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GAMA CONSULTING
engineers and project management

STRUCTURAL DESIGN & DOCUMENTATION – REVISION 2

PROJECT No.: 220529

DATE: 12th April 2024

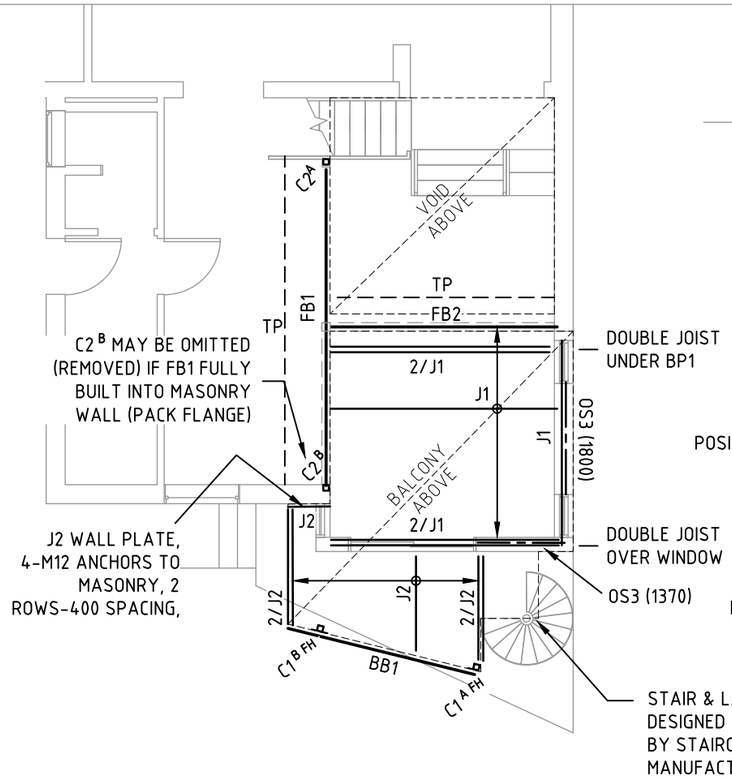
CLIENT: Echelon Studios

SITE: 14 Palmerston Rd, Unley SA

PREPARED BY: J. Wilk / A. Los

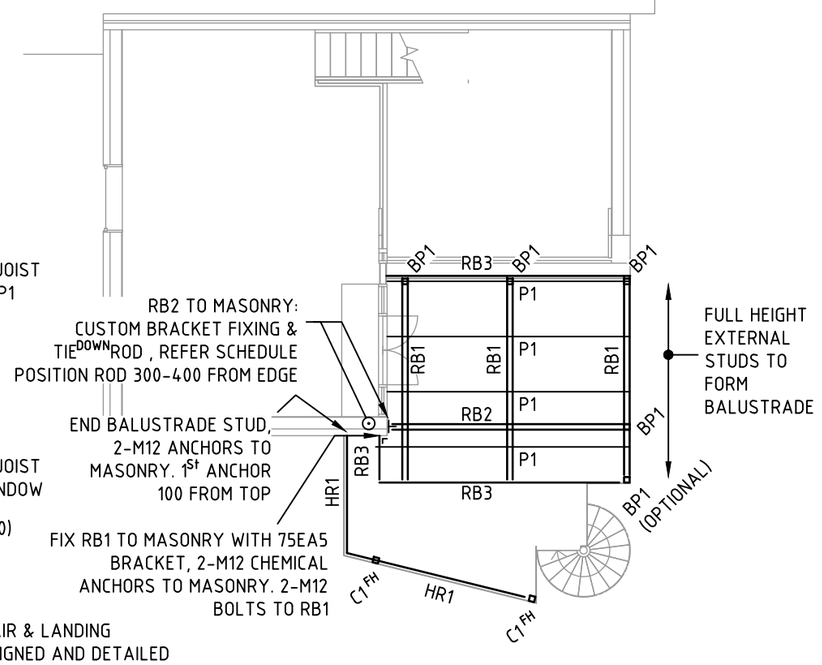
ENCLOSURES

Structural Plan & Details	220529-S01-REV.C
General Steelwork Specifications	Pages 1 – 2
General Timber Specifications	Pages 1 – 2
Design Calculations	Sheets 1 – 16



GROUND FLOOR PLAN

SCALE 1:100



MEZZANINE FLOOR PLAN

SCALE 1:100

LEGEND:

"FH" = FULL HEIGHT MEMBER

"CONT." = CONTINUOUS MEMBER & APPROX. LENGTH

TP = TEMPORARY PROPPING - INDICATIVE ONLY, C.O.S.

