REFERENCE

ADD STRUCTURAL MEMBER

STRUCURAL MEMBER: FOOTING (COLUMN)

NAME: F-1

FOOTING TYPE: COMBINED FOOTING

UNIT: mm

DIMENSIONS

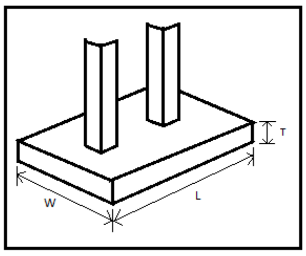
L 5500

W 4000

T 500

QUANTITY 3

DEPTH 1500



LONGITUDINAL REINFORCEMENT		TRANSVERSE REINFORCEMENT		UPPER REINFORCEMENT	
DIAMETER	25	DIAMETER	25	DIAMETER	25
QUANTITY		QUANTITY		QUANTITY	
SPACING	125	SPACING	300	SPACING	300
HOOK TYPE	90	HOOK TYPE	90	HOOK TYPE	90

ADD STRUCTURAL MEMBER

STRUCURAL MEMBER: FOOTING (COLUMN)

NAME: F-2

FOOTING TYPE: ISOLATED FOOTING

UNIT: mm

DIMENSIONS

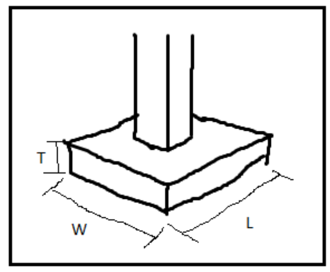
L 3800

W 3800

T 500

QUANTITY 12

DEPTH 1500



LONGITUDINAL REINFORCEMENT		TRANSVERSE REINFORCEMENT	
DIAMETER	25	DIAMETER	25
QUANTITY	11	QUANTITY	11
HOOK TYPE	90	HOOK TYPE	90

Parameters

Unit: Millimeter

Earthworks | Formworks | Concrete | Reinforcements | Paint | Tiles

LAP SPLICES LENGTH

TENSION BARS | COMPRESSION BARS

BAR SIZES (DEFORMED MM)	$f'c$ 20.7	$f'c$ 27.6
	Lapped Splice	Lapped Splice
10	300	300
12	300	300
16	400	400
20	550	500
25	800	750
28	1000	850
32	1300	1100

SPLICING

COLUMN | BEAM | SLAB | WALLS | STAIRS

SPLICE LOCATION	1/2	of clear height
SPLICE ZONE	1/2	of clear height
ALLOWABLE PERCENTAGE	50	
MINIMUM VERTICAL DISTANCE OF ADJACENT BARS	600	

BAR END HOOKS

MAIN BARS | STIRRUPS & TIES

BAR SIZE (DEFORMED)	L 90°	135°	180°
10	150		125
12	200		150
16	250		175
20	300		200
25	450		230
28	550		350
32	600		450

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

REINFORCEMENT GRADE

COLUMNS	FOOTINGS	BEAMS
Grade 60	Grade 60	Grade 60
STAIRS	WALLS	SLABS
		Grade 40

MANUFACTURED LENGTH

COLUMN FOOTING	6.0	7.5	9.0	10.5	12.0	13.5	15.0
WALL FOOTING	6.0	7.5	9.0	10.5	12.0	13.5	15.0
COLUMN	6.0	7.5	9.0	10.5	12.0	13.5	15.0
BEAM/GIRDER	6.0	7.5	9.0	10.5	12.0	13.5	15.0
WALL	6.0	7.5	9.0	10.5	12.0	13.5	15.0
SLAB ON GRADE	6.0	7.5	9.0	10.5	12.0	13.5	15.0
SUSPENDED SLAB	6.0	7.5	9.0	10.5	12.0	13.5	15.0
STAIRS	6.0	7.5	9.0	10.5	12.0	13.5	15.0

