# Calculation Sheet

## (Bearing Wall)

**Project Name :** Sabaa Alboor 432

**Site :** Sabaa Alboor, Baghdad

## 1. GENERAL NOTES FOR STRUCTURAL DRAWING:-

1.1 Following technical codes and standards are applied in the structural design.
-ACI 318-08 Build Code Requirements For Structural Concrete.

1.2 Contractor shall verify all dimensions and elevations and notify the architect or engineer of any discrepancies before proceeding with any part of the work

1.3 Contractor shall verify the location and size of floor, roof, and wall opening with architectural ,mechanical and electrical drawings. No unauthorized holes are permitted.

1.4 Contractor shall verify depressions and recesses for floor finishes and pits with architectural and other applicable drawings.

1.5 Contractor shall verify all inserts and embedded items with mechanical and electrical drawings before pouring concrete.

1.6 Typical details shown here shall be used where applicable, and when specific details are note shown elsewhere.

## 2.FOUNDATION

2.1 Allowable soil capacity is 8.0 ton/m² at 1.0 meter below natural ground level when soil improvement made below this level as per soil investigation report.

2.2 Excavations for footing shall be approved by the soil engineer.

## 3. COMPACTED FILL

3.1 Compaction shall be performed according to the Soil Engineer's recommendation.

3.2 Fill shall be placed in maximum lifts of 20cm, watered as required and compacted to a minimum relative density of 95% of a maximum density determined by A.S.T.M . Standard Test Method D 1557-70.

33 All imported fill material shall be non-expansive.

## 4- MATERIALS

material shall conform to the following specification:

4.1 Normal and Sulphate-resisting Portland Cement ...ASTM C150

4.2 Reinforcing steel bar ..ASTM A615,G60

## 5- CONCRETE:-

5.1 All concrete in contact with soil shall be structural concrete made with sulphate resisting cement and stone aggregate, except where noted otherwise.

5.2 All concrete shall be (concrete 28 day cubic strength ) C30 (300kg/cm²) .....For beams, slabs,columns and foundation.

5.3 Minimum cement content shall be 350 kg/m3.

5.4 Normal maximum size of coarse aggregate is 20mm.

5.5 Maximum slump shall be:

Footing and slab on grade .....10cm max.

Beam .....15cm max

5.6 Admixtures approved by engineer may be used in the mix design.

5.7 Construction joints not indicated on the plans shall be made so as to least impair the strength of the structure.

5.8 No piping other than conduits shall be placed in structural concrete.
Aluminum conduits shall not be used.

5.9 Concrete cover :-

40mm min. to beam stirrup and column tie

20 mm min. for top and bottom slab

75mm min. for concrete in contact with soil.

## 6-REINFORCED STEEL BAR:-

6.1 All detailing, fabrication and placing of reinforcing bars shall comply with latest edition of ACI 315.

6.2 Reinforcing steel shall conform to ASTM A615,Grade 60.

6.3 All Reinforcing bar splices are to be class B tension splices except where otherwise shown.

6.4 Minimum lap of welded wire fabric shall be 150mm or one full mesh plus 50mm.

NOTES:-

1.1. All dimensions are in centimeters unless otherwise mentioned,(Steel bars spacings are in millimeters).

1.2. These drawings are to be read in conjunction with all other relevant drawings depicting Architectural, Mechanical and Electrical information together with all performance and general specifications.

1.4. Drawings must not be scaled. Where no dimensions are given the matter shall be referred to the Engineer.

1.5. Should dimensions or details on drawings are in conflict precedence shall be given to the larger scale drawings subject to approval of the Engineer.

**JIDAR BAGHDAD COM.**

BUILDING-A

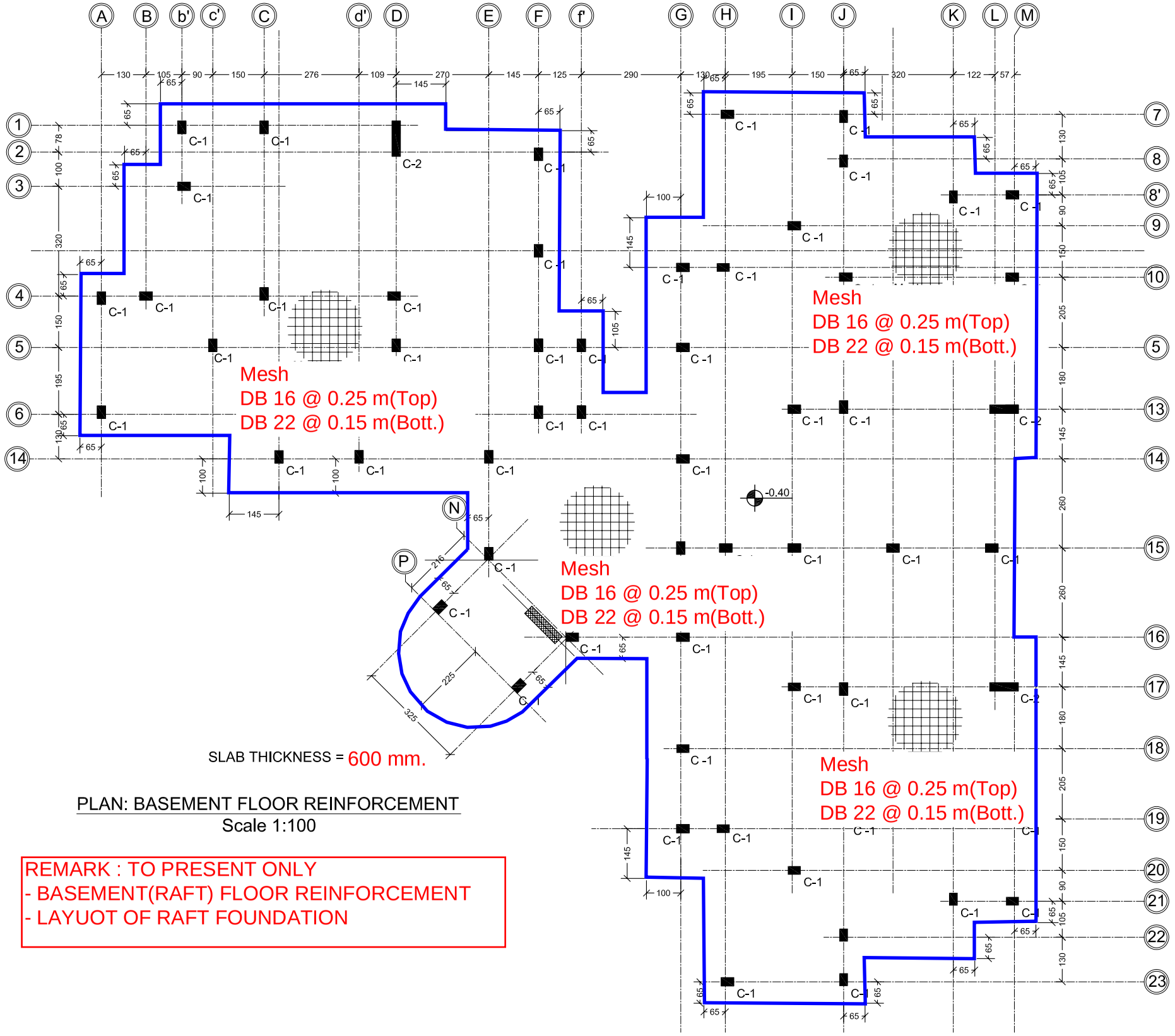
DRAWING TITLE:

GENERAL NOTES

| | NAME & SIGNITURE | |
|---|---|---|
| DESIGNED BY | Ali Kadhim Jassim M.Sc.Eng. England | |
| CHECKED BY | Ali Kadhim Jassim M.Sc.Eng. England | |
| DRAWING BY | Ali Kadhim Jassim M.Sc.Eng. England | |
| APPROVED BY | Ali Kadhim Jassim M.Sc.Eng. England | |

| SCALE | DATE | | SHEET NO. |
|---|---|---|---|
| 1: 100 | 20-12-2011 | STR-01 | |

# PLAN




SLAB THICKNESS = 600 mm.

PLAN: BASEMENT FLOOR REINFORCEMENT
Scale 1:100

REMARK : TO PRESENT ONLY
- BASEMENT(RAFT) FLOOR REINFORCEMENT
- LAYUOT OF RAFT FOUNDATION

NOTES:-

1.1. All dimensions are in centimeters unless otherwise mentioned,(Steel bars spacings are in millimeters).
1.2. These drawings are to be read in conjunction with all other relevant drawings depicting Architectural, Mechanical and Electrical information together with all performance and general specifications.
1.4. Drawings must not be scaled. Where no dimensions are given the matter shall be referred to the Engineer.
1.5. Should dimensions or details on drawings are in conflict precedence shall be given to the larger scale drawings subject to approval of the Engineer.

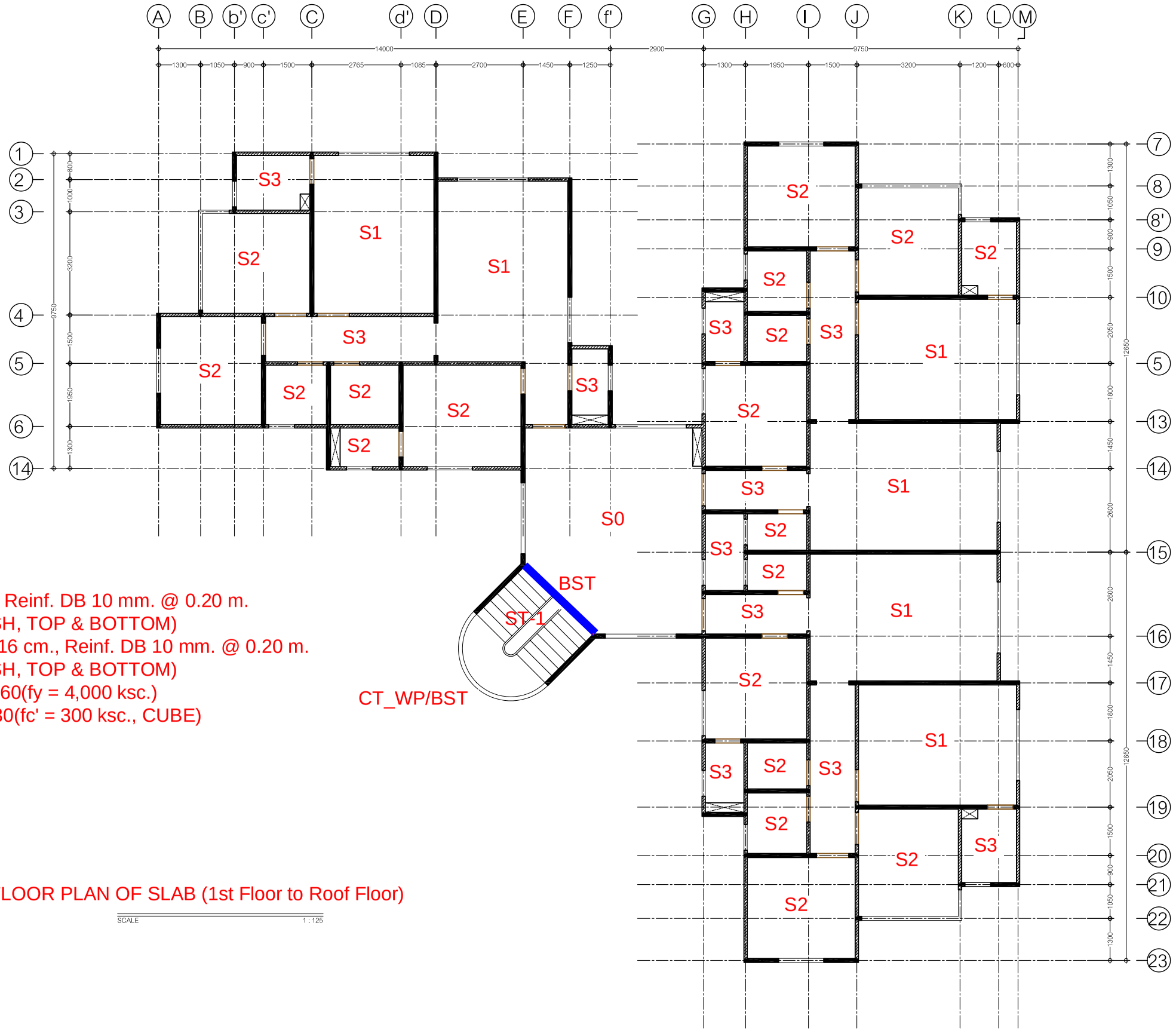
**JIDAR BAGHDAD COM.**

BUILDING-A

DRAWING TITLE :

| | NAME & SIGNITURE |
|---|---|
| DESIGNED BY | Ali Kadhim Jassim M.Sc.Eng. England |
| CHECKED BY | Ali Kadhim Jassim M.Sc.Eng. England |
| DRAWING BY | Ali Kadhim Jassim M.Sc.Eng. England |
| APPROVED BY | Ali Kadhim Jassim M.Sc.Eng. England |

| SCALE | DATE | | SHEET NO. |
|---|---|---|---|
| 1: 100 | 20-12-2011 | STR-03 | |




REMARK :
- S0 THICKNESS 16 cm., Reinf. DB 10 mm. @ 0.20 m.
(TWO LAYER WIRE MESH, TOP & BOTTOM)
- S1 TO S3 THICKNESS 16 cm., Reinf. DB 10 mm. @ 0.20 m.
(TWO LAYER WIRE MESH, TOP & BOTTOM)
- REINF. STEEL GRADE 60(fy = 4,000 ksc.)
- CONCRETE GRADE C30(fc' = 300 ksc., CUBE)

## FLOOR PLAN OF SLAB (1st Floor to Roof Floor)

SCALE 1 : 125

NOTES:-

1.1 All dimensions are in centimeters unless otherwise mentioned.(Steel bars spacings are in millimeters).
1.2 These drawings are to be read in conjunction with all other relevant drawings depicting Architectural, Mechanical and Electrical information together with all performance and general specifications.
1.3 Drawings must not be scaled. Where no dimensions are given the matter shall be referred to the Engineer.
1.4 Should dimensions or details on drawings are in conflict precedence shall be given to the larger scale drawings subject to approval of the Engineer.

PROJECT
SABAA ALBOOR PROJECT

M.V.T. DEVELOPMENT CO., LTD.
23rd FLOOR, P.S. TOWER,
36/79 SUKUMVIT 21 RD.(SOI ASOKE),
KLONGTOEY-NUA, WATTANA,
BANGKOK 10110 THAILAND
Tel. (662) 664-4117, Fax (662) 664-4118

STRUCTURAL DRAWING

NAME & SIGNITURE

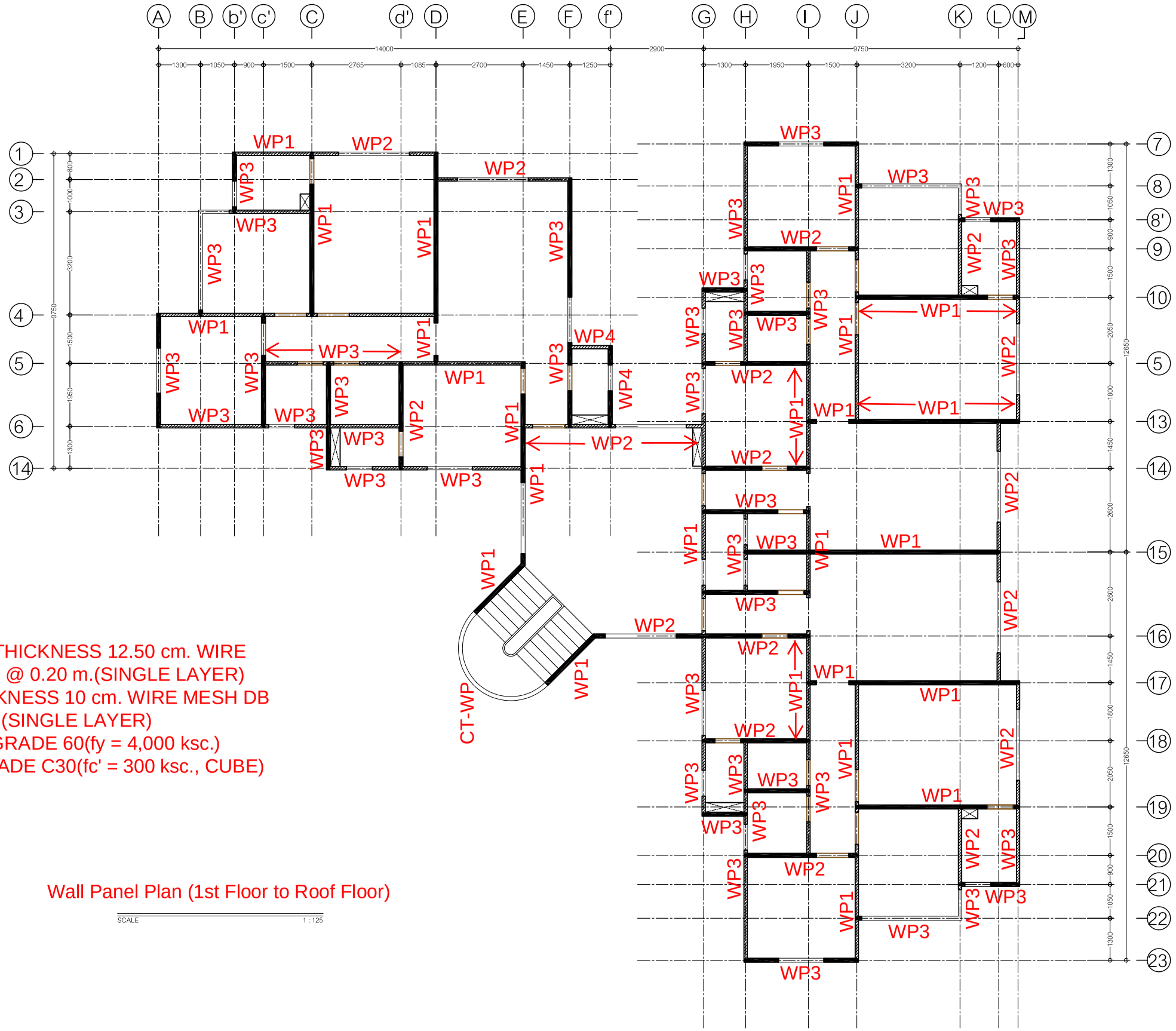
| | | |
|---|---|---|
| Designed by : | M.V.T. Developement co., ltd. Thailand | |
| Checked by : | M.V.T. Developement co., ltd. Thailand | |
| Drawn by : | M.V.T. Developement co., ltd. Thailand | |
| Approved by : | M.V.T. Developement co., ltd. Thailand | |

DRAWING TYPE
- ◯ TENDER DRAWING
- ◯ SUBMIT DRAWING
- ◯ AS-BUILT DRAWING

DRAWING TITLE
2nd FLOOR PLAN

| | | |
|---|---|---|
| Date : | 31 Oct. 2012 | Sheet No. S1-00 |
| Scale : | 1 : 100 | |

SIZE : A2 PAPER (420x594 mm.)




