

BARRY HONEYSETT

Consulting Structural & Civil Engineers

Bathurst House, Smythen Street,
Exeter, Devon, EX1 1BN
Tel: 01392 272510/Fax: 01392 272520
E-mail: engineers@barryhoneysett.co.uk

Made by _____ Project No 18211

Checked by _____ Sheet No 1

Scale _____ Date Nov. 2018

Project/Title PARISH HALL

EAST WORLINGTON

Design in accordance with
BS 6443:1964
BS 6399:1
BS 5268:2
BS 5450:1

LOADING.

ROOF - 25.5° PITCH

Dead -	Natural slate	0.35
	Buttans + Felt	0.03
	Rafter etc	0.10
	Insulations	0.05
	Plaster board + skin	0.13

$$0.66 \times \gamma_{cos 25.5^\circ} = 0.73$$

Imposed - $\frac{0.60}{1.33}$

SNOW LOAD - $s_b = 0.35$

Altitude - 145m - $s_0 = 0.35 + 0.13 \left(\frac{145-100}{100} \right) = 0.4085$

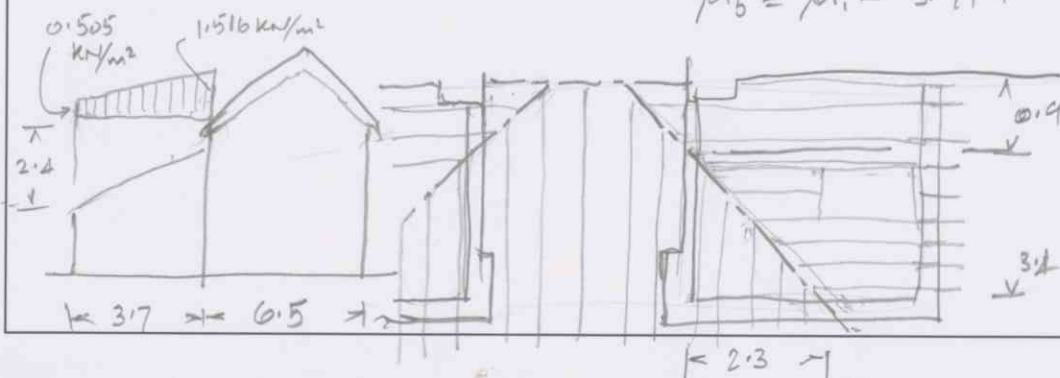
$b_1 = 3.7m \leq 5h_0 \leq 15$ so $l_{s1} = 3.5m$

$$b_2 = 6.5m \quad \frac{2h_0}{s_0} = \frac{2 \times 2.4}{0.4085} = 11.75 > \frac{2b}{l_{s1}} = \frac{2 \times 6.5}{3.5} = 3.71$$

$$s_0 M_1 = \frac{2b}{l_{s1}} = \frac{2 \times 6.5}{3.5} = 3.71$$

$$M_4 = 3.71 \left[\frac{3.0 - 2.5}{1.5} \right] = 1.24 \quad \text{so } S_4 = 1.24 \times 0.4085 = 0.505 \text{ kN/m}^2$$

$$M_5 = M_1 = 3.71 \quad \text{so } S_5 = 3.71 \times 0.4085 = 1.516 \text{ kN/m}^2$$



BARRY HONEYSETT

Consulting Structural & Civil Engineers

Bathurst House, Smythen Street,

Exeter, Devon, EX1 1BN

Tel: 01392 272510

Website: barryhoneysett.co.uk

Email: engineers@barryhoneysett.co.uk

Made by

Project No 18211

Checked by

Sheet No 2

Scale

Date Nov 2018

Project/Title PARISH HALL, EAST WORLINGTON

Design of Common Rafters

$$\text{Mass Span} = 3.1 \text{ m} \times 0.003 = 10.2 \text{ mm}$$

$$\text{Spacing} = 0.4 \text{ m}$$

Check rafter adjacent to Hall wall

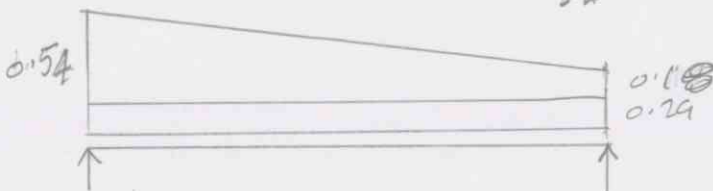
$$\text{UDL} - \text{Dead} \quad 0.73 \times 0.4 = 0.29 \text{ kN/m}$$

