

P. A. Harper Associates.

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SHEET No.

19

REV.

PROJECT No.

24/087

DATE

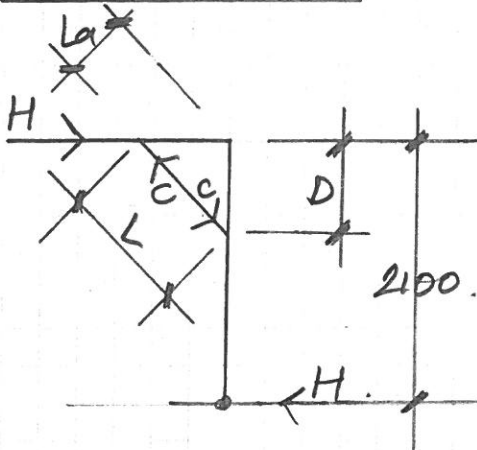
14/01/24

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WJ

PROJECT

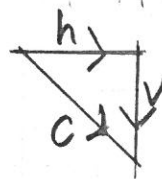
ORR BRACES. - 50X160.



ALL TENSORS 140X30X75 LONG

TENSION SHEAR CAPACITY

$$S = 1.64 \times 140 \times 30 = 6.89 \text{ KN.}$$



FOR $h \neq v \neq 6.89 \text{ KN.}$

$$C \neq 6.89 \sqrt{2} = 9.74 \text{ KN}$$

$$\text{MAX C D+S.} = 9.74 \times 1.25 = \underline{12.2 \text{ KN.}}$$

$$\text{MAX C WIND} = 9.74 \times 1.75 = \underline{17.0 \text{ KN}}$$

BRACE COMPRESSION CAPACITY. -

WORST CASE (LONGEST) LARGE TIE BRACE $L = 1310 \text{ *}$.

$$l/m = 1310/14.4 = 91.$$

$$E/I_{EN} = 8100/8.51 \times 1.75 = 543.$$

$$\left. \begin{array}{l} l/m = 91 \\ E/I_{EN} = 543 \end{array} \right\} k_{12} = 0.34 \text{ (WIND)}$$

$$\text{MAX C} = 160 \times 50 \times 8.51 \times 1.75 \times 0.34 = 40 \text{ KN. NOT OVERDUB.}$$

		KNEE BRACE	SMALL TIE BRACE	LARGE TIE BRACE
D	MM	600	750	925.
L ($D \times \sqrt{2}$)	MM	848.	1070	1310 *
L _a (L/2)	MM	424	535	655
M ($17.0 \times L_a$)	KNM.	7.21.	9.09	11.14
H. (M/2.1)	KN.	3.43	4.33.	5.30.



MAXIMUM HORIZONTAL
LOAD PER BRACE,

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18.

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24/081

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APRIL '24

PROJECT

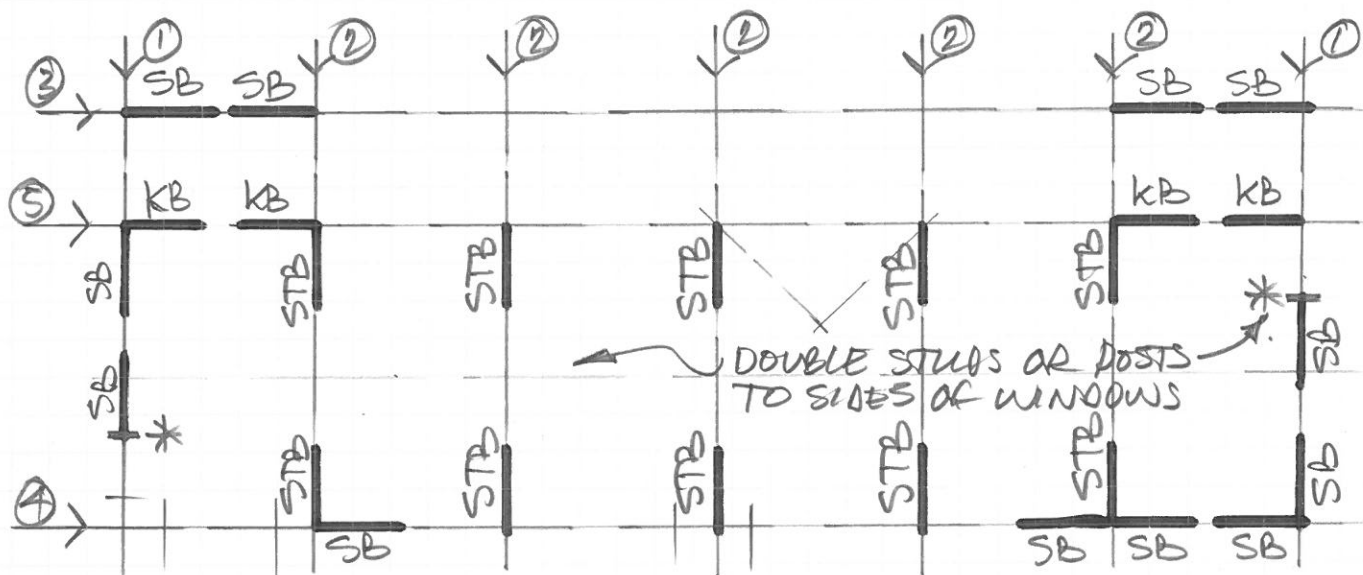
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BRACING/STABILITY

