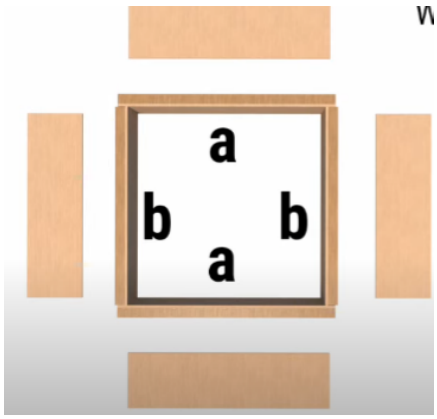
VIOLET = CONSTANT (always in equation) RED = IMPORTANT NOTE TO READ
GREEN = SELECTED BY USER. (Dependent upon input or selection) ORANGE – CORRESPONDING VALUE

FORMWORKS, FRAMEWORKS AND SCAFFOLDING

I. Footing (SAME GIVEN EXAMPLE WITH EXCAVATION)

A. FORMWORKS

F-1



Get the surface area of each side

a= Length of footing (L) = 1m

b= Width of footing (W) = 1m

t = thickness = 0.3 m

A = Perimeter x Thickness x set

Perimeter = 2(a+b) + 0.2

= (2(1+1) +0.2) x 0.3m x 6sets = 7.56 m2

F-2

A= (2(0.9+0.9) +0.2) x 0.3 x 5 sets = 5.7 m2

F-3

A= (2(0.8+0.8) +0.2) x 0.3 x 2 sets = 2.04 m2

Total surface area of footings = 7.56 m2 + 5.7 m2 + 2.04 m2 = 15.3 m2

No. of pieces of Plywood needed = $\frac{TOTAL\ surface\ AREA}{AREA\ OF\ PLYWOOD\ "(1.2\ m * 2.4m)"} = \frac{15.3}{(1.2*2.4)} = 5.31\ pcs\ X\ 50\%$

$= 2.66\ or\ 3\ pcs$

NOTE:

50% is the number of "uses"

If number of uses is set to 2 in FORMWORKS PARAMETERS, multiply by ½ or 50%

If number of uses is set to 3, multiply by 1/3 or 33.33%

¼ or 25%, 1/5 or 20%, 1/6 or 16.67% ….

Always round up the nearest whole number in terms of pieces

VIOLET = CONSTANT (always in equation) RED = IMPORTANT NOTE TO READ
GREEN = SELECTED BY USER. (Dependent upon input or selection) ORANGE – CORRESPONDING VALUE

B. FRAMEWORKS FOR FOOTINGS.

F-1 (SELECTED FOR COMPUTATION SINCE F-1 HAS THE LARGEST AREA= 7.56 m2)
Find the total number of Bd.Ft for lumber framework. (SELECTED FORM LUMBER 2" X 2" X 8')

i. For Length (L) which is 1m in this example. (1m + 0.1m = 1.1m) @ 4 sets
To get the Bd.Ft for the length:

$$= \frac{4(SELECTED\ FORM\ LUMBER^{*}\ ((L+0.1)^{*}3.28)}{12}$$

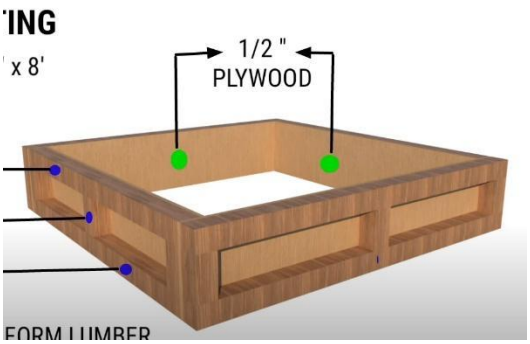
$$= \frac{4(2^{*}\ 2^{*}\ (1.1^{*}3.28)}{12} = 4.81\ bd.ft$$

Note: 2 * 2 Here is from 2" x 2" x 8' Selected by the user

ii. For Width (W) which is 1m in this example. (1m) @ 4 sets
Note: Use only the width, no need to add 0.1m

$$= \frac{4(SELECTED\ FORM\ LUMBER^{*}\ (L^{*}3.28)}{12}$$

$$= \frac{4(2^{*}\ 2^{*}\ (1^{*}3.28)}{12} = 4.37\ bd.ft$$



iii. In a footing there are always 4 sides for form work

2 sets of sides are always identical.

First set of sides:

Determine the number of vertical frame

= (L+0.1)/0.7m + 1

= (1+0.1)/0.7 +1= 2.57 or 3 pcs.

(ALWAYS ROUND UP IF THERE IS A DECIMAL IN THIS PART)

Multiply by 2 (because this is an identical set)

= 3 x2 = 6pcs.

2nd set of sides:

= ((L)/0.7m + 1) = ((1)/0.7 +1)= 2.43 or 3 pcs.

= 3 x 2 = 6pcs

Total number of Pieces = 6+6 = 12 pcs.