$$\text{Imposed} \quad 0.60 \times 0.4 = 0.24 \text{ "}$$

$$\text{Snow-against hall} \quad 0.505 \times \frac{3.0}{3.1} \times 0.4 = 0.18 \text{ "}$$

$$\text{out-slopes} \quad 1.516 \times \frac{3.0}{3.1} \times 0.4 = 0.54 \text{ "}$$

Check rafters adjacent/parallel to wall and perpendicular to wall.



— see quick frame analysis

$$\text{Mass BM} = 1.27 \text{ kNm (D+S para)} \quad \text{Imposed} = 7.5 \times 1.1 \times 1.25 \left(\frac{300}{170} \right)^{1.1}$$

$$\text{Req Z} = 1.270 / 10.98 = 115.66 \text{ cm}^3$$

$$\text{ie } 121 \times 47$$

$$\text{Using } 170 \times 47 \quad - \quad \Delta = 10.2 \text{ mm}$$

$$\text{Using } 145 \times 72 \quad \Delta = 10.8 \text{ mm}$$

Barry Honeysett Consulting Engineers

Bathurst House,
Smythen Street,
Exeter, Devon.
EX1 1BN
01392 272510 email:engineers@barryhoneysett.co.uk

Printed : 29/11/2018

Sheet : 3

Project : 1845

File : Rafter

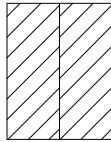
Title : Parish Hall, East Worlington
Porch Roof
Common Rafter

Designed : BIH

Checked :

Section groups

rafter - Timber - 2 - 47 x 122 C24



Depth	=	122.0	mm
E	=	10.80	kN/mm2
I	=	1422	cm4
A	=	114.7	cm2

Joints

Name	X m	Y m
J1	-0.000	0.000
J2	3.400	0.000

Member

Name	Length m	Section group	Ends Left/low'	Other	Joints
M1	3.400	rafter	Pin	Pin	J1 to 2

Bases

Name	Joint	Horizontal kN/m	Vertical kN/m	Rotational kN.m/Rad
B1	J2	Free	Fixed	Pinned
B2	J1	Fixed	Fixed	Pinned

Load cases

Name	Type
Permanent dead	Permanent dead
Imposed	Imposed
Snow perp to hall	Snow
Snow para to hall	Snow

Load combinations

Name	Limit	Factor	Load case
Dead+Snow perp to wall	ULS	1.00	Permanent dead
		0.00	Imposed
		1.00	Snow perp to hall
		0.00	Snow para to hall
Dead+Snow para to wall	ULS	1.00	Permanent dead
		0.00	Imposed
		0.00	Snow perp to hall
		1.00	Snow para to hall
Dead+Imposed	ULS	1.00	Permanent dead
		1.00	Imposed
		0.00	Snow perp to hall
		0.00	Snow para to hall

Barry Honeysett Consulting Engineers
 Bathurst House,
 Smythen Street,
 Exeter, Devon.
 EX1 1BN
 01392 272510 email:engineers@barryhoneysett.co.uk

Printed	: 29/11/2018	Sheet	: 4
Project	: 1845	File	: Rafter
Title	: Parish Hall, East Worlington Porch Roof Common Rafter		
Designed	: BIH	Checked	:

Uniformly distributed loads

Load case : Permanent dead

Name	Member	Value kN/m	Direction	
L1	M1	0.05	Vertical ↓	Self weight
L2	M1	0.29	Vertical ↓	

Uniformly distributed loads

Load case : Imposed

Name	Member	Value kN/m	Direction
L5	M1	0.24	Vertical ↓

Trapazoidal loads

Load case : Snow perp to hall

Name	Member	Start Value kN/m	Dist' m	Finish Value kN/m	Dist' m	Measured from	Direction
L3	M1	0.18	0.000	0.54	3.400	Left end	Vertical ↓

