



GEOTECHNICAL AND ENVIRONMENTAL ASSOCIATES LTD J18119

Job No. Sheet No. Rev.

Dr. Ref.

Made by ML Date 14-Jun-2018 Checked

7 Denmark Street, London WC2H 8LZ
Combined lateral and horizontal movements

Ref. Coordinates Displacements

x y z x y z
[m] [m] [m] [mm] [mm] [mm]

Coordinates: [Distance from wall / wall depth or max. excavation depth (x), Depth / wall depth or max. excavation depth (y), Settlement / wall depth or max. excavation depth (z) (%)]
[0.000,0.000,0.000][1.000,0.000,0.000][0.000,1.000,0.000][1.000,1.000,0.000]

Curve Fitting Polynomial

Method:
x Order: 1
y Order: 0
Polynomial: $z = 0.0x + 0.0$
Coeff. of $-2147483648.E+2147483647$
Determination:

Horizontal Ground Movement Curves (Excavations)

Curve Name: Installation of underpins

Coordinates: [Distance from wall / wall depth or max. excavation depth (x), Depth / wall depth or max. excavation depth (y), Horizontal movement / wall depth or max. excavation depth (z) (%)]
[0.000,0.000,0.150][1.500,0.000,0.000]

Curve Fitting Polynomial

Method:
x Order: 1
y Order: 0
Polynomial: $z = -10.0E-2x + 1.50E-1$
Coeff. of 1.00
Determination:

Polygonal Excavations

Excavation Name: Basement Excavation

Surface level [m]: 0.0
Contribution: Positive
Enabled: Yes
Surface movement curves which are selected are applied between surface and [m]: -3.5000

Corner	x	y	Base Level	Stiffened	Previous Side d	p1	p2*	Next Side d	p1	p2*
	[m]	[m]	[m]		[m]	[%]	[%]	[m]	[%]	[%]
1	34.000	22.600	-3.5000	Yes	0.0	67.000	25.000	0.0	67.000	25.000
2	38.500	17.700	-3.5000	Yes	0.0	67.000	25.000	0.0	67.000	25.000
3	43.100	21.100	-1.1900	Yes	0.0	67.000	25.000	0.0	67.000	25.000
4	39.100	26.100	-3.5000	Yes	0.0	67.000	25.000	0.0	67.000	25.000

Side	Corner 1		Corner 2		Vertical Ground Movement Curve		Horizontal
	x	y	x	y			
	[m]	[m]	[m]	[m]			
1	34.000	22.600	38.500	17.700	No vertical ground movement	Installation of underpins	
2	38.500	17.700	43.100	21.100	No vertical ground movement	Installation of underpins	
3	43.100	21.100	39.100	26.100	No vertical ground movement	Installation of underpins	
4	39.100	26.100	34.000	22.600	No vertical ground movement	Installation of underpins	

Damage Category Strains

Name	0 (Negligible)	1 (Very Slight)	2 (Slight)	3 (Moderate)
	to			
	1 (Very Slight)	2 (Slight)	3 (Moderate)	4 (Severe)
Burland Strain Limits	0.0	500.00E-6	750.00E-6	0.0015000

Specific Structures - Geometry

Structure Name	Sub-Structure Name	Displacement Line	Start Distance Along Line	End Distance Along Line	Vertical Offsets from Line for Vertical Movement Calculations	Vertical Displacement Limit	Damage Category Strains	Poisson's Ratio	E/G
			[m]	[m]	[m]	[mm]			
No 6 Denmark Street	No6 A	No6 A	0.00000	15.46000	0.0	0.10000	Burland Strain Limits	0.20000	2.6000
No 6 Denmark Street	No6 C	No6 C	0.00000	5.99000	0.0	0.10000	Burland Strain Limits	0.20000	2.6000
No 6 Denmark Street	No6 D	No6 D	0.00000	4.58000	0.0	0.10000	Burland Strain Limits	0.20000	2.6000
No 6 Denmark Street	No6 E	No7 E	0.00000	15.86000	0.0	0.10000	Burland Strain Limits	0.20000	2.6000
No 6 Denmark Street	No6 F	No8 F	0.00000	6.26000	0.0	0.10000	Burland Strain Limits	0.20000	2.6000
No 9 Denmark Street	No9 A	No9 A	0.00000	12.68000	0.0	0.10000	Burland Strain Limits	0.20000	2.6000
No 9 Denmark Street	No9 B	No9 B	0.00000	7.62000	0.0	0.10000	Burland Strain Limits	0.20000	2.6000
No 8 Denmark Street	No8 A	No8 A	0.00000	6.36000	0.0	0.10000	Burland Strain Limits	0.20000	2.6000
122 Charing Cross Rd	122A	122A	0.00000	14.92000	0.0	0.10000	Burland Strain Limits	0.20000	2.6000
122 Charing Cross Rd	122B	122B	0.00000	11.24000	0.0	0.10000	Burland Strain Limits	0.20000	2.6000
No 7 Retained	No7 A	No7 A	0.00000	13.46000	0.0	0.10000	Burland Strain Limits	0.20000	2.6000
No 7 Retained	No7 C	No7 C	0.00000	13.86000	0.0	0.10000	Burland Strain Limits	0.20000	2.6000
No 7 Retained	No7 D	No7 D	0.00000	6.48000	0.0	0.10000	Burland Strain Limits	0.20000	2.6000

