CALCULATIONS

Job No: 20026

Job Title: 2 HARRIET PLACE,

FALMOUTH,

CORNWALL

Page Numbers:	Date:	Checked by:
C1-10	JUNE'20	GM
SK01	JUNE'20	GM

JOB NO 20026 SHEET NO 1

DESIGN STANDARDS

The Standards listed below have been used in the preparation of these calculations. All Standards incorporate the latest revision and amendments.

✓	BS648:1964	Schedule of Weights of Buildings Materials.
	BS5268	Structural Use of Timber.
☐		Part 2: 2002: Code of Practice for Permissible stress design, materials and workmanship.
☐		Part 3: 1998: Code of Practice for Trussed Rafter Roofs.
☐		Part 4(4.1) 1978: Fire Resistance of Timber structures.
	BS5628	Code of Practice for Use of Masonry.
✓		Part 1: 1992: Structural Use of Unreinforced Masonry.
☐		Part 2: 2000: Structural Use of Reinforced and Prestressed Masonry.
☐		Part 3: 2001: Materials and components, design and workmanship.
	BS5950	Structural Use of Steel in Building.
✓		Part 1: 2000: Code of Practice for design in simple and continuous construction: hot rolled sections
	BS6399	Loading for Buildings.
✓		Part 1: 1996: Code of Practice for Dead and Imposed Loads.
☐		Part 2: 1997: Code of Practice for Wind Loads
☐		Part 3: 1988: Code of Practice for Imposed Roof Loads.
✓	BS8004	1986: Code of Practice for Foundations.
	BS8110	Structural Use of Concrete
☐		Part 1: 1997: Code of Practice for Design and Construction.
☐		Part 2: 1985: Code of Practice for Special Circumstances

☑ Tick as necessary

Other British Standards used in the calculations:

INTRODUCTION AND CLIENTS BRIEF

1. MBA’s Client is Mr C Knight and Miss N Gawor of 2 Harriet Place, Falmouth.

2. These calculations have been prepared in support of a Building Regulations application made by our Client for the proposed structural alterations at the above property.

3. These calculations should be read in conjunction with MBA engineering drawings for clarity.

4. The structural alterations cover the widening of two openings in two existing walls at the rear of the property at ground floor level.

5. No site investigation has been undertaken and a preliminary inspection of the trial pits for the purposes of these calculations has provided an estimated allowable ground bearing pressure of 75kPa. This should be confirmed on site by a suitably qualified geo-technical engineer and, should the actual ground conditions differ from our assumptions, the information is to be passed to MBA to allow a review to be completed.

6. All Steelwork should be to a minimum grade of S275

7. LOADING

    a. The Dead loads have been derived from assumptions based on limited information of the building, however in the absence of more detailed information a conservative approach has been taken.
    b. The Live loads have been derived from BS6399-1 for use as a domestic dwelling.

8. FIRE PROTECTION

    Elements of the primary structure should have fire protection in accordance with the Building Regulations or architectural details. This is an item that is beyond our expertise to specify.

MBA CONSULTING	Project 2 Harriet Place		Job Ref. 20026
	Section		Sheet no./rev. 3
	Calc. by GM	Date MAY '20	Chk'd by	Date	App'd by	Date

LOADING

Assumed Existing Trussed Rafter Roof		*DL* kN/m²	*LL* kN/m²
Slates		0.60	-
Ply boarding and felt		0.20	-
s/wt Trusses		0.25	-
pitch	30	1.05	-
	load on plan	1.21	-
On plan			-
			-
Ceiling and Services		0.25	-
		0.25	-
Snow			0.60
Total		**1.43**	**0.60**

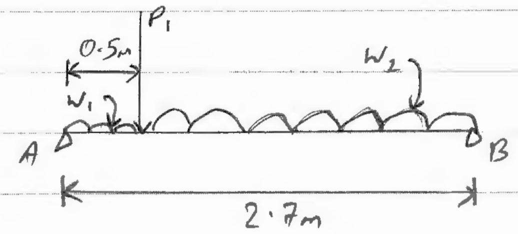
Assumed Existing Floor	*DL* kN/m²	*LL* kN/m²
Partitions	*0.35*	-
Finishes	0.10	-
s/wt timber Joists	0.15	-
Insulation	0.05	-
Ceiling & Services	0.20	-
		-
		-
		-
Domestic	-	1.50
Total	**0.85**	**1.50**

Existing Wall Construction	*DL* kN/m²
25mm Render	0.60
140mm dense blockwork	2.80
PB and Skim	0.15
Total	**3.55**

Made by	Job Title		
GM	2 HARRIET PLACE		
Checked by	**Job No.**	**Sheet**	**Date**
	20026	04	MAY'20

