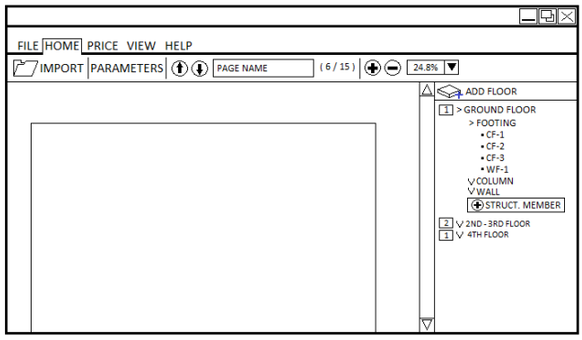
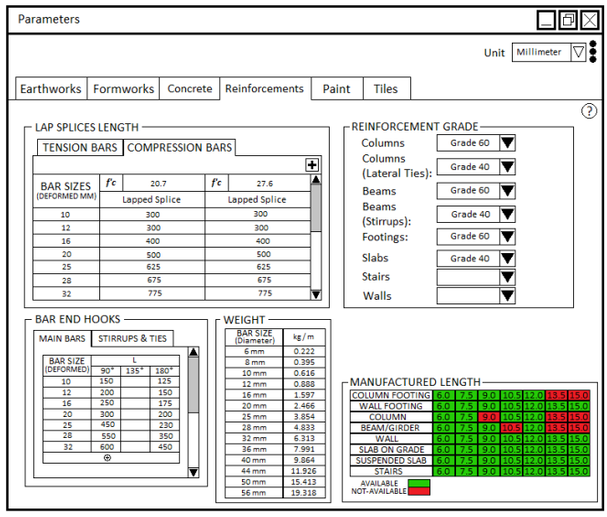
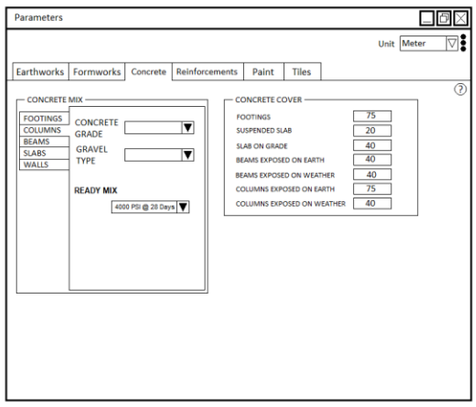
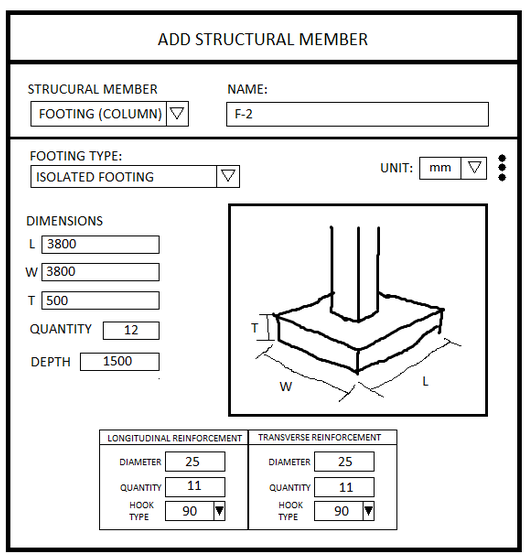
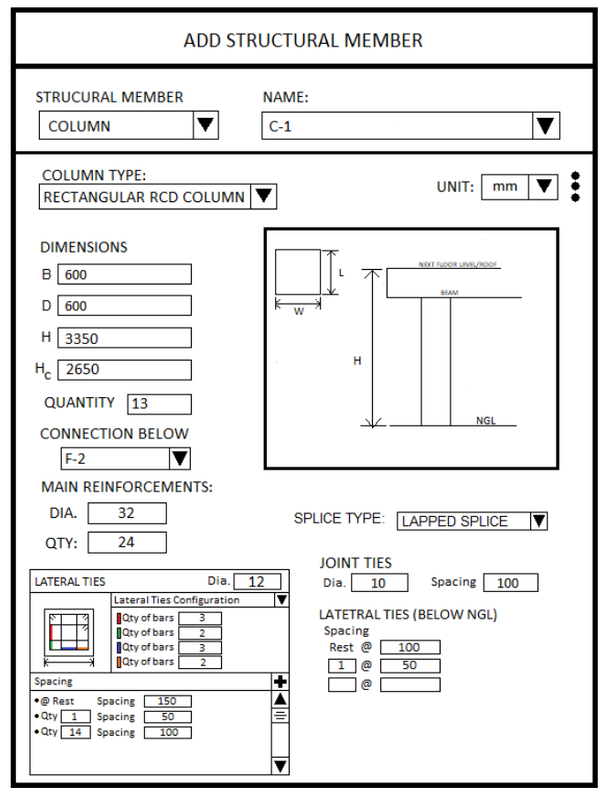
REFERENCE