Specific Structures - Bending Parameters

Structure Name	Sub-Structure Name	Height	Default Properties	Hogging			Sagging		
				2nd Moment of Area (per unit width)	Distance of Bending from N.A.	Distance of N.A. from Edge of Beam in Tension	2nd Moment of Area (per unit width)	Distance of Bending from N.A.	Distance of N.A. from Edge of Beam in Tension
		[m]		[m ³]	[m]	[m]	[m ³]	[m]	[m]
No 6 Denmark Street	No6 A	15.000	Yes	1125.0	15.000	15.000	281.25	7.5000	7.5000
No 6 Denmark Street	No6 C	9.0000	Yes	243.00	9.0000	9.0000	60.750	4.5000	4.5000
No 6 Denmark Street	No6 D	9.0000	Yes	243.00	9.0000	9.0000	60.750	4.5000	4.5000
No 6 Denmark Street	No6 E	15.000	Yes	1125.0	15.000	15.000	281.25	7.5000	7.5000
No 6 Denmark Street	No6 F	15.000	Yes	1125.0	15.000	15.000	281.25	7.5000	7.5000
No 9 Denmark Street	No9 A	18.000	Yes	1944.0	18.000	18.000	486.00	9.0000	9.0000
No 9 Denmark Street	No9 B	18.000	Yes	1944.0	18.000	18.000	486.00	9.0000	9.0000
No 8 Denmark Street	No8 A	18.000	Yes	1944.0	18.000	18.000	486.00	9.0000	9.0000
122 Charing Cross Rd	122A	18.000	Yes	1944.0	18.000	18.000	486.00	9.0000	9.0000
122 Charing Cross Rd	122B	18.000	Yes	1944.0	18.000	18.000	486.00	9.0000	9.0000



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Table with Job No., Sheet No., Rev., Drg. Ref., Made by ML, Date 14-Jun-2018, Checked

Main data table with columns: Type/No., Name, Dist., Coordinates (x, y, z), Displacements (x, y, z), Horizontal displacement, Horizontal displacement, Angle of Line to x Axis



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Table with columns: Type/No., Name, Dist., Coordinates (x, y, z), Displacements (x, y, z), Horizontal displacement, Horizontal displacement, Angle of Line to x Axis. Contains multiple rows of data points.

* Result includes imported displacement(s).

Specific Building Damage Results - Horizontal Displacements

Structure: No 6 Denmark Street | Sub-structure: No6 A

Table with columns: Dist., Coordinates (x, y, z), Displacements (x, y, z), Horizontal displacement along the Line, Horizontal displacement perpendicular to Line. Includes units in [m] and [mm].

Structure: No 6 Denmark Street | Sub-structure: No6 C

Table with columns: Dist., Coordinates (x, y, z), Displacements (x, y, z), Horizontal displacement along the Line, Horizontal displacement perpendicular to Line. Includes units in [m] and [mm].

Structure: No 6 Denmark Street | Sub-structure: No6 D

Table with columns: Dist., Coordinates (x, y, z), Displacements (x, y, z), Horizontal displacement along the Line, Horizontal displacement perpendicular to Line. Includes units in [m] and [mm].



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7 Denmark Street, London WC2H 8LZ
 Combined lateral and horizontal movements

Job No.	Sheet No.	Rev.
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Made by	Date	Checked
ML	14-Jun-2018	

Dist. Coordinates Displacements
 x y z x y Horizontal Horizontal
 displacement displacement
 along the perpendicular

Structure: No 7 Retained | Sub-structure: No7 A

Dist.	Coordinates			Displacements		Horizontal	Horizontal
	x	y	z	x	y	displacement	displacement
				along the	perpendicular	along the	perpendicular
				Line	to Line	Line	to Line
	[m]	[m]	[m]	[mm]	[mm]	[mm]	[mm]
0.0	25.70000	33.20000	-2.50000	0.0	0.0	0.0	0.0
1.9233	26.88571	31.68571	-2.50000	0.0	0.0	0.0	0.0
3.8465	28.07143	30.17143	-2.50000	0.0	0.0	0.0	0.0
5.7698	29.25714	28.65714	-2.50000	0.0	0.0	0.0	0.0
7.6931	30.44286	27.14286	-2.50000	0.0	0.0	0.0	0.0
9.6164	31.62857	25.62857	-2.50000	0.47915	-0.65718	0.81283	-0.027901
11.540	32.81429	24.11429	-2.50000	1.1358	-1.5578	1.9267	-0.066136
13.463	34.00000	22.60000	-2.50000	2.6641	-1.0818	2.4942	1.4306

d - Displacements include imported displacements.

