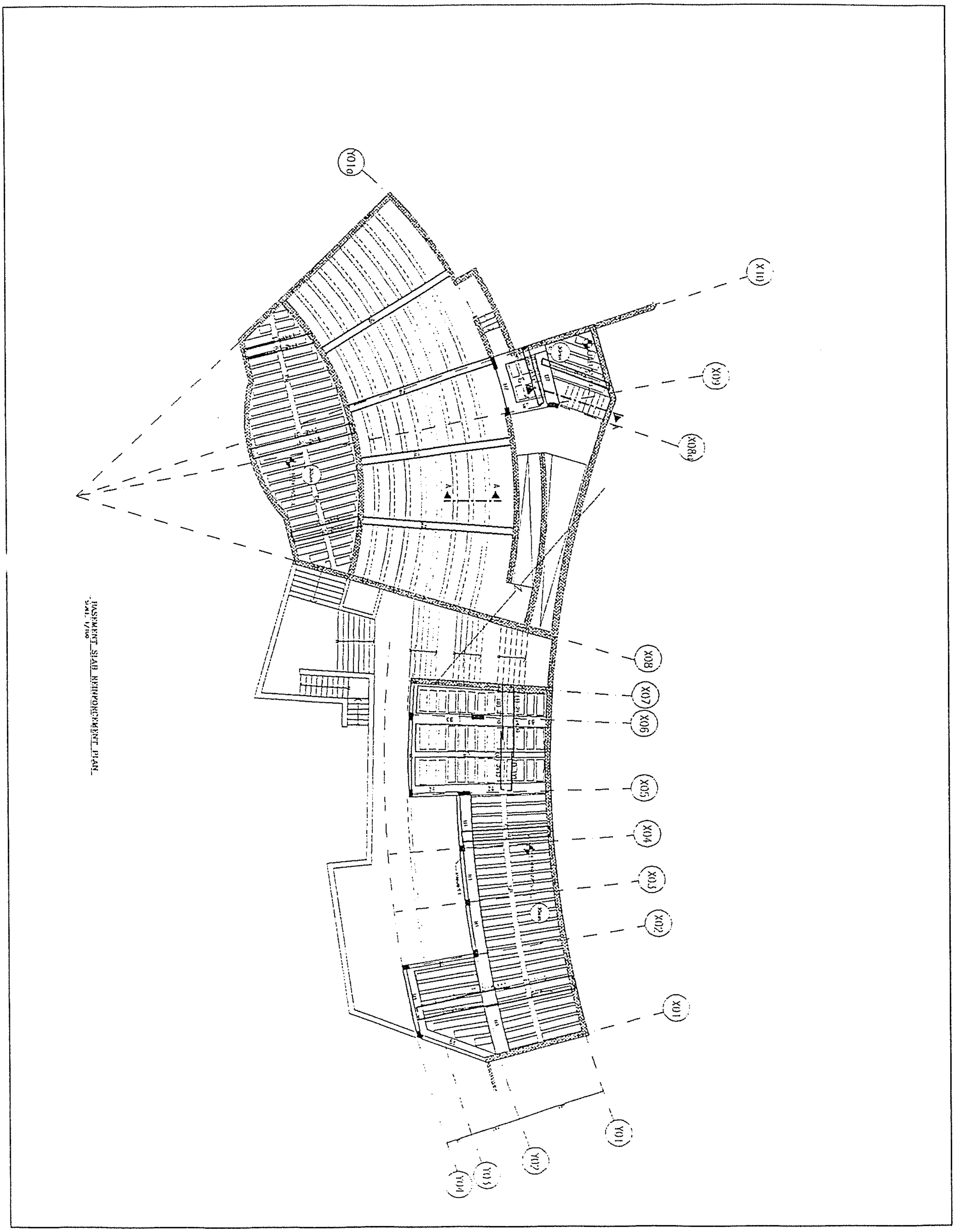
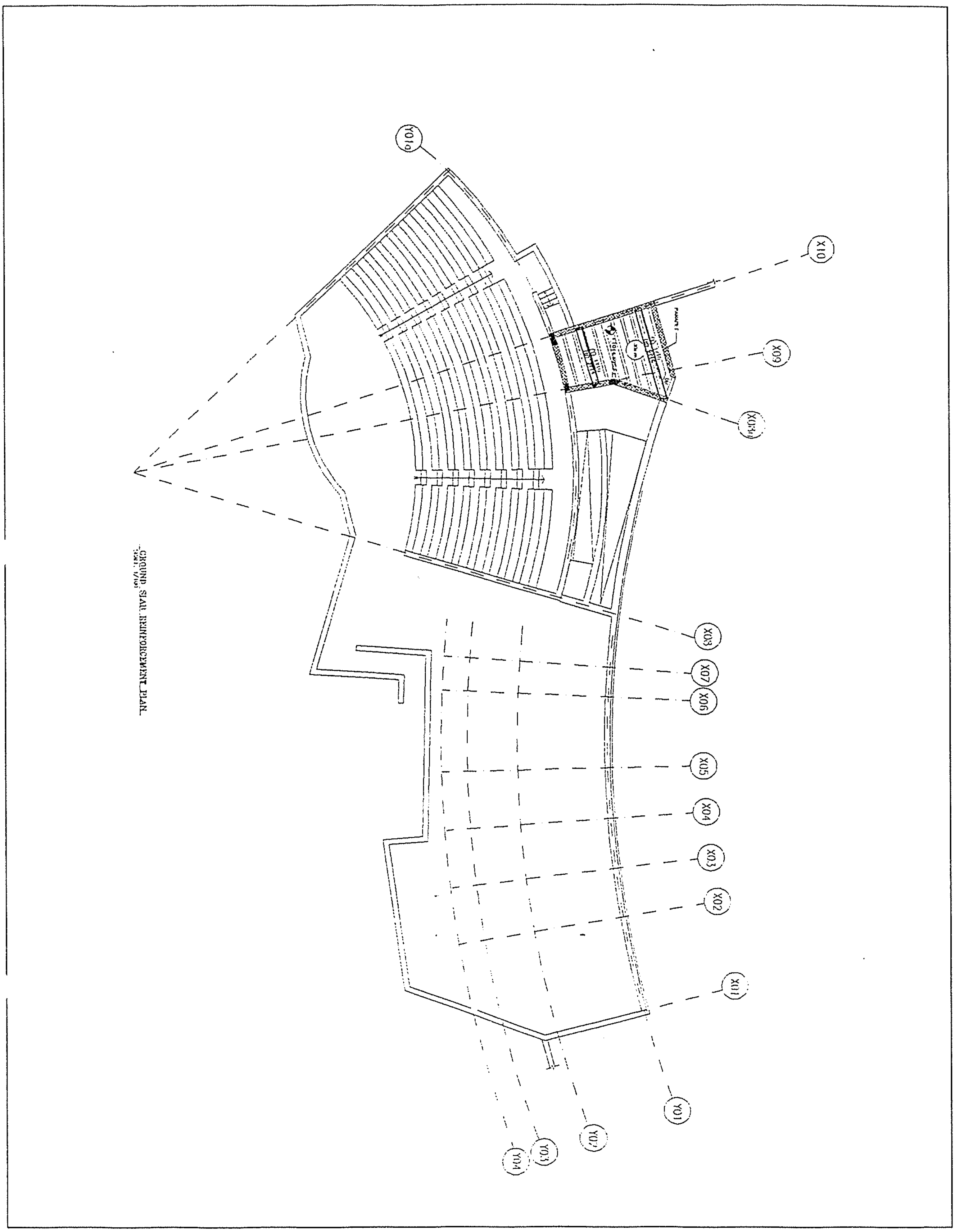
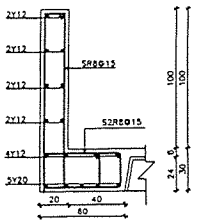
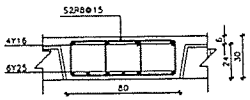
STRUCURAL DETAILS


BASEMENT SLAB REINFORCEMENT PLAN

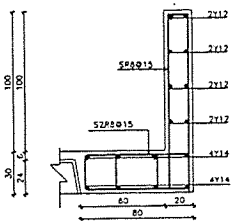

GROUND SLAB REINFORCEMENT PLAN
Y01a
X10
X09
X03a
X08
X07
X06
X05
X04
X03
X02
X01
Y01
Y02
Y03
Y04



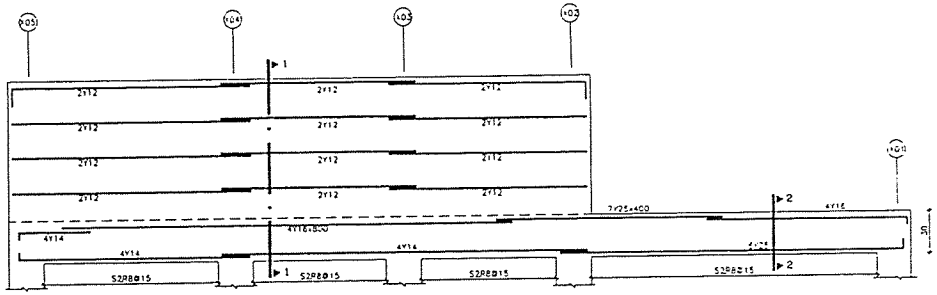
TYPICAL SECTION THROUGH B4
SCALE: 1/20



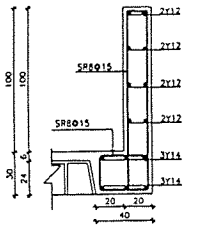
SECTION(2-2) THROUGH B1
SCALE: 1/20



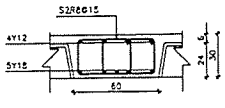
SECTION (1-1) THROUGH B1
SCALE: 1/20



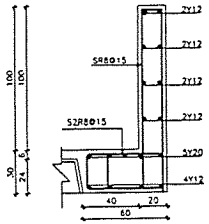
LONGITNDINAL SECTION THROUGH B1
SCALE H=1/50 V=1/20



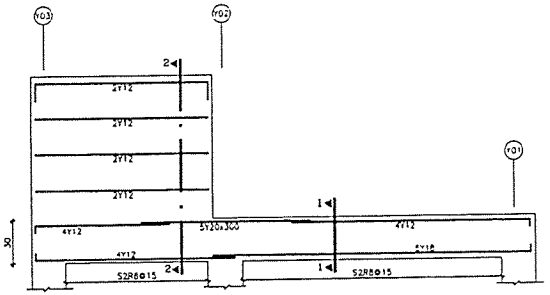
TYPICAL SECTION THROUGH B5
SCALE: 1/20



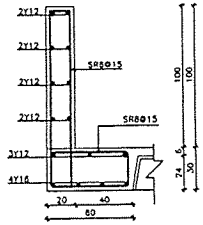
SECTION(1-1) THROUGH B2
SCALE: 1/20



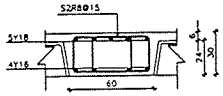
SECTION (2-2) THROUGH B2
SCALE 1/20



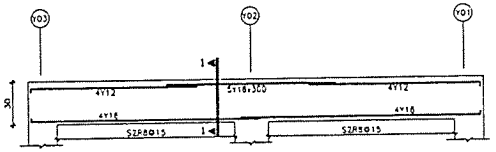
LONGITNDINAL SECTION THROUGH B2
SCALE H=1/50 V=1/20



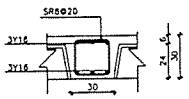
TYPICAL SECTION THROUGH B6
SCALE: 1/20



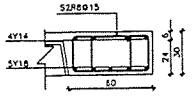
SECTION(1-1) THROUGH B3
SCALE: 1/20



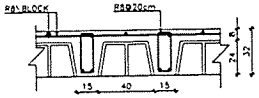
LONGITNDINAL SECTION THROUGH B3
SCALE H=1/50 V=1/20



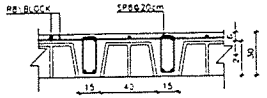
TYPICAL SECTION THROUGH CR
SCALE: 1/20



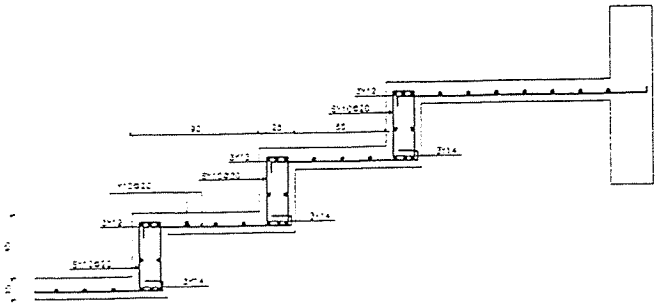
TYPICAL SECTION THROUGH B7
SCALE 1/20



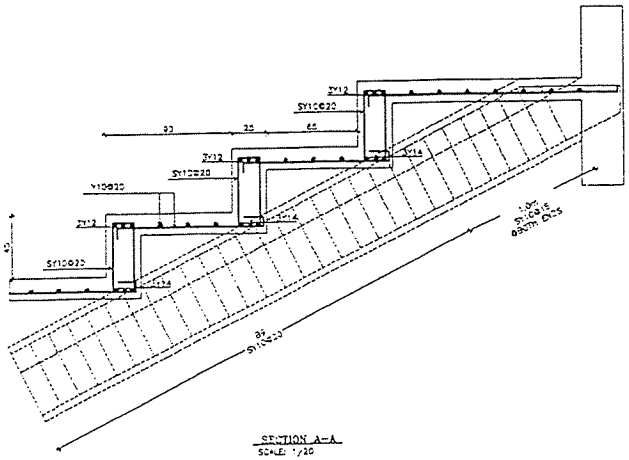
TYPICAL SECTION THROUGH (32cm) SLAB
BLOCK:40cm/RIBS:15cm
SCALE: 1/20