AVAILABLE

NOT-AVAILABLE

Parameters

Unit: Meter

Earthworks | Formworks | Concrete | Reinforcements | Paint | Tiles

CONCRETE MIX

FOOTINGS

COLUMNS

BEAMS

SLABS

WALLS

CONCRETE GRADE

GRAVEL TYPE

READY MIX

4000 PSI @ 28 Days

CONCRETE COVER

FOOTINGS	75
SUSPENDED SLAB	20
SLAB ON GRADE	40
BEAMS EXPOSED ON EARTH	40
BEAMS EXPOSED ON WEATHER	40
COLUMNS EXPOSED ON EARTH	75
COLUMNS EXPOSED ON WEATHER	40

Steps:

1. Determine the quantity of bars of the footing.

LEGEND:

$$Qty_F = Quantity\ of\ footing$$

$Qty_L = Quantity\ of\ Longitudinal\ Reinforcement$ | $F_L = Footing\ Length$

$Qty_T = Quantity\ of\ Transverse\ Reinforcement$ | $F_W = Footing\ Width$

$Qty_U = Quantity\ of\ Upper\ Reinforcement$ | $CC_F = Concrete\ Cover\ of\ Footing$

$db_L = diameter\ of\ Longitudinal\ Reinforcement$ | $S_L = Spacing\ of\ Longitudinal\ Rebar$

$db_T = diameter\ of\ Transverse\ Reinforcement$ | $S_T = Spacing\ of\ Transverse\ Rebar$

$db_U = diameter\ of\ Upper\ Reinforcement$ | $S_U = Spacing\ of\ Upper\ Rebar$

If there is no input on the quantity box, but only on the spacing.

$$Qty_L = Qty_F\left[rounded\ up\ to\ whole\ number\left(\frac{F_W - 2CC_F}{S_L} + 1\right)\right]$$

$$Qty_U = Qty_F\left[rounded\ up\ to\ whole\ number\left(\frac{F_W - 2CC_F}{S_U} + 1\right)\right]$$

$$Qty_T = Qty_F\left[rounded\ up\ to\ whole\ number\left(\frac{F_L - 2CC_F}{S_T} + 1\right)\right]$$

If there is an input on the quantity box.

$$Qty_L = Qty_F \cdot Qty_{L(input)}$$

$$Qty_U = Qty_F \cdot Qty_{U(input)}$$

$$Qty_T = Qty_F \cdot Qty_{T(input)}$$

Example

For F-1

Since there is no input on the quantity box of each reinforcement. Thus,

$$Qty_L = 3\left(\frac{4000 - 2(75)}{125} + 1\right) = 3(31.8) = 3(32) = 96\ pcs.$$

$$Qty_U = 3\left(\frac{4000 - 2(75)}{300} + 1\right) = 3(13.8) = 3(14) = 42\ pcs.$$

$$Qty_T = 3\left(\frac{5500 - 2(75)}{300} + 1\right) = 3(18.8) = 3(19) = 57\ pcs.$$

For F-2

Since there is an input on the quantity box of each reinforcement. Thus,

$$Qty_L = 12 \cdot 11 = 132\ pcs.$$

$$Qty_T = 12 \cdot 11 = 132\ pcs.$$

2. The program will compute the required length of each quantity. (The answer must be converted to meters)

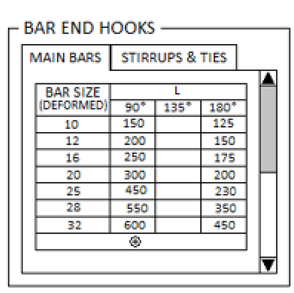
LEGEND:

$L_B\ of\ Qty_L = Bar\ length\ of\ longitudinal\ reinforcement$

$L_B\ of\ Qty_U = Bar\ length\ of\ upper\ reinforcement$

$L_B\ of\ Qty_T = Bar\ length\ of\ transverse\ reinforcement$

$H_L = Hook\ length\ (Use\ the\ what\ type\ of\ bar\ hook\ on\ the\ main\ bars)$



BAR SIZE (DEFORMED)	L		
	90°	135°	180°
10	150		125
12	200		150
16	250		175
20	300		200
25	450		230
28	550		350
32	600		450

$$L_B\ of\ Qty_L = F_L - 2CC_F + 2H_L$$
$$L_B\ of\ Qty_U = F_L - 2CC_F + 2H_L]$$
$$L_B\ of\ Qty_T = F_W - 2CC_F + 2H_L$$