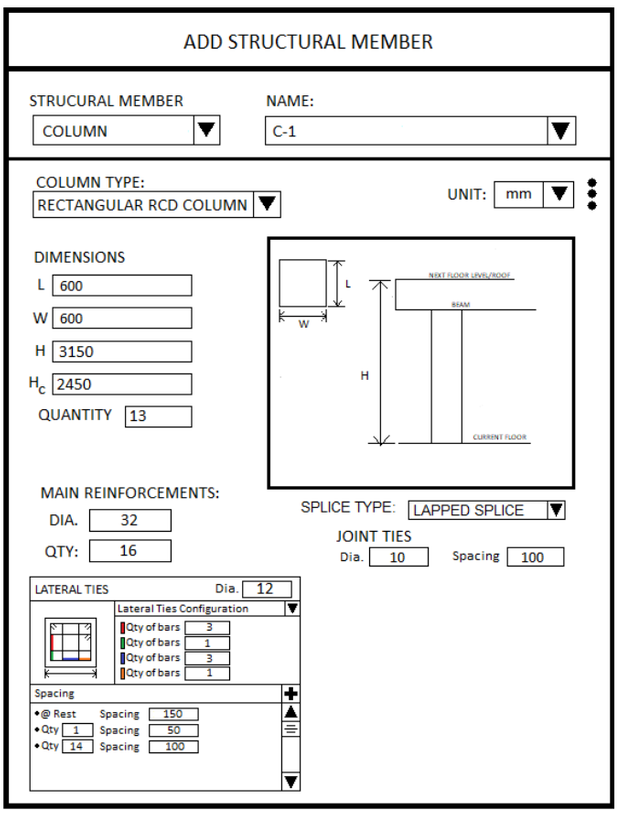




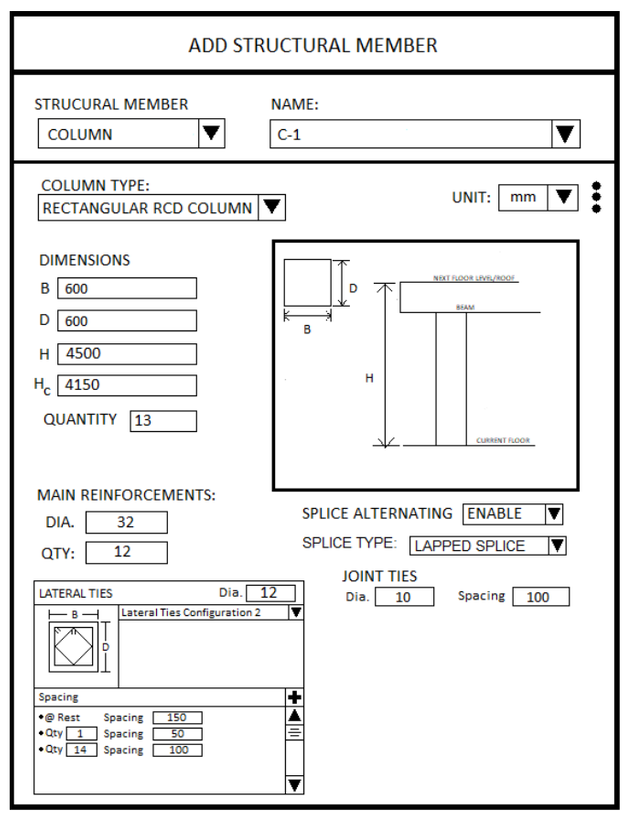




@ GROUND FLOOR



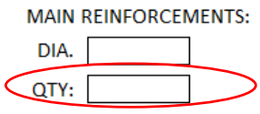
@ 2ND & 3RD FLOOR



@ 4TH FLOOR

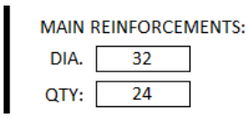
STEPS

1. The program will determine the quantity of the main reinforcement



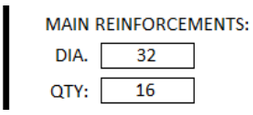
Example:

@ Ground Floor



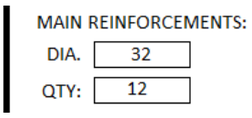
$$Qty_B = 24$$

@ 2nd and 3rd Floor



$$Qty_B = 16$$

@ 4th Floor



$$Qty_B = 12$$

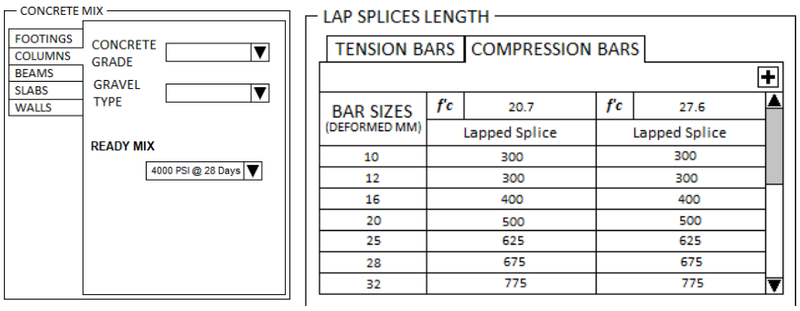
2. The program will determine splice length.
   - If the Splice Type is “Lapped Splice” or “Welded Splice (Lap)”

$$S_L = Splice\ Length\ based\ in\ Parameters$$

   - If the Splice Type is “Welded Splice (Butt)” or “Mechanical”

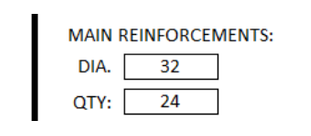
$$S_L = 0$$

Example



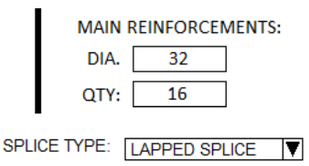
$$f'c = 4000\ psi \rightarrow 27.6$$

@ Ground Floor



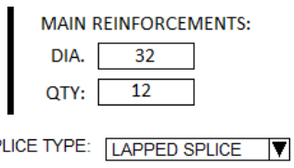
$$S_L = 775$$

@ 2nd-3rd Floor



$$S_L = 775$$

@ 4th Floor



$$S_L = 775$$

3. The program will determine the length of the main reinforcement (Must be converted to meters)

For Ground Floor

$$L_B = H + D_F + 0.5S_L + h_L - d_{F(L)} - d_{F(T)} - CC_F$$

For Upper Floor

$$L_B = H + 0.5S_L$$

Where:

$D_F = Depth\ of\ the\ Footing\ connected\ below$

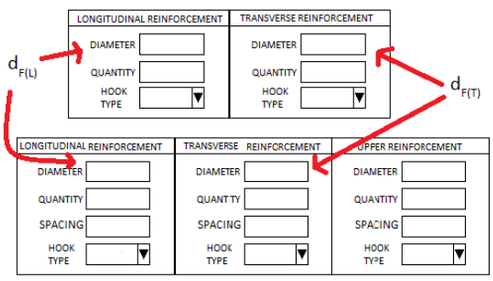
$d_{F(L)} = diameter\ of\ the\ Longitudinal\ reinforcent\ of\ the\ Footing$

$d_{F(T)} = diameter\ of\ the\ Transverse\ reinforcent\ of\ the\ Footing$

$CC_F = Concrete\ Cover\ of\ Footing$

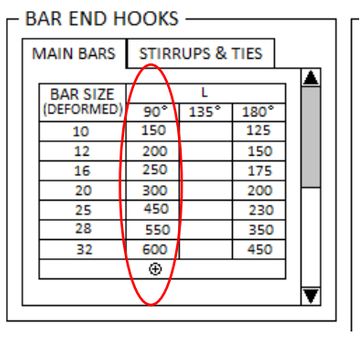
$h_L = Hook\ Length\ @\ 90°\ based\ on\ the\ Parameters$