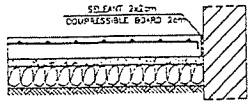
TYPICAL SECTION THROUGH (30cm) SLAB
BLOCK:40cm/RIBS:15cm
SCALE: 1/20



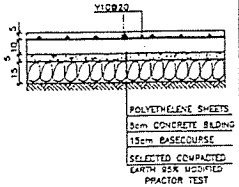
TYPICAL SECTION THROUGH STAIRS
SCALE: 1/20



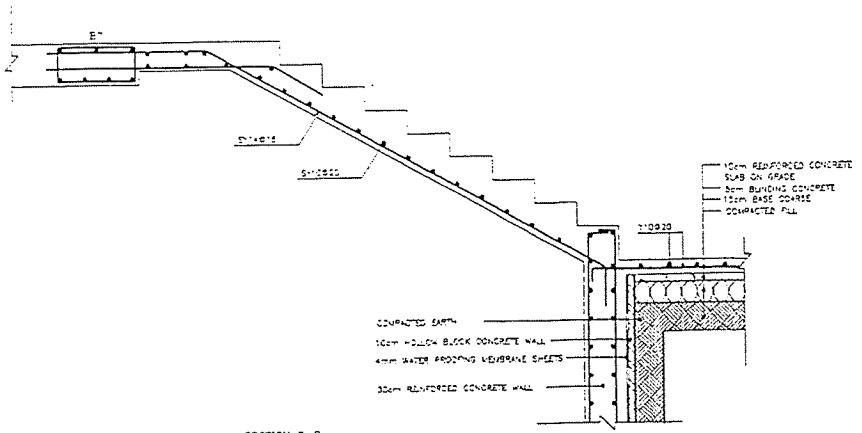
SECTION A-A
SCALE: 1/20



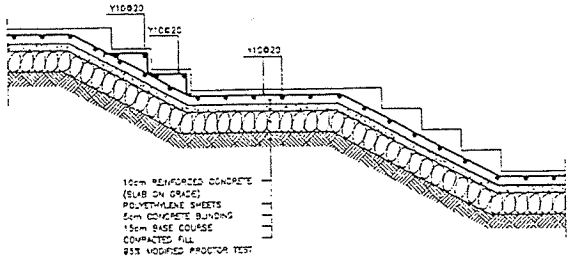
ISOLATION JOINT
SCALE: 1/20



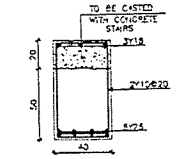
TYPICAL SECTION THROUGH SLAB ON GRADE (SOG)
SCALE: 1/20



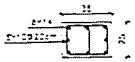
SECTION B-B
SCALE: 1/20



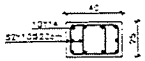
TYPICAL SECTION THROUGH OUTSIDE STAIRS ON GRADE
SCALE: 1/20



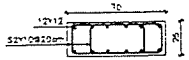
TYPICAL SECTION THROUGH BB
SCALE: 1/20



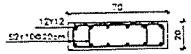
SECTION THROUGH C1
SCALE: 1:20



SECTION THROUGH C2
SCALE: 1/20



SECTION THROUGH C3
SCALE: 1/20



SECTION THROUGH C4
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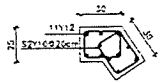
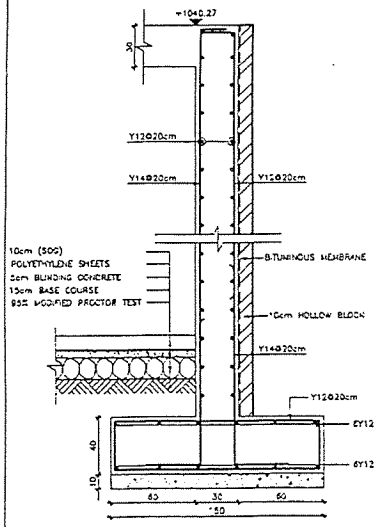
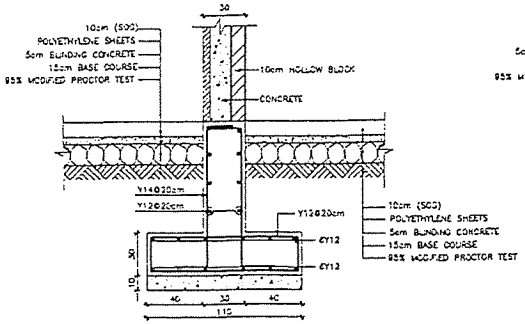


