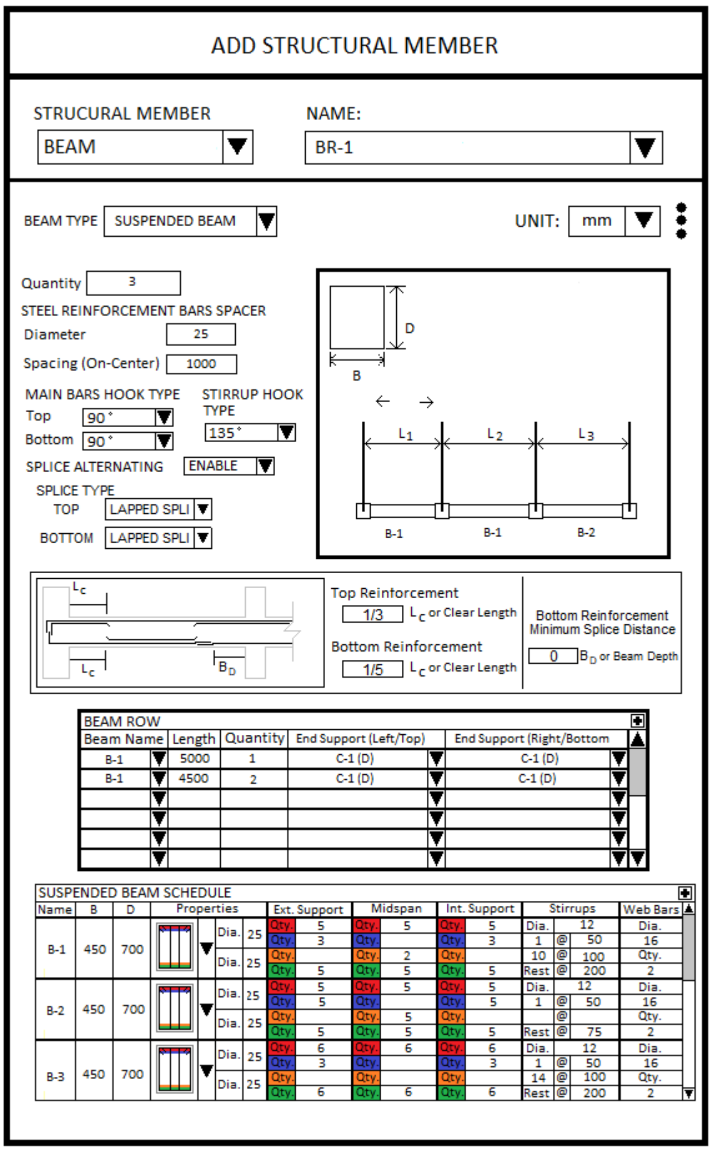
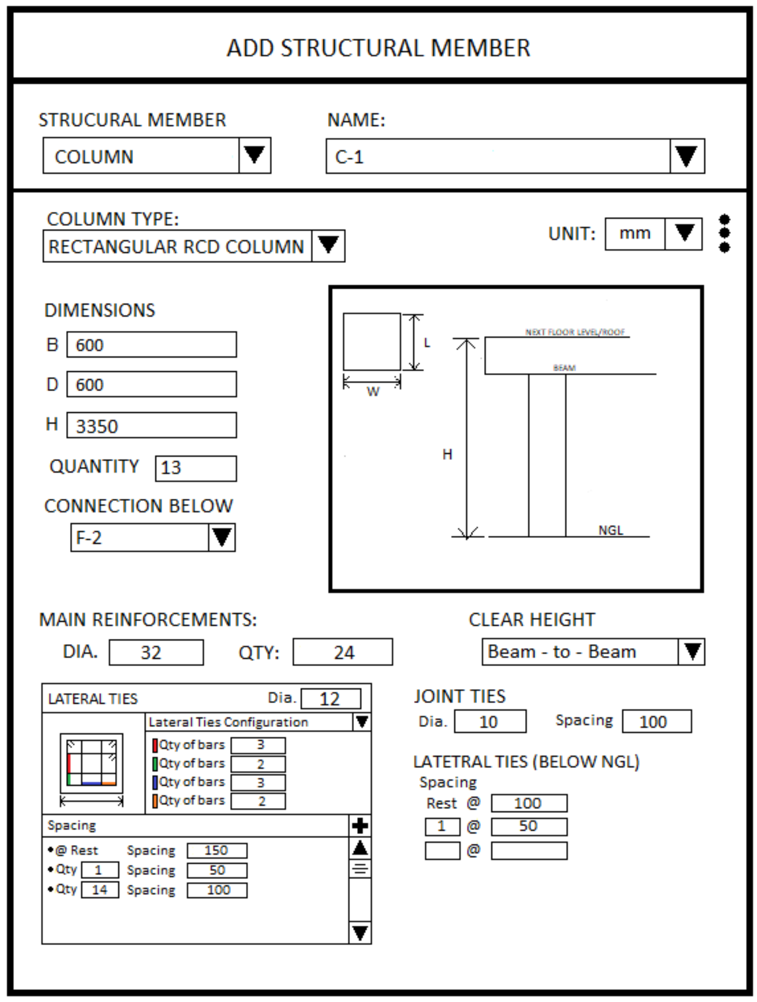
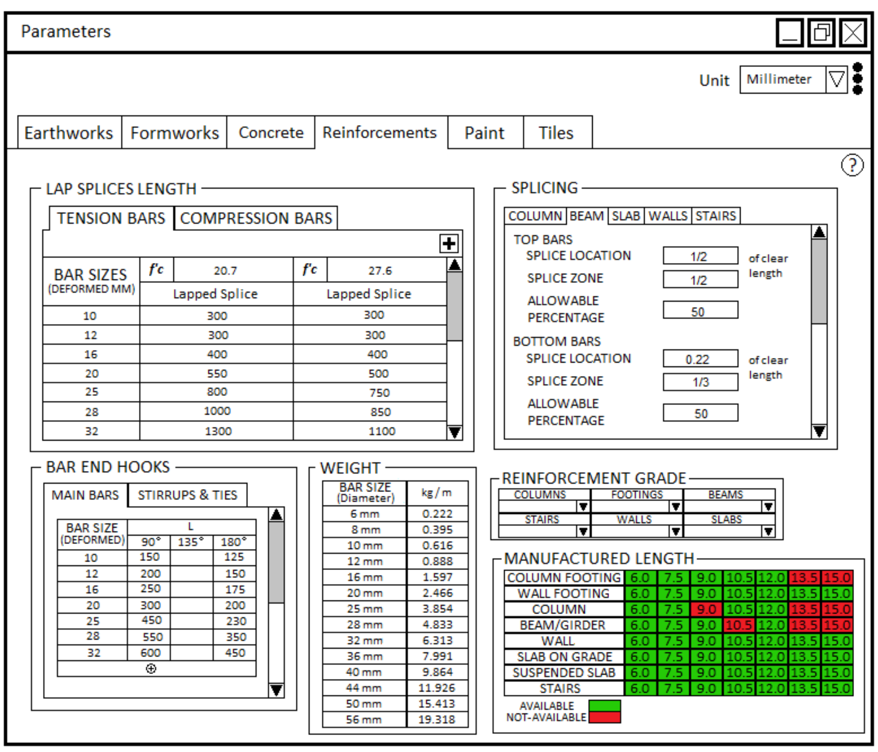
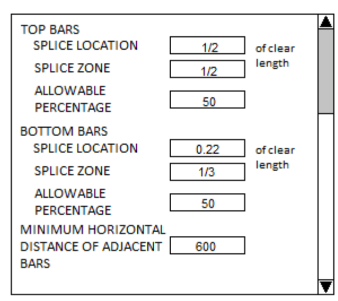
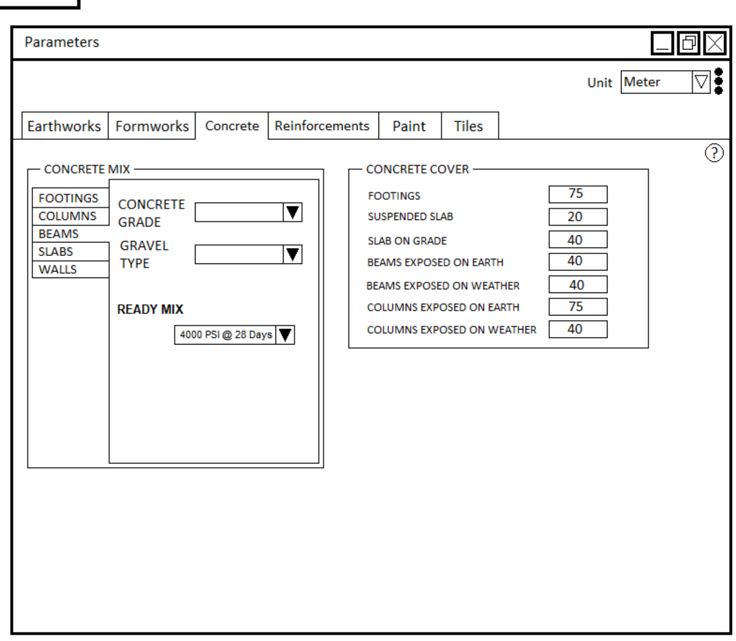
REFERENCE