Uniformly distributed loads

Load case : Snow para to hall

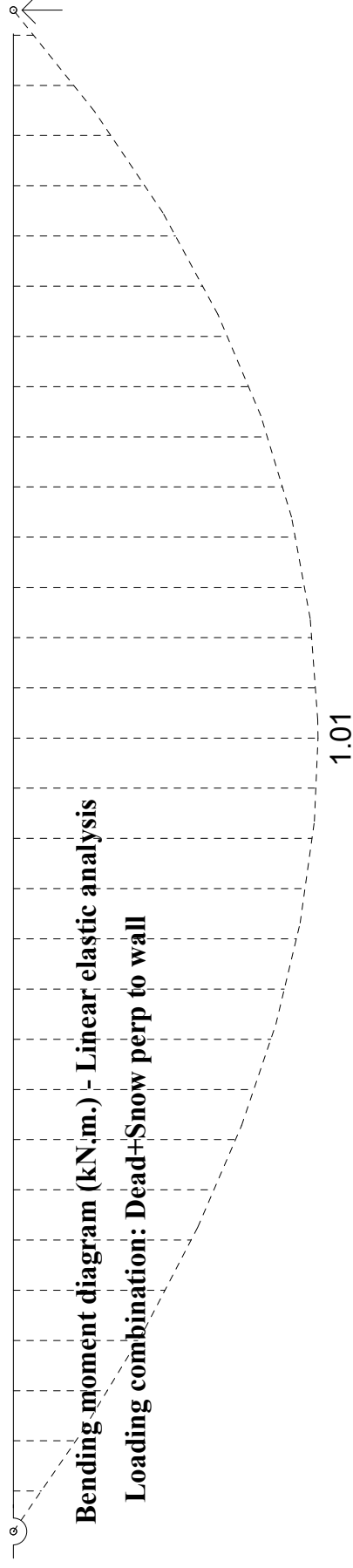
Name	Member	Value kN/m	Direction
L4	M1	0.54	Vertical ↓

Forces - Linear elastic analysis

Loading combination: Dead+Snow perp to wall

Member	Distance m	Measured from	Axial kN	Sense	Shear kN	Moment kN.m
M1	0.000	Left end	0.00		1.08	0.00
	1.773	Left end	0.00		0.00	1.01
	3.400	Left end	0.00		-1.29	0.00

\\Bh_nas\bh_office\PRACTICE\Quiksoft Projects 2010\My Projects\18211\Rafter.QF2



Barry Honeysett Consulting Engineers
 Bathurst House,
 Smythen Street,
 Exeter, Devon.
 EX1 1BN
 01392 272510 email:engineers@barryhoneysett.co.uk

Printed	: 29/11/2018	Sheet	: 5
Project	: 1845	File	: Rafter
Title : Parish Hall, East Worlington Porch Roof Common Rafter			
Designed : BIH		Checked :	

Barry Honeysett Consulting Engineers

Bathurst House,
 Smythen Street,
 Exeter, Devon.
 EX1 1BN
 01392 272510 email:engineers@barryhoneysett.co.uk

Printed : 29/11/2018

Sheet : 6

Project : 1845

File : Rafter

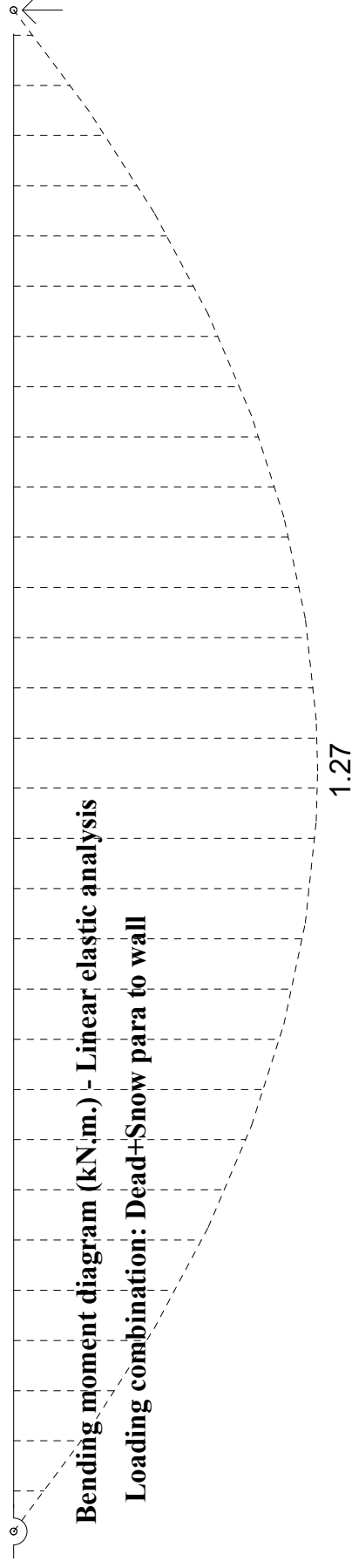
Title : Parish Hall, East Worlington
 Porch Roof
 Common Rafter

