HOW TO MEASURE SAND, AGGREGATE IN TRUCK & HAIWA

Volume Of Dumper = L x B x H

Length of the dumper = L – 6 m , 5.5 m

Width of the dumper = B – 1.7 m

Height of the dumper = H – 2 m



Volume Of Dumper

$$= \frac{(6+5.5)}{2} \times 1.7 \times 2$$

$$= \frac{11.5}{2} \times 1.7 \times 2$$

$$= 5.75 \times 1.7 \times 2$$

= 19.55 Cubic Metre

QUANTITY OF ASPHALT & NUMBERS OF DUMPERS IN A ROAD CONSTRUCTION

Suppose if length, breadth and thickness of asphalt layer are 150m, 10m and 15 cm, then calculate quantity of asphalt. Assume 2400 kg/cu.m dense asphalt.

Calculation:- Asphalt quantity = **540** Tonne

How many dumpers ?

Suppose one dumper carry's 40 tonne of asphalt.

$$\text{How many dumpers} = \frac{540}{40} = 13.5 \text{ No}$$

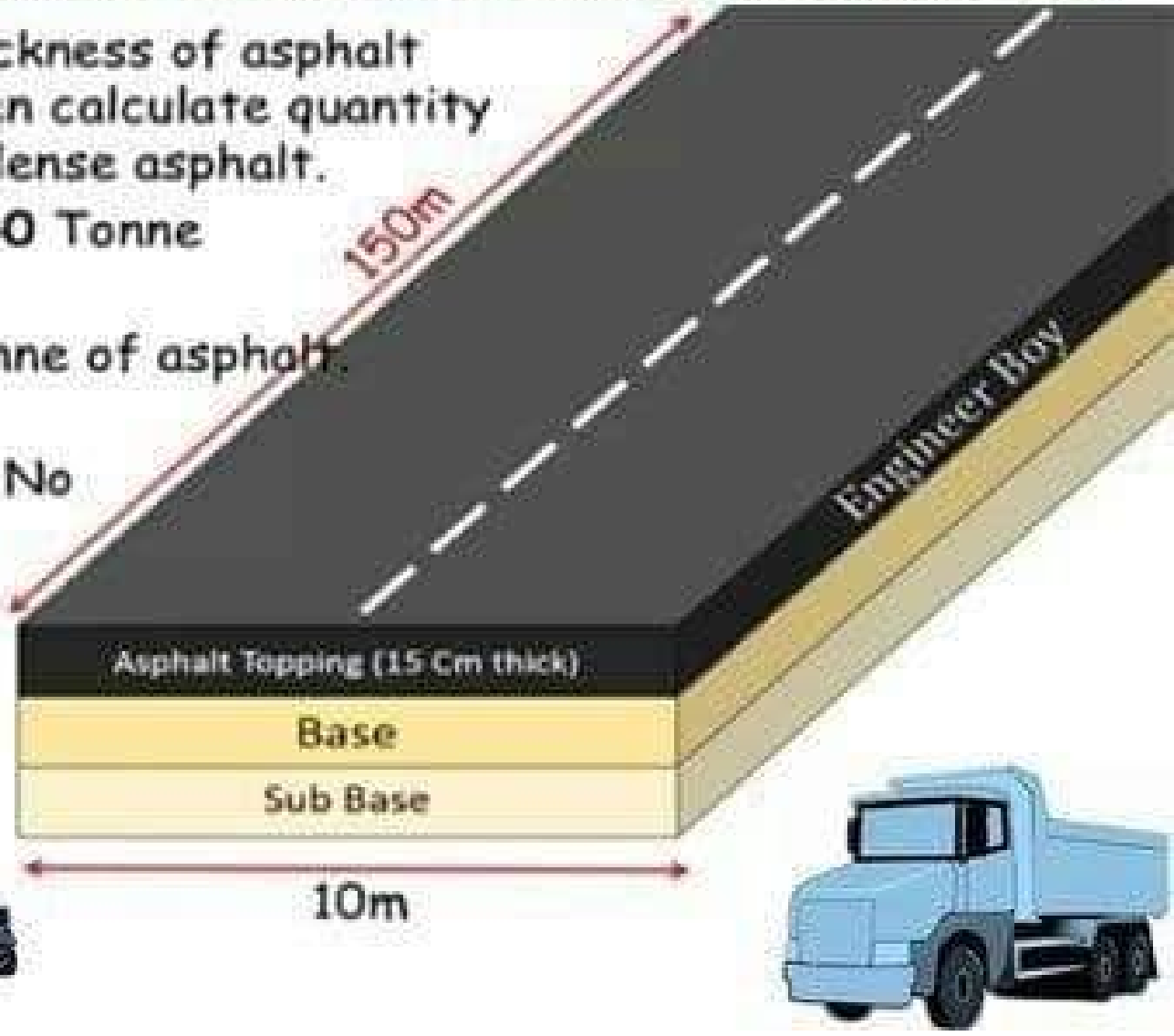
Asphalt quantity = 540000 kg

Asphalt quantity = **540** Tonne

Asphalt quantity = **13.5** dumpers of 40 tonne asphalt one.



Asphalt



MATERIAL CALCULATION FOR PCC CONCRETE

Example#1:

Find cement, sand and crushed stone in given PCC work? Ratio of concrete is 1:2:4



$$Material = \frac{ratio\ of\ material}{sum\ of\ ratio} \times Dry\ volume$$

$$Cement = \frac{1}{7} \times 184.8 = 26.4\ cft$$

$$Cement = \frac{26.4}{1.25} = 21.12\ bags$$

$$Sand = 26.4 \times 2 = 52.8\ cft / 100 = 0.528\ sacra$$

$$bajri = 26.4 \times 4 = 105.6\ cft / 100 = 1.056\ sacra$$

Dry volume = wet volume x 1.54

Wet volume = 20x12x0.5

Wet volume = 120 cft

Dry volume = 120 x 1.54

Dry volume = 184.8 cft

Ratio
1 : 2 : 4
Sum of ratio
1 + 2 + 4 = 7

Example#2:

Find only crushed stone in PCC work of volume 500 cft? Ratio of concrete is 1:3:6



$$Material = \frac{ratio\ of\ material}{sum\ of\ ratio} \times Dry\ volume$$

$$Crushed\ stone = \frac{6}{10} \times 770 = 462\ cft$$

$$bajri = \frac{462}{100} = 4.62\ sacra$$

100 cft = 1 sacra

Dry volume = wet volume x 1.54

Wet volume = 500cft

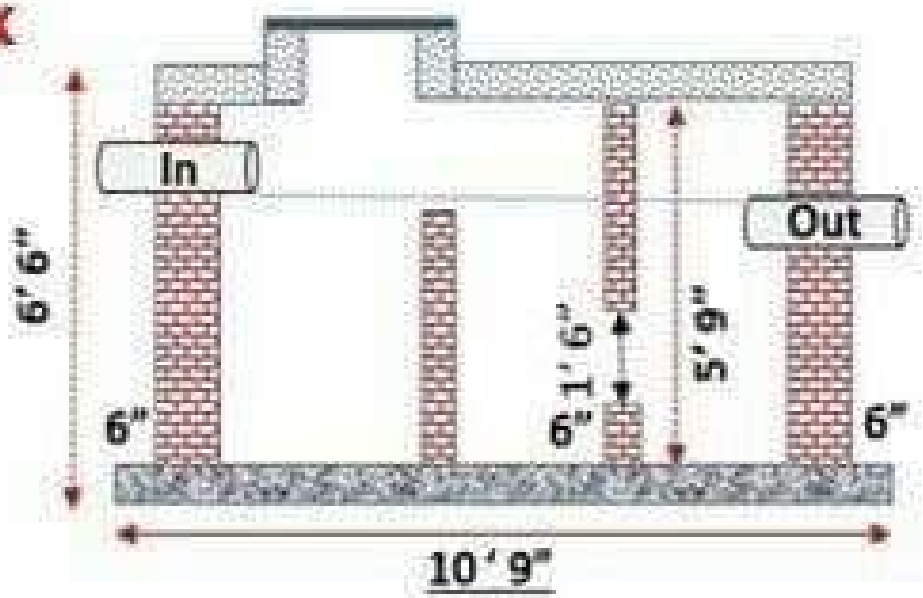
Dry volume = 500 x 1.54

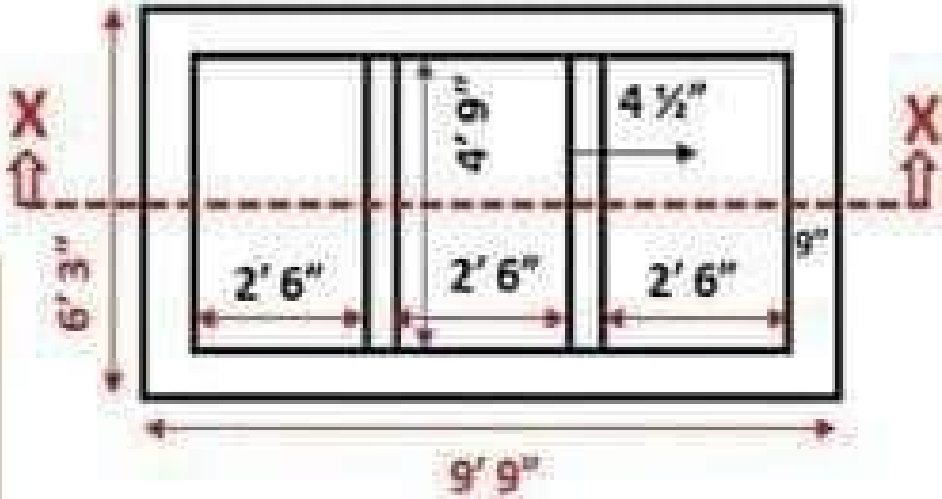
Dry volume = 770 cft

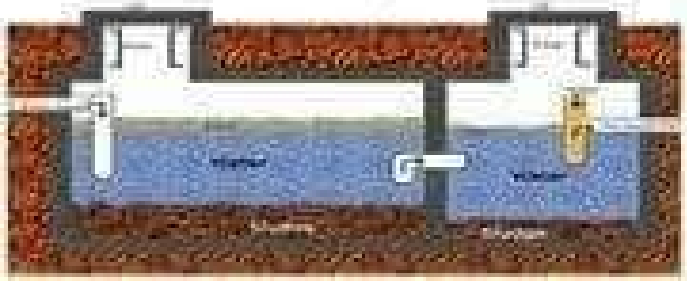
Ratio
1 : 3 : 6
Sum of ratio
1 + 3 + 6 = 10

HOW TO DESIGN SEPTIC TANK

Length of septic Tank	= L	= 9.75 ft
Breadth of septic Tank	= B	= 6.25 ft
Height of Septic Tank	= D	= 5.75 ft
External walls	= 9"	= 0.75 ft
Internal walls	= 4.5"	= 0.375ft
P.C.C 1:2:4	= Thick	= 4 Inch
R.C.C Slab 1:2:4	= Thick	= 5 Inch
Cover Size	= 2' Dia	
Hole In Wall	= 1.5 ft	
Dia Of Pipe Min	= 4 Inch	









Civil Stuff

WE WILL CHECK IF THE COLUMN CAN SUPPORT THE APPLIED LOAD

Question:-

Can the given mild steel column carry 1500 kips load?

