1-4 المقدمة:

يتناول هذا الباب النتائج المتحصل عليها من البرامج المستخدمة في دراسة الحالة لشرح مفهوم نمذجة معلومات البناء ، مع أخذ أمثلة للتصاميم التي تم عملها لبعض العناصر الإنشائية التي احتوتها دراسة الحالة.

2-4 النتائج المتحصل عليها لتصميم القواعد:

FOUNDATION DESIGN - COMBINED FOOTING

* Column E4-D4

A Material Properties

* Concrete Characteristic strength, f_{cu}	=	25	N/mm^2
* Yield Strength of reinforcement, f_y	=	460	N/mm^2
* Bar Diameter of reinforcing bars	=	16	mm
* Cover to main reinforcement, c	=	50	mm
* Soil bearing capacity, q	=	180	kN/m^2

B Dimension and Geometry

* Columns center to center of the two columns, L = 2.50 m
* Column Dimensions:

	Column 1	Column 2	
B =	250	250	mm
D =	500	500	mm

* Assumed length of combined footing, L_b = 4.00 m
* Thickness of the base (assumed) = 500 mm
* Effective depth for assumed thickness, d = 426 mm

C Loading Information:

	Column 1	Column 2	
* Dead load, G_k =	665	610	kN
* Live Load, Q_k =	75	75	kN

* Weight of combined base = 0.0 kN
* Total Service load = 1425.0 kN
* Total Ultimate load = 2025.0 kN

D Analysis of The base:

D1 Base Geometry

* Required areaof base = 7.92 m^2
* The required breadth of footing is = 1.98 m
* Select suitable breadth of base = 2.40 m

a = 1.20 m b = 1.30 m

* Edge distance from column 1 = 0.80 m
* Edge distance from column 2 = 0.70 m

With this arrangement the pressure will be uniform under the base.

* Earth pressure = 210.9 kN/m²

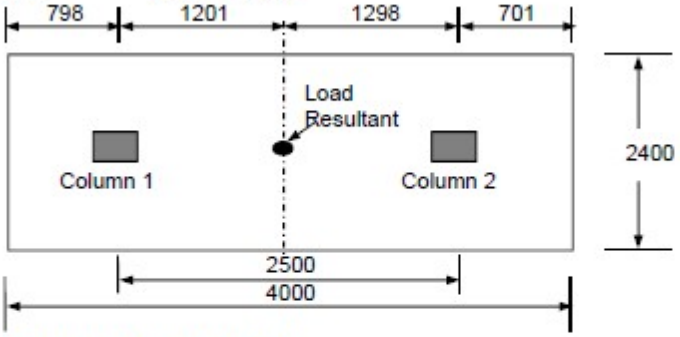


Fig. 1 Base Layou

D2 Bending Moment and Shearing Force:

D2-1 *X - Direction :*

x	0.00	0.80	2.08	3.30	4.00	m
V	0.0	404.1	0.0	618.7	0.0	kN
	-	-646.9	-	-355.3	-	
M	0.0	161.3	-252.0	126.1	0.0	kN-m

Table 1 Values of S B. M.