Designed : BIH

Checked :

Forces - Linear elastic analysis**Loading combination: Dead+Snow para to wall**

Member	Distance m	Measured from	Axial kN	Sense	Shear kN	Moment kN.m
M1	0.000	Left end	0.00		1.49	0.00
	1.700	Left end	0.00		0.00	1.27
	3.400	Left end	0.00		-1.49	0.00



Barry Honeysett Consulting Engineers
 Bathurst House,
 Smythen Street,
 Exeter, Devon.
 EX1 1BN
 01392 272510 email:engineers@barryhoneysett.co.uk

Printed : 29/11/2018	Sheet : 7
Project : 1845	File : Rafter
Title : Parish Hall, East Worlington Porch Roof Common Rafter	
Designed : BIH	Checked :

Barry Honeysett Consulting Engineers

Bathurst House,
 Smythen Street,
 Exeter, Devon.
 EX1 1BN
 01392 272510 email:engineers@barryhoneysett.co.uk

Printed : 29/11/2018

Sheet : 8

Project : 1845

File : Rafter

Title : Parish Hall, East Worlington
 Porch Roof
 Common Rafter

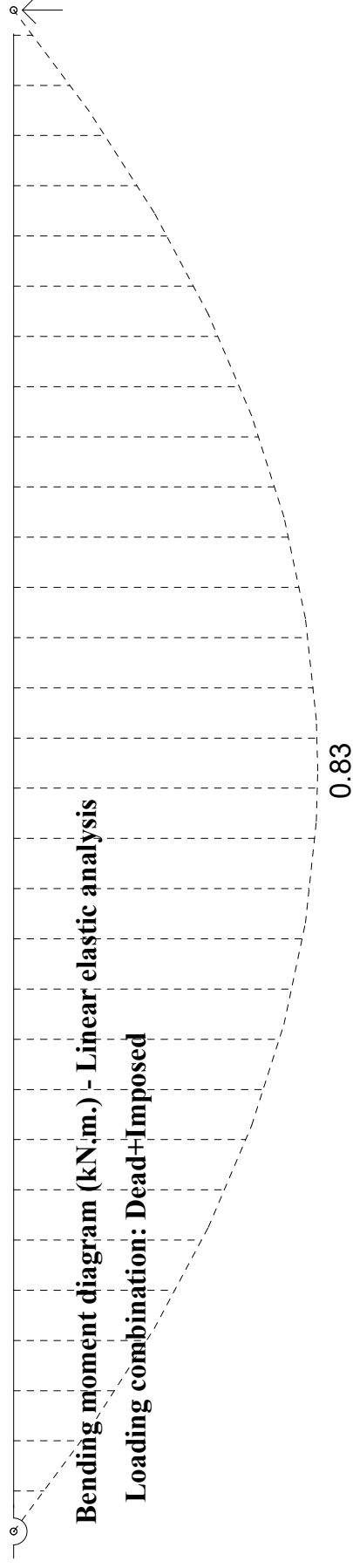
Designed : BIH

Checked :

Forces - Linear elastic analysis**Loading combination: Dead+Imposed**

Member	Distance m	Measured from	Axial kN	Sense	Shear kN	Moment kN.m
M1	0.000	Left end	0.00		0.98	0.00
	1.700	Left end	0.00		0.00	0.83
	3.400	Left end	0.00		-0.98	0.00