VIOLET = CONSTANT (always in equation) RED = IMPORTANT NOTE TO READ
GREEN = SELECTED BY USER. (Dependent upon input or selection) ORANGE – CORRESPONDING VALUE

To get its length:

If the user selected 2*2 = thickness – 0.1m

If the user selected 2*3 = thickness – 0.15 m

In this case use = 0.3 – 0.1 = 0.2m (since the user selected 2*2)

$= \frac{12\ (2*\ 2*\ (0.2*3.28)}{12} = 2.624\ bd.ft$

12 is the number of pcs, but only for this part (vertical frames)

Total number of bd.ft = 4.81 + 4.37 + 2.624 = 11.804 bd. Ft

iv. Solve for the multiplier

Multiplier= (Total bd. Ft /area of the largest footing (F1 =7.56 m2))
Surface area = (L+0.1 x thickness x 2) + (W x thickness x 2)

= 11.804 / ((1.1x0.3x2) +(1x0.3x2)) = 9.38 bd ft / m2

Total Board foot (bd.ft) = 9.38 x 15.3 = 143.514 bd ft. x 50% = 71.575 bd. Ft
Note: 15.3 m2 came from Total surface area of footings computed above from page 1

SELECTED FORM LUMBER UNDER PARAMETERS BY USER: 2" X 2" X 8'

Pcs of wood = $\frac{TOTAL\ NUMBER\ OF\ BD.FT*12}{SELECTED\ LUMBER\ FORM} = \frac{71.757*12}{2*2*8} = 27\ pcs\ of\ \ 2"\ x\ 2"\ x\ 8'$

Total no of pcs for footings 1 2 and 3 = 27pcs of 2" x2" x 8'

Summary for Footing Formworks

Plywood: 3pcs (P 674.00 /pc) = P 2,022.00
Total number of LUMBER: 2" x 2" x 8' @ 27pcs **(P 130.00 /pc) = P 3,510.00**

Total Material Cost= 2,022 + 3510 = P 5,532.00

Unit cost = Total Material cost / area of formworks= 5532/ 15.3 = P 361.568

Labor cost = labor rate* area of formwork = P 300.00 / m2 * 15.3 m2 = P 4590.00

VIOLET = CONSTANT (always in equation) RED = IMPORTANT NOTE TO READ
GREEN = SELECTED BY USER. (Dependent upon input or selection) ORANGE – CORRESPONDING VALUE

D. FOR TRAPEZOIDAL WALL FOOTING
(FOR REFERENCE ONLY, NOT INCLUDED IN THE TOTAL)

L: 53.25 m

L f-f: 32.7 m

BT: 0.4m

BU: 0.2m

T: 0.2m

$$\text{A} = (([(\text{c x L}) + 0.2] + \left(\frac{B_U + B_T}{2} \times T\right)) \text{ x } 2) \text{ x no of sets.}$$

$$c = \sqrt{\left(\frac{BT - BU}{2}\right)^2 + (T)^2}$$

$$c = \sqrt{\left(\frac{0.4 - 0.2}{2}\right)^2 + (0.2)^2} = 0.2236\ m$$

$$\text{A} = (([(0.2236 \text{ x } 53.25) + 0.2] + \left(\frac{0.2 + 0.4}{2} \times 0.2\right)) \text{ x } 2) \text{ x } 1 = 24.3334 \text{ m2}$$

No. of pieces of Plywood needed = $\frac{TOTAL\ surface\ AREA}{AREA\ OF\ PLYWOOD\ "(1.2\ m * 2.4m)"} = \frac{24.334}{(1.2*2.4)} = 8.449\ pcs\ X\ 50\%$

= 4.224 or **5 pcs of plywood**

NOTE: BEFORE COMPUTING THE NO. OF PIECES , ADD ALL THE AREA OF ALL FOOTINGS FIRST (FOOTING, COMBINED FOOTING, TRAPEZOIDAL FOOTING)

For RECTANGULAR WALL FOOTING, no need for form works assuming the trimmed soil is shaped good enough.

IN THIS EXAMPLE, RECTANGULAR WF IS USED, SO NO NEED TO INCLUDE TRAPEZOIDAL WF EXAMPLE IN THE TOTALITY.

VIOLET = CONSTANT (always in equation) RED = IMPORTANT NOTE TO READ
GREEN = SELECTED BY USER. (Dependent upon input or selection) ORANGE – CORRESPONDING VALUE

II. COLUMNS

Note: sets = quantity = QTY

A. Form work

C-1 @ 11 sets

b= 0.25 m

d = 0.25 m

h = 3.87 m

A= Perimeter x height x sets

Perimeter = 2(b+d) + 0.2 = 2(0.25 + 0.25) + 0.2 = 1.2 m

=1.2 x 3.87 x 11 = 51.084 m2

C-2 @ 2 sets

b= 0.2m

d = 0.3 m

h= 3.87

A= Perimeter x height x sets

A= (2(0.2+0.3) +0.2) x 3.87 x 2= 9.288 m2

Area total = 51.084 + 9.288 = 60.372 m2

No. of pieces of Plywood needed = $\frac{TOTAL\ surface\ AREA}{AREA\ OF\ PLYWOOD\ "(1.2\ m * 2.4m)"} = \frac{60.372}{(1.2*2.4)} = 20.96\ pcs\ X\ 50\%$

= 10.481 or **11 pcs**

VIOLET = CONSTANT (always in equation) RED = IMPORTANT NOTE TO READ
GREEN = SELECTED BY USER. (Dependent upon input or selection) ORANGE – CORRESPONDING VALUE

B. **COLUMN (OR POST) FRAMEWORK**

From lumber selected by user: 2” x 3” x 10”
Thickness of plywood = BASED ON ALWAYS ½” (FIXED)

