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SHEET No

01

REV

PROJECT No

26/09/2

DATE

MAY '06

PROJECT

PRIME OAK BUILDINGS LTD.
FINLAYSON - 97267

PREPARED BY

[Signature]

CALCULATIONS FOR STRUCTURAL OAK FRAME

LOADING

PITCHED ROOF

DECK

TILES

0.60

PELT+PLATE

0.08

DRAFTERS

0.08

CEILING

0.20

+ Cos. 35

TOTAL

1.17

SUPER

0.60

TOTAL LOAD.

1.77 W/m^2

WIND LOADS.

$V = 41 \text{ M/S.}$

$S_1 = S_2 = 1.0$

$\theta = 35^\circ$

CLASS 2B.

HEIGHT

S_2

V_s

$q (\text{W/m}^2)$

WALLS.

2.3.0.

0.67

27.47

0.46

ROOF

3.8

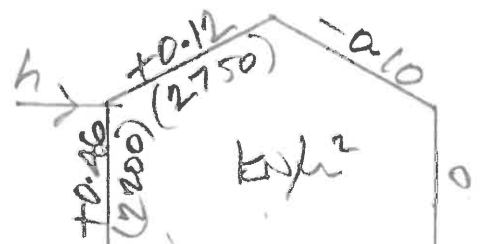
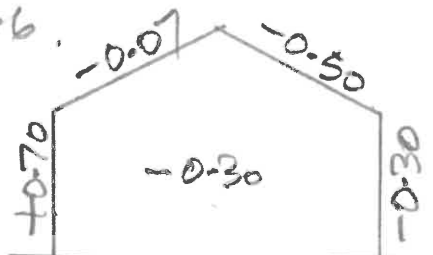
0.698

28.62

0.50

$$W/W = 2.3/4.0 = 0.58$$

$$L/W = 10.5/4.0 = 2.6$$



NET HORIZONTAL
WIND LOAD ON EXTER

COEFFICIENTS

PRESSURES

$$h = (0.46 + 0) 2 \frac{1}{2} + (0.12 + 0.10) 2.75 \sin 35 = 0.506 + 0.347$$
$$= 0.85 \text{ W/m}$$

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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.

SAPELE OR EQUIVALENT - GRADE D40 TO BS5756

PLATES / JOISTS / STUDS.

SOFTWOOD GRADE C16 OR C24.

	T _m	T _T	T _c ^H	T _c ^L	T _S	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	4.26	5.75	2.05	1.11	7240	5960
GLULAM GL24C	7.50	4.50	7.90	2.40	0.71	11000	9100
SAPELE 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.

03

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PROJECT No.

26/0912

DATE

MAY 16

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TYPICAL SECTIONS.

	W	D	I_x	I_y	A	Z_x	Z_y	r_y	
			$10^6 \text{ mm}^4 \text{ cm}^4$	$10^6 \text{ mm}^4 \text{ cm}^4$	$10^3 \text{ mm}^2 \text{ cm}^2$	10^3 mm^2	10^3 mm^2	mm	
140x140 A	32.1	32.10	32.1	32.10	19.6	196	457	457	40.4
140x200 B	93.3	9330	45.7	4570	28.0	280	933	653	40.4
200x200 C	133	13300	133	13300	40.0	400	1333	1333	57.7
100x200 D	66.6	6660	16.7	1670	20.0	200	667	333	28.9
75x140 E	17.1	1710	4.92	492	10.5	105	245	131	21.6
50x225	47.5	4750	23.4	234	11.3	113	422	93.7	14.4
50x200	33.3	3330	20.8	208	10.0	100	393	83.3	14.4
50x175	22.3	2230	1.82	182	8.75	87.5	255	72.9	14.4
50x150	14.1	1410	1.56	156	7.50	75.0	187	62.5	14.4
50x100	4.16	416	1.04	104	5.00	50.0	83.3	41.7	14.4
50x125	8.14	814	1.30	130	6.95	69.5	130	52.1	14.4
50x160 F	17.1	1710	1.67	167	8.00	80.0	213	66.7	14.4
175x175 G	78.1	7816	78.1	7816	30.6	306	893	893	50.5
175x200 H	116.7	11667	89.3	8932	35.0	350	1167	1021	50.5
184x140 I	42.1	4207	72.7	7268	25.8	258	601	790	40.4

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04

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PROJECT No.