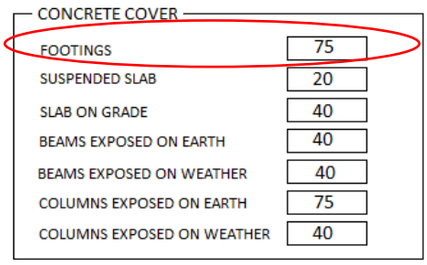
Illustration:



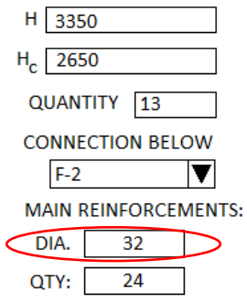
Isolated and Combined Footing

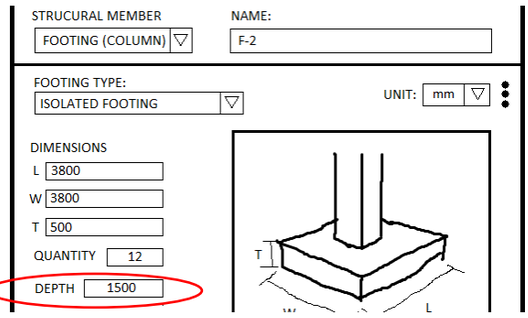
Example:



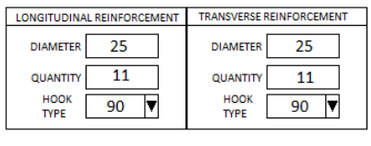


@ Ground Floor





$$h_L = 600,\ D_F = 1500,\ CC_F = 75$$

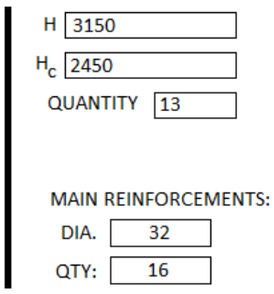


$$d_{F(L)} = 25\ \&d_{F(T)} = 25$$

$$L_B = H + D_F + 0.5S_L + h_L - d_{F(L)} - d_{F(T)} - CC_F$$

$$L_B = 3350 + 1500 + 0.5(775) + 600 - 25 - 25 - 75 = 5712.5\ mm \rightarrow 5.7125\ m$$

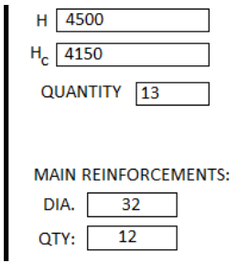
@ 2nd-3rd Floor



$$L_B = H + 0.5S_L$$

$$L_B = 3150 + 0.5(775) = 3537.5\ mm \rightarrow 3.5375\ m$$

@ 4th Floor



$$L_B = H + 0.5S_L$$

$$L_B = 4500 + 0.5(775) = 4887.5\ mm \rightarrow 4.8875\ m$$

4. After determining the quantities of main reinforcement and their respective required bar length, the program will determine their respective manufactured bars and no. of manufactured pcs

LEGEND:

$Qty_P = no.of\ pcs.\ produced$ $Qty_M = no.of\ manufactured\ pcs.$

$L_M = Available\ Manufactured\ Reinforcement\ Length$ $Qty_C = Quantity\ of\ Column$

$L_W = Wastage\ Length$ $L_E = Excess\ manufactured$ bar length

$L_{CB} = Chosen\ Manufactured\ Bar\ Length$

$$Qty_{Pn} = \frac{L_M}{L_B}$$

$$L_W = [Qty_P - Qty_P\ (round\ down\ into\ whole\ number)] \times L_B$$

$$Qty_{Mn} = m \cdot \frac{Qty_B}{Qty_{Pn}} \cdot Qty_C$$

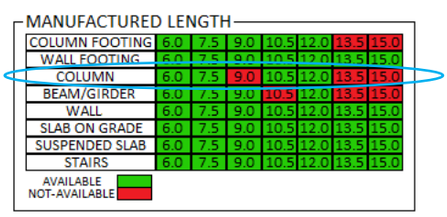
$$L_E\ (m) = [Qty_M(round\ up\ to\ whole\ number) - Qty_M] \times L_M$$