\\Bh_nas\bh_office\PRACTICE\Quiksoft Projects 2010\My Projects\18211\Rafter.QF2



Barry Honeysett Consulting Engineers
 Bathurst House,
 Smythen Street,
 Exeter, Devon.
 EX1 1BN
 01392 272510 email:engineers@barryhoneysett.co.uk

Printed : 29/11/2018	Sheet : 9
Project : 1845	File : Rafter
Title : Parish Hall, East Worlington Porch Roof Common Rafter	
Designed : BIH	Checked :

BARRY HONEYSETT

Consulting Structural & Civil Engineers

Bathurst House, Smythen Street,

Exeter, Devon, EX1 1BN

Tel: 01392 272510

Website: barryhoneysett.co.uk

Email: engineers@barryhoneysett.co.uk

Made by

Project No 18211

Checked by

Sheet No 10

Scale

Date NOV 2018

Project/Title PARISH HALL, EAST WORLINGTON

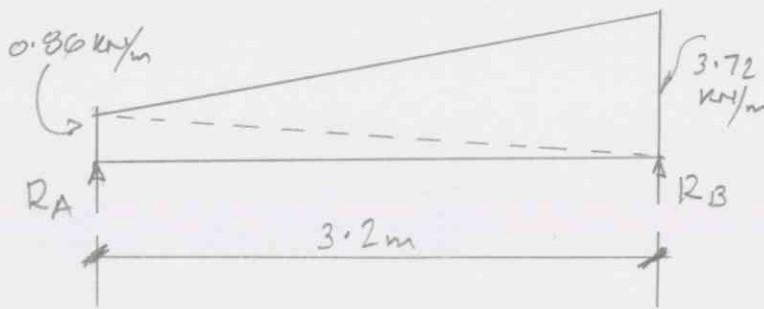
DESIGN OF HIPS

$$\text{Span} = 3.2 \text{ m} \quad \times 0.003 = 9.6 \text{ mm}$$

For Dead + Imposed

$$\text{At lower end DL} = 1.33 \times 1.3 / 2 = 0.86 \text{ kN/m}$$

$$\text{At Upper end DL} = 1.33 \times (2.3 + 3.3) / 2 = 3.72$$



$$\text{Max} = 2.96 \text{ kNm}$$

$$\text{Max } \Delta = 5.10 \text{ mm}$$

See Quikframe analysis

For Dead + Snow

Snow load on tip on support of wall

$$= 1.516 - (1.516 - 0.505) \times \frac{0.9}{3.4} = 1.248$$

$$\text{At lower end DL} = (0.505 + 0.73) \times 1.3 / 2 = 0.80 \text{ kN/m}^2$$

$$\begin{aligned} \text{At Upper end DL} &= 1.248 \times 3.4 / 2 + 0.505 \times \frac{2.3^2}{2} \times \frac{1}{3} + 1.248 \times \frac{2.3^2}{2} \times \frac{2}{3} \\ &+ 0.73 \left(3.4 / 2 + \frac{2.3^2}{2} \times \frac{1}{3} + \frac{2.3^2}{2} \times \frac{2}{3} \right) = 7.94 \text{ kN/m}^2 \end{aligned}$$

$$\text{Max} = 6.15 \text{ kNm}$$

$$\text{Max } \Delta = 10.5 \text{ mm}$$

$$\text{Using C24} \quad \sigma_{\text{max}} = 7.5 \times 1.25 \times \left(\frac{300}{225} \right)^{1.1} = 9.68 \text{ N/mm}^2$$

$$\text{Req } Z = 6150 / 9.68 = 635.6 \text{ cm}^3 \quad \text{ie } 230 \times 72$$

USE 250 x 75

Barry Honeysett Consulting Engineers

Bathurst House,
Smythen Street,
Exeter, Devon.
EX1 1BN
01392 272510 email:engineers@barryhoneysett.co.uk

Printed : 30/11/2018

Sheet : 11

Project : 1845

File : Hip

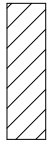
Title : Parish Hall, East Worlington
Porch Roof
Hips

Designed : BIH

Checked :