Structure: No 7 Retained | Sub-structure: No7 C

Dist.	Coordinates			Displacements		Horizontal	Horizontal
	x	y	z	x	y	displacement	displacement
				along the	perpendicular	along the	perpendicular
				Line	to Line	Line	to Line
	[m]	[m]	[m]	[mm]	[mm]	[mm]	[mm]
0.0	39.10000	26.10000	-2.50000	-0.38687	-2.6074	-1.8565	1.8712
1.9800	37.91429	27.68571	-2.50000	1.8512	-2.6975	-3.2689	0.13280
3.9600	36.72857	29.27143	-2.50000	0.73178	-1.0663	-1.2922	0.052496
5.9400	35.54286	30.85714	-2.50000	0.0	0.0	0.0	0.0
7.9200	34.35714	32.44286	-2.50000	0.0	0.0	0.0	0.0
9.9000	33.17143	34.02857	-2.50000	0.0	0.0	0.0	0.0
11.880	31.98571	35.61429	-2.50000	0.0	0.0	0.0	0.0
13.860	30.80000	37.20000	-2.50000	0.0	0.0	0.0	0.0

d - Displacements include imported displacements.

Structure: No 7 Retained | Sub-structure: No7 D

Dist.	Coordinates			Displacements		Horizontal	Horizontal
	x	y	z	x	y	displacement	displacement
				along the	perpendicular	along the	perpendicular
				Line	to Line	Line	to Line
	[m]	[m]	[m]	[mm]	[mm]	[mm]	[mm]
0.0	30.80000	37.20000	-2.50000	0.0	0.0	0.0	0.0
1.0803	29.95000	36.53333	-2.50000	0.0	0.0	0.0	0.0
2.1605	29.10000	35.86667	-2.50000	0.0	0.0	0.0	0.0
3.2408	28.25000	35.20000	-2.50000	0.0	0.0	0.0	0.0
4.3210	27.40000	34.53333	-2.50000	0.0	0.0	0.0	0.0
5.4013	26.55000	33.86667	-2.50000	0.0	0.0	0.0	0.0
6.4815	25.70000	33.20000	-2.50000	0.0	0.0	0.0	0.0

d - Displacements include imported displacements.

Specific Building Damage Results - Vertical Displacements

Structure: No 6 Denmark Street | Sub-structure: No6 A

Dist.	Coordinates			Displacements	
	x	y	z	z	
	[m]	[m]	[m]	[mm]	
0.0	30.80000	37.20000	-2.50000	-0.36396	d
1.9328	31.98750	35.67500	-2.50000	-0.12971	d
3.8656	33.17500	34.15000	-2.50000	-0.18673	d
5.7985	34.36250	32.62500	-2.50000	-0.27255	d
7.7313	35.55000	31.10000	-2.50000	-0.40522	d
9.6641	36.73750	29.57500	-2.50000	-0.61601	d
11.597	37.92500	28.05000	-2.50000	-0.95219	d
13.530	39.11250	26.52500	-2.50000	-1.3819	d
15.463	40.30000	25.00000	-2.50000	-1.8711	d

d - Displacements include imported displacements.

Structure: No 6 Denmark Street | Sub-structure: No6 C

Dist.	Coordinates			Displacements	
	x	y	z	z	
	[m]	[m]	[m]	[mm]	
0.0	43.10000	21.10000	-0.70000	-3.9354	d
1.5000	44.30000	22.00000	-0.70000	-1.2244	d
3.0000	45.50000	22.90000	-0.70000	-0.80501	d
4.5000	46.70000	23.80000	-0.70000	-0.55355	d
6.0000	47.90000	24.70000	-0.70000	-0.78577	d

d - Displacements include imported displacements.

Structure: No 6 Denmark Street | Sub-structure: No6 D

Dist.	Coordinates			Displacements	
	x	y	z	z	
	[m]	[m]	[m]	[mm]	
0.0	47.90000	24.70000	-0.70000	-0.78577	d
0.57255	47.56250	25.16250	-0.70000	-0.40470	d
1.1451	47.22500	25.62500	-0.70000	-0.41394	d
1.7176	46.88750	26.08750	-0.70000	-0.42034	d
2.2902	46.55000	26.55000	-0.70000	-0.42369	d
2.8627	46.21250	27.01250	-0.70000	-0.42394	d
3.4353	45.87500	27.47500	-0.70000	-0.42112	d
4.0078	45.53750	27.93750	-0.70000	-0.41537	d
4.5804	45.20000	28.40000	-0.70000	-0.40691	d

d - Displacements include imported displacements.

Structure: No 6 Denmark Street | Sub-structure: No6 E

Dist.	Coordinates			Displacements	
	x	y	z	z	
	[m]	[m]	[m]	[mm]	
0.0	45.20000	28.40000	-2.50000	-0.40691	d
2.6433	43.61667	30.51667	-2.50000	-0.34446	d
5.2867	42.03333	32.63333	-2.50000	-0.26332	d
7.9300	40.45000	34.75000	-2.50000	-0.18831	d
10.573	38.86667	36.86667	-2.50000	-0.12949	d
13.217	37.28333	38.98333	-2.50000	-0.087091	d
15.860	35.70000	41.10000	-2.50000	-0.11552	d



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Dist. Coordinates Displacements
[m] x y z z
[m] [m] [m] [m] [mm]

d - Displacements include imported displacements.