WALL FRAMING SCHEDULE: 2600mm C.H. + 1140mm BALUSTRADE

EXTERNAL 300 O/A DOUBLE LEAF WALL (NOTE: INTERNAL LEAF LOAD BEARING)
90x45 TOP & BOTTOM PLATES (TRENCHED) TO EACH LEAF
90x45 FULL HEIGHT STUDS AT 600 CTS EXTERNAL LEAF TO FORM BALUSTRADE (PITCHING FROM BRICKWORK) - NON-LOAD BEARING LEAF
90x45 STUDS AT 600 CTS TO INTERNAL LEAF (PITCHING POINT / C.L)
NOGGING AT 1350 CTS VERTICAL
2/90x45 JAMB STUDS
3/90x STUDS TO EXTERNAL CORNERS AND JUNCTIONS
CONNECT EXTERNAL AND INTERNAL LEAF WITH 90x35 STRUT BETWEEN EACH PAIR OF STUD.

- LOCATED AT THE BOTTOM, MIDDLE AND TOP OF THE EXTERNAL LEAF AND NO MORE THAN 1350 CTS VERTICAL
- WHERE EXTERNAL STUDS EXTEND TO FORM BALUSTRADE, SECURE TO FLOOR SYSTEM WITH 2-No.14 SCREWS PER STUD. PACING 90x35 STRUT TO SUIT

WALL FRAMING TIE DOWN SCHEDULE:

PROVIDE BOTH NOMINAL AND SPECIFIC (N1) TIE DOWNS

NOMINAL:	BOTTOM PLATE	-	1/75mm MASONRY NAIL OR M10 ANCHOR AT 1200 MAX. CTS NOTE: ANCHOR FOR BRACING UNITS AS REQUIRED
	PLATES TO STUDS	-	2/75x3.05mm SKEWED NAILS
	LINTELS TO JAMBS	-	2/75x3.05mm NAILS
SPECIFIC:	BOTTOM PLATE	-	N/A
	PLATES TO STUDS	-	30x0.8mm G.I. STRAP 4 NAILS EACH END OF STRAP AT 1200 MAX. CTS
	LINTELS TO JAMBS	-	30x0.8mm G.I. LOOPED STRAP 4 NAILS EACH END OF STRAP, TOP & BOTTOM PLATE

GENERAL NOTES:

1. REFER TO ARCHITECTURAL DRAWINGS FOR SET OUT DIMENSIONS AND LEVELS. DO NOT SCALE.
2. ALL TIMBER FRAME CONSTRUCTION TO COMPLY WITH AS 1684.1-2,.3,.4-2010.
3. ALL TIMBER BOLTED CONNECTIONS TO USE GRADE 4.6/S. PROVIDE WASHERS AS PER TABLE 4.11 AS 1720.1.
4. TO BE READ IN CONJUNCTION WITH GENERAL STEELWORK AND TIMBER SPECIFICATIONS.
5. ALL STEEL WORK TO BE SUITABLY TREATED FOR THE EXPOSED ENVIRONMENT.