ADD STRUCTURAL MEMBER
STRUCURAL MEMBER
BEAM
NAME:
BR-1
BEAM TYPE
SUSPENDED BEAM
UNIT:
mm
Quantity 3
STEEL REINFORCEMENT BARS SPACER
Diameter 25
Spacing (On-Center) 1000
MAIN BARS HOOK TYPE
Top 90°
Bottom 90°
STIRRUP HOOK TYPE
135°
SPLICE ALTERNATING
ENABLE
SPLICE TYPE
TOP LAPPED SPLI
BOTTOM LAPPED SPLI
B-1
B-1
B-2
Top Reinforcement
1/3 Lc or Clear Length
Bottom Reinforcement
1/5 Lc or Clear Length
Bottom Reinforcement Minimum Splice Distance
0 BD or Beam Depth
BEAM ROW
Beam Name | Length | Quantity | End Support (Left/Top) | End Support (Right/Bottom)
B-1 | 5000 | 1 | C-1 (D) | C-1 (D)
B-1 | 4500 | 2 | C-1 (D) | C-1 (D)
SUSPENDED BEAM SCHEDULE
Name | B | D | Properties | Ext. Support | Midspan | Int. Support | Stirrups | Web Bars
B-1 | 450 | 700
B-2 | 450 | 700
B-3 | 450 | 700