WIND LOADS TRANSFERRED BY DIAPHRAGM ACTION OF THE ROOF TO BRACED WALL/FRAME.

BRACES ARRANGED IN PAIRS & LOADS ASSUMED TO BE CARRIED BY COMPRESSION BRACES ONLY FROM SHEET 01.

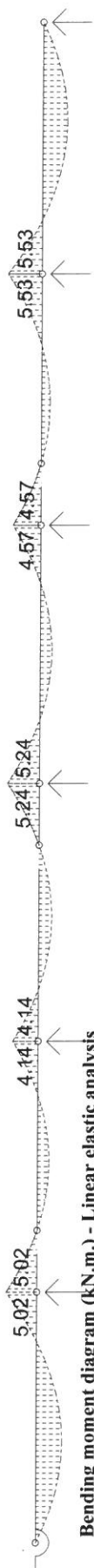
NET HOR WIND LOAD ON EAVES = $w = 0.48 \text{ kN/m}$.



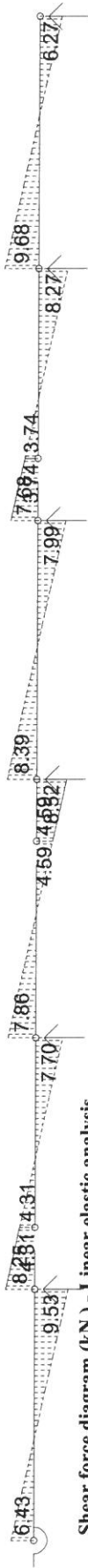
LOAD	kN	No. of BRACES	STUD BRACES	KNEE BRACES	SMALL TIE BRACES
① = $0.48 \times 3.3/2$	= 0.80	1	= 0.80	—	—
② = 0.48×3.4	= 1.63	1	—	—	1.63
③ = $0.48 \times 1.9/2 \times 1.5/2$	= 0.30	2	= 0.15	—	—
④ = $0.48 \times 2.2/2 \times 4.5/2 + 0.48 \times 4.5/2 \times 1.2/2$	= 1.64	2	= 0.82	—	—
⑤ = $0.30 + 1.64$	= 1.94	2	—	0.97	—

SEE SHEET 20

SEE SHEET 19



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	Designed : PAH		Checked : 17



Shear force diagram (kN.) - Linear elastic analysis
Loading combination: DEAD+SUPER

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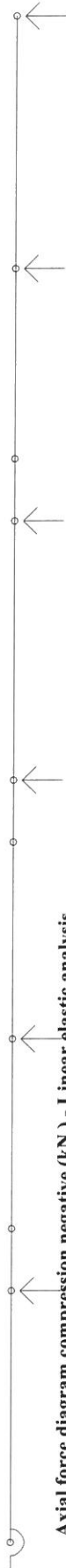
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<i>Quikframe - Plane Frame Analysis 8.60</i>	<i>P A HARPER ASSOCIATES LTD</i> 01785 851266 harperpa@hotmail.com		Printed : 22/04/2024	Sheet : 11
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Member deflections - Linear elastic analysis**Loading combination: DEAD+SUPER**

