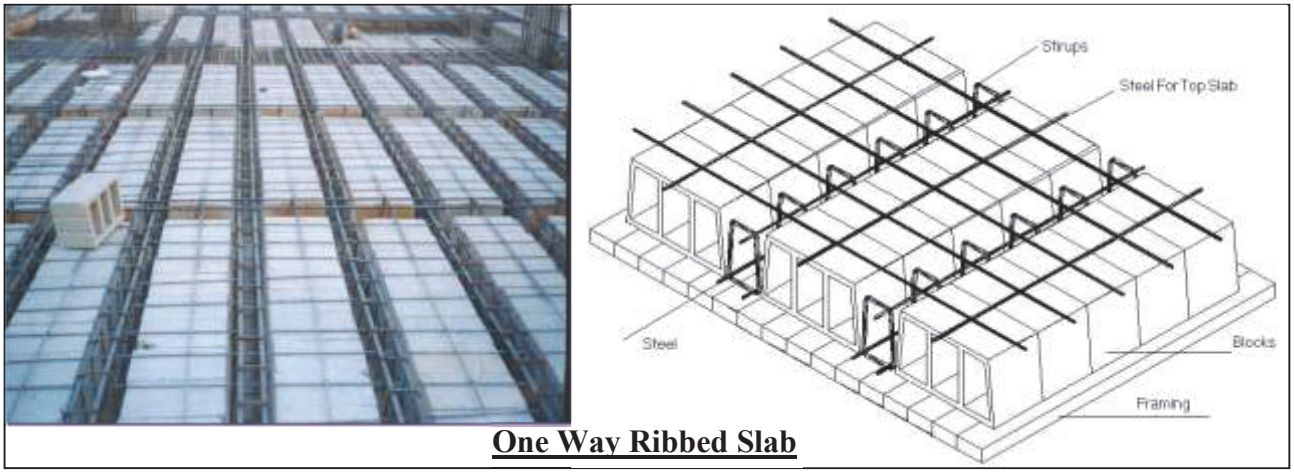
d. Columns

Concrete of Floors: Measured in m^2

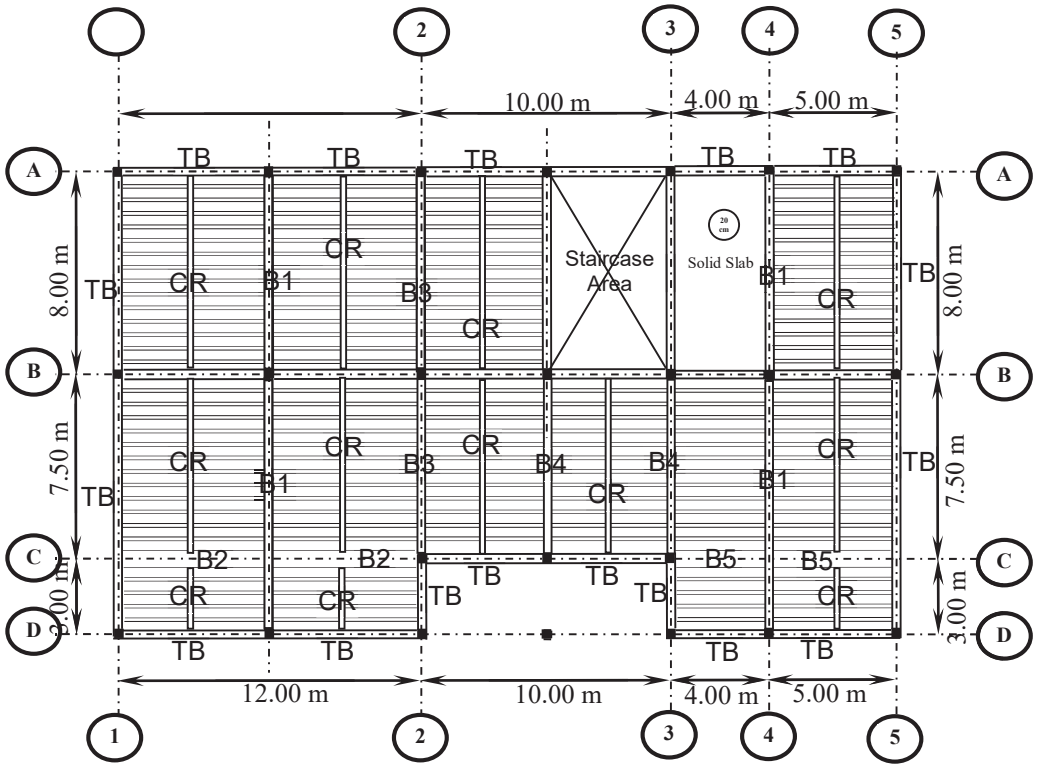
Concrete of Stairs: Measured in m^3

Concrete of Slabs

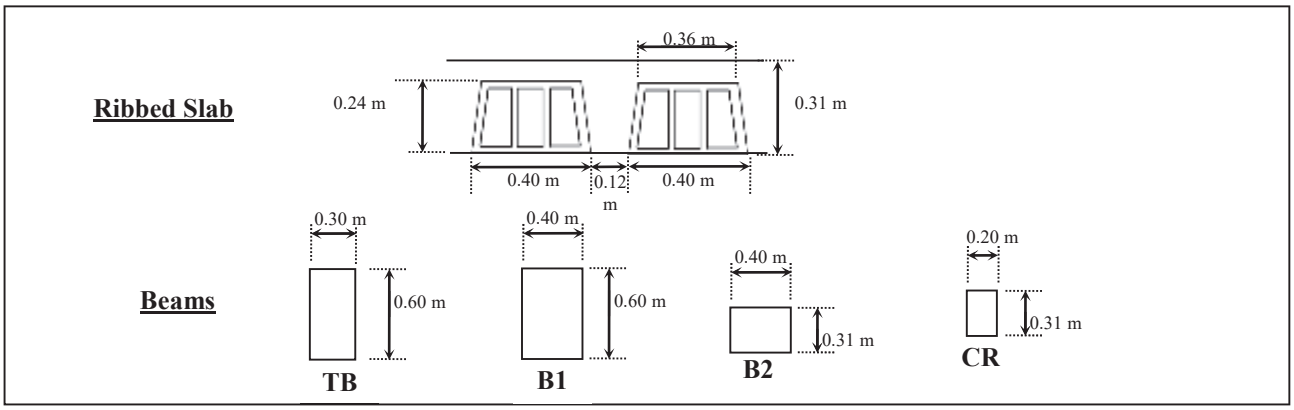
Measured in m^3



One Way Ribbed Slab



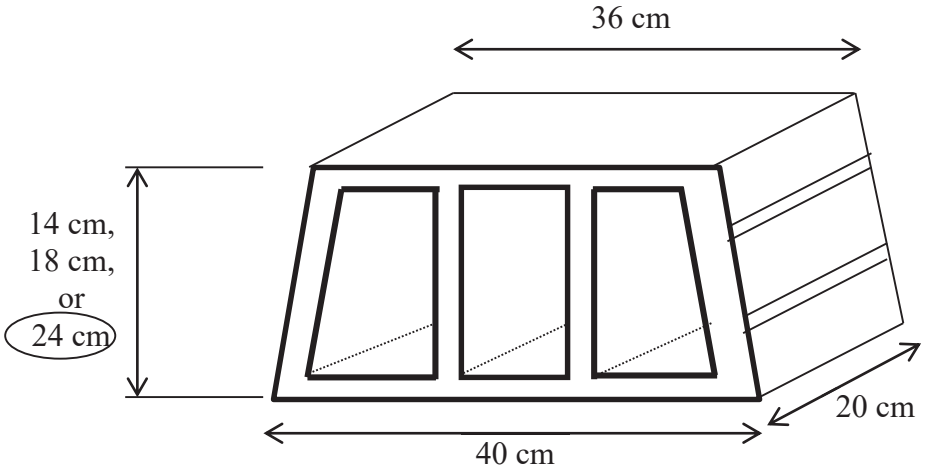
Ground Floor Slab



Find concrete volume for the following types of slabs:

(A) Solid Slab. (B) One-way Ribbed Slab

Item	Work Description	Unit	Dimensions			No.	Total Quantity	Notes
			Length	Width	Height			
1	Solid Slab	m^3	4.4	3.7	0.20	1	3.256	Basement Slab (A)
2	One-way Ribbed Slab	m^3	1.3	10	0.31			
			7.4	13.7	0.31			
			5.9	9.9	0.31			
			2.1	5.9	0.31		57.406	
	Reduce bricks volume					38x18		(B)
						16x13		(C)
						15x17		(D)
						7x10		(E)
	Total volume of Bricks=	No.	0.2	0.38	0.24	1217	-22.198	B,C,D, and E
	Total Concrete Volume=	m^3					35.208	



Slab Block Dimensions

Steel Reinforcement

The reinforcing used in concrete may be reinforcing bars, welded wire mesh (WWF), or a combination of the two.