REMARK :
- WP1 & CT_WP THICKNESS 12.50 cm. WIRE MESH DB 10 mm. @ 0.20 m.(SINGLE LAYER)
- WP2-WP4 THICKNESS 10 cm. WIRE MESH DB 10 mm. @ 0.25 m.(SINGLE LAYER)
- REINF. STEEL GRADE 60(fy = 4,000 ksc.)
- CONCRETE GRADE C30(fc' = 300 ksc., CUBE)

## Wall Panel Plan (1st Floor to Roof Floor)

SCALE 1 : 125

NOTES:-

1.1 All dimensions are in centimeters unless otherwise mentioned.(Steel bars spacings are in millimeters).
1.2 These drawings are to be read in conjunction with all other relevant drawings depicting Architectural, Mechanical and Electrical information together with all performance and general specifications.
1.3 Drawings must not be scaled. Where no dimensions are given the matter shall be referred to the Engineer.
1.4 Should dimensions or details on drawings are in conflict precedence shall be given to the larger scale drawings subject to approval of the Engineer.

PROJECT
SABAA ALBOOR PROJECT

M.V.T. DEVELOPMENT CO., LTD.
23rd FLOOR, P.S. TOWER,
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STRUCTURAL DRAWING

NAME & SIGNITURE

| | | |
|---|---|---|
| Designed by : | M.V.T. Developpement co., ltd. Thailand | |
| Checked by : | M.V.T. Developpement co., ltd. Thailand | |
| Drawn by : | M.V.T. Developpement co., ltd. Thailand | |
| Approved by : | M.V.T. Developpement co., ltd. Thailand | |

DRAWING TYPE
- ○ TENDER DRAWING
- ○ SUBMIT DRAWING
- ○ AS-BUILT DRAWING

DRAWING TITLE

| | | |
|---|---|---|
| Date : | 31 Oct. 2012 | Sheet No. S1-00 |
| Scale : | 1 : 100 | |

SIZE : A2 PAPER (420x594 mm.)

# Solid Slab Design

# Solid Slab Design List

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| fc' | = | 300 | ksc. | Live Load | = | 200 | kg./m.$^2$ |
| fy | = | 4,000 | ksc. | Finishing | = | 15 | kg./m.$^2$ |
| | | | | Covering | = | 2.50 | cm. |

| Serial | Thickness (cm.) | Size (Max.) | | Type | Moment | | Asx/m. | Asy/m. |
|---|---|---|---|---|---|---|---|---|
| | | Lx(m.) | Ly(m.) | | Mux(t.m) | Muy(t.m) | Wire Mesh(Top&Bott.) | |
| S0 | 16.00 | 5.60 | 6.65 | Two way | 1.567 | 1.236 | DB 10 mm. @ 0.20 m. | |
| S1 | 12.00 | 4.05 | 5.90 | Two way | 0.902 | 0.546 | DB 10 mm. @ 0.20 m. | |
| S2 | 12.00 | 3.25 | 3.79 | Two way | 0.435 | 0.352 | DB 10 mm. @ 0.20 m. | |
| S3 | 12.00 | 1.40 | - | One way | 0.402 | - | DB 10 mm. @ 0.20 m. | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

Remark : Use Bottom As Along Short Span

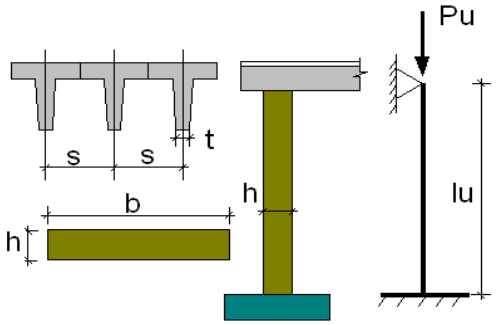
# Wall Panel Design [WP1-WP4]

C.D.P

# Design of Bearing Wall (Calculation Sheet)

## INPUT DATA:

| | | |
|---|---|---|
| fcu = | 300 | kg/cm² |
| fy = | 4000 | kg/cm² |
| Pu | 87.084 | tons |
| h | 0.125 | m. |
| Lu | 3.2 | m. |
| S | 2.95 | m. |
| Bearing wide (t) | 5.9 | m. |
| wall length (b) | 5.9 | m. |




## 1-Check of thicness (h)

h ≥ lu/25 or 12 cm.

| | | | |
|---|---|---|---|
| L/25 = | 0.128 | m < h | ok |

## 2- Check of bearing strength of concrete

| | | | |
|---|---|---|---|
| Area of bearing (A1) = h * t | 0.76 | m.² | |
| Bearing capacity = (0.67*fc/δc *A1) | 1011.97 | ton > Pu | ok |

## 3- Calculate design strengthnof wall

Effective horizontal length of wall

Minimum of

| | | | |
|---|---|---|---|
| S = | 2.95 | cm. | Governs |
| t+4h = | 6.41 | cm. | |
| K = | 0.80 | | |
| 0.35*fcuAg ( 1 - ( k lu / ( 32h ) ^2 ) ) | 193.28 | ton > Pu | ok |

## 4- Determine Reinforcement

| | | |
|---|---|---|
| Virtical As = | 6.40 | cm.²/m |
| Horizontal As = | 3.84 | cm.²/m |

Maximum spacing for vertical RFT.

25 cm

Maximum spacing for Horizontal RFT.

20 cm

15*d

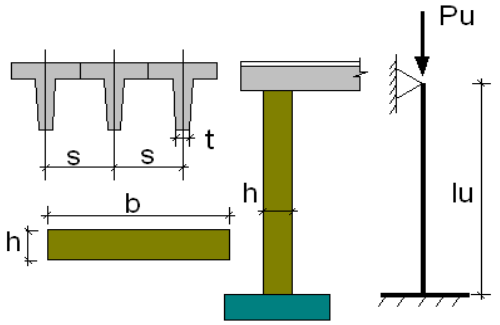
Use Reiforcement

| | No. /m | Diameter |
|---|---|---|
| Vertical Asv | 5 | Ø 10 |
| Horizontal Ash | 7 | Ø 10 |

# Design of Bearing Wall (Calculation Sheet)

## INPUT DATA:

| | | |
|---|---|---|
| fcu = | 300 | kg/cm² |
| fy = | 4000 | kg/cm² |
| Pu | 65.313 | tons |
| h | 0.125 | m. |
| Lu | 3.2 | m. |
| S | 2.95 | m. |
| Bearing wide (t) | 5.9 | m. |
| wall length (b) | 5.9 | m. |




## 1-Check of thicness (h)

h ≥ lu/25 or 12 cm.

| | | | |
|---|---|---|---|
| L/25 = | 0.128 | m < h | ok |

## 2- Check of bearing strength of concrete

| | | | |
|---|---|---|---|
| Area of bearing (A1) = h * t | 0.76 | m.² | |
| Bearing capacity = (0.67*fc/δc *A1) | 1011.97 | ton > Pu | ok |

## 3- Calculate design strengthnof wall

Effective horizontal length of wall

Minimum of

| | | | |
|---|---|---|---|
| S = | 2.95 | cm. | Governs |
| t+4h = | 6.41 | cm. | |
| K = | 0.80 | | |
| 0.35*fcuAg ( 1 - ( k lu / ( 32h ) ^2 ) ) | 193.28 | ton > Pu | ok |

## 4- Determine Reinforcement

| | | |
|---|---|---|
| Virtical As = | 6.40 | cm.²/m |
| Horizontal As = | 3.84 | cm.²/m |

Maximum spacing for vertical RFT.

25 cm

Maximum spacing for Horizontal RFT.

20 cm

15*d

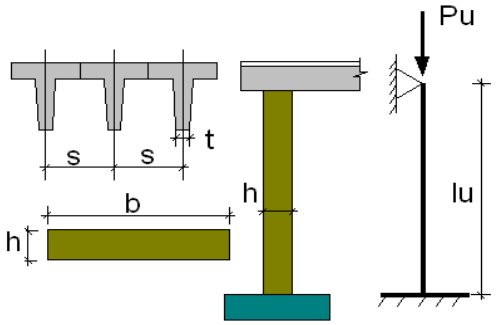
Use Reiforcement

| | No. /m | Diameter |
|---|---|---|
| Vertical Asv | 5 | Ø 10 |
| Horizontal Ash | 7 | Ø 10 |

# Design of Bearing Wall (Calculation Sheet)

## INPUT DATA:

| | | |
|---|---|---|
| fcu = | 300 | kg/cm² |
| fy = | 4000 | kg/cm² |
| Pu | 43.542 | tons |
| h | 0.125 | m. |
| Lu | 3.2 | m. |
| S | 2.95 | m. |
| Bearing wide (t) | 5.9 | m. |
| wall length (b) | 5.9 | m. |




## 1-Check of thicness (h)

h ≥ lu/25 or 12 cm.

| | | | |
|---|---|---|---|
| L/25 = | 0.128 | m < h | ok |

## 2- Check of bearing strength of concrete

| | | | |
|---|---|---|---|
| Area of bearing (A1) = h * t | 0.76 | m.² | |
| Bearing capacity = (0.67*fc/δc *A1) | 1011.97 | ton > Pu | ok |

## 3- Calculate design strengthnof wall

Effective horizontal length of wall

Minimum of

| | | | |
|---|---|---|---|
| S = | 2.95 | cm. | Governs |
| t+4h = | 6.41 | cm. | |
| K = | 0.80 | | |
| 0.35*fcuAg ( 1 - ( k lu / ( 32h ) ^2 ) ) | 193.28 | ton > Pu | ok |

## 4- Determine Reinforcement

| | | |
|---|---|---|
| Virtical As = | 6.40 | cm.²/m |
| Horizontal As = | 3.84 | cm.²/m |

Maximum spacing for vertical RFT.

25 cm

Maximum spacing for Horizontal RFT.

20 cm

15*d

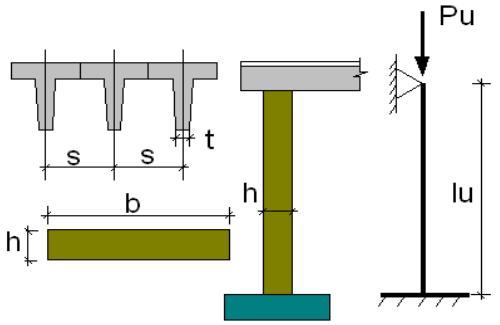
Use Reiforcement

| | No. /m | Diameter |
|---|---|---|
| Vertical Asv | 5 | Ø 10 |
| Horizontal Ash | 7 | Ø 10 |

# Design of Bearing Wall (Calculation Sheet)

## INPUT DATA:

| | | |
|---|---|---|
| fcu = | 300 | kg/cm² |
| fy = | 4000 | kg/cm² |
| Pu | 21.771 | tons |
| h | 0.125 | m. |
| Lu | 3.2 | m. |
| S | 2.95 | m. |
| Bearing wide (t) | 5.9 | m. |
| wall length (b) | 5.9 | m. |




## 1-Check of thicness (h)

h ≥ lu/25 or 12 cm.

| | | | |
|---|---|---|---|
| L/25 = | 0.128 | m < h | ok |

## 2- Check of bearing strength of concrete

| | | | |
|---|---|---|---|
| Area of bearing (A1) = h * t | 0.76 | m.² | |
| Bearing capacity = (0.67*fc/δc *A1) | 1011.97 | ton > Pu | ok |

## 3- Calculate design strengthnof wall

Effective horizontal length of wall

Minimum of

| | | | |
|---|---|---|---|
| S = | 2.95 | cm. | Governs |
| t+4h = | 6.41 | cm. | |
| K = | 0.80 | | |
| 0.35*fcuAg ( 1 - ( k lu / ( 32h ) ^2 ) ) | 193.28 | ton > Pu | ok |

## 4- Determine Reinforcement

| | | |
|---|---|---|
| Virtical As = | 6.40 | cm.²/m |
| Horizontal As = | 3.84 | cm.²/m |

Maximum spacing for vertical RFT.

25 cm

Maximum spacing for Horizontal RFT.

20 cm

15*d

Use Reiforcement

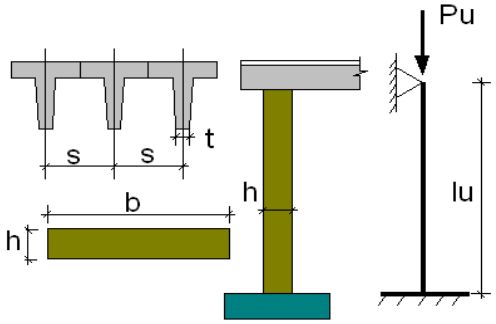
| | No. /m | Diameter |
|---|---|---|
| Vertical Asv | 5 | Ø 10 |
| Horizontal Ash | 7 | Ø 10 |

C.D.P

# Design of Bearing Wall (Calculation Sheet)

## INPUT DATA:

| | | |
|---|---|---|
| fcu = | 300 | kg/cm² |
| fy = | 4000 | kg/cm² |
| Pu | 32.256 | tons |
| h | 0.10 | m. |
| Lu | 3.2 | m. |
| S | 2.025 | m. |
| Bearing wide (t) | 4.05 | m. |
| wall length (b) | 4.05 | m. |




## 1-Check of thicness (h)

h ≥ lu/25 or 12 cm.

| | | | |
|---|---|---|---|
| L/25 = | 0.128 | m < h | ok |

## 2- Check of bearing strength of concrete

| | | | |
|---|---|---|---|
| Area of bearing (A1) = h * t | 0.52 | m.² | |
| Bearing capacity = (0.67*fc/δc *A1) | 694.66 | ton > Pu | ok |

## 3- Calculate design strengthnof wall

Effective horizontal length of wall

Minimum of

| | | | |
|---|---|---|---|
| S = | 2.03 | cm. | Governs |
| t+4h = | 4.56 | cm. | |

| | | | |
|---|---|---|---|
| K = | 0.80 | | |
| 0.35*fcuAg ( 1 - ( k lu / ( 32h ) ^2 ) ) | 132.68 | ton > Pu | ok |

## 4- Determine Reinforcement

| | | |
|---|---|---|
| Virtical As = | 6.40 | cm.²/m |
| Horizontal As = | 3.84 | cm.²/m |

Maximum spacing for vertical RFT.

25 cm

Maximum spacing for Horizontal RFT.

20 cm

15*d

Use Reiforcement

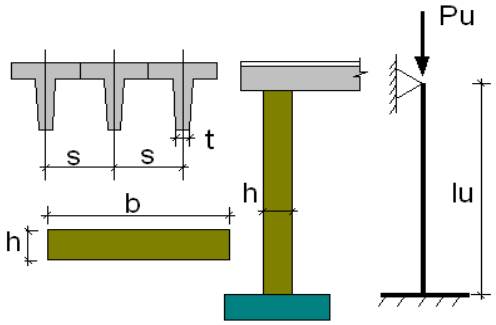
| | No. /m | Diameter |
|---|---|---|
| Vertical Asv | 5 | Ø 10 |
| Horizontal Ash | 7 | Ø 10 |

C.D.P

# Design of Bearing Wall (Calculation Sheet)

## INPUT DATA:

| | | |
|---|---|---|
| fcu = | 300 | kg/cm² |
| fy = | 4000 | kg/cm² |
| Pu | 21.504 | tons |
| h | 0.10 | m. |
| Lu | 3.2 | m. |
| S | 2.025 | m. |
| Bearing wide (t) | 4.05 | m. |
| wall length (b) | 4.05 | m. |




## 1-Check of thicness (h)

h ≥ lu/25 or 12 cm.

| | | | |
|---|---|---|---|
| L/25 = | 0.128 | m < h | ok |

## 2- Check of bearing strength of concrete

| | | | |
|---|---|---|---|
| Area of bearing (A1) = h * t | 0.52 | m.² | |
| Bearing capacity = (0.67*fc/δc *A1) | 694.66 | ton > Pu | ok |

## 3- Calculate design strengthnof wall

Effective horizontal length of wall

Minimum of

| | | | |
|---|---|---|---|
| S = | 2.03 | cm. | Governs |
| t+4h = | 4.56 | cm. | |

| | | | |
|---|---|---|---|
| K = | 0.80 | | |
| 0.35*fcuAg ( 1 - ( k lu / ( 32h ) ^2 ) ) | 132.68 | ton > Pu | ok |

## 4- Determine Reinforcement

| | | |
|---|---|---|
| Virtical As = | 6.40 | cm.²/m |
| Horizontal As = | 3.84 | cm.²/m |

Maximum spacing for vertical RFT.

25 cm

Maximum spacing for Horizontal RFT.

20 cm

15*d

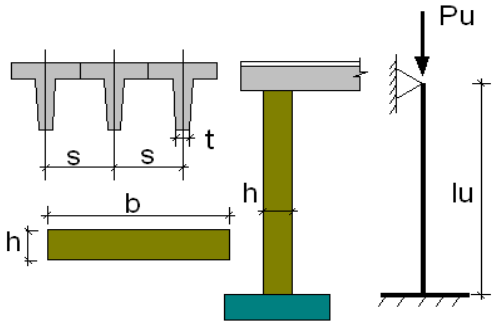
Use Reiforcement

| | No. /m | Diameter |
|---|---|---|
| Vertical Asv | 5 | Ø 10 |
| Horizontal Ash | 7 | Ø 10 |

# Design of Bearing Wall (Calculation Sheet)

## INPUT DATA:

| | | |
|---|---|---|
| fcu = | 300 | kg/cm² |
| fy = | 4000 | kg/cm² |
| Pu | 10.752 | tons |
| h | 0.10 | m. |
| Lu | 3.2 | m. |
| S | 2.025 | m. |
| Bearing wide (t) | 4.05 | m. |
| wall length (b) | 4.05 | m. |




## 1-Check of thicness (h)

h ≥ lu/25 or 12 cm.

L/25 = 0.128 m < h ok

## 2- Check of bearing strength of concrete

Area of bearing (A1) = h * t 0.52 m.²

Bearing capacity = (0.67*fc/δc *A1) 694.66 ton > Pu ok

## 3- Calculate design strengthnof wall

Effective horizontal length of wall

Minimum of

S = 2.03 cm. Governs

t+4h = 4.56 cm.

K = 0.80

0.35*fcuAg ( 1 - ( k lu / ( 32h ) ^2 ) ) 132.68 ton > Pu ok

## 4- Determine Reinforcement

Virtical As = 6.40 cm.²/m

Horizontal As = 3.84 cm.²/m

Maximum spacing for vertical RFT.

25 cm

Maximum spacing for Horizontal RFT.

20 cm

15*d

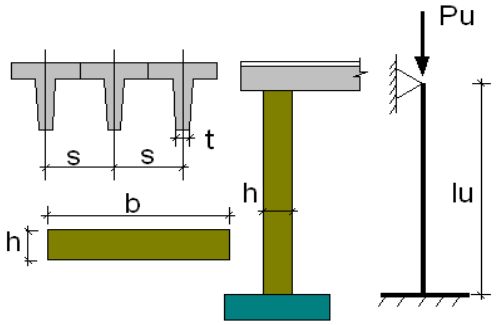
Use Reiforcement

| | No. /m | Diameter |
|---|---|---|
| Vertical Asv | 5 | Ø 10 |
| Horizontal Ash | 7 | Ø 10 |

# Design of Bearing Wall (Calculation Sheet)

## INPUT DATA:

| | | |
|---|---|---|
| fcu = | 300 | kg/cm² |
| fy = | 4000 | kg/cm² |
| Pu | 13.95 | tons |
| h | 0.10 | m. |
| Lu | 3.2 | m. |
| S | 1.2 | m. |
| Bearing wide (t) | 2.4 | m. |
| wall length (b) | 2.4 | m. |




## 1-Check of thicness (h)

h ≥ lu/25 or 12 cm.

| | | | |
|---|---|---|---|
| L/25 = | 0.128 | m < h | ok |

## 2- Check of bearing strength of concrete

| | | | |
|---|---|---|---|
| Area of bearing (A1) = h * t | 0.29 | m.² | |
| Bearing capacity = (0.67*fc/δc *A1) | 385.92 | ton > Pu | ok |

## 3- Calculate design strengthnof wall

Effective horizontal length of wall

Minimum of

| | | | |
|---|---|---|---|
| S = | 1.20 | cm. | Governs |
| t+4h = | 2.88 | cm. | |
| K = | 0.80 | | |
| 0.35*fcuAg ( 1 - ( k lu / ( 32h ) ^2 ) ) | 67.20 | ton > Pu | ok |

## 4- Determine Reinforcement

| | | |
|---|---|---|
| Virtical As = | 6.00 | cm.²/m |
| Horizontal As = | 3.60 | cm.²/m |

Maximum spacing for vertical RFT.