Member	Distance m	Measured from	Dx mm	Dy mm	Pz Rad
	0.667	Left end	0.0	-1.5 ↓	-0.0032 ↻
	0.800	Left end	0.0	-1.9 ↓	-0.0032 ↻
M8	0.000	Left end	0.0	-1.9 ↓	-0.0032 ↻
	0.407	Left end	0.0	-2.0 ↓	0.0000
	0.814	Left end	0.0	-1.8 ↓	0.0009 ↻
	1.221	Left end	0.0	-1.3 ↓	0.0017 ↻
	1.628	Left end	-0.0	-0.6 ↓	0.0019 ↻
	2.035	Left end	-0.0	0.1 ↑	0.0010 ↻
	2.442	Left end	0.0	0.0	-0.0016 ↻
M9	0.000	Left end	0.0	0.0	-0.0016 ↻
	0.540	Left end	0.0	-1.8 ↓	-0.0043 ↻
	1.081	Left end	0.0	-4.1 ↓	-0.0037 ↻
	1.621	Left end	0.0	-5.4 ↓	-0.0012 ↻
	2.161	Left end	0.0	-5.2 ↓	0.0022 ↻
	2.702	Left end	0.0	-3.2 ↓	0.0051 ↻
	3.242	Left end	0.0	-0.0	0.0063 ↻

Joint deflections - Linear elastic analysis**Loading combination: DEAD+SUPER**

Joint	Dx mm	Dy mm	Pz Rad
J1	0.0	0.0	-0.0067 ↻
J2	0.0	0.0	0.0025 ↻
J3	0.0	0.4 ↑	-0.0022 ↻
J4	0.0	0.0	-0.0008 ↻
J5	0.0	-2.6 ↓	0.0042 ↻
J6	0.0	0.0	0.0012 ↻
J7	0.0	0.0	-0.0007 ↻
J8	0.0	-1.9 ↓	-0.0004 ↻
J9	0.0	0.0	-0.0016 ↻
J10	0.0	0.0	0.0063 ↻

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Member deflections - Linear elastic analysis

Loading combination: DEAD+SUPER

Member	Distance m	Measured from	Dx mm	Dy mm	Pz Rad
M1	0.000	Left end	0.0	0.0	-0.0067 ↻
	0.540	Left end	0.0	-3.4 ↓	-0.0055 ↻
	1.081	Left end	0.0	-5.6 ↓	-0.0025 ↻
	1.621	Left end	0.0	-6.0 ↓	0.0011 ↻
	2.161	Left end	0.0	-4.6 ↓	0.0039 ↻
	2.702	Left end	0.0	-2.1 ↓	0.0048 ↻
	3.242	Left end	0.0	0.0	0.0025 ↻
M2	0.000	Left end	0.0	0.0	0.0025 ↻
	0.133	Left end	-0.0	0.3 ↑	0.0015 ↻
	0.267	Left end	-0.0	0.4 ↑	0.0008 ↻
	0.400	Left end	-0.0	0.5 ↑	0.0002 ↻
	0.533	Left end	-0.0	0.5 ↑	-0.0001 ↻
	0.667	Left end	-0.0	0.5 ↑	-0.0003 ↻
	0.800	Left end	0.0	0.4 ↑	-0.0004 ↻
M3	0.000	Left end	0.0	0.4 ↑	-0.0004 ↻
	0.407	Left end	-0.0	-0.4 ↓	-0.0017 ↻
	0.814	Left end	-0.0	-0.9 ↓	-0.0007 ↻
	1.221	Left end	-0.0	-1.0 ↓	0.0005 ↻
	1.628	Left end	-0.0	-0.6 ↓	0.0012 ↻
	2.035	Left end	-0.0	-0.1 ↓	0.0010 ↻
	2.442	Left end	0.0	0.0	-0.0008 ↻
M4	0.000	Left end	0.0	0.0	-0.0008 ↻
	0.421	Left end	-0.0	-0.8 ↓	-0.0025 ↻
	0.843	Left end	-0.0	-1.9 ↓	-0.0026 ↻
	1.264	Left end	-0.0	-2.8 ↓	-0.0017 ↻
	1.686	Left end	-0.0	-3.3 ↓	-0.0004 ↻
	2.107	Left end	-0.0	-3.2 ↓	0.0009 ↻
	2.529	Left end	0.0	-2.6 ↓	0.0014 ↻
M5	0.000	Left end	0.0	-2.6 ↓	0.0014 ↻
	0.133	Left end	-0.0	-2.1 ↓	0.0042 ↻
	0.267	Left end	-0.0	-1.5 ↓	0.0039 ↻
	0.400	Left end	-0.0	-1.0 ↓	0.0036 ↻
	0.533	Left end	-0.0	-0.6 ↓	0.0030 ↻
	0.667	Left end	-0.0	-0.2 ↓	0.0022 ↻
	0.800	Left end	0.0	-0.0	0.0012 ↻
M6	0.000	Left end	0.0	-0.0	0.0012 ↻
	0.555	Left end	0.0	-0.2 ↓	-0.0015 ↻
	1.110	Left end	0.0	-1.2 ↓	-0.0016 ↻
	1.665	Left end	0.0	-1.7 ↓	-0.0001 ↻
	2.219	Left end	0.0	-1.3 ↓	0.0014 ↻
	2.774	Left end	0.0	-0.4 ↓	0.0016 ↻
	3.329	Left end	0.0	0.0	-0.0007 ↻
M7	0.000	Left end	0.0	0.0	-0.0007 ↻
	0.133	Left end	0.0	-0.1 ↓	-0.0015 ↻
	0.267	Left end	0.0	-0.4 ↓	-0.0022 ↻
	0.400	Left end	0.0	-0.7 ↓	-0.0027 ↻
	0.533	Left end	0.0	-1.1 ↓	-0.0030 ↻

