BalcoDeck® Balconette Hybrid®

WIND LOAD ASSESSMENT REPORT

PROJECT OVERVIEW:

Project reference : [redacted]
Customer name : [redacted]
Address : [redacted]
Prepared For : **Building Control / Surveyor / Customer**
Date : **13-01-2026**

PURPOSE:

This report provides wind loading calculations for structural assessment of a freestanding decking system- BalcoDeck®, an **Aerofoil balustrade** fixed on top of the deck which is Located on the **first-floor terrace (Balcony 1)** of a residential building.

APPLICABLE STANDARDS:

List the standards used:
BS EN 1991-1-4:2005 + A1:2010 – Wind Actions
UK National Annex to BS EN 1991-1-4
BS EN 1990:2002 – Basis of Structural Design
BS 6180:2011 – Barriers in and about buildings (for balustrades)

DESCRIPTION:

Design wind loads are influenced by several variable factors. These include site location, site altitude above sea level, type of terrain, site orography, deck level above ground floor and height of balustrade above ground level.

These parameters and conditions are defined in BS EN 1991-1-4:2002 + A1:2010 '*Actions on structures – wind actions'* and UK National Annex to EN 1991-1-4:2002 + A1:2010.

BS 8579:2020 '*Guide to the design of balconies and terraces*' further defines upper bound pressure coefficients for rectangular buildings which are up to 50m in height. These upper bound coefficients are dependent on the location of the balcony/terrace, i.e., top-level, mid-level, or on the corner of the building.

Each site location, in combination with the position of the balcony/terrace on the building will result in a specific **characteristic wind pressure** for that balustrade/balcony.

Structural calculations for our various systems will always relate to this **characteristic wind pressure** and the various loads, parameters and spans be based on this number.

To calculate wind loads the following factors are considered:

a) The site location is geographically within the isopleth in Figure NA 1 of the UK National Annex.

b) Site altitude above sea level.

c) Height to the top of balustrade above ground level.

d) Distance of the site from the coast.

e) Directional, seasonal, and probability factors are all taken as normal, for which the relevant coefficient is 1.0. This is a slightly conservative approach.

f) Location of the balcony/terrace on the building. i.e., mid-level, top-level, or on the corners of the building as shown in Figure 5 of BS 8579: 2020 *'Guide to the design of balconies and terraces.*

g) Sites with no significant orography in relation to wind effects. (i.e., orography coefficient 1.0). Increased wind load coefficients apply to sites on upwind or downwind slopes of isolated hills, ridges, cliffs, or escarpments, as detailed in section A.3 of BS EN 1991-1-4:2005 + A1:2010.

BASIC SITE PARAMETERS:

1.	Location	=	**London, United Kingdom**		
2.	Basic site wind velocity *[Figure NA 1 of NA to BS EN 1991-1-4:2005+A1:2010]*	=	$V_{b\ map}$	=	**22 m/s**
3.	Site altitude above sea level	=	A	=	**89 m**
4.	Decking height above ground level	=	z_{deck}	=	**3 m (1st floor terrace)**
5.	Balustrade Handrail height above ground level	=	z	=	**4.3 m**
6.	Distance upwind to shoreline	=	d_{shore}	=	**42 km Terrain Category III**
7.	Roughness length	=	z_0	=	**0.30 m for Terrain Category III**
8.	Terrain roughness upwind of the structure *[Figure NA 3 of NA to BS EN 1991-1-4:2005+A1:2010]*	=	C_r (z)	=	**0.83**
9.	Altitude factor as z < 10m *[Equations (NA.2b) of NA to BS EN 1991-1-4:2005+A1:2010]*	=	C_{alt}	=	1+ 0.001 x A = 1+ 0.001 x 89 = **1.089**
10.	Directional factor	=	C_{dir}	=	**1.0 max**
11.	Seasonal factor	=	C_{season}	=	**1.0 max**
12.	Probability factor	=	C_{prob}	=	**1.0 max**
13.	Orography coefficient (if orography is significant)	=	C_o	=	**Assumed to be 1.0 (Figure A.1)**

WIND PRESSURE CALCULATION:

1.	Site wind velocity	=	V_b	=	$V_{b\ map}$ (C_{dir} x C_{season} x C_{prob}) x C_{alt} = **23.958 m/s**
2.	Site wind pressure	=	q_b	=	0.613 $(V_b)^2$ = **351.853 N/m²**
3.	Exposure factor for country terrain *[Figure NA 7, of NA to BS EN 1991-1-4:2005+A1:2010]*	=	C_e (*z*)	=	**1.35**
4.	Peak wind velocity pressure at Deck (Characteristic wind pressure expressed in kN/m²)	=	q_p	=	q_b x C_e (*z*) = **475.002 N/m²**

BalcoDeck® is designed as a freestanding, elevated surface without side walls or mechanical fixings to the primary structure. Given its exposure and susceptibility to uplift, it is conservatively modelled as a free-standing partially enclosed canopy (fascia with minimal gap), per EN 1991-1-4:2005, Clause 7.3. This approach reflects the deck's structural independence, absence of internal pressure, and edge exposure, and ensures safety under wind uplift conditions.

5.	External pressure coefficient (canopy)	=	C_{pe}	=	**−0.6**

WIND UPLIFT LOAD ON DECK:

6. Wind Pressure on Deck Surface	=	w_e	=	$q_p(z) \times C_{pe}$		
[Equation 5.1 of BS EN 1991-1-4:2005+A1:2010]			=	475.002 N/m^2 x 0.6		
			=	**285.00 N/m^2**		
7. Deck Area	=	A_{deck}	=	7.41 m x 2.44 m		
			=	**18.0804 m^2**		
8. Total uplift Force	=	F_{uplift}	=	w_e x Decking area		
			=	285.00 x 18.0804		
			=	**5152.93N**	=	**5.153 kN**
9. Weight of the Decking Substructure			=	**362.54 kg**	=	**3556.50 N**
10. Weight of the Decking			=	**335.02 kg**	=	**3286.55 N**
11. Weight of the Balustrade			=	**410.93 kg**	=	**4031.22 N**
12. Total Dead Load			=	**10874.27 N**	=	**10.874 kN**

Total Dead Load = 10.874 kN > F_{uplift} = 5.153 kN

Deck will not lift-off under peak wind pressure.

13. Aluminium Joist spacing	=	**600 mm**		
14. Aluminium Pedestal spacing along the joist	=	**700 mm**		
15. Pedestal Grid	=	**600 mm × 700 mm**		
16. Deck Area per Pedestal	=	**0.6 m × 0.7 m**	=	**0.42 m^2**
17. Number of Aluminium pedestals	=	**63 pedestals**		
18. Dead load per pedestal	=	**10874.27 N / 63**	≈	**172.61 N**
19. Aluminium Pedestal Base Area	=	**200 mm × 200 mm**	=	**40,000 mm^2**

CALCULATION OF LATERAL WIND LOAD (SLIDING):

The lateral load acts on the vertical face of the decking system — mainly the edges (joists, fascia and board thickness).

We treat the system like a low parapet or screen subject to horizontal wind pressure and the wind is acting on one side of the deck (e.g., full side).

20. Projected Area	=	A_{proj}	=	width of deck × (height of deck + Balustrade height)		
			=	7.41 m x (0.180 m+ 1.125m)		
			=	**9.68 m^2**		
21. Net pressure coefficient; mid-wall balconies	=	$C_{p,net}$	=	**1.5**		
22. Net pressure coefficient; top floor & corner bals.	=	$C_{p,\,net}$	=	**1.8**		

Cp,net = 1.8 adopted in accordance with BS 8579:2020 for top-floor, edge-exposed balconies.