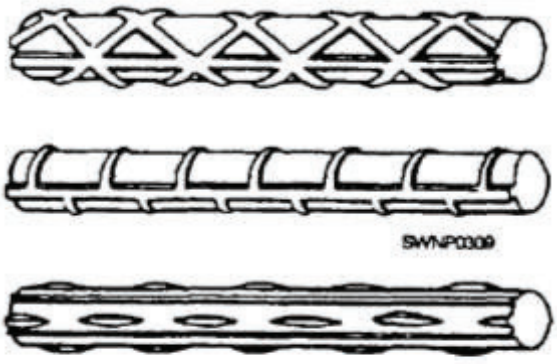


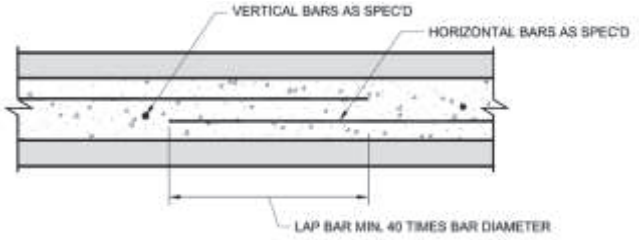
Figure 7-1.—Various types of deformed bars.

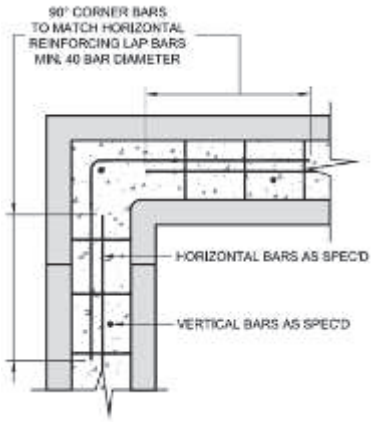
Size (mm)	6	8	10	12	14	16	18	20
Area (mm²)	28.3	50.3	78.5	113.0	153.96	201.0	254.0	314.0
Weight (kg per m)	0.222	0.395	0.617	0.888	1.209	1.58	**2.00**	2.47

Size (mm)	22	25	28	32	36	40	45	50
Area (mm²)	381.0	491.0	616.0	804.0	1020.0	1257.0	1509.0	1963.0
Weight (kg per m)	2.98	3.85	4.83	6.31	7.99	9.86	12.50	15.41

Unit weight of standard reinforcing steel bars

$$Unit\ Weight\ of\ \emptyset\ Bar = \frac{\emptyset^2}{18^2} \times 2\ \ (kg/m)$$

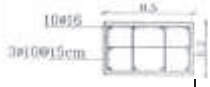




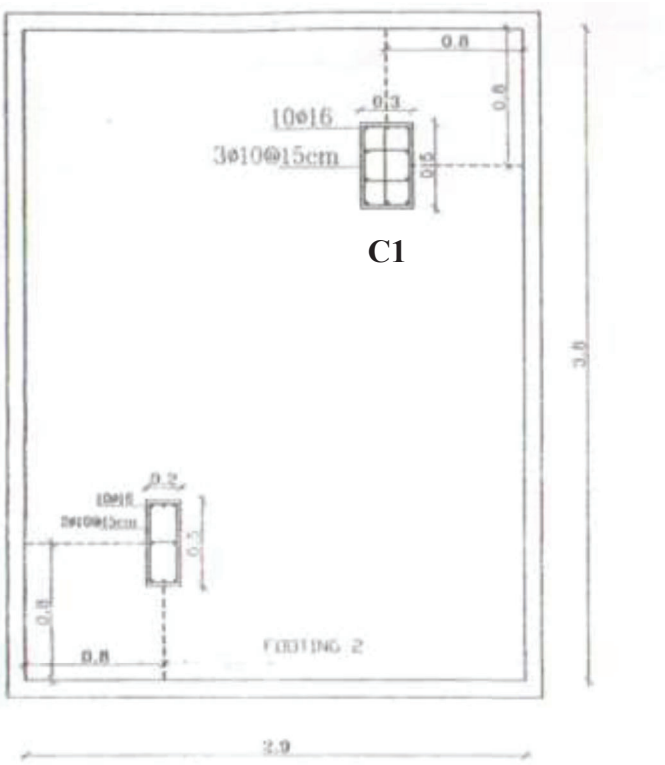
Example:

Find reinforcement bars quantities and weight for the following items:

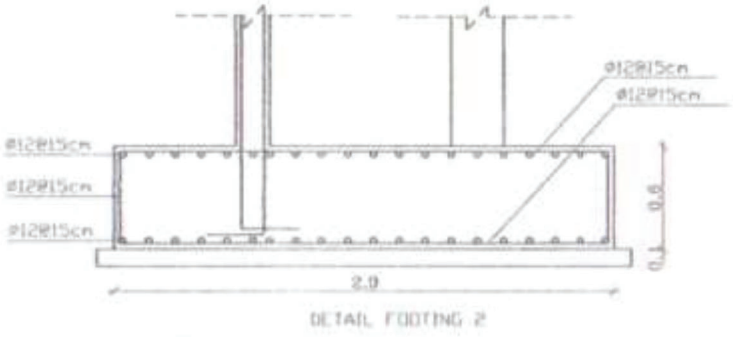
1. Footings. 2. Walls. 3. Columns. 4. Slabs

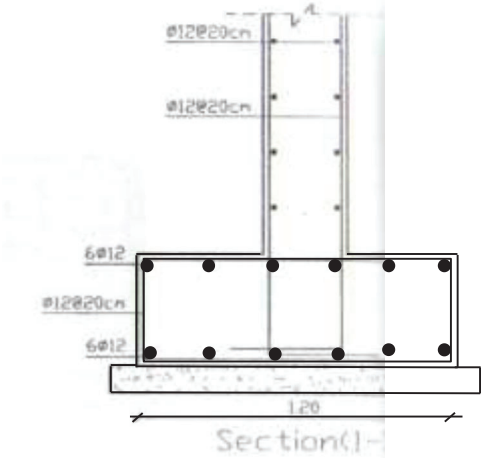
Item	Work Description	Reinforcement Bar Shape	Bars Length	Number of Bars	Total Length	Weight per 1 m.r	Total Weight
1.1	Footing 2	Ø12	(3.8-.08+0.6-.08)x2+.2=7.24	(2.9-.08)/.15+1=20 20x1=20	144.8	0.888	128.6 kg
		Ø12	(2.9-.08+0.6-.08)x2+.2=6.88	(3.8-.08)/.15+1=26 26x1=26	178.9	0.888	158.8 kg
1.2	Continuous footing section 1-1 (30 m)		6	30/(6-50x.012)=5.5 5x12=60	360	0.888	319.7 kg
			30-(5.4x5)=3 m 3+0.6=3.6 m	12	43.2	0.888	38.4 kg
			(1.2-.08+.6-.08)x2 +.2 = 3.5 m	30/.2=150	525	0.888	466.2 kg
2.	Walls (length 30 m x height 4 m x thickness 0.3 m)	Ø12	4 +.55+.6 =5.15	2x 30/.2=300	1545	0.888	1,372.0 kg
		Ø12	6	2 x (4/.2 +1)=42 42x5.5= 231	1386	0.888	1,230.8 kg
3.	Columns C1 (height 4 m, 2 columns)	10Ø16	4+.55+.6=5.15	10x2= 20		1.58	
	C1 Stirrups		(.45+.25)x2+.1= (.15+.25)x2 +.1=	4/.15=		0.617	

			(.45+.13)x2 +.1=				
4.	**Slabs**						
	Solid Slab	Ø12 10Ø	3.1+.3+.12+.12= 3.8+.3+.12+.12=	2x 3.8/.15= 2x 3.1/.15=		0.888	
	Ribbed Slab (B,C)	2Ø10 T 10Ø	10-.3+.1+.1= 10+3.7-.3+.1+.1=	2 x 4 = 2 x 12 =		0.617	
		2Ø14 T					
		10Ø 2Ø12 B					
		2Ø14 B					
		2Ø12 B					
	Ribbed Slab (D,E)						
	B1						
	B2						
	B4						
	CR						
	DR						



Assume concrete covering is 4cm.





Assume the length of continuous footing is 30 m.

Assume required reinforcement overlapping equals 50 times the bar diameter.

For Ø12mm it equals 0.60 m