SECTION THROUGH C5
SCALE: 1/20

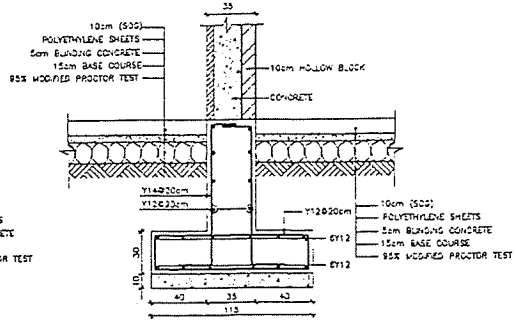
COLUMNS REINFORCEMENT DETAILS



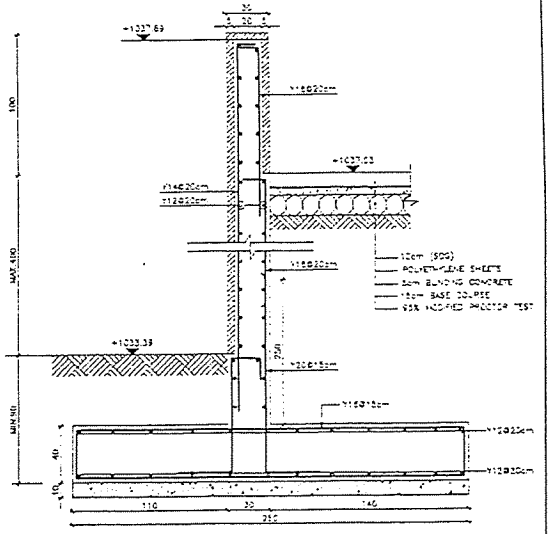
SECTION 1-1
SCALE 1/20



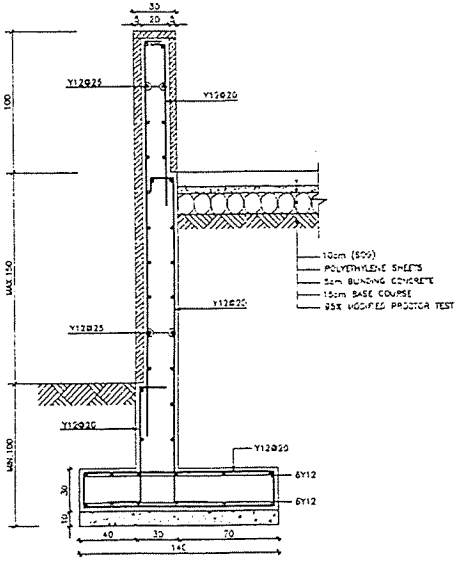
SECTION 2-2
SCALE 1/20



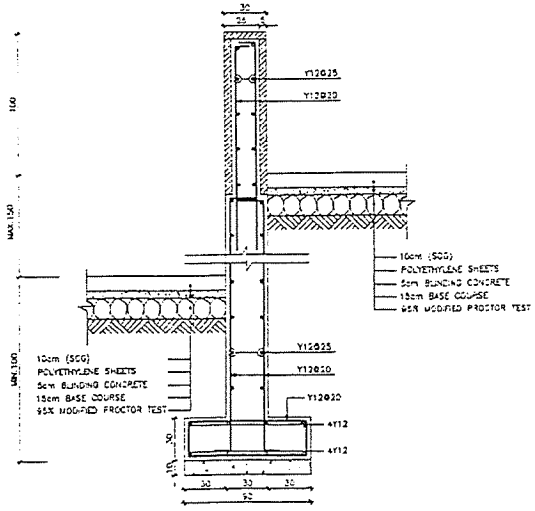
SECTION 3-3
SCALE 1/20



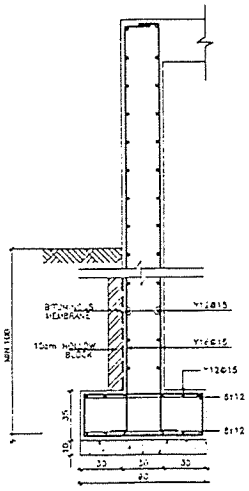
SECTION 4-4
SCALE 1/20



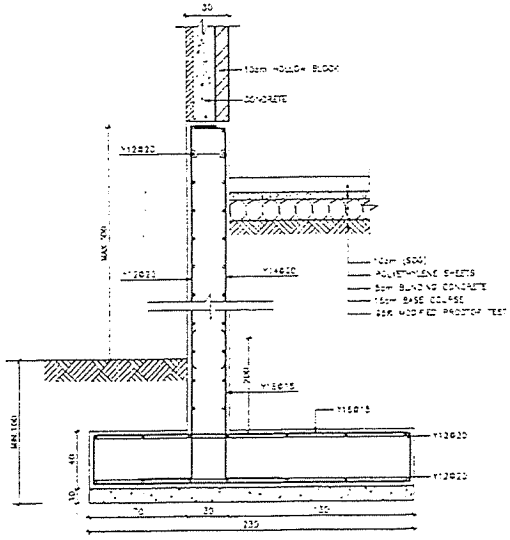
SECTION 5-5
SCALE 1/20

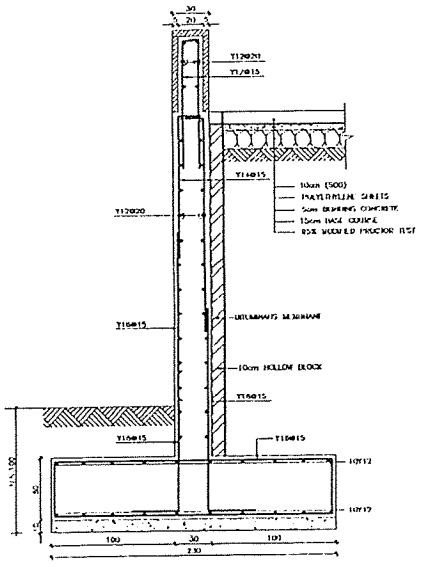


SECTION 6-6
SCALE 1/20

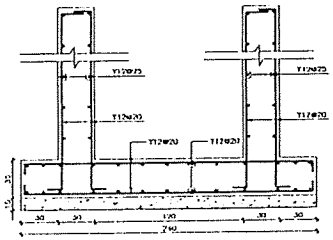


SECTION 7-7
SCALE 1/20

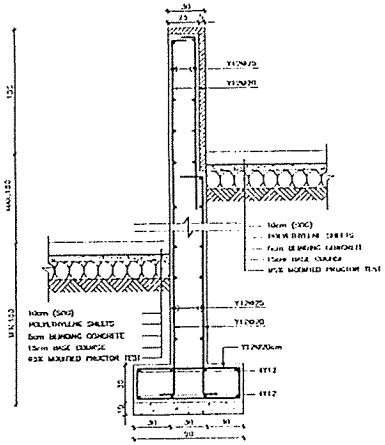




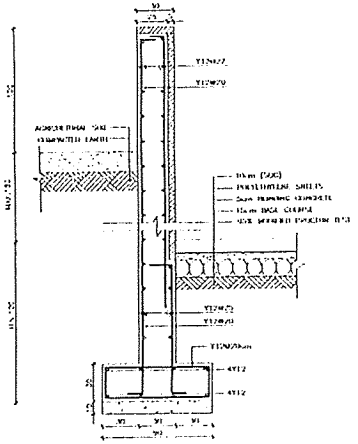
SECTION 8-8
SCALE 1/20



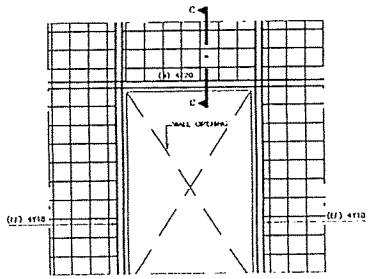
SECTION 9-9
SCALE 1/20

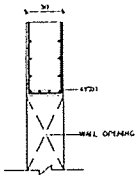


SECTION 10-10
SCALE 1/20



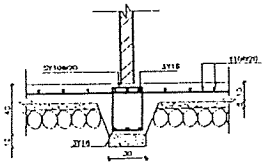
SECTION 11-11
SCALE 1/20



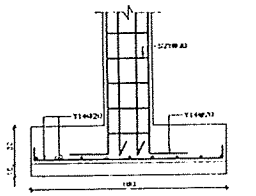


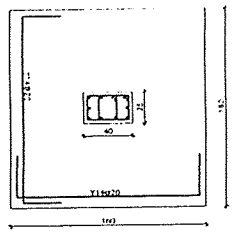
SECTION C-C
SCALE 1/20

TYPICAL WALL OPENING REINFORCEMENT DETAIL
SCALE AS SHOWN

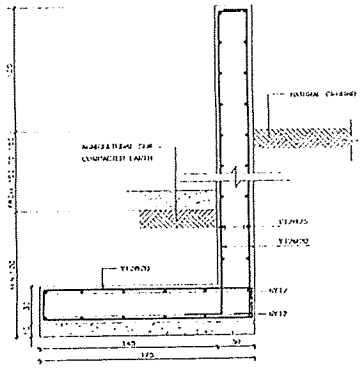


TYPICAL SECTION THROUGH UB BEAMS BELOW PARTITIONS
SCALE 1/20

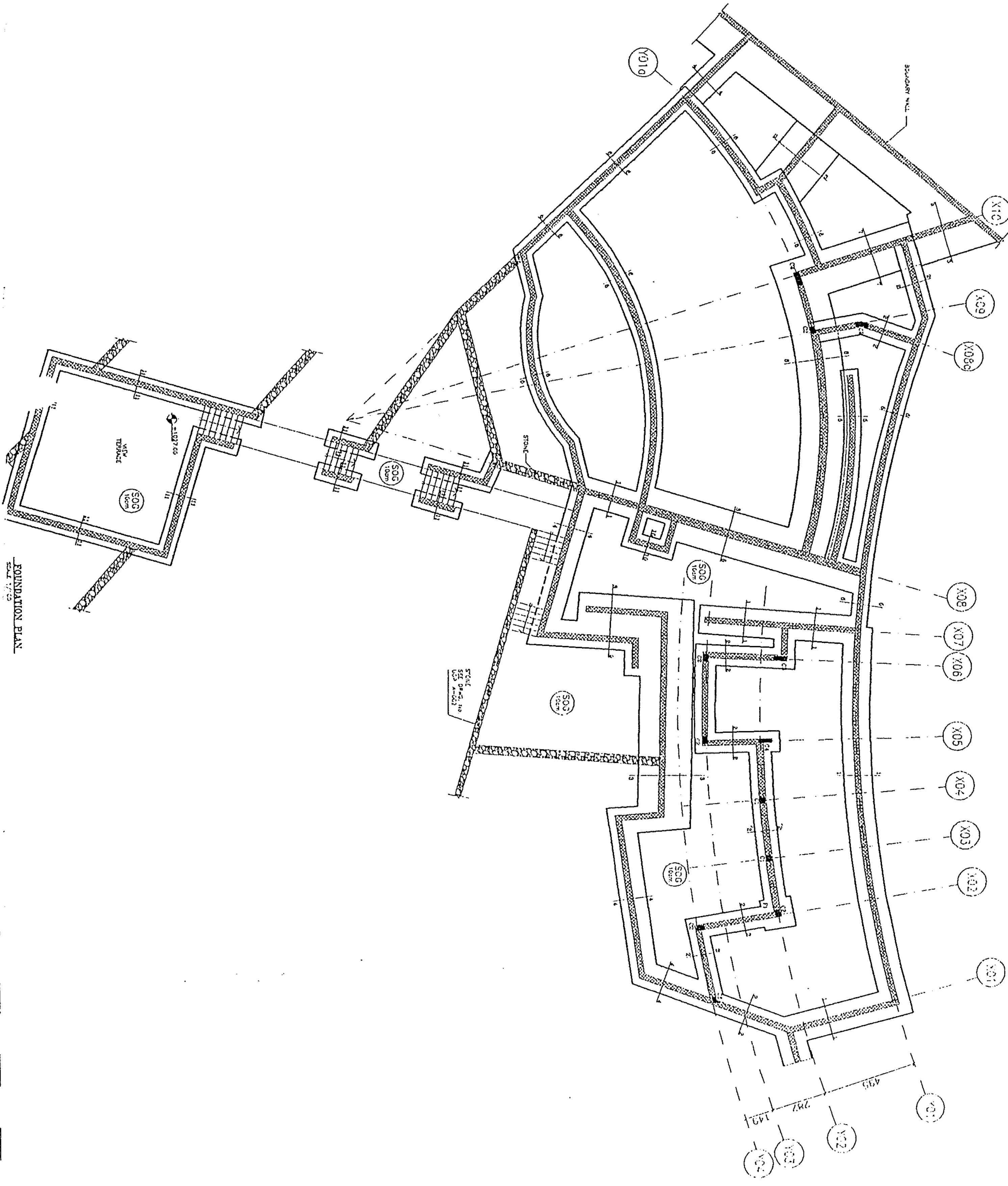




FLOOR DETAILS
SCALE 1/20



TYPICAL SECTION THROUGH BOUNDARY WALL
SCALE 1/20



FOUNDATION PLAN

LOWER OBSERVATION POINT

consolidated consultants engineering & environment	Project: Karak Tourism Development	Number: 7
	Subject: Lower observation point	
		Made by / Date
		Checked / Date

1. Design of slab and Beams

Load calculations :

slab system : one way ribbed slab , 25 cm thickness

own weight : 4.12 KN/m^2

FILL & TILES : 4.0 KN/m^2

Total dead Load : 6.12 KN/m^2

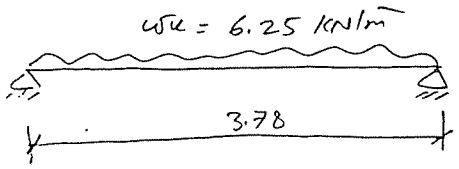
Live Load : 2.0 KN/m^2

$W_u = 1.4(6.12) + 1.6(2.0)$

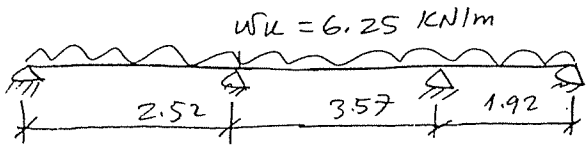
$W_u = 11.77 \simeq 12.0$ KN/m^2

Design of Ribs :

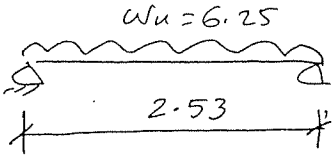
"R_1"



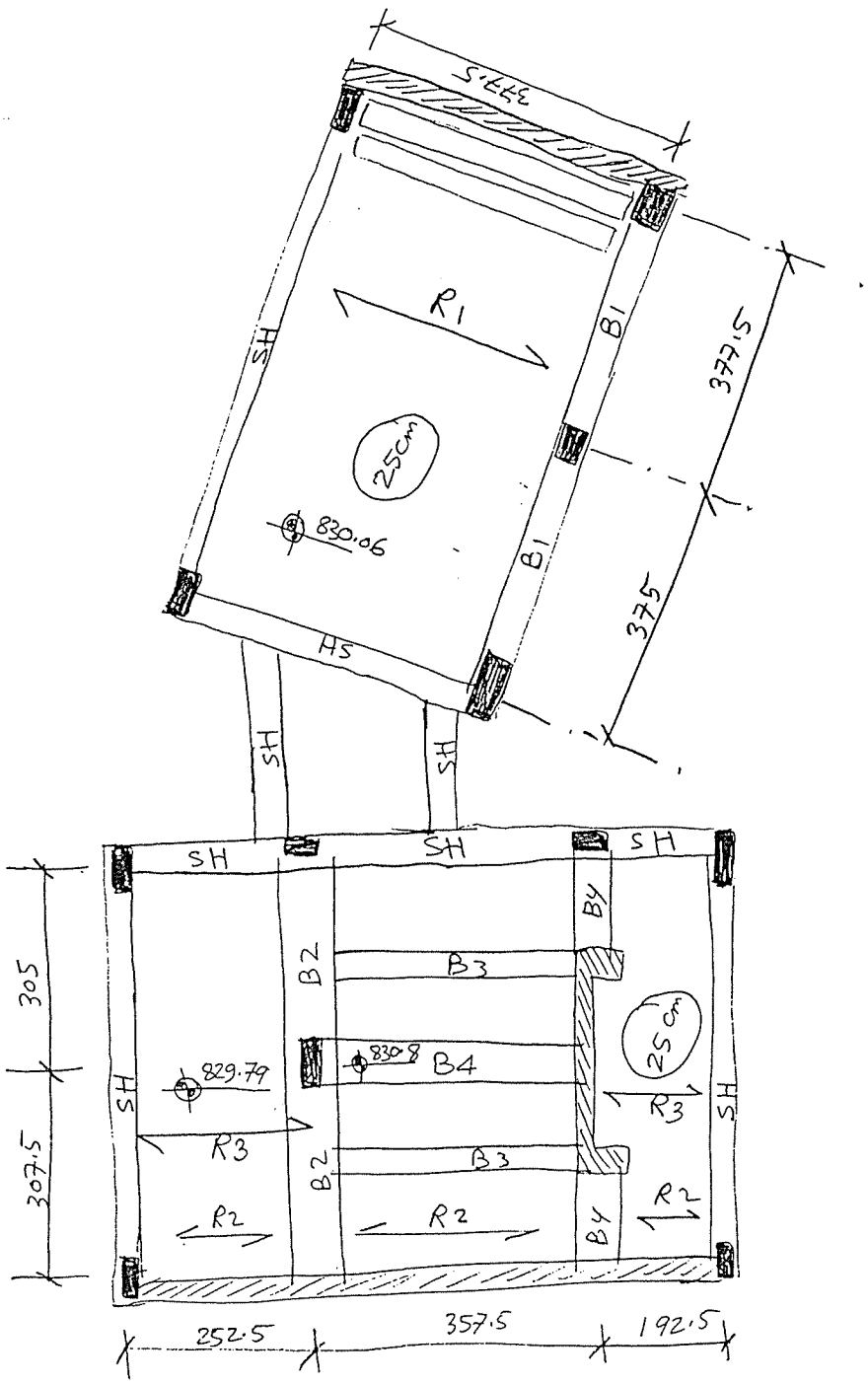
"R_2"



"R_3"



consolidated consultants engineering & environment	Project	Number 2
	Subject	
		Made by / Date
		Checked / Date



Slab plan

consolidated consultants engineering & environment	Project	Number 3
	Subject	
		Made by / Date
		Checked / Date

Design of Beams:

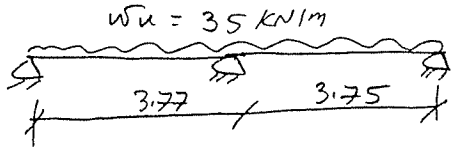
B1 (25 x 50)

Slab = 12 x 1.9 = 22.8 kN

ow = 3 x 1.14 = 4.2 kN

Parapet = 0.25 x 24 x 1.4 = 8.4 kN

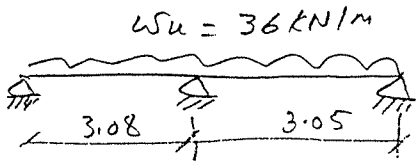
Total = 35.4 kN/m



B1

B2 (25 x 60)

Slab = 3 x 12 = 36 kN/m
(including ow)

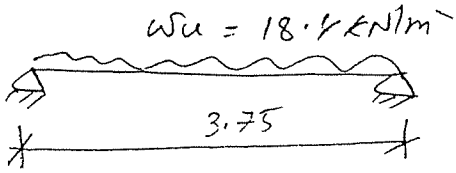


B3 (25 x 70)

ow = 0.25 x 24 x 1.4 = 8.4

sky light weight = 10

18.4 kN



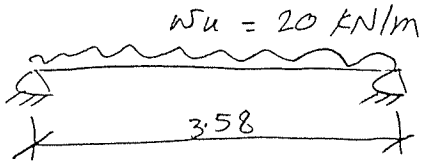
B4 (25 x 60)

ow = 0.15 x 24 x 1.4 = 5.04

Le = 2 x 0.6 x 1.6 = 5.12

sky light weight = 10

20 kN/m



SPANS Bent and Beam Analysis Program V4.1 SPANS
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R1

Number of spans = 1 Number of load cases = 1

Span	Length	Width	Depth	Flange thickness	Flange width
1	3.780	0.120	0.250	0.070	0.520

Load case number : 1

Span	UDL	Load 1		Load 2		Load 3		Load 4		Load 5	
		Val	Dis	Val	Dis	Val	Dis	Val	Dis	Val	Dis
1	6.25	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Span Line Load From Length Intensity

Support	Width	Redistribution
1	0.000	0 %
2	0.000	0 %

elope

Span	lft BM	span BM	rgt BM	lft SF	rgt SF
1	0.0	11.2	-0.0	11.8	-11.8

Required Steel Areas (mm square)

Span	Top L	Bot L	Top M	Bot M	Top R	Bot R
1	39	0	0	152	39	0

Maximum Spacing of Shear Stirrups in mm

Span	leg	L-zone	spacing	dia.	R-zone	spacing	dia.	Rest-spc	dia.
1	2	0.94	161	8	0.94	161	8	161	8

Span 1
Span/Depth 17.6
Allowable 30.1

39	0	39	Requ. Top
1 Φ 10	0 Φ 0	1 Φ 10	
0 Φ 0	0 Φ 0	0 Φ 0	
79	0	79	Prov. Top
	span 1		
0	152	0	Requ. Bot
0 Φ 0	2 Φ 14	0 Φ 0	
0 Φ 0	0 Φ 0	0 Φ 0	
0	308	0	Prov. Bot

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R2

Number of spans = 3 Number of load cases = 1

Span	Length	Width	Depth	Flange thickness	Flange width
1	2.520	0.120	0.250	0.070	0.520
2	3.570	0.120	0.250	0.070	0.520
3	1.920	0.120	0.250	0.070	0.520