Solution:- 2) Check for buckling

$$\text{Euler's}_{\text{buckling}} = \frac{\pi^2 EI}{l^2}$$

$$\text{Euler's}_{\text{buckling}} = \frac{\pi^2 \times 29000 \times 833.34}{96^2}$$

Buckling load= 25880.8 kips

25880.8 kips > 1500 kips

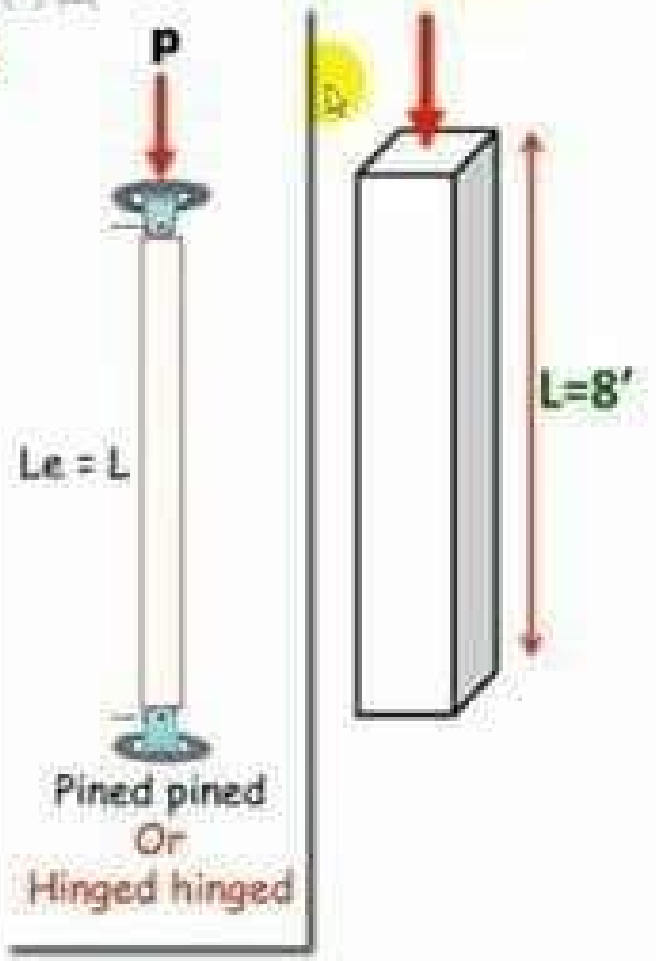
So the column is ok in buckling

10" x 10"

$$I = \frac{side^4}{12}$$

$$I = \frac{10^4}{12}$$

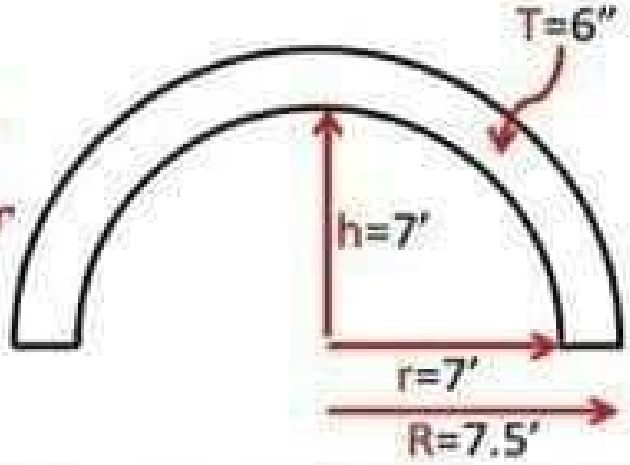
$$I = 833.34 in^4$$



How to Estimate Materials for RCC Dome

Example#1 Work out the cement , sand , crushed stone and steel for given half spherical dome. Concrete is 1:2:4 and steel is 1.5% as #4 bar . Also calculate external surface paint.

solution:- Dome volume?

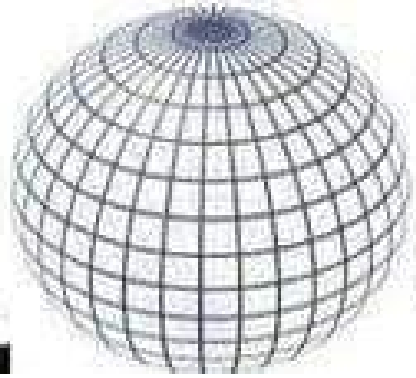


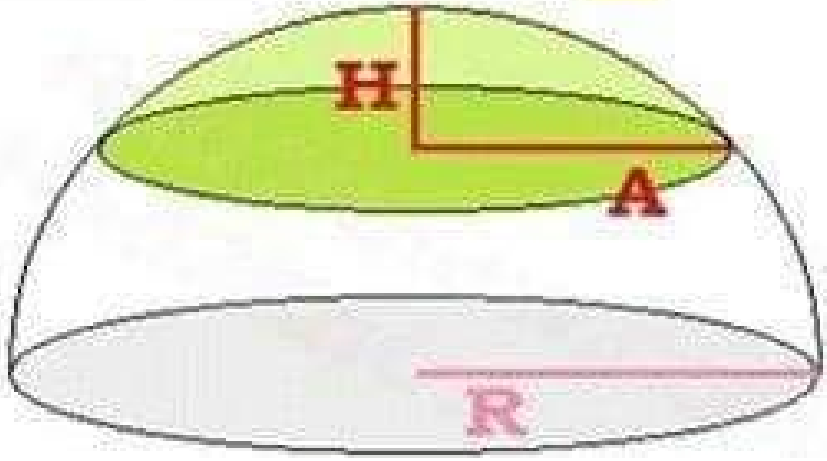
$$\text{Dome concrete} = \frac{4\pi(R^3 - r^3)}{3\,(2)} = \frac{4\pi(7.5^3 - 7^3)}{6} = 165.195 \text{ cft}$$

$$\text{steel} = \frac{1.5\%}{100} \times 165.195 = 2.478\ ft^3 \times 222.323 = 551 \text{ kg \# 4 bar}$$

$$\text{Total net RCC} = 165.195\ ft^3 - 2.478\ ft^3 = 162.717\ ft^3$$

$$\text{External surface Paint} = \frac{4\pi R^2}{2} = \frac{4\pi(7.5^2)}{2} = 353.43 \text{ sft}$$







Example: if we are asked to select a suitable size for a circular water tank to store 20000 liters of water for a residential building. Note that the tank depth should not be more then 2 meters.

Solution/Design:

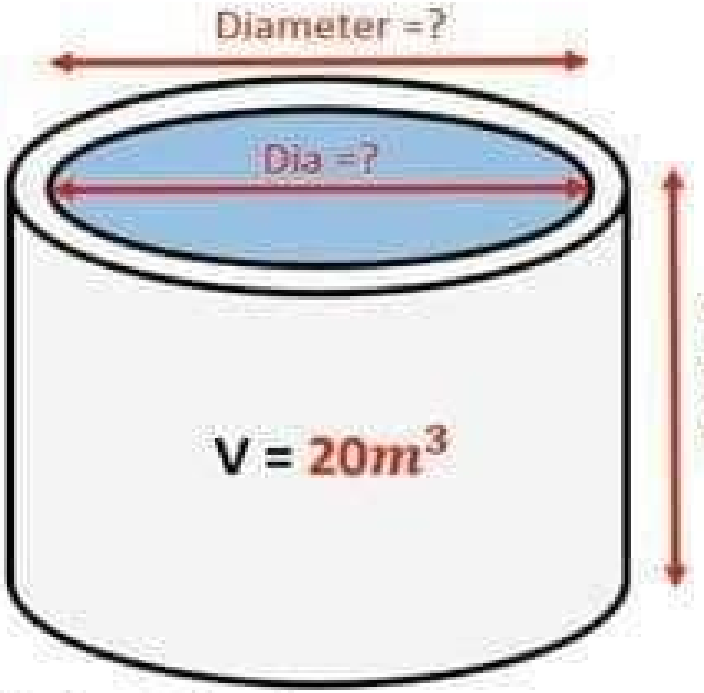
$$\text{Total Capacity of Tank} = \frac{20000}{1000} = 20m^3$$

Tank volume = Base area x depth

$$20m^3 = \frac{\pi D^2}{4} \times d$$

Trials:

If depth = 0.5 meter then diameter = ?
If depth = 1 meter then diameter = ?
If depth = 1.5 meter then diameter = ?
If depth = 2 meter then diameter = ?





Final Design

$$20m^3 = \frac{\pi(D)^2}{4} \times 0.5$$

$$\frac{20m^3}{0.393} = \frac{0.393(D)^2}{0.393}$$

$$\sqrt{50.90} = \sqrt{(D)^2}$$

$D = 7.13$ m Say D = 7 meters

So if depth = 0.5m then Dia = 7 m

and if depth = 1m then Dia = 5 m

and if depth = 1.5m then Dia = 4.12 m

and if depth = 2m then Dia = 3.56 m

and if depth = 1.5m then Dia = 4.12 m

Provide 1.5 meters depth and 4.12 say 4.10 meters diameter.

Example#1 cont Given:- q_a = 6 ksf 5' below the grade

fc' for footing= 3 Ksi Fy=60 Ksi Column = 14" x 14"

fc' for column= 4 Ksi sD.L= 390 K and sL.L= 260 K

Design solution:- *check for beam shear*

$$\emptyset V c_b > V u_b$$

$$0.75 \times 4\sqrt{fc'}\, b\, d > 7.3 \times 11 \times b$$

$$0.75 \times 4\sqrt{3000}\, b\, 30 > 80.3\, b$$

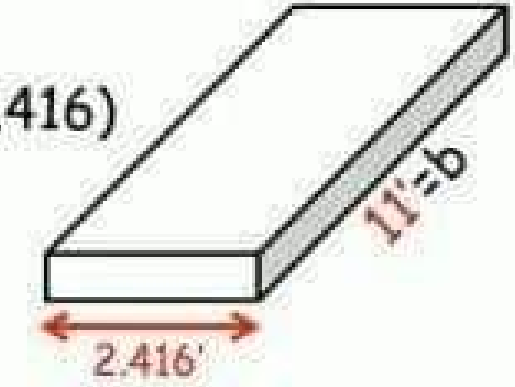
$$0.75 \times 4\sqrt{3000}\,(132)\,30 > 80.3\,(2.416)$$

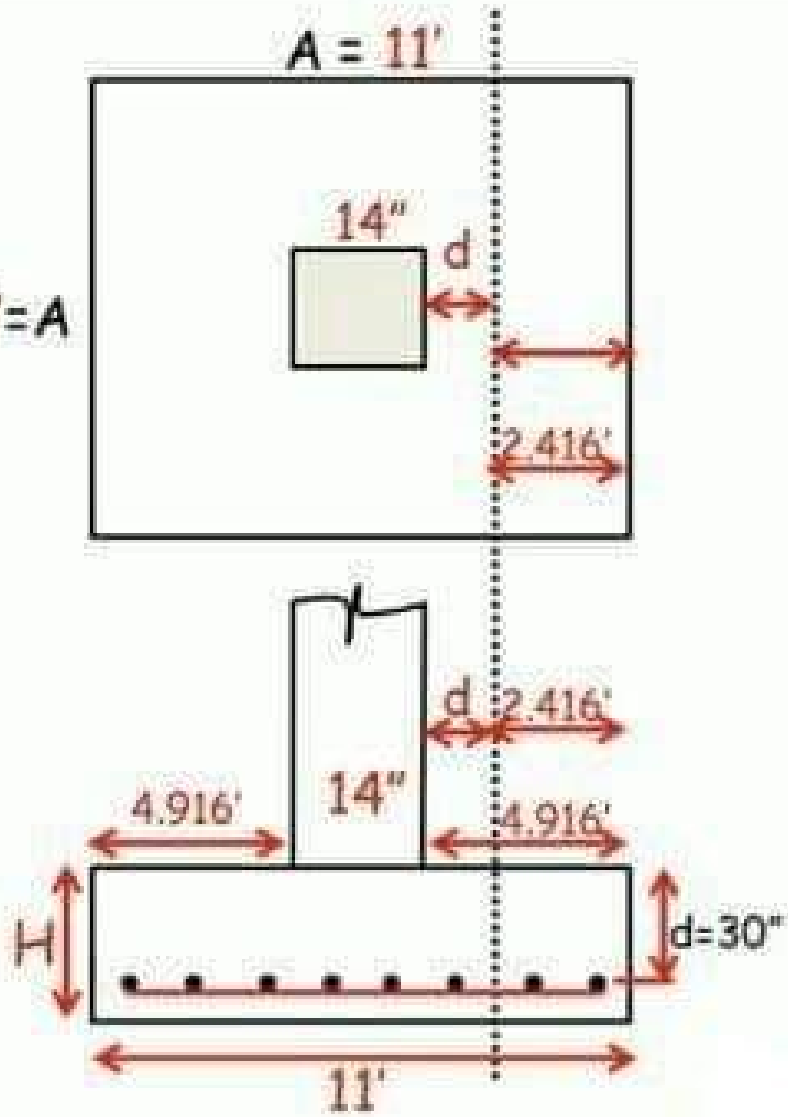
$$650k > 193\ k$$

d=30" +2" +1"