Example:

For F-1

$L_B\ of\ Qty_L = 5500 - 2(75) + 2(450) = 6250\ mm = 6.25\ m$

$L_B\ of\ Qty_U = 5500 - 2(75) + 2(450) = 6250\ mm = 6.25\ m$

$L_B\ of\ Qty_T = 4000 - 2(75) + 2(450) = 4750\ mm = 4.75\ m$

For F-2

$L_B\ of\ Qty_L = 3800 - 2(75) + 2(450) = 4550\ mm = 4.55\ m$

$L_B\ of\ Qty_T = 3800 - 2(75) + 2(450) = 4550\ mm = 4.55\ m$

3. The program will check the available manufactured bar lengths. And will compute the following equations to determine the manufactured bar length and its corresponding manufactured quantity.

LEGEND:	
$Qty_P = Produced\ Quantity$	$L_M = Manufactured\ Bar\ Length$
$Qty_M = Manufactured\ Quantity$	$L_W = Wastage\ Length$
$Qty_M = Extra\ Quantity$	$L_E = Excess\ Length$

- For Combined Footing
  a) If $(L_B\ of\ \ Qty_L + L_B\ of\ \ Qty_T) \leq Largest\ L_M$ and $db_L = db_U = db_T$
     I. Case 1: $(Qty_L + Qty_U) < Qty_T$
     For $(\boldsymbol{Qty_L} + \boldsymbol{Qty_U})$

$$Qty_P = \frac{L_M}{L_B\ of\ \ Qty_L + L_B\ of\ \ Qty_T}$$

$If\ \boldsymbol{Qty_P < 1}$

$$L_W = 0$$

$Else$

$$L_W =\cdot L_M - (L_B\ of\ Qty_L + L_B\ of\ \ Qty_T) \cdot Qty_P(round\ down\ into\ whole\ number)$$

$$Qty_{M(a)} = \frac{Qty_L + Qty_U}{Qty_P(round\ down\ to\ whole\ number)}$$

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

And

$$Total\ Wastage = L_E + L_W[Qty_M(round\ down\ to\ whole\ number)]$$

The manufactured bar length that has the smallest total wastage will be the chosen manufactured bar length and its corresponding manufactured quantity

For $\boldsymbol{Qty_T}$

$$Qty_P = \frac{L_M}{L_B\ of\ \ Qty_T}$$

$If\ \boldsymbol{Qty_P} < \mathbf{1}$ $$L_W = 0$$ $Else$ $$L_W =\cdot L_M - (L_B\ of\ Qty_T) \cdot Qty_P (round\ down\ into\ whole\ number)$$

$$Qty_M = \frac{Qty_T - Qty_L - Qty_U}{Qty_P (round\ down\ to\ whole\ number)}$$

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

And

$$Total\ Wastage = L_E + L_W [Qty_M (round\ down\ to\ whole\ number)]$$

The manufactured bar length that has the smallest total wastage will be the chosen manufactured bar length and its corresponding manufactured quantity

II. Case 2: $(Qty_L + Qty_U) \geq Qty_T$

For $\boldsymbol{Qty_T}$

$$Qty_P = \frac{L_M}{L_B\ of\ \ Qty_L + L_B\ of\ \ Qty_T}$$

$If\ \boldsymbol{Qty_P} < \mathbf{1}$ $$L_W = 0$$ $Else$ $$L_W =\cdot L_M - (L_B\ of\ Qty_L + L_B\ of\ \ Qty_T) \cdot Qty_P (round\ down\ into\ whole\ number)$$

$$Qty_{M(a)} = \frac{Qty_T}{Qty_P (round\ down\ to\ whole\ number)}$$

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

And

$$Total\ Wastage = L_E + L_W [Qty_M (round\ down\ to\ whole\ number)]$$

The manufactured bar length that has the smallest total wastage will be the chosen manufactured bar length and its corresponding manufactured quantity