And

$$Total\ Wastage\ = L_E + L_W[Qty_{Mn}\ (round\ down\ to\ whole\ number)]$$

Then the program will choose the manufactured bar length with the lowest $Total\ wastage$

Example:



@ Ground Floor: $Qty_B = 24$ & $L_B = 5.7125\ m$

L [M]	Qty [B]	L [B]	Qty (Column)	Qty [P]	Qty [M]	L [W]	L [E]	Total Waste

6	24	5.7125	13	1.05	1	312	312	0.288	0	89.700
7.5				1.31	1	312	312	1.788	0	557.700
10.5				1.84	1	312	312	4.788	0	1493.700
12				2.10	2	156	156	0.575	0	89.700

$Qty_M = 312$ & $L_M = 6\,m$

@ 2nd-3rd Floor: $Qty_B = 16$ & $L_B = 3.5375\,m$

L [M]	Qty [B]	L [B]	Qty (Column)	Qty [P]		Qty [M]		L [W]	L [E]	Total Waste
6	16	3.5375	13	1.70	1	208	208	2.463	0	512.200
7.5				2.12	2	104	104	0.425	0	44.200
10.5				2.97	2	104	104	3.425	0	356.200
12				3.39	3	69.33	70	1.388	8	103.738

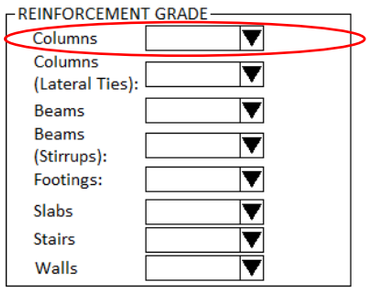
$Qty_M = 104$ & $L_M = 7.5\,m$

@ 4th Floor: $Qty_B = 12$ & $L_B = 4.8875\,m$

L [M]	Qty [B]	L [B]	Qty (Column)	Qty [P]		Qty [M]		L [W]	L [E]	Total Waste
6	12	4.8875	13	1.23	1	156	156	1.113	0	173.550
7.5				1.53	1	156	156	2.613	0	407.550
10.5				2.15	2	78	78	0.725	0	56.550
12				2.46	2	78	78	2.225	0	173.550

$Qty_M = 78$ & $L_M = 10.5\,m$

5. The program will determine the Price of the Reinforcement of the column

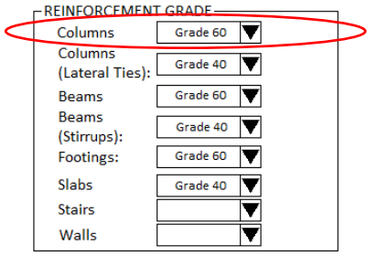


$$Price_{Total} = Qty_M Price_M$$

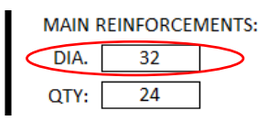
Where:

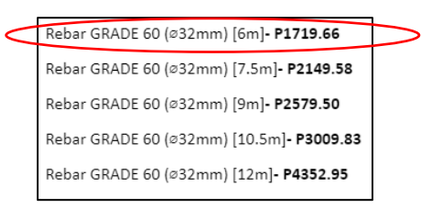
$$Price_M = Price\ of\ the\ steel\ reinforcement\ based\ on\ Pricing$$
$$= Sorted\ through\ Reinforcement\ Grade, diameter, and\ Manufactured\ Length$$