H=33"

H=36" = 3ft





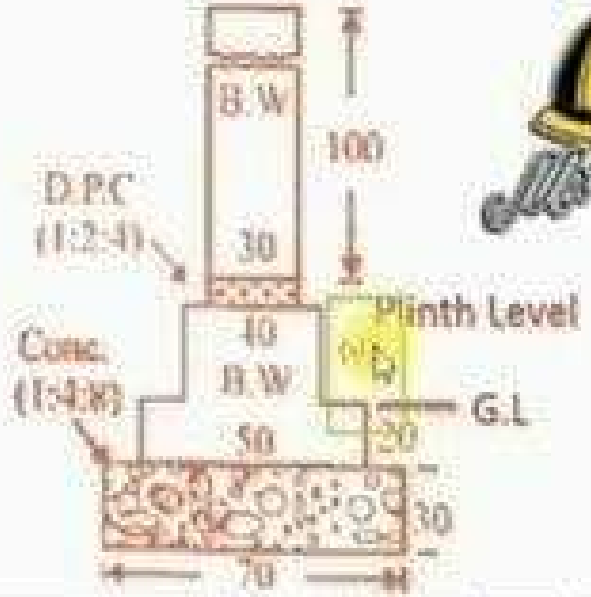
Depth "d" = 30" is okay for beam shear.....

How to Calculate Quantity of Straight Wall

Example: Workout the Following Quantities from Given data and Sketch for a Straight wall 6 Meter Long

1. Earth Work
2. Concrete Work
3. Brick Work in Foundation and Plinth
4. Damp Proof Course
5. Brick Work in Super Structure
6. Cement Plaster
7. White Wash





Solution:

S.No	Description	No	L	B	H	Quantity
1.	Excavation	1	6.40	0.70	0.50	2.24 m³
2.	Concrete (1:4:8)	1	6.40	0.70	0.30	1.34 m³
3.	Brick Work in Foundation and Plinth					
	(A) First Step	1	6.20	0.50	0.20	0.62 m³
	(B) Second Step	1	6.10	0.40	0.60	1.46 m³
	Total					2.08 m³
4.	D.P.C (1.2.4) 4 cm thick	1	6.10	0.40	--	2.44 m²
5.	Brick Work in Cement Mortar (1:4) in Super Structure	1	6.00	0.30	1.00	1.80 m³
6.	Cement Plaster 2.5 cm thick With Mortar (1:3)					
	(A) Front and Back	2	6.00	--	1.00	12.0 m²
	(B) Sides	2	0.30	--	1.00	0.60 m²
	(C) Top	1	6.00	0.30	--	1.80 m²
	Total					14.4 m²
7.	White Wash 3 Coats	As per item No: 6				14.4 m²

How To Calculate Cement Bags In 1 Cubic Meter

Consider the nominal mix is 1:2:4

Wastage of cement is considered as 2%

Output of mix is considered as 66%

To achieve 1 cum output,

We need 1/0.66 = 1.5151 say 1.52 cum dry mix.

Add the wastage of 2%, i.e (1.52 + 0.02) = 1.54 cum.

$$\text{Volume of cement} = \left(\frac{Cement}{Cement+Sand+Aggregate}\right) \times \text{Dry Mix}$$

$$= \left(\frac{1}{1+2+4}\right) \times 1.54$$

$$= 0.22 \text{ cum}$$

Density of cement is 1440 kg/cum





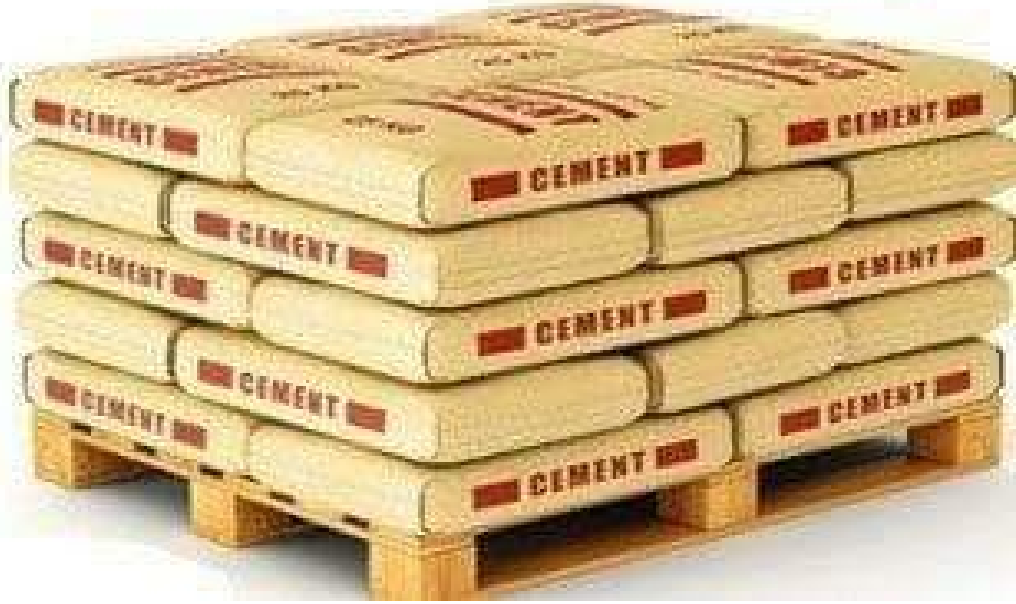
Weight of 1 bag cement = 50 kg.

So the volume of 1 bag cement = 50/1440

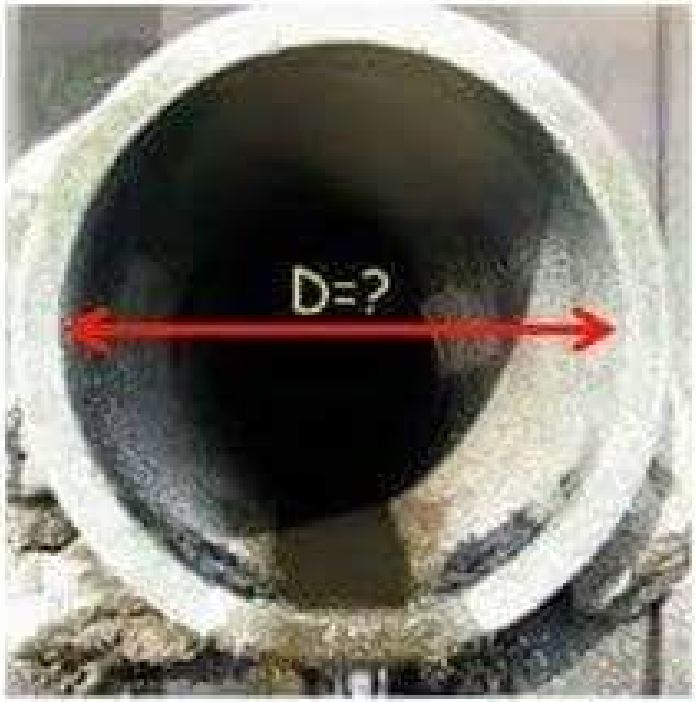
Volume = 0.0347 cum.

No of cement bags in 1 cum = 0.22/0.0347

So Nos Of Bags = **6.34 bags.**



Example#1 Design a circular sewer pipe having average discharge equal to 40 litr/sec. Sewage velocity is 1.5 m/sec.



Design solution:

Max flow = 40 x 3 = 120 litr/sec = 0.12 m^3/sec

Max flow = **0.12** cumec

Full flow = 0.12 x 1.5 = **0.18** cumec

Remember! $Q = A \times V$ Or $A = \frac{Q}{V}$

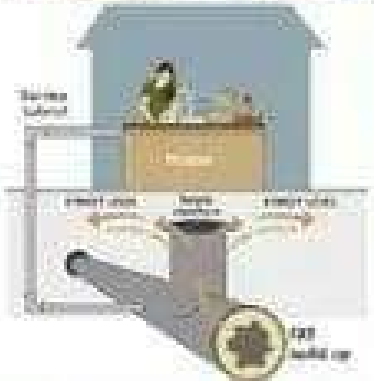
$A = \frac{0.18}{1.5} = 0.12$ sq.m

$4x\frac{\pi D^2}{\pi\ 4} = \frac{0.12\ x4}{\pi}$

$\sqrt{D^2} = \sqrt{0.1527887454}$



D = 0.3908820095m Or D = 39 cm Say D = 40 cm





Example: if we are asked to select a suitable size for a circular water tank to store 20000 liters of water for a residential building. Note that the tank depth should not be more then 2 meters.

Solution/Design:

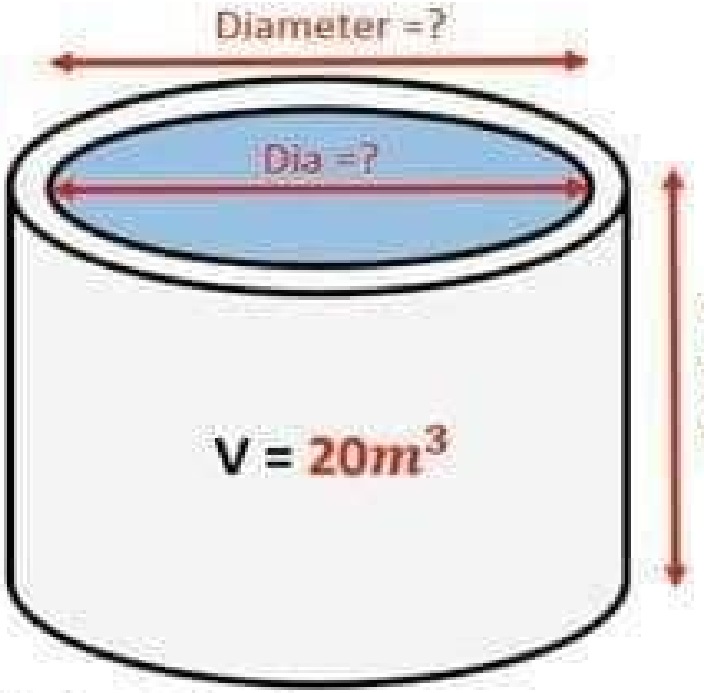
$$\text{Total Capacity of Tank} = \frac{20000}{1000} = 20m^3$$

Tank volume = Base area x depth

$$20m^3 = \frac{\pi D^2}{4} \times d$$

Trials:

If depth = 0.5 meter then diameter = ?
If depth = 1 meter then diameter = ?
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Final Design

$$20m^3 = \frac{\pi(D)^2}{4} \times 0.5$$

$$\frac{20m^3}{0.393} = \frac{0.393(D)^2}{0.393}$$

$$\sqrt{50.90} = \sqrt{(D)^2}$$

$D = 7.13$ m Say D = 7 meters

So if depth = 0.5m then Dia = 7 m

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and if depth = 1.5m then Dia = 4.12 m

and if depth = 2m then Dia = 3.56 m

and if depth = 1.5m then Dia = 4.12 m

Provide 1.5 meters depth and 4.12 say 4.10 meters diameter.

How to estimate the volume of brick chimney

Volume=?

