
Executive Summary

This calculation package is a DRAFT issue (NOT FOR CONSTRUCTION)



Figure 1: Kaleidoscope (left) to be installed in Regent's Place and Teleidoscope (right) in Cumberland Market

Wind Loading

The wind loads are calculated to BS EN 1991.

Wind Calculation - Lateral Wind Forces on Sculpture

location = London

L_{shore} = 40 km

A_{alt} = 47.0 m

c_{alt} = 1.047

v_{b,map} = 21.4 m/s

v_{b,0} = v_{b,map} x c_{alt} = 22.4 m/s ..fundamental basic wind velocity

Roof Type = flat

eaves type = sharp

L_{building} = 1,000mm

W_{building} = 1,000mm

H_{eaves} = 2,000mm

h_{building} = 2,000mm

c_{dir} = 1.00 ..225° clockwise from North

c_{prob} = [(1 - K x ln(-ln(1-p)))/(1 - K x ln(-ln(0.98)))]^n = 1.0 ..probability factor

v_b = c_{dir} * c_{season} * v_{b,0} * c_{prob} = 22.4m/s ..basic wind speed

q_b = 0.5 x ρ_{air} x v_b² = 0.308kN/m² ..basic velocity pressure

location = Town

z = 49,000mm

c_{e(z)} = 2.80 ..exposure factor

from [BS EN 1991-1-4:2005+A1:2010 UK NA Figure NA.7]

c_{e,T} = 0.83 ..exposure correction factor

from [BS EN 1991-1-4:2005+A1:2010 UK NA Figure NA.8]

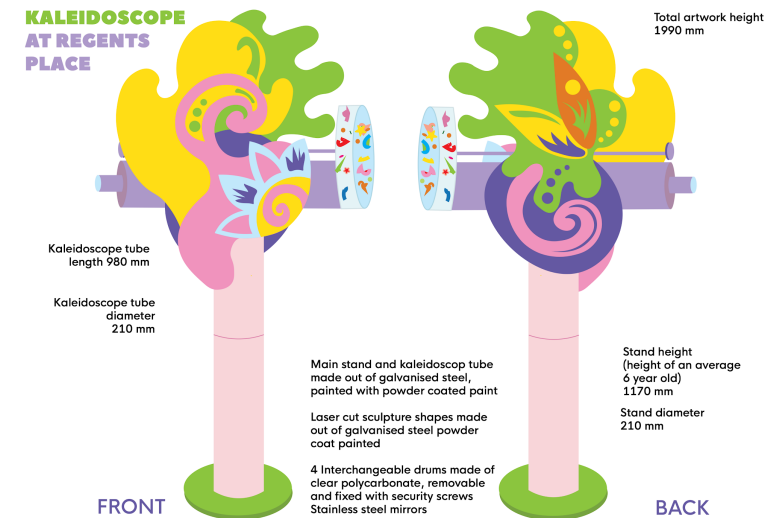


Figure 2: Kaleidoscope is 1990mm tall and weighs 115kg.
Teleidoscope is shorter and heavier but wider 1127mm wide.

Wind Force on Sculpture (modelled as Panel)

c_{pe} (zone D) = 0.80

c_{pe} (zone E) = -0.70

c_{size} = 1.00 ..size factor

from [BS EN 1991-1-4:2005+A1:2010 UK NA Table NA.3]

$c_{dynamic}$ = 1.00 ..dynamic factor

from [BS EN 1991-1-4:2005+A1:2010 UK NA Figure NA.8]

$q_p = c_{exposure} \times c_{e,T} \times q_b = 0.72 \text{ kN/m}^2$..peak velocity pressure

$p = 1.07 \text{ kN/m}^2$..

$A_{ref} = 1.13 \text{ m}^2$..reference area

$F_w = 1.21 \text{ kN}$..resultant wind force

Horizontal Loading

To UK National Annex to BS EN 1991-1:2002 location is:

- Category C "Areas where people may congregate"
- C5 Areas susceptible to large crowds
- (ix) Footways or pavements greater than 1.5m wide adjacent to sunken areas (Table NA.8 "Horizontal loads on partition walls and parapets")

THEREFORE design for 1.5 kN/m.