75/092

DATE

11/1/20

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PROJECT

FACTORS

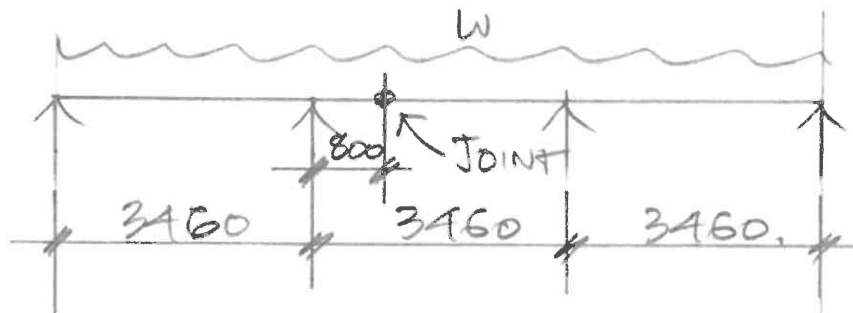
SAXN 2350

SPACING 450.

FROM TABLE 28.

PROVIDE 50X150 C/B.

EXTERIOR BEAMS. - 140X200.



$$W_v = 1.77 \times 4.0/2 = 3.54 \text{ kN/m}$$

$$W_h = 3.54 / 24 \tan 35 = 2.53 \text{ kN}$$

SEE PRINTOUT FOR ANALYSIS.

$$M_v = 4.20 \text{ kNm}$$

$$M_h = 4.20 \times 2.53 / 3.54 = 3.0 \text{ kNm}$$

$$I_m = 4.20 / 0.933 + 3.0 / 0.653 = 9.1$$

$$I_{m, adm} = 10.5 \times 1.25 = 13.1$$

} OK

PROVIDE 140W X 200 D. OAK.

J1 J2 J3 J4 J5

Joint numbers

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<i>Quikframe - Plane Frame Analysis 8.60</i>	P A HARPER ASSOCIATES LTD			Printed : 16/05/2026	Sheet : 4
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	harperpa@hotmail.com			Title : No project title	08
				Designed : PAH	Checked :

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

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

RAFTERS - Timber - 50 x 150 See grade strengths

Depth	=	150.0	mm
E	=	8.800	kN/mm2
I	=	1406	cm4
A	=	75.00	cm2

Joints

Name	X m	Y m
J1	-0.000	0.000
J2	3.460	0.000
J3	4.260	0.000
J4	6.920	0.000
J5	10.380	0.000

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Members

Name	Length m	Section group	Ends Left/low'	Other	Joints
M1	3.460	BX	Fix	Fix	J1 to 2
M2	0.800	BX	Fix	Pin	J2 to 3
M3	2.660	BX	Fix	Fix	J3 to 4
M4	3.460	BX	Fix	Fix	J4 to 5

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	J5	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	3.54	Vertical ↓
L2	M2	3.54	Vertical ↓
L3	M3	3.54	Vertical ↓
L4	M4	3.54	Vertical ↓

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		5.07	0.00
	1.433	Left end	0.00		0.00	3.64
	2.867	Left end	0.00		-5.07	-0.00
	3.460	Left end	0.00		-7.17	-3.63
M2	0.000	Left end	0.00		5.96	-3.63
	0.800	Left end	0.00		3.13	-0.00
M3	0.000	Left end	0.00		3.13	0.00

