BUROHAPPOLD ENGINEERING

033622-BH-010 Typical loading for GW Series 1 TTC

Project	NR - Working Groups for Electrification Standards
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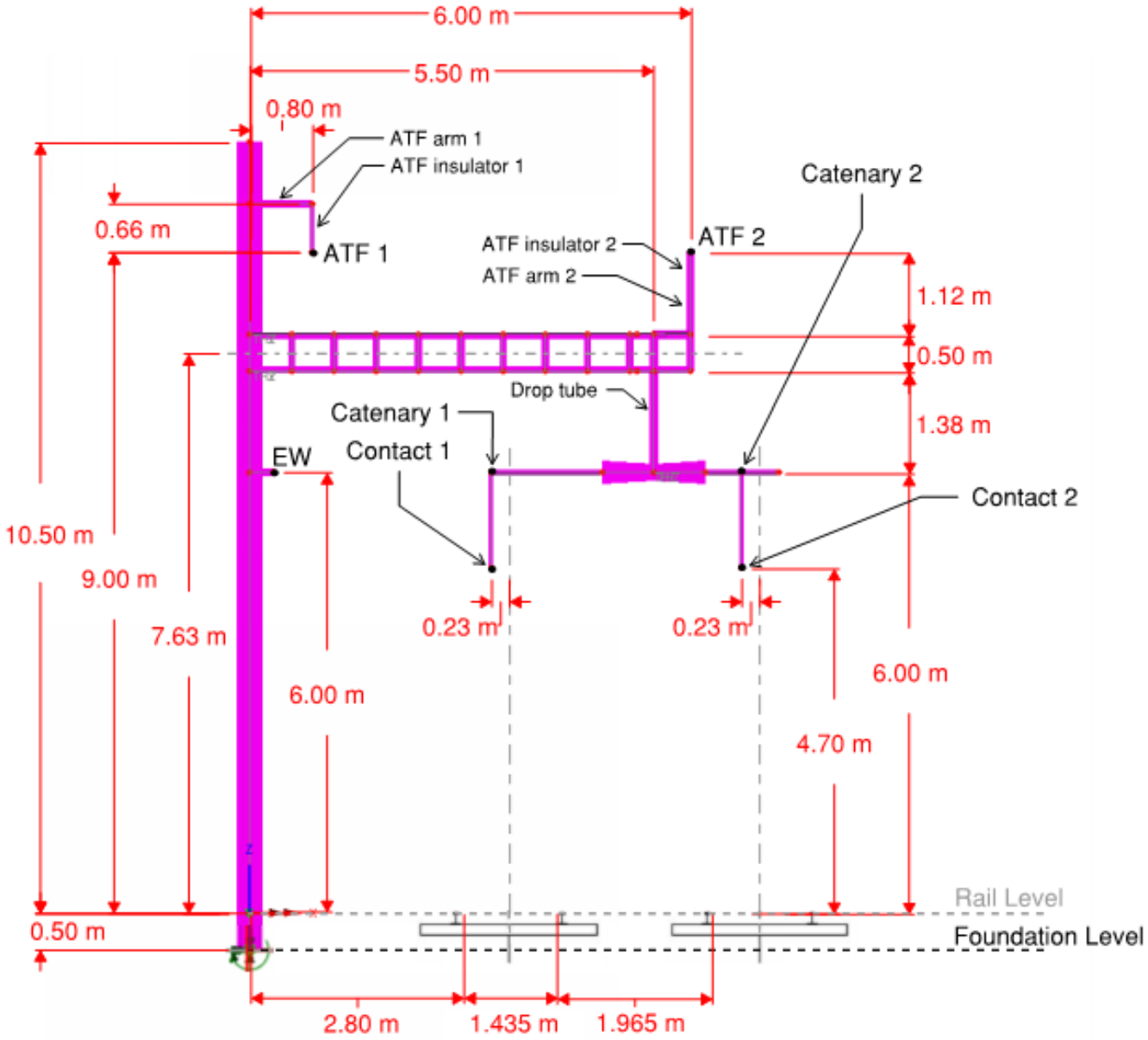
1 Typical GW Series 1 TTC loading

1.1 Introduction

The standard GW Series 1 TTC has a 350x12.5 SHS mast for a 6m boom. The maximum walk out is 2.8m with the drop tube located at a maximum distance of 5.5m from mast centre. Pull-off, where across track tension force due to stagger acts away from the structure, is the worst case for combination with across track wind and vertical actions to determine the overturning moment at the base of the mast.

The loads presented here are for a TTC on a tangent track at 65m structural spacing. All loads are unfactored.