Structure: No 6 Denmark Street | Sub-structure: No6 F

Dist. Coordinates Displacements
[m] x y z z
[m] [m] [m] [m] [mm]

Vertical Offset 1
0.0 35.70000 41.10000 -3.50000 0.0
1.0438 34.88333 40.45000 -3.50000 0.0
2.0875 34.06667 39.80000 -3.50000 0.0
3.1313 33.25000 39.15000 -3.50000 0.0
4.1751 32.43333 38.50000 -3.50000 0.0
5.2188 31.61667 37.85000 -3.50000 0.0
6.2626 30.80000 37.20000 -3.50000 0.0

Structure: No 9 Denmark Street | Sub-structure: No9 A

Dist. Coordinates Displacements
[m] x y z z
[m] [m] [m] [m] [mm]

Vertical Offset 1
0.0 20.60000 29.40000 -3.50000 0.0
1.8118 21.71429 27.97143 -3.50000 0.0
3.6235 22.82857 26.54286 -3.50000 0.0
5.4353 23.94286 25.11429 -3.50000 0.0
7.2470 25.05714 23.68571 -3.50000 0.0
9.0588 26.17143 22.25714 -3.50000 0.0
10.871 27.28571 20.82857 -3.50000 0.0
12.682 28.40000 19.40000 -3.50000 0.0

Structure: No 9 Denmark Street | Sub-structure: No9 B

Dist. Coordinates Displacements
[m] x y z z
[m] [m] [m] [m] [mm]

Vertical Offset 1
0.0 28.40000 19.40000 -3.50000 0.0
1.0888 29.07143 18.54286 -3.50000 0.0
2.1776 29.74286 17.68571 -3.50000 0.0
3.2664 30.41429 16.82857 -3.50000 0.0
4.3552 31.08571 15.97143 -3.50000 0.0
5.4441 31.75714 15.11429 -3.50000 0.0
6.5329 32.42857 14.25714 -3.50000 0.0
7.6217 33.10000 13.40000 -3.50000 0.0

Structure: No 8 Denmark Street | Sub-structure: No8 A

Dist. Coordinates Displacements
[m] x y z z
[m] [m] [m] [m] [mm]

Vertical Offset 1
0.0 25.70000 33.20000 -3.50000 0.0
1.0600 24.85000 32.56667 -3.50000 0.0
2.1200 24.00000 31.93333 -3.50000 0.0
3.1800 23.15000 31.30000 -3.50000 0.0
4.2400 22.30000 30.66667 -3.50000 0.0
5.3000 21.45000 30.03333 -3.50000 0.0
6.3600 20.60000 29.40000 -3.50000 0.0

Structure: 122 Charing Cross Rd | Sub-structure: 122A

Dist. Coordinates Displacements
[m] x y z z
[m] [m] [m] [m] [mm]

Vertical Offset 1
0.0 29.30000 10.20000 -3.50000 -0.16452 d
2.1314 31.00000 11.48571 -3.50000 -0.24889 d
4.2629 32.70000 12.77143 -3.50000 -0.38558 d
6.3943 34.40000 14.05714 -3.50000 -0.61841 d
8.5258 36.10000 15.34286 -3.50000 -1.0428 d
10.657 37.80000 16.62857 -3.50000 -1.8750 d
12.789 39.50000 17.91429 -3.50000 -3.1917 d
14.920 41.20000 19.20000 -3.50000 -6.7078 d
d - Displacements include imported displacements.

Structure: 122 Charing Cross Rd | Sub-structure: 122B

Dist. Coordinates Displacements
[m] x y z z
[m] [m] [m] [m] [mm]

Vertical Offset 1
0.0 41.20000 19.20000 -3.50000 -6.7078 d
1.2494 41.97778 18.22222 -3.50000 -1.9764 d
2.4988 42.75556 17.24444 -3.50000 -1.2729 d
3.7482 43.53333 16.26667 -3.50000 -0.86891 d
4.9976 44.31111 15.28889 -3.50000 -0.61876 d
6.2470 45.08889 14.31111 -3.50000 -0.45422 d
7.4964 45.86667 13.33333 -3.50000 -0.34088 d
8.7458 46.64444 12.35556 -3.50000 -0.26004 d
9.9952 47.42222 11.37778 -3.50000 -0.20083 d
11.245 48.20000 10.40000 -3.50000 -0.15657 d
d - Displacements include imported displacements.

Structure: No 7 Retained | Sub-structure: No7 A

Dist. Coordinates Displacements
[m] x y z z
[m] [m] [m] [m] [mm]

Vertical Offset 1
0.0 25.70000 33.20000 -2.50000 -0.19281 d
1.9233 26.88571 31.68571 -2.50000 -0.13851 d
3.8465 28.07143 30.17143 -2.50000 -0.20175 d
5.7698 29.25714 28.65714 -2.50000 -0.29997 d
7.6931 30.44286 27.14286 -2.50000 -0.45983 d
9.6164 31.62857 25.62857 -2.50000 -0.73827 d
11.540 32.81429 24.11429 -2.50000 -1.2715 d
13.463 34.00000 22.60000 -2.50000 -4.9721 d
d - Displacements include imported displacements.