Solution:-

$$V=\frac{h}{3}\{(A_1+A_2+\sqrt{A_1 A_2})-(a_1+a_2+\sqrt{a_1 a_2})\}$$

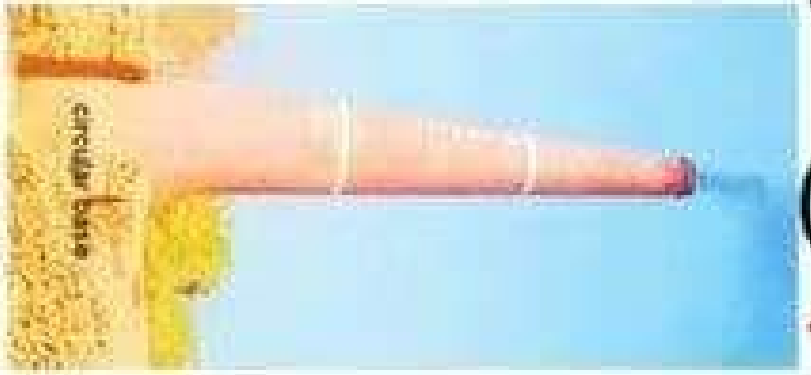
$$A_1=\frac{\pi D_1^2}{4}=\frac{\pi 5^2}{4}=19.634\ m^2 \qquad A_2=\frac{\pi D_2^2}{4}=\frac{\pi 1.60^2}{4}=2.01\ m^2$$

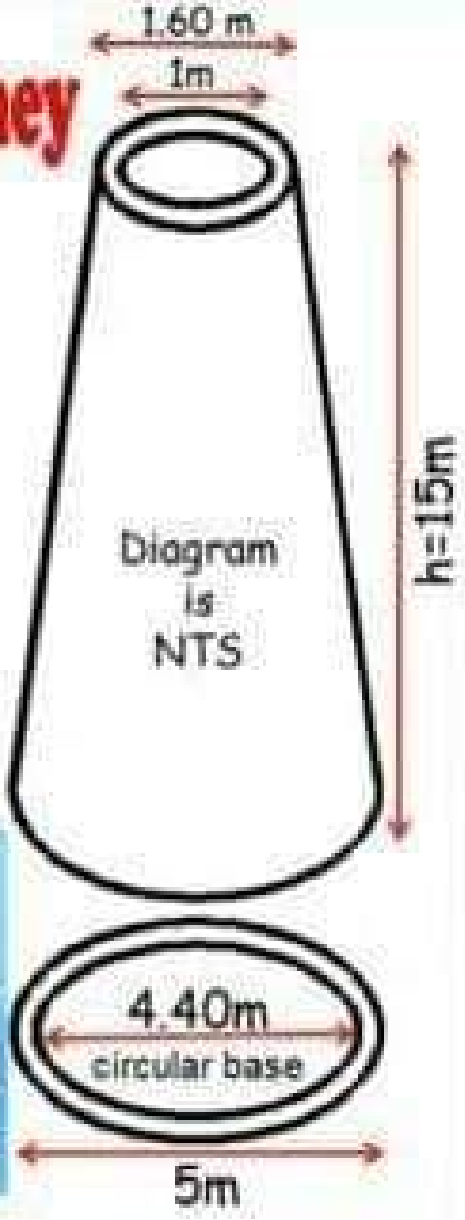
$$a_1=\frac{\pi d_1^2}{4}=\frac{\pi 4.4^2}{4}=15.205\ m^2 \qquad a_2=\frac{\pi d_2^2}{4}=\frac{\pi 1^2}{4}=0.785\ m^2$$

$$V=\frac{15}{3}\{(19.634+2.01+\sqrt{19.634 \times 2.01})-(15.205+0.785+\sqrt{15.205 \times 0.785})\}$$

$$V=\frac{15}{3}\{(27.926)-(19.445)\}$$

V= 42.40 m³ Chimney Volume = 42.40 m³





Materials calculation for floors?



1)Materials in sub Base

Brick ballast= 3.6 m^3

2)Materials in Base

cement= 15.8 *bags*

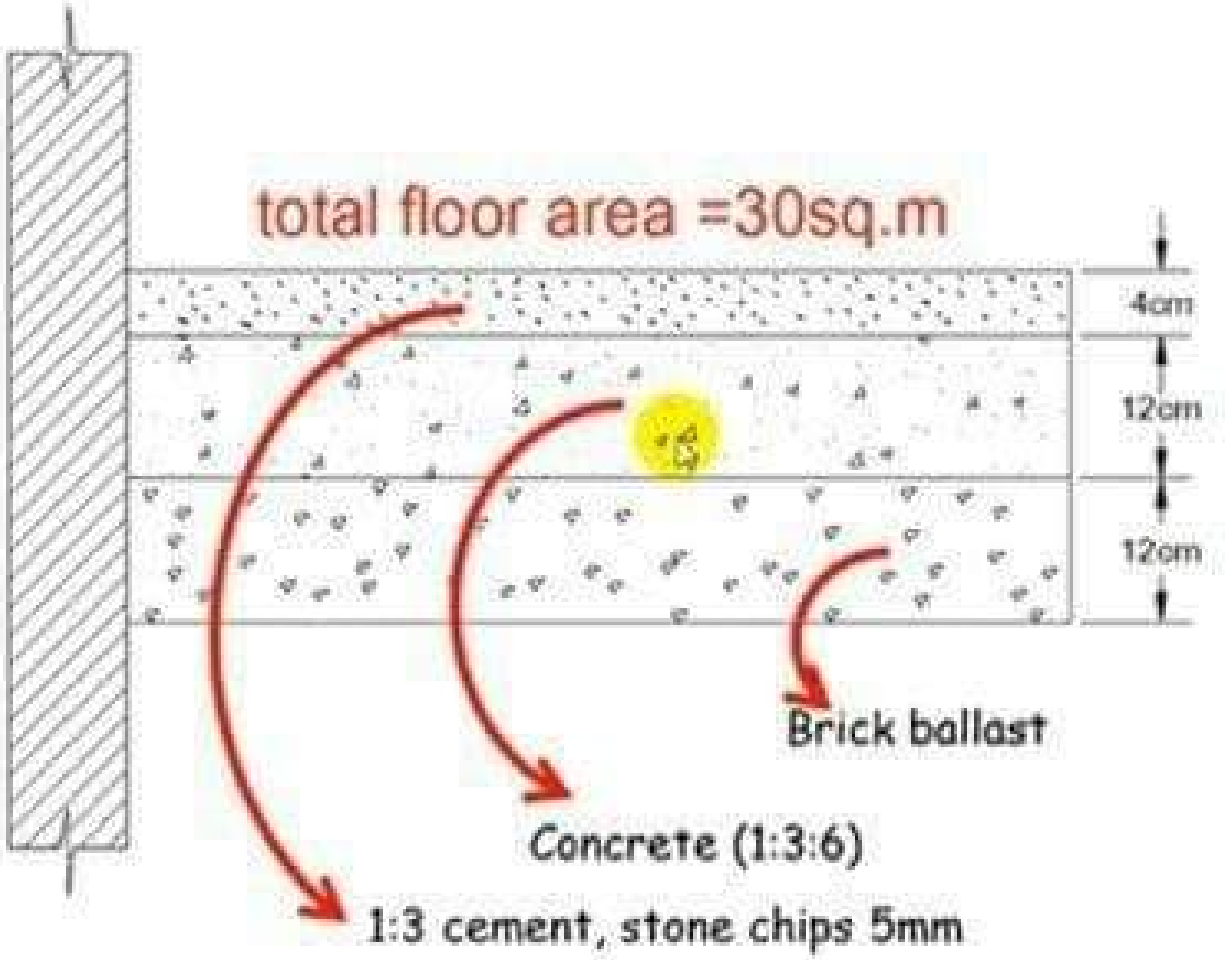
Sand **= 1.66** m^3

bajri **= 3.326** m^3

3)Materials in topping

cement= 10.88 *bags*

Stone chips **= 1.66** m^3

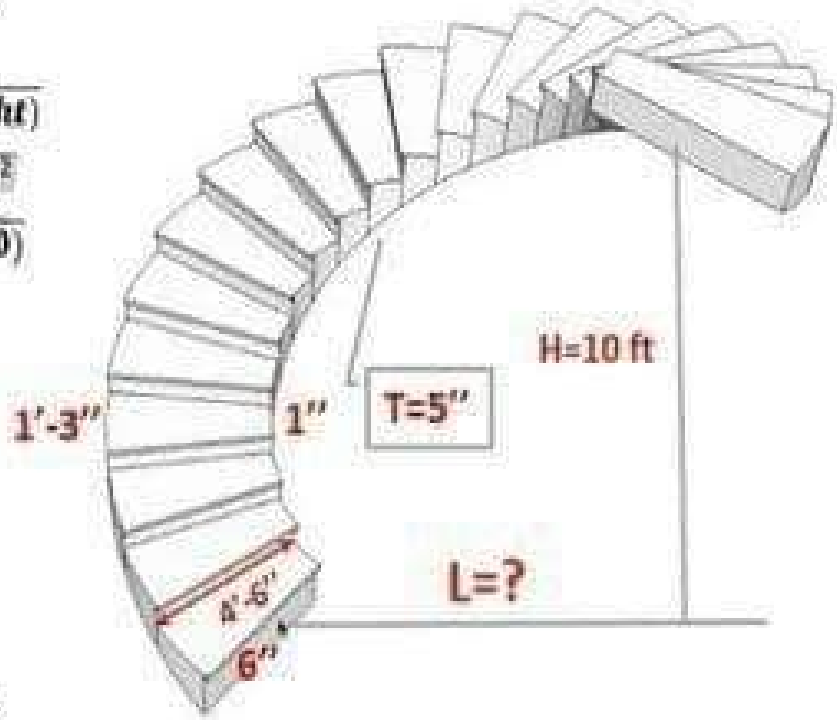


Semi Round Stair Quantity

- Linear Length Of Stair = ?
- Inclined Length Of Stair = ?
- Waist Of Stair = 4.5 Feet
- Thickness Of S.Waist = 0.41 Feet
- Riser Of Stair = 6" = 0.5 Feet
- Tread Of Stair = 1'-3" – 1'
- No Of Steps $= \frac{Height}{One\ Riser}$

$= \frac{10}{0.5} = 20$ No's

- Linear Length = 2 (n × R) 0.50
- = 2 (3.142 × 9.5) 0.50
- = 29.84 Feet
- Inclined Length $= \sqrt{(Base) + (Height)}$
- $= \sqrt{(29.84)^2 + (10)^2}$
- $= \sqrt{(890.42) + (100)}$
- $= \sqrt{990.42}$
- = 31.47 Feet
- One Step Volume $= \frac{L \times W \times H}{2}$
- $= \frac{4.5 \times 1.125 \times 0.5}{2}$
- $= \frac{2.53}{2} = 1.26$ Cft
- Total Steps = 20 × 1.26 = 25.2 Cft
- Total Volume = 58.062 + 25.2
- = 83.26 Cft

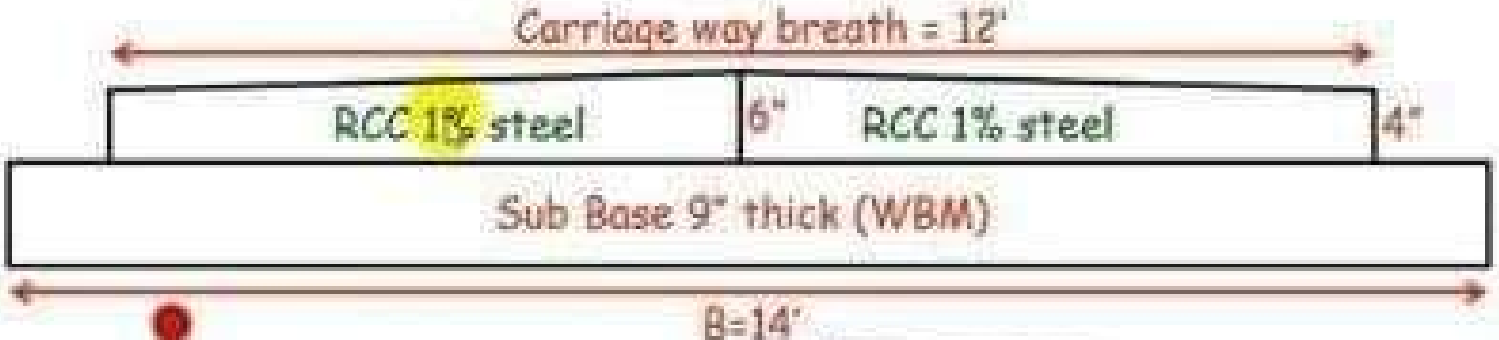


Stair Section

RCC Road quantity

Example # 1

Calculate concrete, steel and sub base material for given road section, take 60' as road length. Ignore joints in calculation.