25 cm

Maximum spacing for Horizontal RFT.

20 cm

15*d

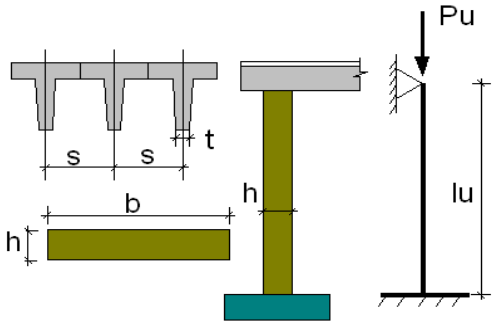
Use Reiforcement

| | No. /m | Diameter |
|---|---|---|
| Vertical Asv | 4 | Ø 10 |
| Horizontal Ash | 7 | Ø 10 |

# Design of Bearing Wall (Calculation Sheet)

## INPUT DATA:

| | | |
|---|---|---|
| fcu = | 300 | kg/cm² |
| fy = | 4000 | kg/cm² |
| Pu | 9.3 | tons |
| h | 0.10 | m. |
| Lu | 3.2 | m. |
| S | 1.2 | m. |
| Bearing wide (t) | 2.4 | m. |
| wall length (b) | 2.4 | m. |




## 1-Check of thicness (h)

h ≥ lu/25 or 12 cm.

| | | | |
|---|---|---|---|
| L/25 = | 0.128 | m < h | ok |

## 2- Check of bearing strength of concrete

| | | | |
|---|---|---|---|
| Area of bearing (A1) = h * t | 0.29 | m.² | |
| Bearing capacity = (0.67*fc/δc *A1) | 385.92 | ton > Pu | ok |

## 3- Calculate design strengthnof wall

Effective horizontal length of wall

Minimum of

| | | | |
|---|---|---|---|
| S = | 1.20 | cm. | Governs |
| t+4h = | 2.88 | cm. | |
| K = | 0.80 | | |
| 0.35*fcuAg ( 1 - ( k lu / ( 32h ) ^2 ) ) | 67.20 | ton > Pu | ok |

## 4- Determine Reinforcement

| | | |
|---|---|---|
| Virtical As = | 6.00 | cm.²/m |
| Horizontal As = | 3.60 | cm.²/m |

Maximum spacing for vertical RFT.

25 cm

Maximum spacing for Horizontal RFT.

20 cm

15*d

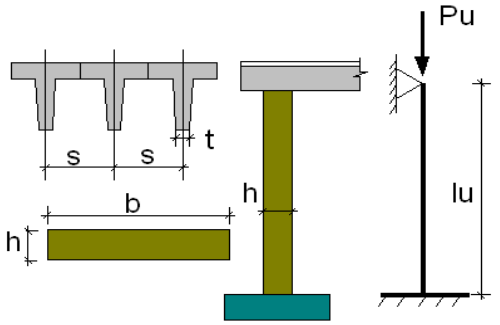
Use Reiforcement

| | No. /m | Diameter |
|---|---|---|
| Vertical Asv | 4 | Ø 10 |
| Horizontal Ash | 7 | Ø 10 |

# Design of Bearing Wall (Calculation Sheet)

## INPUT DATA:

| | | |
|---|---|---|
| fcu = | 300 | kg/cm² |
| fy = | 4000 | kg/cm² |
| Pu | 4.65 | tons |
| h | 0.10 | m. |
| Lu | 3.2 | m. |
| S | 1.2 | m. |
| Bearing wide (t) | 2.4 | m. |
| wall length (b) | 2.4 | m. |




## 1-Check of thicness (h)

h ≥ lu/25 or 12 cm.

| | | | |
|---|---|---|---|
| L/25 = | 0.128 | m < h | ok |

## 2- Check of bearing strength of concrete

| | | | |
|---|---|---|---|
| Area of bearing (A1) = h * t | 0.29 | m.² | |
| Bearing capacity = (0.67*fc/δc *A1) | 385.92 | ton > Pu | ok |

## 3- Calculate design strengthnof wall

Effective horizontal length of wall

Minimum of

| | | | |
|---|---|---|---|
| S = | 1.20 | cm. | Governs |
| t+4h = | 2.88 | cm. | |
| K = | 0.80 | | |
| 0.35*fcuAg ( 1 - ( k lu / ( 32h ) ^2 ) ) | 67.20 | ton > Pu | ok |

## 4- Determine Reinforcement

| | | |
|---|---|---|
| Virtical As = | 6.00 | cm.²/m |
| Horizontal As = | 3.60 | cm.²/m |

Maximum spacing for vertical RFT.

25 cm

Maximum spacing for Horizontal RFT.

20 cm

15*d

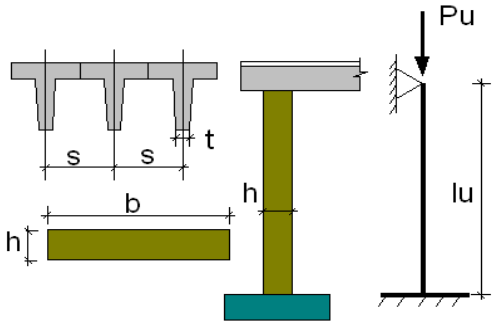
Use Reiforcement

| | No. /m | Diameter |
|---|---|---|
| Vertical Asv | 4 | Ø 10 |
| Horizontal Ash | 7 | Ø 10 |

# Design of Bearing Wall (Calculation Sheet)

## INPUT DATA:

| | | |
|---|---|---|
| fcu = | 300 | kg/cm² |
| fy = | 4000 | kg/cm² |
| Pu | 7.12 | tons |
| h | 0.10 | m. |
| Lu | 3.2 | m. |
| S | 1.225 | m. |
| Bearing wide (t) | 2.45 | m. |
| wall length (b) | 2.45 | m. |




## 1-Check of thicness (h)

h ≥ lu/25 or 12 cm.

| | | | |
|---|---|---|---|
| L/25 = | 0.128 | m < h | ok |

## 2- Check of bearing strength of concrete

| | | | |
|---|---|---|---|
| Area of bearing (A1) = h * t | 0.29 | m.² | |
| Bearing capacity = (0.67*fc/δc *A1) | 393.96 | ton > Pu | ok |

## 3- Calculate design strengthnof wall

Effective horizontal length of wall

Minimum of

| | | | |
|---|---|---|---|
| S = | 1.23 | cm. | Governs |
| t+4h = | 2.93 | cm. | |

| | | | |
|---|---|---|---|
| K = | 0.80 | | |
| 0.35*fcuAg ( 1 - ( k lu / ( 32h ) ^2 ) ) | 68.60 | ton > Pu | ok |

## 4- Determine Reinforcement

| | | |
|---|---|---|
| Virtical As = | 6.00 | cm.²/m |
| Horizontal As = | 3.60 | cm.²/m |

Maximum spacing for vertical RFT.

25 cm

Maximum spacing for Horizontal RFT.

20 cm

15*d

Use Reiforcement

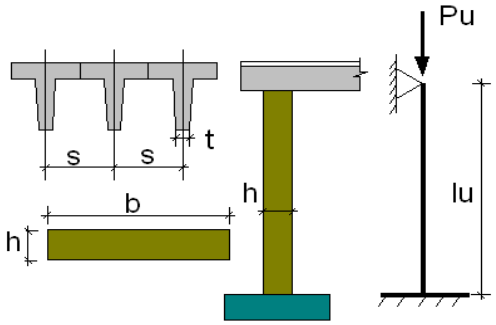
| | No. /m | Diameter |
|---|---|---|
| Vertical Asv | 4 | Ø 10 |
| Horizontal Ash | 7 | Ø 10 |

C.D.P

# Design of Bearing Wall (Calculation Sheet)

## INPUT DATA:

| | | |
|---|---|---|
| fcu = | 300 | kg/cm² |
| fy = | 4000 | kg/cm² |
| Pu | 4.747 | tons |
| h | 0.10 | m. |
| Lu | 3.2 | m. |
| S | 1.225 | m. |
| Bearing wide (t) | 2.45 | m. |
| wall length (b) | 2.45 | m. |




## 1-Check of thicness (h)

h ≥ lu/25 or 12 cm.

| | | | |
|---|---|---|---|
| L/25 = | 0.128 | m < h | ok |

## 2- Check of bearing strength of concrete

| | | | |
|---|---|---|---|
| Area of bearing (A1) = h * t | 0.29 | m.² | |
| Bearing capacity = (0.67*fc/δc *A1) | 393.96 | ton > Pu | ok |

## 3- Calculate design strengthnof wall

Effective horizontal length of wall

Minimum of

| | | | |
|---|---|---|---|
| S = | 1.23 | cm. | Governs |
| t+4h = | 2.93 | cm. | |

| | | | |
|---|---|---|---|
| K = | 0.80 | | |
| 0.35*fcuAg ( 1 - ( k lu / ( 32h ) ^2 ) ) | 68.60 | ton > Pu | ok |

## 4- Determine Reinforcement

| | | |
|---|---|---|
| Virtical As = | 6.00 | cm.²/m |
| Horizontal As = | 3.60 | cm.²/m |

Maximum spacing for vertical RFT.

25 cm

Maximum spacing for Horizontal RFT.

20 cm

15*d

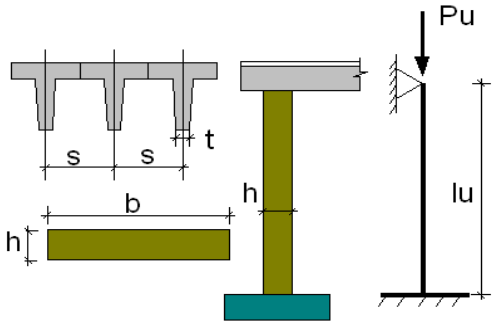
Use Reiforcement

| | No. /m | Diameter |
|---|---|---|
| Vertical Asv | 4 | Ø 10 |
| Horizontal Ash | 7 | Ø 10 |

# Design of Bearing Wall (Calculation Sheet)

## INPUT DATA:

| | | |
|---|---|---|
| fcu = | 300 | kg/cm² |
| fy = | 4000 | kg/cm² |
| Pu | 2.373 | tons |
| h | 0.10 | m. |
| Lu | 3.2 | m. |
| S | 1.225 | m. |
| Bearing wide (t) | 2.45 | m. |
| wall length (b) | 2.45 | m. |




## 1-Check of thicness (h)

h ≥ lu/25 or 12 cm.

| | | | |
|---|---|---|---|
| L/25 = | 0.128 | m < h | ok |

## 2- Check of bearing strength of concrete

| | | | |
|---|---|---|---|
| Area of bearing (A1) = h * t | 0.29 | m.² | |
| Bearing capacity = (0.67*fc/δc *A1) | 393.96 | ton > Pu | ok |

## 3- Calculate design strengthnof wall

Effective horizontal length of wall

Minimum of

| | | | |
|---|---|---|---|
| S = | 1.23 | cm. | Governs |
| t+4h = | 2.93 | cm. | |

| | | | |
|---|---|---|---|
| K = | 0.80 | | |
| 0.35*fcuAg ( 1 - ( k lu / ( 32h ) ^2 ) ) | 68.60 | ton > Pu | ok |

## 4- Determine Reinforcement

| | | |
|---|---|---|
| Virtical As = | 6.00 | cm.²/m |
| Horizontal As = | 3.60 | cm.²/m |

Maximum spacing for vertical RFT.

25 cm

Maximum spacing for Horizontal RFT.

20 cm

15*d

Use Reiforcement

| | No. /m | Diameter |
|---|---|---|
| Vertical Asv | 4 | Ø 10 |
| Horizontal Ash | 7 | Ø 10 |

# Schedule of Wall Panel

| Building Wall Design Table<br>WP1 | | | | Thickness = 125 mm.<br>Concrete Grade = 300 ksc.<br>Steel Grade 60 = 4,000 ksc. | | |
|---|---|---|---|---|---|---|
| Wall Panel Ref. No. | Floor Ref. No. | In Floor Plan | Hight (m.) | Ult. Vert. Load Capacity (kg./m.) | Vertical Reinf.<br>Horizontal Reinf. | Length (m.) |
| WP101 | 1st | WP1 | 3.20 | 14,760.00 | DB 10 mm. @ 0.20 m.<br>DB 10 mm. @ 0.20 m. | 5.90 |
| WP201 | 2nd | WP1 | 3.20 | 11,070.00 | DB 10 mm. @ 0.20 m.<br>DB 10 mm. @ 0.20 m. | 5.90 |
| WP301 | 3rd | WP1 | 3.20 | 7,380.00 | DB 10 mm. @ 0.20 m.<br>DB 10 mm. @ 0.20 m. | 5.90 |
| WP401 | 4th | WP1 | 3.20 | 3,690.00 | DB 10 mm. @ 0.20 m.<br>DB 10 mm. @ 0.20 m. | 5.90 |

**Remark** : Control Design by Use Max Load and Max Length

# Schedule of Wall Panel

| Building Wall Design Table<br>WP2 | | | | Thickness = 100 mm.<br>Concrete Grade = 300 ksc.<br>Steel Grade 60 = 4,000 ksc. | | |
|---|---|---|---|---|---|---|
| Wall Panel Ref. No. | Floor Ref. No. | In Floor Plan | Hight (m.) | Ult. Vert. Load Capacity (kg./m.) | Vertical Reinf.<br>Horizontal Reinf. | Length (m.) |
| WP102 | 1st | WP2 | 3.20 | 7,965.00 | DB 10 mm. @ 0.20 m.<br>DB 10 mm. @ 0.20 m. | 4.05 |
| WP202 | 2nd | WP2 | 3.20 | 5,310.00 | DB 10 mm. @ 0.20 m.<br>DB 10 mm. @ 0.20 m. | 4.05 |
| WP302 | 3rd | WP2 | 3.20 | 2,655.00 | DB 10 mm. @ 0.20 m.<br>DB 10 mm. @ 0.20 m. | 4.05 |
| | | | | | | |

**Remark** : Control Design by Use Max Load and Max Length

# Schedule of Wall Pannel

| Building Wall Design Table<br>WP3 | | | | Thickness = 100 mm.<br>Concrete Grade = 300 ksc.<br>Steel Grade 60 = 4,000 ksc. | | |
|---|---|---|---|---|---|---|
| Wall Panel Ref. No. | Floor Ref. No. | In Floor Plan | Hight (m.) | Ult. Vert. Load Capacity (kg./m.) | Vertical Reinf.<br>Horizontal Reinf. | Length (m.) |
| WP103 | 1st | WP3 | 3.20 | 5,812.50 | DB 10 mm. @ 0.25 m.<br>DB 10 mm. @ 0.25 m. | 2.40 |
| WP203 | 2nd | WP3 | 3.20 | 3,875.00 | DB 10 mm. @ 0.25 m.<br>DB 10 mm. @ 0.25 m. | 2.40 |
| WP303 | 3rd | WP3 | 3.20 | 1,937.50 | DB 10 mm. @ 0.25 m.<br>DB 10 mm. @ 0.25 m. | 2.40 |
| | | | | | | |

**Remark** : Control Design by Use Max Load and Max Length

# Schedule of Wall Panel

| Building Wall Design Table<br>WP4 | | | | Thickness = 100 mm.<br>Concrete Grade = 300 ksc.<br>Steel Grade 60 = 4,000 ksc. | | |
|---|---|---|---|---|---|---|
| Wall Panel Ref. No. | Floor Ref. No. | In Floor Plan | Hight (m.) | Ult. Vert. Load Capacity (kg./m.) | Vertical Reinf.<br>Horizontal Reinf. | Length (m.) |
| WP104 | 1st | WP4 | 3.20 | 2,906.25 | DB 10 mm. @ 0.25 m.<br>DB 10 mm. @ 0.25 m. | 2.45 |
| WP204 | 2nd | WP4 | 3.20 | 1,937.50 | DB 10 mm. @ 0.25 m.<br>DB 10 mm. @ 0.25 m. | 2.45 |
| WP304 | 3rd | WP4 | 3.20 | 968.75 | DB 10 mm. @ 0.25 m.<br>DB 10 mm. @ 0.25 m. | 2.45 |
| | | | | | | |

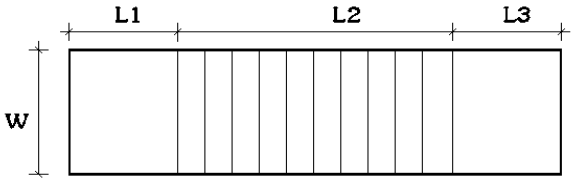
**Remark** : Control Design by Use Max Load and Max Length

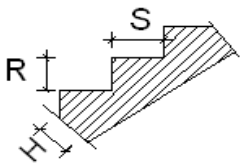
# Stair Design

# Design of stair (Calculation Sheet)

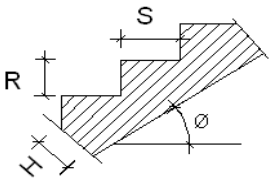
## INPUT DATA:

| | | |
|---|---|---|
| fcu= | 300 | kg/cm² |
| fy= | 4000 | kg/cm² |
| R | 0.20 | m. |
| S | 0.3 | m. |
| H | .17 | m. |
| Cover | 0.025 | m. |
| W | 1.5 | m. |
| L1 | 1.5 | m. |
| L2 | 2.5 | m. |
| L3 | 0.001 | m. |
| Live load | 0.30 | t/m² |
| Dead Load | 0.05 | t/m² |




## 1- Loads




tan ( Ø ) = R / s

Wu (Landing) = (1.4* OwL + 1.4*DL + 1.6 * LL) * W

Wu (Landing) = 1.718 t/m

Wu (Flight) = (1.4 * OwF /cosϕ + 1.4*DL / cosϕ + 1.6 * LL) * W

Wu (Flight) = 2.550 t/m

## 2- Flight

| | | |
|---|---|---|
| R1= | 4.866 | ton |
| R2 = | 4.087 | ton |
| X_Zero shear | 2.092 | m. |
| Mumax | 4.645 | m.t |