Structure: No 7 Retained | Sub-structure: No7 C

Dist. Coordinates Displacements
x y z z



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[m]	[m]	[m]	[m]	[mm]
Vertical Offset 1				
0.0	39.10000	26.10000	-2.50000	-2.8012 d
1.9800	37.91429	27.68571	-2.50000	-1.0633 d
3.9600	36.72857	29.27143	-2.50000	-0.66625 d
5.9400	35.54286	30.85714	-2.50000	-0.42796 d
7.9200	34.35714	32.44286	-2.50000	-0.28276 d
9.9000	33.17143	34.02857	-2.50000	-0.19100 d
11.880	31.98571	35.61429	-2.50000	-0.13110 d
13.860	30.80000	37.20000	-2.50000	-0.36396 d

d - Displacements include imported displacements.

Structure: No 7 Retained | Sub-structure: No7 D

Dist.	Coordinates			Displacements
	x	y	z	z
[m]	[m]	[m]	[m]	[mm]
Vertical Offset 1				
0.0	39.80000	37.20000	-2.50000	-0.36396 d
1.0803	29.95000	36.53333	-2.50000	-0.094844 d
2.1605	29.10000	35.86667	-2.50000	-0.097651 d
3.2408	28.25000	35.20000	-2.50000	-0.099264 d
4.3210	27.40000	34.53333	-2.50000	-0.099597 d
5.4013	26.55000	33.86667	-2.50000	-0.098627 d
6.4815	25.70000	33.20000	-2.50000	-0.19281 d

d - Displacements include imported displacements.

Specific Building Damage Results - All Segments

Structure: No 6 Denmark Street | Sub-structure: No6 A

Vertical Offset from Line for Vertical Movement Calculations	Segment	Start	Length	Curvature	Deflection Ratio	Average Horizontal Strain	Max Tensile Strain	Max Gradient of Horizontal Displacement Curve	Max Gradient of Vertical Displacement Curve	Min Radius of Curvature	Damage Category
[m]		[m]	[m]		[%]	[%]	[%]			[m]	
0.0	1	0.0	15.460	Sagging	0.0046004	363.81E-6	0.0060968	798.06E-6	253.32E-6	10468.	0 (Negligible)

Tensile horizontal strains are +ve, compressive horizontal strains are -ve.

Structure: No 6 Denmark Street | Sub-structure: No6 C

Vertical Offset from Line for Vertical Movement Calculations	Segment	Start	Length	Curvature	Deflection Ratio	Average Horizontal Strain	Max Tensile Strain	Max Gradient of Horizontal Displacement Curve	Max Gradient of Vertical Displacement Curve	Min Radius of Curvature	Damage Category
[m]		[m]	[m]		[%]	[%]	[%]			[m]	
0.0	1	0.0	5.9900	Sagging	0.032028	0.0097352	0.039185	-267.58E-6	-0.0018068	797.55	0 (Negligible)

Tensile horizontal strains are +ve, compressive horizontal strains are -ve.

Structure: No 6 Denmark Street | Sub-structure: No6 D

Vertical Offset from Line for Vertical Movement Calculations	Segment	Start	Length	Curvature	Deflection Ratio	Average Horizontal Strain	Max Tensile Strain	Max Gradient of Horizontal Displacement Curve	Max Gradient of Vertical Displacement Curve	Min Radius of Curvature	Damage Category
[m]		[m]	[m]		[%]	[%]	[%]			[m]	
0.0	1	0.0	1.7001	Sagging	0.015018	0.0	0.014881	0.0	-665.57E-6	670.91	0 (Negligible)
	2	1.7001	2.8799	Hogging	317.28E-6	0.0	315.18E-6	0.0	-14.760E-6	106420.	0 (Negligible)

Tensile horizontal strains are +ve, compressive horizontal strains are -ve.

Structure: No 6 Denmark Street | Sub-structure: No6 E

Vertical Offset from Line for Vertical Movement Calculations	Segment	Start	Length	Curvature	Deflection Ratio	Average Horizontal Strain	Max Tensile Strain	Max Gradient of Horizontal Displacement Curve	Max Gradient of Vertical Displacement Curve	Min Radius of Curvature	Damage Category
[m]		[m]	[m]		[%]	[%]	[%]			[m]	
0.0	1	0.0	4.8542	Hogging	174.83E-6	0.0	173.63E-6	0.0	-30.692E-6	280980.	0 (Negligible)
	2	4.8542	11.006	Sagging	609.50E-6	0.0	604.57E-6	0.0	-30.692E-6	82751.	0 (Negligible)

Tensile horizontal strains are +ve, compressive horizontal strains are -ve.

Structure: No 6 Denmark Street | Sub-structure: No6 F

Vertical Offset from Line for Vertical Movement Calculations	Segment	Start	Length	Curvature	Deflection Ratio	Average Horizontal Strain	Max Tensile Strain	Max Gradient of Horizontal Displacement Curve	Max Gradient of Vertical Displacement Curve	Min Radius of Curvature	Damage Category
[m]		[m]	[m]		[%]	[%]	[%]			[m]	
0.0	All settlements are less than the Settlement Trough Limit Sensitivity.										

Tensile horizontal strains are +ve, compressive horizontal strains are -ve.

Structure: No 9 Denmark Street | Sub-structure: No9 A

Vertical Offset from Line for Vertical Movement Calculations	Segment	Start	Length	Curvature	Deflection Ratio	Average Horizontal Strain	Max Tensile Strain	Max Gradient of Horizontal Displacement Curve	Max Gradient of Vertical Displacement Curve	Min Radius of Curvature	Damage Category
[m]		[m]	[m]		[%]	[%]	[%]			[m]	
0.0	All settlements are less than the Settlement Trough Limit Sensitivity.										