23. Peak wind velocity pressure at Balustrade	=	w_{lat}	=	$q_b \times C_e\,(z) \times C_{p,\,net}$
(Lateral wind pressure in kN/m^2)			=	351.853 x 1.35 x 1.8
			=	**855.00 N/m^2 = 0.855 kN/m^2**

24. Lateral Wind Force = F_{lat} = $w_{lat} \times A_{proj}$
= $0.855\ kN/m^2 \times 9.68\ m^2$
= **8.27 kN**

25. Frictional Resistance = $R_{friction}$ = $\mu \times$ Total Dead load
= $0.3 \times 10.874\ kN$
= **3.26 kN**

Default conservative value used here, i.e, $\mu = 0.3$ if pedestal sits directly on membrane

$R_{friction} = 3.26\ kN$ < $F_{lat} = 8.27\ kN$

26. Residual Lateral Load to Be Resisted by Adhesive = $F_{residual}$ = $F_{lat} - R_{friction}$
= **5.01 kN**

Sikaflex®-11 FC+ adhesive under each Aluminium pedestal can resist the Sliding (Lateral Wind Load) by resisting the shear between the pedestal and the substrate, reducing sliding risk. Especially helpful where friction alone is insufficient (e.g. low pedestal weight or slippery membranes).

CALCULATION OF SLIDING RESISTANCE USING Sikaflex®-11 FC+ AS ADHESIVE:

27. Lateral Wind Load per Aluminium pedestal = Residual Lateral Wind Pressure x Deck Area per Pedestal
= $(5.01\ kN/9.68\ m^2) \times 0.42\ m^2$ = **0.217 kN**

28. Sliding Resistance = F_{shear} = (Adhesive Shear Strength x Pedestal Base Area) / γ
= $0.25\ N/mm^2 \times 40{,}000\ mm^2 / (1000 \times 3)$ = **3.3 kN**

Total Sliding Resistance = 3.3 kN > 0.217 kN (✓)

The use of Sikaflex®-11 FC+ adhesive under each Aluminium pedestal provides more than adequate resistance against residual lateral (sliding).

CONCLUSION:

The wind load assessment, based on BS EN 1991-1-4:2005+A1:2010 and the UK National Annex, confirms that the proposed BalcoDeck® system on the **first-floor balcony** is subject to the following characteristic wind pressures:

- **Uplift pressure** on the deck surface: **285.00 N/m²**
- **Lateral wind pressure** on the balustrade: **855.00 N/m²**

The corresponding loads are:

- **Total uplift force** = **5.152 kN**
- **Total dead weight** = **10.874 kN**

Deck is safe against uplift — dead load > uplift.

- **Total lateral wind force** = **8.27 kN**
- **Frictional resistance (μ = 0.30, conservative): 3.26 kN**

The **lateral sliding resistance** of the system is influenced by both the friction between the pedestals and the roof membrane, and the use of Sikaflex®-11 FC+ adhesive.

Residual lateral force to be resisted = 5.01 kN

To resist the residual sliding force, the system uses **Sikaflex®-11 FC+ adhesive** under each aluminium pedestal. With a shear resistance of **3.3 kN per pedestal** (with γ = 3.0), the adhesive provides sufficient lateral anchorage per pedestal **(only 0.217 kN each**), ensuring the System is **safe against sliding** under lateral wind load.

<u>Recommended Passive Measures to Enhance Sliding Resistance:</u>

1. Balustrade attached to the wall

Attaching the balustrade to the wall can supplement sliding resistance by transferring lateral wind loads directly into the building structure, reducing the horizontal load that must be resisted by the deck pedestals. Its effectiveness depends on the rigidity of the wall fixings and the proportion of wind load carried by the balustrade. The calculations above conservatively assume the full wind load acts on the deck. Any wall attachment therefore provides additional redundancy and improves overall sliding stability.

2. **Anti-slip Rubber Pads**

To enhance sliding resistance and provide additional passive friction, the use of **anti-slip rubber pads** beneath the aluminium pedestals is recommended. These pads can achieve a friction coefficient of μ > 0.3 on roof membranes. Installing anti-slip pads would increase the frictional resistance, further improving the stability of the deck under lateral wind forces.

3. Perimeter Confinement

The use of perimeter kerbs or parapet engagement is strongly recommended as a supplementary restraint. This provides passive resistance to lateral displacement with minimal installation complexity and does not rely on adhesive strength.

4. Ballast

The deck can be ballasted using pavers or concrete slabs to increase frictional resistance and reduce the risk of sliding or uplifting. Ballast weight should be coordinated with roof structural limits and the load-bearing capacity of the roof structure.

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