1.2 Typical arrangement diagram



1.3 Tabulated vertical actions

1.3.1 Self weight

Self Weights	Load (kN)	Horizontal distance from mast centre (m)
Self weight of mast	14.410	0.000
Self weight of boom	5.087	3.000
Self weight of back to back	3.400	5.500
Self weight ATF arm 1	0.500	0.418
Self weight ATF arm 2	0.500	6.000
Self weight of catenary 1	0.383	3.288
Self weight of catenary 2	0.383	6.688
Self weight of contact 1	0.682	3.288
Self weight of contact 2	0.682	6.688
Self weight of ATF 1	0.461	0.835
Self weight of ATF 2	0.461	6.000
Self weight of EW	0.293	0.325

1.3.2 Ice loading

Ice Loads		Load (kN)	Horizontal distance from mast centre (m)
Ice on mast	without wind	4.235	0.000
Ice on boom	without wind	3.887	3.000
Ice on back to back	without wind	0.122	5.500
Ice on ATF arm 1	without wind	0.088	0.418
Ice on ATF arm 2	without wind	0.088	6.000
Ice on catenary 1	without wind	4.007	3.288
Ice on catenary 2	without wind	4.007	6.688
Ice on contact 1	without wind	3.623	3.288
Ice on contact 2	without wind	3.623	6.688
Ice on ATF 1	without wind	3.280	0.835
Ice on ATF 2	without wind	3.280	6.000
Ice on EW	without wind	3.382	0.325
Ice on mast	with wind	0.693	0.000
Ice on boom	with wind	0.636	3.000
Ice on back to back	with wind	0.200	5.500
Ice on ATF arm 1	with wind	0.014	0.418
Ice on ATF arm 2	with wind	0.014	6.000
Ice on catenary 1	with wind	0.152	3.288
Ice on catenary 2	with wind	0.152	6.688
Ice on contact 1	with wind	0.161	3.288
Ice on contact 2	with wind	0.161	6.688
Ice on ATF 1	with wind	0.199	0.835
Ice on ATF 2	with wind	0.199	6.000
Ice on EW	with wind	0.177	0.325

1.4 Tabulated horizontal actions (across track)

1.4.1 Across track wind

Wind Loads		Load (kN)	Vertical height above foundation level (m)
Wind on mast	without ice	4.316	5.500
Wind on boom	without ice	0.188	7.630
Wind on drop tube	without ice	0.186	7.190
Wind on ATF insulator 1	without ice	0.100	9.830
Wind on ATF insulator 2	without ice	0.100	9.170
Wind on catenary 1	without ice	0.328	6.500
Wind on catenary 2	without ice	0.328	6.500
Wind on contact 1	without ice	0.412	5.200
Wind on contact 2	without ice	0.412	5.200
Wind on ATF 1	without ice	0.656	9.500
Wind on ATF 2	without ice	0.656	9.500
Wind on EW	without ice	0.525	6.500
Wind on mast	with ice[1]	4.439	5.500
Wind on boom	with ice[1]	0.424	7.630
Wind on drop tube	with ice[1]	0.201	7.190
Wind on ATF insulator 1	with ice[1]	0.100	9.830
Wind on ATF insulator 2	with ice[1]	0.100	9.170
Wind on catenary 1	with ice[1]	0.819	6.500
Wind on catenary 2	with ice[1]	0.819	6.500
Wind on contact 1	with ice[1]	0.894	5.200
Wind on contact 2	with ice[1]	0.894	5.200
Wind on ATF 1	with ice[1]	1.154	9.500
Wind on ATF 2	with ice[1]	1.154	9.500
Wind on EW	with ice[1]	1.009	6.500

[1] These wind forces can be reduced by 50% when combined with ice

1.4.2 Across track wire tension

Wire Tension Loads		Load (kN)	Vertical height above foundation level (m)
Catenary tension	at +20°C OLE set up	0.184	6.500
Contact tension	at +20°C OLE set up	0.234	5.200
ATF tension	at +20°C OLE set up	0.072	9.500
EW tension	at +20°C OLE set up	0.047	6.500
Catenary tension	at +10°C with wind	0.184	6.500
Contact tension	at +10°C with wind	0.234	5.200
ATF tension	at +10°C with wind	0.149	9.500
EW tension	at +10°C with wind	0.107	6.500
Catenary tension	at -5°C with wind and ice	0.184	6.500
Contact tension	at -5°C with wind and ice	0.234	5.200
ATF tension	at -5°C with wind and ice	0.206	9.500
EW tension	at -5°C with wind and ice	0.146	6.500
Catenary tension	at -10°C with ice	0.184	6.500
Contact tension	at -10°C with ice	0.234	5.200
ATF tension	at -10°C with ice	0.193	9.500
EW tension	at -10°C with ice	0.132	6.500
Catenary tension	at -18°C without wind or ice	0.184	6.500
Contact tension	at -18°C without wind or ice	0.234	5.200
ATF tension	at -18°C without wind or ice	0.195	9.500
EW tension	at -18°C without wind or ice	0.126	6.500