Solution:-

① Quantity of sub base materials =

=Length x breath x thickness

$= L \times B \times (d + \frac{d}{2})$

$= 60 \times 14 \times (0.75 + \frac{0.75}{2})$

Sub base = 945 cft

② RCC work

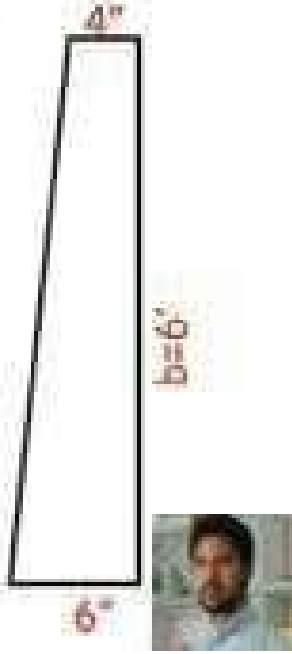


RCC work = X-section area x road length

$\text{RCC work} = 2 \times (\frac{0.334+0.5}{2}) b \times L$

$\text{RCC work} = 2 \times (\frac{0.334+0.5}{2}) 6 \times 60$

RCC work = 300.25 cft



Example#1 Workout the quantity of earth work f0r an embankment 150m long and 10m wide at the top. Side slope is 2:1 and depths at each 30m interval are 0.60, 1.2, 1.4, 1.6, 1.4, and 1.6m.

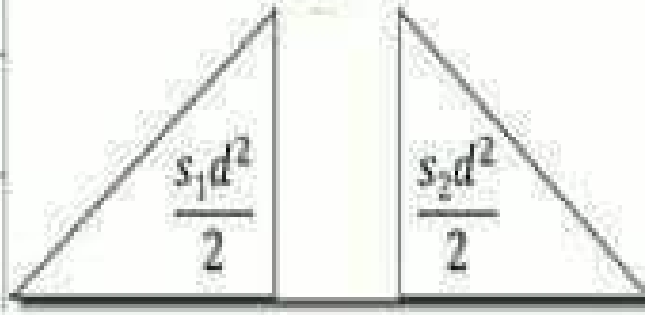
solution:- Mean area method

Station	depth	Center area =B.d	Area of sides=Sd^2	total area B.D +Sd^2	Mean area A1+A2/2	interval	quantity Cut	quantity Fill
0	0.6	6	0.72	6.72				
30	1.2	12	2.88	14.88	10.8	30		324
60	1.4	14	3.92	17.92	16.4	30		492
90	1.6	16	5.12	21.12	19.52	30		585.6
120	1.4	14	3.92	17.92	19.52	30		585.6
150	1.6	16	5.12	21.12	19.52	30		585.6
Total filling or embankment quantity =								**2572.8m^3**



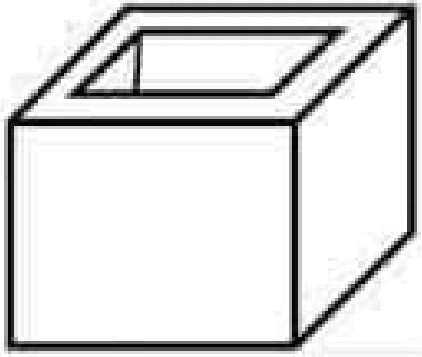
$\frac{6.72 + 14.88}{2}$ =10.8 sq.m

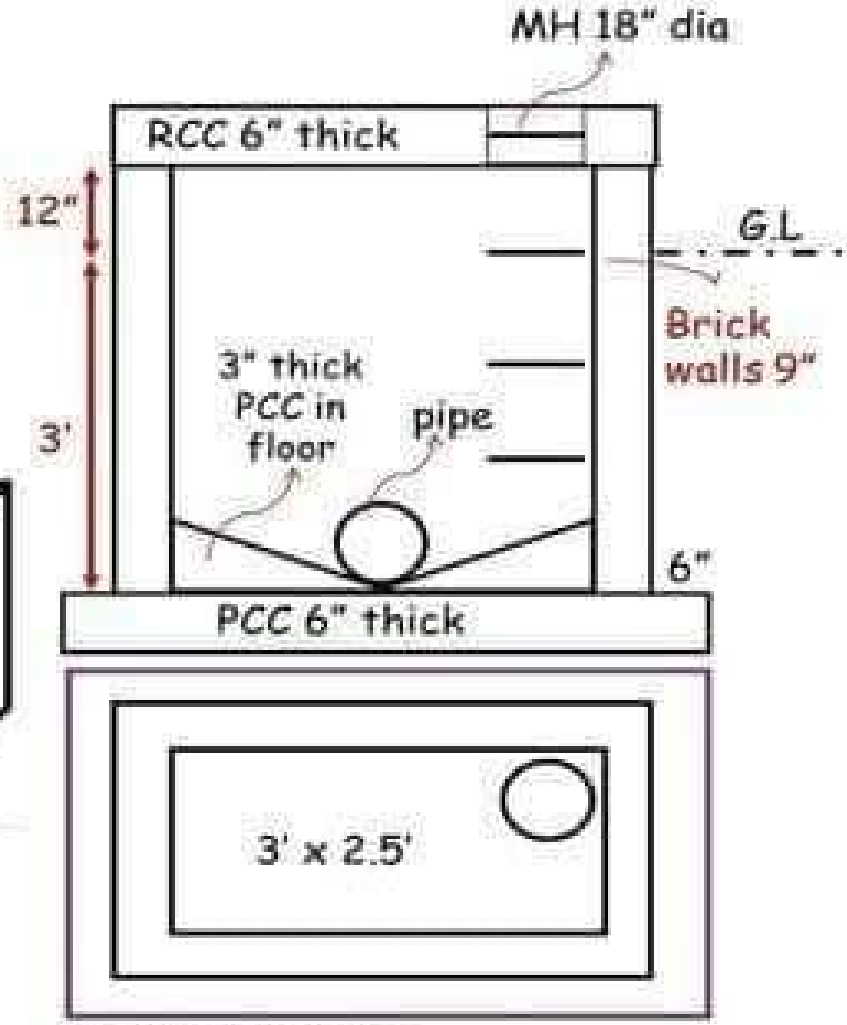
$\frac{14.88 + 17.92}{2}$ =16.4 sq.m



Manhole Quantity

1) Total excavation = 96.25 cft
2) PCC in bed layer = 13.75 cft
3) PCC (concrete) in floor = **0.9375 cft.**
4) RCC in Slab = 8.12 cft
5) Brick work = 42 cft
6) Inside Plaster = 44 Sft
7) Iron steps = 3 @ 12" c/c
8) MH covers = 1 cover with 18" dia





Brick work for walls :

= Volume of external Box – volume of internal Box

=4.5 x 4 x 4 - (3 x 2.5 x 4)

72 - 30

= 42 cft

Inside plaster :

= inside parameter x Height

= {(3 x 2) + (2.5 x 2)} x 4

Example : calculate lime and glue of three coat for the given plastered wall...

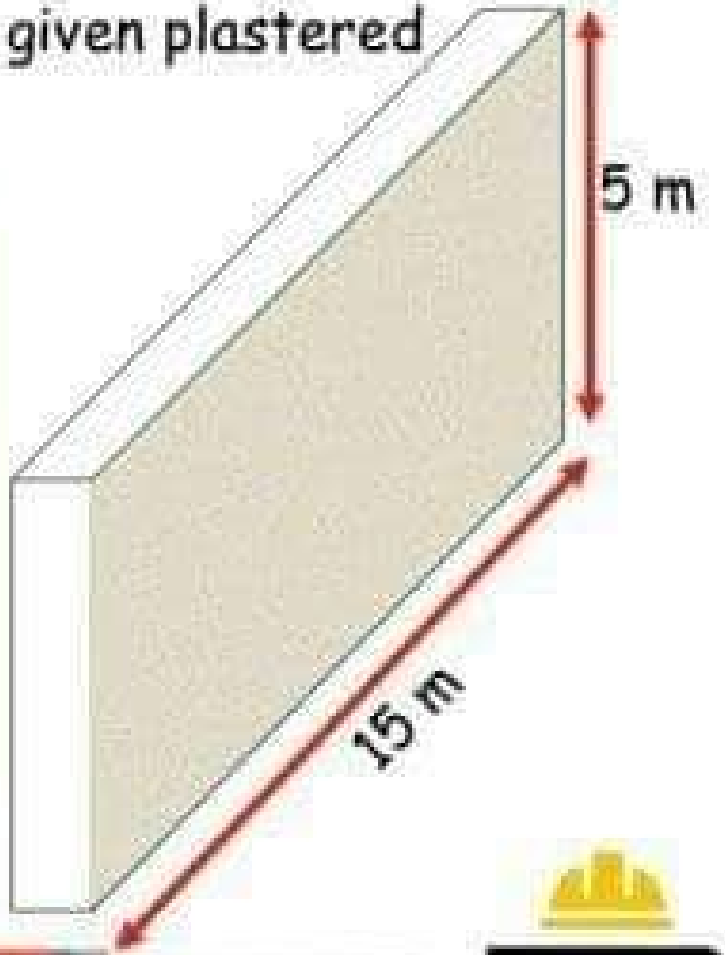
Solution :

Total white washing area= 15 m x 5 m = 75 m^2

White unslacked lime = $\frac{3.5\ kg}{10\ m^2}$ x 75 m^2 = 26.25 kg

Glue = $\frac{0.12\ kg}{10\ m^2}$ x 75 m^2 = 0.9 kg

say 1 kg



Points to Remember.. For smooth surface

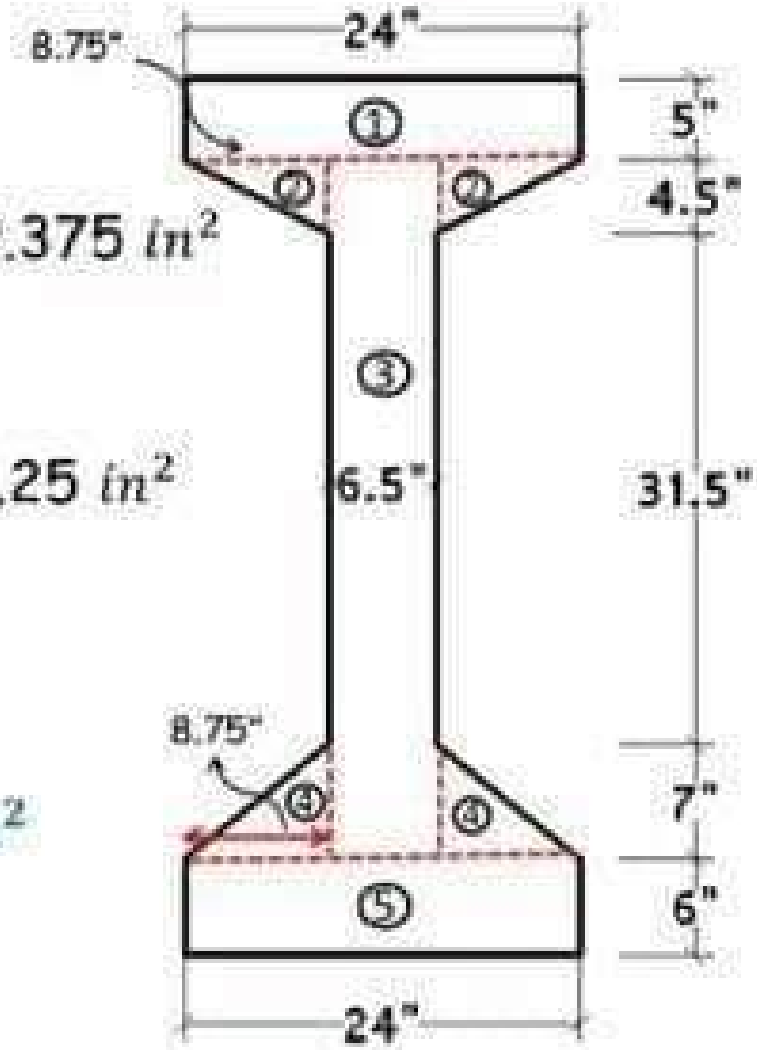
1) 2 kg per 10 m^2 of white fat lime is required for a single coat white washing with 0.06 kg Glue.
2) 2.8 kg per 10 m^2 of white fat lime is required for double coat white washing with 0.06 kg Glue.
3) 3.5 kg per 10 m^2 of white fat lime is required for a triple coat white washing with 0.12 kg Glue.
4) Color can be added lump sum. There is no specific way because it depends on choice.



