

CONTROL SHEET

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**10.0m OCTAGONAL LIGHTING
COLUMN WITH SINGLE OR DOUBLE
ARM BRACKET**

INPUT SUMMARY REPORT

MATERIAL DATA :

MAT TYPE	YIELD STRESS (N/mm ²)	MODULUS OF ELASTICITY (N/mm ²)	MAT DENSITY (Gm/Cm ³)
1	355	210000	7.85
2	235	210000	7.85

POLE DESCRIPTION :

POLE SHAPE	MAT TYPE	A/F TOP DIAM. (mm)	A/F BOT. DIAM. (mm)	POLE HEIGHT (mm)
Octagonal	1	78	250	10000

SEGMENT PROPERTIES :

SEGMENT NO.	MAT TYPE	SEGMENT LENGTH (mm)	OVERLAP LENGTH (mm)	A/F TOP DIAM. (mm)	A/F BOT. DIAM. (mm)	SEGMENT THICK (mm)	SEGMENT WEIGHT (kg)
1	S355JO	10000		78.00	250.00	4.0	166.48

BRACKET DATA :

SECTION TYPE	MATERIAL TYPE	BRACKET RISE ANGLE (Deg)	BRACKET PROJECTION (mm)	HEIGHT OF VERTICAL SECTION (mm)
Circular	2	5	1500	60

DESIGN PARAMETERS :

DESIGN WIND SPEED (Kmph)	WEIGHT OF LANTERN & BRACKET (N)	WIND AREA OF FIXTURE/S ARRANGEMENT (m ²)	LENGTH OF LUMINAIRE (mm)
162	345	0.296	858

NATURAL FREQUENCY CALCULATION

OVERALL HEIGHT OF COLUMN	10.000	m
A/F TOP	78.000	mm
A/F BOTTOM	250.000	mm
CONICITY OF MAST (mm/m)	17.200	
DESIGN WIND VELOCITY	162.000	kmph
VERTICAL FORCE DUE TO WEIGHT OF FIXTURE/S AND BRACKET	345.000	N
COLUMN DIMENSIONS		

SECTION: 1 (Bottom) (INCLUDES THE DOOR OPENING)		
TOP DIMENSION	78.000	mm
SECTION LENGTH	10,000.000	mm
MATERIAL THICKNESS	4.000	mm
NATURAL FREQUENCY OF THE COLUMN ASSEMBLY	1.844	Hz
BETA FACTOR	1.309	

DESIGN CALCULATION OF LIGHTING COLUMN USING "BS5649" STANDARD

PROJECT :

CLIENT : ASHGHAL

COLUMN : 10.0m OCTAGONAL LIGHTING COLUMN WITH SINGLE OR DOUBLE ARM BRACKET

Type of Column	:	Octagonal	
Height of Column	:	10191	mm
Height of Tapered Portion of Column	:	10000	mm
Height of Vertical Section	:	60	mm
A/F Top	:	78	mm
A/F Bottom	:	250	mm
Area of Fixture/s Arrangement	:	.296	m ²
Length of Fixture	:	858	mm
Weight of Fixture/s & Bracket	:	345	N
Bracket Rise Angle	:	5	deg
Bracket Projection	:	1500	mm
Diameter of Bracket	:	60.3	mm
Thickness of Bracket	:	4	mm
Diameter of Vertical Section	:	60.3	mm
Thickness of Vertical Section	:	4	mm
Max. Wind Speed	:	162	kmph
Shape Coefficient of Fixture.....	:	1	
Factor 'K'	:	2.482	
Factor 'f'	:	1.309	

COLUMN SECTION	HEIGHT OF EACH EXPOSED SECTION FROM BOTTOM TO TOP (mm)	THICKNESS (mm)
1	10000	4.00

Number of Doors	:	1	
Height of Lower Door (From Ground Level)	:	500	mm
Height of Lower Door	:	600	mm
Distance Between Doors	:	0	mm
Height of Upper Door	:	0	mm
Width of Lower Door	:	135	mm
Width of Upper Door	:	0	mm
Size of Stiffener - Width	:	8	mm
Size of Stiffener - Thickness	:	8	mm
Projection of Stiffener	:	0	mm
Yield Stress	:	355	N/mm ²

STRESS CALCULATION

PROJECT :

CLIENT : ASHGHAL

COLUMN : 10.0m OCTAGONAL LIGHTING COLUMN WITH SINGLE OR DOUBLE ARM BRACKET

LEVEL (m)	Zp (mm ³)	Zpnr (mm ³)	Zpyr (mm ³)	Mxx (N-m)	Myy (N-m)	Mp (N-m)	Tp (N-m)	Mup (N-m)	Mux (N-m)	Muy (N-m)	Tu (N-m)	C.S.R.
10	23,656	0	0	153.4	0	153.4	0	7,302.6	0.0	0.0	5,310.6	0.021
9	35,931	0	0	1,076.1	0	1,076.1	0	11,091.8	0.0	0.0	8,066.2	0.097
8	50,762	0	0	2,188.8	0	2,188.8	0	15,670.1	0.0	0.0	11,395.6	0.140
7	68,150	0	0	3,517.9	0	3,517.9	0	21,037.5	0.0	0.0	15,298.9	0.167
6	88,093	0	0	5,087.6	0	5,087.6	0	27,193.8	0.0	0.0	19,775.9	0.187
5	110,592	0	0	6,931.0	0	6,931.0	0	33,812.2	0.0	0.0	24,826.8	0.205
4	135,647	0	0	9,082.1	0	9,082.1	0	40,016.7	0.0	0.0	30,451.4	0.227
3	163,259	0	0	11,565.6	0	11,565.6	0	46,625.6	0.0	0.0	36,649.9	0.248
2	193,426	0	0	14,404.9	0	14,404.9	0	53,626.1	0.0	0.0	43,422.2	0.269
Door	0	193,293	214,101	18,133.0	0	18,133.0	0	0.0	51,871.7	57,455.6	19,434.0	0.350
G.Level	261,429	0	0	20,881.0	0	20,881.0	0	68,757.3	0.0	0.0	58,688.1	0.304