Look for the value in the table that matched the category

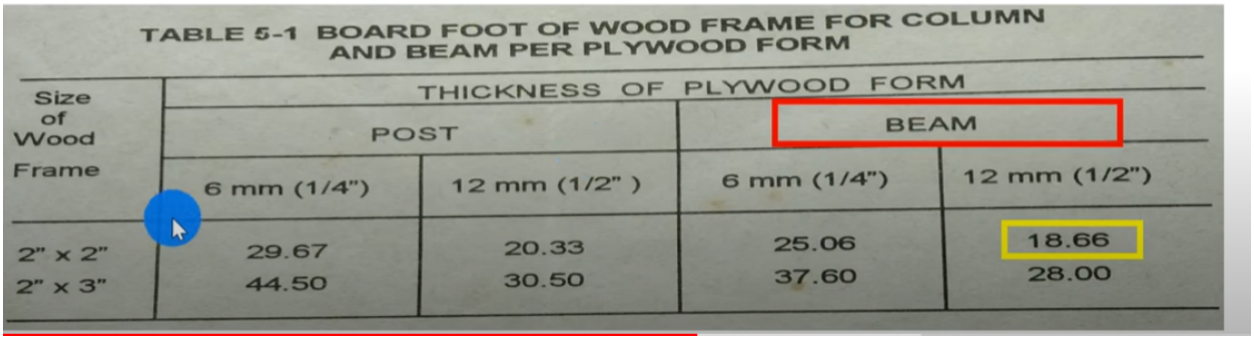


TABLE 5-1 BOARD FOOT OF WOOD FRAME FOR COLUMN AND BEAM PER PLYWOOD FORM

Size of Wood Frame	THICKNESS OF PLYWOOD FORM			
	POST		BEAM	
	6 mm (1/4")	12 mm (1/2")	6 mm (1/4")	12 mm (1/2")
2" x 2"	29.67	20.33	25.06	18.66
2" x 3"	44.50	30.50	37.60	28.00

Note: disregard the rectangular highlights in this table

=11 pcs x 30.5 = **335 bd. Ft**

Pcs of wood = $\frac{TOTAL\ NUMBER\ OF\ BD.\ FT*12}{SELECTED\ LUMBER\ FORM} = \frac{335*12}{2*3*10} = 67\ pcs\ of\ 2" \times 3" \times 10'$

C. SCAFFOLDING

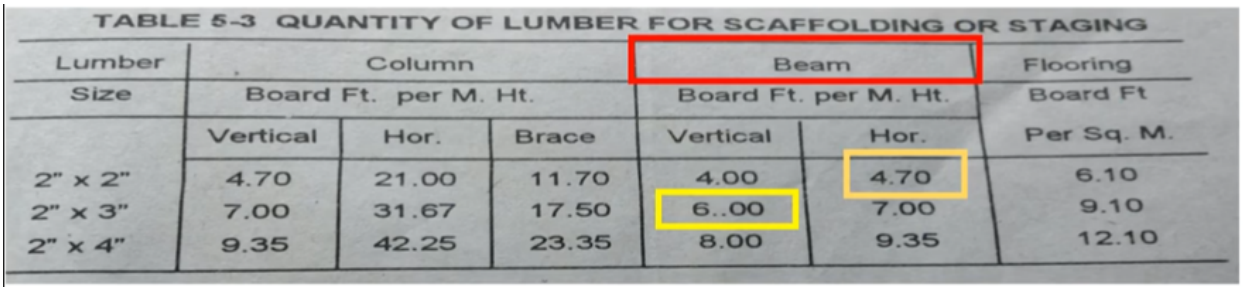


TABLE 5-3 QUANTITY OF LUMBER FOR SCAFFOLDING OR STAGING

Lumber Size	Column Board Ft. per M. Ht.			Beam Board Ft. per M. Ht.		Flooring Board Ft Per Sq. M.
	Vertical	Hor.	Brace	Vertical	Hor.	
2" x 2"	4.70	21.00	11.70	4.00	4.70	6.10
2" x 3"	7.00	31.67	17.50	6..00	7.00	9.10
2" x 4"	9.35	42.25	23.35	8.00	9.35	12.10

Note: disregard the rectangular highlights in this table

VERTICAL SUPPORT

FORM LUMBER (2” X 3” 8’)

= Total column height x value in the table

Total height = (3.87 x 11) + (3.87x 2) = 50.31

VIOLET = CONSTANT (always in equation) RED = IMPORTANT NOTE TO READ
GREEN = SELECTED BY USER. (Dependent upon input or selection) ORANGE – CORRESPONDING VALUE

=50.31 X 7 = 352.17 bd. Ft

Pcs of wood =

$$\frac{TOTAL\ NUMBER\ OF\ BD.\ FT*12}{SELECTED\ LUMBER\ FORM} = \frac{352.17*12}{2*3*8} = 88.04 \times 50\% = 44.02\ or\ 45\ pcs\ of\ 2" \times 3" \times 8'$$

HORIZONTAL BRACE (2 X 2 X 8)

= Total column height x value in the table

Total height = (3.87 x 11) + (3.87x 2) = 50.31

=50.31 X 31.67 = 1593.3177 bd. ft

Pcs of wood =

$$\frac{TOTAL\ NUMBER\ OF\ BD.\ FT*12}{SELECTED\ LUMBER\ FORM} = \frac{31593.32*12}{2*2*8} = 597.49 \times 50\% = 298.74\ or\ 299\ pcs\ of\ 2" \times 2" \times 8'$$