Load case number : 1

Span	UDL	Load 1		Load 2		Load 3		Load 4		Load 5	
		Val	Dis	Val	Dis	Val	Dis	Val	Dis	Val	Dis
1	6.25	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	6.25	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	6.25	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Span Line Load From Length Intensity

Support	Width	Redistribution
1	0.000	0 %
2	0.000	0 %
3	0.000	0 %
4	0.000	0 %

Envelope

Span	lft BM	span BM	rgt BM	lft SF	rgt SF
1	0.0	2.3	-6.3	5.4	-10.4
2	-6.3	4.1	-5.4	11.4	-10.9
3	-5.4	0.8	0.0	8.8	-3.2

Required Steel Areas (mm square)

Span	Top L	Bot L	Top M	Bot M	Top R	Bot R
1	39	0	0	39	87	0
2	87	0	0	56	74	0
3	74	0	0	39	39	0

Maximum Spacing of Shear Stirrups in mm

Span	leg	L-zone	spacing	dia.	R-zone	spacing	dia.	Rest-spc	dia.
1	2	0.63	161	8	0.63	161	8	161	8
2	2	0.89	161	8	0.89	161	8	161	8
3	2	0.48	161	8	0.48	161	8	161	8

Span	1	2	3
Span/Depth	11.7	16.6	8.9
Allowable	36.8	41.6	36.8

39	0	87	0	74	0	39	Requ. Top
0 Φ 10	0 Φ 0	2 Φ 12	0 Φ 0	2 Φ 12	0 Φ 0	2 Φ 12	
0 Φ 0	0 Φ 0	0 Φ 0	0 Φ 0	0 Φ 0	0 Φ 0	0 Φ 0	
79	0	226	0	226	0	226	Prov. Top

span 1	span 2	span 3

	0		39		0		56		0		39		0	Requ. Bot
0	Φ	0	2	Φ	12	0	Φ	0	2	Φ	12	0	Φ	0	2	Φ	0	
0	Φ	0	0	Φ	0	0	Φ	0	0	Φ	0	0	Φ	0	0	Φ	0	
	0		226		0		226		0		226		0	Prov. Bot

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R3

Number of spans = 1 Number of load cases = 1

Span	Length	Width	Depth	Flange thickness	Flange width
1	2.530	0.120	0.250	0.070	0.520

Load case number : 1

Span	UDL	Load 1		Load 2		Load 3		Load 4		Load 5	
		Val	Dis	Val	Dis	Val	Dis	Val	Dis	Val	Dis
1	6.24	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Span Line Load From Length Intensity

Support	Width	Redistribution
1	0.000	0 %
2	0.000	0 %

velope

Span	lft BM	span BM	rgt BM	lft SF	rgt SF
1	0.0	5.0	-0.0	7.9	-7.9

Required Steel Areas (mm square)

Span	Top L	Bot L	Top M	Bot M	Top R	Bot R
1	39	0	0	68	39	0

Maximum Spacing of Shear Stirrups in mm

Span	leg	L-zone	spacing	dia.	R-zone	spacing	dia.	Rest-spc	dia.
1	2	0.63	161	8	0.63	161	8	161	8

Span 1
Span/Depth 11.8
Allowable 32.0

39	0	39	Requ. Top
1 Φ 10	0 Φ 0	1 Φ 10	
0 Φ 0	0 Φ 0	0 Φ 0	
79	0	79	Prov. Top
	span 1		
0	68	0	Requ. Bot
0 Φ 0	2 Φ 12	0 Φ 12	
0 Φ 0	0 Φ 0	0 Φ 0	
0	226	0	Prov. Bot

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B1

Number of spans = 2 Number of load cases = 1

Span	Length	Width	Depth	Flange thickness	Flange width
1	3.775	0.500	0.250	0.000	0.500
2	3.750	0.500	0.250	0.000	0.500

Load case number : 1

Span	UDL	Load 1		Load 2		Load 3		Load 4		Load 5	
		Val	Dis	Val	Dis	Val	Dis	Val	Dis	Val	Dis
1	35.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	35.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Span Line Load From Length Intensity

Support	Width	Redistribution
^	0.000	0 %
-	0.000	0 %
3	0.000	0 %

Envelope

Span	lft BM	span BM	rgt BM	lft SF	rgt SF
1	0.0	35.2	-61.9	49.7	-82.5
2	-61.9	34.4	0.0	82.1	-49.1

Required Steel Areas (mm square)

Span	Top L	Bot L	Top M	Bot M	Top R	Bot R
1	164	0	0	496	951	0
2	951	0	0	484	164	0

Maximum Spacing of Shear Stirrups in mm

Span	leg	L-zone	spacing	dia.	R-zone	spacing	dia.	Rest-spc	dia.
1	2	0.94	122	8	0.94	122	8	122	8
2	2	0.94	122	8	0.94	122	8	122	8

Span	1	2
Span/Depth	17.6	17.4
Allowable	29.9	30.1

164	0	951	0	164	Requ. Top
3 Φ 12	0 Φ 0	5 Φ 20	0 Φ 0	3 Φ 12	
0 Φ 0	0 Φ 0	0 Φ 0	0 Φ 0	0 Φ 0	
339	0	1570	0	339	Prov. Top

	span 1		span 2		
0	496	0	484	0	Requ. Bot
0 Φ 0	4 Φ 16	0 Φ 0	4 Φ 16	0 Φ 0	
0 Φ 0	0 Φ 0	0 Φ 0	0 Φ 0	0 Φ 0	
0	804	0	804	0	Prov. Bot

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B2

Number of spans = 2 Number of load cases = 1

Span	Length	Width	Depth	Flange thickness	Flange width
1	3.050	0.600	0.250	0.000	0.600
2	3.080	0.600	0.250	0.000	0.600

Load case number : 1

Span	UDL	Load 1		Load 2		Load 3		Load 4		Load 5	
		Val	Dis	Val	Dis	Val	Dis	Val	Dis	Val	Dis
1	36.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	36.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Span Line Load From Length Intensity

Support	Width	Redistribution
1	0.000	0 %
2	0.000	0 %
3	0.000	0 %

Envelope

Span	lft BM	span BM	rgt BM	lft SF	rgt SF
1	-0.0	23.4	-42.3	41.0	-68.8
2	-42.3	24.2	-0.0	69.2	-41.7

Required Steel Areas (mm square)

Span	Top L	Bot L	Top M	Bot M	Top R	Bot R
1	196	0	0	318	595	0
2	595	0	0	328	196	0

Maximum Spacing of Shear Stirrups in mm

Span	leg	L-zone	spacing	dia.	R-zone	spacing	dia.	Rest-spc	dia.
1	2	0.76	102	8	0.76	102	8	102	8
2	2	0.77	102	8	0.77	102	8	102	8

Span	1	2
Span/Depth	14.2	14.3
Allowable	36.6	36.3

196	0	595	0	196	Requ. Top
4 Φ 12	0 Φ 0	6 Φ 14	0 Φ 0	4 Φ 12	
0 Φ 0	0 Φ 0	0 Φ 0	0 Φ 0	0 Φ 0	
452	0	923	0	452	Prov. Top
	span 1		span 2		
0	318	0	328	0	Requ. Bot
0 Φ 0	5 Φ 16	0 Φ 0	5 Φ 16	0 Φ 0	
0 Φ 0	0 Φ 0	0 Φ 0	0 Φ 0	0 Φ 0	
0	1005	0	1005	0	Prov. Bot

SPANS Bent and Beam Analysis Program V4.1 SPANS
SPANS Prepared by H. Saffarini 2/2/93 SPANS

B3

Number of spans = 1 Number of load cases = 1

Span	Length	Width	Depth	Flange thickness	Flange width
1	3.750	0.700	0.250	0.000	0.700

Load case number : 1

Span	UDL	Load 1		Load 2		Load 3		Load 4		Load 5	
		Val	Dis	Val	Dis	Val	Dis	Val	Dis	Val	Dis
1	20.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Span Line Load From Length Intensity

Support	Width	Redistribution
1	0.000	0 %
2	0.000	0 %

Envelope

Span	lft BM	span BM	rgt BM	lft SF	rgt SF
1	0.0	35.2	0.0	37.5	-37.5

Required Steel Areas (mm square)

Span	Top L	Bot L	Top M	Bot M	Top R	Bot R
1	229	0	0	482	229	0

Maximum Spacing of Shear Stirrups in mm

Span	leg	L-zone	spacing	dia.	R-zone	spacing	dia.	Rest-spc	dia.
1	4	0.94	161	8	0.94	161	8	161	8

Span 1
Span/Depth 17.4
Allowable 29.3

229	0	229 Requ. Top
4 Φ 12	0 Φ 0	4 Φ 12
0 Φ 0	0 Φ 0	0 Φ 0
452	0	452 Prov. Top

|	span 1	|
0	482	0 Requ. Bot
0 Φ 0	6 Φ 14	0 Φ 0
0 Φ 0	0 Φ 0	0 Φ 0
0	923	0 Prov. Bot

SPANS Bent and Beam Analysis Program V4.1 SPANS
SPANS Prepared by H. Saffarini 2/2/93 SPANS

B4

Number of spans = 1 Number of load cases = 1

Span	Length	Width	Depth	Flange thickness	Flange width
1	3.580	0.600	0.250	0.000	0.600

Load case number : 1

Span	UDL	Load 1		Load 2		Load 3		Load 4		Load 5	
		Val	Dis	Val	Dis	Val	Dis	Val	Dis	Val	Dis
1	20.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Span Line Load From Length Intensity

Support	Width	Redistribution
1	0.000	0 %
2	0.000	0 %

velope

Span	lft BM	span BM	rgt BM	lft SF	rgt SF
1	0.0	32.0	0.0	35.8	-35.8

Required Steel Areas (mm square)

Span	Top L	Bot L	Top M	Bot M	Top R	Bot R
1	196	0	0	441	196	0

Maximum Spacing of Shear Stirrups in mm

Span	leg	L-zone	spacing	dia.	R-zone	spacing	dia.	Rest-spc	dia.
1	2	0.89	102	8	0.89	102	8	102	8

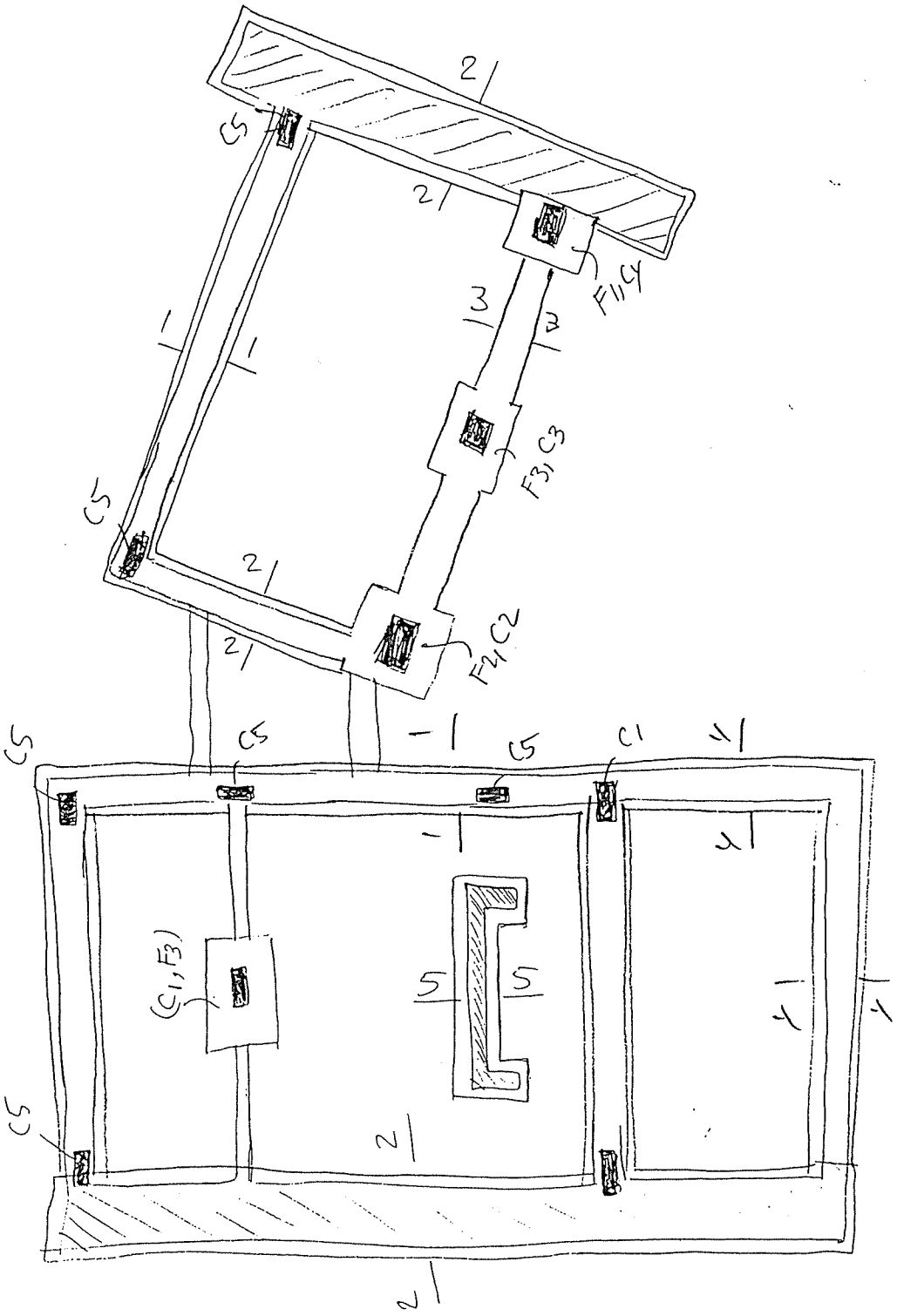
Span 1
Span/Depth 16.7
Allowable 28.7

196	0	196 Requ. Top
4 Φ 12	0 Φ 0	4 Φ 12
0 Φ 0	0 Φ 0	0 Φ 0
452	0	452 Prov. Top

span 1

0	441	0 Requ. Bot
0 Φ 0	5 Φ 14	0 Φ 0
0 Φ 0	0 Φ 0	0 Φ 0
0	769	0 Prov. Bot

consolidated consultants engineering & environment	Project	Number
	Subject Foundation plan	
		Made by / Date
		Checked / Date