MBA CONSULTING

B_1



A = DL = 19.6kN
LL = 2.6kN

B = DL = 17.1kN
LL = 3.3kN

W_1 = ROOF DL = 1.43 x 1.2 = 1.72kN/m
ROOF LL = 0.60 x 1.2 = 0.72kN/m

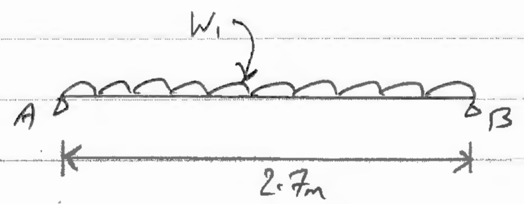
PROVIDE
203x133x30UB

W_2 ROOF DL = 1.43 x 1.2 = 1.72kN/m
ROOF LL = 0.60 x 1.2 = 0.72kN/m
WALL DL = 3.55 x 2.4 = 8.52kN/m
FLOOR DL = 0.85 x 1.2 = 1.02kN/m
FLOOR LL = 1.50 x 1.2 = 1.80kN/m

TOTAL DL = 11.26kN/m
LL = 2.52kN/m

P_1 = CONCRETE BEAM = 8.52 x 1.2 = 10.23kN

B_2



A = B = DL = 3.3kN
LL = 1.4kN

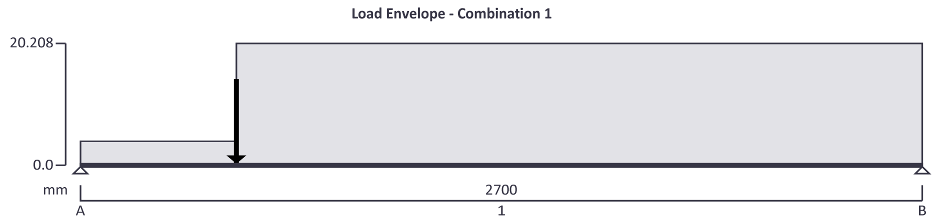
W_1 = DL = 1.21 x 1.75 = 2.12kN/m
LL = 0.60 x 1.75 = 1.05kN/m

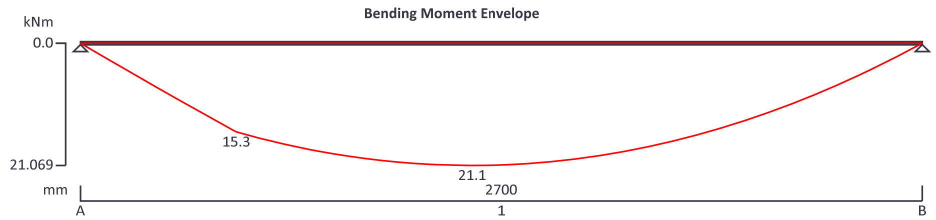
PROVIDE
203x133x30UB

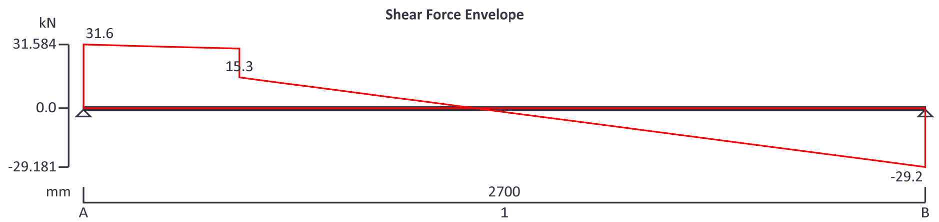
STEEL BEAM ANALYSIS & DESIGN (BS5950)

In accordance with BS5950-1:2000 incorporating Corrigendum No.1

TEDDS calculation version 3.0.07







Support conditions

Support A	Vertically restrained
	Rotationally free
Support B	Vertically restrained
	Rotationally free

Applied loading

Beam loads	Dead partial UDL 1.72 kN/m from 0 mm to 500 mm
	Imposed partial UDL 0.72 kN/m from 0 mm to 500 mm
	Dead partial UDL 11.26 kN/m from 500 mm to 2700 mm
	Imposed partial UDL 2.52 kN/m from 500 mm to 2700 mm
	Dead point load 10.23 kN at 500 mm
	Dead self weight of beam × 1

Load combinations

Load combination 1	Support A	Dead × 1.40
		Imposed × 1.60
		Dead × 1.40
		Imposed × 1.60
	Support B	Dead × 1.40