For $(\boldsymbol{Qty_L} + \boldsymbol{Qty_U})$

$$Qty_P = \frac{L_M}{L_B\ of\ \ Qty_L}$$

$If\ \boldsymbol{Qty_P} < \mathbf{1}$ $$L_W = 0$$ $Else$ $$L_W =\cdot L_M - (L_B\ of\ Qty_L) \cdot Qty_P (round\ down\ into\ whole\ number)$$

$$Qty_M = \frac{Qty_L + Qty_U - Qty_T}{Qty_P(round\ down\ to\ whole\ number)}$$

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

And

$$Total\ Wastage = L_E + L_W[Qty_M(round\ down\ to\ whole\ number)]$$

The manufactured bar length that has the smallest total wastage will be the chosen manufactured bar length and its corresponding manufactured quantity

b) If $(L_B\ of\ \ Qty_L + L_B\ of\ \ Qty_T) > Largest\ L_M$ or $db_L \neq db_U \neq db_T$

- ➢ Note x is either **L** for Longitudinal, **U** for Upper, and **T** for Transverse

$$Qty_P = \frac{L_M}{L_B\ of\ \ Qty_x}$$

$If\ \boldsymbol{Qty_P} < \mathbf{1}$
$$L_W = 0$$
$$Else$$
$$L_W =\cdot L_M - (L_B\ of\ Qty_x) \cdot Qty_P(round\ down\ into\ whole\ number)$$

$$Qty_M = \frac{Qty_x}{Qty_P(round\ down\ to\ whole\ number)}$$

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

And

$$Total\ Wastage = L_E + L_W[Qty_M(round\ down\ to\ whole\ number)]$$

The manufactured bar length that has the smallest total wastage will be the chosen manufactured bar length and its corresponding manufactured quantity

- For Isolated Footing
  - ➢ Note x is either **L** for Longitudinal, **U** for Upper, and **T** for Transverse

$$Qty_P = \frac{L_M}{L_B\ of\ \ Qty_x}$$

$If\ \boldsymbol{Qty_P} < \mathbf{1}$
$$L_W = 0$$
$Else$
$$L_W =\cdot L_M - (L_B\ of\ \ Qty_x) \cdot Qty_P(round\ down\ into\ whole\ number)$$

$$Qty_M = \frac{Qty_x}{Qty_P(round\ down\ to\ whole\ number)}$$

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

And

$$Total\ Wastage = L_E + L_W[Qty_M(round\ down\ to\ whole\ number)]$$

The manufactured bar length that has the smallest total wastage will be the chosen manufactured bar length and its corresponding manufactured quantity

Example.

Based on the reference the available bars for the column footing are **6**, **7.5**, **9**, **10.5**, and **12** meters

MANUFACTURED LENGTH

COLUMN FOOTING	6.0	7.5	9.0	10.5	12.0	13.5	15.0
WALL FOOTING	6.0	7.5	9.0	10.5	12.0	13.5	15.0
COLUMN	6.0	7.5	9.0	10.5	12.0	13.5	15.0
BEAM/GIRDER	6.0	7.5	9.0	10.5	12.0	13.5	15.0
WALL	6.0	7.5	9.0	10.5	12.0	13.5	15.0
SLAB ON GRADE	6.0	7.5	9.0	10.5	12.0	13.5	15.0
SUSPENDED SLAB	6.0	7.5	9.0	10.5	12.0	13.5	15.0
STAIRS	6.0	7.5	9.0	10.5	12.0	13.5	15.0

AVAILABLE
NOT-AVAILABLE

For F-1

Check Conditions

$$(L_B\ of\ \ Qty_L + L_B\ of\ \ Qty_T) = (6.25 + 4.75) = 11\ m$$

$$Largest\ L_M = 12\ m$$

Thus,

$$(L_B\ of\ \ Qty_L + L_B\ of\ \ Qty_T) < Largest\ L_M$$

And

$$(Qty_L + Qty_U) = (96 + 42) = 120$$

$$Qty_T = 57$$

Thus,

$$(Qty_L + Qty_U) > Qty_T \therefore Case\ 2$$

For $\boldsymbol{Qty_T}$

@ $L_M = 6\ m$

$$Qty_P = \frac{L_M}{L_B\ of\ Qty_L + L_B\ of\ Qty_L} = \frac{6}{6.25 + 4.75} = 0.5454$$