Section groups

rafter - Timber - 70 x 245 C24



Depth	=	245.0	mm
E	=	7.200	kN/mm ²
I	=	8579	cm ⁴
A	=	171.5	cm ²

Joints

Name	X m	Y m
J1	-0.000	0.000
J2	3.200	0.000

Member

Name	Length m	Section group	Ends Left/low'	Other	Joints
M1	3.200	rafter	Pin	Pin	J1 to 2

Bases

Name	Joint	Horizontal kN/m	Vertical kN/m	Rotational kN.m/Rad
B1	J2	Free	Fixed	Pinned
B2	J1	Fixed	Fixed	Pinned

Load cases

Name	Type
Dead + Snow	Permanent dead
Dead + Imposed	Imposed

Load combinations

Name	Limit	Factor	Load case
Dead+Snow	ULS	1.00	Dead + Snow
		0.00	Dead + Imposed
Dead+ Imposed	ULS	0.00	Dead + Snow
		1.00	Dead + Imposed

Uniformly distributed loads**Load case : Dead + Snow**

Name	Member	Value kN/m	Direction	
L1	M1	0.07	Vertical ↓	Self weight
L2	M1	0.29	Vertical ↓	

Barry Honeysett Consulting Engineers
 Bathurst House,
 Smythen Street,
 Exeter, Devon.
 EX1 1BN
 01392 272510 email:engineers@barryhoneysett.co.uk

Printed	: 30/11/2018	Sheet	: 12
Project	: 1845	File	: Hip
Title	: Parish Hall, East Worlington Porch Roof Hips		
Designed	: BIH	Checked	:

Trapazoidal loads

Load case : Dead + Snow

Name	Member	Start Value kN/m	Dist' m	Finish Value kN/m	Dist' m	Measured from	Direction
L4	M1	0.80	0.000	7.94	3.200	Left end	Vertical ↓

Trapazoidal loads

Load case : Dead + Imposed

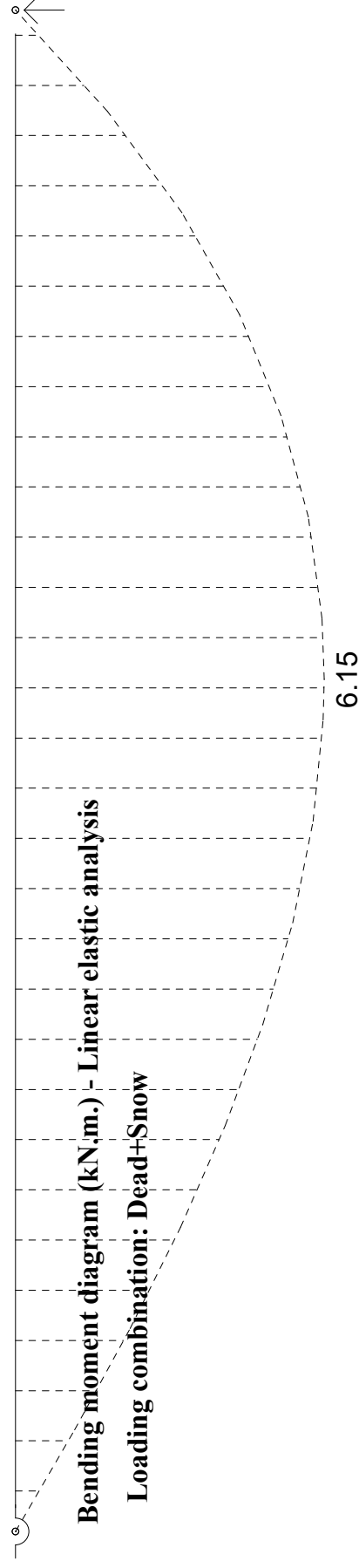
Name	Member	Start Value kN/m	Dist' m	Finish Value kN/m	Dist' m	Measured from	Direction
L3	M1	0.86	0.000	3.72	3.200	Left end	Vertical ↓

Forces - Linear elastic analysis

Loading combination: Dead+Snow

Member	Distance m	Measured from	Axial kN	Sense	Shear kN	Moment kN.m
M1	0.000	Left end	0.00		5.67	0.00
	1.792	Left end	0.00		0.00	6.15
	3.200	Left end	0.00		-9.47	0.00