Foundation plan

C14

Retaining Wall Design : EXTERNAL WALL max height 3.0 m

Input Data

Seepage allowed

Theory : Coulomb
Wall type : Cantilever

SEISMIC ANALYSIS SETTINGS:

Seismic Analysis ON/OFF:ON

VALUES OF PRESSURE COEFFICIENTS:

Active Pressure coefficient Ka :0.30
Passive Pressure coefficient Kp :4.98
Seismic Active Pressure coefficient Kas :0.41
Seismic Passive Pressure coefficient Kps :2.10
Base frictional constant μ :0.58

FORCES ACTING ON THE WALL:

Description	FORCES (kN) and their LEVER ARMS (m) F Horizontal left (+)	Lever arm	F Vertical down (+)	Lever arm
Destabilizing forces:				
Total Active pressure Pa	22.122	0.971	5.695	0.600
Siesmic component of Pa	5.527	1.470	1.481	0.600
Siesmic wall inertia	4.406	1.500		
Stabilizing forces:				
Passive pressure on base Pp	-18.878	0.333		
Siesmic component of Pp	25.910	0.600		
Weight of the wall + base			29.375	0.524
Weight of soil on the base			35.730	0.904

EQUILIBRIUM CALCULATIONS AT SLS

1.Moment Equilibrium

Point of rotation: bottom front corner of base.

For Overturning moment Mo calculate as follows:
Mo = Sum(hor. forces x l.a.) - Sum(vert. forces x l.a.)
For Stabilizing moment Mr calculate as follows:
Mr = -Sum(hor. forces x l.a.) + Sum(vert. forces x l.a.)
where l.a. = lever arm of each force.

Stabilizing moment Mr = 54.0 kNm

Destabilizing moment Mo : 24.7 kNm

Safety factor against overturning = Mr/Mo = 2.19

2.Force Equilibrium

Sum of Vertical forces Pv :	70.8 kN
Frictional resistance Pfric :	40.9 kN
Passive Pressure on shear key :	0.0 kN
Passive pressure on base :	18.9 kN
=> Horizontal resistance Fr :	59.8 kN
Horizontal sliding force Fh :	26.5 kN

Safety factor against overall sliding = Fr/Fh = 2.25

SOIL PRESSURES UNDER BASE

Maximum pressure :114.0 kPa
Minimum pressure : 0 kPa at 0.2 m from right hand side of base.
Maximum pressure occurs at left hand side of base

WALL MOMENTS (ULS) AND REINFORCEMENT TO BS8110 - 1997

Position from base top (m)	Moment (kNm)	Front Reinforcing (mm^2/m)	Back Reinforcing (mm^2/m)	Nominal (0.13%) (mm^2/m)
0.00	27.96	0.00	311.76	390.00
0.06	26.94	0.00	300.45	390.00
0.11	25.89	0.00	288.71	390.00
0.17	24.80	0.00	276.61	390.00
0.22	23.69	0.00	264.24	390.00
0.28	22.57	0.00	251.65	390.00
0.33	21.43	0.00	238.93	390.00
0.39	20.28	0.00	226.16	390.00
0.44	19.14	0.00	213.40	390.00
0.50	18.00	0.00	200.73	390.00
0.55	16.88	0.00	188.23	390.00
0.61	15.78	0.00	175.97	390.00
0.66	14.71	0.00	164.03	390.00
0.72	13.67	0.00	152.47	390.00
0.77	12.68	0.00	141.38	390.00
0.83	11.73	0.00	130.79	390.00
0.88	10.82	0.00	120.71	390.00
0.94	9.96	0.00	111.11	390.00
0.99	9.15	0.00	102.00	390.00
1.05	8.37	0.00	93.35	390.00
1.10	7.64	0.00	85.17	390.00
1.16	6.94	0.00	77.44	390.00
1.21	6.29	0.00	70.15	390.00
1.27	5.68	0.00	63.29	390.00
1.32	5.10	0.00	56.86	390.00
1.38	4.56	0.00	50.85	390.00
1.43	4.06	0.00	45.24	390.00
1.49	3.59	0.00	40.02	390.00
1.54	3.16	0.00	35.19	390.00
1.60	2.76	0.00	30.74	390.00
1.65	2.39	0.00	26.66	390.00
1.71	2.06	0.00	22.93	390.00
1.76	1.75	0.00	19.56	390.00
1.82	1.48	0.00	16.52	390.00
1.87	1.24	0.00	13.81	390.00
1.93	1.02	0.00	11.42	390.00
1.98	0.84	0.00	9.35	390.00
2.04	0.68	0.00	7.57	390.00
2.09	0.55	0.00	6.09	390.00
2.15	0.44	0.00	4.89	390.00
2.20	0.36	0.00	3.96	390.00
2.26	0.29	0.00	3.21	390.00

2.37	0.17	0.00	1.94	390.00
2.42	0.13	0.00	1.43	390.00
2.48	0.09	0.00	0.99	390.00
2.53	0.06	0.00	0.63	390.00
2.59	0.03	0.00	0.36	390.00
2.64	0.01	0.00	0.16	390.00
2.70	0.00	0.00	0.04	390.00
2.75	0.00	0.00	0.00	390.00

BASE MOMENTS (ULS) AND REINFORCEMENT TO BS8110 - 1997

Position from left (m)	Moment (kNm)	Top Reinforcing (mm^2/m)	Bot Reinforcing (mm^2/m)	Nominal (0.13%) (mm^2/m)
0.03	-0.00	0.00	0.00	325.00
0.06	-0.05	0.00	0.67	325.00
0.08	-0.19	0.00	2.70	325.00
0.11	-0.43	0.00	6.07	325.00
0.14	-0.77	0.00	10.79	325.00
0.17	-1.20	0.00	16.86	325.00
0.20	-1.72	0.00	24.28	325.00
0.22	-2.35	0.00	33.05	325.00
0.25	-3.06	0.00	43.16	325.00
0.28	-3.88	0.00	54.63	325.00
0.31	-4.79	0.00	67.44	325.00
0.34	-5.79	0.00	81.61	325.00
0.36	-6.89	0.00	97.12	325.00
0.39	-8.09	0.00	113.98	325.00
0.42	-9.38	0.00	132.19	325.00
0.45	-10.77	0.00	151.75	325.00
0.48	-12.26	0.00	172.66	325.00
0.50	-12.37	0.00	174.20	325.00
0.53	19.53	275.07	0.00	325.00
0.56	18.47	260.22	0.00	325.00
0.59	17.37	244.69	0.00	325.00
0.62	16.30	229.63	0.00	325.00
0.64	15.27	215.06	0.00	325.00
0.67	14.27	200.96	0.00	325.00
0.70	13.30	187.34	0.00	325.00
0.73	12.37	174.20	0.00	325.00
0.76	11.47	161.53	0.00	325.00
0.78	10.60	149.35	0.00	325.00
0.81	9.77	137.64	0.00	325.00
0.84	8.97	126.41	0.00	325.00
0.87	8.21	115.65	0.00	325.00
0.90	7.48	105.38	0.00	325.00
0.92	6.79	95.58	0.00	325.00
0.95	6.12	86.26	0.00	325.00
0.98	5.50	77.42	0.00	325.00
1.01	4.90	69.06	0.00	325.00
1.04	4.34	61.17	0.00	325.00
1.06	3.82	53.76	0.00	325.00
1.09	3.32	46.83	0.00	325.00
1.12	2.87	40.38	0.00	325.00
1.15	2.44	34.41	0.00	325.00
1.18	2.05	28.91	0.00	325.00
1.20	1.70	23.90	0.00	325.00
1.23	1.37	19.36	0.00	325.00
1.26	1.09	15.29	0.00	325.00
1.29	0.83	11.71	0.00	325.00
1.32	0.61	8.60	0.00	325.00
1.34	0.42	5.97	0.00	325.00
1.37	0.27	3.82	0.00	325.00
1.40	0.15	2.15	0.00	325.00

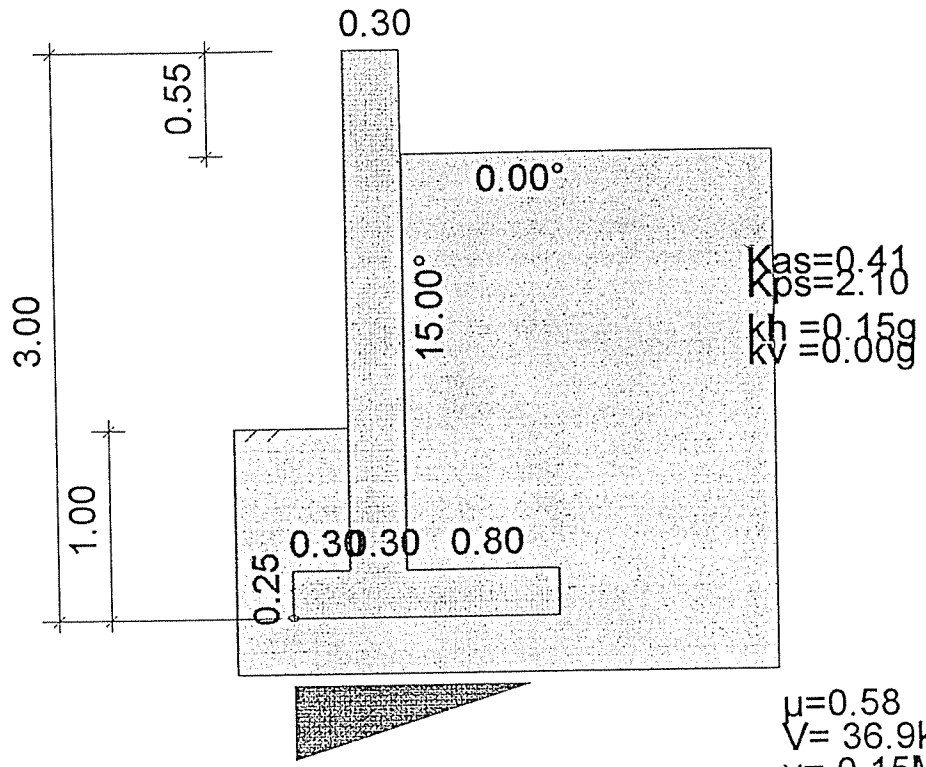
SHEAR CHECK AT WALL-BASE JUNCTION TO BS8110 - 1997

Shear force at bottom of wall V = 36.9 kN

Allowable shear stress vc = 0.38 MPa (based on Wall tensile reinf.)

