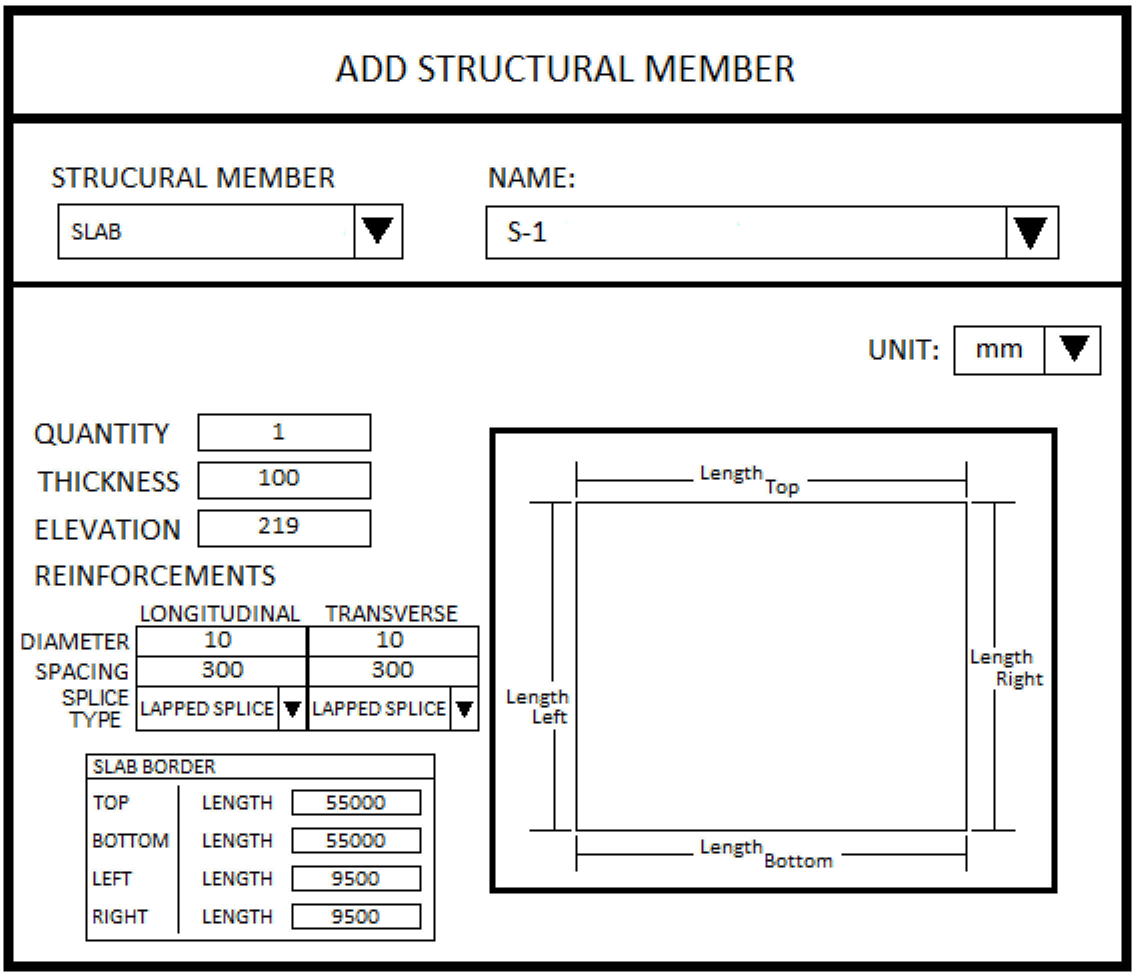
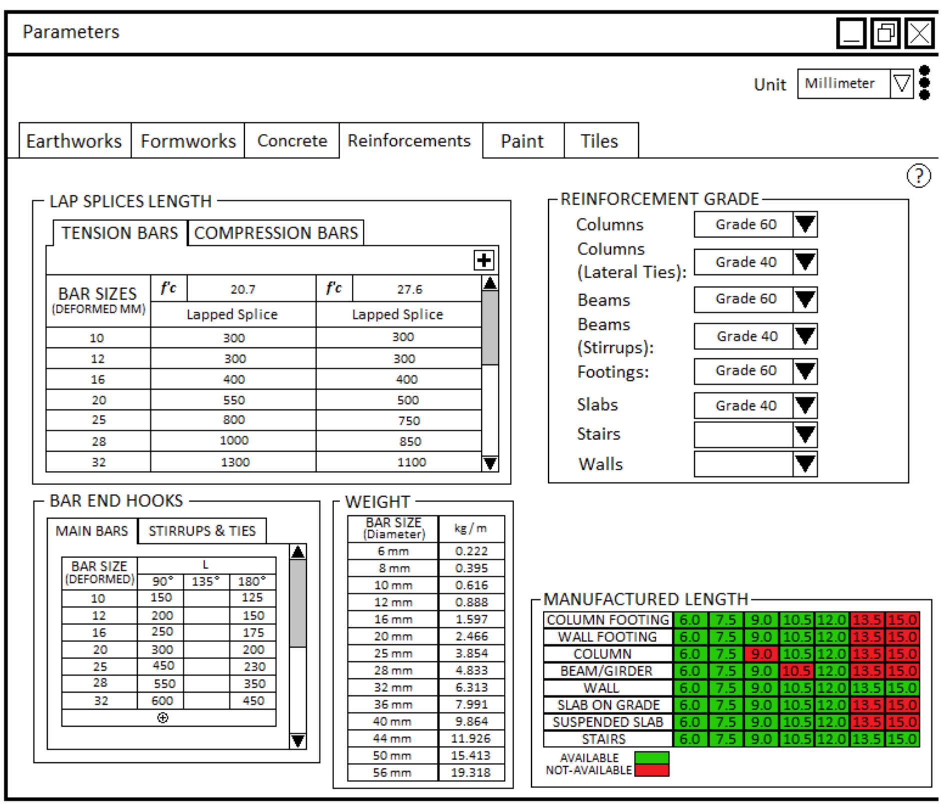
