STRUCTURAL CALCULATIONS

STRUCTURAL ENGINEERS

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FIRE BREAST REMOVAL
76a Earlsfield Road
LONDON
SW18 3DN

PROJECT NO: 2020-45

November 2020

V.A.T. Reg. No. 107 7099 09

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Made By	: SB
Date	**: 2020.11**
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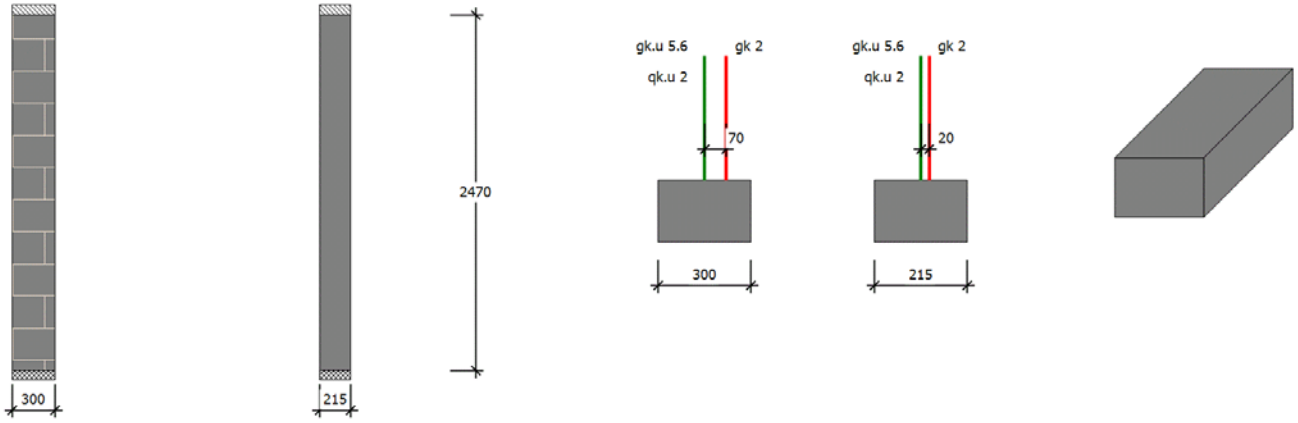
C:\Users\steff\Documents\Masterseries Docs\Masonry\76a Earlsfield rd Columns.MSN

2 X COLUMNS AT GROUND FLOOR TO SUPPORT FIRE BREAST HORIZONTAL LINTEL LOCATED AT FIRST FLOOR LEVEL

VERTICALLY SPANNING, VERTICALLY LOADED, MASONRY COLUMN DESIGN TO BS EN 1996-1-1:2005

Brief Title



Summary of Design Data

EuroCode National Annex	Using UK values:A1 2012		
Column Dimensions	h=2.470 m, hef xx=2.470 m, hef zz=1.853		
Support Conditions	Vertically Spanning Column, Top Simple, Bottom Cont.		
Masonry Column	t=215 mm, b=300 mm, tef=215 mm, bef=300 mm		
Limiting Dimensions	λ=11.5<=λ_{lim}=27	0.425	OK

Column Design

Partial Safety Factor (γ_{mc}/γ_{mf})	Construction Class 1, Unit Manufacture II	2.6/2.3	Table NA.1
Unit Material	Concrete Blocks, Group 2, γ=19.62 kN/m³ Normalised mean compressive strength =7.3 N/mm²		
Mortar Material	General Purpose fm =6 N/mm²		
Unit Ratio	Unit height=215, Least horizontal dimensions=100	2.15	
Compressive Strength (f_k)	k = 0.7, α = 0.7, β = 0.3	4.3 N/mm²	Small Area
Loads from above	Dead Load=5.6 kN, Live Load=2.0 kN		
Loads @ this level	Dead Load=2.0 kN, ex=20 mm, ey=70 mm (cast concrete lintel)		
Section Properties	Area=645 cm², Zx=2311 cm³		
Capacity reduction factor, ~F	e_{major}=14.0 mm, hef=2470 mm, tef=300.0 mm, t=300.0 mm e_{minor}=4.0 mm, hef=1853 mm, tef=215.0 mm, t=215.0 mm BS 5628 Cl. 28.2.3(a)	0.849	
Fr=~F.f_k.Area/γ_{mc}	0.849x4.3x645/2.6	90.7 kN	
Fd/Fr	1.25(γ.Area.h+gk+gku)+1.5qku=16.4/90.7	0.181	OK

Columns to be secured to wall with stainless steel strong tie wall starter kits.