Sketch of Wall

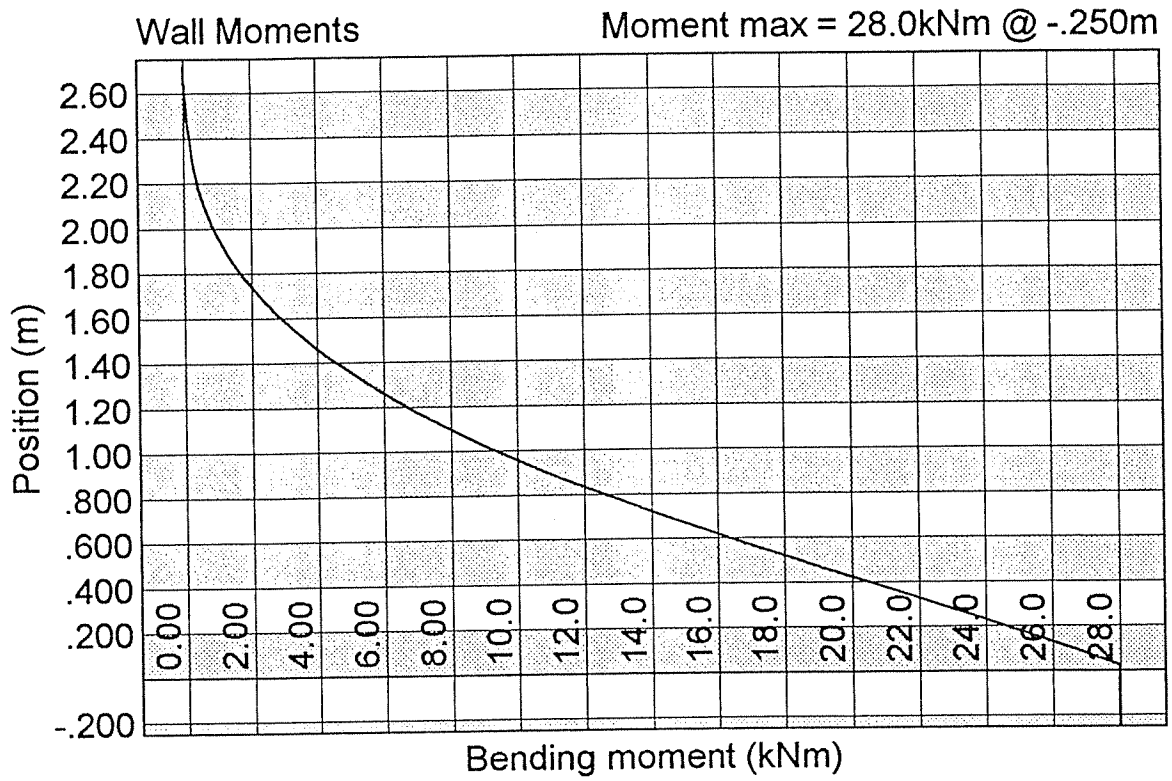
Design code: BS8110 - 1997



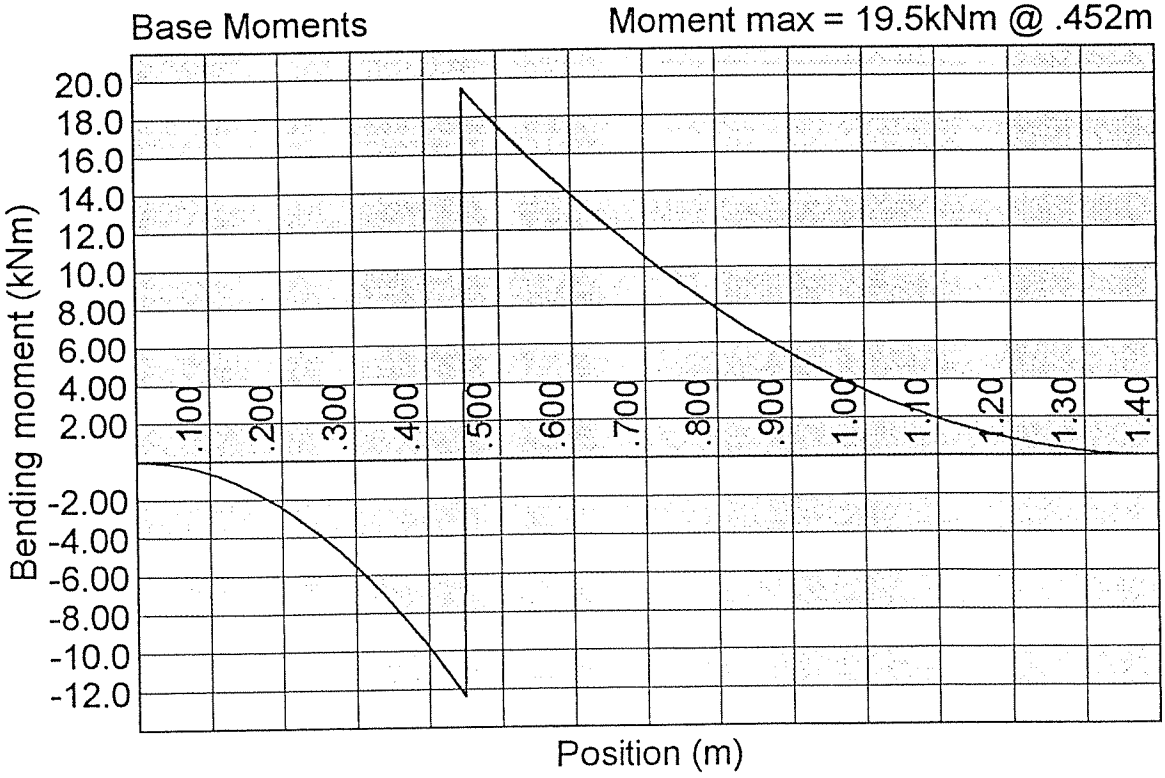
Wall type: Cantilever
Theory: Coulomb

SFslip = 2.25
SFovt = 2.19

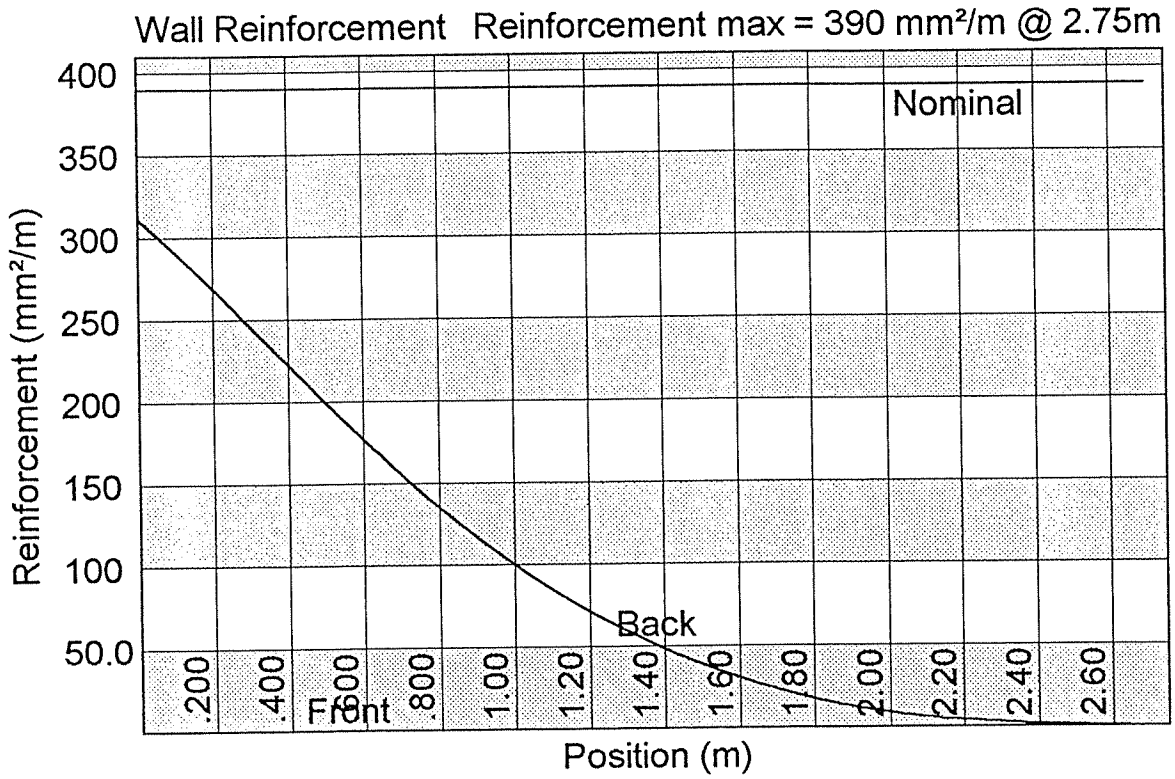
Wall Bending Moments



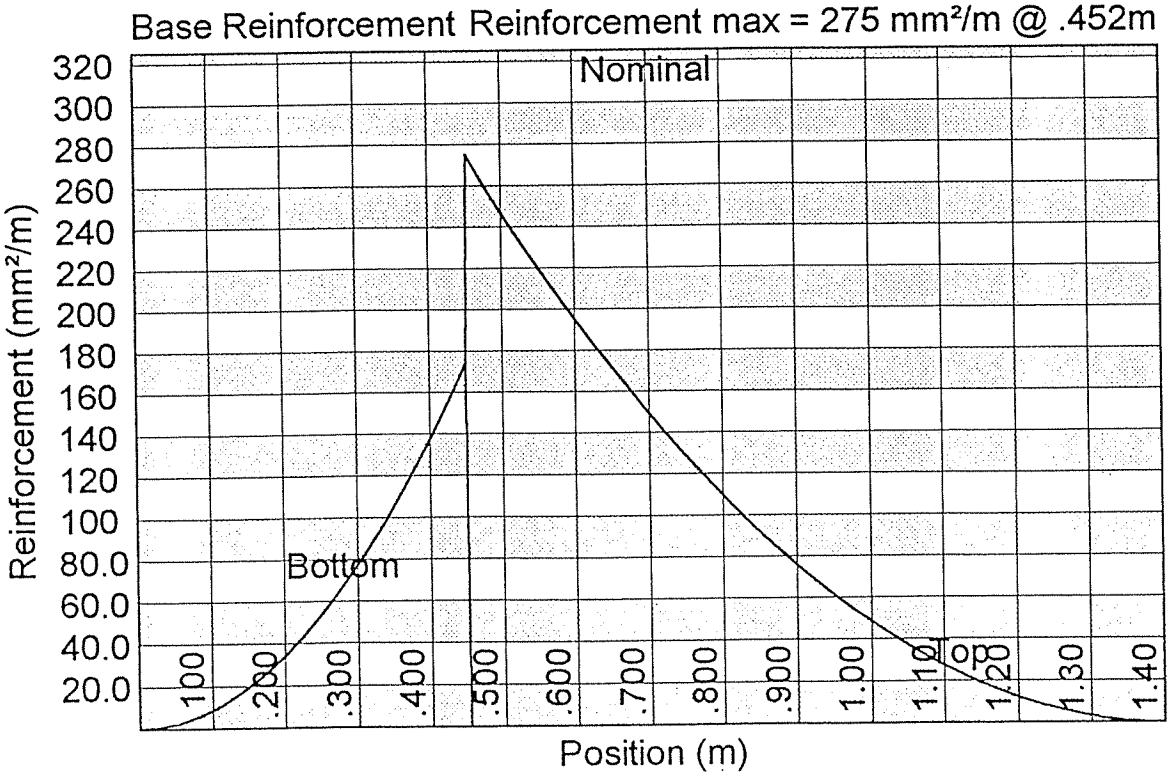
Base Bending Moments



Wall Reinforcement



Base Reinforcement



C14

Retaining Wall Design : EXTERNAL WALL maximum height 2.0 m

Input Data

Seepage allowed

Theory : Coulomb
Wall type : Cantilever

SEISMIC ANALYSIS SETTINGS:

Seismic Analysis ON/OFF:ON

VALUES OF PRESSURE COEFFICIENTS:

Active Pressure coefficient Ka :0.30
Passive Pressure coefficient Kp :4.98
Seismic Active Pressure coefficient Kas :0.41
Seismic Passive Pressure coefficient Kps :2.10
Base frictional constant μ :0.58

FORCES ACTING ON THE WALL:

escription	FORCES (kN) and their LEVER ARMS (m) F Horizontal left (+)	Lever arm	F Vertical down (+)	Lever arm
Destabilizing forces:				
Total Active pressure Pa	7.958	0.578	1.995	0.500
Siesmic component of Pa	1.936	0.870	0.519	0.500
Siesmic wall inertia	2.625	1.000		
Stabilizing forces:				
Passive pressure on base Pp	-18.878	0.333		
Siesmic component of Pp	25.910	0.600		
Weight of the wall + base			17.500	0.350
Weight of soil on the base			7.020	0.408

EQUILIBRIUM CALCULATIONS AT SLS

1.Moment Equilibrium

Point of rotation: bottom front corner of base.

For Overturning moment Mo calculate as follows:
Mo = Sum(hor. forces x l.a.) - Sum(vert. forces x l.a.)
For Stabilizing moment Mr calculate as follows:
Mr = -Sum(hor. forces x l.a.) + Sum(vert. forces x l.a.)
where l.a. = lever arm of each force.