Imposed × 1.60

Analysis results

Maximum moment; M_{max} = **21.1** kNm; M_{min} = **0** kNm

Maximum shear; V_{max} = **31.6** kN; V_{min} = **-29.2** kN

Deflection; δ_{max} = **1.9** mm; δ_{min} = **0** mm

Maximum reaction at support A; R_{A_max} = **31.6** kN; R_{A_min} = **31.6** kN

Unfactored dead load reaction at support A; R_{A_Dead} = **19.6** kN

Unfactored imposed load reaction at support A; $R_{A\_Imposed}$ = **2.6** kN

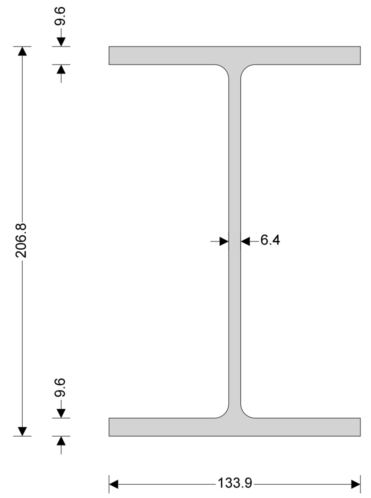
Maximum reaction at support B; R_{B_max} = **29.2** kN; R_{B_min} = **29.2** kN

Unfactored dead load reaction at support B; R_{B_Dead} = **17.1** kN

Unfactored imposed load reaction at support B; $R_{B\_Imposed}$ = **3.3** kN

Section details

Section type; **UKB 203x133x30 (Tata Steel Advance)**; Steel grade; **S275**



Classification of cross sections - Section 3.5

Tensile strain coefficient; ε = **1.00**; Section classification; **Plastic**

Shear capacity - Section 4.2.3

Design shear force; F_v = **31.6** kN; Design shear resistance; P_v = **218.4** kN

PASS - Design shear resistance exceeds design shear force

Moment capacity - Section 4.2.5

Design bending moment; M = **21.1** kNm; Moment capacity low shear; M_c = **86.5** kNm

Buckling resistance moment - Section 4.3.6.4

Buckling resistance moment; M_b = **63.2** kNm; M_b / m_{LT} = **67.9** kNm

PASS - Buckling resistance moment exceeds design bending moment

Check vertical deflection - Section 2.5.2

Consider deflection due to dead and imposed loads

Limiting deflection δ_{lim} = **9** mm; Maximum deflection; δ = **1.91** mm

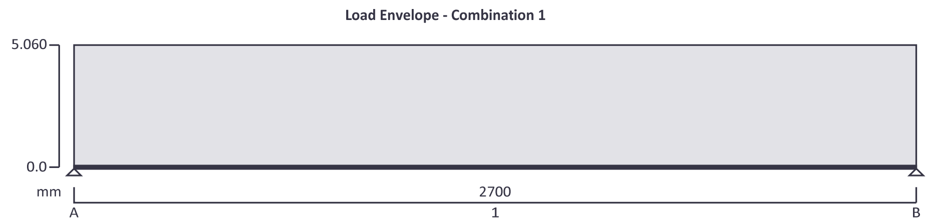
PASS - Maximum deflection does not exceed deflection limit

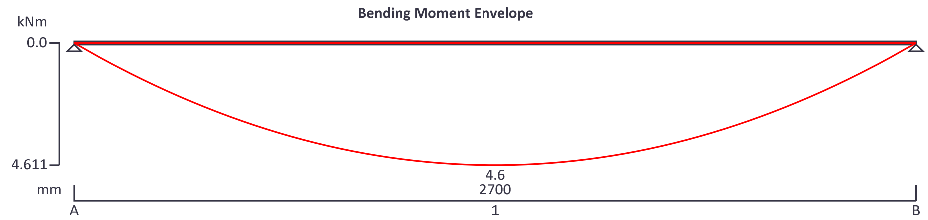
	Project				Job Ref.	
MBA CONSULTING	2 Harriet Place				20026	
	Section				Sheet no./rev.	
	B2				7	
	Calc. by	Date	Chk'd by	Date	App'd by	Date
	GM	MAY '20				

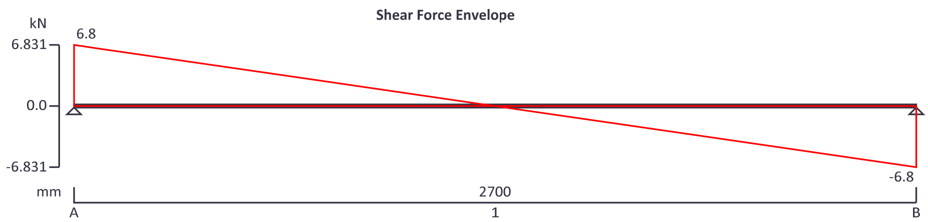
STEEL BEAM ANALYSIS & DESIGN (BS5950)

In accordance with BS5950-1:2000 incorporating Corrigendum No.1

TEDDS calculation version 3.0.07







Support conditions

Support A	Vertically restrained	
	Rotationally free	
Support B	Vertically restrained	
	Rotationally free	

