C L P Structures

STRUCTURAL ENGINEERING CONSULTANTS

Job Name:- Utility Protection Slab

Job Number:- 619-07

Date:- Oct-17

Description:- Utility protection slab, designed as a semi rigid slab on an elastic foundation.

Calculations By:- Chris Lyons AMIStructE, Btech, IEng.

Client:-

ELITE PRECAST CONCRETE

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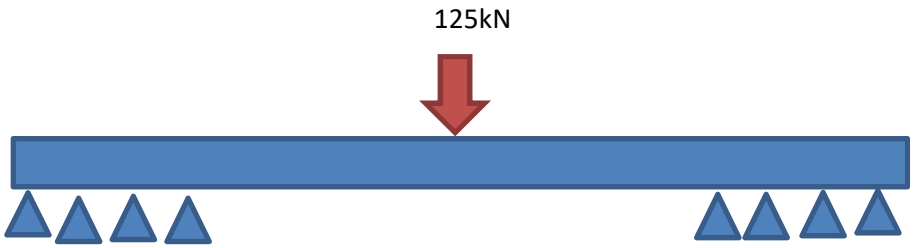
Registered No. 8929503 England

C L P Structures Structural Engineering Consultants	Project:	Utility Protection Slab			Job Ref.	619-07
	Subject:	B125 Loading Calcs			Sht No.	2
	Prepared:	CEL	Date:	Oct-17	Rev.	

Ref.	Calculations

Design slab to withstand B125 loading.

Therefore slab to withstand point load of 125kN.



slab will be sat on the ground and should therefore be designed as a 'semi rigid slab supported on an elastic foundation'

Length = 2.5 m

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BEAM ON ELASTIC FOUNDATION ANALYSIS

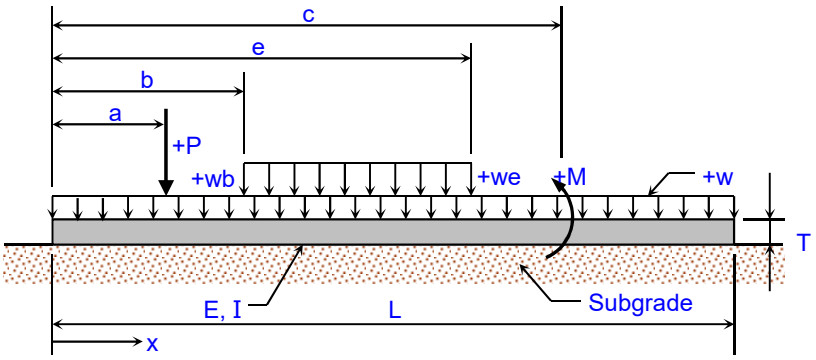
For Soil Supported Beam, Combined Footing, Slab Strip or Mat Strip of Assumed Finite Length with Both Ends Free

Job Name:	Elite Utility Protection Slabs	Subject:	Utility Slab Load Check		
Job Number:	619-07	Originator:	CEL	Checker:	CL

Input Data:

Beam Data:

Length, L =	2.5000	m
Width, B =	1.0000	m
Thickness, T =	0.1500	m
Modulus, E =	27800	MPa
Subgrade, ks =	23563	kN/m^3



Beam Loadings:

Full Uniform:

w = 3.6000 kN/m

Distributed:	Start b (m)	Start wb (kN/m)	End e (m)	End we (kN/m)
#1:				
#2:				
#3:				
#4:				
#5:				
#6:				

Point Loads:	a (m)	P (kN)
#1:	1.2500	125.00
#2:		
#3:		
#4:		
#5:		
#6:		
#7:		
#8:		
#9:		
#10:		
#11:		
#12:		

Moments:	c (m)	M (kN-m)
#1:		
#2:		
#3:		
#4:		

Nomenclature

Results:

Beam Flexibility Criteria:

for β*L <= π/4	beam is rigid
for π/4 < β*L < π	beam is semi-rigid
for β*L >= π	beam is flexible
for β*L >= 6	beam is semi-infinite long

Inertia, I =	0.00028	m^4	I = B*T^3/12
β =	0.932		β = ((ks*B)/(4*E*I))^(1/4)
β*L =	2.329		β*L = Flexibility Factor

Beam is semi-rigid

Max. Shears and Locations:

+V(max) =	62.50	kN	@ x =	1.25 m
-V(max) =	-62.50	kN	@ x =	1.25 m

Max. Moments and Locations:

+M(max) =	33.88	kN-m	@ x =	1.25 m
-M(max) =	0.00	kN-m	@ x =	0.00 m

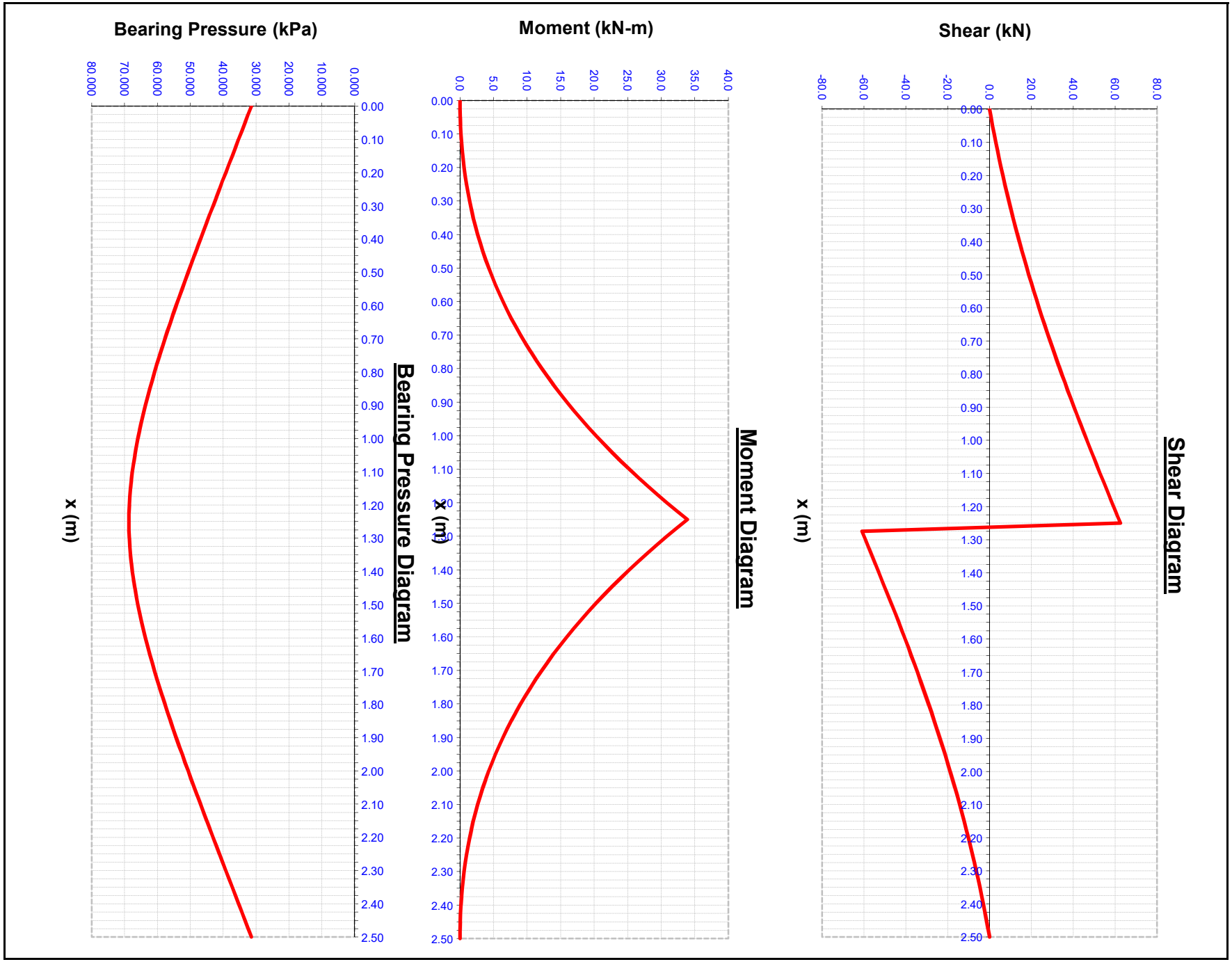
Max. Deflection and Location:

Δ(max) =	-2.915	mm	@ x =	1.25 m

Soil Pressures, Locations, and %Brg. Area:

Q(max) =	68.686	kPa	@ x =	1.25 m
Q(min) =	31.433	kPa	@ x =	0.00 m
%Brg. Area =	100.00	%		

Comments:


Bearing Pressure (kPa)
80.000
70.000
60.000
50.000
40.000
30.000
20.000
10.000
0.000
x (m)
0.00
0.10
0.20
0.30
0.40
0.50
0.60
0.70
0.80
0.90
1.00
1.10
1.20
1.30
1.40
1.50
1.60
1.70
1.80
1.90
2.00
2.10
2.20
2.30
2.40
2.50
Bearing Pressure Diagram
Moment (kN-m)
0.0
5.0
10.0
15.0
20.0
25.0
30.0
35.0
40.0
x (m)
Moment Diagram
Shear (kN)
-80.0
-60.0
-40.0
-20.0
0.0
20.0
40.0
60.0
80.0
x (m)
Shear Diagram

C L P Structures Structural Engineering Consultants	Project:	Utility Protection Slab			Job Ref.	619-07
	Subject:	B125 Loading Calcs			Sht No.	5
	Prepared:	CEL	Date:	Oct-17	Rev.	

Ref.	Calculations

Check Reinforcement in Protection slab

BM (Bending Moment) :-	40.6603	kNm (ULT)
b (Breadth) :-	1000	mm
D (Total Depth) :-	150	mm
Reinforcement Cover :-	25	mm
Link size :-	0	mm
d (Effective Depth) =	112	mm
Fcu (Concrete Cube Strength) :-	40	N/mm^2
Fy (Rebar Strength) :-	460	N/mm^2
k = M / (b x d^2 x fcu)	0.08104	< 0.15 OK
z = d [0.5 + (sqrt (0.25 - k / 0.9))]	100.795	mm
z < 0.95 d Therefore OK	100.795	mm
Compression Reinft. Not Req.		^{2}
As = M / (fy x gm x z)	923.106	mm^2

	Number	Bar Size			
Use :-	6	16	1206	mm^2	OK

Note:-
K' where compression reinft. is required has been taken as 0.15. This limits redistribution to 10%.