DIAGONAL BRACE (2 X 2 X 8)

= Total column height x value in the table

Total height = (3.87 x 11) + (3.87x 2) = 50.31

=50.31 X 17.5 = 880.425 bd. ft

Pcs of wood =

$$\frac{TOTAL\ NUMBER\ OF\ BD.\ FT*12}{SELECTED\ LUMBER\ FORM} = \frac{880.425*12}{2*2*8} = 330.1593 \times 50\% = 165.0796\ or\ 166\ pcs\ of\ 2" \times 2" \times 8'$$

Plywood: **11 pcs (P 674.00 /pc) = P 7,414.00**

2x2x8: **465 pcs (P 130.00 /pc) = P 60,450.00**

2x3x8: **45 pcs (P 150.00 /pc) = P 6,750.00**

2x3x10: **67 pcs (P 150.00 /pc) = P 10,050.00**

Total material cost = **P84,664.00**

Unit Cost= 84,664.00/60.37 **= P1402.418**

Labor cost = 60.37 * 300 = P18,111.00

VIOLET = CONSTANT (always in equation) RED = IMPORTANT NOTE TO READ
GREEN = SELECTED BY USER. (Dependent upon input or selection) ORANGE – CORRESPONDING VALUE

III. Beams / TIE BEAMS

B-1

A. formwork

d= 0.55m

b= 0.3m

L= 40 m

Area total = (2(d) + b+ 0.1) x Length

= (2 (0.55) + 0.3 + 0.1) x 40 = 60m2

No. of pieces of Plywood needed = $\frac{TOTAL\ surface\ AREA}{AREA\ OF\ PLYWOOD\ "(1.2\ m * 2.4m)"} = \frac{60}{(1.2*2.4)} = 20.83\ pcs\ X\ 50\%$

= 10.416 or **11 pcs**

B. Framework

Lumber selected: 2” x 3” x 8’

Thickness of formwork: ½ ”

Look for the value in the table that matched the category

TABLE 5-1 BOARD FOOT OF WOOD FRAME FOR COLUMN AND BEAM PER PLYWOOD FORM

Size of Wood Frame	THICKNESS OF PLYWOOD FORM			
	POST		BEAM	
	6 mm (1/4")	12 mm (1/2")	6 mm (1/4")	12 mm (1/2")
2" x 2"	29.67	20.33	25.06	18.66
2" x 3"	44.50	30.50	37.60	28.00

Note: disregard the rectangular highlights in this table

= 11pcs x 28 =308 **bd. Ft**

Pcs of wood = $\frac{TOTAL\ NUMBER\ OF\ BD.\ FT*12}{SELECTED\ LUMBER\ FORM} = \frac{308*12}{2*3*8} = 77\ pcs\ of\ 2" \times 3" \times 8'$

VIOLET = CONSTANT (always in equation) RED = IMPORTANT NOTE TO READ
GREEN = SELECTED BY USER. (Dependent upon input or selection) ORANGE – CORRESPONDING VALUE

C. Scaffolding for beams (NO SCAFFOLDING FOR TIE BEAMS!!!)

TABLE 5-3 QUANTITY OF LUMBER FOR SCAFFOLDING OR STAGING

Lumber Size	Column Board Ft. per M. Ht.			Beam Board Ft. per M. Ht.		Flooring Board Ft
	Vertical	Hor.	Brace	Vertical	Hor.	Per Sq. M.
2" x 2"	4.70	21.00	11.70	4.00	4.70	6.10
2" x 3"	7.00	31.67	17.50	6..00	7.00	9.10
2" x 4"	9.35	42.25	23.35	8.00	9.35	12.10

Note: disregard the rectangular highlights in this table

Vertical Support (2" x 2" x 8')
= Total length of beams x value in the table
= 40m x 4 = 160 bd. Ft

Pcs of wood = $\frac{TOTAL\ NUMBER\ OF\ BD.\ FT*12}{SELECTED\ LUMBER\ FORM} = \frac{160*12}{2*2*8} = 60\ x\ 50\% = 30\ pcs\ of\ 2x2x8$

Horizontal Support (2" x 2" x 8')
= 40m x 4.7 = 188 bd. Ft
Pcs of wood =
$\frac{TOTAL\ NUMBER\ OF\ BD.\ FT*12}{SELECTED\ LUMBER\ FORM} = \frac{188*12}{2*2*8} = 70.5\ x\ 50\% = 35.25\ or\ 36\ pcs\ of\ 2x2x8$

Plywood: **11 pcs (P 674.00 /pc) = P 7,414.00**

2x2x8: **66 pcs (P 130.00 /pc) = P 8,580.00**

2x3x8: **77 pcs (P 150.00 /pc) = P 11,550.00**

Total material cost = **P 27,544.00**

Unit Cost= 27,544.00/60 **= P459.07**

Labor cost = 60 * 300 = P18,000.00

VIOLET = CONSTANT (always in equation) RED = IMPORTANT NOTE TO READ
GREEN = SELECTED BY USER. (Dependent upon input or selection) ORANGE – CORRESPONDING VALUE

IV. SLAB (SUSPENDED SLAB ONLY)

Not applicable to ground floor slabs, 2nd floor and above only.

A. FORMWORK

L= 3.5 m

W= 3m

A= L x W = 3.5 x 3 = 10.5m2

No. of pieces of Plywood needed = $\frac{TOTAL\ surface\ AREA}{AREA\ OF\ PLYWOOD\ "(1.2\ m * 2.4m)"} = \frac{10.5}{(1.2*2.4)}\ 3.64\ or\ 4pcs$

No. of uses of formwork is not applicable in slab, do not multiply 50 % (in sus. slab only).