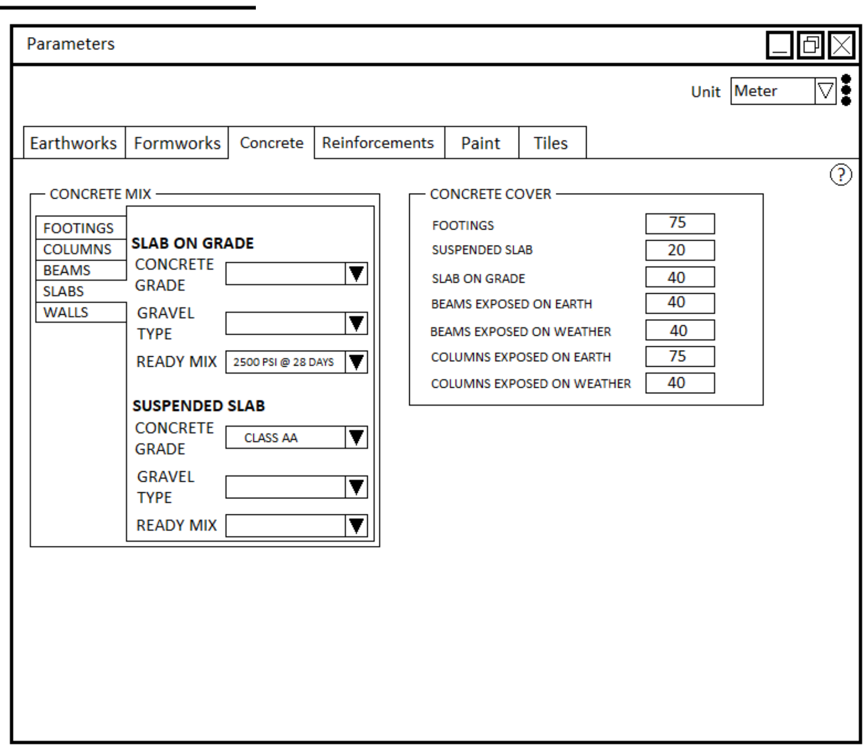
REFERENCE