Engineer Boy

Example #2 Work out concrete for the given bridge girder. Take length = 30 ft

Solution:



Area of figure 1 = 24" x 5" = 120 in^2

Area of figure 2 = $\frac{base \times height}{2} \times 2 = \frac{8.75" \times 4.5"}{2} \times 2 = 39.375\ in^2$

Area of figure 3 = 43" x 6.5" = 279.5in^2

Area of figure 4 = $\frac{base \times height}{2} \times 2 = \frac{8.75" \times 7"}{2} \times 2 = 61.25\ in^2$

Area of figure 5 = 24" x 6" = 144 in^2

Total sectional area= 120 in^2 +39.375 in^2 +279.5 in^2

+61.25 in^2 + 144 in^2 = 644.125in^2

Total sectional area= $\frac{644.125\ in^2}{12 \times 12}$

Engineer Boy

CONCRETE VOLUME FOR RETAINING WALL

Here we have three parts one is base Slab (A) the 2nd is stem (B)
And the 3rd one is counterfort (C).
The volume of retaining wall = Volume of base slab + Volume of stem + Volume of counterfort
= Volume of A + Volume of B + Volume of C

1) . Volume Of Base Slab (A):

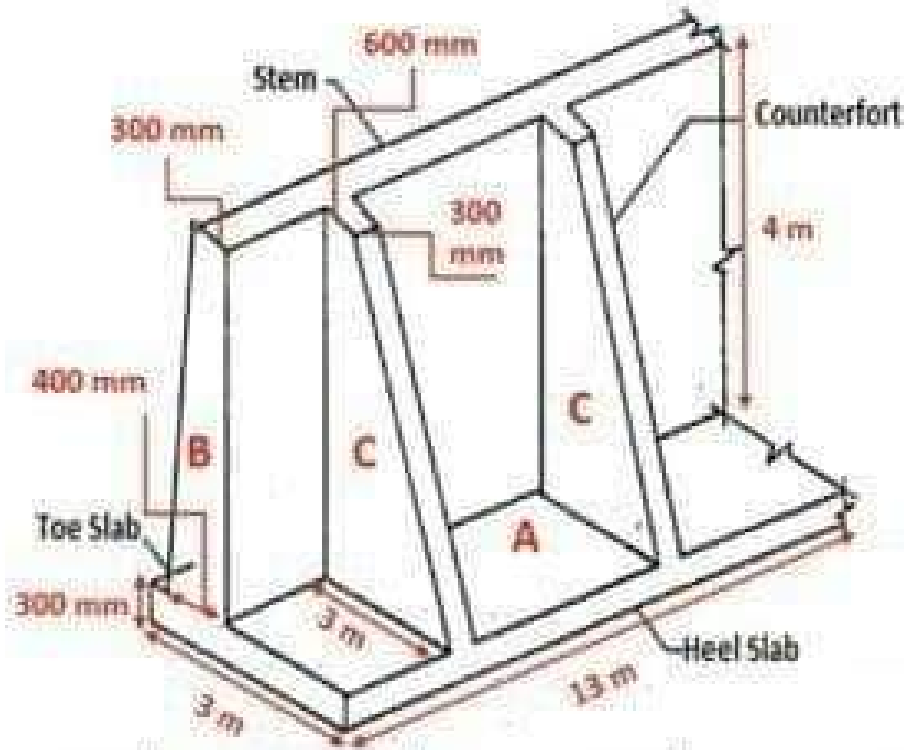
Volume of A = l x b x h = 13 x 3 x 0.3 = 11.7 m^3

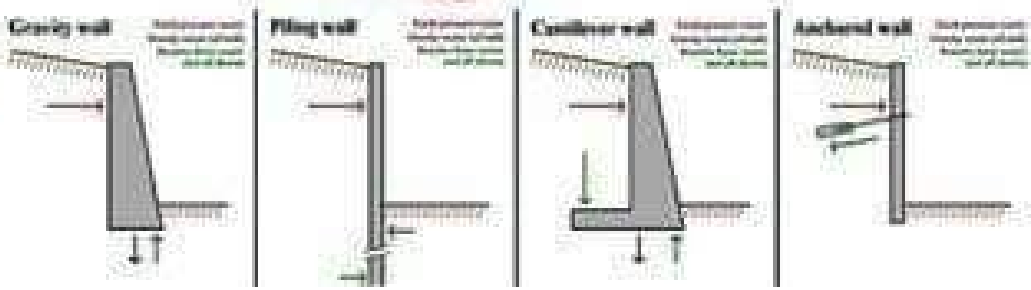
2) . Volume Of Stem (B):

Part B is a trapezoid,
So Volume of B = [((a + b)/2) x h] x l = [((0.3 + 0.4)/2) x 4] x 13
= 18.2 m^3

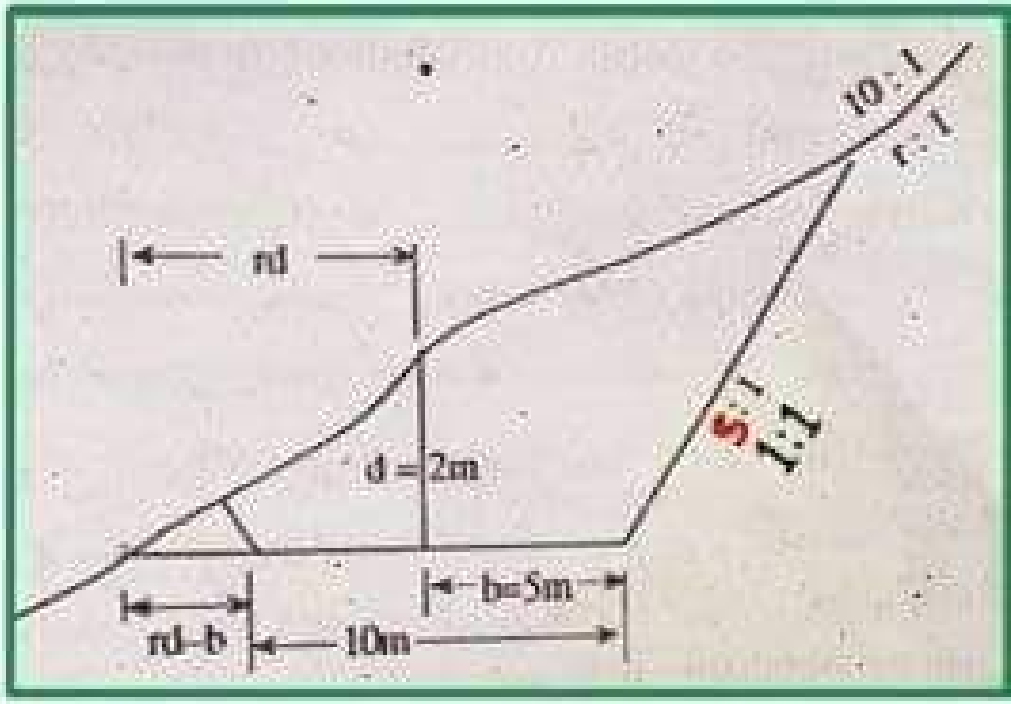
3) . Volume Of Counterfort (C):

Part C is also a trapezoid,
So Volume of C = [((a + b)/2) x h] x l = [((0.6 + 3)/2) x 4] x 0.3 = 2.16 m^3
The above retaining wall there is 2 counterfort so,
Volume of C = 2.16 x 2 = 4.32 m^3
Total volume of retaining wall = 11.7 + 18.2 + 4.32 = 34.22 m^3





Example1 : Work out the quantity of earth work for 50 meter long road in hilly area. Formation width of the road is 10 meter, average depth for cutting at center line of the road is 2 meter, cross slope of hill side is 10:1 and side slope are 1:1 in cutting and 1.5:1 in filling



Solution :

Volume of earth work

= Area in cutting x length ------(1)

$$\text{Area in cutting} = \frac{sb^2+2r^2bd+sr^2d^2}{r^2-s^2}$$

$$A = \frac{1(5)^2+2(10)^2(5)(2)+1(10)^2(2)^2}{10^2-1^2}$$

$$A = 24.50\ m^2$$

Earth work = 24.50 m^2 x 50 m = 1225 m^3

SL KHAN

How to create the design of a single flat stair

Procedure Way#1

1) Suppose suitable Rise for one step.

2) Find No. of Rise

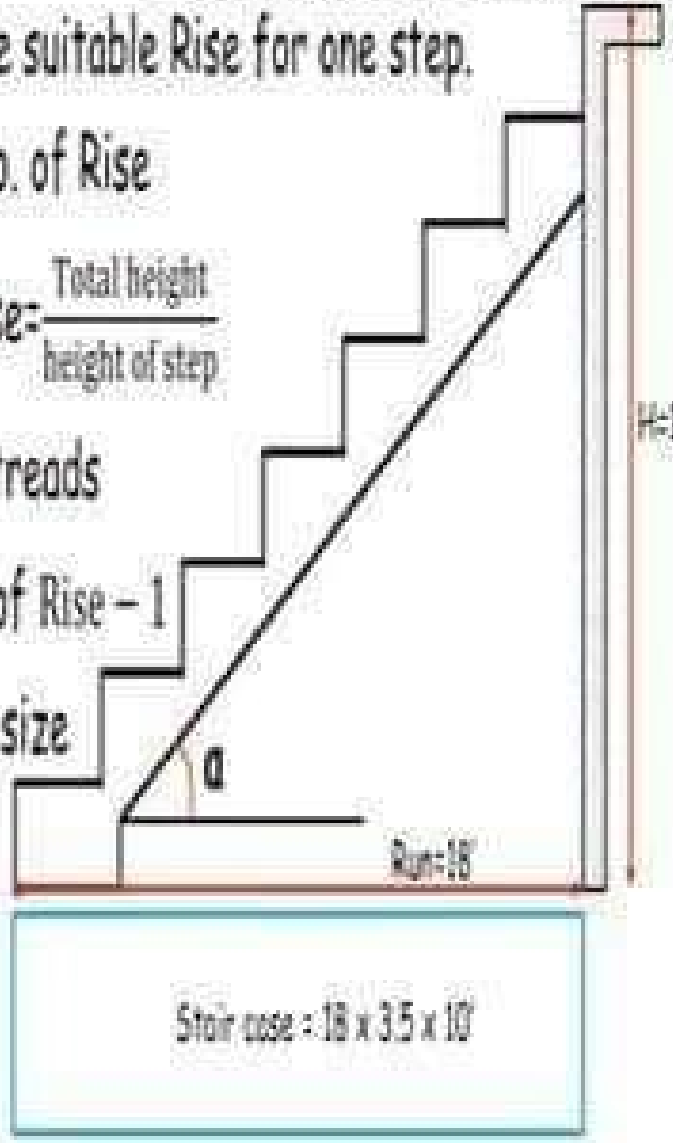
$$\text{No. of Rise} = \frac{\text{Total height}}{\text{height of step}}$$