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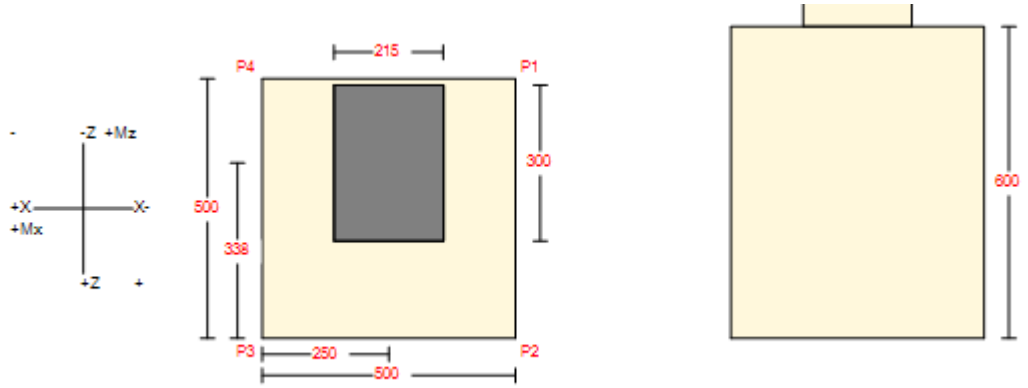
2 x Mass Concrete Foundations For Columns



Basic Properties

Design to	EC 2: 2004 - Using UK values
Fy, Fcu, Covers T, B, S	460 N/mm², 35 N/mm², 50 mm, 50 mm, 50 mm
Gross: Area, Area1, Z zz, Z xx	0.25, 0.065, 0.021, 0.021
Axial Ecentricities e-zz, e-xx	0.0, 88.0
Conc Den, LFsrv , LFult	23.4, 1.0, 1.0
Surcharge = Sur_{ext} + h_0 • γ_{soil}	10.0 = 10.0 + 0.0 • 18.0
SWP = SWP_0 + γ_{soil} • (h_0 + D)	161 = 150 + 18 x (0.000 + 0.600)

Mass Concrete Pad Design

x-x projections	143, 143	600 mm	OK
z-z projections	188, 12	600 mm	OK

Mass Concrete Section Capacity

Mu=0.85•f_{ctd}•B•D^2/6	0.85•1.291 • 500 • 600^2/6	32.92 kN.m

Critical Serviceability : 2 : Dead plus Live

Fpad = Den•d•Area•LF	23.4 x 0.6 x 0.25 x 1.00	3.5 kN
Fsur = Sur•(Area-Area1)•LF	10.0 x (0.25 - 0.065) x 1.00	1.9 kN
Fcol = F	13.3 +	13.3 kN
Fres = F + Fpad + Fsur	13.3 + 3.5 + 1.9	18.7 kN
Mxx res = Mxx + Vz•D + Fcol•exx	0.0 + (0.0 x 0.6) + (13.3 x 0.088)	1.2 kN.m
Effective B (Be) = Fn(Mzz,Fres,B)	1.2, 18.7, 500	500 mm

Pressure

Pmax = Fn(Pa, Pzz, Pxx, p1-4)	74.8, ±0.0, ±56.3, 131.1, 18.5, 18.5, 131.1	131.1 kN/m²	OK
Check for up-lift	Le 500 >=500 Be 500 >=500		OK

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FOS Overturning

Mxx Rest = (F)•e+(pad+sur)•L/2	(13) x 0.338 + (4 + 2) x 0.250	6 kN.m	
FOS OT xx = Mxx Rest / Mxx ot	6 / 0	5846.79 > 1.5	OK

Critical Ultimate : 1 : Dead plus Live

Fpad = Den•d•Area•LF	23.4 x 0.6 x 0.25 x 1.00	3.5 kN	
Fsur = Sur•(Area-Area1)•LF	10.0 x (0.25 - 0.065) x 1.00	1.9 kN	
Fcol = F	20.0 +	20.0 kN	
Fres = F + Fpad + Fsur	20.0 + 3.5 + 1.9	25.4 kN	
Mxx res = Mxx + Vz•D + Fcol•exx	0.0 + (0.0 x 0.6) + (20.0 x 0.088)	1.8 kN.m	
Effective B (Be) = Fn(Mzz,Fres,B)	1.8, 25.4, 500	500 mm	

Pressure

$ecc_x = M_{zz} / F$	0.0 / 25.4 about centre of base	0.0 mm	
$ecc_z = M_x x / F$	1.8 / 25.4 about centre of base	69.4 mm	
$Area = Lx_{eff} \bullet Lz_{eff}$	500.0 • 361.2	0.2 m²	
Pressure = F / Area	25.4 / 0.2	140.4 kN/m²	
Pressures P_1 to P_9	P_4 =140.4 , P_8 =140.4 , P_1 =140.4 P_7 =140.4 , P_9 =140.4 , P_5 =140.4 P_3 =0.0 , P_6 =0.0 , P_2 =0.0	140.4 kN/m²	Max

Moments and Shears

Static load reduction w=(Sur + Den•D)•L_F	(10.0 + 23.4 x 0.6) x 1.00	24.0kN/m²	
Check for up-lift			(ULS)

FOS Overturning

Mxx Rest = (F)•e+(pad+sur)•L/2	(20) x 0.338 + (4 + 2) x 0.250	8 kN.m	
FOS OT xx = Mxx Rest / Mxx ot	8 / 0	8101.25 > 1.0	OK

Moments at Column Face

X-X Moment LowerM - w•B•la²/2	0.1 - 24 • 0.5 • 0.2² / 2	-0.1 kN.m	OK
X-X Moment UpperM - w•B•la²/2	0 - 24 • 0.5 • 0² / 2	0.0 kN.m	OK
Z-Z Moment Left UpperM - w•B•la²/2	0.5 - 24 • 0.5 • 0.1² / 2	0.4 kN.m	OK
Z-Z Moment Right UpperM - w•B•la²/2	0.5 - 24 • 0.5 • 0.1² / 2	0.4 kN.m	OK

Dimensional Checks

Mass concrete Pad.	No checks required	OK