B. Scaffolding

Form lumber selected by user: 2” x 3” x 10’
A= 10.5 m2 x 9.1 = 95.55 bd.ft

$\frac{95.55*12}{2*3*10} = 19.11\ or\ 20pcs\ of\ 2"x\ 3"\ x10'$

SIZE	FLOORING bd. Ft. Per sq.m
2" x 2"	6.1
2"x 3"	9.1
2" x 4"	12.1

Plywood: 4 **pcs (P 674.00 /pc) = P 2,696.00**

2x3x10: **20 pcs (P 150.00 /pc) = P 3,000.00**

Total material cost = P 5,696.00

Unit cost = 5696 / 10.5 = P542.48

Labor cost = 10.5*300 = P 3150.00

VIOLET = CONSTANT (always in equation) RED = IMPORTANT NOTE TO READ
GREEN = SELECTED BY USER. (Dependent upon input or selection) ORANGE – CORRESPONDING VALUE

IIV. STAIRS (U-STAIRS)

IN THIS EXAMPLE, U-STAIRS IS USED

STEPS (FIRST FLIGHT)	10
STEPS (2ND FLIGHT)	7
STAIR LENGTH:	1200 mm
RISER HEIGHT :	150 mm
TREAD WIDTH:	225 mm
WAIST SLAB THICKNESS:	150mm
LANDING WIDTH:	1200 mm
GAP:	125 mm
LANDING THICKNESS:	150 mm

FIRST FLIGHT:

$$L = \sqrt{(RISER\ HEIGHT\ *\ NO\ OF\ STEPS)^2 + (TREAD\ WIDTH\ *\ NO\ OF\ STEPS)^2}$$

$$FLIGHT\ 1\ LENGTH = \sqrt{(150\ *\ 10)^2 + (225\ *\ 10)^2} = 2.705m$$

$AREA\ OF\ PLYWOOD\ FOR\ BOTTOM\ SUPPORT$

$$A = L \times SL\ STAIR\ LENGTH = 2.705 \times 1.2 = 3.246\ m3$$

RISER BOARD

$$A = (L\ *\ (RISER\ HEIGHT\ +\ 0.1))\ *\ 2$$

$$A = (2.705\ *\ (0.15\ +\ 0.1))\ *\ 2 = 0.8656\ m2$$

NOTE: STAIR LENGTH SHOULD BE "STAIR WIDTH" (SW)

SECOND FLIGHT:

$$L = \sqrt{(RISER\ HEIGHT\ *\ NO\ OF\ STEPS)^2 + (TREAD\ WIDTH\ *\ NO\ OF\ STEPS)^2}$$

$FLIGHT\ 2\ LENGTH = \sqrt{(105\ *\ 10)^2 + (157.5\ *\ 10)^2} = 1.892 \approx 1.9m$ (ROUND UP MULTIPLES OF 5)

$AREA\ OF\ PLYWOOD\ FOR\ BOTTOM\ SUPPORT$

$$A = L \times STAIR\ WIDTH\ "SW" = 1.9 \times 1.2 = 2.28\ m3$$

RISER BOARD

$$A = (L\ *\ (RISER\ HEIGHT\ +\ 0.1))\ *\ 2$$

$$A = (1.9\ *\ (0.15\ +\ 0.1))\ *\ 2 = 0.608\ m2$$

LANDING

A=SW*2+GAP*LANDING WIDTH+2*LANDING WIDTH*LAND THCK +[SL*2+GAP)*LAND THCK]

$$A = [((1.2\ *\ 2) + 0.125)\ *\ 1.2] + [2\ *\ (1.2\ *\ 0.15)] + ((1.2\ *\ 2) + 0.125)\ *\ 0.15) = 3.76875\ m2$$

VIOLET = CONSTANT (always in equation) RED = IMPORTANT NOTE TO READ
GREEN = SELECTED BY USER. (Dependent upon input or selection) ORANGE – CORRESPONDING VALUE

STEPS:

A= SW x RISER X (STEPS FIRST FLIGHT + STEPS SECOND FLIGHT) = (1.2 X 0.15) X (10+7) = **3.06 m2**

Area total= Add all acquired area **(BOLD NUMBERS) X QTY OF STAIRS IN THAT FLOOR**

$Area\ total = (3.246 + 0.8656 + 2.28 + 0.608 + 3.76875 + 3.06) \times 1 =$ **13.82835 m2**

No. of pieces of Plywood needed = $\frac{TOTAL\ surface\ AREA}{AREA\ OF\ PLYWOOD\ "(1.2\ m * 2.4m)"} = \frac{13.828}{(1.2*2.4)} = 4.801 \times 50\%$

$= 2.4\ or\ 3pcs$

FRAMEWORK FOR STAIRS:

By Default, 2" x 3" x8' is used

FOR FRONT SUPPORT BRACING

$$= \frac{\frac{SW}{0.6}(LUMBER\ WOOD\ SIZE \times (L \times 3.28))}{12}$$

$\frac{SW}{0.6} = \frac{1.2}{0.6} = 2$ **(ROUND UP TO NEAREST WHOLE NUMBER IF THERE'S A DECIMAL. ALWAYS. E.G 2.38 = 3)**

$Front\ wood\ bracing\ (FIRST\ FLIGHT) = \frac{2(2\times3\times(2.705\times3.28))}{12} = 8.8724\ bd.\ ft$

