KA ENGINEERING GROUP

FOUNDATION DESIGN CHECK ANALYSIS

SITE NAME: Training Tower 15M

SITE ADDRESS: Peterborough

SITE COORDINATES: 52.569497°N, 0.240531°W

CLIENT: RST

Internal Ref: 4056		Client Ref: Training Tower 15M		
1	First Issue	Kelechi A.  3-Mar-22	Ayo F.  3-Mar-22	Ayo F.  4-Mar-22
Revision No	**Description**	**Designed By**	**Checked By**	**Approved By**

TRS RADIO STRUCTURES LTD

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Title	**Scope and Methodology**	Sheet No	2 of 3
Client	RST	Prepared By	Kelechi A.
Project Stream		Checked By	Ayo F.
Date	4-Mar-22	Revision Number	1

REFERENCE

EXECUTIVE SUMMARY

The proposed foundation base of 3m x 3m x 1.5m deep is suitable to support the structure considering the calculated base design reactions and provided allowable soil bearing pressure.

DESIGN RECOMMENDATION

The foundation design check is based on assumptions for soil properties and capacity. It is recommended that soil investigation be completed prior to constructtion.

SCOPE

It is proposed to assess the proposed foundation to support the proposed 19m slimline triangular lattice tower considering the proposed ancillaries using assumed soil design data.

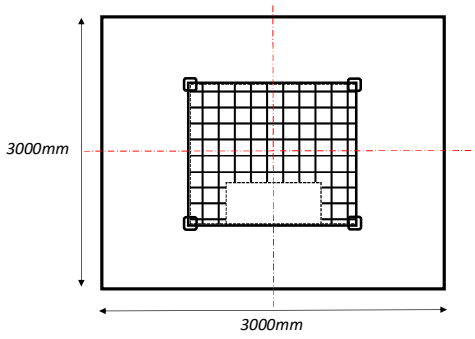
DESIGN CODES

[1] EN 1990 (2002) +A1: Basis for Structural Design.
[2] EN 1992-1-1 (2004): Eurocode 2: Design of Concrete Structures.
[3] EN 1993-1: Design of Steel Structures.
[4] EN 1997-1 (2004): Eurocode 7: Geotechnical Design.
[5] Drawing Reference: Training Tower 15M

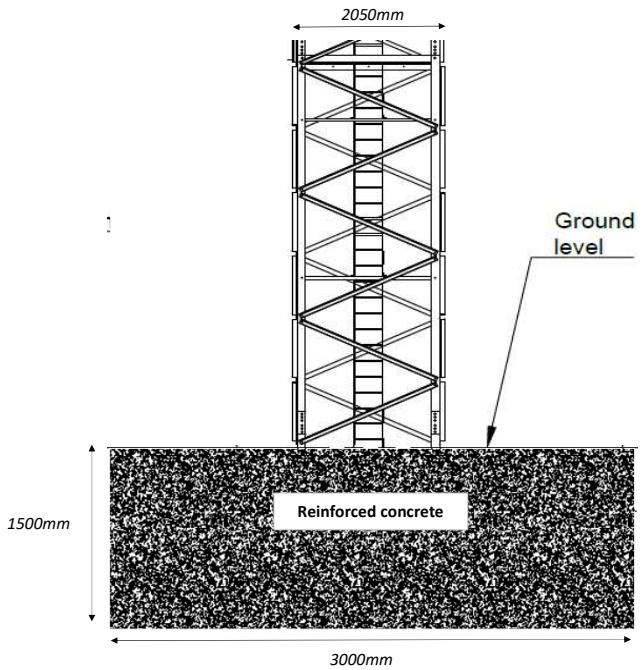
LOADS

The foundation base is analysed to Eurocode and using the structure calculated base reactions. A range of in-house processing suites and manual calculation is used to complete the design.
The foundation base is analysed for one primary scenario: without buoyancy conditions. The foundation is analysed for the following reactions considering wind and selfweights of the lattice tower: overturning moment, shear, and axial weight. Recommended design factors for variable and permanent loads and materials are also applied.