## 3- Shear stength

$qcu = 0.24\sqrt{\frac{fcu}{\gamma_c}} * 10 \ kg/cm^2$ 10.7331 kg/cm²

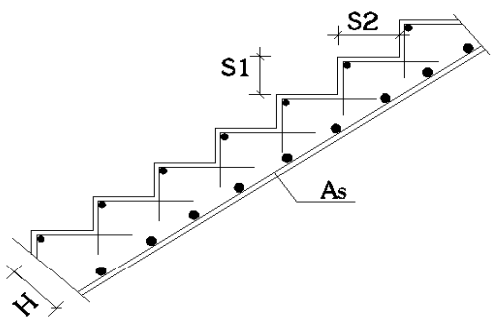
qu = Qu/ b*d 2.3338 kg/cm²

## 4- Reinforcement

| | | |
|---|---|---|
| As min.= | 3.1275 | cm² |
| As = | 10.2600 | cm² |

## 5- Details

| | | |
|---|---|---|
| As | 10.00 | Φ 12 |

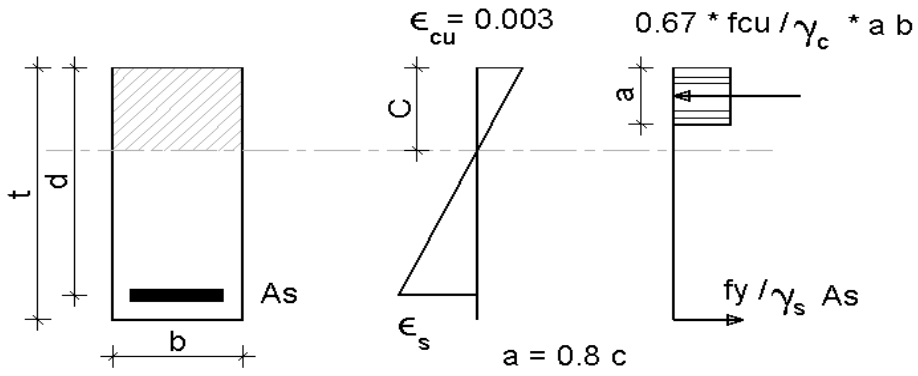


# Beam Design [BST & HEADER]

C.D.P **Design of Beams (Calculation Sheet)** BST

## INPUT DATA:

| | | |
|---|---|---|
| fy= | 4000.00 | kg/cm² |
| fcu= | 300.00 | kg/cm² |
| Mu(Moment)= | 4.86 | m.t |
| Vu(Shear)= | 6.48 | ton |
| Tu (Torsion)= | 0.00 | m.t |
| b = | 12.50 | cm |
| t = | 45.00 | cm |
| cover = | 2.50 | cm |
| d = | 39.90 | cm |




## CALCULATIONS:

### Flexure Design

1- Force Equilibrium

C = T  0.67 fcu b a / γc = fy As /γs

2- Moment Equilibrium

Mu = (C or T) ( d - a/2 )

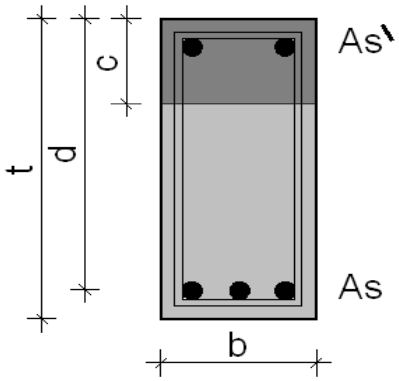
0.67 fcu/γc b $(a)^2/2$ - 0.67 fcu/γc b d (a) + Mu=0

a = **8.09** **cm**

As(Required) =( 0.67 fcu/γc b a) /( fy/γs)

As(Required) = **3.90** **cm²**

a/d **0.20** **Ok > 0.1**




### CHECK OF ρ max.

μmax. = **0.01293** Table(4-1)

Asmax=μmax. b d **6.45** **cm²** ok

### CHECK OF ρ min.

As,min2 = 1.3*As_req. **5.07** **cm²**

As,min1 = 11/fy *(bd) **1.37** **cm²**

As,min3 = 0.25 or 0.15% (bd) **0.75** **cm²**

Asmin4= $0.225\ \frac{\sqrt{fcu}}{fy}\ bd$ **1.54** **cm²**

As,min = **1.54** **cm²**

### Area Steel Required

As = **3.90** **cm²**

εs = 0.003 * (d - c ) / c

εs = **0.00883**

| Use | 4 | ϕ | 12 |
|---|---|---|---|

**Tension-controlled**

## Shear Design

qu =Qu / b.d **12.99** **kg/cm²**

$qcu = 0.24 \sqrt{\frac{fcu}{\gamma_c}} * 10 \quad kg/cm^2$

qcu = **10.73** **kg/cm²**

$qumax = 0.70 \sqrt{\frac{fcu}{\gamma_c}} * 10 \quad kg/cm^2$

qumax = **31.30** **kg/cm²** **And less than 40 kg/cm²**

qsu = qu - 1/2 qcu **7.63** **kg/cm²**

Ast / b.s = qsu /(fy /γs)

Ast = **1.01** **cm²**

S = **22.01** **cm**

μmin1 = 0.40/fy = Ast/(b.S)

Smax1 = **48.25** **cm**

Smax2 =0.15 or 0.1 % * μ **53.62** **cm**

Smax3 = 20 cm **20.00** **cm**

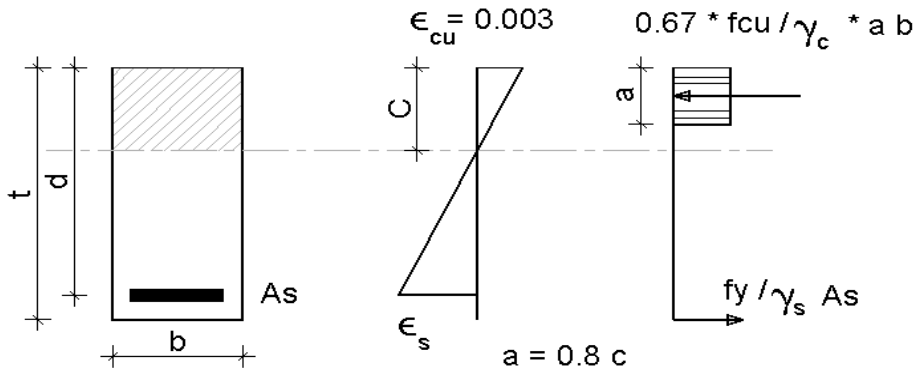
Smax= **20.00** **cm**

| Use Stirrup | 5 | ϕ | 8 | \m |
|---|---|---|---|---|
| Branch Number | | 2 | | |

C.D.P **Design of Beams (Calculation Sheet)** Header

## INPUT DATA:

| | | |
|---|---|---|
| fy= | 4000.00 | kg/cm² |
| fcu= | 300.00 | kg/cm² |
| Mu(Moment)= | 3.53 | m.t |
| Vu(Shear)= | 4.52 | ton |
| Tu (Torsion)= | 0.00 | m.t |
| b = | 12.50 | cm |
| t = | 80.00 | cm |
| cover = | 2.40 | cm |
| d = | 76.00 | cm |




## CALCULATIONS:

### Flexure Design

1- Force Equilibrium

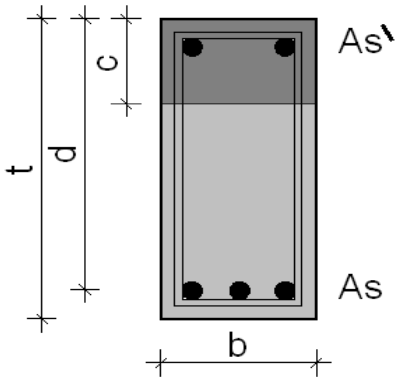
C = T  0.67 fcu b a / γc = fy As /γs

2- Moment Equilibrium

Mu = (C or T) ( d - a/2 )

0.67 fcu/γc b $(a)^2/2$ - 0.67 fcu/γc b d (a) + Mu=0

| | | | |
|---|---|---|---|
| a = | 7.60 | cm | |
| As(Required) =( 0.67 fcu/γc b a) /( fy/γs) | | | |
| As(Required) = | 3.66 | cm² | |
| a/d | 0.10 | | Ok > 0.1 |




### CHECK OF ρ max.

| | | | |
|---|---|---|---|
| μmax. = | 0.01293 | | Table(4-1) |
| Asmax=μmax. b d | 12.28 | cm² | ok |

### CHECK OF ρ min.

| | | |
|---|---|---|
| As,min2 = 1.3*As_req. | 4.76 | cm² |
| As,min1 = 11/fy *(bd) | 2.61 | cm² |
| As,min3 = 0.25 or 0.15% (bd) | 1.43 | cm² |
| Asmin4= $0.225\ \frac{\sqrt{fcu}}{fy}$ bd | 2.93 | cm² |
| As,min = | 2.93 | cm² |

### Area Steel Required

As = 3.66 cm²

εs = 0.003 * (d - c ) / c

εs = 0.06155

| Use | 2 | ϕ | 16 |
|---|---|---|---|

Tension-controlled

Header1/2

## Shear Design

qu =Qu / b.d **4.76** **kg/cm²**

$qcu = 0.24\sqrt{\frac{fcu}{\gamma_c}} * 10 \quad kg/cm^2$

qcu = **10.73** **kg/cm²**

$qumax = 0.70\sqrt{\frac{fcu}{\gamma_c}} * 10 \quad kg/cm^2$

qumax = **31.30** **kg/cm²** **And less than 40 kg/cm²**

qsu = qu - 1/2 qcu **-0.61** **kg/cm²**

Ast / b.s = qsu /(fy /γs)

Ast = **1.01** **cm²**

S = **Min. Stirrup** **cm**

μmin1 = 0.40/fy = Ast/(b.S)

Smax1 = **48.25** **cm**

Smax2 =0.15 or 0.1 % * μ **53.62** **cm**

Smax3 = 20 cm **20.00** **cm**

Smax= **20.00** **cm**

| Use Stirrup | 5 | ϕ | 8 | \m |
|---|---|---|---|---|
| Branch Number | | 2 | | |

Header 2/2

# Mat Foundation Design

# FOUNDATION CALCULATION SHEET

## One-Stop Solution for Foundation


| TITLE | DESCRIPTION |
|---|---|
| PROJECT/JOB NO. | 1-1 |
| PROJECT/JOB NAME | Sabaa Alboor 432 |
| CLIENT NAME | Sabaa |
| SITE NAME | Sabaa Alboor, Baghdad |
| DOCUMENT NO. | |
| REFERENCE NO. | |
| STRUCTURE NAME | Sabaa Alboor, Baghdad |
| LOAD COMBINATION GROUP | |

| REV | DATE | DESCRIPTION | PREP'D | CHK'D | APPR'D | APPR'D |
|---|---|---|---|---|---|---|
| | | | | | | |
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| AFES | Calculation Sheet of Foundation | Project Na. : Sabaa Alboor 432 | |
|---|---|---|---|
| | | Project No. : 1-1 | |
| | | Client : Sabaa | Page 1 |

# FOUNDATION LISTS

| Group Name | No. | Description | No. | Description |
|---|---|---|---|---|
| MAT1 | 1 | F1 | | |

| AFES | Calculation Sheet of Foundation | Project Na. : Sabaa Alboor 432 | |
|---|---|---|---|
| | | Project No. : 1-1 | |
| | | Client : Sabaa | Page 2 |

# CONTENTS

| AFES | Calculation Sheet of Foundation | Project Na. : Sabaa Alboor 432 | |
|---|---|---|---|
| | | Project No. : 1-1 | |
| | | Client : Sabaa | Page 3 |

# 1. GENERAL

## 1.1 CODE & STANDARD

| Items | Description |
|---|---|
| Design Code | American Concrete Institute (ACI 318) |
| Horizontal Force for Wind | UNIFORM BUILDING CODE (UBC-1997) |
| Horizontal Force for Seismic | UNIFORM BUILDING CODE [UBC-1997] |
| Unit System | Input : MKS, Output : IMPERIAL, Calculation Unit : IMPERIAL |

## 1.2 MATERIALS & UNIT WEIGHT

| Items | Value (Input Unit system / Output Unit System) | |
|---|---|---|
| Concrete (f'c : compressive strength) | 300.00 kgf/cm$^2$ | 4267.003 psi |
| Lean Concrete (Lf'c : compressive strength) | 240.00 kgf/cm$^2$ | 3413.602 psi |
| Reinforcement (10M ~ 16M , yield strength) | 4000.00 kgf/cm$^2$ | 56893.370 psi |
| Reinforcement (19M ~ , yield strength) | 4000.00 kgf/cm$^2$ | 56893.370 psi |
| Rs (Soil unit weight) | 1.600 ton/m$^3$ | 99.886 lb/ft$^3$ |
| Rc (Concrete unit weight) | 2.400 ton/m$^3$ | 149.829 lb/ft$^3$ |
| Es (Steel Modulus of Elasticity) | 2.04 x 10$^6$ kgf/cm$^2$ | 29015.620 ksi |
| Ec (Concrete Modulus of Elasticity) | 261856.00 kgf/cm$^2$ | 3724.467 ksi |

**- Soil Capacity**

| Items | Value (Input Unit system / Output Unit System) | |
|---|---|---|
| Soil Name | Unit-01 | |
| Footing List | F1 | |
| Qa (Soil Bearing Capacity) | 8 tonf/m$^2$ | 1638.55 psf |
| Buoyancy | Not Consider | |
| WL (Water Label from the EL = 0) | 0 mm | 0 ft |
| FD (Frost Depth from the EL = 0) | 0 mm | 0 ft |
| Internal Friction Angle | 0° | |
| Passive Soil Pressure | Not Consider | |
| Cu (Undrained cohesion) | Clay , 0 psf | |

## 1.3 SUBSOIL CONDITION & SAFETY FACTORS

| Items | Description (Input/Output) |
|---|---|
| Allowable Increase of Soil (Wind) | 33.33 % |
| Allowable Increase of Soil (Seismic) | 33.33 % |
| Allowable Increase of Soil (Test) | 20 % |
| Safety factor against overturning for OVM1(FO1) | 1.5 |
| Safety factor against overturning for OVM2(FO2) | 1.5 |
| Safety factor against overturning for OVM3(FO3) | 1.5 |
| Safety factor against overturning for OVM4(FO4) | 1.9 |
| Safety factor against sliding for the SL1(FS1) | 1.5 |
| Safety factor against sliding for the SL2(FS2) | 1.8 |
| Safety factor against sliding for the SL3(FS3) | 1.5 |

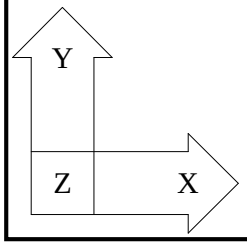
| | |
|---|---|
| Safety factor against sliding for the SL4(FS4) | 1.5 |
| Friction factor ($\mu$) | .35 |

## 1.4 LOAD COMBINATION

| Index | Load Case Name | Load Case Description |
|---|---|---|
| 1 | DL | DEAD LOAD |
| 2 | LL | LIVE LOAD |

| Comb . ID | Load Combination for Reinforcement |
|---|---|
| 1 | 1.4 DL + 1.7 LL |

## 2. DRAWING


**REFERENCE DWGS**

| NO. | DWG NO. | DWG TITLE |
|---|---|---|
| | | |
| | | |
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| | | |
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| | | |
| | | |
| | | |
| | | |

**NOTES**

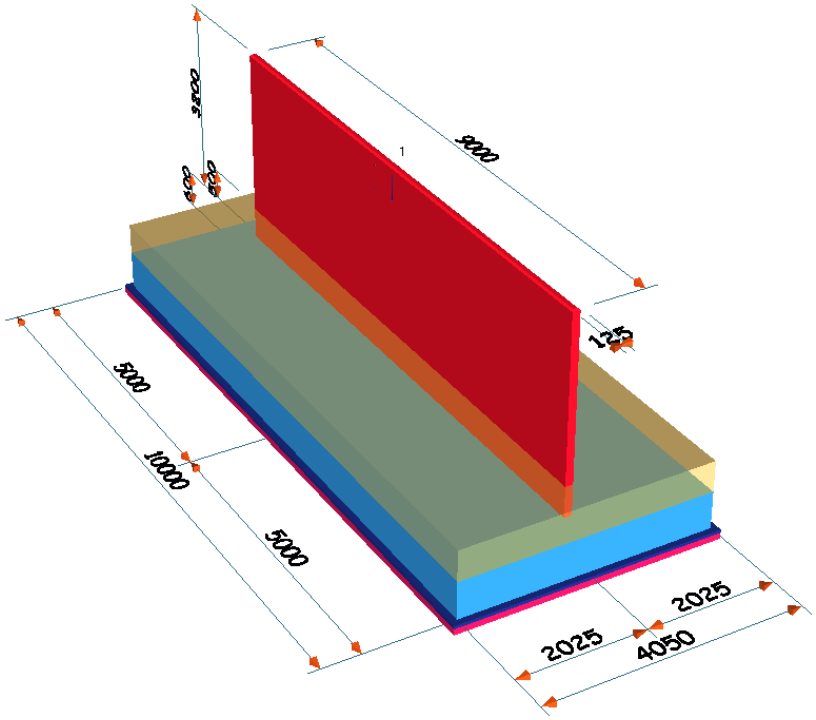
* OUTPUT UNIT : mm

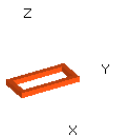
**Sabaa Alboor 432 PROJECT**

**FOUNDATION LOCATION PLAN**
**Sabaa Alboor, Baghdad**

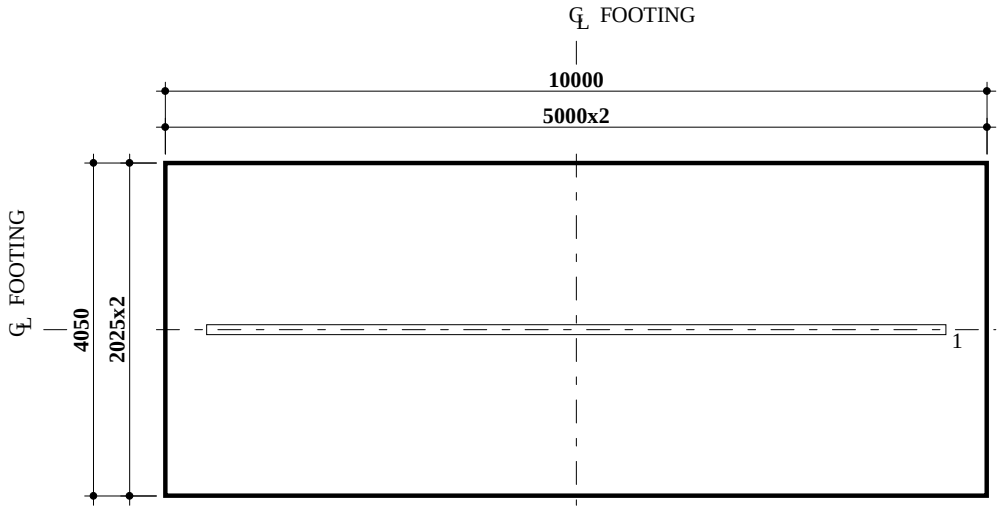
| SQUAD CHECK | | | | | | |
|---|---|---|---|---|---|---|
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | PROCESS | PIPING | VESSELS | STRUCT. | ELEC. | INST. |

| SCALE | JOB NO. | MICROFILM NO. |
|---|---|---|
| AS SHOWN | 1-1 | |




**OUTPUT UNIT : mm**




FOUNDATION PLAN

**REFERENCE DWGS**

| NO. | DWG NO. | DWG TITLE |
|---|---|---|
| | | |
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| | | |
| | | |