ADD STRUCTURAL MEMBER
STRUCURAL MEMBER
COLUMN
NAME:
C-1
COLUMN TYPE:
RECTANGULAR RCD COLUMN
UNIT:
mm
DIMENSIONS
B 600
D 600
H 3350
QUANTITY 13
CONNECTION BELOW
F-2
NEXT FLOOR LEVEL/ROOF
BEAM
H
NGL
MAIN REINFORCEMENTS:
DIA. 32
QTY: 24
CLEAR HEIGHT
Beam - to - Beam
LATERAL TIES
Dia. 12
Lateral Ties Configuration
Qty of bars 3
Qty of bars 2
Qty of bars 3
Qty of bars 2
Spacing
@ Rest Spacing 150
Qty 1 Spacing 50
Qty 14 Spacing 100
JOINT TIES
Dia. 10
Spacing 100
LATETRAL TIES (BELOW NGL)
Spacing
Rest @ 100
1 @ 50
@


Parameters
Unit Millimeter
Earthworks
Formworks
Concrete
Reinforcements
Paint
Tiles
LAP SPLICES LENGTH
TENSION BARS
COMPRESSION BARS
BAR SIZES (DEFORMED MM) | f'c 20.7 Lapped Splice | f'c 27.6 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
TOP BARS
SPLICE LOCATION 1/2 of clear length
SPLICE ZONE 1/2
ALLOWABLE PERCENTAGE 50
BOTTOM BARS
SPLICE LOCATION 0.22 of clear length
SPLICE ZONE 1/3
ALLOWABLE PERCENTAGE 50
BAR END HOOKS
MAIN BARS
STIRRUPS & TIES
BAR SIZE (DEFORMED) | 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
STAIRS WALLS SLABS
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


TOP BARS
SPLICE LOCATION 1/2 of clear length
SPLICE ZONE 1/2
ALLOWABLE PERCENTAGE 50
BOTTOM BARS
SPLICE LOCATION 0.22 of clear length
SPLICE ZONE 1/3
ALLOWABLE PERCENTAGE 50
MINIMUM HORIZONTAL DISTANCE OF ADJACENT BARS 600


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. The program will determine the dimension of the support

LEGEND:

- If the support is a Column connected to its width **"Support Name(D)"** then
  a) Case 1: The Beam Type is "Footing Tie Beam" & "Grade Beam"

$$Dim_{S:Left/Top} = \frac{B_{column}+(CC_{EE}-CC_{EW})}{2} \quad or \quad Dim_{S:Right/Bott} = \frac{B_{column}+(CC_{EE}-CC_{EW})}{2}$$

  b) Case 2: The Beam Type is "Suspended Beam" & "Roof Beam"

$$Dim_{S:Left/Top} = \frac{B_{column}}{2} \quad or \quad Dim_{S:Right/Bott} = \frac{B_{column}}{2}$$

- If the support is a Column connected to its length **"Support Name(B)"** then
  a) Case 1: The Beam Type is "Footing Tie Beam" & "Grade Beam"

$$Dim_{S:Left/Top} = \frac{D_{column}+(CC_{EE}-CC_{EW})}{2} \quad or \quad Dim_{S:Right/Bott} = \frac{D_{column}+(CC_{EE}-CC_{EW})}{2}$$

  b) Case 2: The Beam Type is "Suspended Beam" & "Roof Beam"

$$Dim_{S:Left/Top} = \frac{D_{column}}{2} \quad or \quad Dim_{S:Right/Bott} = \frac{D_{column}}{2}$$