PROPOSED FOUNDATION PLAN VIEW



PROPOSED FOUNDATION ELEVATION VIEW



COMMENTS

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Title	**Foundation Design Check Analysis**	Sheet No	3 of 3
Client	RST	Prepared By	Kelechi A.
Project Stream		Checked By	Ayo F.
Date	4-Mar-22	Revision Number	1

REFERENCE

EXECUTIVE SUMMARY

COMMENTS

Parameter	Symbol	Value	Units	
Concrete Base Length	L	3.00	m	
Concrete Base Breadth	B	3.00	m	
Concrete Base Depth	H	1.50	m	
Base area	A	9.00	m^2	
Concrete Density	rho	25.00	kN/m^3	
Concrete Class	-	C35/45	-	
Allowable bearing capacity factor	γ_f	2.50	-	
Allowable bearing capacity at concrete depth	$q_{allowable}$	100.00	kN/m^2	Assumed
Ground water	-	No ground water	m	Assumed
Soil bulk density	γ	16.00	kN/m^3	

Load Factors	Permanent		Variable Actions	
	Unfavourable	Favourable	Unfavourable	Favourable
	1.35	1.00	1.5	1.00

ANALYSIS LOADS

Base self-weight	338	kN	
Excavated soil weight (overburden pressure)	0	kN	***Conservatively ignored***

	Structure Base Reactions at Serviceability		Structure Base Reactions at Ultimate	
Axial load, P	35	kN	35	kN
Shear load, SF	18	kN	27	kN
Overturning moment	150	kNm	225	kNm

	SLS		ULS	
Total axial load, N	373	kN	373	kN
Total moment load, M	177	kNm	265	kNm
Buoyancy upthrust (N/A)	0	kN	0	kN

ECCENTRICITY CHECK

Eccentricity no buoyancy, e	0.47			*e= applied moment/axial loads*
L/6	0.50	B/6	0.50	-
Structure location away from centroid, e_{xx}	0.00	e_{yy}	0.00	m

e<L/6, there is positive pressure along the length L
e<B/6, there is positive pressure along the length B

FOUNDATION SERVICEABILITY LIMIT CHECK - BEARING

Allowable bearing stress, $q_{allowable}$	100.00	kN/m^2
Maximum Bearing Pressure, P_{max}	80.68	kN/m^2
Minimum Bearing Pressure, P_{min}	2.20	kN/m^2

Design suitable: Maximum bearing pressure < Allowable pressure

$$for\ e \le \frac{L}{6}, \frac{B}{6}: \quad P_{max} = \frac{N}{BL} \pm \frac{6Pe_{xx}}{BL^2} \pm \frac{6Pe_{yy}}{LB^2} \pm \frac{6M}{BL^2}$$

$$for\ e > \frac{L}{6}, \frac{B}{6}: \quad P_{max} = \frac{2N}{3B(\frac{L}{2} - e)} \pm \frac{6Pe_{xx}}{BL^2} \pm \frac{6Pe_{yy}}{LB^2}$$

FOUNDATION SERVICEABILITY LIMIT CHECK - SLIDING

Structural Case: No buoyancy

μ	0.31	
Sliding Resistance	114	kN
Design sliding factor of safety	6.38	
Allowable sliding factor of safety	2.00	

$$= \frac{\mu \times Selfweight}{Shear\ reaction}$$

Ok in Sliding check

FOUNDATION SERVICEABILITY LIMIT CHECK - OVERTURNING

Structural Case: No buoyancy

Shortest distance: centre of pole to edge of foundation, XX	1.50	m
Shortest distance: centre of pole to edge of foundation, YY	1.50	m
Shortest distance of centroid to foundation base from edge, XX	1.50	m
Shortest distance of centroid to foundation base from edge, YY	1.50	m
Minimum overturning resistance	559	kNm
Design overturning moment factor of safety	3.73	
Allowable overturning moment factor of safety	1.50	

$$= \min\left(\left(\frac{Selfweights \times Lmin)}{Overturning\ reaction}\right)xx, \left(\frac{Selfweights \times Lmin)}{Overturning\ reaction}\right)yy\right)$$

Ok in Overturning moment