Forces - Linear elastic analysis
Loading combination: DEAD+SUPER

Member	Distance m	Measured from	Axial kN	Sense	Shear kN	Moment kN.m
	0.883	Left end	0.00		0.00	1.38
	1.767	Left end	0.00		-3.13	0.00
	2.660	Left end	0.00		-6.29	-4.20
M4	0.000	Left end	0.00		7.34	-4.20
	0.686	Left end	0.00		4.91	-0.00
	2.073	Left end	0.00		0.00	3.40
	3.460	Left end	0.00		-4.91	0.00

Reactions - Linear elastic analysis
Loading combination: DEAD+SUPER

Base	Joint	Horizontal kN	Vertical kN	Moment kN.m
B1	J1	0.00	5.07	-0.00
B2	J2	0.00	13.13	0.00
B3	J4	0.00	13.63	0.00
B4	J5	0.00	4.91	0.00

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	-0.0053
	0.577	Left end	0.0	-2.9	-0.0043
	1.153	Left end	0.0	-4.8	-0.0020
	1.730	Left end	0.0	-5.1	0.0007
	2.307	Left end	0.0	-4.0	0.0030
	2.883	Left end	0.0	-2.0	0.0039
	3.460	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	0.0020
	0.267	Left end	-0.0	0.5	0.0015
	0.400	Left end	-0.0	0.7	0.0012
	0.533	Left end	-0.0	0.9	0.0010
	0.667	Left end	-0.0	1.0	0.0009
	0.800	Left end	0.0	1.1	0.0008
M3	0.000	Left end	0.0	1.1	0.0008
	0.443	Left end	-0.0	0.4	-0.0013
	0.887	Left end	-0.0	0.0	-0.0005
	1.330	Left end	-0.0	-0.1	0.0002
	1.773	Left end	-0.0	0.1	0.0005
	2.217	Left end	0.0	0.3	0.0000
	2.660	Left end	0.0	0.0	-0.0017
M4	0.000	Left end	0.0	0.0	-0.0017
	0.577	Left end	0.0	-1.6	-0.0034
	1.153	Left end	0.0	-3.5	-0.0028
	1.730	Left end	0.0	-4.6	-0.0008

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

Member	Distance m	Measured from	Dx mm	Dy mm	Pz Rad
	2.307	Left end	0.0	-4.3	0.0018
	2.883	Left end	0.0	-2.6	0.0039
	3.460	Left end	0.0	-0.0	0.0049

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

Joint	Dx mm	Dy mm	Pz Rad
J1	0.0	0.0	-0.0053
J2	0.0	0.0	0.0025
J3	0.0	1.1	-0.0016
J4	0.0	0.0	-0.0017
J5	0.0	0.0	0.0049



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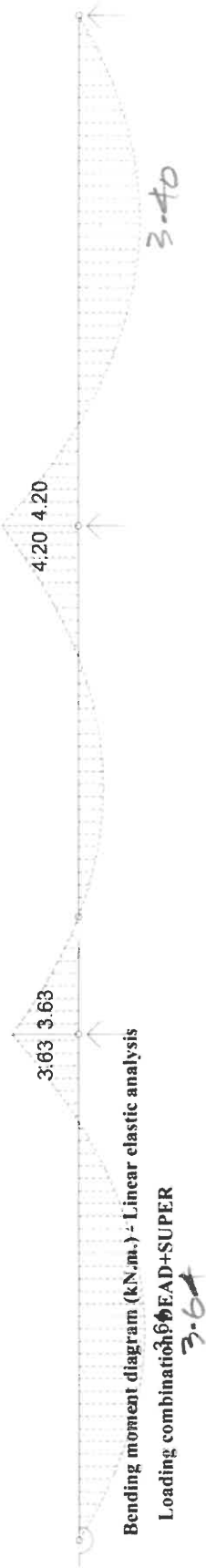
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SHEET No

