BUROHAPPOLD ENGINEERING

Series 1 Standard STC & TTC foundation loading

Project GW Electrification – Innovation in OLE Structures
Subject Foundation loads – ORE Study
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01	First Issue	TCE	09/09/2015	SEF
02	Graphs replaced with tables and text amended	TCE	29/09/2015	SEF

1 Introduction

The following tables present worst case actions at the base of the mast for standard STC and TTC Series 1 OLE gantry structures on the Great Western Mainline. All loading has been derived using ULS combinations of actions in accordance with:

- NR/L3/CIV/072 Wind Loading of OLE Structures
- NR/L3/CIV/073 Design of Overhead Line Structures

All loads are unfactored i.e. all partial factors = 1.0. To convert the loads to SLS combinations multiply the wind values by a factor of 0.66. This is required to convert from 1 in 50 year wind load to 1 in 3 year wind load.

The worst case loading for both the STC and TTC structures has been identified as occurring under the following load combinations:

Load Combination B1 - Maximum Wind (across track)
Wind: 1 in 50 year wind
Ice: N/A
Temperature: 10°C

Load Combination B2 - Maximum Wind (along track)
Wind: 1 in 50 year wind
Ice: N/A
Temperature: 10°C

2 Series 1 Standard STC (HEB 220)

2.1 Across Track Moment

The worst case across track moments for a standard STC structure occur under the following conditions:

Load combination B1, Structure spacing = 65m, Track Radius = 1651m

Direction	Description	Unit	Action			
			Permanent	Wind*	Other variable	∑
Fx	Across track shear	kN	1.16	12.38	0.88	14.43
Fy	Along track shear	kN	0.00	0.00	0.00	0.00
Fz	Axial compression	kN	10.47	0.00	0.00	10.47
Mx	Along track moment	kNm	0.00	0.00	0.21	0.21
My	Across track moment	kNm	13.69	73.66	7.02	94.37
Mz	Torsion	kNm	0.00	0.27	0.16	0.43

2.2 Along Track Moment

The worst case along track moments for a standard STC structure occur under the following conditions:

Load combination B2, Structure spacing = 40m, Track Radius = 625m

Direction	Description	Unit	Action			
			Permanent	Wind*	Other variable	∑
Fx	Across track shear	kN	1.89	0.00	1.24	3.13
Fy	Along track shear	kN	0.00	8.97	0.00	8.97
Fz	Axial compression	kN	9.77	0.00	0.00	9.77
Mx	Along track moment	kNm	0.00	48.47	0.16	48.62
My	Across track moment	kNm	16.06	0.00	9.87	25.93
Mz	Torsion	kNm	0.00	4.37	0.25	4.63

* To convert to SLS multiply Wind values by 0.66.

3 Series 1 Standard TTC

3.1 Across Track Moment

The worst case across track moments for a standard TTC structure occur under the following conditions:

Load combination B1, Structure spacing = 65m, Track Radius = 1651m

Direction	Description	Unit	Action			
			Permanent	Wind*	Other variable	∑
Fx	Across track shear	kN	2.32	19.02	0.88	22.23
Fy	Along track shear	kN	0.00	0.00	0.00	0.00
Fz	Axial compression	kN	26.97	0.00	0.00	26.97
Mx	Along track moment	kNm	0.00	0.00	0.52	0.52
My	Across track moment	kNm	63.61	118.08	7.27	188.97
Mz	Torsion	kNm	0.00	0.48	0.31	0.80

3.2 Along Track Moment

The worst case along track moments for a standard TTC structure occur under the following conditions:

Load combination B2, Structure spacing = 40m, Track Radius = 625m

Direction	Description	Unit	Action			
			Permanent	Wind*	Other variable	∑
Fx	Across track shear	kN	3.78	0.00	1.24	5.02
Fy	Along track shear	kN	0.00	18.95	0.00	18.95
Fz	Axial compression	kN	25.86	0.00	0.00	25.86
Mx	Along track moment	kNm	0.00	119.13	0.41	119.54
My	Across track moment	kNm	67.30	0.00	10.23	77.53
Mz	Torsion	kNm	0.00	29.68	0.51	30.19

* To convert to SLS multiply Wind values by 0.66.