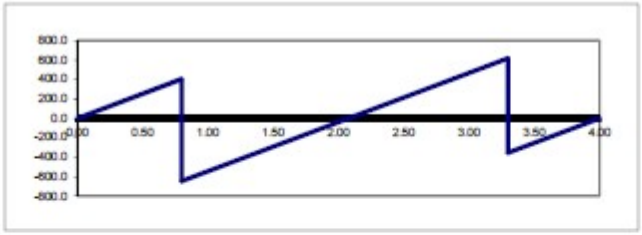


Fig. 2 Shear Forc Diagram (k

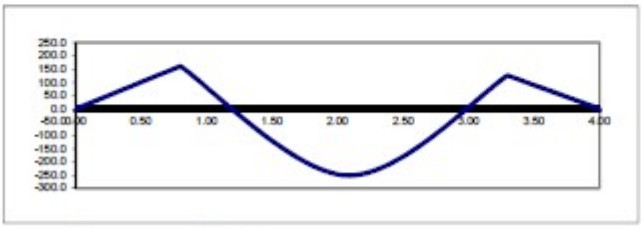


Fig. 3 Bending Mc Diagram (k

D2-2 Y- Direction and Transverse Bending

M = 121.9 kN-m/m

E Design For Bending

	X - Direction			Y -direction	
	Bottom- Column 1	Top	Bottom- Column 2	Bottom	Top
M =	161.3	252.0	126.1	121.9	-
k =	0.0148	0.0231	0.0116	0.0269	-
z/d =	0.98	0.97	0.99	0.97	-
z =	404.7	404.7	404.7	404.7	-
A_s =	995.9	1556.0	778.6	752.5	-
A_{smin} =	1560.0	1560.0	1560.0	650.0	650.0
A_{cr} =	1560.0	1560.0	1560.0	752.5	650.0
Bar Dia =	16	16	16	16	16
Nb =	8	8	8	3	3
S_{max} =	300.0	300.0	300.0	300.0	300.0
S_p =	100	150	100	100	150
A_{sp} =	5028.6	3419.4	5028.6	2212.6	1408.0
	Y16@100	Y16@150	Y16@100	Y16@100	Y16@150

G. SUMMARY

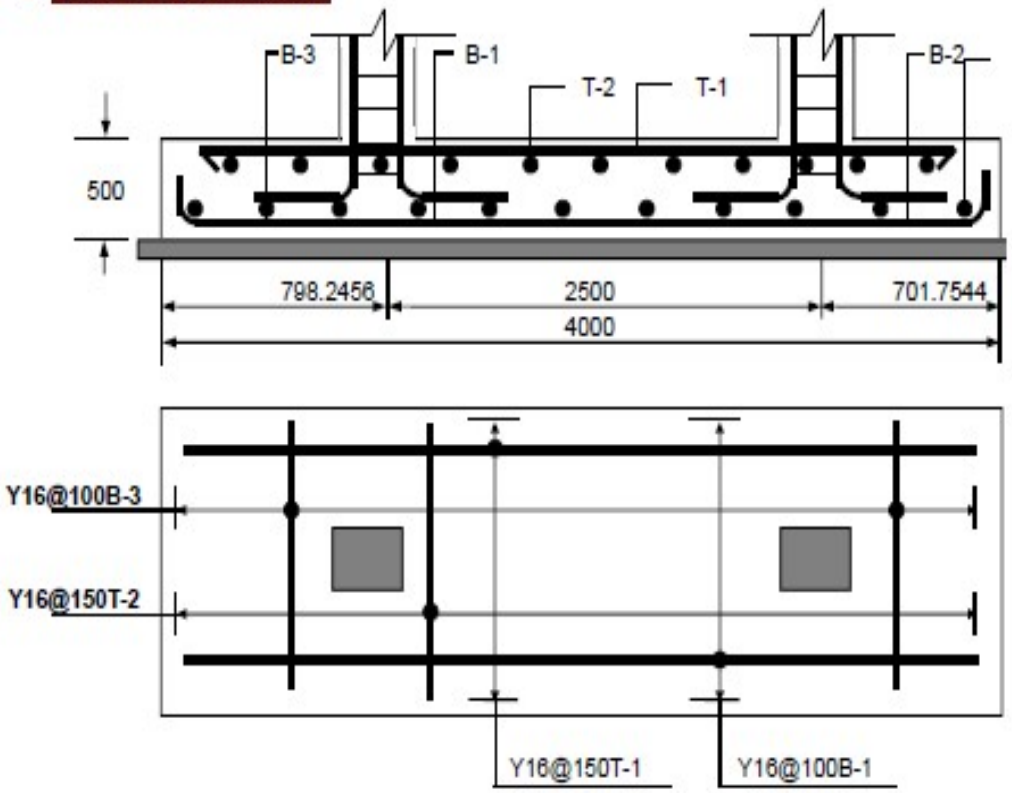
Base Data	B (m)	L (m)	H (m)	LED(m)	RED(m)
	2.40	4.00	0.50	0.80	0.70