**NOTES**

*** OUTPUT UNIT : mm**

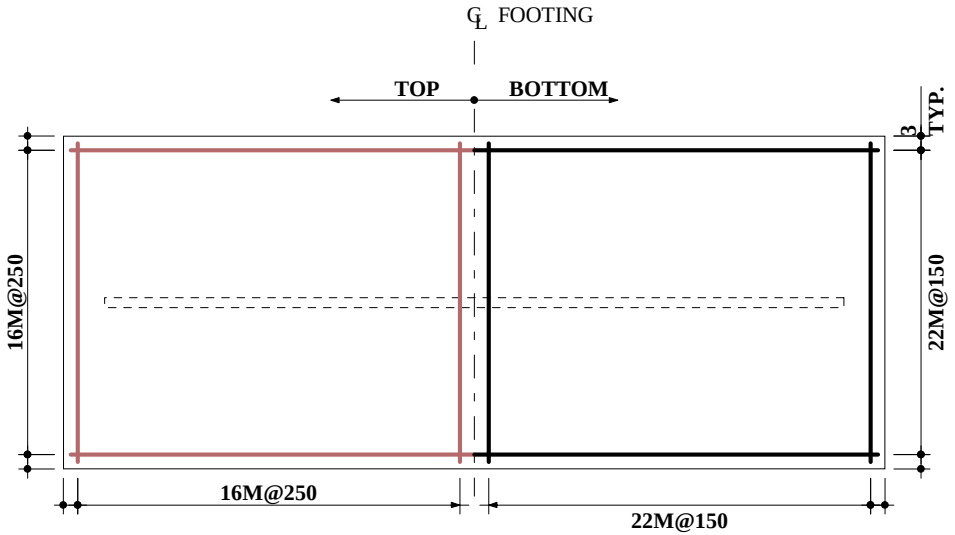
**Sabaa Alboor 432 PROJECT**

**FOUNDATION DETAIL FOR F1**

| SQUAD CHECK | PROCESS | PIPING | VESSELS | STRUCT. | ELEC. | INST. |
|---|---|---|---|---|---|---|
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

| REV. | DATE | DESCRIPTION | DRWN | CHKD | APPD | APPD | APPD |
|---|---|---|---|---|---|---|---|
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |

| SCALE | JOB NO. | MICROFILM NO. |
|---|---|---|
| AS SHOWN | 1-1 | |




REINFORCEMENT PLAN

**REFERENCE DWGS**

| NO. | DWG NO. | DWG TITLE |
|---|---|---|
| | | |
| | | |
| | | |
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| | | |
| | | |
| | | |
| | | |
| | | |

**NOTES**

* OUTPUT UNIT : mm

**Sabaa Alboor 432 PROJECT**

**FOUNDATION DETAIL FOR F1**

| SQUAD CHECK | PROCESS | PIPING | VESSELS | STRUCT. | ELEC. | INST. |
|---|---|---|---|---|---|---|
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

| REV. | DATE | DESCRIPTION | DRWN | CHKD | APPD | APPD | APPD |
|---|---|---|---|---|---|---|---|
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |

| SCALE | JOB NO. | MICROFILM NO. |
|---|---|---|
| AS SHOWN | 1-1 | |

| AFES | Calculation Sheet of Foundation | Project Na. : Sabaa Alboor 432 | |
|---|---|---|---|
| | | Project No. : 1-1 | |
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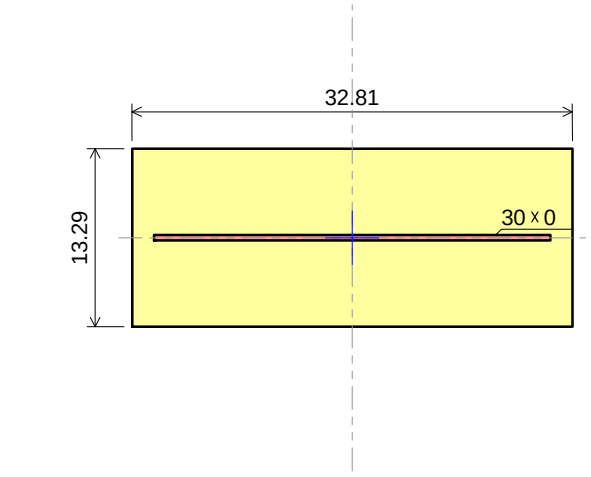
# 3. FOUNDATION DATA

## 3.1 FOOTING AND SECTION DATA

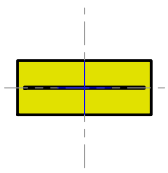
( ft )




| Ft. Name | F1 |
|---|---|
| Ft. Type | MAT |
| Area | 435.939 ft$^2$ |
| Ft. Thickness | 1.97 ft |
| Ft. Volume | 858.146 ft$^3$ |
| Ft. Weight | 128.576 kips |
| Soil Height | 1.64 ft |
| Soil Volume | 695.275 ft$^3$ |
| Soil Weight | 69.448 kips |
| Buoyancy | Not Consider |
| Self Weight (except Pr.SW) | 198.024 kips |


**Section Data**

( ft )



| Ft.Name | Direction | Ft. Volume | Soil Volume | Pier Wt |
|---|---|---|---|---|
| F1 | All Direct | 858.146 ft$^3$ | 695.275 ft$^3$ | 19.048 kips |
| **Sec.Name** | **Section Area** | **Ft. Weight** | **Soil Weight** | **Total Weight** |
| S1 | 435.939 ft$^2$ | 128.576 kips | 69.448 kips | 217.072 kips |

## 3.2 PIER DATA

Off X , Off Y is offset position from the Center of the footing

If Pier Shape is Circle or Circle wall, Pl is a Diameter. and Pw is a Inner Diameter

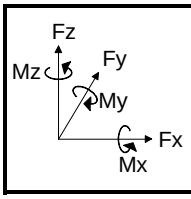
Area is pier concrete area

Weight is pier and inner soil weight in case circle wall except Tank1 Type(Circle Ring Footing Shape)

Unit( Length : ft , Weight : kips , Area : ft$^2$ )

| Ft.Name | Pr.Name | Shape | Pl | Pw | Ph | Area | Weight | Off X | Off Y |
|---|---|---|---|---|---|---|---|---|---|
| F1 | 1 | Rectangle | 29.528 | 0.410 | 10.499 | 12.109 | 19.048 | 0.000 | 0.000 |

## 3.3 LOAD CASE




Input the point loads in the global coordinate system direction. Positive directions of moments (shown in the sketch) are based on the right hand rule.

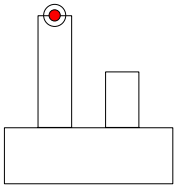
| Index | Load Case Name | Load Case Description |
|---|---|---|
| 1 | DL | DEAD LOAD |
| 2 | LL | LIVE LOAD |

Unit( kips , kips-ft )

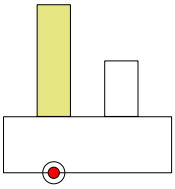
| Ft.Name | Pr.Name | Load Case | Fx | Fy | Fz | Mx | My |
|---|---|---|---|---|---|---|---|
| F1 | 1 | 1 | 0 | 0 | -110.23 | 0 | 0 |
| | | 2 | 0 | 0 | -286.61 | 0 | 0 |
| | Footing SW | | 0.000 | 0.000 | -198.024 | 0.000 | 0.000 |

## 3.4 LOAD COMBINATION

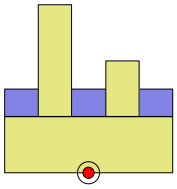
In Pier Top
without Self Weight



In Footing Bottom
with Pier Self Weight,
But without Footing Self Weight,



In Footing Bottom Center
with Pier & Footing Self Weight & Soil Weight,
Case PileType
in centroid of Pile Group
Case NonPileType
in centroid of Footing



### 3.4.1 Load Combination in Pier Top (Without SW)

Unit( kips , kips-ft )

| Ft.Name | Pr.Name | L.Comb. | ΣFx | ΣFy | ΣFz | ΣMx | ΣMy |
|---|---|---|---|---|---|---|---|
| F1 | 1 | 1 | 0.000 | 0.000 | -641.555 | 0.000 | 0.000 |

### 3.4.2 Load Combination in Footing Bottom (With Pier SW)

Unit( kips , kips-ft )

| Ft.Name | Pr.Name | L.Comb. | ΣFx | ΣFy | ΣFz | ΣMx | ΣMy |
|---|---|---|---|---|---|---|---|
| F1 | 1 | 1 | 0.000 | 0.000 | -641.555 | 0.000 | 0.000 |

### 3.4.3 Load Combination in Footing Bottom Center (With Pier & Footing SW)

**Load Combination of Elastic Condition**

There is no Load Combination

**Load Combination of Ultimate Condition**

- C.G. of Load is coordinate from left bottom. Unit : ft

Unit( kips , kips-ft )

| Ft.Name | Sec.Na | L.Comb. | ΣFx | ΣFy | ΣFz | ΣMx | ΣMy | C.G. of Loads |
|---|---|---|---|---|---|---|---|---|
| F1 | S1 | 1 | 0.000 | 0.000 | -641.555 | 0.000 | 0.000 | 16.4 , 6.6 |

# 4. CHECK OF STABILITY

There is no Static LoadCombination

| AFES | Calculation Sheet of Foundation | Project Na. : Sabaa Alboor 432 | |
|---|---|---|---|
| | | Project No. : 1-1 | |
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# 5. DESIGN OF FOOTING

## 5.1 DESIGN MOMENT AND SHEAR FORCE

Footing design is in accordance with unltimate strength method at footing bottom.
Calculated total pier load as
$\Sigma Q = \Sigma Fz$ - Self Weight Factor x (Soil Weight + Footing Weight)
Ft.Name : Footing Name , Sec.Name : Strip Name for Footing Reinforcement Design
Dir. : Direction , L.Comb. : Load Combination Index , Sl or Sw : Strip X or Y width

### 5.1.1 Data

Unit( ft , kips , kips-ft )

| Ft.Name | Sec.Na | Dir. | L.Comb. | Fl or Fw | Sl or Sw | ΣFz | ΣM | ΣQ |
|---|---|---|---|---|---|---|---|---|
| F1 | S1 | X | 1 | 32.81 | 13.29 | 641.555 | 0.00 | 641.555 |
| | S1 | Y | 1 | 13.29 | 32.81 | 641.555 | 0.000 | 641.555 |

### 5.1.2 Design Parameters

Yield Strength - 10M ~ 16M : $f_y1$ , 19M ~ : $f_y2$
f_cl : Clear Cover for edge of footing reinforcement
f_clt : Clear Cover for top of footing reinforcement
f_clb : Clear Cover for bottom of footing reinforcement
Loc. : Location of Critical Point from left side of footing

Unit(psi,in)

| ϕ(Flexure) | ϕ(Shear) | f'c | fy1 | fy2 | f_cl | f_clt | f_clb |
|---|---|---|---|---|---|---|---|
| .85 | .8 | 4267.00 | 56893.37 | 56893.37 | 0.1 | 0.1 | 0.1 |

## 5.2 REQUIRED REINFORCEMENT

### 5.2.1 Reinforcement Formula

- Shrinkage and temperature reinforcement ---- ACI CODE 7.12.2

$As \geq = fac \cdot b \cdot h$ , fac = following

Area of shrinkage and temperature reinforcement shall provide at least the following ratio of reinforcement area to gross concrete area, but not less than 0.0014

(a) Slabs where Grade 40 or 50 deformed bars are used .....0.0020
(b) Slabs where Grade 60 deformed bars or welded wire reinforcement are used.....0.0018
(c) Slabs where reinforcement with yield stress exeeding 60,000 psi measured at a yield strain of 0.35 percent is used ..... $\frac{0.0018 \times 60{,}000}{f_y}$

- Required Reinforcement by Analysis

$As \geq As_2$

- At every section of flexural members where tensile reinforcement is required

$As \geq As_5 \geq As_4$ ---- ACI Eq (10-3)

- The requirements of Eq (10-3) need not be applied, if every section As provided is at least one -third greater then that required by analysis ---- ACI CODE 10.5.3

$As_2 = \rho_{req} \cdot b \cdot d$

$As_3 = 1.333\ \rho_{req} \cdot b \cdot d$

$As_4 = \frac{200}{f_y} \cdot b \cdot d$

$As_5 = \frac{3\sqrt{f_{ck}}}{f_y} \cdot b \cdot d$

$As_{max} = 0.75\ \rho_b \cdot b \cdot d$

$\rho_b = 0.85 \times \beta_1 \times \frac{f_{ck}}{f_y} \times \frac{0.003 \times E_s}{0.003 \times E_s + f_y}$

| AFES | Calculation Sheet of Foundation | Project Na. : Sabaa Alboor 432 | |
|---|---|---|---|
| | | Project No. : 1-1 | |
| | | Client : Sabaa | Page 15 |

Selected As = Max ( $As_1$ , $As_2$ , Min ( $As_3$ , Max ( $As_4$ , $As_5$ ) ) )

**If Selected As < Using As < $As_{max}$ , then OK!!**

Note : The reinforcement is calculated bases on the maximum moment under the foundation in each direction.
But, the 'ISO' , 'OCT' , 'HEX' , 'COMB' , 'TANK1' foundations are calaulated as face pier
Where,

$$Rn = \frac{Mu}{\phi bd^2} \quad , \phi = .85 \quad , \rho.req = \frac{0.85 \cdot fck}{fy} \times \left( 1 - \sqrt{1 - \frac{2Rn}{0.85fck}} \right)$$

### 5.2.2 Check of Footing Reinforcement

◉ Footing Name : F1 GroupType : Mat_Foundation

- X direction (Unit Width)

| Sec.Nam | L.Comb. | | Using Bar (in) | Loc. (ft) | Width b (ft) | d (in) | As ($in^2$) |
|---|---|---|---|---|---|---|---|
| S1 | 1 | top | 1.22 - 16M @ 9.84 | 16.404 | 1.000 | 23.189 | 0.380 |
| | 1 | botom | 2.03 - 22M @ 5.91 | 31.168 | 1.000 | 23.071 | 1.196 |

| Sec.Nam | L.Comb. | | Mu (kips-ft) | Rn | ρ·Req |
|---|---|---|---|---|---|
| S1 | 1 | top | - | - | - |
| | 1 | bottom | 6.495 | 14.357 | 0.0003 |

| Sec.Nam | L.Comb. | | $As_1(in^2)$ | $As_2(in^2)$ | $As_3(in^2)$ | $As_4(in^2)$ | $As_5(in^2)$ | $As_{max}(in^2)$ |
|---|---|---|---|---|---|---|---|---|
| S1 | 1 | top | 0.255 | - | - | 0.978 | 0.958 | 6.839 |
| | 1 | bottom | 0.255 | 0.070 | 0.093 | 0.973 | 0.954 | 6.804 |

| Sec.Nam | L.Comb. | | Using As($in^2$) | Select As($in^2$) | Result |
|---|---|---|---|---|---|
| S1 | 1 | top | 0.380 | 0.255 | OK |
| | 1 | bottom | 1.196 | 0.255 | OK |

- Y direction (Unit Width)

| Sec.Nam | L.Comb. | | Using Bar (in) | Loc. (ft) | Width b (ft) | d (in) | As ($in^2$) |
|---|---|---|---|---|---|---|---|
| S1 | 1 | top | 1.22 - 16M @ 9.84 | 6.644 | 1.000 | 22.323 | 0.380 |
| | 1 | botom | 2.03 - 22M @ 5.91 | 6.440 | 1.000 | 22.205 | 1.196 |

| Sec.Nam | L.Comb. | | Mu (kips-ft) | Rn | ρ·Req |
|---|---|---|---|---|---|
| S1 | 1 | top | - | - | - |
| | 1 | bottom | 100.085 | 238.813 | 0.0043 |

| Sec.Nam | L.Comb. | | $As_1(in^2)$ | $As_2(in^2)$ | $As_3(in^2)$ | $As_4(in^2)$ | $As_5(in^2)$ | $As_{max}(in^2)$ |
|---|---|---|---|---|---|---|---|---|
| S1 | 1 | top | 0.255 | - | - | 0.942 | 0.923 | 6.584 |
| | 1 | bottom | 0.255 | 1.158 | 1.544 | 0.937 | 0.918 | 6.549 |

| Sec.Nam | L.Comb. | | Using As($in^2$) | Select As($in^2$) | Result |
|---|---|---|---|---|---|
| S1 | 1 | top | 0.380 | 0.255 | OK |
| | 1 | bottom | 1.196 | 1.158 | OK |

| AFES | Calculation Sheet of Foundation | Project Na. : Sabaa Alboor 432 | |
|---|---|---|---|
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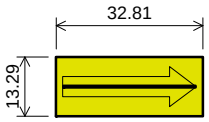
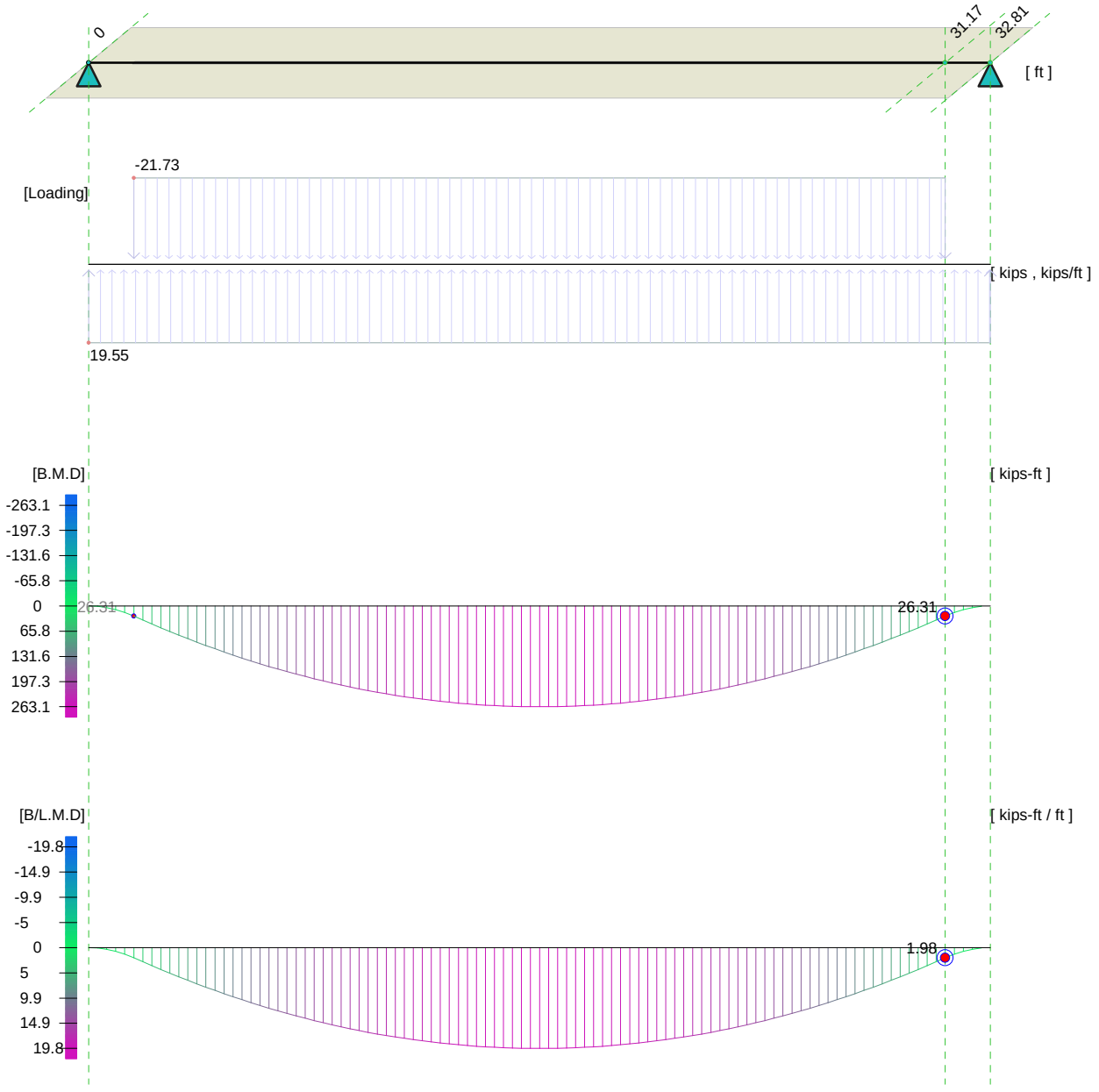
Title

