	A	B	C	D	E
1	**TITLE: Dead Load, Live Load & Wind Load Calculation of FORCE on existing rear wall and front 4 no. columns AND Suitability of Steel**				
2	**(within decorative columns) to support TOTAL Roof Forces. RE: Proposed Porch at Melville Hall PO36 9DH**				
3					
4	A		Preliminary Calculations	value	
5	1		Angle of Roof Truss		
6			$\tan^{-1}$(Rise/ (L/2))		
7			$\tan^{-1}$ (1/ (6/2))m		
8			$\tan^{-1}$ 0.333 =	18.42	
9					
10	2		Length of Principal Rafter [PR]		
11			hyp = 1 / Sin. 18.42 =	3.17 m	
12					
13	3		Half Plan Area		
14			L/2 x spacing of Roof Truss [RT]		
15			(6/2) x 0.9125 =	2.74 m²	
16			multiply by 4 (RT 1-3 full plan (area supported by existing rear wall))	10.96 m²	
17			multiply by 4 (RT 3-6 full plan (area supported by 4 no. columns (front))	10.96 m²	
18					
19	4		Half Slope Area		
20			L of PR x spacing of Roof Truss [RT]		
21			3.17 x 0.9125 =	2.88 m²	
22			multiply by 4 (RT 1-3 full plan (area supported by existing rear wall))	11.52 m²	
23			multiply by 4 (RT 3-6 full plan (area supported by 4 no. columns (front))	11.52 m²	
24					
25					
26	B		Load		
27	1		Weight of Roofing Material		
28	a		Artificial slate (to match existing)	0.25 kN/m²	
29			Artificial slate x Half Slope Area: 0.25 x 2.88 =	0.72 kN/m²	
30			multiply by 4 (RT 1-3 full plan (weight supported by existing rear wall))	2.88 kN/m²	
31			multiply by 4 (RT 3-6 full plan (weight supported by 4 no. columns (front))	2.88 kN/m²	
32	b		external grade 1/2" composite board 0.1 kN/m², Purlins/Battens + Felt 0.05 kN/m²	0.15 kN/m²	

	A	B	C	D	E
33			Board + battens + felt + purlins x Half Slope Area: 0.15 x 2.88 =	0.43 kN/m²	
34			multiply by 4 (RT 1-3 full plan (weight supported by existing rear wall))	1.7 kN/m²	
35			multiply by 4 (RT 3-6 full plan (weight supported by 4 no. columns (front))	1.7 kN/m²	
36	c		Plastic interlock ceiling	0.01 kN/m²	
37			Ceiling x Half Plan area: 0.01 x 2.74	0.027 kN/m²	
38			multiply by 4 (RT 1-3 full plan (weight supported by existing rear wall))	0.11 kN/m²	
39			multiply by 4 (RT 3-6 full plan (weight supported by 4 no. columns (front))	0.11 kN/m²	
40	d		Joists 0.1 kN/m²	0.1 kN/m²	
41					
42			TOTAL DEAD LOAD evenly spread on existing rear wall	4.82 kN/m²	
43			TOTAL DEAD LOAD evenly spread across 4 no. columns (front)	4.82 kN/m²	
44			TOTAL DEAD LOAD on each column (front)	1.2 kN/m²	[1]
45					
46	2		Weight of five no. Roof Truss [RT]		
47			qty (span/3 +5)		
48			5(6/3 + 5) = 35 N/m²	0.035 kN/m²	
49			TOTAL LIVE LOAD evenly spread on existing rear wall	0.02 kN/m²	
50			TOTAL LIVE LOAD evenly spread across 4 no. columns (front)	0.02 kN/m²	
51			TOTAL LIVE LOAD on each column (front)	0.004 kN/m²	[2]
52					
53	3		Weight of Wind force		
54			Assume weight of wind bracing 12 N/m² on half plan area		
55			12 x 2.74 = 32.88 N/m²	0.03 kN/m²	
56			TOTAL WIND LOAD evenly spread on existing rear wall	0.015 kN/m²	
57			TOTAL WIND LOAD evenly spread across 4 no. columns (front)	0.015 kN/m²	
58			TOTAL WIND LOAD on each column (front)	0.004 kN/m²	[3]
59					
60			TOTAL LOAD on each column (front): [1]+[2]+[3]	1.208 kN/m²	
61					
62					
63	C		**Suitability of Vertical Roof Support (Inside decorative fiberglass column), with 1m depth foundation**		
64					

	A	B	C	D	E
65			Galvanised Steel Tube O/S dia 60mm, wall thickness 10mm with stress factor up to 250,000 kN/m²		
66	1		Compression: stress on each column steel insert = Force applied/CSA, = 1.208/0.002 =	604 kN/m²	
67			604 kN/m² load is well within the proposed steel pole compression capacity of 250,000 kN/m²		
68	2		Buckling: critical = π^2 E I / L² = 7,882 kN/m², which is safely above the total load 1.208 kN/m² imposed on column	7,882 kN/m²	
69			where E = elasticity of steel = 200 x 10^6 kN/m²		
70			where I = moment of inertia = 60^4 /12 (40^4/12) = 8.67x10^-5		
71			where L = length of steel tube+foundation, L² = 21.69		