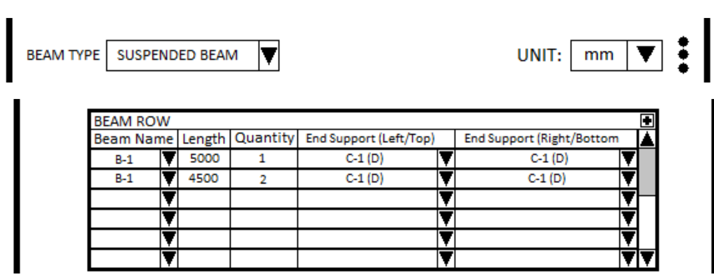
- If the support is a Beam, then

$$Dim_{S:Left/Top} = \frac{B_{beam}}{2} \quad or \quad Dim_{S:Right/Bott} = \frac{B_{beam}}{2}$$

- If there is No support, then

$$Dim_{S:Left/Top} = 0 \quad or \quad Dim_{S:Right/Bott} = 0$$

Example:



Ref (1)

Since *Ref (1)* is connected to *C-1(D)* @ its left/top and @ its right/bottom. Thus,

$$Dim_{Left(1)} = \frac{B_{C1}}{2} = \frac{600}{2} = 300$$

$$Dim_{Right(1)} = \frac{B_{C1}}{2} = \frac{600}{2} = 300$$

Ref (2)

Since *Ref (2)* is connected to *C-1(D)* @ its left/top and @ its right/bottom. Thus,

$$Dim_{Left(2)} = \frac{B_{C1}}{2} = \frac{600}{2} = 300$$

$$Dim_{Right(2)} = \frac{B_{C1}}{2} = \frac{600}{2} = 300$$

2. The program will compute the clear length of each beam

$$L_C = L - \left(Dim_{Left} + Dim_{Right}\right)$$

Example:

BEAM ROW				
Beam Name	Length	Quantity	End Support (Left/Top)	End Support (Right/Bottom
B-1	5000	1	C-1 (D)	C-1 (D)
B-1	4500	2	C-1 (D)	C-1 (D)

Ref (1)

$$L_{C(1)} = L_1 - \left(Dim_{Left(1)} + Dim_{Right(1)}\right) = 5000 - (300 + 300) = 4400\ mm$$

Ref (2)

$$L_{C(2)} = L_2 - \left(Dim_{Left(2)} + Dim_{Right(2)}\right) = 4500 - (300 + 300) = 3900\ mm$$

3. The program will check the quantity of Qty_{BLUE} and Qty_{RED} of each sector to determine the $X_{(\_)U}$ of each beam.

@ Exterior Support

- If the Qty_{BLUE} and Qty_{RED} are both more than zero, then

$$X_{EU} = 1$$

- Else

$$X_{EU} = 0$$

@ Midspan

- If the Qty_{BLUE} and Qty_{RED} are both more than zero, then

$$X_{MU} = 1$$

- Else

$$X_{MU} = 0$$

@ Interior Support

- If the Qty_{BLUE} and Qty_{RED} are both more than zero then

$$X_{IU} = 1$$

- Else

$$X_{IU} = 0$$

Example:

BEAM ROW				
Beam Name	Length	Quantity	End Support (Left/Top)	End Support (Right/Bottom
B-1	5000	1	C-1 (D)	C-1 (D)
B-1	4500	2	C-1 (D)	C-1 (D)

SUSPENDED BEAM SCHEDULE														
Name	B	D	Properties		Ext. Support		Midspan		Int. Support		Stirrups			Web Bars
B-1	450	700	Dia.	25	Qty.	5	Qty.	5	Qty.	5	Dia.	12		Dia.
					Qty.	3	Qty.		Qty.	3	1	@	50	16
			Dia.	25	Qty.		Qty.	2	Qty.		10	@	100	Qty.
					Qty.	5	Qty.	5	Qty.	5	Rest	@	200	2
B-2	450	700	Dia.	25	Qty.	5	Qty.	5	Qty.	5	Dia.	12		Dia.
					Qty.	5	Qty.		Qty.	5	1	@	50	16
			Dia.	25	Qty.		Qty.	5	Qty.			@		Qty.
					Qty.	5	Qty.	5	Qty.	5	Rest	@	75	2
B-3	450	700	Dia.	25	Qty.	6	Qty.	6	Qty.	6	Dia.	12		Dia.
					Qty.	3	Qty.		Qty.	3	1	@	50	16
			Dia.	25	Qty.		Qty.		Qty.		14	@	100	Qty.
					Qty.	6	Qty.	6	Qty.	6	Rest	@	200	2