Rein-force-ment	PARALLEL TO L			PARALLEL TO B	
	Bottom		Top	Transverse	
	Colum1	Column2		Bottom	TOP
	Y16@100	Y16@100	Y16@150	Y16@100	Y16@150

H. PERFORMANCE

Bearing Capacity : **82 %**
Bending Capacity : **31.0 %**
Av.Shaer Capacity : **41.1 %**
Cr. shear Capacity: **57.7 %**

J. STRUCTURAL DETAILING



COMBINED FOOTING - TYPICAL DETAIL
NOT TO SCALE

Notes:

* *All Dimensions are in mm*
* *Concrete Grade :* **25**
* *Steel Grade :* **460**
* *Total Concrete Volume for base is* **4.8**

FOUNDATION DESIGN - PAD SQUARE BASE

PAGE 1/2

A. FOOTING TYPE: F1

B. Soil Bearing Capacity (*accumed*) = 180 kN/sq.m

C. MATERIALS : f_{cu} = 25 N/sq.mm f_y = 460 N/sq.mm

D. BEARING CAPACITY REQUIREMENTS:

Column Loads				*Column Dimensions:*			
* Ultimate load	=	1248.0	kN	B_C	=	250	mm
* Service Load	=	868.0	kN	H_C	=	500	mm

* Required Base Area A_r = 6.31 sq.m — *B(required)* = 2.30 m

Selected B = 2.50 m

A_p = 6.25 sq.m

* Earth pressure EP = 188.7 kN/sq.m
* Assume depth of Base, h = 500 mm — d = 426.0 mm
* Bar Diameter (mm) = 16 mm — A_{bar} = 201.1 sq.mm

E. DESIGN FOR BENDING

M = 316.9 kN-m — *M = qB(B-BC)^2/2*

k = 0.0279 — *k = M/bd^2 fbu*

z/d = 0.97 — *z/d = 0.5 + sqrt(0.25 - k/0.9)*

z = 404.7 mm — *z <= 0.95d*

A_s = 1960.6 sq.mm — *As = M/0.95f_y z*

A_{smin} = 1625 sq.mm — *Asmin = 0.13Bh/100 for fy = 460N/sq.mm*

A_{sr} = 1960.6 sq.mm — *Asmin = 0.24Bh/100 for fy = 250N/sq.mm*

N_{bar} = 10

S_{max} = 250 mm

Spacing = 150 mm — * *Select spacing here <= S max.*

A_{sp} = 3418.4 sq.mm

F. DESIGN FOR SHEAR:

1- Average Shear: V_{av} = 1248.00 kN — Perimeter u_1 = 1600 mm

v_{av} = 1.95 N/sq.mm — *v_{av} =V_av/bd*

v_{conc} = 4.00 N/sq.mm OK — *v_{conc} =0.8sqrt(f_cu)*

2- Critical Shear: V_{cr} = 348.94 kN — *V_cr = q*B*((B - BC)/2 - d)*

v_{cr} = 0.33 N/sq.mm — *v_cr = V_cr/u_1 d*

$100A_s/bd$ = 0.32

v_c = 0.43 N/sq.mm OK

v_c = 0.79(100A_s/100)^0.333(400/d)^0.25/1.25

3-Punching Shear: a_1 = 1.78 m — a_2 = 1.528 m

V_p = 705.51 kN — Perimeter u_2 = 6812 mm

v_p = 0.25 N/sq.mm OK

V_p =q[B*B - (3d+BC)*(3d+HC)], v_p = V_p/u_2d*

G. SUMMARY

Base Data	B (m)	L (m)	H (m)	Reinforcement
	2.50	2.50	0.50	Y16@150e.w.