Tensile horizontal strains are +ve, compressive horizontal strains are -ve.

Structure: No 9 Denmark Street | Sub-structure: No9 B

Vertical Offset from Line for Vertical Movement Calculations	Segment	Start	Length	Curvature	Deflection Ratio	Average Horizontal Strain	Max Tensile Strain	Max Gradient of Horizontal Displacement Curve	Max Gradient of Vertical Displacement Curve	Min Radius of Curvature	Damage Category
[m]		[m]	[m]		[%]	[%]	[%]			[m]	
0.0	All settlements are less than the Settlement Trough Limit Sensitivity.										

Tensile horizontal strains are +ve, compressive horizontal strains are -ve.

Structure: No 8 Denmark Street | Sub-structure: No8 A



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Vertical Offset from Line for Vertical Movement	Segment	Start	Length	Curvature	Deflection Ratio	Average Horizontal Strain	Max Tensile Strain	Max Gradient of Horizontal Displacement	Max Gradient of Vertical Displacement Curve	Min Radius of Curvature	Damage Category
0.0											
Calculations		[m]	[m]		[%]	[%]	[%]			[m]	
All settlements are less than the Settlement Trough Limit Sensitivity. Tensile horizontal strains are +ve, compressive horizontal strains are -ve.											

Structure: 122 Charing Cross Rd | Sub-structure: 122A

Vertical Offset from Line for Vertical Movement	Segment	Start	Length	Curvature	Deflection Ratio	Average Horizontal Strain	Max Tensile Strain	Max Gradient of Horizontal Displacement Curve	Max Gradient of Vertical Displacement Curve	Min Radius of Curvature	Damage Category	
0.0	1	0.0	14.920	Sagging	0.019826		0.0	0.021495	0.0	0.0016496	1728.6	0 (Negligible)
Tensile horizontal strains are +ve, compressive horizontal strains are -ve.												

Structure: 122 Charing Cross Rd | Sub-structure: 122B

Vertical Offset from Line for Vertical Movement	Segment	Start	Length	Curvature	Deflection Ratio	Average Horizontal Strain	Max Tensile Strain	Max Gradient of Horizontal Displacement Curve	Max Gradient of Vertical Displacement Curve	Min Radius of Curvature	Damage Category	
0.0	1	0.0	11.240	Sagging	0.035601		0.0	0.032365	0.0	-0.0037870	314.72	0 (Negligible)
Tensile horizontal strains are +ve, compressive horizontal strains are -ve.												

Structure: No 7 Retained | Sub-structure: No7 A

Vertical Offset from Line for Vertical Movement	Segment	Start	Length	Curvature	Deflection Ratio	Average Horizontal Strain	Max Tensile Strain	Max Gradient of Horizontal Displacement Curve	Max Gradient of Vertical Displacement Curve	Min Radius of Curvature	Damage Category	
0.0	1	0.0	13.460	Sagging	0.022319		0.018524	0.044063	-578.83E-6	0.0019236	949.63	0 (Negligible)
Tensile horizontal strains are +ve, compressive horizontal strains are -ve.												

Structure: No 7 Retained | Sub-structure: No7 C

Vertical Offset from Line for Vertical Movement	Segment	Start	Length	Curvature	Deflection Ratio	Average Horizontal Strain	Max Tensile Strain	Max Gradient of Horizontal Displacement Curve	Max Gradient of Vertical Displacement Curve	Min Radius of Curvature	Damage Category	
0.0	1	0.0	13.860	Sagging	0.010371		0.013394	0.025489	-997.36E-6	-878.33E-6	2393.4	0 (Negligible)
Tensile horizontal strains are +ve, compressive horizontal strains are -ve.												

Structure: No 7 Retained | Sub-structure: No7 D

Vertical Offset from Line for Vertical Movement	Segment	Start	Length	Curvature	Deflection Ratio	Average Horizontal Strain	Max Tensile Strain	Max Gradient of Horizontal Displacement Curve	Max Gradient of Vertical Displacement Curve	Min Radius of Curvature	Damage Category	
0.0	1	0.0	3.2208	Sagging	0.0055644		0.0	0.0054994	0.0	-249.13E-6	3430.1	0 (Negligible)
	2	3.2208	0.076665	Hogging	22.806E-6		0.0	22.781E-6	0.0	1.4939E-6	925330.	0 (Negligible)
	3	3.2974	3.1826	Sagging	0.0019470		0.0	0.0019248	0.0	87.190E-6	9778.6	0 (Negligible)
Tensile horizontal strains are +ve, compressive horizontal strains are -ve.												