\\Bh_nas\bh_office\PRACTICE\Quiksoft Projects 2010\My Projects\18211\Hip.QF2



Barry Honeysett Consulting Engineers
 Bathurst House,
 Smythen Street,
 Exeter, Devon.
 EX1 1BN
 01392 272510 email:engineers@barryhoneysett.co.uk

Printed : 30/11/2018 Sheet : 13
 Project : 1845 File : Hip
 Title : Parish Hall, East Worlington
 Porch Roof
 Hips
 Designed : BIH Checked :

Barry Honeysett Consulting Engineers

Bathurst House,
 Smythen Street,
 Exeter, Devon.
 EX1 1BN
 01392 272510 email:engineers@barryhoneysett.co.uk

Printed : 30/11/2018

Sheet : 14

Project : 1845

File : Hip

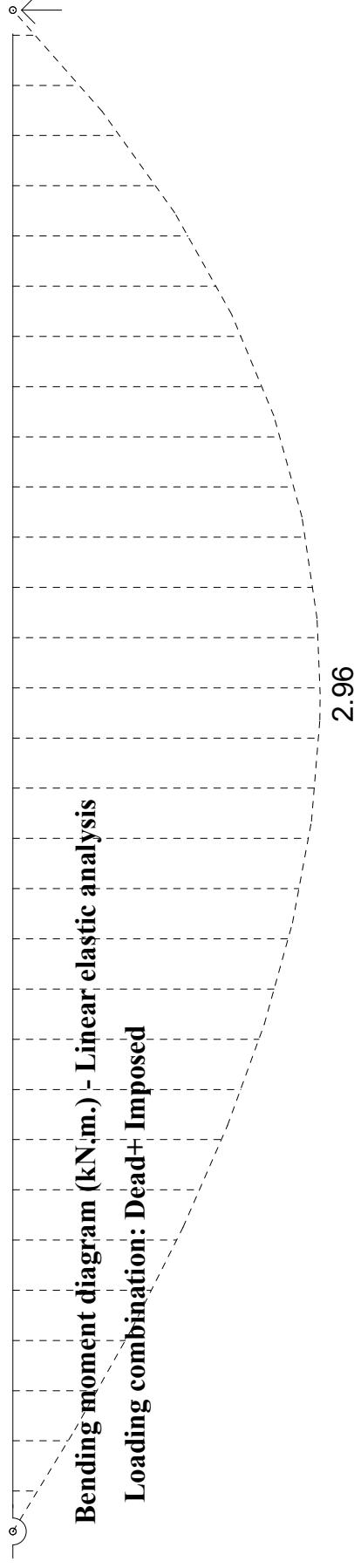
Title : Parish Hall, East Worlington
 Porch Roof
 Hips

Designed : BIH

Checked :

Forces - Linear elastic analysis**Loading combination: Dead+ Imposed**

Member	Distance m	Measured from	Axial kN	Sense	Shear kN	Moment kN.m
M1	0.000	Left end	0.00		2.90	0.00
	1.762	Left end	0.00		-0.00	2.96
	3.200	Left end	0.00		-4.43	0.00



Barry Honeysett Consulting Engineers
 Bathurst House,
 Smythen Street,
 Exeter, Devon.
 EX1 1BN
 01392 272510 email:engineers@barryhoneysett.co.uk

Printed	: 30/11/2018	Sheet	: 15
Project	: 1845	File	: Hip
Title : Parish Hall, East Worlington Porch Roof Hips			
Designed : BIH		Checked :	