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Forces - Linear elastic analysis**Loading combination: DEAD+SUPER**

Member	Distance m	Measured from	Axial kN	Sense	Shear kN	Moment kN.m
M1	0.000	Left end	0.00		6.43	0.00
	1.306	Left end	0.00		0.00	4.20
	2.612	Left end	0.00		-6.43	-0.00
	3.242	Left end	0.00		-9.53	-5.02
M2	0.000	Left end	0.00		8.25	-5.02
	0.800	Left end	0.00		4.31	-0.00
M3	0.000	Left end	0.00		4.31	0.00
	0.877	Left end	0.00		0.00	1.89
	1.753	Left end	0.00		-4.31	-0.00
	2.442	Left end	0.00		-7.70	-4.14
M4	0.000	Left end	0.00		7.86	-4.14
	0.665	Left end	0.00		4.59	0.00
	1.597	Left end	0.00		-0.00	2.14
	2.529	Left end	0.00		-4.59	0.00
M5	0.000	Left end	0.00		-4.59	-0.00
	0.800	Left end	0.00		-8.52	-5.24
M6	0.000	Left end	0.00		8.39	-5.24
	0.824	Left end	0.00		4.34	-0.00
	1.706	Left end	0.00		-0.00	1.91
	2.588	Left end	0.00		-4.34	-0.00
	3.329	Left end	0.00		-7.99	-4.57
M7	0.000	Left end	0.00		7.68	-4.57
	0.800	Left end	0.00		3.74	-0.00
M8	0.000	Left end	0.00		3.74	0.00
	0.761	Left end	0.00		0.00	1.42
	1.522	Left end	0.00		-3.74	0.00
	2.442	Left end	0.00		-8.27	-5.53
M9	0.000	Left end	0.00		9.68	-5.53
	0.693	Left end	0.00		6.27	-0.00
	1.967	Left end	0.00		0.00	4.00
	3.242	Left end	0.00		-6.27	0.00

Reactions - Linear elastic analysis**Loading combination: DEAD+SUPER**

Base	Joint	Horizontal kN	Vertical kN	Moment kN.m
B1	J1	0.00	6.43 ↑	0.00
B2	J2	0.00	17.77 ↑	-0.00
B3	J4	0.00	15.56 ↑	0.00
B4	J6	0.00	16.91 ↑	0.00
B5	J7	0.00	15.67 ↑	0.00
B6	J9	0.00	17.95 ↑	0.00
B7	J10	0.00	6.27 ↑	-0.00

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Members

Name	Length m	Section group	Ends Left/low'	Other	Joints
M1	3.242	GXY	Fix	Fix	J1 to 2
M2	0.800	GXY	Fix	Pin	J2 to 3
M3	2.442	GXY	Fix	Fix	J3 to 4
M4	2.529	GXY	Fix	Pin	J4 to 5
M5	0.800	GXY	Fix	Fix	J5 to 6
M6	3.329	GXY	Fix	Fix	J6 to 7
M7	0.800	GXY	Fix	Pin	J7 to 8
M8	2.442	GXY	Fix	Fix	J8 to 9
M9	3.242	GXY	Fix	Fix	J9 to 10