$Front\ wood\ bracing\ (SECOND\ FLIGHT) = \frac{2(2\times3\times(1.9\times3.28))}{12} = 6.23\ bd.\ ft$

$Bracing\ support\ per\ steps = \frac{TOTAL\ STEPS\ (LUMBER\ SIZE\times(3.28))}{12} \times \frac{SL}{0.6} (*\ rounded\ off\ value)$

$Bracing\ support\ per\ steps = \frac{(10+7)\ (2\times3\times(3.28))}{12} = 27.88\ bd.\ ft$ x 2 = **55.76 bd. ft**

NOTE: 2 is from $\frac{SW}{0.6} = \frac{1.2}{0.6} = 2$

FOR BACK SUPPORT BRACING

$\frac{SW}{0.3} = \frac{1.2}{0.3} = 4$ **(ROUND UP TO NEAREST WHOLE NUMBER IF THERE'S A DECIMAL. ALWAYS.)**

VIOLET = CONSTANT (always in equation) RED = IMPORTANT NOTE TO READ
GREEN = SELECTED BY USER. (Dependent upon input or selection) ORANGE – CORRESPONDING VALUE

Back $wood\ bracing\ (FIRST\ FLIGHT) = \frac{4(2\times3\times(2.705\times3.28))}{12} = 17.7448\ bd.\ ft$

$Back\ wood\ bracing\ (SECOND\ FLIGHT) = \frac{4(2\times3\times(1.9\times3.28))}{12} = 12.464\ bd.\ ft$

FOR STEPS

No. of steps: 10+7= 17

SL = 1.2 m

Lumber wood: 2" x 3"

$Wood\ bracing\ for\ steps = \frac{2(LUMBER\ WOOD\ SIZE\times(SW\times3.28))}{12}$ **x no. of steps**

$Wood\ bracing\ for\ steps = \frac{2(2\times3\times(1.2\times3.28))}{12}$ **x 17= 66.912 BD Ft.**

TOTAL VOLUME FOR STAIRS (FRAMEWORK): 8.8724 + 6.23+55.76+17.7448+12.464 = **167.9832 bd. Ft**

Pcs of wood =
$\frac{TOTAL\ NUMBER\ OF\ BD.\ FT*12}{SELECTED\ LUMBER\ FORM} = \frac{167.98*12}{2*3*8} = 41.995\ x\ 50\% = 20.99\ \ or\ 21\ pcs\ of\ 2x3x8$

SCAFFOLDING FOR STAIRS:

USER SELECTION: 2" X 3" x 8 '

12 bd ft / m (CONSTANT)

= Flight 1 length + SW*2+ Gap + flight 2 length
= 2.705 + 1.2*2 + 0.125+ 1.9 = 7.13 m
7.13 m x 12 bd ft/ m = **85.56 bd. Ft**

TOTAL VOLUME OF WOOD FOR STAIRS (SCAFFOLDING):

Pcs of wood =
$\frac{TOTAL\ NUMBER\ OF\ BD.\ FT*12}{SELECTED\ LUMBER\ FORM} = \frac{85.56*12}{2*3*8} = 21.39\ x\ 50\% = 10.695\ \ or\ 11\ pcs\ of\ 2x3x8$

VIOLET = CONSTANT (always in equation) RED = IMPORTANT NOTE TO READ
GREEN = SELECTED BY USER. (Dependent upon input or selection) ORANGE – CORRESPONDING VALUE

PLYWOOD: 27+ 5 = 3 pcs (P 674.00 /pc) = P 2,022.00

2"x3"x8" =32 pcs(P 150.00 /pc) = P 4800.00

Total material cost = P 6,822.00

Unit cost = 6,822.00/13.83 = P 493.28

Labor cost = 13.83*300 = P 4,149.00

FOR NAILS

KG OF NAILS = TOTAL AREA OF PLYWOOD or PHENOLIC or ECOBOARD * 0.215

note: 0.215 is inputted by the user in formworks parameters.

KG OF NAILS = ADD ALL AREA OF FORMWORKS= 15.3 + 60.37+60+10.5+13.83 = 160 m2
= 160 m2 * 0.215
= **34.40 kg**

= 34.40 kg (@ 150php /kg)
= 34.4 x 150php
= PHP 5,160.00

VIOLET = CONSTANT (always in equation) RED = IMPORTANT NOTE TO READ
GREEN = SELECTED BY USER. (Dependent upon input or selection) ORANGE – CORRESPONDING VALUE

FOR STRAIGHT STAIRS
(FOR REFERENCE ONLY, NOT INCLUDED IN THE TOTALITY OF THIS EXAMPLE)
- **Basically from U -stairs , remove 2nd flight, landing, and gap, you get straight stairs**

FLIGHT:

$$L = \sqrt{(RISER\ HEIGHT\ *\ NO\ OF\ STEPS)^2 + (TREAD\ WIDTH\ *\ NO\ OF\ STEPS)^2}$$

$$FLIGHT\ 1\ LENGTH\ = \sqrt{(150\ *\ 10)^2 + (225\ *\ 10)^2} = 2.705m$$

$$AREA\ OF\ PLYWOOD\ FOR\ BOTTOM\ SUPPORT$$

$$A\ = L \times SL\ STAIR\ LENGTH\ = 2.705 \times 1.2\ = 3.246\ m3$$

RISER BOARD

$$A\ = (L\ *\ (RISER\ HEIGHT\ +\ 0.1))\ *\ 2$$

$$A\ = (2.705\ *\ (0.15\ +\ 0.1))\ *\ 2\ =\ 0.8656\ m2$$

STEPS:

A= SL x RISER X (no of STEPS) = (1.2 X 0.15) X (10) = 1.8 m2

Area total= Add all acquired area **(BOLD NUMBERS) X QTY OF STAIRS IN THAT FLOOR**

$$Area\ total\ = (3.246\ +\ 0.8656\ +\ 1.8) \times 1\ =$$ **5.9116 m2**

No. of pieces of Plywood needed = $\frac{TOTAL\ surface\ AREA}{AREA\ OF\ PLYWOOD\ "(1.2\ m\ *\ 2.4m)"} = \frac{5.9116}{(1.2*2.4)} = 2.05 \times 50\%$

$$= 1.02\ or\ 2pcs$$

VIOLET = CONSTANT (always in equation) RED = IMPORTANT NOTE TO READ
GREEN = SELECTED BY USER. (Dependent upon input or selection) ORANGE – CORRESPONDING VALUE

FRAMEWORK FOR STRAIGHT STAIRS:

By Default, 2" x 3" is used

FOR FRONT SUPPORT BRACING

$$\frac{\frac{SL}{0.6}(LUMBER\ WOOD\ SIZE \times (SL \times 3.28))}{12}$$

$\frac{SL}{0.6} = \frac{1.2}{0.6} = 2$ **(ROUND UP TO NEAREST WHOLE NUMBER IF THERE'S A DECIMAL. ALWAYS. E.G 2.38 = 3)**

$$Front\ wood\ bracing\ = \frac{2(2\times3\times(2.705\times3.28))}{12} = 8.8724\ bd.\ ft$$

$$Bracing\ support\ per\ steps\ = \frac{TOTAL\ STEPS\ (LUMBER\ SIZE\times(3.28))}{12} \times \frac{SL}{0.6} (*\ rounded\ off\ value)$$

$$Bracing\ support\ per\ steps\ = \frac{(10)\ (2\times3\times(3.28))}{12} = 16.4\ bd.\ ft$$ x 2 = **32.8 bd. ft**

FOR BACK SUPPORT BRACING

$\frac{SL}{0.3} = \frac{1.2}{0.3} = 4$ **(ROUND UP TO NEAREST WHOLE NUMBER IF THERE'S A DECIMAL. ALWAYS.)**

$$Back\ wood\ bracing\ = \frac{4(2\times3\times(2.705\times3.28))}{12} = 17.7448\ bd.\ ft$$

FOR STEPS

No. of steps: 10

SL = 1.2 m

Lumber wood: 2" x 3"

$$Wood\ bracing\ for\ steps\ = \frac{2(LUMBER\ WOOD\ SIZE\times(SL\times3.28))}{12}$$ **x no. of steps**

$$Wood\ bracing\ for\ steps\ = \frac{2(2\times3\times(1.2\times3.28))}{12}$$ **x 10 = 39.36 BD Ft.**

VIOLET = CONSTANT (always in equation) RED = IMPORTANT NOTE TO READ
GREEN = SELECTED BY USER. (Dependent upon input or selection) ORANGE – CORRESPONDING VALUE

SCAFFOLDING FOR STAIRS:

USER SELECTION: 2" X 3"

12 bd ft / m (CONSTANT)

= Flight length
= 2.705
2.705 m x 12 bd ft/ m = **32.46 bd. Ft**

TOTAL VOLUME OF WOOD FOR STAIRS:
= (ALL BD. FT. OF SAME LUMBER SIZE) X QTY of stairs

= 8.8742 + 32.8+17.7448+39.36+32.46
* NOTE THAT IN THIS CASE ALL LUMBER SIZE IS 2" x 3".

= **131.239 bd ft. (2" x 3" lumber size)**

FOR L-STAIRS

(FOR REFERENCE ONLY, NOT INCLUDED IN THE TOTALITY OF THIS EXAMPLE)

- **Basically, from U -stairs, remove the gap and you'll get L-stairs**

FIRST FLIGHT:

$$L = \sqrt{(RISER\ HEIGHT\ *\ NO\ OF\ STEPS)^2 + (TREAD\ WIDTH\ *\ NO\ OF\ STEPS)^2}$$

$$FLIGHT\ 1\ LENGTH\ = \sqrt{(150\ *\ 10)^2 + (225\ *\ 10)^2} = 2.705m$$

$$AREA\ OF\ PLYWOOD\ FOR\ BOTTOM\ SUPPORT$$

$$A\ =\ L \times SW\ STAIR\ WIDTH\ =\ 2.705 \times 1.2\ =\ 3.246\ m2$$

RISER BOARD

$$A\ =\ (L\ *\ (RISER\ HEIGHT\ +\ 0.1))\ *\ 2$$

$$A\ =\ (2.705\ *\ (0.15\ +\ 0.1))\ *\ 2\ =\ 0.8656\ m2$$

VIOLET = CONSTANT (always in equation) RED = IMPORTANT NOTE TO READ
GREEN = SELECTED BY USER. (Dependent upon input or selection) ORANGE – CORRESPONDING VALUE