ADD STRUCTURAL MEMBER
STRUCURAL MEMBER
SLAB
NAME:
S-1
UNIT:
mm
QUANTITY
1
THICKNESS
100
ELEVATION
219
REINFORCEMENTS
LONGITUDINAL
TRANSVERSE
DIAMETER
10
10
SPACING
300
300
SPLICE TYPE
LAPPED SPLICE
LAPPED SPLICE
SLAB BORDER
TOP LENGTH 55000
BOTTOM LENGTH 55000
LEFT LENGTH 9500
RIGHT LENGTH 9500
Length Top
Length Left
Length Right
Length Bottom


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
REINFORCEMENT GRADE
Columns Grade 60
Columns (Lateral Ties): Grade 40
Beams Grade 60
Beams (Stirrups): Grade 40
Footings: Grade 60
Slabs Grade 40
Stairs
Walls
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
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
SLAB ON GRADE
CONCRETE GRADE
GRAVEL TYPE
READY MIX
2500 PSI @ 28 DAYS
SUSPENDED SLAB
CONCRETE GRADE
CLASS AA
GRAVEL TYPE
READY MIX
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. The program will determine the Length of the Border $\boldsymbol{X}$

| $\boldsymbol{X}$ can be Identified either Top, Bottom, Left, or Right |
|---|

| SLAB BORDER | | |
|---|---|---|
| TOP | LENGTH | |
| BOTTOM | LENGTH | |
| LEFT | LENGTH | |
| RIGHT | LENGTH | |

**Example:**

S-1

| SLAB BORDER | | |
|---|---|---|
| TOP | LENGTH | 55000 |
| BOTTOM | LENGTH | 55000 |
| LEFT | LENGTH | 9500 |
| RIGHT | LENGTH | 9500 |

$L_{Top} = 55000$

$L_{Bottom} = 55000$

$L_{Left} = 9500$

$L_{Right} = 9500$

2. The program will determine the Longitudinal Length and Transverse Length

$$L_A = \frac{L_{Top} + L_{Bottom}}{2} \ \& \ L_B = \frac{L_{Left} + L_{Right}}{2}$$

**Example:**

S-1

$$L_A = \frac{L_{Top} + L_{Bottom}}{2} = \frac{55000 + 55000}{2} = 55000$$

$$L_B = \frac{L_{Left} + L_{Right}}{2} = \frac{9500 + 9500}{2} = 9500$$

3. The program will compute the quantity of the reinforcements.

LEGEND

$CC_{SoG} = Concrete\ Cover\ of\ Slab\ on\ Grade$

| CONCRETE COVER | | |
|---|---|---|
| FOOTINGS | | mm |
| SUSPENDED SLAB | | mm |
| SLAB ON GRADE | | mm |
| BEAMS EXPOSED ON EARTH | | mm |
| BEAMS EXPOSED ON WEATHER | | mm |
| COLUMNS EXPOSED ON EARTH | | mm |
| COLUMNS EXPOSED ON WEATHER | | mm |

If $L_A \geq L_B$

$$Qty\ of\ L_A = \frac{L_B - 2CC_{SoG}}{Spacing_{LONG}} + 1$$

$$Qty\ of\ L_B = \frac{L_A - 2CC_{SoG}}{Spacing_{TRANS}} + 1$$

If $L_A < L_B$

$$Qty\ of\ L_A = \frac{L_B - 2CC_{SoG}}{Spacing_{TRANS}} + 1$$

$$Qty\ of\ L_B = \frac{L_A - 2CC_{SoG}}{Spacing_{LONG}} + 1$$

**Example:**

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 |

S-1 $L_A > L_B$

REINFORCEMENTS

| | LONGITUDINAL | TRANSVERSE |
|---|---|---|
| DIAMETER | 10 | 10 |
| SPACING | 300 | 300 |
| SPLICE TYPE | LAPPED SPLICE | LAPPED SPLICE |