Specific Building Damage Results - Critical Values for All Segments within Each Sub-Structure

Structure: No 6 Denmark Street | Sub-structure: No6 A

Vertical Offset from Line for Vertical Movement	Deflection Ratio	Average Horizontal Strain	Max Slope	Max Settlement	Max Tensile Strain	Max Gradient of Horizontal Displacement Curve	Max Gradient of Vertical Displacement Curve	Min Radius of Curvature (Hogging)	Min Radius of Curvature (Sagging)	Damage Category
0.0	0.0046004	363.81E-6	253.32E-6	1.8705	0.0060968	798.06E-6	253.32E-6		10468.0	0 (Negligible)

Structure: No 6 Denmark Street | Sub-structure: No6 C

Vertical Offset from Line for Vertical Movement	Deflection Ratio	Average Horizontal Strain	Max Slope	Max Settlement	Max Tensile Strain	Max Gradient of Horizontal Displacement Curve	Max Gradient of Vertical Displacement Curve	Min Radius of Curvature (Hogging)	Min Radius of Curvature (Sagging)	Damage Category
0.0	0.032028	0.0097352	-0.0018068	3.9354	0.039185	-267.58E-6	-0.0018068		797.55	0 (Negligible)

Structure: No 6 Denmark Street | Sub-structure: No6 D

Vertical Offset from Line for Vertical Movement	Deflection Ratio	Average Horizontal Strain	Max Slope	Max Settlement	Max Tensile Strain	Max Gradient of Horizontal Displacement Curve	Max Gradient of Vertical Displacement Curve	Min Radius of Curvature (Hogging)	Min Radius of Curvature (Sagging)	Damage Category
0.0	0.015018		-665.57E-6	0.78577	0.014881	0.0	-665.57E-6	106420.	670.91	0 (Negligible)

Structure: No 6 Denmark Street | Sub-structure: No6 E

Vertical Offset from Line for Vertical Movement	Deflection Ratio	Average Horizontal Strain	Max Slope	Max Settlement	Max Tensile Strain	Max Gradient of Horizontal Displacement Curve	Max Gradient of Vertical Displacement Curve	Min Radius of Curvature (Hogging)	Min Radius of Curvature (Sagging)	Damage Category



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Movement Calculations

Offset from Line for Vertical Movement Calculations [m]	Deflection Ratio [%]	Average Horizontal Strain [%]	Max Slope	Max Settlement [mm]	Max Tensile Strain [%]	Max Gradient of Horizontal Displacement Curve	Max Gradient of Vertical Displacement Curve	Min Curvature (Hogging)	Min Radius of Curvature (Sagging)	Damage Category
0.0	609.50E-6	0.0	-30.692E-6	0.40691	604.57E-6	0.0	-30.692E-6	280980.	82751.0	(Negligible)

Structure: No 6 Denmark Street | Sub-structure: No6 F

Offset from Line for Vertical Movement Calculations [m]	Deflection Ratio [%]	Average Horizontal Strain [%]	Max Slope	Max Settlement [mm]	Max Tensile Strain [%]	Max Gradient of Horizontal Displacement Curve	Max Gradient of Vertical Displacement Curve	Min Curvature (Hogging)	Min Radius of Curvature (Sagging)	Damage Category

Structure: No 9 Denmark Street | Sub-structure: No9 A

Offset from Line for Vertical Movement Calculations [m]	Deflection Ratio [%]	Average Horizontal Strain [%]	Max Slope	Max Settlement [mm]	Max Tensile Strain [%]	Max Gradient of Horizontal Displacement Curve	Max Gradient of Vertical Displacement Curve	Min Curvature (Hogging)	Min Radius of Curvature (Sagging)	Damage Category

Structure: No 9 Denmark Street | Sub-structure: No9 B

Offset from Line for Vertical Movement Calculations [m]	Deflection Ratio [%]	Average Horizontal Strain [%]	Max Slope	Max Settlement [mm]	Max Tensile Strain [%]	Max Gradient of Horizontal Displacement Curve	Max Gradient of Vertical Displacement Curve	Min Curvature (Hogging)	Min Radius of Curvature (Sagging)	Damage Category

Structure: No 8 Denmark Street | Sub-structure: No8 A

Offset from Line for Vertical Movement Calculations [m]	Deflection Ratio [%]	Average Horizontal Strain [%]	Max Slope	Max Settlement [mm]	Max Tensile Strain [%]	Max Gradient of Horizontal Displacement Curve	Max Gradient of Vertical Displacement Curve	Min Curvature (Hogging)	Min Radius of Curvature (Sagging)	Damage Category

Structure: 122 Charing Cross Rd | Sub-structure: 122A

Offset from Line for Vertical Movement Calculations [m]	Deflection Ratio [%]	Average Horizontal Strain [%]	Max Slope	Max Settlement [mm]	Max Tensile Strain [%]	Max Gradient of Horizontal Displacement Curve	Max Gradient of Vertical Displacement Curve	Min Curvature (Hogging)	Min Radius of Curvature (Sagging)	Damage Category
0.0	0.019826	0.0	0.0016496	6.7076	0.021495	0.0	0.0016496	-	1728.6	0 (Negligible)

Structure: 122 Charing Cross Rd | Sub-structure: 122B

Offset from Line for Vertical Movement Calculations [m]	Deflection Ratio [%]	Average Horizontal Strain [%]	Max Slope	Max Settlement [mm]	Max Tensile Strain [%]	Max Gradient of Horizontal Displacement Curve	Max Gradient of Vertical Displacement Curve	Min Curvature (Hogging)	Min Radius of Curvature (Sagging)	Damage Category
0.0	0.035601	0.0	-0.0037870	6.7078	0.032365	0.0	-0.0037870	-	314.72	0 (Negligible)