- Ref (1)

@ Exterior

$$Qty_{RED(1)} = 5 > 0$$

$Qty_{BLUE(1)} = 3 > 0$

Since both are greater than 0. Thus $X_{EU(1)} = 1$

@ Midspan

$Qty_{RED(1)} = 5 > 0$

$Qty_{BLUE(1)} = 0$

Since $Qty_{BLUE(1)} = 0$. Thus $X_{MU(1)} = 0$

@ Interior

$Qty_{RED(1)} = 5 > 0$

$Qty_{BLUE(1)} = 3 > 0$

Since both are greater than 0. Thus $X_{IU(1)} = 1$

- Ref (2)

@ Exterior

$Qty_{RED(2)} = 5 > 0$

$Qty_{BLUE(2)} = 3 > 0$

Since both are greater than 0. Thus $X_{EU(2)} = 1$

@ Midspan

$Qty_{RED(2)} = 5 > 0$

$Qty_{BLUE(2)} = 0$

Since $Qty_{BLUE(2)} = 0$. Thus $X_{MU(2)} = 0$

@ Interior

$Qty_{RED(2)} = 5 > 0$

$Qty_{BLUE(2)} = 3 > 0$

Since both are greater than 0. Thus $X_{IU(2)} = 1$

4. The program will check the quantity of Qty_{GREEN} and Qty_{ORANGE} of each sector to determine the $X_{(\_)U}$ of each beam

@ Exterior Support

- If the Qty_{GREEN} and Qty_{ORANGE} are both more than zero, then

$$X_{EB} = 1$$

- Else

$$X_{EB} = 0$$

@ Midspan

- If the Qty_{GREEN} and Qty_{ORANGE} are both more than zero, then

$$X_{MB} = 1$$

- Else

$$X_{MB} = 0$$

@ Interior Support

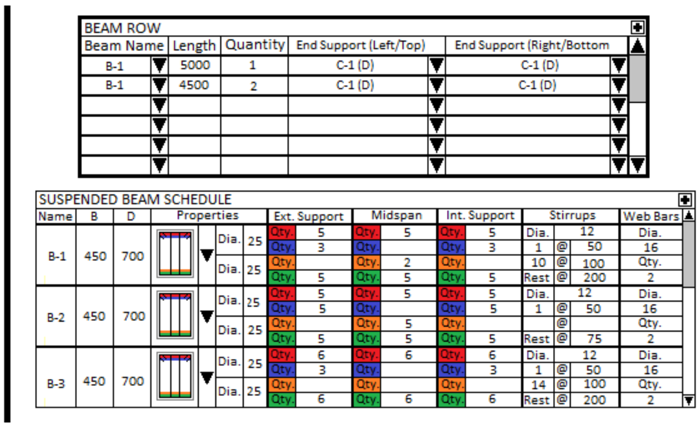
- If the Qty_{GREEN} and Qty_{ORANGE} are both more than zero then

$$X_{IB} = 1$$

- Else

$$X_{IB} = 0$$

Example:



BEAM ROW

Beam Name	Length	Quantity	End Support (Left/Top)	End Support (Right/Bottom
B-1	5000	1	C-1 (D)	C-1 (D)
B-1	4500	2	C-1 (D)	C-1 (D)

SUSPENDED BEAM SCHEDULE

Name	B	D	Properties		Ext. Support		Midspan		Int. Support		Stirrups			Web Bars
B-1	450	700	Dia.	25	Qty.	5	Qty.	5	Qty.	5	Dia.		12	Dia.
					Qty.	3	Qty.		Qty.	3	1	@	50	16
			Dia.	25	Qty.		Qty.	2	Qty.		10	@	100	Qty.
					Qty.	5	Qty.	5	Qty.	5	Rest	@	200	2
B-2	450	700	Dia.	25	Qty.	5	Qty.	5	Qty.	5	Dia.		12	Dia.
					Qty.	5	Qty.		Qty.	5	1	@	50	16
			Dia.	25	Qty.		Qty.	5	Qty.			@		Qty.
					Qty.	5	Qty.	5	Qty.	5	Rest	@	75	2
B-3	450	700	Dia.	25	Qty.	6	Qty.	6	Qty.	6	Dia.		12	Dia.
					Qty.	3	Qty.		Qty.	3	1	@	50	16
			Dia.	25	Qty.		Qty.		Qty.		14	@	100	Qty.
					Qty.	6	Qty.	6	Qty.	6	Rest	@	200	2

Ref (1)

