

PROJECT: Mercedes-Benz Totem
Address: Mercedes-Benz, Richfield Avenue, Reading RG1 8EQ
NGR: E: 494836 N: 180964

Issue: A
Engineer: OA

TOTEM DESIGN**INPUT DATA, ASSUMPTIONS AND LIMITATIONS**

- Base reactions and steelwork stresses resulted as per BS EN 1991-1-4:2005+A1:2010 wind load calculation and totem aperture as per drawings provided;
- Relevant drawing: "Touchscreen Slough Technical 001.pdf";
- All steelwork considered gr. S275. Main supporting poles to be **CHS 168.3x5**;
- Bolts to be gr. 8.8 provided with anchor plate / washer;
- Weight of reinforced concrete considered **24kN/m³**;
- Soil's internal angle of friction conservatively assumed **17°**;
- Soil's allowable bearing pressure conservatively assumed **100kPa at 1.0m BGL**;
- Soil is considered dry;
- $V_{G,inf} = 0.9$;
- $V_{G,sup} = 1.0$;

Site Data

$V_{b,map}$	21.6 m/s
Altitude (AMSL)	28 m
Distance to sea:	54 km
Terrain Category	IV
z_e - reference height:	3.46 m AGL
Distance inside town	1 km

Basic Wind Velocity

C_{alt}	1.028
$V_{b,0} = V_{b,map} C_{alt}$	22.20 m/s
C_{dir} (directional factor)	1.0
C_{season} (season factor)	1.0
$V_b = C_{dir} C_{season} V_{b,0}$	22.20 m/s
q_b	0.302 kPa

Peak velocity pressure

$C_{e(z)}$	1.71
$q_{p(z)} = C_{e(z)} q_b C_{e,T}$	0.40 kN/m ²
$C_{e,T}$	0.78

Structural Factor $C_s C_d$

f	7.1 Hz
$C_s C_d$	1.00

Design loads

$$F_w = C_s C_d C_f q_{p(z_e)} A_{ref}$$

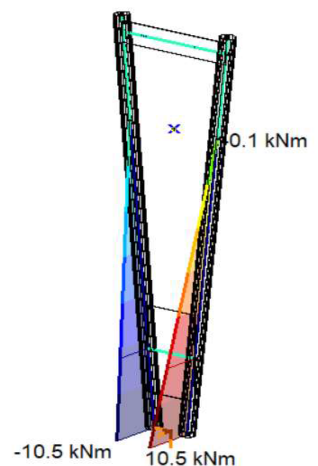
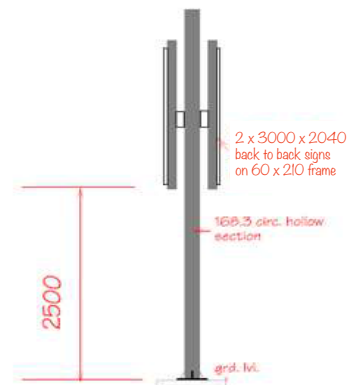
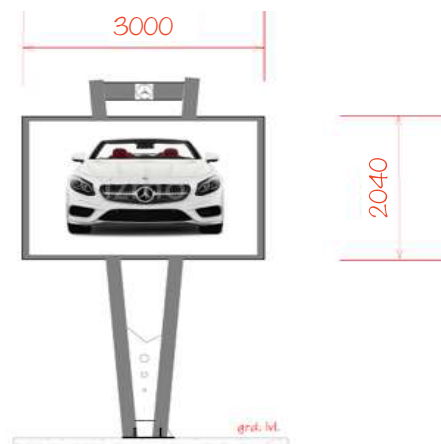
C_f	1.80 per BS EN 1991-1-4 cl. 7.4.3
A_{ref}	5.53 m ² (height * width)
F_w	4.0 kN

STEELWORK CALCULATIONS

Max. Bending Moment	10.5	kNm	
CHS 168.3x5 Moment Capacity	36.7	kNm	(to BS EN 1993-1-1)

Utilization Ratio **28.6% PASS**

Top Displacement (ULS)	36.5mm	OK
Top Rotation (ULS)	0.59°	OK

**Ultimate Steel Bending**

FIXING CALCULATIONS

Number of Bolts	6
Bolt Size	M24
Tensile Area	353 mm ²
Grade	8.8
Dist 1	300 mm
Dist 2	258 mm

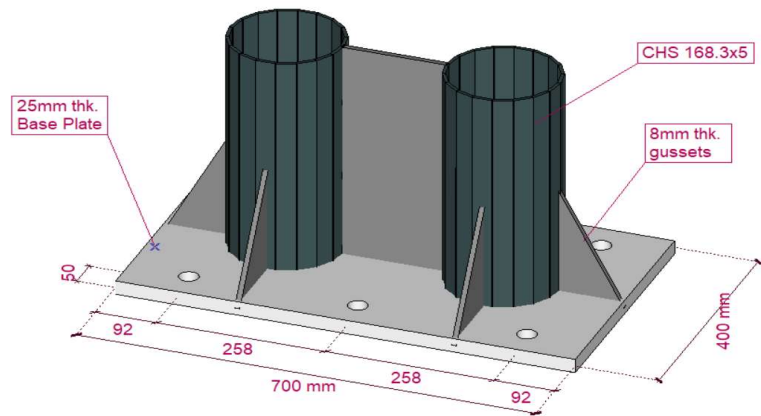
$F_{t,Rd}$	203.3 kN
$F_{v,Rd}$	135.6 kN

Max. Bolt Tension	23.3 kN
Max Bolt Shear	1.0 kN

Utilization Ratio 11.5% **PASS** bolts

Base Plate Steel Yield	275 N/mm ²
Max. Von Mises Stress	136 N/mm ²

Utilization Ratio 49.5% **PASS** base plate



Base Plate Design

FOUNDATION CALCULATIONS

Proposed Foundation Dimensions

Max. Plan Size	1.50 m
Min. Plan Size	1.50 m
Thickness	1.00 m

Un-Factored Foundation Loads

OTM Wind	13.9 kNm
Shear	4 kN
Axial	6.5 kN

1. Overturning Check

Total Weight	60.5 kN
Minimum Lever Arm	0.75 m
Calculated Stability	40.8 kNm
Total OTM	17.9 kNm
SF against OTM	2.28 PASS (required 1.75)

2. Sliding Check

Sliding

Internal friction angle	17.0 °	=> tanδ	0.306
Total Weight	60.5 kN		
F	16.6 kN		(frictional resistance under base)
Pole Base Shear	4.0 kN		
SF against Sliding	4.15 PASS		(required 2.0)

3. Bearing Pressure Check

Eccentricity	0.30 m		
Soil compressed	91 %	OK	
Max. pressure	59.2 kPa	PASS	(allowable 100kPa)
Min. pressure	0.0 kPa		

Conclusions and recommendations

Considering the above input data, design parameters and calculations, the new RC foundation, steelwork and fixing assembly would be **ADEQUATE** to resist the wind loads as depicted above. If anything unclear or cannot be applied we shall be notified in order to amend the design.

OVERALL RATING:

Foundation	PASS	Steelwork	PASS	Fixing	PASS
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