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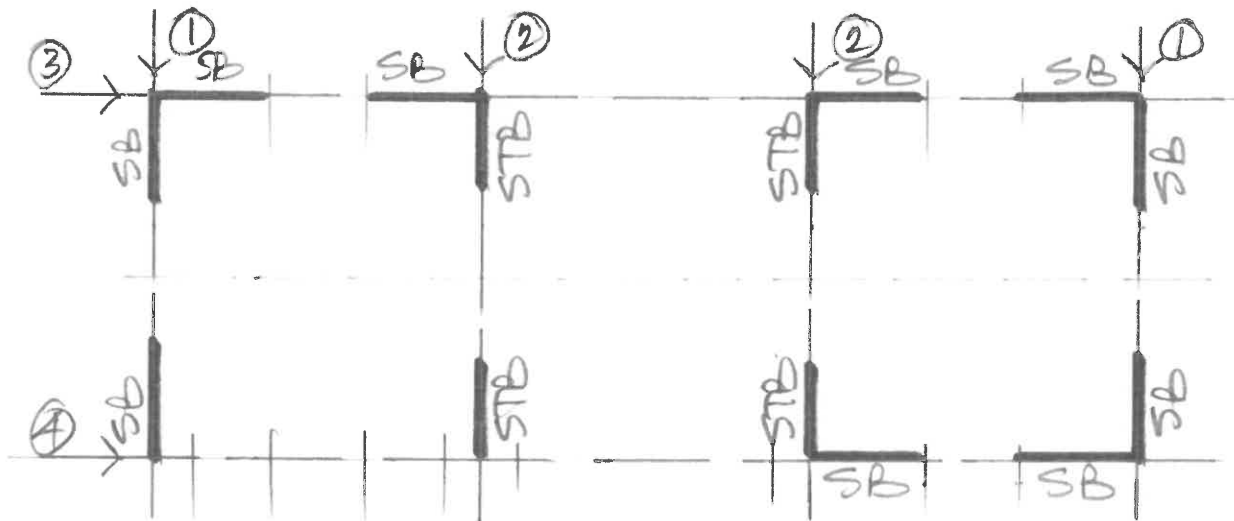
BRACING / STABILITY.

WIND LOADS TRANSFERRED BY DIAPHRAGM ACTIONS OF THE ROOF TO BRACED WALLS / FRAME

BRACES SPACED IN RAFTS & LOADS ASSUMED TO BE CARRIED BY COMPRESSION BRACES ONLY.

FROM SHEET 01:-

NET HORIZONTAL WIND LOAD ON EAVES = $W = 0.85 \text{ kN/m}$



LOADS

kN

No. of
BRACES

STUD
BRACES.

SMALL
TIE BRACES.

$$① = 0.85 \times 3.5/2 = 1.49 \div 1 = 1.49$$

$$② = 0.85 \times 3.5 = 2.98 \div 1 = 2.98$$

$$③ \left\{ 0.46 \times 2.3/2 \times 1.0/2 \right\} = 1.81 \div 2 = 0.91$$

$$④ \left\{ +0.50 \times 1.0/2 \times 1.0/2 \right\} = 1.81 \div 1 = 1.81$$

SEE SHEET 19



SEE SHEET 18
LOK

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SHEET No

18

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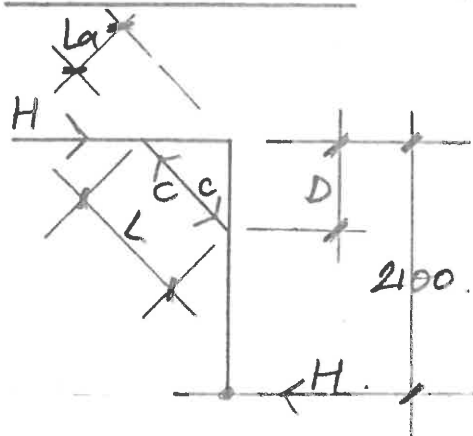
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PROJECT

OKK BRACES. - 50X160.