@ Exterior

$Qty_{GREEN(1)} = 5 > 0$

$Qty_{ORANGE(1)} = 3 > 0$

Since $Qty_{ORANGE(1)} = 0$. Thus $X_{EU(1)} = 0$

@ Midspan

$Qty_{GREEN(1)} = 5 > 0$

$Qty_{ORANGE(1)} = 2 > 0$

Since both are greater than 0. Thus $X_{MU(1)} = 1$

@ Interior

$Qty_{GREEN(1)} = 5 > 0$

$Qty_{ORANGE(1)} = 0$

Since $Qty_{ORANGE(1)} = 0$. Thus $X_{IU(1)} = 0$

Ref (2)

@ Exterior

$Qty_{GREEN(2)} = 5 > 0$

$Qty_{ORANGE(2)} = 3 > 0$

Since $Qty_{ORANGE(2)} = 0$. Thus $X_{EU(2)} = 0$

@ Midspan

$Qty_{GREEN(2)} = 5 > 0$

$$Qty_{ORANGE(2)} = 2 > 0$$

Since both are greater than 0. Thus $X_{MU(2)} = 1$

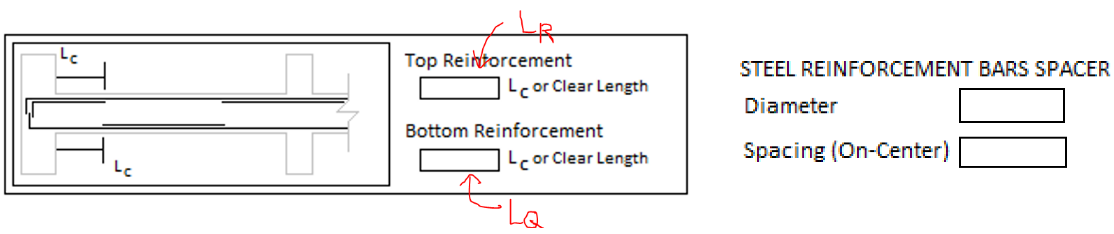
@ Interior

$$Qty_{GREEN(2)} = 5 > 0$$

$$Qty_{ORANGE(2)} = 0$$

Since $Qty_{ORANGE(2)} = 0$. Thus $X_{IU(2)} = 0$

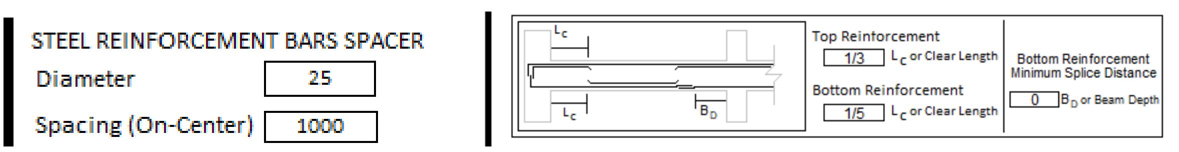
5. The program will determine the quantity of bar spacers of each beam. (Must be round-up to whole number)



$$Qty_{SA(n)} = \frac{L_{Cn}\left[L_R X_{EU} + L_R X_{IU} + (1-2L_R)X_{MU}\right]}{Spacing} + 1$$

$$Qty_{SB(n)} = \frac{L_{Cn}\left[L_Q X_{EB} + L_Q X_{IB} + (1-2L_Q)X_{MB}\right]}{Spacing} + 1$$

Example:



$$L_R = \frac{1}{3} \ \&\ L_Q = \frac{1}{5}$$

Ref (1)

$$Qty_{SA(1)} = \frac{L_{C1}\left[L_R X_{EU} + L_R X_{IU} + (1-2L_R)X_{MU}\right]}{Spacing} + 1 = \frac{4400\left[\frac{1}{3}(1)+\frac{1}{3}(1)+\left(1-2\left(\frac{1}{3}\right)\right)(0)\right]}{1000} + 1 = 3.93 \rightarrow 4$$

$$Qty_{SB(1)} = \frac{L_{C1}\left[L_R X_{EB} + L_R X_{IB} + (1-2L_R)X_{MB}\right]}{Spacing} + 1 = \frac{4400\left[\frac{1}{5}(0)+\frac{1}{5}(0)+\left(1-2\left(\frac{1}{5}\right)\right)(1)\right]}{1000} + 1 = 3.64 \rightarrow 4$$

Ref (2)

$$Qty_{SA(2)} = \frac{L_{C2}\left[L_R X_{EU} + L_R X_{IU} + (1-2L_R)X_{MU}\right]}{Spacing} + 1 = \frac{3900\left[\frac{1}{3}(1)+\frac{1}{3}(1)+\left(1-2\left(\frac{1}{3}\right)\right)(0)\right]}{1000} + 1 = 3.6 \rightarrow 4$$

$$Qty_{SB(2)} = \frac{L_{C2}\left[L_R X_{EB} + L_R X_{IB} + (1-2L_R)X_{MB}\right]}{Spacing} + 1 = \frac{3900\left[\frac{1}{5}(0)+\frac{1}{5}(0)+\left(1-2\left(\frac{1}{5}\right)\right)(1)\right]}{1000} + 1 = 3.34 \rightarrow 4$$