SECOND FLIGHT:

$$L = \sqrt{(RISER\ HEIGHT\ *\ NO\ OF\ STEPS)^2 + (TREAD\ WIDTH\ *\ NO\ OF\ STEPS)^2}$$

$$FLIGHT\ 2\ LENGTH = \sqrt{(105\ *\ 10)^2 + (157.5\ *\ 10)^2} = 1.892 \approx 1.9m$$ (ROUND UP MULTIPLES OF 5)

$AREA\ OF\ PLYWOOD\ FOR\ BOTTOM\ SUPPORT$

$$A = L \times SL\ STAIR\ LENGTH = 1.9 \times 1.2 = 2.28\ m3$$

RISER BOARD

$$A = (L\ *\ (RISER\ HEIGHT\ +\ 0.1))\ *\ 2$$

$$A = (1.9\ *\ (0.15\ +\ 0.1))\ *\ 2 = 0.608\ m2$$

LANDING

$$A = SL^2 + [2\ *\ (LAND\ THCK\ *\ SL)]$$

$$A = \left[\left(\left(1.2^2\right)\right)\right] + [2\ *\ (0.15\ *\ 1.2)] = 1.8\ m2$$

STEPS:

A= SL x RISER X (STEPS FIRST FLIGHT + STEPS SECOND FLIGHT) = (1.2 X 0.15) X (10+7) = **3.06 m2**

Area total= Add all acquired area **"BOLD NUMBERS" X QTY OF STAIRS IN THAT FLOOR**

$$Area\ total = (3.246 + 0.8656 + 2.28 + 0.608 + 1.8 + 3.06) \times 1 =$$ **11.8596 m2**

No. of pieces of Plywood needed = $\frac{TOTAL\ surface\ AREA}{AREA\ OF\ PLYWOOD\ "(1.2\ m\ *\ 2.4m)"} = \frac{11.8596}{(1.2*2.4)} = 4.1179 \times 50\%$

$$= 2.05\ or\ 3pcs$$

VIOLET = CONSTANT (always in equation) RED = IMPORTANT NOTE TO READ
GREEN = SELECTED BY USER. (Dependent upon input or selection) ORANGE – CORRESPONDING VALUE

FRAMEWORK FOR STAIRS:

By Default, 2" x 3" x 8' is used

FOR FRONT SUPPORT BRACING

$$\frac{\frac{SL}{0.6}(LUMBER\ WOOD\ SIZE \times (SL \times 3.28))}{12}$$

$\frac{SL}{0.6} = \frac{1.2}{0.6} = 2$ **(ROUND UP TO NEAREST WHOLE NUMBER IF THERE'S A DECIMAL. ALWAYS. E.G 2.38 = 3)**

$$Front\ wood\ bracing\ (FIRST\ FLIGHT) = \frac{2(2\times3\times(2.705\times3.28))}{12} = 8.8724\ bd.\ ft$$

$$Front\ wood\ bracing\ (SECOND\ FLIGHT) = \frac{2(2\times3\times(1.9\times3.28))}{12} = 6.23\ bd.\ ft$$

$$Bracing\ support\ per\ steps = \frac{TOTAL\ STEPS\ (LUMBER\ SIZE\times(3.28))}{12} \times \frac{SL}{0.6}(*\ rounded\ off\ value)$$

$$Bracing\ support\ per\ steps = \frac{(10+7)\ (2\times3\times(3.28))}{12} = 27.88\ bd.\ ft$$ x 2 = **55.76 bd. ft**

FOR BACK SUPPORT BRACING

$\frac{SL}{0.3} = \frac{1.2}{0.3} = 4$ **(ROUND UP TO NEAREST WHOLE NUMBER IF THERE'S A DECIMAL. ALWAYS.)**

$$Back\ wood\ bracing\ (FIRST\ FLIGHT) = \frac{4(2\times3\times(2.705\times3.28))}{12} = 17.7448\ bd.\ ft$$

$$Back\ wood\ bracing\ (SECOND\ FLIGHT) = \frac{4(2\times3\times(1.9\times3.28))}{12} = 12.464\ bd.\ ft$$

FOR STEPS

No. of steps: 10+7= 17

SL = 1.2 m

Lumber wood: 2" x 3"

VIOLET = CONSTANT (always in equation) RED = IMPORTANT NOTE TO READ
GREEN = SELECTED BY USER. (Dependent upon input or selection) ORANGE – CORRESPONDING VALUE

$$Wood\ bracing\ for\ steps = \frac{2(LUMBER\ WOOD\ SIZE \times (SW \times 3.28))}{12}$$ **x no. of steps**

$$Wood\ bracing\ for\ steps = \frac{2(2 \times 3 \times (1.2 \times 3.28))}{12}$$ **x 17= 66.912 BD Ft.**

SCAFFOLDING FOR STAIRS:

USER SELECTION: 2" X 2"

12 bd ft / m (CONSTANT)

= Flight 1 length + SW+ flight 2 length
= 2.705 + 1.2 + 1.9 = 5.805 m
5.805 m x 12 bd ft/ m = **69.66 bd. Ft**

TOTAL VOLUME OF WOOD FOR STAIRS:
= ALL BD. FT. X QTY

*** FOR 2" X 3" LUMBER WOOD**
= 8.8724 + 6.23 + 55.76 + 17.7448 +12.464 + 66.912 = 167.9832 X 1 **= 167.98 bd. ft**

*** FOR 2" X 2" LUMBER WOOD**
= **69.66 bd. Ft**