# Bending Moment Diagram

| Foundation name | Section name | Direction | L/C ID |
|---|---|---|---|
| F1 | S1 | X | 1 |

| Analysis Method | | |
|---|---|---|
| Conventional Rigid Method with eqilibrium equation (Method 2) | | |
| ΣFz -641.555 kips | ΣMy 0.000 kips-ft | Moment intia 39103.3600 $ft^4$ |
| Area 435.939 $ft^2$ | Contact Area 435.939 $ft^2$ (100 %) | Critical Point Method Critical Max Point |
| Critical Value $Mu_{bottom}$ = 1.98 kips-ft/ft , $Mu_{top}$ = 0 kips-ft/ft | | |



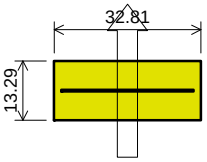
| AFES | Calculation Sheet of Foundation | Project Na. : Sabaa Alboor 432 | |
|---|---|---|---|
| | | Project No. : 1-1 | |
| | | Client : Sabaa | Page 17 |

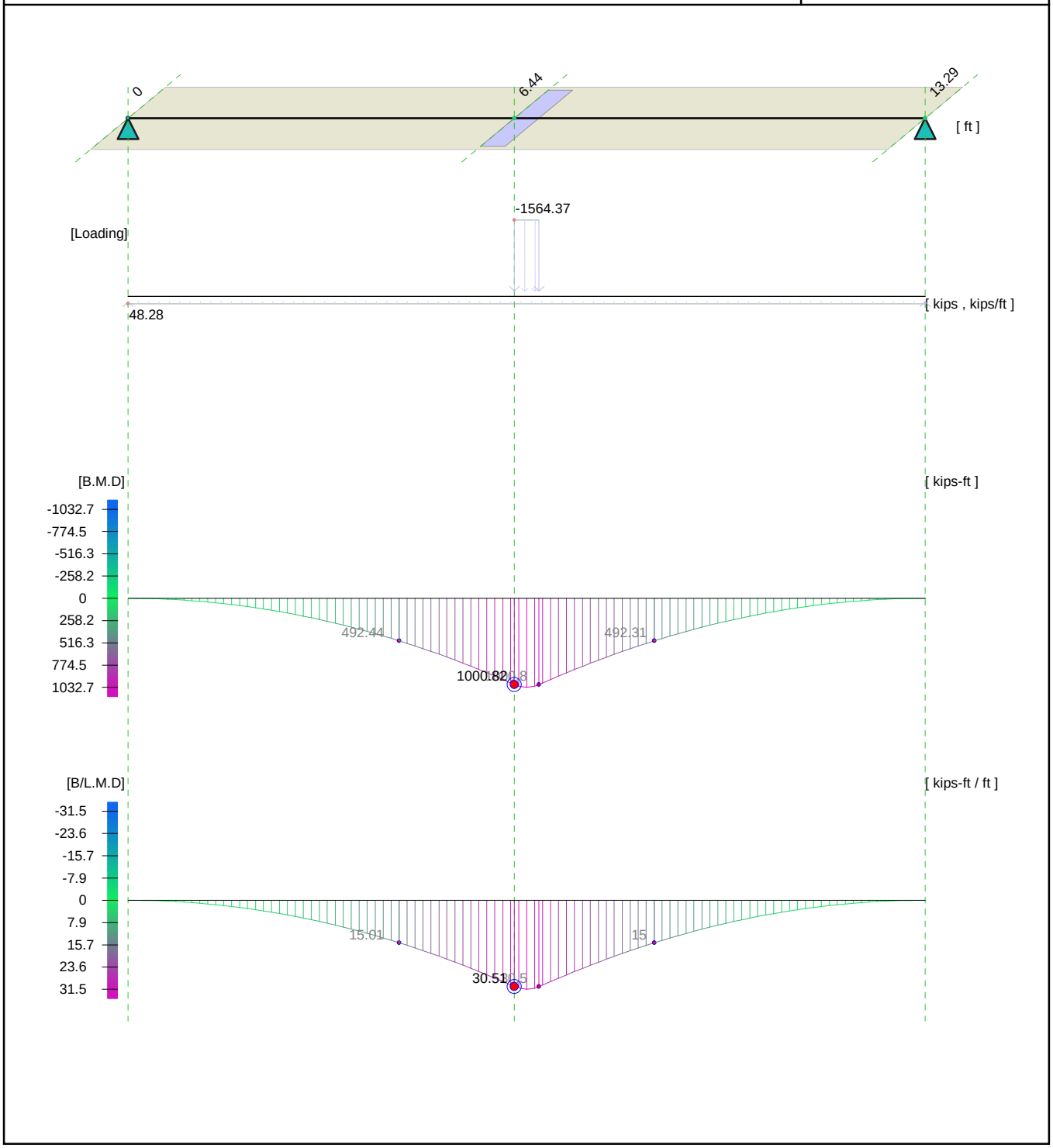
Title

# Bending Moment Diagram

| Foundation name | Section name | Direction | L/C ID |
|---|---|---|---|
| F1 | S1 | Y | 1 |

| Analysis Method | | |
|---|---|---|
| Conventional Rigid Method with eqilibrium equation (Method 2) | | |
| $\Sigma Fz$ -641.555 kips | $\Sigma Mx$ 0.000 kips-ft | Moment intia 6413.9280 $ft^4$ |
| Area 435.939 $ft^2$ | Contact Area 435.939 $ft^2$ (100 %) | Critical Point Method Critical Max Point |
| Critical Value | $Mu_{bottom}$ = 30.506 kips-ft/ft , $Mu_{top}$ = 0 kips-ft/ft | |



| AFES | Calculation Sheet of Foundation | Project Na. : Sabaa Alboor 432 | |
|---|---|---|---|
| | | Project No. : 1-1 | |
| | | Client : Sabaa | Page 18 |

## 5.3 ONE WAY SHEAR FORCE

### 5.3.1 One-Way Shear Formula

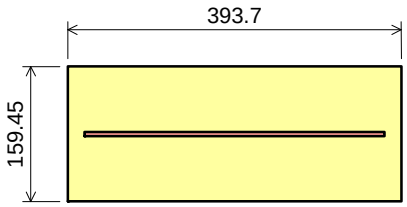
ACI 318-05 CODE 11.3.1.1

- For members subject to shear and flexure only.
- $\phi V_c = .8 \cdot 2 \sqrt{f_{ck}}\ B'w\ d$ (eq 11-3)
- **Vu <= $\phi V_c$ , then OK!!**

### 5.3.2 Check of One-Way Shear

◉ Footing Name : F1 GroupType : Mat_Foundation PileType : False

Unit : in




- X direction One-Way Shear (Unit Width)

| Sec.Nam | L.Comb. | Loc. (in) | d (in) | Bw (in) | ϕVc (kips) | Vu (kips) | Result |
|---|---|---|---|---|---|---|---|
| S1 | 1 | 0 | 23.1 | 12 | 28.935 | 0 | OK |

- Y direction One-Way Shear (Unit Width)

| Sec.Nam | L.Comb. | Loc. (in) | d (in) | Bw (in) | ϕVc (kips) | Vu (kips) | Result |
|---|---|---|---|---|---|---|---|
| S1 | 1 | 105.28 | 22.2 | 12 | 27.849 | 6.647 | OK |

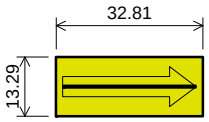
| AFES | Calculation Sheet of Foundation | Project Na. : Sabaa Alboor 432 | |
|---|---|---|---|
| | | Project No. : 1-1 | |
| | | Client : Sabaa | Page 19 |

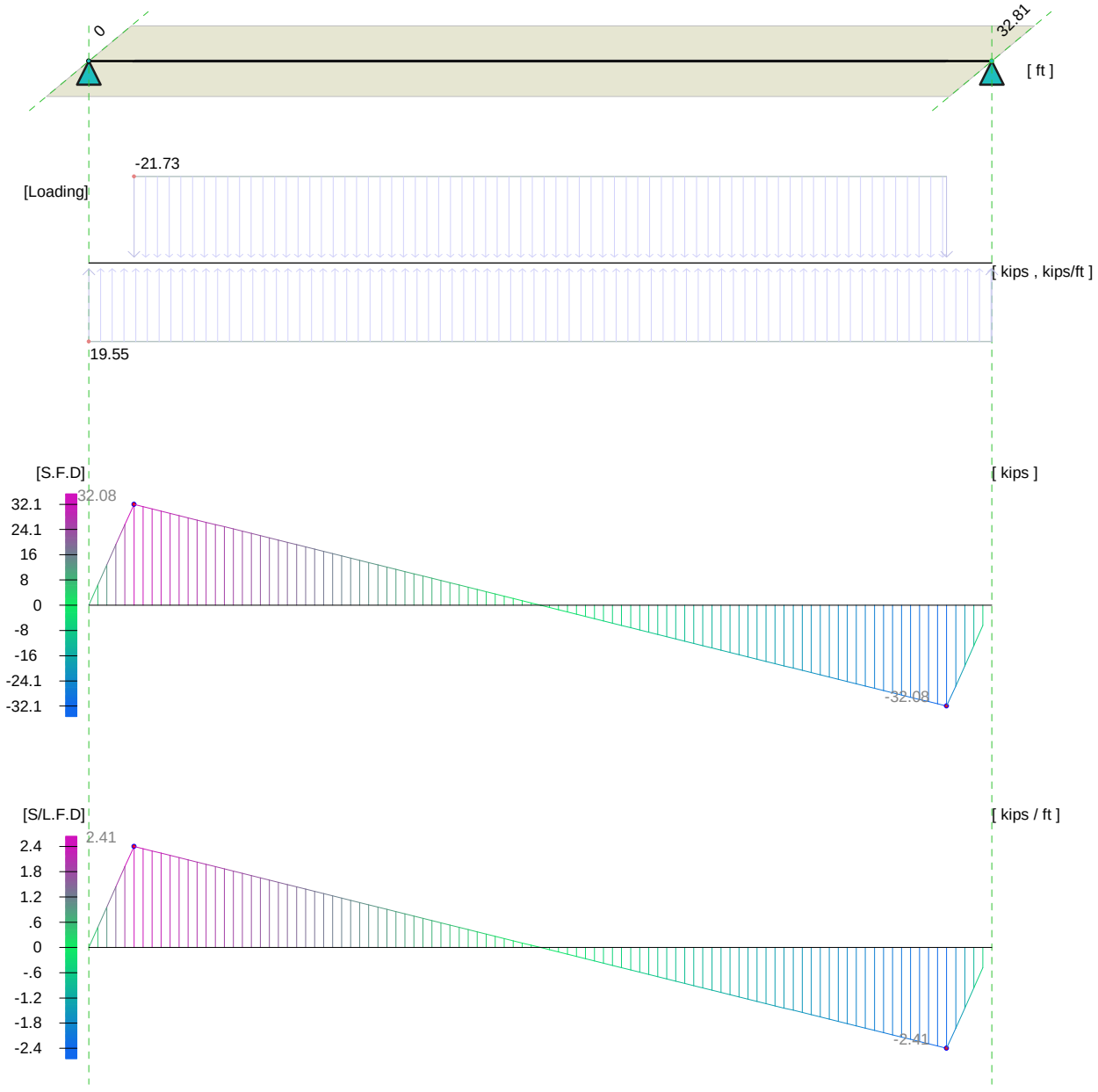
Title

# Shear Force Diagram

| Foundation name | Section name | Direction | L/C ID |
|---|---|---|---|
| F1 | S1 | X | 1 |

| Analysis Method | | |
|---|---|---|
| Conventional Rigid Method with eqilibrium equation (Method 2) | | |
| ΣFz -641.555 kips | ΣMy 0.000 kips-ft | Moment intia 39103.3600 ft$^4$ |
| Area 435.939 ft$^2$ | Contact Area 435.939 ft$^2$ (100 %) | Critical Point Method Critical Max Point |
| Critical Value Vu = 0 kips/ft | | |



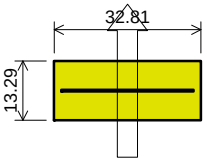
| AFES | Calculation Sheet of Foundation | Project Na. : Sabaa Alboor 432 |
|---|---|---|
| | | Project No. : 1-1 |
| | | Client : Sabaa — Page 20 |

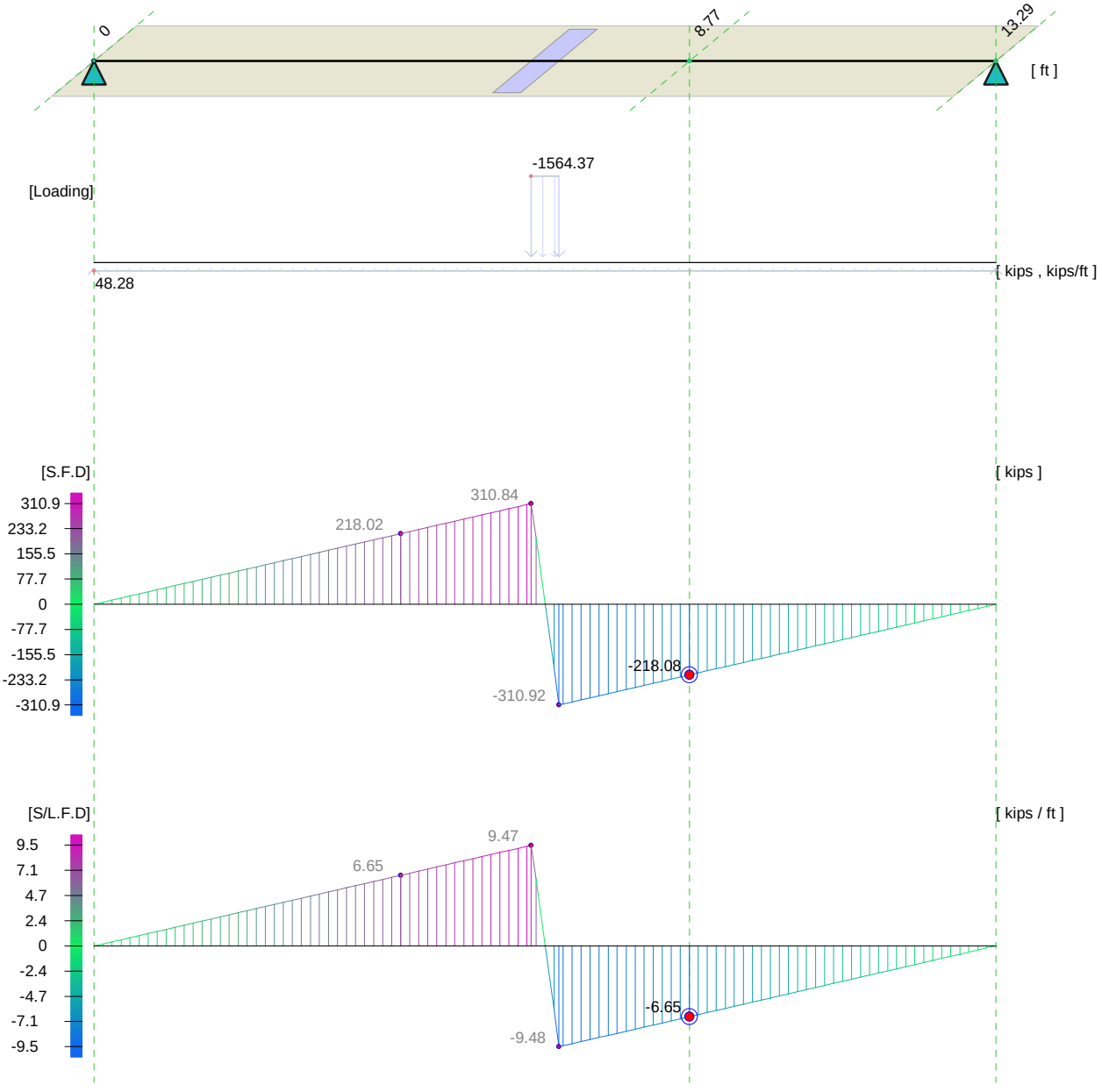
Title

# Shear Force Diagram

| Foundation name | Section name | Direction | L/C ID |
|---|---|---|---|
| F1 | S1 | Y | 1 |

| Analysis Method | | |
|---|---|---|
| Conventional Rigid Method with eqilibrium equation (Method 2) | | |
| ΣFz: -641.555 kips | ΣMx: 0.000 kips-ft | Moment intia: 6413.9280 ft$^4$ |
| Area: 435.939 ft$^2$ | Contact Area: 435.939 ft$^2$ (100 %) | Critical Point Method: Critical Max Point |
| Critical Value: Vu = -6.647 kips/ft | | |



| AFES | Calculation Sheet of Foundation | Project Na. : Sabaa Alboor 432 | |
|---|---|---|---|
| | | Project No. : 1-1 | |
| | | Client : Sabaa | Page 21 |

## 5.4 TWO WAY SHEAR FORCE

### 5.4.1 Two-Way Shear Formula

$Vu = \Sigma Fz \cdot$ Shade Ratio

(a) $\phi V_{c1} = .8 \cdot 2 \cdot (1 + 2/\beta_c) \sqrt{f_{ck}}\ b_o \cdot d$ (eq 11-33) <- Vc1

(b) $\phi V_{c2} = .8 \cdot 2 \cdot (1 + \alpha_s\, d / 2\, b_o) \sqrt{f_{ck}}\ b_o \cdot d$ (eq 11-34) <- Vc2

(c) $\phi V_{c3} = .8 \cdot 4 \sqrt{f_{ck}}\ b_o \cdot d$ (eq 11-35) <- Vc3

$\phi Vc = Min(\phi V_{c1}, \phi V_{c2}, \phi V_{c3})$ ACI 318-05 CODE 11.12.2.1

**$Vu \leq \phi V_c$ , then OK**

where

$\beta$ = ratio of long side to short side of the column, concentrated load or reaction area