$$Qty\ of\ L_A = \frac{L_B - 2CC_{SoG}}{Spacing_{LONG}} + 1 = \frac{9500 - 2(40)}{300} + 1 = 32.4 \rightarrow 33\ pcs$$

$$Qty\ of\ L_B = \frac{L_A - 2CC_{SoG}}{Spacing_{TRANS}} + 1 = \frac{55000 - 2(40)}{300} + 1 = 184.07 \rightarrow 185\ pcs$$

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

$$S_L = Splice\ Length\ (Tension)\ based\ in\ Parameters$$

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 |

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

$$S_L = 0$$

Example:

CONCRETE MIX

FOOTINGS | COLUMNS | BEAMS | SLABS | WALLS

**SLAB ON GRADE**

| | |
|---|---|
| CONCRETE GRADE | |
| GRAVEL TYPE | |
| READY MIX | 2500 PSI @ 28 DAYS |

**SUSPENDED SLAB**

| | |
|---|---|
| CONCRETE GRADE | CLASS AA |
| GRAVEL TYPE | |
| READY MIX | |

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 |

$$f'c = 2500\ psi \rightarrow 17.5$$

The program will pick the closest larger $f'c$. Thus

$$f'c = 20.7$$

S-1

REINFORCEMENTS

| | LONGITUDINAL | TRANSVERSE |
|---|---|---|
| DIAMETER | 10 | 10 |
| SPACING | 300 | 300 |
| SPLICE TYPE | LAPPED SPLICE | LAPPED SPLICE |