NOTE have not used category (x) as although the footpath varies in width the majority of the footpath seems to be less than 3m width so it would be a poor approximation for what the flow of people is likely to be like.

Regarding height of action (from BS EN 1991-1-1:2002 section 6.4 Horizontal loads on parapets and partition walls acting as barriers):

- Characteristic value of line load "acting at the height of the partition wall or parapets but not higher than 1.2m"
- Kaleidoscope and Teleidoscope are both set about 1.2m above ground level

THEREFORE load assumed to act at 1.2m above ground level.

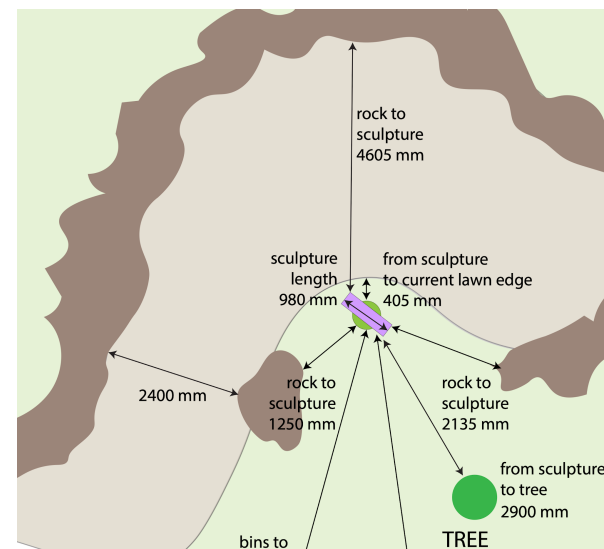


Figure 3: Kaleidoscope will be installed next to a footpath of typical width less than 3m. Teleidoscope assumed similar.

Overturning Check at Foundation to Ground Interface

Unfavourable Load Cases

0kM, Eurocode-Wind

L = 2.500m (lever-arm)

ULS = 1.82kN

...M_unfavourable = 4.5kNm

BY INSPECTION wind loading case does not govern

Overturning Check at Foundation to Ground Interface

Unfavourable Load Cases

0kM, Two Persons Climbing

L = 0.189m (lever-arm)

ULS = 2.70kN

...M_unfavourable = 0.5kNm

BY INSPECTION people climbing does not govern

Overturning Check at Foundation to Ground Interface

Unfavourable Load Cases
0kM, Eurocode-Horizontal
L = 2.200m (lever-arm)
ULS = 2.54kN

...M_unfavourable = 5.6kNm

Favourable Load Cases
0kM, Kaleidoscope-Gravity
L = 0.375m
ULS = 1.02kN

0kM, Foundation-Gravity
L = 0.375m
ULS = 12.66kN

: 0kM, Adhesive-Vertical
L = 0.150m
ULS = 5.48kN

...M_favourable = 5.9kNm

M_unfavourable = 5.6kNm
M_favourable = 5.9kNm

...PASS (overturning) = 1.07 > 1.00 FOS required

FOUNDATION works if 750 x 750 x 1000 (H)

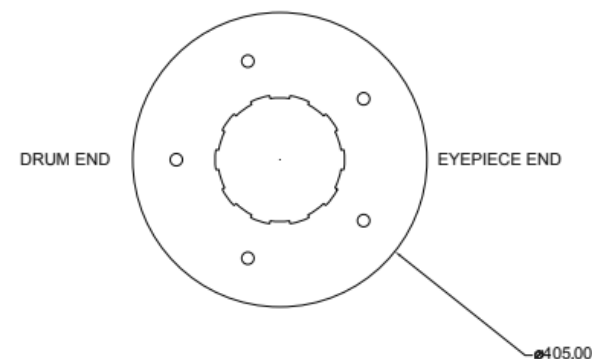


Figure 4: Kaleidoscope baseplate is 8mm plate, 405mm diameter.
Fixings into foundation are M16 stainless steel, 200mm long