3) Calculate No. of treads

$$\text{No. of treads} = \text{No. of Rise} - 1$$

4) Calculate tread's size

4) Check for pitch



Stair case = 18 x 3.5 x 10'

Lets try Procedure Way#1

Suppose rise = 6"

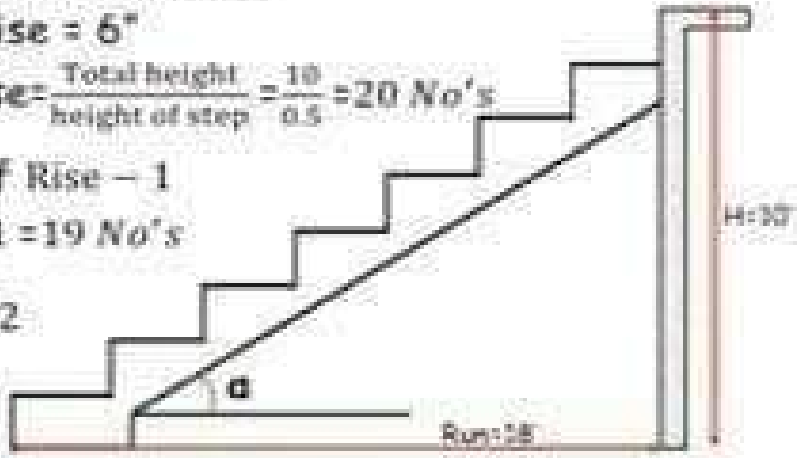
$$\text{No. of Rise} = \frac{\text{Total height}}{\text{height of step}} = \frac{10}{0.5} = 20\ No's$$

$$\text{No. of treads} = \text{No. of Rise} - 1$$

$$\text{No. of treads} = 20 - 1 = 19\ No's$$

$$\text{Tread's size} = \frac{18'}{19} \times 12$$

Tread's size= 11.37"



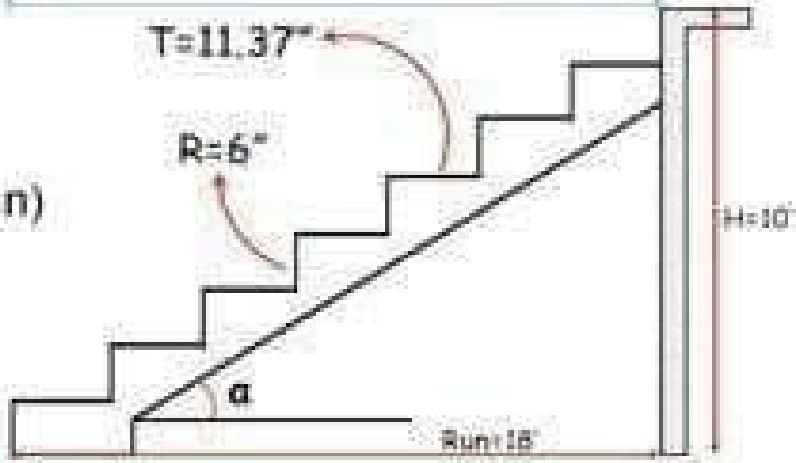
Stair case = 18 x 3.5 x 10'

Lets try Procedure Way#1

$$\alpha = \tan^{-1}(\text{Rise/Run})$$

$$\alpha = \tan^{-1}\left(\frac{6}{11.37}\right)$$

$$\alpha = 27.82\ Deg$$



Stair case = 18 x 3.5 x 10'

How to find Slope of the Stair?

$$\tan\alpha = \frac{Rise}{Run} \qquad \tan\alpha = \frac{Rise}{R}$$

$$\tan\alpha = \frac{6}{12} \qquad \tan\alpha = \frac{6}{12}$$

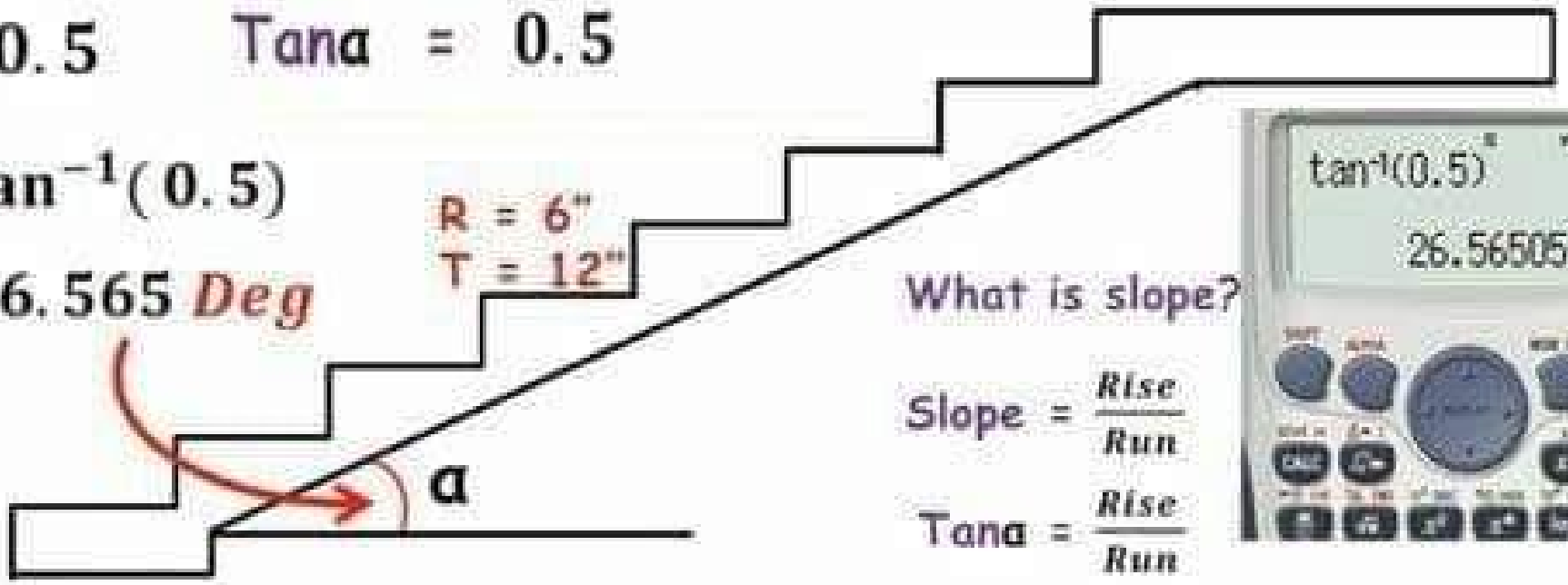
0.5 = 6/12

$$\tan\alpha = 0.5 \qquad \tan\alpha = 0.5$$

$$\alpha = \tan^{-1}(0.5)$$

$$\alpha = 26.565\ Deg$$

now what? if the rise and run of the stair are unknown...?



What is slope?

$$\text{Slope} = \frac{Rise}{Run}$$

$$\tan\alpha = \frac{Rise}{Run}$$

Example:- Calculate steel in kg for given slab if both directional steel are #4@12" c/c? Ignore concrete cover

Solution:-

L1= 20 ft.

L2=L1 - 2

L2=20 - 2 =18'

L3=L2 - 2

L3=18 - 2 =16'

L4=L3 - 2

L4=16 - 2 =14'

L5=L4 - 2

L5=14 - 2 =12'

L6=L5 - 2

L6=12 - 2 =10'

L7=L6 - 2

L7=10 - 2 =8'

L8=8 - 2 =6'

L9=6 - 2 =4'

L10=4 - 2 =2'

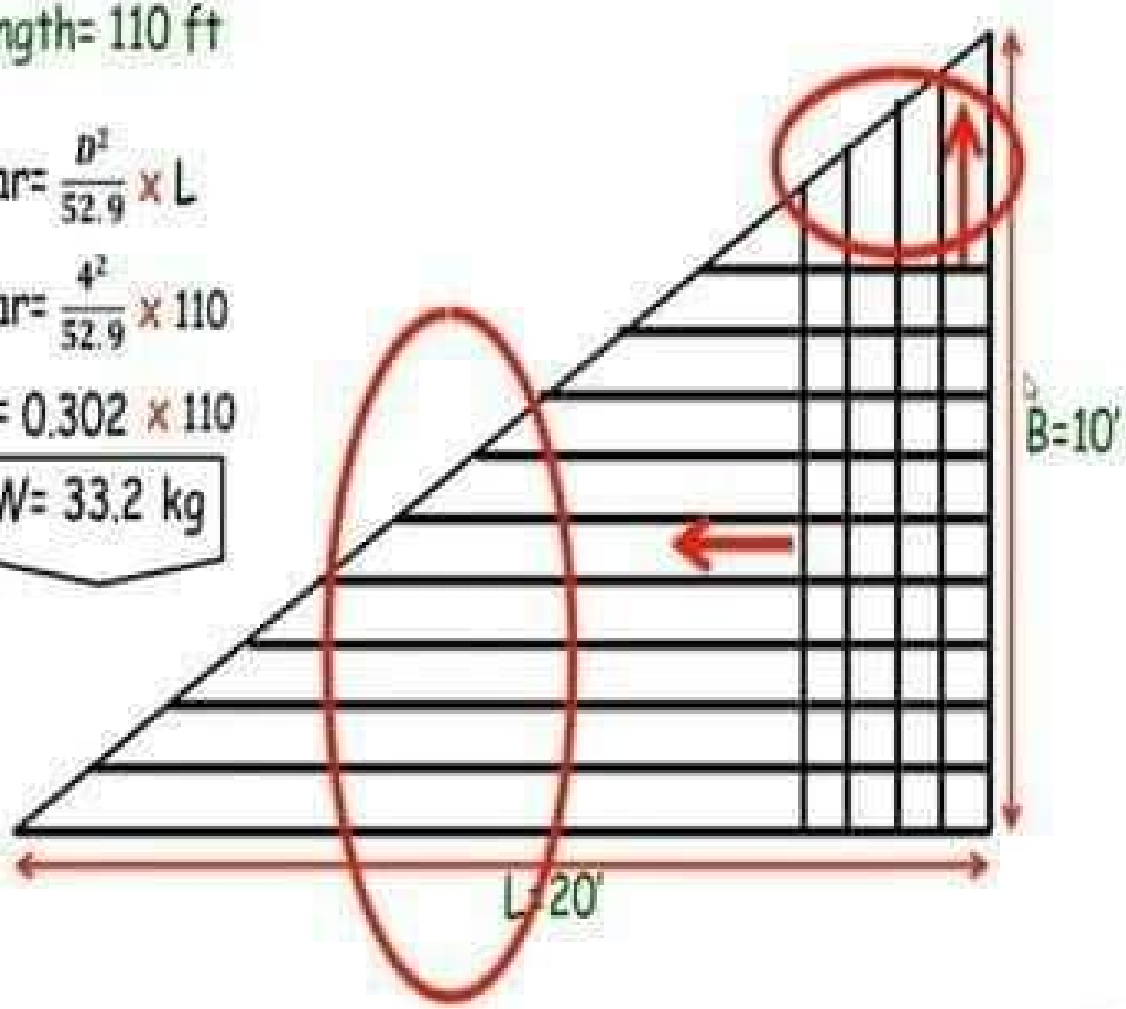
Total length= 110 ft

W of bar= $\frac{D^2}{52.9} \times L$

W of bar= $\frac{4^2}{52.9} \times 110$

W= 0.302 x 110

W= 33.2 kg



Materials calculation for floors?