Bases

Name	Joint	Horizontal kN/m	Vertical kN/m	Rotational kN.m/Rad
B1	J1	Fixed	Fixed	Pinned
B2	J2	Free	Fixed	Pinned
B3	J4	Free	Fixed	Pinned
B4	J6	Free	Fixed	Pinned
B5	J7	Free	Fixed	Pinned
B6	J9	Free	Fixed	Pinned
B7	J10	Free	Fixed	Pinned

Load cases

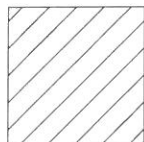
Name	Type
DEAD+SUPER	Permanent dead
Removable dead	Removable dead
Imposed	Imposed
Notional	Notional

Load combinations

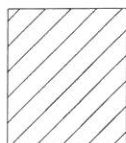
Name	Limit	Factor	Load case
DEAD+SUPER	SLS	1.00	DEAD+SUPER
		0.00	Removable dead
		0.00	Imposed
		0.00	Notional

Uniformly distributed loads**Load case : DEAD+SUPER**

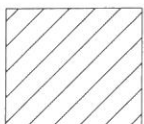
Name	Member	Value kN/m	Direction
L1	M1	4.92	Vertical ↓
L2	M2	4.92	Vertical ↓
L3	M3	4.92	Vertical ↓
L4	M4	4.92	Vertical ↓
L5	M5	4.92	Vertical ↓
L6	M6	4.92	Vertical ↓
L7	M7	4.92	Vertical ↓
L8	M8	4.92	Vertical ↓
L9	M9	4.92	Vertical ↓

GXY - Timber - 175 x 175 See grade strengths

Depth	=	175.0	mm
E	=	8.100	kN/mm2
I	=	7816	cm4
A	=	306.3	cm2

HX - Timber - 175 x 200 See grade strengths

Depth	=	200.0	mm
E	=	8.100	kN/mm2
I	=	11670	cm4
A	=	350.0	cm2

HY - Timber - 200 x 175 See grade strengths

Depth	=	175.0	mm
E	=	8.100	kN/mm2
I	=	8932	cm4
A	=	350.0	cm2

IX - Timber - 184 x 140 See grade strengths

Depth	=	140.0	mm
E	=	8.100	kN/mm2
I	=	4207	cm4
A	=	257.6	cm2

IY - Timber - 140 x 184 See grade strengths

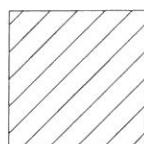
Depth	=	184.0	mm
E	=	8.100	kN/mm2
I	=	7268	cm4
A	=	257.6	cm2

Joints

Name	X m	Y m
J1	-0.000	0.000
J2	3.242	0.000
J3	4.042	0.000
J4	6.484	0.000
J5	9.013	0.000
J6	9.813	0.000
J7	13.142	0.000
J8	13.942	0.000
J9	16.384	0.000
J10	19.626	0.000

Section groups

AXY - Timber - 140 x 140 See grade strengths



Depth	=	140.0	mm
E	=	8.100	kN/mm2
I	=	3201	cm4
A	=	196.0	cm2

BX - Timber - 140 x 200 See grade strengths



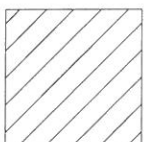
Depth	=	200.0	mm
E	=	8.100	kN/mm2
I	=	9333	cm4
A	=	280.0	cm2

BY - Timber - 200 x 140 See grade strengths



Depth	=	140.0	mm
E	=	8.100	kN/mm2
I	=	4573	cm4
A	=	280.0	cm2

CXY - Timber - 200 x 200 See grade strengths



Depth	=	200.0	mm
E	=	8.100	kN/mm2
I	=	13330	cm4
A	=	400.0	cm2

DX - Timber - 100 x 200 See grade strengths



Depth	=	200.0	mm
E	=	8.100	kN/mm2
I	=	6667	cm4
A	=	200.0	cm2

EX - Timber - 75 x 140 See grade strengths

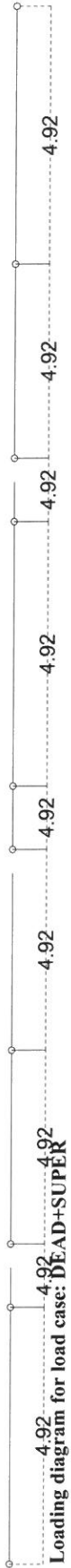


Depth	=	140.0	mm
E	=	10.65	kN/mm2
I	=	1715	cm4
A	=	105.0	cm2

FX - Timber - 50 x 160 See grade strengths



Depth	=	160.0	mm
E	=	8.100	kN/mm2
I	=	1707	cm4
A	=	80.00	cm2



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Quikframe - Plane Frame Analysis 8.60

