STAIRS (U-STAIRS) @ 1 SET(S)

TREAD WIDTH: 225 mm
Riser : 150mm
STEPS FLIGHT 1: 10
STEPS FLIGHT 2: 7
Waist slab thickness: 150 mm
Landing slab thickness: 150 mm
Stair Width: 1.2 m
Gap: 125 mm
Landing width : 1.2m

FIRST FLIGHT:

1.) **WAIST SLAB REBAR 1 (10 mmØ @ 150mm spacing)**
= Lapping + L + 9D
Lapping = 40D = 40(10) = 400 mm
L = $\sqrt{(Riser\ *\ steps)^2 + (Tread\ *\ steps)^2}$
L = $\sqrt{(2250)^2 + (1500)^2}$ = 2704.6 or 2725 mm
= 400 + 2725 +9 (10) = 3215mm or **3225 mm**

NO. of Bars: (150 mm spacing)
= (1200/ 100) + 1 = **13 bars**

2.) **WAIST SLAB REBAR 2 (10 mmØ)**
= (2x 9D) + Width of Landing + L
= (2 x 9(10)) + 1200+ 2725 = 4105 or **4125 mm**

NO. of Bars: (150 mm spacing)
= (1200/ 100) + 1 = **13 bars**

3.) **WAIST SLAB REBAR 3 (10 mmØ)**
= 9D + Landing Width + Beam Width + Lap length
= 9(10) + 1200 + 300 + 400 = 1990 mm or **2000 mm**

NO. of Bars: (150 mm spacing)
= (1200/ 100) + 1 = **13 bars**

4.) **DISTRIBUTION OR TEMP BARS (10 mmØ)**
= **1200 mm** (Stair Width for Distribution or Temp bars)
= 2[(Length/Spacing)+1] = 2((2725/150)+1]
= **38.33 or 39 bars**

5.) LANDING REBAR (10 mmØ)

= Width of stairs x 2 + Gap
= (1200 x 2) + 125
= **2525 mm**

No. of Bars: (STAIR WIDTH / SPACING) +1
= (1200/150) + 1
= **9 bars**

SECOND FLIGHT:

6.) WAIST SLAB REBAR 1 (10 mmØ @ 150mm spacing)

= Lapping + L + 9D
Lapping = 40D = 40(10) = 400 mm
L = $\sqrt{(Riser\ *\ steps)^2 + (Tread\ *\ steps)^2}$
L = $\sqrt{(150\ *\ 7)^2 + (150\ *\ 7)^2}$ = 1892.91 or 1900 mm
= 400 + 1900 +9 (10) = 2390 mm or **2400 mm**

NO. of Bars: (150 mm spacing)
= (1200/ 100) + 1 = **13 bars**

7.) WAIST SLAB REBAR 2 (10 mmØ)

= (2x 9D) + Width of Landing + L
= (2 x 9(10)) + 1200+ 1900 = 3280 or **3300 mm**
NO. of Bars: (150 mm spacing)
= (1200/ 100) + 1 = **13 bars**

8.) WAIST SLAB REBAR 3 (10 mmØ)

= 9D + Landing Width + Beam Width + Lap length
= 9(10) + 1200 + 300 + 400 = 1990 mm or **2000mm**
NO. of Bars: (150 mm spacing)
= (1200/ 100) + 1 = **13 bars**

9.) DISTRIBUTION OR TEMP BARS (10 mmØ)

= **1200 mm** (Stair Width for Distribution or Temp bars)
= 2[(Length/Spacing)+1] = 2((1900/150)+1]
= **27.33 or 28 pcs**

STEPS:

10.) CHAIR BARS (10 mmØ @ 150 O.C.)

LENGTH OF CHAIR BARS:
= Tread + Riser = 225 + 150 = **375 mm**

NO. OF CHAIR BARS
= (STAIR WIDTH / SPACING) +1
= (1200 / 150) +1 = 9 bars x 17 steps = **153 pcs**

11.) Nose bar (10 mmØ)
= 1200 mm
= 10+7 = **17 pcs**

To select what manufactured length to be selected:

Consider waist slab rebar 1 @ 3225 mm in length for 13 pcs.