$$L_{W(6)} = 0 \vdots\ Since\ Qty_{P(6)} < 1$$

$$Qty_{M(6)} = \frac{57}{0} = Undefined$$

$$L_{E(6)} = [Undefined - Undefined] \cdot 6 = Undefined$$

$$Total = Undefined + 0(Undefined) = Undefined$$

You can see the answers in the table

L [M]	Qty [Total]	L [B] of Qty [L] + L [B] of Qty [T	Qty [P]		Qty [M]		L [W]	L [E]	Total Waste
6	57	11	0.55	0	#####	#DIV/0!	0.000	#DIV/0!	#DIV/0!
7.5			0.68	0	#####	#DIV/0!	0.000	#DIV/0!	#DIV/0!
9			0.82	0	#####	#DIV/0!	0.000	#DIV/0!	#DIV/0!
10.5			0.95	0	#####	#DIV/0!	0.000	#DIV/0!	#DIV/0!
12			1.09	1	57	57	1.000	0	57.000

Thus,

$L_{MC(a)} = 12\ m$ and $Qty_{MC(a)} = 57\ pcs.$

For $\boldsymbol{Qty_L} + \boldsymbol{Qty_U}$

$$Qty_P = \frac{L_M}{L_B\ of\ Qty_L + L_B\ of\ Qty_L} = \frac{6}{6.25} = 0.96$$

$$L_{W(6)} = 0 \vdots\ Since\ Qty_{P(6)} < 1$$

$$Qty_{M(6)} = \frac{96 + 42 - 57}{0} = \frac{81}{0} = Undefined$$

$$L_{E(6)} = [Undefined - Undefined] \cdot 6 = Undefined$$

$$Average = \frac{Undefined + 0}{2} = Undefined$$

L [M]	Qty [L] + Qty [U] - Qty [U]	L [B] of Qty [L]	Qty [P]		Qty [M]		L [W]	L [E]	Total Waste
6			0.96	0	#####	#DIV/0!	0.000	#DIV/0!	#DIV/0!
7.5			1.20	1	81	81	1.250	0	101.250
9	81	6.25	1.44	1	81	81	2.750	0	222.750
10.5			1.68	1	81	81	4.250	0	344.250
12			1.92	1	81	81	5.750	0	465.750

Thus,

$L_{MC(b)} = 7.5\ m$ and $Qty_{MC(b)} = 81\ pcs.$

For F-2

@Longitudinal Reinforcement

L [M]	Qty [Total]	L [B] of Qty [L]	Qty [P]		Qty [M]		L [W]	L [E]	Total Waste
6			1.32	1	132	132	1.450	0	191.400
7.5			1.65	1	132	132	2.950	0	389.400
9	132	4.55	1.98	1	132	132	4.450	0	587.400
10.5			2.31	2	66	66	1.400	0	92.400
12			2.64	2	66	66	2.900	0	191.400

Thus the

$L_{MC(a)} = 10.5\ m$ and $Qty_{MC(a)} = 66\ pcs.$

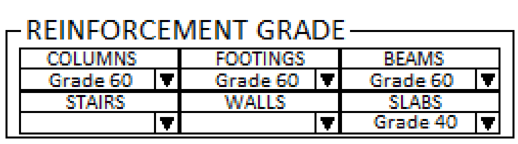
@Transverse Reinforcement

L [M]	Qty [T]	L [B] of Qty [T]	Qty [P]		Qty [M]		L [W]	L [E]	Total Waste
6			1.32	1	132	132	1.450	0	191.400
7.5			1.65	1	132	132	2.950	0	389.400
9	132	4.55	1.98	1	132	132	4.450	0	587.400
10.5			2.31	2	66	66	1.400	0	92.400
12			2.64	2	66	66	2.9	0	191.400

Thus the

$L_{MC(b)} = 10.5\ m$ and $Qty_{MC(b)} = 66\ pcs.$

4. The program will compute the price of the steel reinforcement of the footing



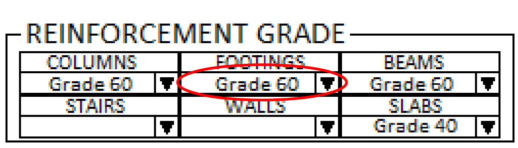
$$Price_{Total} = \sum Qty_M Price_M$$

Where:

$Price_M = Price\ of\ the\ steel\ reinforcement\ based\ on\ Pricing$

$= Sorted\ through\ Reinforcement\ Grade, diameter, and\ Manufactured\ Length$

Example



F-1

	LONGITUDINAL REINFORCEMENT	TRANSVERSE REINFORCEMENT	UPPER REINFORCEMENT
DIAMETER	25	25	25
QUANTITY			
SPACING	125	300	300
HOOK TYPE	90	90	90

$Qty_{M(a)}Price_{M(a)};\qquad d_a = 25\ mm$

$Qty_{M(a)} = 57$

$L_{MC(a)} = 12\ m$

Thus,

Rebar GRADE 60 (⌀25mm) [6m]- **P 1040.31**

Rebar GRADE 60 (⌀25mm) [7.5m]- **P 1300.39**

Rebar GRADE 60 (⌀25mm) [9m]- **P 1560.47**

Rebar GRADE 60 (⌀25mm) [10.5m]- **P 1820.54**

Rebar GRADE 60 (⌀25mm) [12m]- **P 2080.62**

$Price_{M(a)} = 2080.62$

$Qty_{M(a)}Price_{M(a)} = 57(2080.62) = ₱\,118{,}595.34$

$Qty_{M(b)}Price_{M(b)};\qquad d_b = 25$

$Qty_{M(b)} = 81$

$L_{MC(b)} = 7.5\ m$

Thus,

Rebar GRADE 60 (⌀25mm) [6m]- **P 1040.31**

Rebar GRADE 60 (⌀25mm) [7.5m]- **P 1300.39**

Rebar GRADE 60 (⌀25mm) [9m]- **P 1560.47**

Rebar GRADE 60 (⌀25mm) [10.5m]- **P 1820.54**

Rebar GRADE 60 (⌀25mm) [12m]- **P 2080.62**

$Price_{M(a)} = 1300.39$

$Qty_{M(b)}Price_{M(b)} = 81(1300.39) = ₱\,105{,}331.59$

$$Price_{Total} = \sum Qty_M Price_M = 118{,}595.34 + 105{,}331.59 = ₱\,\mathbf{223{,}926.93}$$

F-2

	LONGITUDINAL REINFORCEMENT	TRANSVERSE REINFORCEMENT
DIAMETER	25	25
QUANTITY	11	11
HOOK TYPE	90	90

$Qty_{M(a)}Price_{M(a)};\qquad d_a = 25\ mm$

$Qty_{M(a)} = 66$

$L_{MC(a)} = 10.5\ m$

Thus,

Rebar GRADE 60 (⌀25mm) [6m]- **P 1040.31**

Rebar GRADE 60 (⌀25mm) [7.5m]- **P 1300.39**

Rebar GRADE 60 (⌀25mm) [9m]- **P 1560.47**

Rebar GRADE 60 (⌀25mm) [10.5m]- **P 1820.54**

Rebar GRADE 60 (⌀25mm) [12m]- **P 2080.62**

$Price_{M(a)} = 1820.54$

$Qty_{M(a)}Price_{M(a)} = 66(1820.54) = ₱\,120{,}155.64$

$Qty_{M(b)}Price_{M(a)}$; $\quad d_b = 25\ mm$

$Qty_{M(b)} = 66$

$L_{MC(b)} = 10.5\ m$

Thus,

Rebar GRADE 60 (⌀25mm) [6m]- **P 1040.31**

Rebar GRADE 60 (⌀25mm) [7.5m]- **P 1300.39**

Rebar GRADE 60 (⌀25mm) [9m]- **P 1560.47**

Rebar GRADE 60 (⌀25mm) [10.5m]- **P 1820.54**

Rebar GRADE 60 (⌀25mm) [12m]- **P 2080.62**

$Price_{M(b)} = 1820.54$

$Qty_{M(b)}Price_{M(b)} = 66(1820.54) = ₱\,120{,}155.64$

$$Price_{Total} = \sum Qty_M Price_M = 120{,}155.64 + 120{,}155.64 = ₱\,\mathbf{240{,}311.28}$$

5. The program will compute the weight of the chosen manufactured bar length in transverse and longitudinal reinforcement of the footing.