6. The program will determine the total quantity of bar spacers of each beam.

$$Qty_{S(n)} = Qty_{SA(n)} + Qty_{SB(n)}$$

Example:

Ref (1)

$$Qty_{S(1)} = Qty_{SA(1)} + Qty_{SB(1)} = 4 + 4 = 8$$

Ref (2)

$$Qty_{S(2)} = Qty_{SA(2)} + Qty_{SB(2)} = 4 + 4 = 8$$

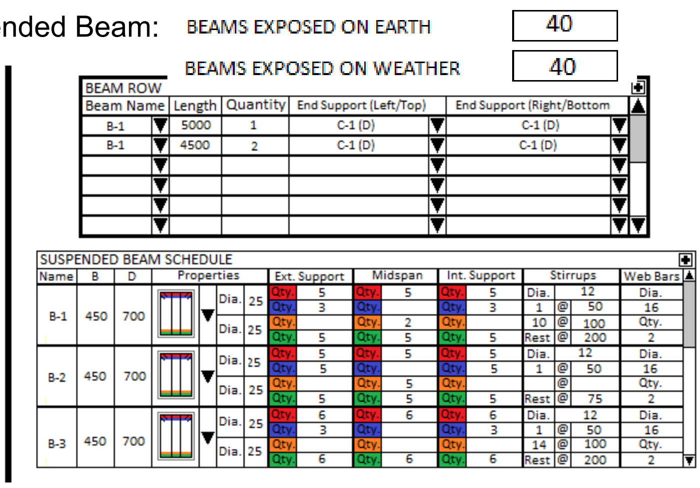
7. The program will determine the Length of the $Qty_{S(n)}$ **must be converted to meters**

LEGEND:

$$L_{Bn} = B_{B(n)} - 2\left(d_s\right) - 2CC_B$$

Example:

The beam type is Suspended Beam:



BEAMS EXPOSED ON EARTH	40
BEAMS EXPOSED ON WEATHER	40

BEAM ROW

Beam Name	Length	Quantity	End Support (Left/Top)	End Support (Right/Bottom
B-1	5000	1	C-1 (D)	C-1 (D)
B-1	4500	2	C-1 (D)	C-1 (D)

SUSPENDED BEAM SCHEDULE

Name	B	D	Properties		Ext. Support		Midspan		Int. Support		Stirrups			Web Bars
B-1	450	700	Dia.	25	Qty.	5	Qty.	5	Qty.	5	Dia.		12	Dia.
					Qty.	3	Qty.		Qty.	3	1	@	50	16
			Dia.	25	Qty.		Qty.	2	Qty.		10	@	100	Qty.
					Qty.	5	Qty.	5	Qty.	5	Rest	@	200	2
B-2	450	700	Dia.	25	Qty.	5	Qty.	5	Qty.	5	Dia.		12	Dia.
					Qty.	5	Qty.		Qty.	5	1	@	50	16
			Dia.	25	Qty.		Qty.	5	Qty.			@		Qty.
					Qty.	5	Qty.	5	Qty.	5	Rest	@	75	2
B-3	450	700	Dia.	25	Qty.	6	Qty.	6	Qty.	6	Dia.		12	Dia.
					Qty.	3	Qty.		Qty.	3	1	@	50	16
			Dia.	25	Qty.		Qty.		Qty.		14	@	100	Qty.
					Qty.	6	Qty.	6	Qty.	6	Rest	@	200	2

Ref (1): B – 1

$$L_{B(1)} = B_{B(1)} - 2CC_B = 450 - 2(40) = 370\ mm \rightarrow 0.370\ m$$

Ref (2): B – 1

$$L_{B(2)} = B_{B(2)} - 2CC_B = 450 - 2(40) = 370\ mm \rightarrow 0.370\ m$$

8. 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:

If $Qty_{S(n)} or\ its\ L_B\ is\ equal\ to\ ZERO\ then,$

$$Qty_{Pn} = 0\ pcs$$

$$L_{CBn} = 0\ m$$

Else, compute

$$Qty_{Pn} = \frac{L_M}{L_{Bn}}$$

$$Qty_{Mn} = \frac{Qty_{S(n)} \bullet Qty_{Beam(n)}}{Qty_{Pn}\ (round\ down\ into\ whole\ number)} \bullet Qty_{Beam\ Row}$$

$$L_W = \left[Qty_{Pn} - Qty_{Pn}\ (round\ down\ into\ whole\ number)\right] \times L_{Bn}$$