We have manufactured lengths of (6m , 7.5m 9m, 10.5 and 12m)

Try: **7.5m**

Step 1:
=7.5/3.225 = **2.325** (number of 3.225m in 7.5m length in decimal)

Step 2:
Get the whole number which is **2 (There are sure 2 pieces of 3.225 in a 7.5m length "sure cut")**

Step 3:
Get the decimal which is 0.325 (Only 32.5 % is left from the required 3.225)

Step 4:
Multiply 0.325 with 3.225 = 1.05 m (This is the waste length from 7.5m)

Step 5:
Get the waste percentage from the single piece: (1.05 / 7.5 = 14%)

Step 6:
Know how many 7.5m steel are needed to achieve 13 pcs of 3.225 (13 / 2 "sure cut" from step 2) = 6.5

Step 7:
You can't buy 6.5 pcs of 7.5m lengths so make that **7 pcs**. Round up, This is your "sure order".
Note: Still, there are 6 pcs of 7.5m lengths that will have a waste of 1.05m and the last one will have larger wastage because you only need one cut of 3.225 in the last piece.

Step 8:
There will always be a wastage. Calculate the total length of wastage from 7 pcs of 7.5m
= wastage per length x 6 [this is from step 7, which is 6.5. Just get the whole number]
= 1.05 x 6 = 6.3 m
For the 7th pc, subtract only a single of the required length , 3.225.
= 7.5 - 3.225 = 4.275m (wastage from the last piece or the 7th piece)
Add the total wastage.
= 6.3 + 4.275 = **10.575 m (total wastage from 7pcs)**

Step 9:
Get the total wastage percentage. 10.575/(7.5 x 7) =20.14%

Step 10:
Get the percentage of wastage per last piece only. 4.275/ 7.5 = 57%

Step 11:
Get the average of **waste percentage from the single piece**, **total wastage percentage and, percentage of wastage per last piece.**

= (0.14+0.2014+0.557) / 3
= 0.29946 or 30% average wastage.

Compare other manufactured lengths by undergoing the same procedure. **Decide by selecting the least average wastage.**

For 6m = 47.43%
For 9m = 41.98%
For 10.5m = 32.43%
For 12m = 40.88%

We can observe from the results that the 7.5 m manufactured length was the lowest average wastage therefore, making it the optimal choice. Still, the quantity surveyor or the estimator has still the last call to make the best judgment on what he or she should select, as the estimator has the knowledge on how the wastage should be used wisely.

For U - Stairs (example)

In terms of pcs.

6m @ 43 pcs (P 147.84 / pc of GRADE 33 6m x43 = PHP 6357.12)

7.5m @ 19 pcs (P184.80pc of GRADE 33 7.5m x 19 = PHP 3511.20)

9m @ 7 pcs (P221.76pc of GRADE 33 9m x 7 = PHP 1552.32)

TOTAL MATERIAL COST = 6357.12+3511.20+1552.32

= P 11420.64

In terms of KG:

6m x 43 x 0.616= 96.158.928 kg

7.5m x 19 x 0.616 = 87.87 kg

9m x 7 x 0.616 = 38.808 kg

Total = 285.516 x 1 set(s) = 285.516 kg

LABOR COST: 15php / kg

= 285.516 * 15 = PHP 4,282.74

Size	Inches	Kg./M
10mm	3/8"	0.616
12mm	1/2"	0.888
16mm	5/8"	1.578
20mm	3/4"	2.466
25mm	1.0"	3.853
28mm	1 1/8"	4.834
32mm	1 1/4"	6.313
36mm	1 3/8"	7.99

SIZE OF REBAR (DIAMETER)	WEIGHT/ METER
10	0.616 kg/m
12	0.888 kg/m
16	1.578 kg/m
20	2.466 kg/m
25	3.853 kg/m