For Combined Footing

$$Weight = L_{MC(y)} \cdot Qty_{M(y)} \cdot W_D$$

For Isolated Footing

$$Weight = L_{MC(y)} \cdot Qty_{M(y)} \cdot W_D$$

Where:

$W_D = corresponding\ weight\ of\ the\ reinforcement\ diameter\ (Table\ in\ the\ Parameters)$

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

F-1

Since $(L_B\ of\ \ Qty_L + L_B\ of\ \ Qty_T) \leq Largest\ L_M$ and $db_L = db_U = db_T$. Thus,

$@\ Qty_T: diameter = 25\ mm$, thus $W_D = 3.854$

$Weight_{1(a)} = L_{MC(y)} \cdot Qty_{M(y)} \cdot W_D$

$= 12(57) \cdot 3.854$

$Weight_{1(a)} = \mathbf{2636.136\ kg}$

$@\ Qty_L + Qty_U: diameter = 25\ mm$, thus $W_D = 3.854$

$Weight_{1(b)} = L_{MC(y)} \cdot Qty_{M(y)} \cdot W_D$

$= 7.5(81) \cdot 3.854$

$Weight_{1(b)} = \mathbf{2341.305\ kg}$

F-2

$@\ Qty_L: diameter = 25\ mm$, thus $W_D = 3.854$

$Weight_{2(a)} = L_{M(chosen)} \cdot Qty_{M(chosen)} \cdot W_D =$

$= (10.5) \cdot (66) \cdot (3.854)$

$Weight_{2(a)} = \mathbf{2670.822\ kg}$

$@\ Qty_T: diameter = 25\ mm$, thus $W_D = 3.854$

$Weight_{2(b)} = L_{M(chosen)} \cdot Qty_{M(chosen)} \cdot W_D =$

$= (10.5) \cdot (66) \cdot (3.854)$

$Weight_{2(b)} = \mathbf{2670.822\ kg}$

6. The program will compute the total weight of reinforcements on each footing.

$$Weight_{TOTAL(n)} = \varphi \cdot \sum_{y=a}^{y} (Weight_{ny})$$

Where:

$\varphi = just\ a\ factor$

$\varphi = 1$

Example:

For F-1

$Weight_{TOTAL(1)} = \varphi \cdot \sum_{y=a}^{b} (Weight_{ny}) = 1 \cdot (2636.136 + 2341.305)$

$Weight_{TOTAL(1)} = \mathbf{4977.441\ kg}$

For F-2

$Weight_{TOTAL} = \varphi \cdot \sum_{y=a}^{b} (Weight_{ny}) = 1 \cdot (2670.822 + 2670.822)$

$Weight_{TOTAL} = \mathbf{5341.644\ kg}$

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

$$Price_{Labor} = Weight_{TOTAL} \cdot L_R$$

Where:

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

Example:

CATEGORY: LABOR RATE (REBAR **PER KG**) - 9 items

FOOTING [KG]- **P 17**
WALL FOOTING [KG]- **P 17**
COLUMN [KG]- **P 15**
STAIRS [KG]- **P 15**
BEAM [KG]- **P 16**
FOOTING TIE BEAM [KG] - **P 16**
SLAB ON GRADE [KG]- **P 17**
SUSPENDED SLAB [KG]- **P 18**
WALLS [KG]- **P 16**

For F-1

$Price_{Labor} = Weight_{TOTAL} \cdot L_R$

$$Price_{Labor} = 4977.441 \cdot 17$$

$$Price_{Labor} = ₱\ \mathbf{84,616.497}$$

For F-2

$$Price_{Labor} = Weight_{TOTAL} \cdot L_R$$

$$Price_{Labor} = 5341.644 \cdot 17$$

$$Price_{Labor} = ₱\ \mathbf{90,807.948}$$