Maximum CSR (Combined Stress Ratio) 0.350<= 1 - SAFE

Vertical Section

Actual Bending Moment : 153.392 N-m
 Actual Torsion : 0.000 N-m
 Ultimate Bending Moment : 2590.877 N-m
 Ultimate Torsion : 2034.868 N-m

Combine Stress Ratio : 0.059 <= 1 - SAFE

Bracket Arm

Actual Bending Moment : 695.081 N-m
 Ultimate Bending Moment : 2590.877 N-m

Combine Stress Ratio : 0.268 <= 1 - SAFE

Legends :

Zp : Plastic Modulus

Zpnr : Plastic Modulus about axis n-n

Zpyr : Plastic Modulus about axis y-y

Mxx : Moment about axis x-x

Myy : Moment about axis y-y

Mp : Combined Moment

Tp : Torsion Moment

Mup : Moment Strength in Mp Direction

Mux : Moment Strength in x - Direction

Muy : Moment Strength in y - Direction

Tu : Torsion Strength

DEFLECTION CALCULATION

PROJECT :

CLIENT : ASHGHAL

COLUMN : 10.0m OCTAGONAL LIGHTING COLUMN WITH SINGLE OR DOUBLE ARM BRACKET

LEVEL (m)	A/F (mm)	WIND FORCE (N)	SHEARING FORCE (N)	BENDING MOMENT (N-m)	MOMENT OF INERTIA (m ⁴ X10 ⁻⁶)	SLOPE (RAD)	DEFLECTION (m)
10	78.00		316.53	57.52000	0.70909	0.01440	0.06681
		65.49					
9	95.20		382.01	406.79000	1.32736	0.01348	0.05286
		76.91					
8	112.40		458.92	827.25000	2.22891	0.01187	0.04019
		87.43					
7	129.60		546.35	1329.89000	3.46716	0.01007	0.02922
		96.86					
6	146.80		643.20	1924.66000	5.09553	0.00826	0.02005
		111.40					
5	164.00		754.60	2623.56000	7.16746	0.00649	0.01268
		117.33					
4	181.20		871.94	3436.83000	9.73635	0.00478	0.00705
		126.13					
3	198.40		998.06	4371.83000	12.85564	0.00313	0.00310
		134.39					
2	215.60		1132.46	5437.09000	16.57876	0.00154	0.00077
		142.14					
1	232.80		1274.59	6640.61000	20.95913	0.00000	0.00000
		57.44					
0	250.00		1332.04	7943.93000	26.05016	0.00000	0.00000

Horizontal Deflection at the end of the Bracket	:	0.07057	m	
Allowable Horizontal Deflection at the end of the Bracket	:	0.46765	m	> 0.07057 - SAFE
Vertical Deflection at the end of the Bracket	:	0.00290	m	
Allowable Vertical Deflection at the end of the Bracket	:	0.04822	m	> 0.00290 - SAFE

BASEPLATE AND ANCHOR BOLT CALCULATION

(FOR : 10.0m OCTAGONAL LIGHTING COLUMN WITH SINGLE OR DOUBLE ARM BRACKET)

Maximum Bending moment @ Ground Level (Including Overload Factor)	=	20,881,050	N-mm
Base Plate Dimensions :	=	450 mm x 450 mm x 25 mm Thick	
Anchor Bolt Centers, D	=	300 mm	
Hence, M25 x 800 mm Long Anchor Bolts with Tensile Area A =		394 mm ²	
Elastic Modulus Bolt Group, Z _e	=	AxDx (1/√2 + √2)	
	=	394 x 300 x 2.121	
	=	250740.1 mm ³	
Max. Tension in the Bolt	=	$\frac{20881050 \times 394}{250740.1}$	
	=	32811.41 N	
Plastic Modulus of Bolt Group, Z _p	=	AxDx√2 x 2	
	=	394 x 300 x 2.828	
	=	334320.1 mm ³	
Limiting Bending Moment	=	334320.1 x 235 / 1.15	
	=	6.831758E+07 N-mm	
Actual Overload Factor for Bolts	=	$\frac{6.831758E+07}{20881050 / 1.1}$	= 3.598 > 1.1
Check Local Bond	=	$\frac{32811.41}{(\pi \times 25 \times (800 - 120 + 12 \times 25))}$	
	=	.426 N/mm ²	< 1.5
Hence, M25 x 800 mm LONG J type Anchor Bolts are suitable			
Moment on the base plate	=	32811.41 x 87.13203	
	=	2858925 N.mm	
Width of Section resisting Bending of single Bolt	=	386.396 mm	
Plastic Modulus of Base Plate	=	$\frac{386.396 \times 25^2}{4}$	
	=	60374.38 mm ³	
Limiting Bending Moment	=	60374.38 x 235 / 1.15	
	=	1.233737E+07 N-mm	
Actual Overload Factor for Base Plate	=	$\frac{12337370}{2858925 / 1.1}$	= 4.746 > 1.1

Hence, 450 mm x 450 mm x 25 mm Thick Baseplate is suitable.

Drawings

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