H. PERFORMANCE

Bearing Capacity : 86.0 %

Bending Capacity : 67.0 %

Shaer Capacity : 76.7 %

Punching Capacity: 67.8 %

FOUNDATION DESIGN - PAD SQUARE BASE

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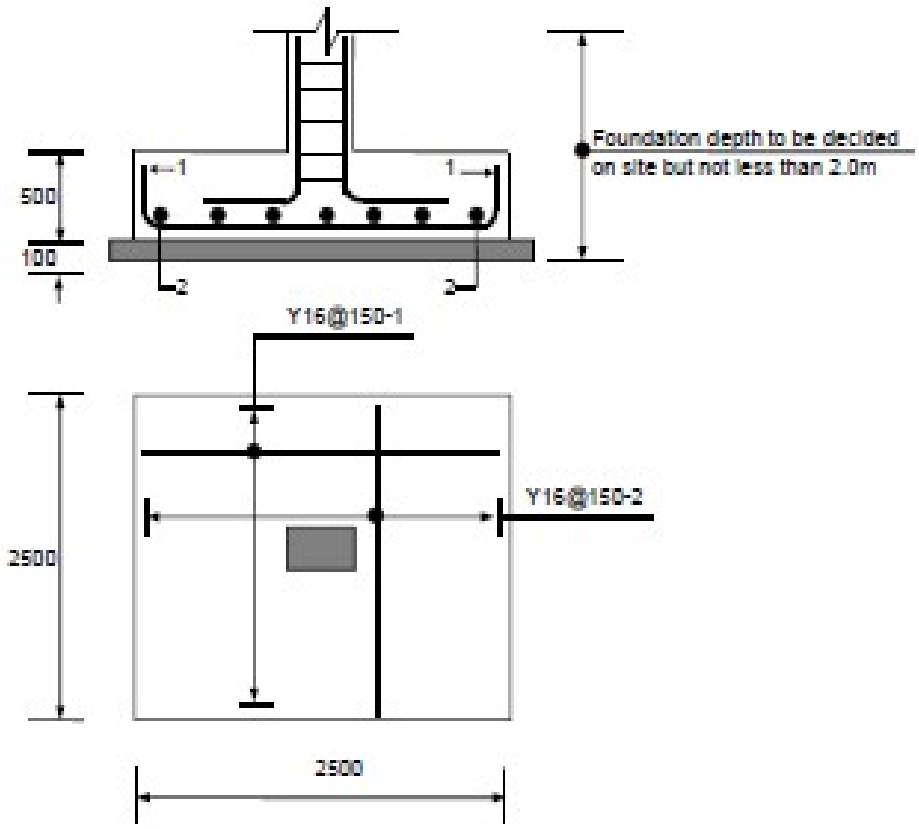
K. STRUCTURAL DETAILING



FOUNDATION DETAIL FOR COLUMN : F1

Notes:

- *All Dimensions are in mm*
- *Concrete Grade : 26*
- *Steel Grade : 460*
- *Total Concrete Volume for base is 3.13 m^3*

3-4 النتائج المتحصل عليها من إجراء اختبار القص الإختراقي:

Punching Shear Check (BS8110-1:1997)

Input						
fcu =	25	N/mm2				
fy =	460	N/mm2				
Slab Thickness =	200	mm				
Bar Size =	16	mm	Spacing =	150	mm	
Cover =	25	mm				
dav =	159	mm	Asprov =	1339.7	mm2	
Out put						
1- at the column face :						
0.8 (fcu)^0.5 =	4.0					
0.8 (fcu)^0.5 vs 5 =	4.0					
1- at 1.5d from the column face :						
(100As/bv*d) =	0.8426		Should not be taken as greater than 3			
(400/d)^(0.25) =	1.259406		Should not be taken as less than 0.6			
(fcu/25) =	1		Should not be taken as less than 1			
Vc =	0.751778	N/mm2				