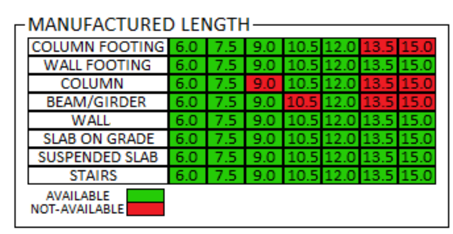
$$L_E\ (m) = \left[Qty_{Mn} (round\ up\ to\ whole\ number) - Qty_{Mn}\right] \times L_M$$

And

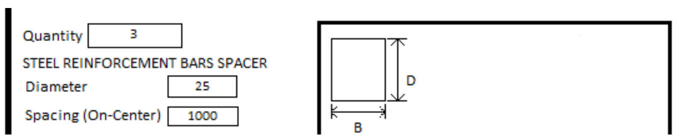
$$Total\,Wastage\ = L_E + L_W Qty_{Mn}(round\ down\ to\ whole\ number)$$

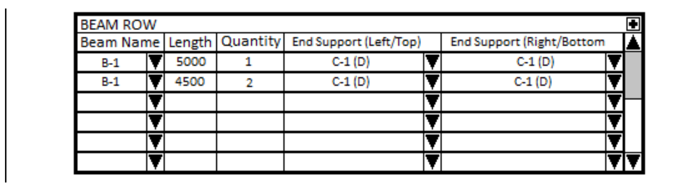
Then the program will choose the manufactured bar length with the lowest $Total\,Wastage$.

Example:



The available Manufactured Length (L_M) are 6, 7.5, 9, and 12.





$$Qty_{Beam\ Row} = 3$$

Ref (1) $Qty_{Beam(1)} = 1$

@ $L_M = 6\,m$

$$Qty_{Pn} = \frac{L_M}{L_B} = \frac{6}{0.370} = 16.22$$

$$Qty_{M(1a)} = \frac{Qty_{S(1)} \bullet Qty_{Beam(1)}}{Qty_{P(1a)}(round\ down\ into\ whole\ number)} Qty_{Beam\ Row} = \frac{8 \cdot 1}{16}(3) = 1.5$$

$$L_{W(1a)} = \left[Qty_{P(1a)} - Qty_{P(1a)}(round\ down\ into\ whole\ number)\right] \times L_{B(1)} = [16.22 - 16] \times 0.37 = 0.08$$

$$L_{E(1a)} = \left[Qty_{M(1a)}(round\ up\ to\ whole\ number) - Qty_{Mn}\right] \times L_{M(a)} = [2 - 1.5] \times 6 = 3\,m$$

$$Total\,Wastage_{1a} = L_{E(1a)} + L_{W(1a)} Qty_{M(1a)}(round\ down\ to\ whole\ number) = 3 + 0.08(1) = 3.08\,m$$

L [M]	Qty [S] X Qty [Beam]	L [B]	Qty (BeamRow)	Qty [P]		Qty [M]		L [W]	L [E]	Total Waste
6	8	0.37	3	16.22	16	1.5	2	0.080	3	3.080
7.5				20.27	20	1.2	2	0.100	6	6.100
9				24.32	24	1	1	0.120	0	0.120
12				32.43	32	0.75	1	0.160	3	3.000

Thus $Qty_{M(1)} = 1$ and $L_{CM(1)} = 9\,m$

Ref (2) $Qty_{Beam(2)} = 2$

L [M]	Qty [S] X Qty [Beam]	L [B]	Qty (BeamRow)	Qty [P]		Qty [M]		L [W]	L [E]	Total Waste
6	16	0.37	3	16.22	16	3	3	0.080	0	0.240
7.5				20.27	20	2.4	3	0.100	4.5	4.700
9				24.32	24	2	2	0.120	0	0.240
12				32.43	32	1.5	2	0.160	6	6.160

Thus $Qty_{M(2)} = 3$ and $L_{CM(1)} = 6\,m$

9. The program will then compute the total weight of the reinforcement.

$$W_T = W_D\left(\sum L_{CMn} Qty_{Mn}\right)$$

Where:

$$W_D = Weight\ based\ of\ the\ closest\ coresponding\ average\ diameter\ of\ the\ spacer.$$

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

STEEL REINFORCEMENT BARS SPACER

Diameter	25
Spacing (On-Center)	1000

$$W_T = W_D\left(\sum_{n=1}^{2} L_{CBn} Qty_{Mn}\right) = 3.854[9(1) + 6(3)] = 104.058\ kg$$