Stabilizing moment Mr = 15.3 kNm

Destabilizing moment Mo : 6.2 kNm

Safety factor against overturning = Mr/Mo = 2.45

2.Force Equilibrium

Sum of Vertical forces Pv : 26.5 kN
Frictional resistance Pfric : 15.3 kN
Passive Pressure on shear key : 0.0 kN
Passive pressure on base : 18.9 kN
=> Horizontal resistance Fr : 34.2 kN
Horizontal sliding force Fh : 10.6 kN

Safety factor against overall sliding = Fr/Fh = 3.23

SOIL PRESSURES UNDER BASE

Maximum pressure : 40.7 kPa
Minimum pressure : 12.3 kPa
Maximum pressure occurs at left hand side of base

WALL MOMENTS (ULS) AND REINFORCEMENT TO BS8110 - 1997

Position from base top (m)	Moment (kNm)	Front Reinforcing (mm²/m)	Back Reinforcing (mm²/m)	Nominal (0.13%) (mm²/m)
0.00	3.90	0.00	43.51	390.00
0.04	3.94	0.00	43.93	390.00
0.07	3.95	0.00	44.06	390.00
0.11	3.94	0.00	43.92	390.00
0.14	3.90	0.00	43.52	390.00
0.18	3.85	0.00	42.90	390.00
0.21	3.77	0.00	42.06	390.00
0.25	3.68	0.00	41.03	390.00
0.28	3.57	0.00	39.82	390.00
0.32	3.45	0.00	38.46	390.00
0.35	3.31	0.00	36.97	390.00
0.39	3.17	0.00	35.36	390.00
0.42	3.02	0.00	33.65	390.00
0.46	2.86	0.00	31.86	390.00
0.49	2.69	0.00	30.02	390.00
0.53	2.52	0.00	28.14	390.00
0.56	2.35	0.00	26.24	390.00
0.60	2.18	0.00	24.34	390.00
0.63	2.01	0.00	22.46	390.00
0.67	1.85	0.00	20.62	390.00
0.70	1.69	0.00	18.83	390.00
0.74	1.54	0.00	17.13	390.00
0.77	1.39	0.00	15.52	390.00
0.81	1.26	0.00	14.01	390.00
0.84	1.13	0.00	12.61	390.00
0.88	1.01	0.00	11.31	390.00
0.91	0.91	0.00	10.10	390.00
0.95	0.81	0.00	8.99	390.00
0.98	0.71	0.00	7.97	390.00
1.02	0.63	0.00	7.04	390.00
1.05	0.56	0.00	6.20	390.00
1.09	0.49	0.00	5.45	390.00
1.12	0.43	0.00	4.78	390.00
1.16	0.38	0.00	4.19	390.00
1.19	0.33	0.00	3.67	390.00
1.23	0.29	0.00	3.23	390.00
1.26	0.25	0.00	2.81	390.00
1.30	0.22	0.00	2.42	390.00
1.33	0.19	0.00	2.07	390.00
1.37	0.16	0.00	1.74	390.00
1.40	0.13	0.00	1.43	390.00
1.44	0.10	0.00	1.16	390.00

1.51	0.06	0.00	0.70	390.00
1.54	0.05	0.00	0.52	390.00
1.58	0.03	0.00	0.36	390.00
1.61	0.02	0.00	0.23	390.00
1.65	0.01	0.00	0.13	390.00
1.68	0.01	0.00	0.06	390.00
1.72	0.00	0.00	0.01	390.00
1.75	0.00	0.00	0.00	390.00

BASE MOMENTS (ULS) AND REINFORCEMENT TO BS8110 - 1997

Position from left (m)	Moment (kNm)	Top Reinforcing (mm^2/m)	Bot Reinforcing (mm^2/m)	Nominal (0.13%) (mm^2/m)
0.01	-0.00	0.00	0.00	325.00
0.03	-0.00	0.00	0.06	325.00
0.04	-0.02	0.00	0.24	325.00
0.06	-0.04	0.00	0.53	325.00
0.07	-0.07	0.00	0.95	325.00
0.08	-0.11	0.00	1.48	325.00
0.10	-0.15	0.00	2.14	325.00
0.11	-0.21	0.00	2.91	325.00
0.13	-0.27	0.00	3.80	325.00
0.14	-0.34	0.00	4.81	325.00
0.15	-0.42	0.00	5.93	325.00
0.17	-0.51	0.00	7.18	325.00
0.18	-0.61	0.00	8.54	325.00
0.20	-0.71	0.00	10.03	325.00
0.21	-0.83	0.00	11.63	325.00
0.22	-0.95	0.00	13.35	325.00
0.24	-1.08	0.00	15.19	325.00
0.25	-1.22	0.00	17.15	325.00
0.27	-1.36	0.00	19.23	325.00
0.28	-1.52	0.00	21.42	325.00
0.29	-1.68	0.00	23.74	325.00
0.31	-1.86	0.00	26.17	325.00
0.32	-2.04	0.00	28.72	325.00
0.34	-2.23	0.00	31.39	325.00
0.35	-2.43	0.00	34.18	325.00
0.36	-2.63	0.00	37.09	325.00
0.38	-2.63	0.00	37.09	325.00
0.39	0.09	1.26	0.00	325.00
0.41	0.08	1.16	0.00	325.00
0.42	0.08	1.07	0.00	325.00
0.43	0.07	0.98	0.00	325.00
0.45	0.06	0.89	0.00	325.00
0.46	0.06	0.81	0.00	325.00
0.48	0.05	0.73	0.00	325.00
0.49	0.05	0.65	0.00	325.00
0.50	0.04	0.58	0.00	325.00
0.52	0.04	0.52	0.00	325.00
0.53	0.03	0.45	0.00	325.00
0.55	0.03	0.39	0.00	325.00
0.56	0.02	0.34	0.00	325.00
0.57	0.02	0.29	0.00	325.00
0.59	0.02	0.24	0.00	325.00
0.60	0.01	0.20	0.00	325.00
0.62	0.01	0.16	0.00	325.00
0.63	0.01	0.13	0.00	325.00
0.64	0.01	0.10	0.00	325.00
0.66	0.01	0.07	0.00	325.00
0.67	0.00	0.05	0.00	325.00
0.69	0.00	0.03	0.00	325.00
0.70	0.00	0.02	0.00	325.00

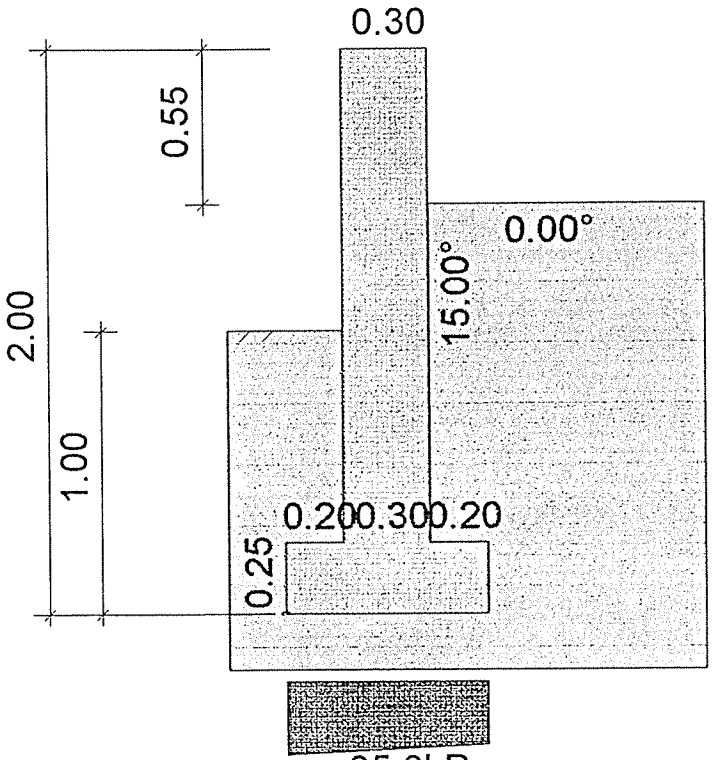
SHEAR CHECK AT WALL-BASE JUNCTION TO BS8110 - 1997

Shear force at bottom of wall V = 15.0 kN

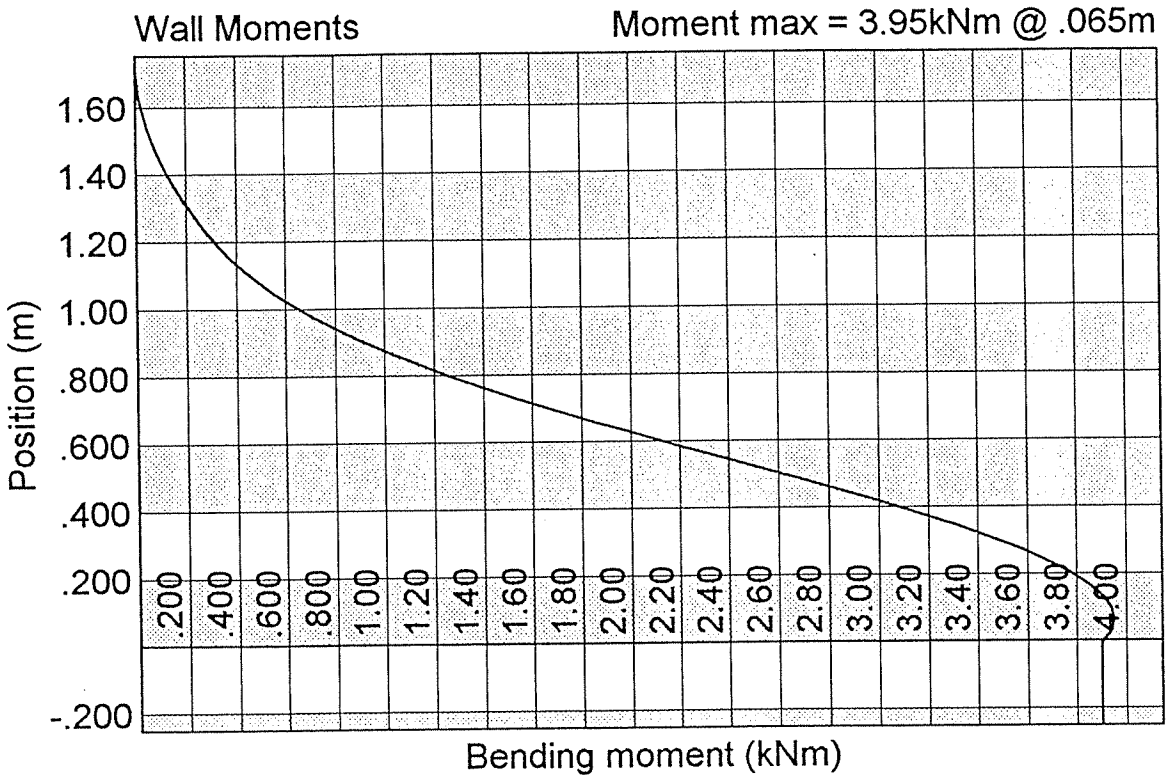
Allowable shear stress vc = 0.38 MPa (based on Wall tensile reinf.)