Example: Calculate materials in given floor section ?

1)Brick ballast in sub base= 3.6



Solution:-

3) Topping stone chips and cement(1:3)

Total wet volume = $30 \times 0.04 = 1.2\ m^3$

$$Material = \frac{ratio\ of\ material}{sum\ of\ ratio} \times Dry\ volume$$

$$Cement = \frac{1}{4} \times 1.524 = 0.381\ cu.m$$

$$Cement = \frac{0.381}{0.035} = 10.88 bags$$

Stone chips = $0.381 \times 3 = 1.143\ m^3$

cement= 10.88 *bags*

Stone chips = 1.66 m^3

Dry volume = wet volume x 1.27

Dry volume = 1.2 x 1.27

Dry volume = 1.524 m^3

Ratio

1 : 3

Sum of ratio

1 + 3 = 4

How To Calculate Cutting Length Of Stirrups

Rectangular Column:

Size Of Column = 300mm × 400mm

Length Of Column (A) = 300 - (2 × 44) = 212mm

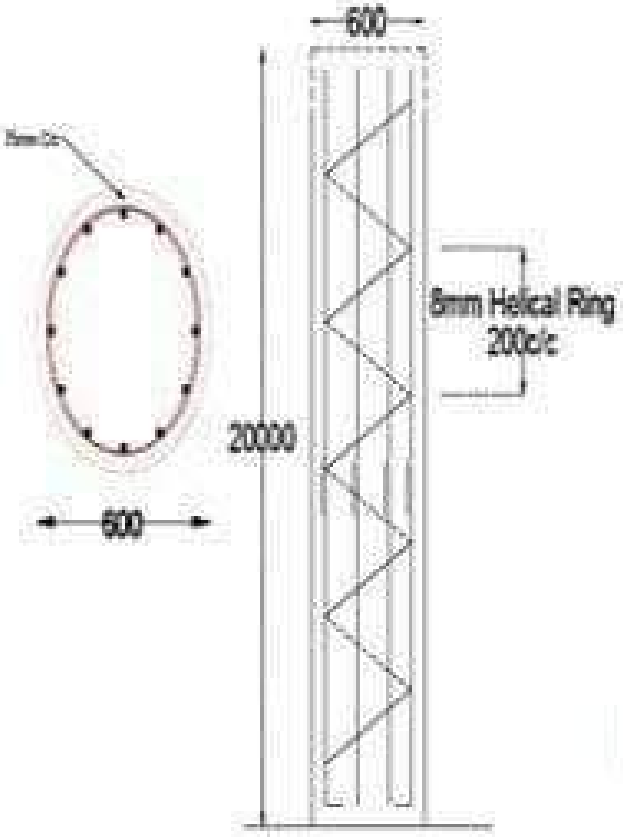
Breadth Of Column (B) = 400 - (2 × 44) = 312mm

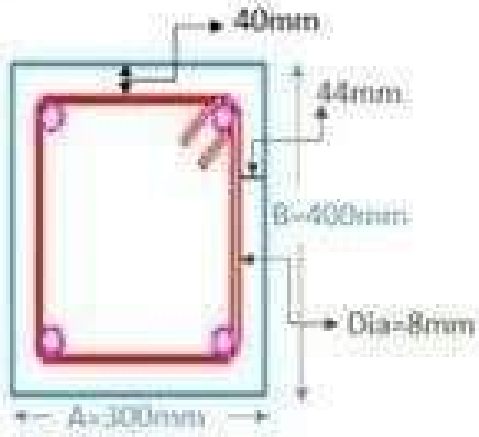
Hook Length = 10 D = 10 × 8 = 80 × 2 = 160mm

Cutting Length Of Stirrup = (A ×2) + (B ×2) + Hook Length

= (212 ×2) + (312 ×2) + 160

= 1208 mm / 1000 = 1.208m





Circular Column:

Dia Of Column = 600mm

Dia Of Stirrup c/c = 600 – (2× 40) – (4 + 4) = 512mm

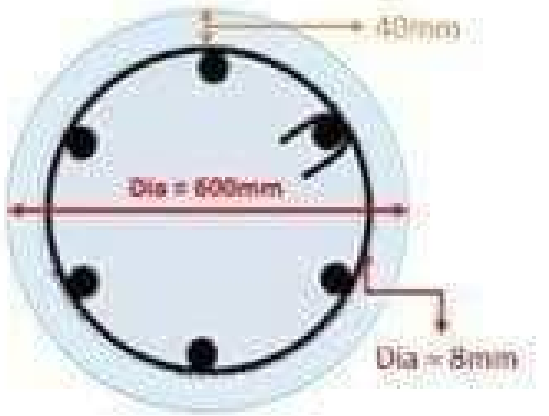
Parameter Of Stirrup = πd = 3.142 × 512 = 1608.704mm

Hook Length = 10 D = 10 × 8 = 80 × 2 = 160mm

Cutting Length Of Stirrup = Parameter Of Stirrup + Hook L

= 1608.704 × 160

= 1768.704 mm / 1000 = 1.768m



HOW TO DESIGN AND CALCULATE THE VOLUME OF CONCRETE FOR U-SHAPE STAIRCASE

Wet Volume = 90.4 cuft

Dry Volume = 90.4 × 1.54

= 139.21 cuft

We will calculate for 1:2:4 Concrete mix.

Volume of cement $= \frac{1}{7} \times$ Dry Volume $= \frac{1}{7} \times 139.21$

= 19.88 cuft

Number Of Bags $= \frac{19.88}{1.25} = 15.90$, Say 16 Bags

Volume Of Sand $= \frac{2}{7} \times$ Dry Volume $= \frac{2}{7} \times 139.21$

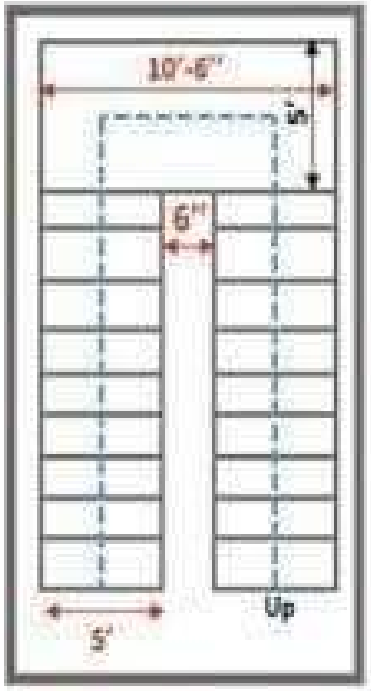
= 39.77 cuft

Volume Of Crush $= \frac{4}{7} \times$ Dry Volume $= \frac{4}{7} \times 139.21$

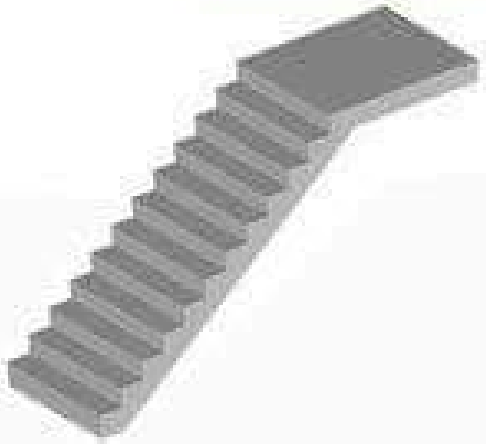
= 79.54 cuft



Section Of Staircase



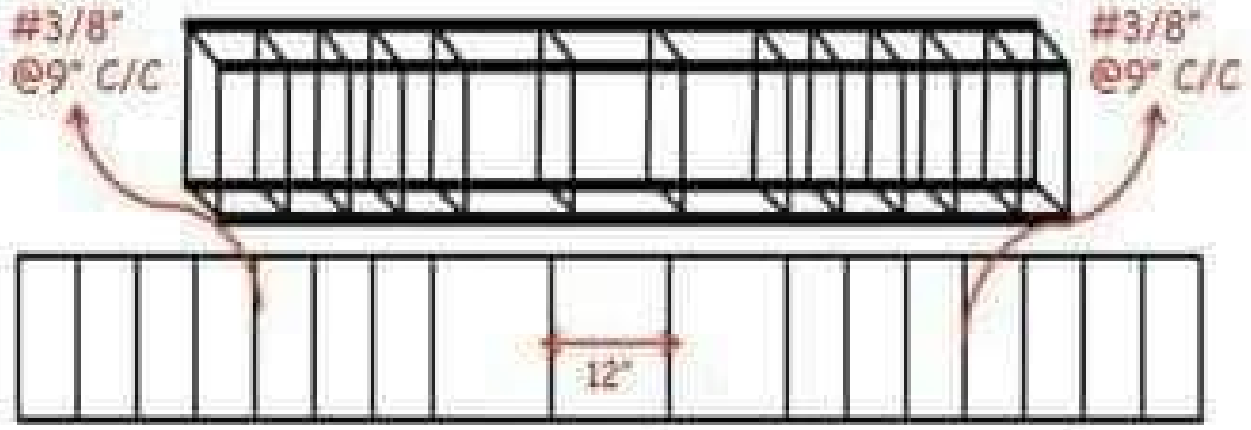
Plan Of Staircase



Quantity survey: Steel calculation for beams

For example:-

Calculate steel in kg for given beam.? Take 1" C.C to all sides. Length=15'



Solution:- Calculation for stirrups

Length of all stirrups bar=

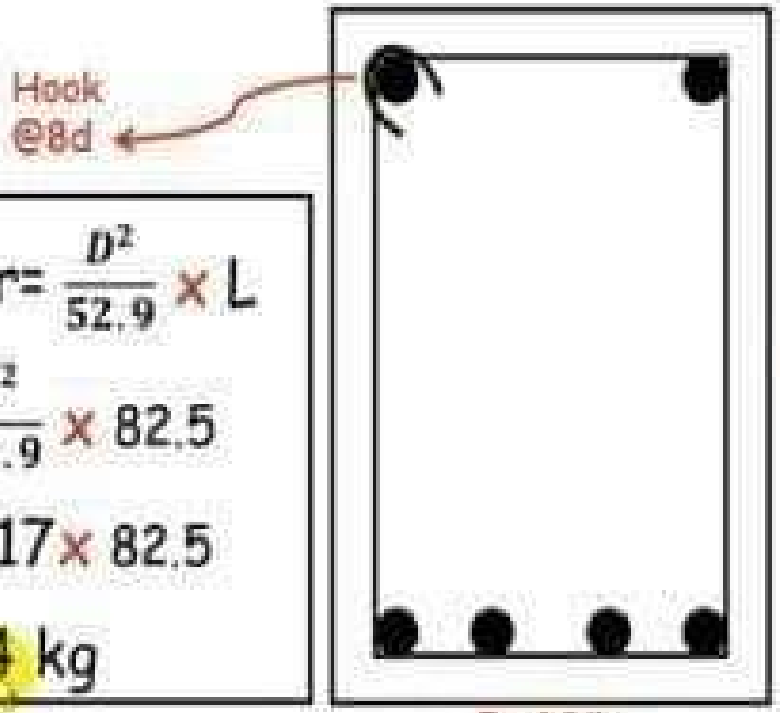
Length of one stirrup x number of stirrups

$= 2\{12 - 2(c.c)\} + 2\{(18-2(c.c))\} + 8d \times 18$

$= 2\{12 - 2(1)\} + 2\{(18 - 2(1)\} + 8\frac{3}{8} \times 18$

Length of all stirrups bar= $\frac{990"}{12}$

Length of all stirrups bar= 82.5'



W of bar= $\frac{D^2}{52.9} \times L$

$W = \frac{3^2}{52.9} \times 82.5$

$W = 0.17 \times 82.5$

W= 14 kg