$\alpha_s$ = 40 for interior colimns

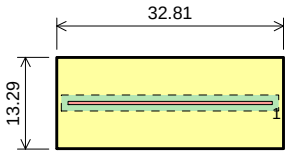
= 30 for edge columns

= 20 for corner columns

$b_o$ = perimeter of critical section

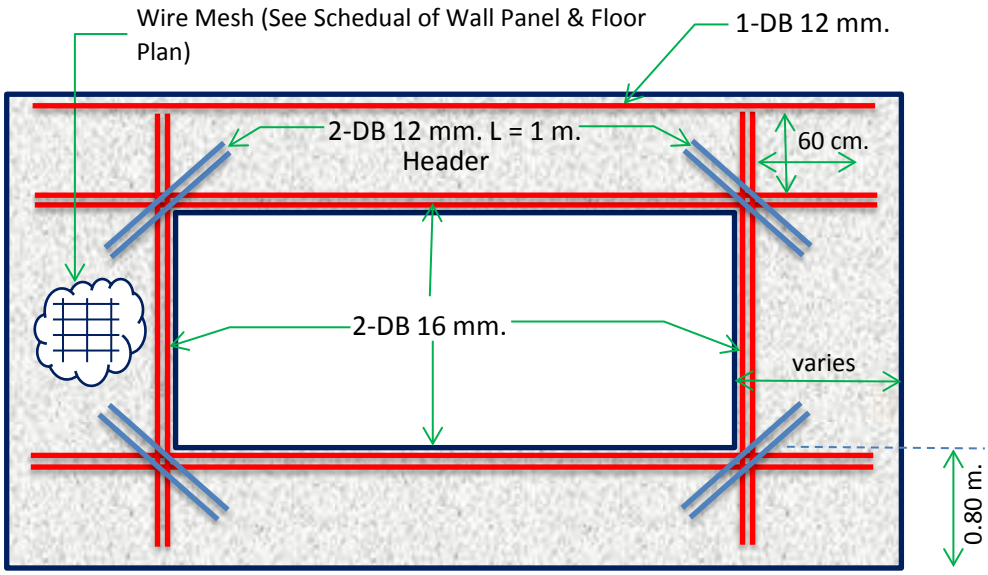
$$\text{Shade Ratio} = \frac{\text{Footing Area - Punching Area}}{\text{Footing Area}}$$

### 5.4.2 Check of Two-WayShear

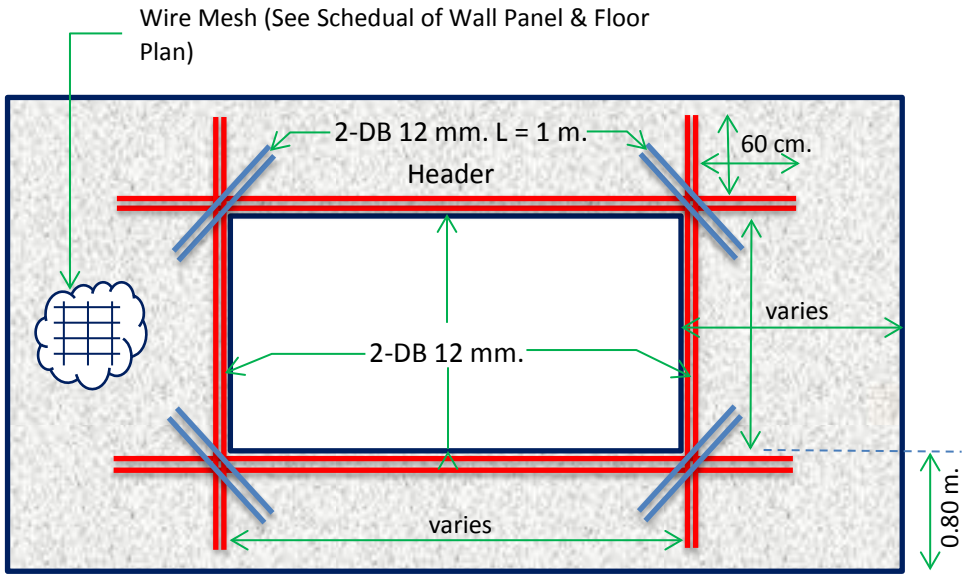



| | | | |
|---|---|---|---|
| **Ft.Name** | F1 | **Punching Area** | 10564.260 $in^2$ |
| **Pr.Name** | 1 | **Ratio Shade** | .832 |
| **Shape** | Rectangle | **$\phi$ Vc1** | 2009.332 kips |
| **L.Comb.** | 1 | **$\phi$ Vc2** | 3067.626 kips |
| **Pl** | 354.33 in | **$\phi$ Vc3** | 3910.051 kips |
| **Pw** | 4.92 in | **$\phi$ Vc** | 2009.332 kips |
| **bo / d** | 810.79 / 23.07 in | **Vu** | 533.590 kips |
| **$\beta$c / $\alpha$s** | 72 / 40 | **Result** | **OK** |

## Detail At Position of Window



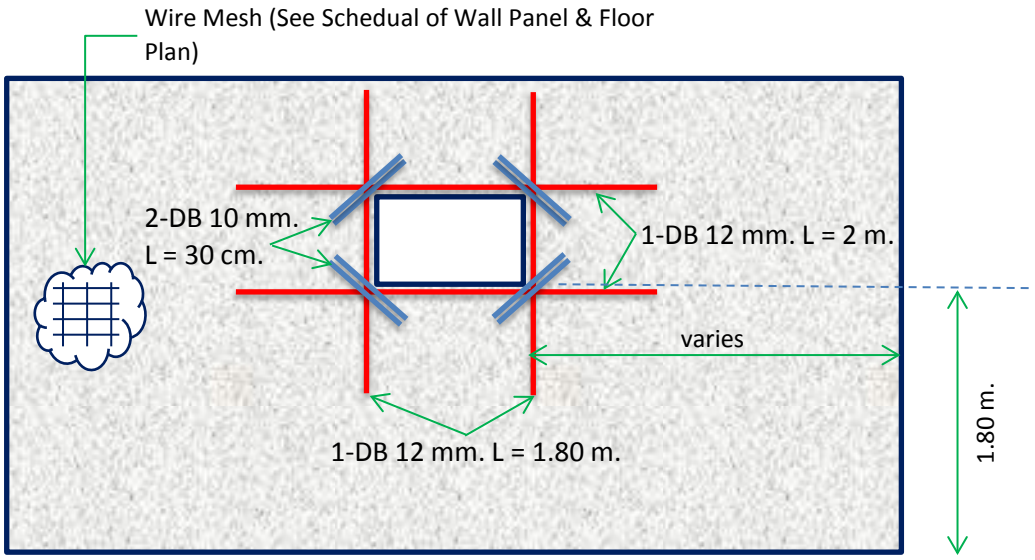

Detail of Wall Panel At : **w/1**



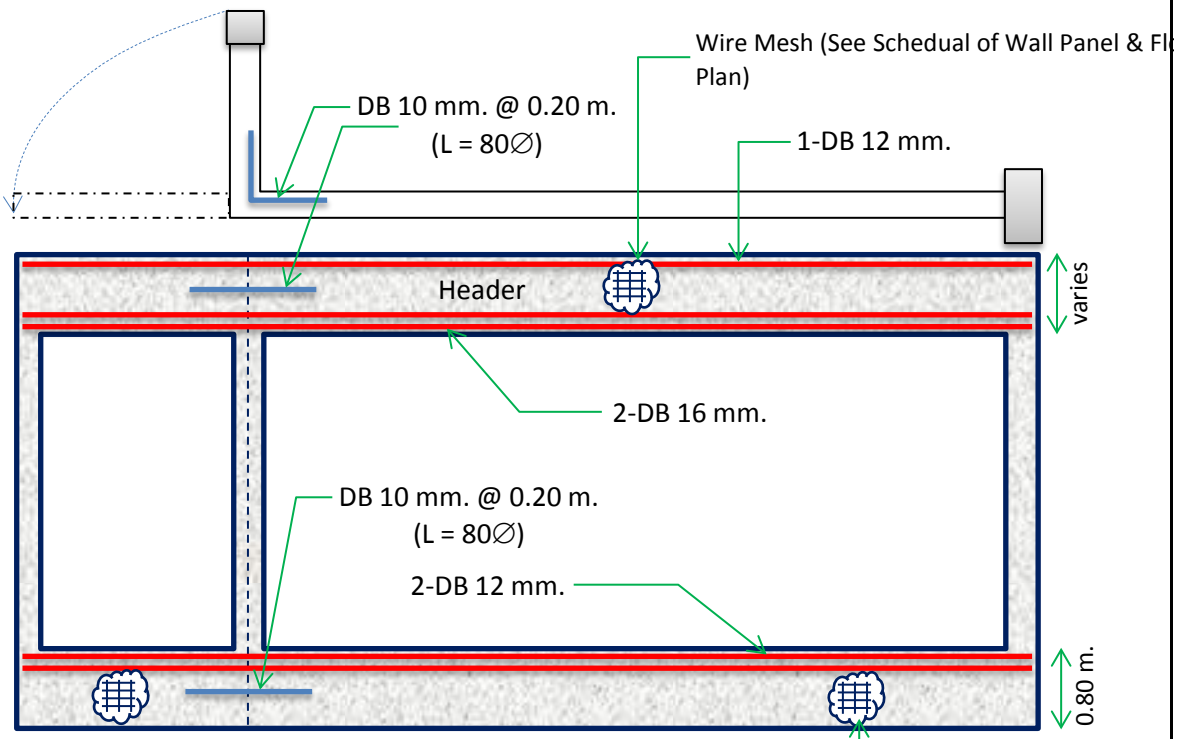

Detail of Wall Panel At : **w/3, w/5, w/6**

**Side View & Not Scale**

# Detail At Position of Window




Detail of Wall Panel At : **w/4**

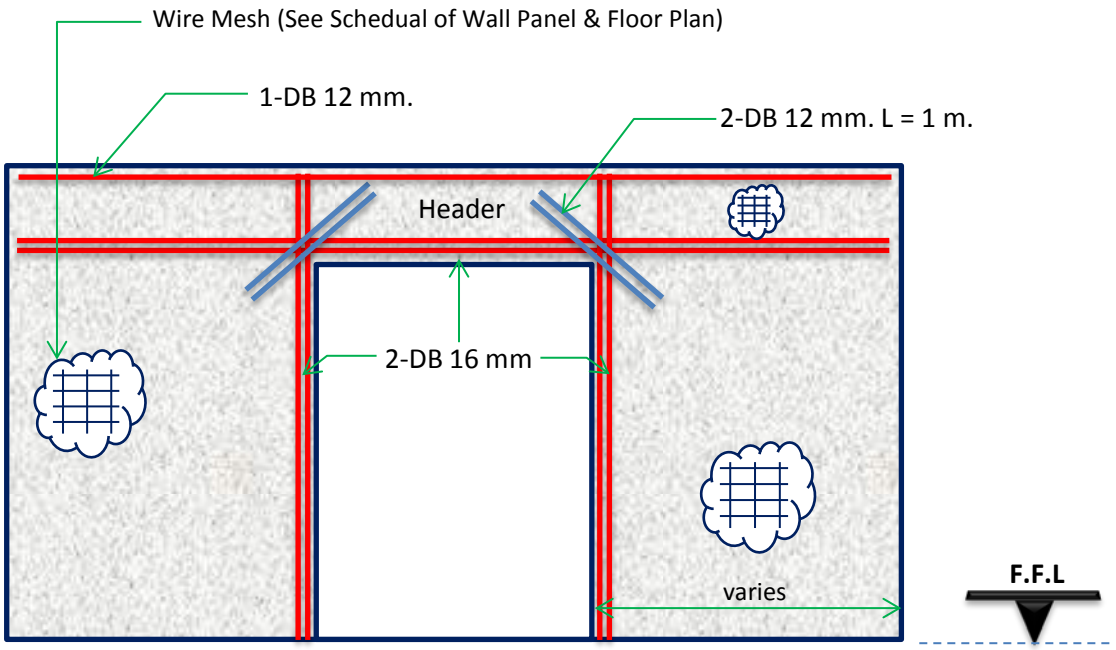



Detail of Wall Panel At : **w/2**

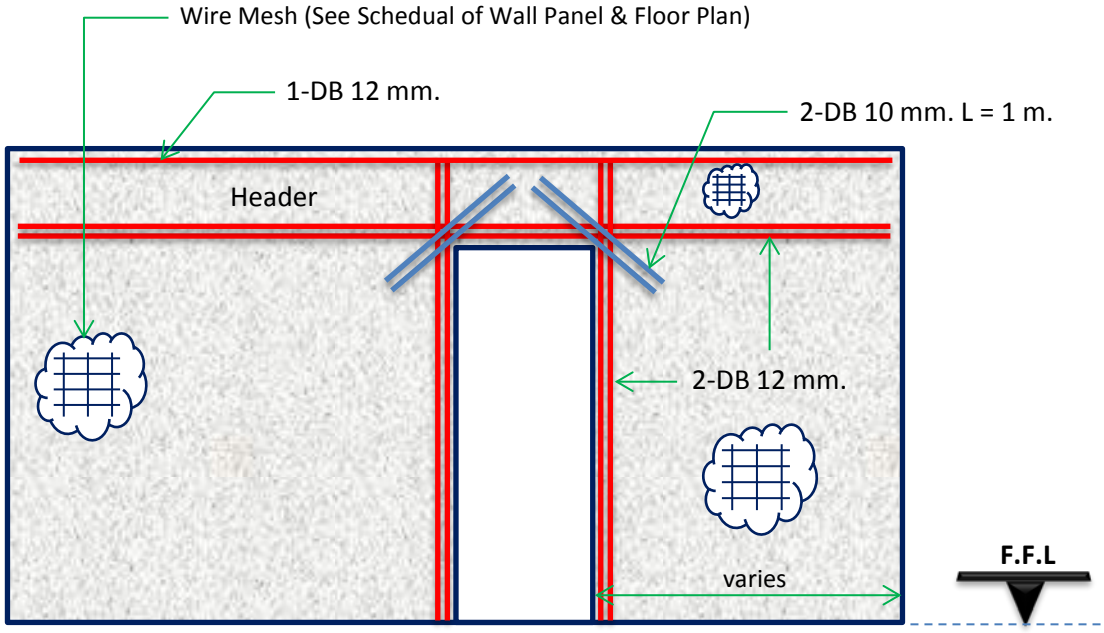
Wire Mesh (See Schedual of Wall Panel & Floor Plan)