BARRY HONEYSETT

Consulting Structural & Civil Engineers

Bathurst House, Smythen Street,

Exeter, Devon, EX1 1BN

Tel: 01392 272510

Website: barryhoneysett.co.uk

Email: engineers@barryhoneysett.co.uk

Made by

Project No 18211

Checked by

Sheet No 16

Scale

Date Nov 2018

Project/Title PARISH HILL, EAST WORLINGTON

LINTELS

Lintel over Door into Store door Span = 1.6m

$$UDL = (0.73 + 1.505) \times 3.4/2 + 1.8 \times 1.2 = 5.96 \text{ kN/m}$$

$$\text{Max BM} = 5.96 \times 1.6^2/8 = 1.91 \text{ kNm}$$

USE 100 x 140 dep PC lintel
ie stress line - 1215A - 12M = 3.7 kNm

Eaves Beam over Entrance Door

$$\text{Span} = 2m \\ \times 0.003 = 6$$

$$UDL = 1.33 \times 3.4/2 = 2.59 \text{ kN/m}$$

$$\text{Max BM} = 2.59 \times 2^2/8 = 1.30 \text{ kNm}$$

$$\text{Using C24 - } \sigma_{\text{max}} = 7.5 \times 1.25 \times \left(\frac{3000}{200}\right)^2 = 9.80 \text{ N/mm}^2 \\ E_{\text{min}} = 7200 \text{ N/mm}^2$$

$$\text{Req } Z = 1300/9.80 = 132.6 \text{ cm}^3 \text{ ie } 94 \times 90$$

$$\text{Req } I = \frac{5 \times 2.59 \times 2^4 \times 10^{12}}{384 \times 7200 \times 6} = 12.49 \times 10^6 \text{ mm}^4 \\ \text{ie } 119 \times 90$$

USE 125 x 90 C24

Beam against Hall Span = 2.0m

$$UDL = 0.73 \times 3.4/2 + \left(0.505 \times \frac{3.4^2}{6} + 1.516 \times \frac{3.4^2}{3}\right) = 8.06 \text{ kN/m}$$

$$\text{Max BM} = 8.06 \times 2^2/8 = 2.01 \text{ kNm}$$

$$\text{Req } Z = 2010/9.8 = 205.5 \text{ cm}^3 \text{ ie } 117 \times 90$$

$$\text{Req } I = \frac{5 \times 8.06 \times 2^4 \times 10^{12}}{384 \times 7200 \times 6} = 38.87 \times 10^6 \text{ mm}^4 \text{ ie } 173 \times 90$$

USE 200 x 100 C24

Bathurst House, Smythen Street,
Exeter, Devon, EX1 1BN
Tel: 01392 272510/Fax: 01392 272520
E-mail: engineers@barryhoneysett.co.uk

Made by BIH Project No 18211
Checked by _____ Sheet No 17
Scale _____ Date Nov. 2018
Project/Title PARISH HALL
EAST WORLINGTON
SHELVING

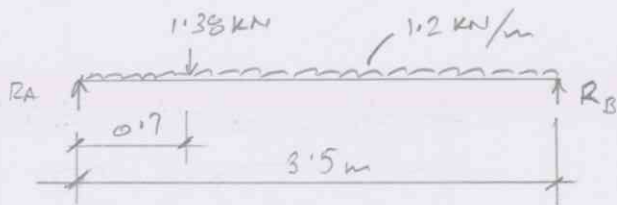
Design of Shelving support.

Span = 3.5 m

UDL - Dead - 0.2 x 1.4 = 0.28
Imposed 1.0 x 1.6 = 1.6
1.2 1.88 kN/m

Limit deflection to 20mm

Point load from short section = $1.2 \times 2.3\frac{1}{2} = 1.38$ kN (2.16)



$R_A = 1.2 \times 3.5\frac{1}{2} + 1.38 \times 2.8\frac{1}{3.5} = 3.20$ kN

$R_B = 1.2 \times 3.5\frac{1}{2} + 1.38 \times 0.7\frac{1}{3.5} = 2.38$ kN (3.72)

Dist to point of max BM

$= 2.38 / 1.2 = 1.98$ (1.98)

Max BM = $2.38 \times 1.98 - 1.2 \times 1.98 = 2.34$ kNm (3.64)

equivalent UDL = 1.53 kN/m

Using SHS - $P_b = 235$ N/mm² =

Req S = $3.640 \times 10^3 / 235 = 15.50$ cm³

Req I = $\frac{5 \times 1.53 \times 3.5^4 \times 10^{12}}{384 \times 205 \times 10^3 \times 20} = 72.83 \times 10^4$ mm⁴

USE 70 x 70 x 4 OR 80 x 80 x 3 SHS

S = 24.8

25.8 cm³

I = 72.1

87.8 cm⁴

Req Bending Area on Cob = $3200 / 0.15 = 21333$ mm²
ie 100 x 214