The Splice Type is “Lapped Splice” Thus $S_L = Based\ on\ Parameters$

$$3000\ psi = 20.7\ MPa$$

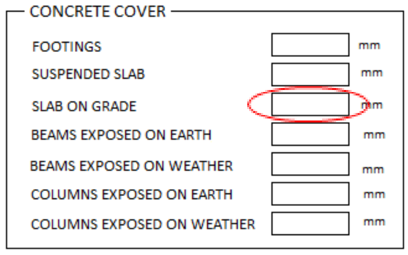
$$S_L @ L_A = 300$$

$$S_L @ L_B = 300$$

5. The program will determine the effective length of each slab.

LEGEND

$CC_{SoG} = Concrete\ Cover\ of\ Slab\ on\ Grade$

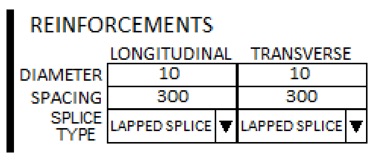



$$EL_A = L_A - 2CC_{SoG}$$

$$EL_B = L_B - 2CC_{SoG}$$

**Example:**

S-1




$EL_A = L_A - 2CC_{SoG} = 55000 - 2(40) = 54920\ mm \rightarrow 54.92\ m$

$EL_B = L_B - 2CC_{SoG} = 9500 - 2(40) = 9420\ mm \rightarrow 9.42\ m$

6. The program will determine the right manufactured reinforcement length and its needed manufactured quantity.

- If $EL_{(\_)} < Largest\ L_M$

$$Qty_P = \frac{L_M}{EL_{(\_)}}$$

$If\ \boldsymbol{Qty_P < 1}$

$$L_W = 0$$

$Else$

$$L_W = L_M - (EL_X) \cdot Qty_P (round\ down\ into\ whole\ number)$$

$$Qty_M = \frac{Qty\ of\ L_X}{Qty_P (round\ down\ to\ whole\ number)}$$

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

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

- If $EL_{(\_)} > Largest\ L_M$

$$Qty_M = \frac{EL_X}{L_M - S_L}$$

$$L_B = [Qty_M - Qty_M (round\ down\ into\ whole\ number)](L_M - S_L)$$

$$L_E = L_M - L_B$$

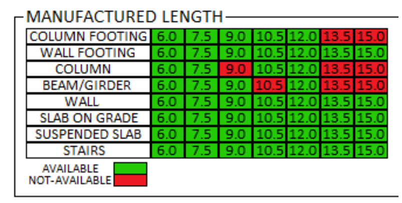
And

$$Total\ Wastage = L_E \cdot Qty\ of\ L_X$$

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

$$Qty_{CM} = Qty\ of\ L_X \cdot Qty_M (round\ up\ into\ whole\ number)$$

**Example:**




S-1

- $Qty\ of\ L_A = 33\ \&\ EL_A = 54.92\ m$

$$EL_L = 54.92\ m > Largest\ L_M = 15.0\ m$$

| L [M] | Qty of L[X] | EL [X] | Splice Length | Qty [SoG] | Qty [M] | | L [B] | L [E] | Qty [CM] | Total Waste |
|---|---|---|---|---|---|---|---|---|---|---|
| 6 | | | | | 9.64 | 10 | 3.620 | 2.380 | 330 | 78.540 |
| 7.5 | | | | | 7.63 | 8 | 4.520 | 2.980 | 264 | 98.340 |
| 9 | | | | | 6.31 | 7 | 2.720 | 6.280 | 231 | 207.240 |
| 10.5 | 33 | 54.92 | 0.30 | 1 | 5.38 | 6 | 3.920 | 6.580 | 198 | 217.140 |
| 12 | | | | | 4.69 | 5 | 8.120 | 3.880 | 165 | 128.040 |
| 13.5 | | | | | 4.16 | 5 | 2.120 | 11.380 | 165 | 375.540 |
| 15 | | | | | 3.74 | 4 | 10.820 | 4.180 | 132 | 137.940 |

$Qty_{CM} = 330$ and $L_{CM} = 6\ m$

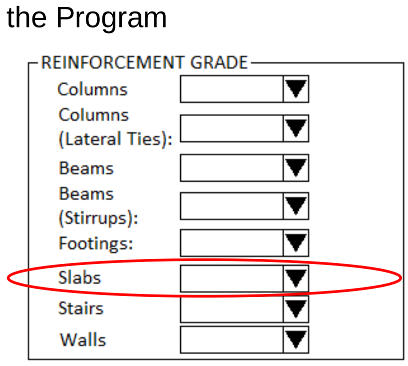
- $Qty\ of\ L_B = 185\ \&\ EL_B = 9.42\ m$

$$EL_L = 9.42\ m < Largest\ L_M = 15.0\ m$$

| L [M] | Qty [Total] | L [B] | Qty (**B**eam**R**ow) | Qty [P] | | Qty [M] | | L [W] | L [E] | Total Waste |
|---|---|---|---|---|---|---|---|---|---|---|
| 6 | | | | 0.64 | 0 | ##### | ##### | 0.000 | #DIV/0! | #DIV/0! |
| 7.5 | | | | 0.80 | 0 | ##### | ##### | 0.000 | #DIV/0! | #DIV/0! |
| 9 | | | | 0.96 | 0 | ##### | ##### | 0.000 | #DIV/0! | #DIV/0! |
| 10.5 | 185 | 9.42 | 1 | 1.11 | 1 | 185 | 185 | 1.080 | 0 | 199.800 |
| 12 | | | | 1.27 | 1 | 185 | 185 | 2.580 | 0 | 477.300 |
| 13.5 | | | | 1.43 | 1 | 185 | 185 | 4.08 | 0.00 | 754.80 |
| 15 | | | | 1.59 | 1 | 185 | 185 | 5.58 | 0.00 | 1921.60 |