Applied loading

Beam loads	Dead full UDL 2.12 kN/m	
	Imposed full UDL 1.05 kN/m	
	Dead self weight of beam × 1	

Load combinations

Load combination 1	Support A	Dead × 1.40
		Imposed × 1.60
		Dead × 1.40
		Imposed × 1.60
	Support B	Dead × 1.40
		Imposed × 1.60

Analysis results

Maximum moment;	M_{max} = **4.6** kNm;	M_{min} = **0** kNm

Maximum shear; V_{max} = **6.8** kN; V_{min} = **-6.8** kN

Deflection; δ_{max} = **0.4** mm; δ_{min} = **0** mm

Maximum reaction at support A; R_{A_max} = **6.8** kN; R_{A_min} = **6.8** kN

Unfactored dead load reaction at support A; R_{A_Dead} = **3.3** kN

Unfactored imposed load reaction at support A; $R_{A\_Imposed}$ = **1.4** kN

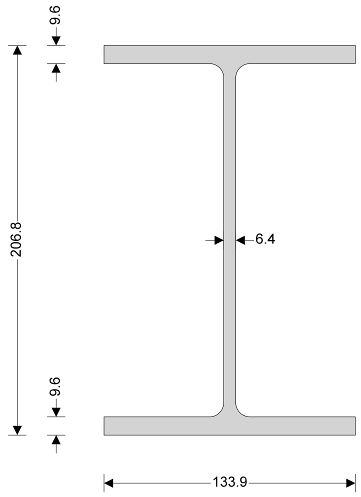
Maximum reaction at support B; R_{B_max} = **6.8** kN; R_{B_min} = **6.8** kN

Unfactored dead load reaction at support B; R_{B_Dead} = **3.3** kN

Unfactored imposed load reaction at support B; $R_{B\_Imposed}$ = **1.4** kN

Section details

Section type; **UKB 203x133x30 (Tata Steel Advance)**; Steel grade; **S355**



Classification of cross sections - Section 3.5

Tensile strain coefficient; ε = **0.88**; Section classification; **Plastic**

Shear capacity - Section 4.2.3

Design shear force; F_v = **6.8** kN; Design shear resistance; P_v = **281.9** kN

PASS - Design shear resistance exceeds design shear force

Moment capacity - Section 4.2.5

Design bending moment; M = **4.6** kNm; Moment capacity low shear; M_c = **111.6** kNm

Buckling resistance moment - Section 4.3.6.4

Buckling resistance moment; M_b = **75.2** kNm; M_b / m_{LT} = **81.3** kNm

PASS - Buckling resistance moment exceeds design bending moment

Check vertical deflection - Section 2.5.2

Consider deflection due to dead and imposed loads

Limiting deflection δ_{lim} = **9** mm; Maximum deflection; δ = **0.404** mm

PASS - Maximum deflection does not exceed deflection limit

Made by GM	Job Title 2 HARRIET PLACE		
Checked by	Job No. 20026	Sheet 9	Date MAY'20

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WORST CASE MASONRY BEARING

LOAD ON WALL = 19.6 x 1.4 + 2.6 x 1.6 = 31.32 kN

ALLOWABLE STRESS = $\frac{1.5 \times 3.5}{3.5}$ = 1.5 N/mm^2

ACTUAL STRESS (NO PADSTONE) = $\frac{31.32 \times 10^3}{150 \times 140}$ = 1.49 N/mm^2 ∴ ACCEPTABLE

STRESS AT 0.4h

h_{eff} = 2.4m $\frac{2400}{140}$ = 17 @ 0.05t β = 0.80

t_{eff} = 140mm

0.4 x 2.4 x 0.14 x 0.44 x 18 x 1.4 + 31.32 = 32.8 kN

ALLOWABLE STRESS = $\frac{0.8 \times 3.5}{3.5}$ = 0.8 N/mm^2

$\frac{32.8 \times 10^3}{140 \times 700}$ = 0.33 N/mm^2 < 0.8 N/mm^2 ∴ ACCEPTABLE

Made by CM	Job Title 2 HARRIET PLACE		
Checked by	Job No. 20026	Sheet 10	Date MAY'20

MBA CONSULTING

WORST CASE FOUNDATION CHECK

LOAD FROM BEAM = DL = 19.6kN/m
LL = 2.6kN/m
WALL SELF WEIGHT = DL = 8.6kN/m
ROOF OVER = DL = 1.7kN/m
LL = 0.7kN/m
TOTAL = 33.2kN/m

$\frac{33.2kN/m}{75kPa} = 0.44$ ∴ 450 WIDE EXISTING STRIP FOUNDATION ACCEPTABLE