**Side View & Not Scale**

# Detail At Position of Door



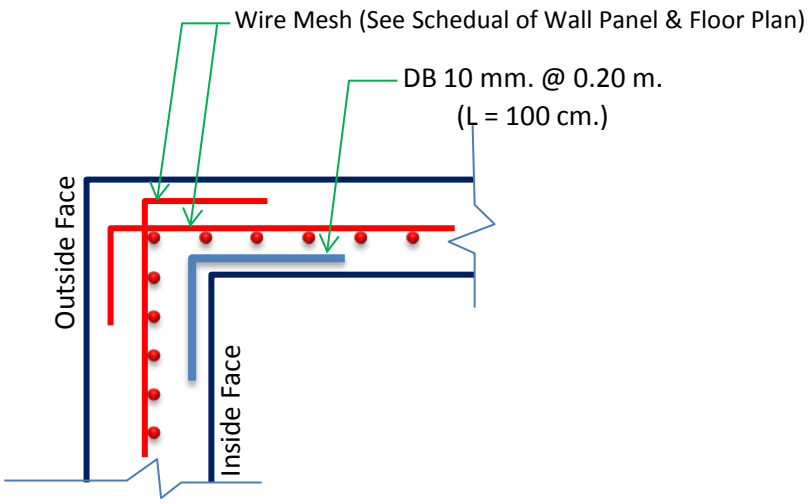

Detail of Wall Panel At : **D/4**

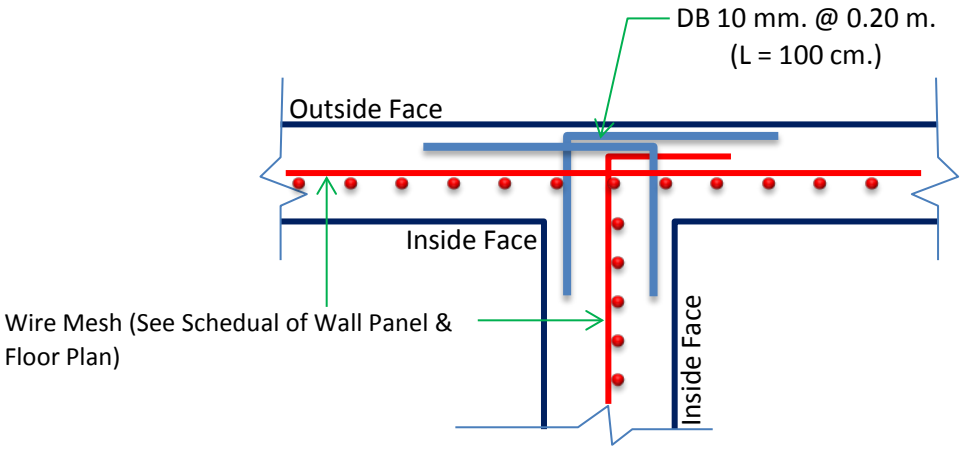


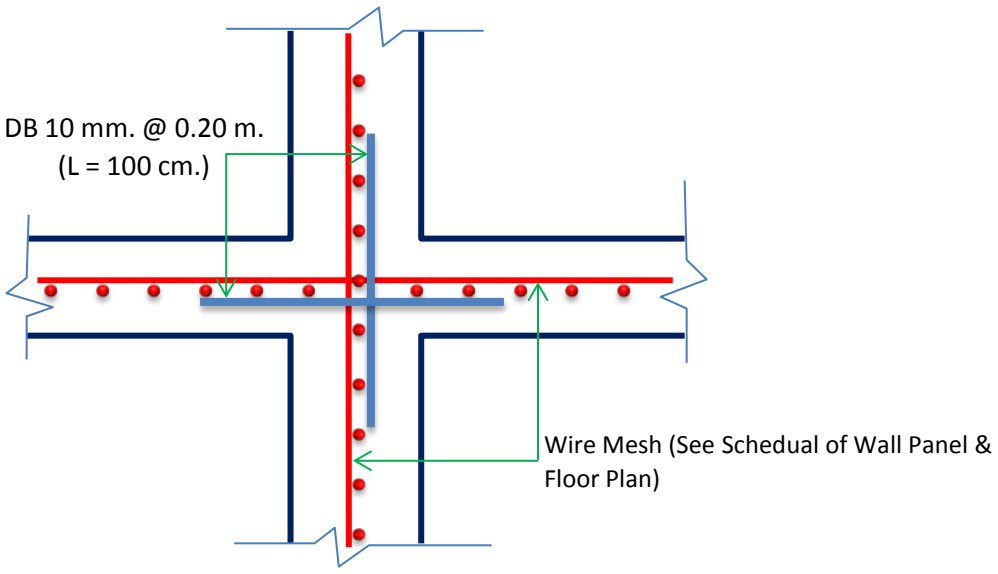

Detail of Wall Panel At : **D/1, D2, D3, D5**

**Side View & Not Scale**

# Detail At Joint of Wall Panel

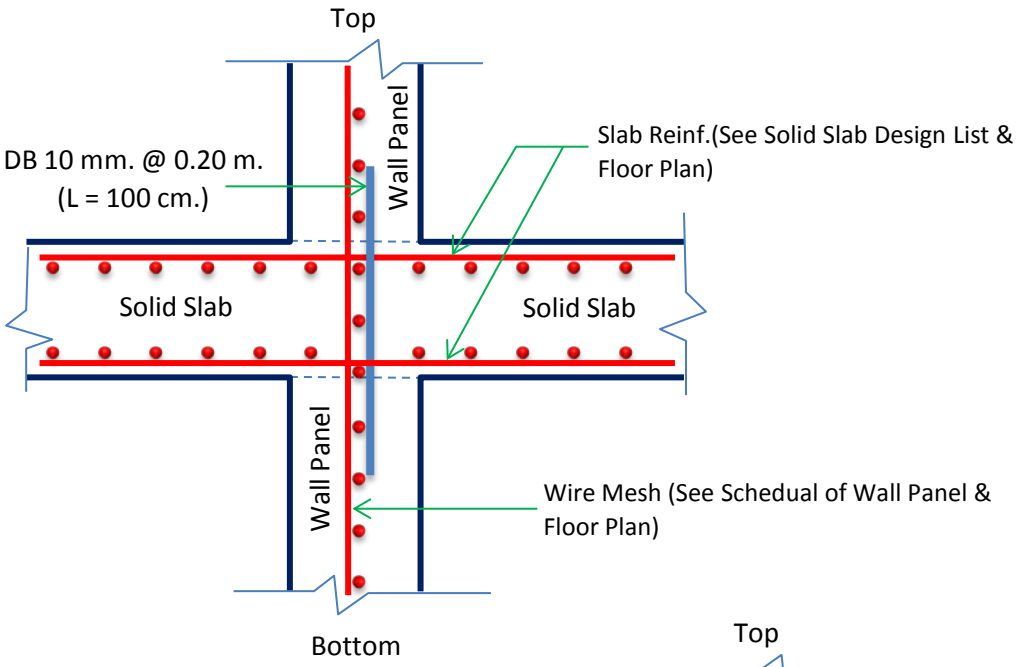


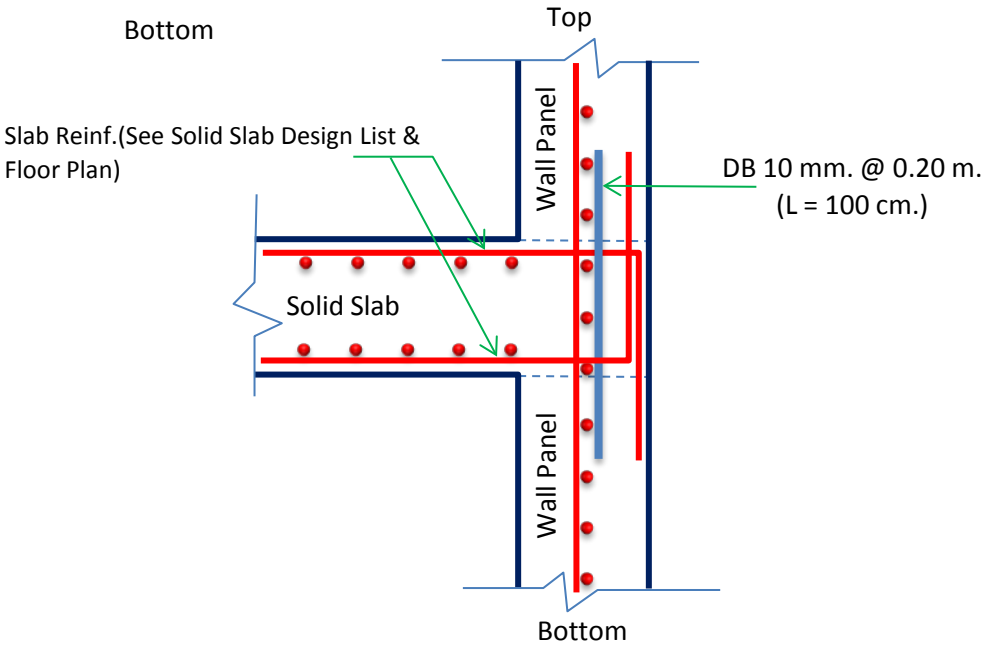



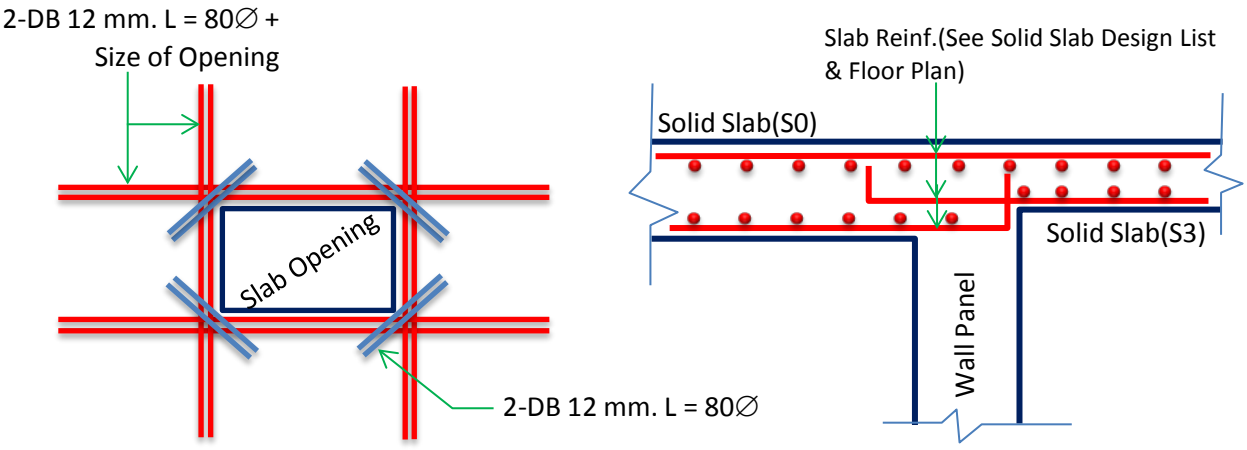




**Top View & Not Scale**

# Detail At Joint of Slab & Wall Panel

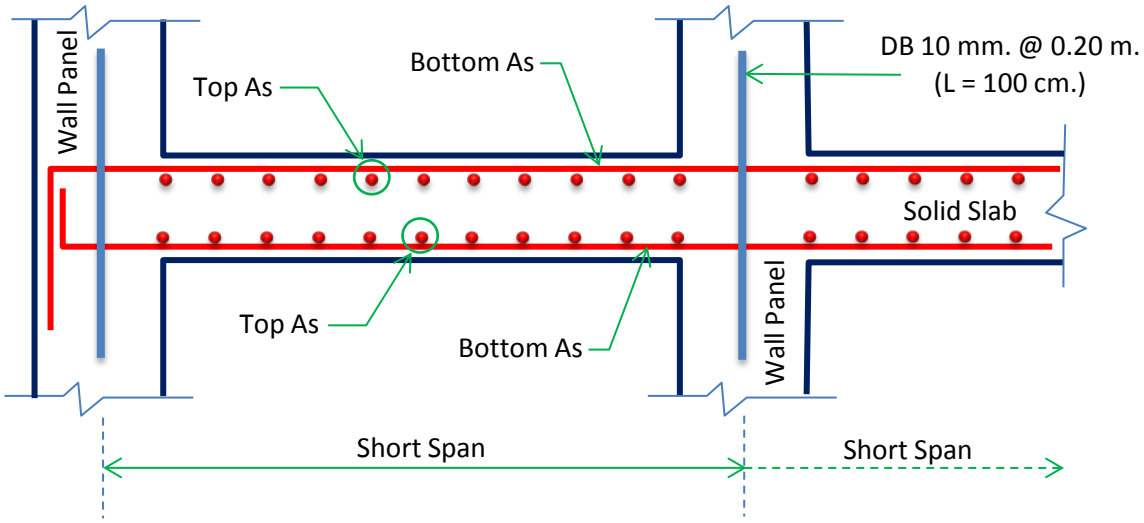


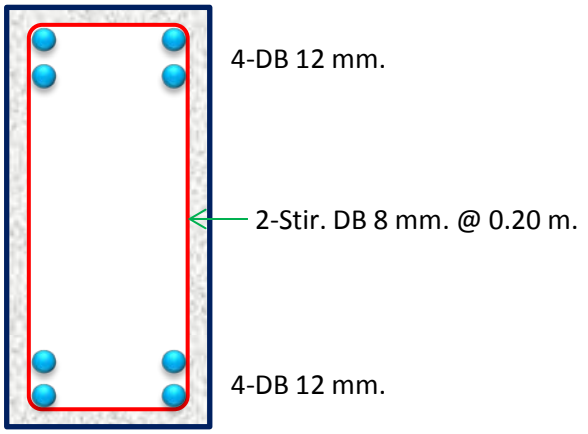

**Side View & Not Scale**

# Detail of Solid Slab & Beam

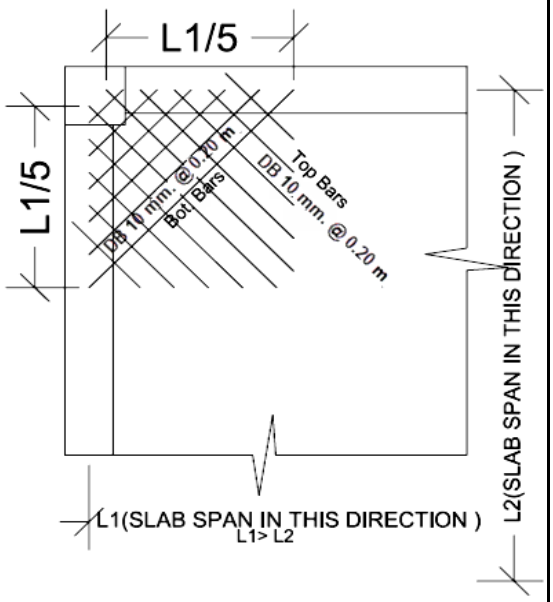



**Solid Slab Design List**

| Serial | Thickness (cm.) | Use Bottom As Along Short Span | Use Top As Along Long Span |
|---|---|---|---|
| S0 | 16 | DB 10 mm. @ 0.20 m. | DB 10 mm. @ 0.20 m. |
| S1 | 12 | DB 10 mm. @ 0.20 m. | DB 10 mm. @ 0.20 m. |
| S2 | 12 | DB 10 mm. @ 0.20 m. | DB 10 mm. @ 0.20 m. |
| S3 | 12 | DB 10 mm. @ 0.20 m. | DB 10 mm. @ 0.20 m. |



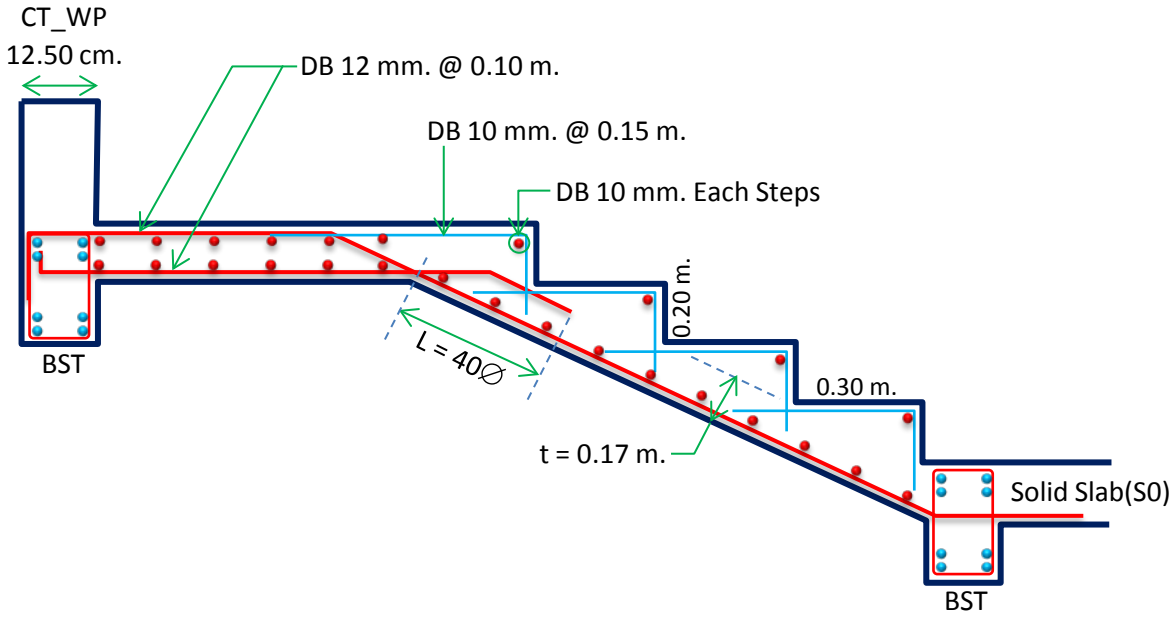

**BST: 12.50 x 45 cm.**

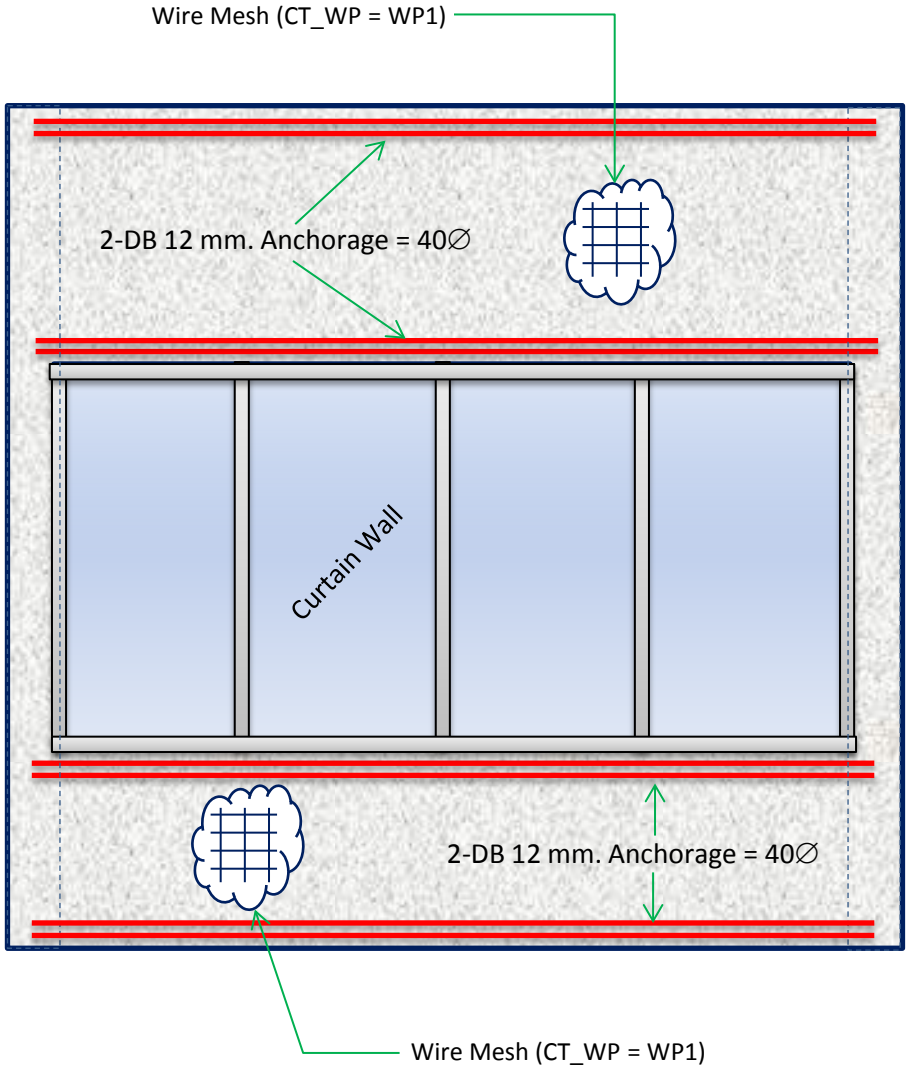



**Tort. Reinr. At Exterior Corner Slab**

**Side View & Not Scale**

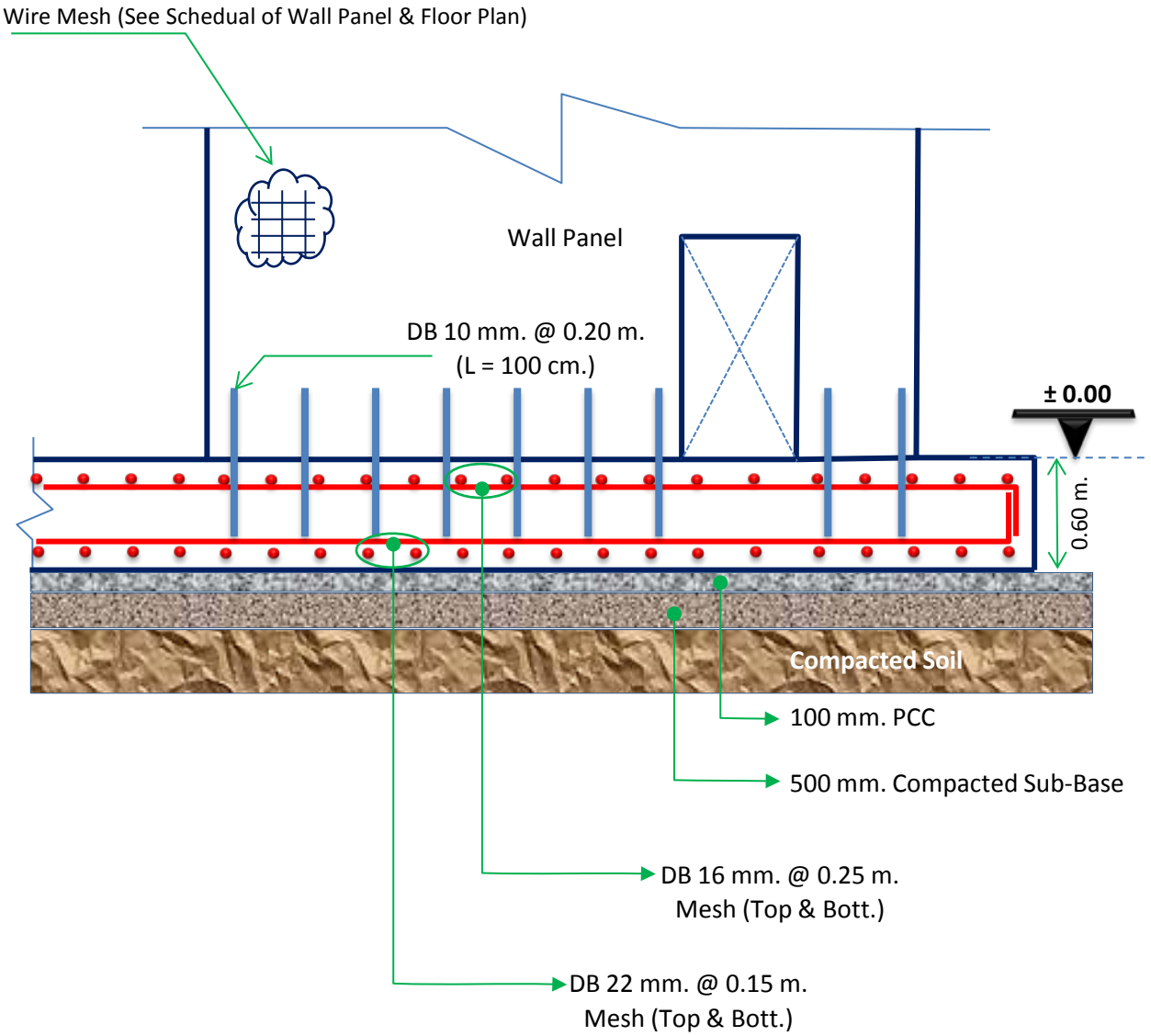
# Detail of Stair & Curtain Wall




Side View & Not Scale

# Detail of Raft Foundation




Side View & Not Scale