Sketch of Wall

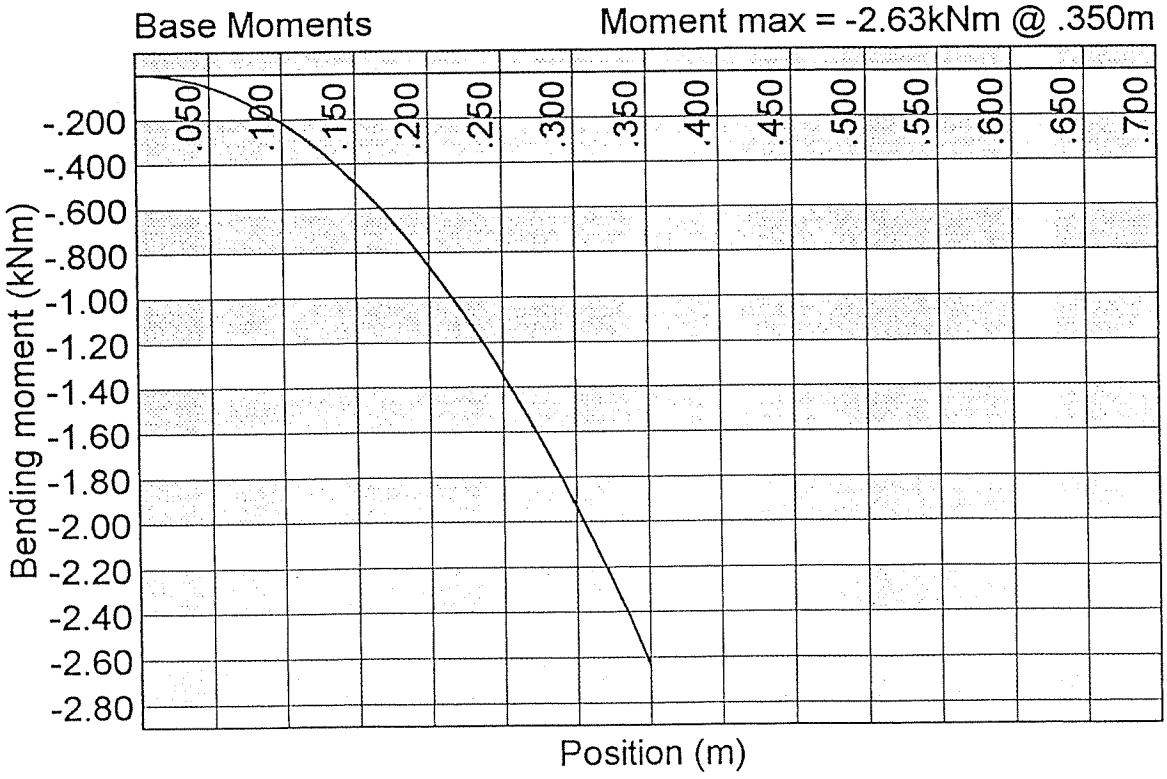
Design code: BS8110 - 1997



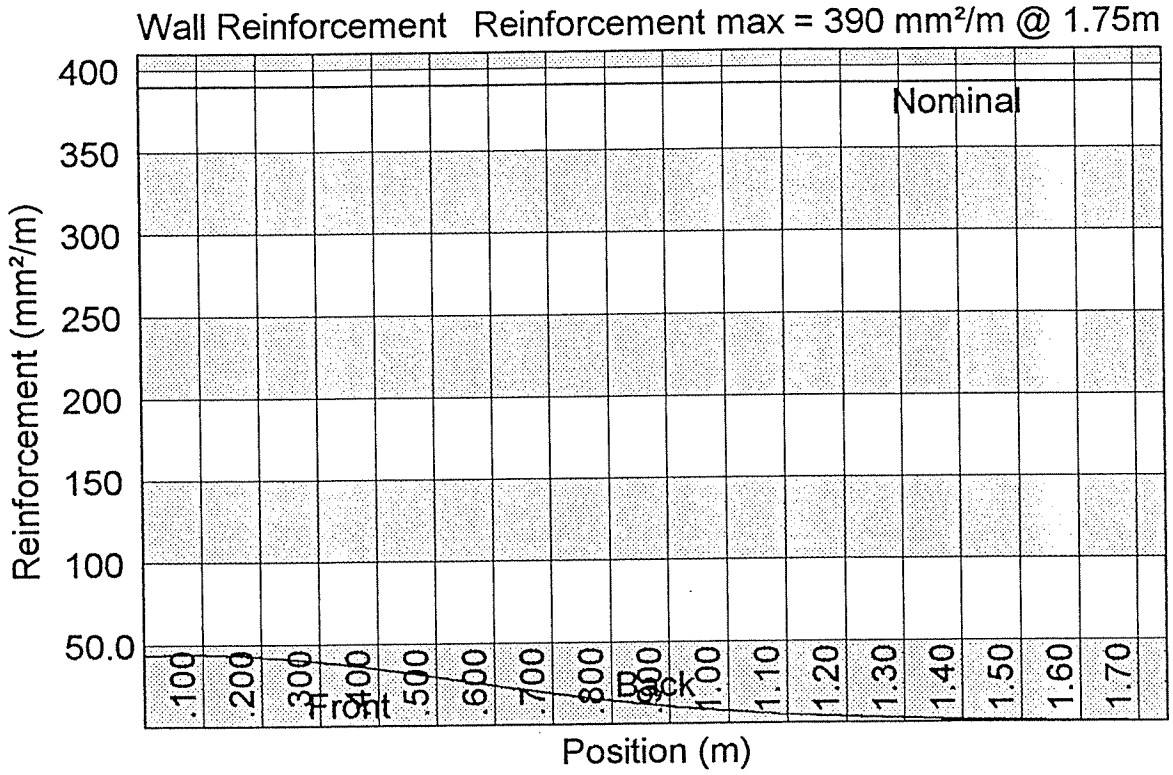
Wall Bending Moments



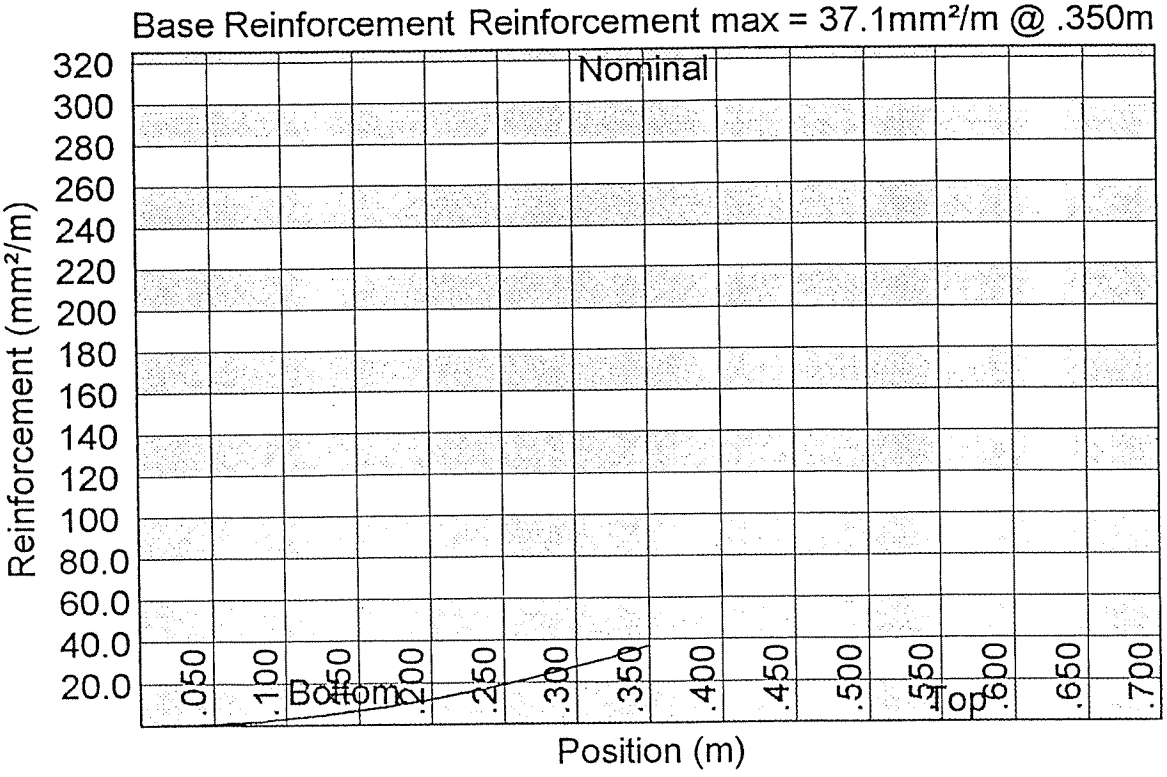
Base Bending Moments



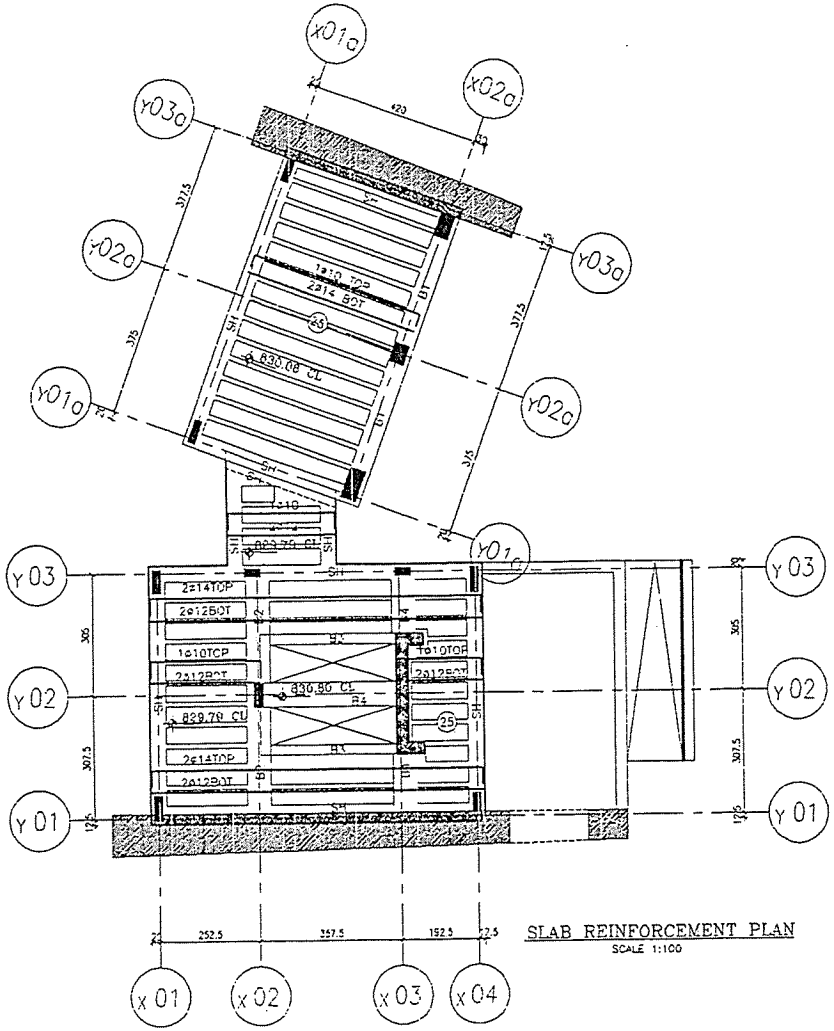
Wall Reinforcement



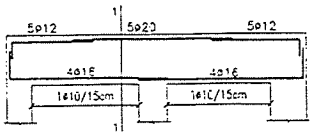
Base Reinforcement



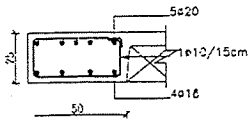
STRUCURAL DETAILS



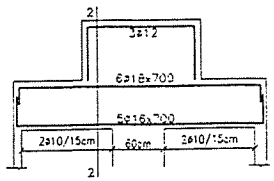
SLAB REINFORCEMENT PLAN
SCALE 1:100



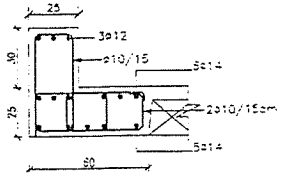
LONG SECTION IN B1
SCALE 1:10 SCALE 1:20



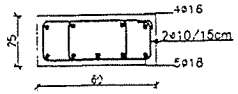
SECTION 1-1 THROUGH B1
SCALE 1:20



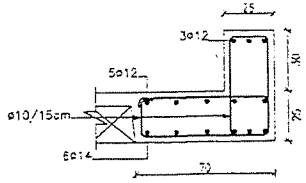
LONG SECTION IN B2
HOR. SCALE 1:100 VER. SCALE 1:20



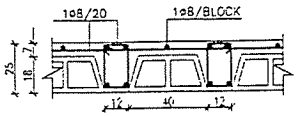
SECTION 2-2 THROUGH B2
SCALE 1:20



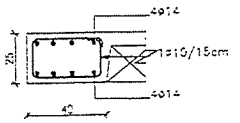
CROSS SECTION THROUGH B4
SCALE 1:20



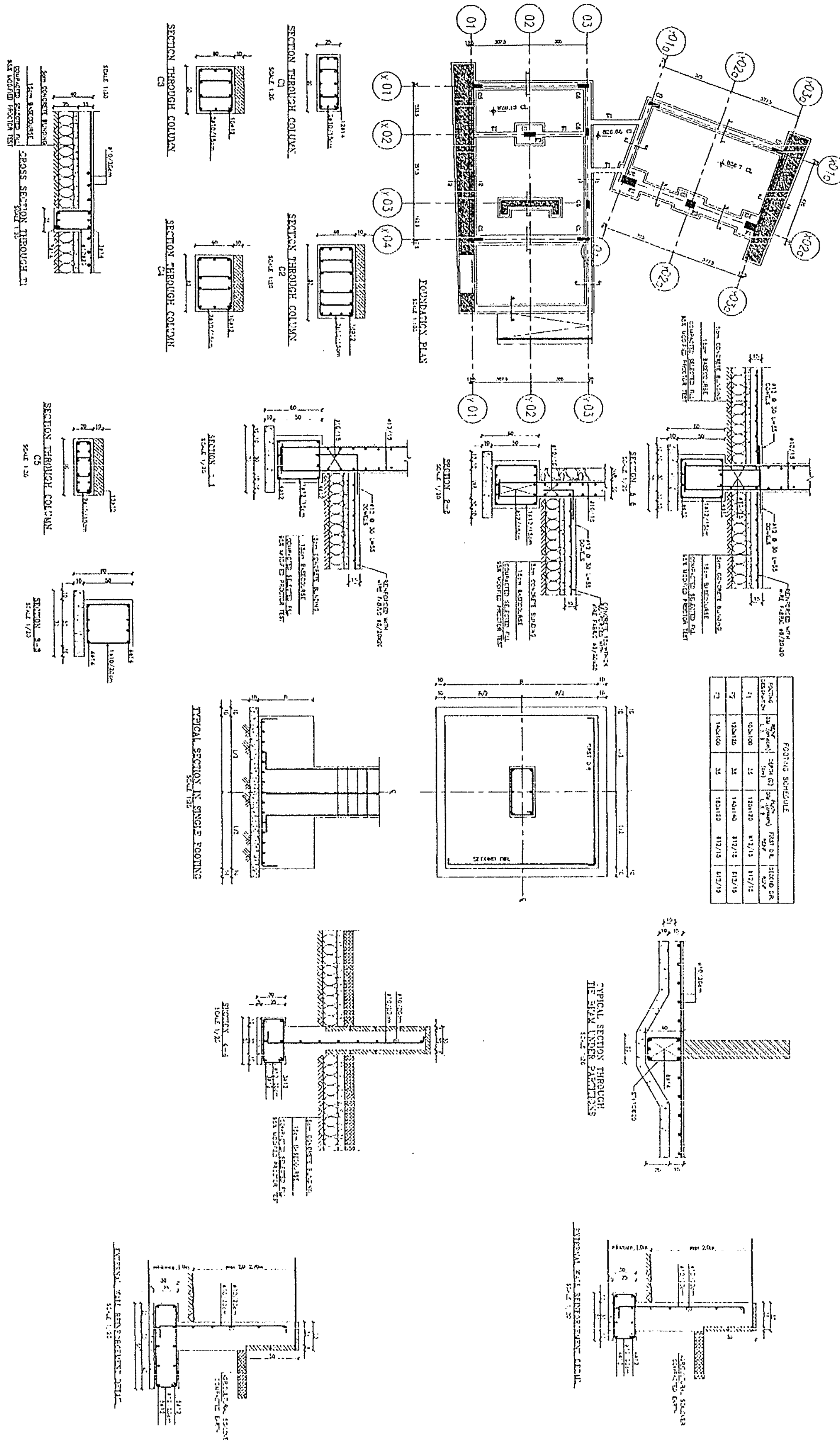
CROSS SECTION THROUGH B3
SCALE 1:20



TYPICAL SECTION THROUGH RIB SLAB
SCALE 1/20



CROSS SECTION THROUGH SH
SCALE 1:20


FOUNDATION PLAN
SECTION THROUGH COLUMN C1
SECTION THROUGH COLUMN C2
SECTION THROUGH COLUMN C3
SECTION THROUGH COLUMN C4
SECTION THROUGH COLUMN C5
CROSS SECTION THROUGH T1
FOOTING SCHEDULE
TYPICAL SECTION IN SINGLE FOOTING