Structure: No 7 Retained | Sub-structure: No7 A

Offset from Line for Vertical Movement Calculations [m]	Deflection Ratio [%]	Average Horizontal Strain [%]	Max Slope	Max Settlement [mm]	Max Tensile Strain [%]	Max Gradient of Horizontal Displacement Curve	Max Gradient of Vertical Displacement Curve	Min Curvature (Hogging)	Min Radius of Curvature (Sagging)	Damage Category
0.0	0.022319	0.018524	0.0019236	4.9665	0.044063	-578.83E-6	0.0019236	-	949.63	0 (Negligible)

Structure: No 7 Retained | Sub-structure: No7 C

Offset from Line for Vertical Movement Calculations [m]	Deflection Ratio [%]	Average Horizontal Strain [%]	Max Slope	Max Settlement [mm]	Max Tensile Strain [%]	Max Gradient of Horizontal Displacement Curve	Max Gradient of Vertical Displacement Curve	Min Curvature (Hogging)	Min Radius of Curvature (Sagging)	Damage Category
0.0	0.010371	0.013394	-878.33E-6	2.8012	0.025489	-997.36E-6	-878.33E-6	-	2393.4	0 (Negligible)

Structure: No 7 Retained | Sub-structure: No7 D

Offset from Line for Vertical Movement Calculations [m]	Deflection Ratio [%]	Average Horizontal Strain [%]	Max Slope	Max Settlement [mm]	Max Tensile Strain [%]	Max Gradient of Horizontal Displacement Curve	Max Gradient of Vertical Displacement Curve	Min Curvature (Hogging)	Min Radius of Curvature (Sagging)	Damage Category
0.0	0.0055644	0.0	-249.13E-6	0.36396	0.0054994	0.0	-249.13E-6	925330.	3430.1	0 (Negligible)

Specific Building Damage Results - Critical Segments within Each Structure

Structure Name	Parameter	Critical Sub-Structure	Critical Segment	Start	End	Curvature	Max Slope	Max Settlement	Max Tensile Strain	Min Radius of Curvature (Hogging)	Min Radius of Curvature (Sagging)	Damage Category	
No 6 Denmark Street	Max Slope	No6 C		1	0.0	5.9900	Sagging	0.0018068	3.9354	0.039185	-	797.55	0 (Negligible)
	Max Settlement	No6 C		1	0.0	5.9900	Sagging	0.0018068	3.9354	0.039185	-	797.55	0 (Negligible)
	Max Tensile Strain	No6 C		1	0.0	5.9900	Sagging	0.0018068	3.9354	0.039185	-	797.55	0 (Negligible)
	Min Radius of Curvature (Hogging)	No6 D		2	1.7001	4.5800	Hogging	14.760E-6	0.42394	315.18E-6	106420.	-	0 (Negligible)



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Structure Name	Parameter	Critical Sub-Structure	Critical Start Segment	End	Curvature	Max Slope	Max Settlement	Max Tensile Strain	Min Radius of Curvature (Hogging)	Min Radius of Curvature (Sagging)	Damage Category
	Min Radius of Curvature (Sagging)	No6 D	1	0.0	1.7001	Sagging	665.57E-6	0.78577	0.014881	670.91	0 (Negligible)
No 9 Denmark Street	All settlements are less than the Settlement Trough Limit Sensitivity.										
	All settlements are less than the Settlement Trough Limit Sensitivity.										
	All settlements are less than the Settlement Trough Limit Sensitivity.										
No 8 Denmark Street	All settlements are less than the Settlement Trough Limit Sensitivity.										
	All settlements are less than the Settlement Trough Limit Sensitivity.										
	All settlements are less than the Settlement Trough Limit Sensitivity.										
122 Charing Cross Rd	Max Slope	122B	1	0.0	11.240	Sagging	0.0037870	6.7078	0.032365	-	314.72 0 (Negligible)
	Max Settlement	122B	1	0.0	11.240	Sagging	0.0037870	6.7078	0.032365	-	314.72 0 (Negligible)
	Max Tensile Strain	122B	1	0.0	11.240	Sagging	0.0037870	6.7078	0.032365	-	314.72 0 (Negligible)
	Min Radius of Curvature (Hogging)		-	-	-	-	-	-	-	-	-
	Min Radius of Curvature (Sagging)	122B	1	0.0	11.240	Sagging	0.0037870	6.7078	0.032365	-	314.72 0 (Negligible)
No 7 Retained	Max Slope	No7 A	1	0.0	13.460	Sagging	0.0019236	4.9665	0.044063	-	949.63 0 (Negligible)
	Max Settlement	No7 A	1	0.0	13.460	Sagging	0.0019236	4.9665	0.044063	-	949.63 0 (Negligible)
	Max Tensile Strain	No7 A	1	0.0	13.460	Sagging	0.0019236	4.9665	0.044063	-	949.63 0 (Negligible)
	Min Radius of Curvature (Hogging)	No7 D	2	3.2208	3.2974	Hogging	1.4939E-6	0.099282	22.781E-6	925330.	- 0 (Negligible)
	Min Radius of Curvature (Sagging)	No7 A	1	0.0	13.460	Sagging	0.0019236	4.9665	0.044063	-	949.63 0 (Negligible)