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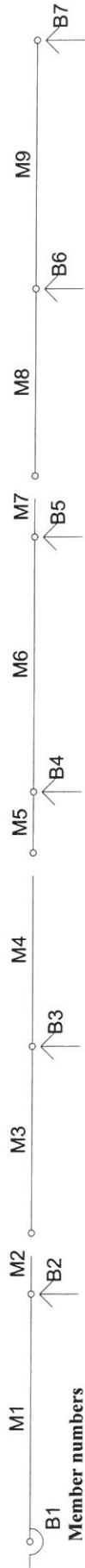
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9



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J1 J2 J3 J4 J5 J6 J7 J8 J9 J10

Joint numbers

<i>Quikframe - Plane Frame Analysis 8.60</i>	<i>P A HARPER ASSOCIATES LTD</i> 01785 851266 harperpa@hotmail.com		Printed : 22/04/2024	Sheet : 1
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DS

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SHEET No.

04

REV.

PROJECT No.

24/087

DATE

April 24

PROJECT

PREPARED BY

RAPIDS.

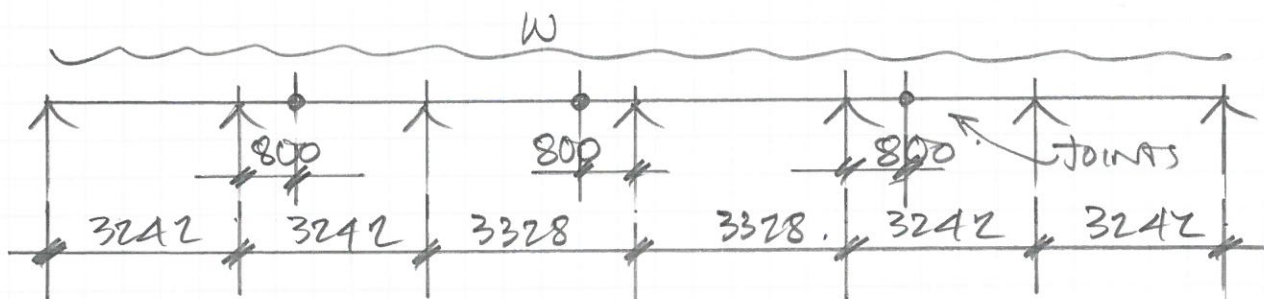
SPKN. 2300

SPACING 450

FROM TABLE 20.

PROVIDE 50x150 CIG.

EXPOSE BEAMS. - 175x175.



$$WV = 1.64 \times 4.5/2 + 1.64 \times 1.5/2 = 3.69 + 1.23 = 4.92 \text{ wfm}$$

$$Wh = 3.69 / 2 \tan 20^\circ = 4.45 \text{ wfm}$$

SEE PRINTOUT FOR ANALYSIS.

$$MV = 5.53 \text{ wfm}$$

$$Mh = 5.53 \times 4.45 / 4.92 = 5.0 \text{ wfm}$$

$$fm = (5.53 + 5.0) / 0.893 = 11.8 \text{ - } \left. \begin{array}{l} \\ \end{array} \right\} \text{OK}$$

$$fm_{adm} = 10.5 \times 1.25 = 13.1 \text{ - }$$

PROVIDE 175x175 OAK.

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SHEET No.

03

REV.

PROJECT No.

24/087

DATE

April '24

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[Signature]

PROJECT

TYPICAL SECTIONS

W D	I_x 10^6 mm^4	I_y 10^6 mm^4	A 10^3 mm^2	Z_x 10^3 mm^3	Z_y 10^3 mm^3	r_g mm
140x140 A	32.1	32.1	19.6	457	457	40.4
140x200 B	93.3	45.7	28.0	933	653	40.4
200x200 C	133	133	40.0	1233	1233	57.7
100x200 D	66.6	16.7	20.0	667	333	28.9
75x140 E	17.1	4.92	10.5	245	131	21.6
50x225	47.5	2.34	11.3	422	93.7	14.4
50x200	33.3	2.08	10.0	393	83.3	14.4
50x175	22.3	1.82	8.75	255	72.9	14.4
50x150	14.1	1.56	7.50	187	62.5	14.4
50x100	4.16	1.04	5.00	83.3	41.7	14.4
50x125	8.14	1.30	6.25	130	52.1	14.4
50x160 F	17.1	1.67	8.00	213	66.7	14.4
175x175 G	78.1	78.1	30.6	893	893	50.5
175x200 H	116.7	89.3	35.0	1167	1021	50.5
184x140 I	42.1	72.7	25.8	601	790	40.4

P. A. Harper Associates.

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SHEET No.