Example



@ Ground Floor



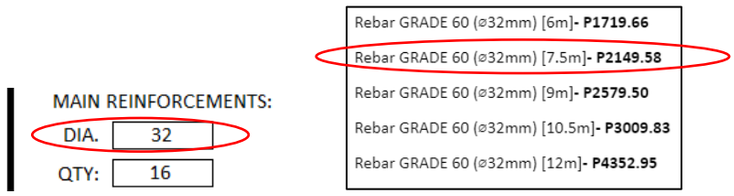


$Qty_M = 312\ and\ L_M = 7.5\ m\ \therefore Price_M = ₱\,1719.66$

$Price_{Total} = Qty_M Price_M = 312 \cdot 1719.66$

$Price_{Total} = ₱\,\mathbf{536,533.92}$

@ 2nd – 3rd Floor

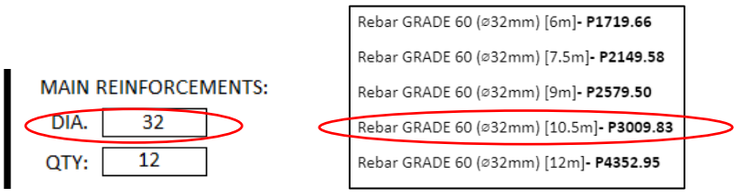


$Qty_M = 104\ and\ L_M = 7.5\ m\ \ \therefore Price_M = ₱\,2149.58$

$Price_{Total} = Qty_M Price_M = 104 \cdot 2149.58$

$Price_{Total} = \mathbf{₱\,223,556.32}$

@ 4th Floor



$Qty_M = 78\ and\ L_M = 10.5\ m\ \ \therefore Price_M = ₱\,3009.83$

$Price_{Total} = Qty_M Price_M = 78 \cdot 3009.83$

$Price_{Total} = \mathbf{₱\,234,766.74}$

6. The program will then compute the weight of the main reinforcement of each floor of the column.

$$W = L_M Qty_M W_D$$

Where:

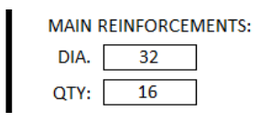
$W_D = Weight\ based\ of\ the\ cdiameter\ of\ the\ main\ reinforcement.$

Example:

WEIGHT

BAR SIZE (Diameter)	kg/m
6 mm	0.222
8 mm	0.395
10 mm	0.616
12 mm	0.888
16 mm	1.597
20 mm	2.466
25 mm	3.854
28 mm	4.833
32 mm	6.313
36 mm	7.991
40 mm	9.864
44 mm	11.926
50 mm	15.413
56 mm	19.318

@ Ground Floor



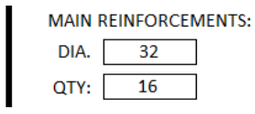
$W_D = 6.313$

$W = L_M Qty_M W_D$

$W = 6(312)(6.313)$

$W = \mathbf{11817.936\ kg}$

@ 2nd-3rd Floor



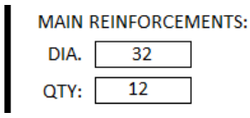
$W_D = 6.313$

$W = L_M Qty_M W_D$

$W = 7.5(104)(6.313)$

$W = \mathbf{4924.14\ kg}$

@ 4th Floor



$$W_D = 6.313$$

$W = L_M Qty_M W_D$

$W = 10.5(78)(6.313)$

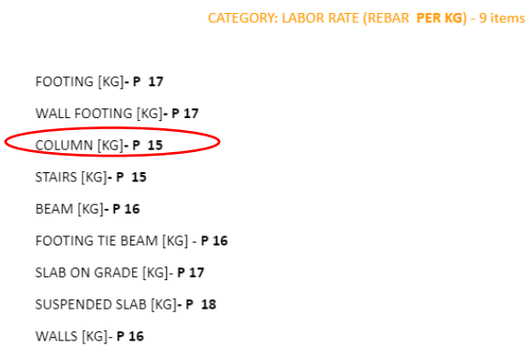
$W = \mathbf{5170.347\ kg}$

7. The program will compute the labor price of the column.

$$Price_{Labor} = W \cdot L_R$$

Where:

$L_R = Labor\ Rate\ in\ Footing\ based\ in\ the\ Pricing$



$$L_R = ₱\ 15$$

Example

@ Ground Floor

$$W = 11817.936\ kg$$

$Price_{Labor} = W \cdot L_R$

$Price_{Labor} = 11817.936 \cdot 15$

$Price_{Labor} = \mathbf{₱\ 177,269.04}$

@ 2nd - 3rd Floor

$$W = 4924.14\ kg$$

$Price_{Labor} = W \cdot L_R$

$Price_{Labor} = 4924.14 \cdot 15$

$Price_{Labor} = \mathbf{₱\ 73,862.10}$

@ 4th Floor

$$W = 5170.347\ kg$$

$Price_{Labor} = W \cdot L_R$

$Price_{Labor} = 5170.347 \cdot 15$

$Price_{Labor} = \mathbf{₱\ 77,555.205}$