ALL TENSONS 140X30X75 LONG

TENSION SHEAR CAPACITY

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

$$\text{for } h \neq v \neq 6.89 \text{ kN}$$

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

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

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

BRACE COMPRESSION CAPACITY. -

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

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

$$E/l_{\text{eff}} = 8100/8.51 \times 1.75 = 543$$

$$\left. \begin{array}{l} k_{12} = 0.34 \text{ (WIND)} \end{array} \right\}$$

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

		KNEE BRACE	SMALL TIE BRACE	LARGE TIE BRACE
D	mm	600	750	925
L ($D \times \sqrt{2}$)	mm	848	1070	1310 *
La ($L/2$)	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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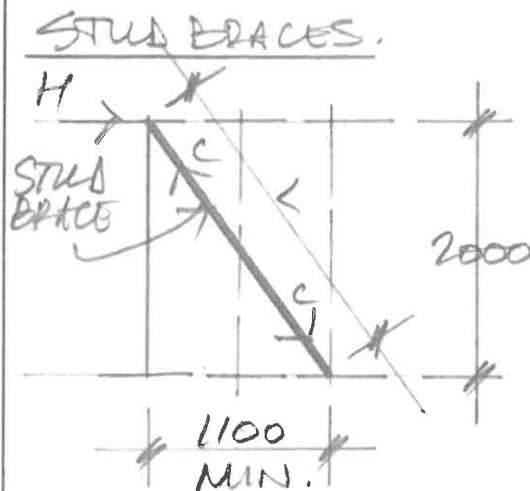
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PROJECT



$$H = 1.81 \text{ kN}$$

$$L = \sqrt{2.0^2 + 1.1^2} = 2.28 \text{ m}$$

$$l_{fu} = 2280 / 14.4 = 158$$

$$E / I_c^4 = 5800 / 6.8 \times 1.75 = 487 \quad \left. \begin{array}{l} l_{fu} = 158 \\ E / I_c^4 = 487 \end{array} \right\} k_{12} = 0.115$$

$$I_{adm} = 6.8 \times 1.75 \times 0.115 = 1.37$$

$$C = 1.81 \times 2.28 / 1.1 = 3.75 \text{ kN}$$

$$A_{dFA} \text{ reqd} = 3750 / 1.37 = 2738 \text{ mm}^2$$

PROVIDE 50X75 UG.

POSTS - 140X140.

$$D+T \quad C = 13.63 \text{ kN}$$

$$I_c = 13630 / 140 (140 - 30) = 0.89 \quad \left. \begin{array}{l} I_c = 0.89 \\ l_{fu} = 54 \end{array} \right\} \text{VOK}$$

$$l_{fu} = 2200 / 40.4 = 54$$

$$D+W \quad C_0 = 13.63 \times 1.17 / 1.77 = 9.0 \text{ kN}$$

KTU'S BRACES. $H_w = 2.98 \text{ kN}$

$$M_w = 2.98 (2.20 - 0.75) = 4.32 \text{ kNm}$$

$$Z = (140 - 30) 140^2 / 6 = 0.36 \times 10^6$$

$$I_m = 4.32 / 0.36 = 12.0$$

$$I_c = 9000 / 140 (140 - 30) = 0.58$$

$$E / I_c^4 = 8100 / 8.51 \times 1.75 = 544 \quad \therefore k_{12} = 0.633$$

$$I_c = \pi^2 8100 / 54^2 = 27$$

$$C.F. = \frac{12.0}{10.5 (1 - \frac{1.5 \times 0.633 \times 0.58}{27})} + \frac{0.58}{8.51 \times 0.633} = 1.17 + 0.107 = 1.28 \neq 1.75 \text{ VOK}$$

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MAY/26

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PROJECT

SUPPORT FRAME LOADS

LOADS AT FFL FROM OAK FRAME STRUCTURE ABOVE
ALL TO BE SUPPORTED ON PERMANENT STEEL FRAME,
TRUCKS, SUPPORT PILES, SUB-BASE, ETC.

ALL UNFACTORED DEAD + SUPER VERTICAL LOADS
REFERENCE PRIME OAK LTD DRAWING 97267.000-VI.

15 kN - P2, P3.

7 kN - P1, P4, P6, P7, P9, P10, P11, P12

2 kN - P5, P8.

TYPICAL EXTERNAL WALLS = 3 kN/m.