02

REV.

PROJECT No.

24/087

DATE

14/01/24

PROJECT

PREPARED BY

MATERIALS.

TRADITIONAL FRAMES.

GREEN EUROPEAN OAK - GRADE A, UNLESS NOTED OTHERWISE.
VISUALLY STRENGTH GRADED TO BS5756.

GLULAM FRAMES.

NORDIC SPRUCE - GRADE GL24C TO BS EN. 14080.

STRUCTURAL JOINERY.

SHAPLE OR EQUIVALENT - GRADE D40 TO BS5756

PARTERS/JOISTS/STUFS.

SOFTWOOD GRADE C16 OR C24.

	TM	TF	TE ^H	TE ^L	TS	E _{mean}	E _{min}
OAK GRADE A	10.50	6.30	8.51	3.29	1.64	10650	8100.
B	9.17	5.50	7.43	2.65	1.43	9260	7130
C	7.10	4.25	5.75	2.05	1.11	7240	5960
GLULAM GL24C	7.50	4.50	7.90	2.40	0.71	11000	9100
SHAPLE D40	12.50	7.50	12.60	3.90	3.00	10800	7500
SOFTWOOD C16.	5.30	3.20	6.80	2.20	0.67	8800	5800
C24.	7.50	4.50	7.90	2.40	0.71	10800	7200.

FIXINGS.

ALL FIXINGS, BOLTS, NAILS, CLEATS, ETC IN CONTACT WITH
ANY OAK IN EXTERNAL, DAMP OR EXPOSED AREAS
TO BE STAINLESS STEEL.

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SHEET No.

01

REV.

PROJECT No.

24/081

DATE

APRIL '24

PROJECT

DRUM OAK BUILDINGS LTD
HENDERSON - 90523.

PREPARED BY

[Signature]

LOADING.

PITCHED ROOF

DEAD	SLATE	0.60	} $\pm \cos 22\frac{1}{2}^\circ$
	PELT+RATT.	0.08	
	RAPTOR	0.08	
	CEILING	0.20	
	TOTAL	1.04	
	SUPER	0.60	
	TOTAL LOAD	1.64	N/m^2

WIND LOAD.

$V = 39 \text{ m/s.}$

$S_1 = S_3 = 1.0$

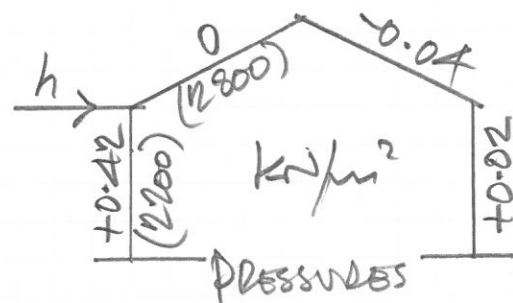
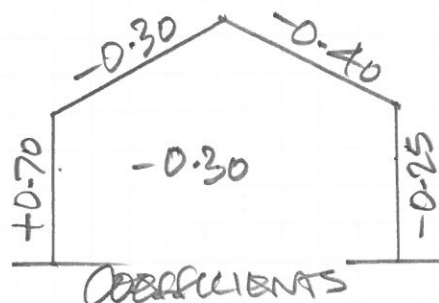
$\theta = 22\frac{1}{2}^\circ$

CLASS 2B.

	HEIGHT	S_2	V_s	$q(\text{N/m}^2)$
WALLS	± 3.0	0.67	26.13	0.42
Roof	3.4	0.684	26.67	0.44

$$h/w = 2.2/6.0 = 0.37$$

$$t/w = 19.8/6.0 = 3.3$$



NET HORIZONTAL WIND
LOAD ON EAVES.

$$h = (0.42 - 0.02) \times 2.2/2 + 0.04 \times 2.8 \times S_2 \times 22\frac{1}{2} = 0.44 + 0.04 = 0.48 \text{ N/m}^2$$