$Qty_{CM} = 185$ and $L_{CM} = 10.5\ m$

7. The program will determine the cost of the Program



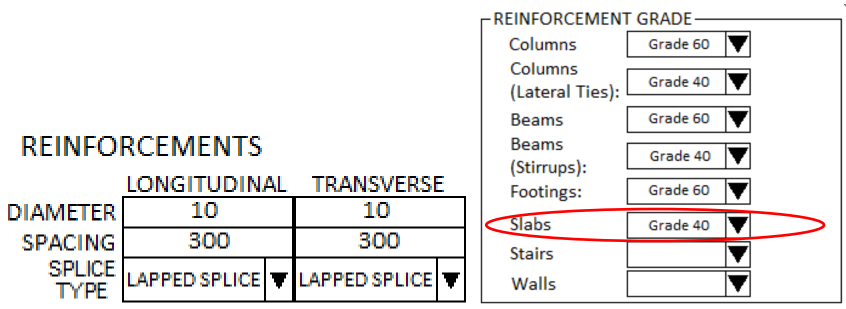

$$Price_{BR} = \sum Qty_M Price_M$$

Where:

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

**Example:**

S-1 $L_A > L_B$




Rebar GRADE 40 (⌀10mm) [6m]- **P 162.62**

Rebar GRADE 40 (⌀10mm) [7.5m]- **P 203.28**

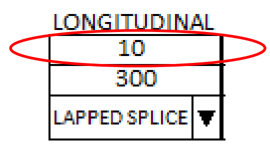
Rebar GRADE 40 (⌀10mm) [9m]- **P 243.94**

Rebar GRADE 40 (⌀10mm) [10.5m]- **P 284.59**

Rebar GRADE 40 (⌀10mm) [12m]- **P 325.25**

- $L_A$

$$Qty_{CM} = 330\ and\ L_{CM} = 6\ m$$

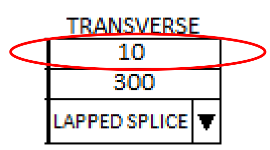



$$Price_M = ₱\ 162.62$$

$$Qty_M Price_M = 330(162.62) = ₱\ 53664.6$$

- $L_B$

$$Qty_{CM} = 185\ and\ L_{CM} = 10.5\ m$$




$$Price_M = 284.59$$

$$Qty_M Price_M = 185(284.59) = ₱\ 52649.15$$

- Total

$$Price_{BR} = \sum Qty_M Price_M = 53664.6 + 52649.15 = ₱\ \mathbf{106313.75}$$

8. The program will determine the weight of the slab

If $L_A \geq L_B$

$$W_{SoG} = W_{D(L)} \cdot Qty_{CM(A)} \cdot L_{CM(A)} + W_{D(T)} \cdot Qty_{CM(B)} \cdot L_{CM(B)}$$

If $L_A < L_B$

$$W_{SoG} = W_{D(L)} \cdot Qty_{CM(B)} \cdot L_{CM(B)} + W_{D(T)} \cdot Qty_{CM(A)} \cdot L_{CM(A)}$$

Where:

$$W_{D(X)} = Weight\ based\ on\ closest\ diameter\ in\ Parameter$$

**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 |

S-1 $L_A > L_B$

REINFORCEMENTS

| | LONGITUDINAL | TRANSVERSE |
|---|---|---|
| DIAMETER | 10 | 10 |
| SPACING | 300 | 300 |
| SPLICE TYPE | LAPPED SPLICE | LAPPED SPLICE |

$$W_{SoG} = W_{D(L)} \cdot Qty_{CM(A)} \cdot L_{M(A)} + W_{D(T)} \cdot Qty_{CM(B)} \cdot L_{CM(B)}$$

$$W_{SoG} = 0.616 \cdot 330 \cdot 6 + 0.616 \cdot 185 \cdot 10.5$$

$$W_{SoG} = \mathbf{2416.26\ kg}$$

9. The program will determine the labor price of the slab

$$Price_{Labor} = W_{SoG} \cdot L_R$$

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**

$$Price_{Labor} = W_{SoG} \cdot L_R = 2416.26(17) = ₱\ \mathbf{41076.42}$$