MEMBER SCHEDULE

MEMBER	SIZE	CONNECTION & COMMENT
FB1	250UB37	FLOOR BEARER. LOCATE UNDER EXISTING CONCRETE SUSPENDED SLAB. FIX TOP FLANGE TO UNDERSIDE OF SUSPENDED SLAB WITH M12 SCREW ANCHORS AT 900 CTS MAX. CONNECTION TO C1: 10mm CLEAT, 3-M16 8.8/S.
FB2	2/200x63 LVL	PITCHING BEAM - SUPPORT EXISTING. CONNECTION TO FB1: 6mm CLEAT, 2-M12 4.6/S. (T.B.C.)
BB1	230 PFC	CANTILEVERED BALCONY BEARER, OPEN FACE TOWARD C1. CONNECTION TO C1A: 90x230x10 'CLOSING PLATE' WELDED TO FLANGES + 10 WEB STIFFENER WELDED ALL AROUND, 2-M16 8.8/S TO C1. 10mm CLEAT TO C1 (TYP.) CONNECTION TO C1B: 255x230x10 'CLOSING PLATE' + 10 WEB STIFFENER, 4-M16 8.8/S TO C1 (2 EACH SIDE). NOTE: AT CANTILEVER END PROVIDE 6mm CLEAT & 2-M12 FOR FIXING TO 2/J2 JOISTS
RB1	2/185x42 F7 (LOSP)	ROOF BEAM (H3 TREATED). CONNECTION TO RB2: 2 x No.18-7 x 300 [TYPE 17] SCREW "BUILDEX LANDSCAPING SCREW". PRE-DRILL HOLES. INSTALL FROM RB1 (TOP) AND INTO RB2 (TOP). POSITION SCREWS TO DIAGONALLY OPPOSITE MEMBERS
RB2	2/230x42 F7 (LOSP)	CONTINUOUS ROOF BEAM (H3 TREATED). LOCATE BENEATH RB1. CONNECTION TO MASONRY: CUSTOM BRACKET (TO SUIT) 200 WIDEx200 HEIGHTx6 END PL + 120x200x6 CLEAT PL, 4-M12 CHEMICAL ANCHORS, 3-M12 4.6/S TO RB2. NOTE: BRACKET IS CENTRAL TO BRICK EDGE
RB3	185x42 F7 (LOSP)	EDGE / FASCIA BEAM (H3 TREATED). CONNECTION TO RB1: CONNECT TO EACH RAFTER WITH 3xNo.14x150 [TYPE 17] BUGLE SCREWS (6 TOTAL), PRE-DRILL ALL HOLES.
P1	138x42 F7 (LOSP)	SOLDIERED ROOF PURLINS AT 900 CTS. MAX. NOTE: ADDITIONAL PRULIN MAY BE REQUIRED ON LEADING EDGE TO SUIT SELECTED ROOF SHEETING OVERHANG. PURLIN SPACING MAY BE CLOSED TO SUIT
J1	200x45 LVL	FLOOR JOISTS AT 350 CTS. MAX.
J2	200x45 LVL	FLOOR JOISTS (H3 TREATED) AT 450 CTS. MAX.
C1	75x75x4.0 C350 SHS	COLUMN - EXTEND TO TOP OF BALUSTRADE. 10mm CAP PLATE. CONNECTION TO CONCRETE: 16mm BASE PLATE, 4-M16 ANCHORS TO CONCRETE. 150mm (MIN) EMBEDMENT, 65mm (MIN) EDGE DISTANCE, 200mm (MIN) SPACING.
C2	89x89x5.0 C350 SHS	COLUMN. 10mm CAP PLATE. C2A CONNECTION TO CONCRETE (TOP CELLAR WALL): 12mm BASE PLATE, 2-M16 ANCHORS TO CONCRETE. 150mm (MIN) EMBEDMENT, INSTALLED CENTRAL TO WALL (MINIMUM 150 THICK C.O.S.) C2B CONNECTION TO CONCRETE: 12mm BASE PLATE, 2-M16 ANCHORS TO CONCRETE. 150mm (MIN) EMBEDMENT.
BP1	88x88 F7	BALCONY POST (H3 TREATED - LOSP).
HR1	140x 45 MGP10	CONTINUOUS STRUCTURAL HANDRAIL (H3 TREATED). PROVIDE 140x35 - 600 CTS BALUSTRADE STUDS UNDER.
MASONRY ANCHORS	M12	M12 CHEMICAL ANCHORS WHERE SPECIFIED. GRADE 4.6 GALV. ROD OR EQUIVALENT. CHEMICALLY SET 85mm INTO MASONRY WITH SIEVE SLEEVE (HIT-HY170 CHMICAL AND HILTI HIT-SC SCREEN TUBE OR EQUIVALENT).
TIEDOWNROD	M12 [GR. 4.6] GALV.	TIE DOWN ROD. INSERTED 2000 (MIN.) DOWN CAVITY FROM TOP OF WALL. TOP CONNECTION: 150x150x16 (GAV.) PLATE WITH Ø14 HOLE. FIX TO ROD BOT. CONNECTION: PROVIDE STANDARD "J" HOOK. PROVIDE Ø10 PIN x 280L EMBEDED 50 (MIN) INTO EACH LEAF. HOOK THE ROD ONTO THE PIN AND TENSION
OS3 (EXTENT)	—— - ——	INSTALLED TO INTERNAL LEAF ONLY. EGGER OS'BRACE (TYPE 3 - 6.0 kN/m CAPACITY). OS BRACING INSTALLATION SHALL BE CARRIED OUT IN ACCORDANCE WITH EGGER "OS'BRACE H2 BLUE" MANUAL.

REV	DESCRIPTION	DATE	CHECKED
C	BALCONY ROOF REVISED	12/04/24	JW
B	STAIRCASE LANDING REVISED	02/05/23	JW
A	ISSUED FOR BUILDING APPROVAL	01/03/23	JW

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PROJECT NORI RESIDENCE
14 PALMERSTON RD
UNLEY SA

CLIENT ECHELON STUDIO

STATUS APPROVAL

DESCRIPTION
STRUCTURAL PLAN & DETAILS

DRAWN	DESIGN
AL	JW
DRAFT CHECK	DESIGN CHECK
JW	JW

DRAWING No. 220529-S01

SHEET SIZE A3 | REVISION C

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GENERAL STEELWORK SPECIFICATIONS

General Notes

Structural drawings shall be read in conjunction with the architect's drawings and all associated specifications and reports.

Refer to the architect's drawings for all dimensions, levels, set-downs etc. and subsequently checked on-site by the builder prior to fabrication.

Do not scale from the structural drawings.

It is the builder's responsibility to ensure that no part of the structure is overstressed during construction and that the structure is maintained in a stable condition.

Steelwork Notes

Structural steelwork shall be erected in accordance with AS 4100, the Steel Structures code and AS 3828, the Guidelines for the Erection of Building Steelwork code. The details depicted on the drawings and sketches are to suit the completed in-service condition. The builder shall be responsible for the safe erection of all steelwork, and shall ensure that all steelwork is securely supported and fastened to ensure it can adequately withstand all loading liable to be encountered during erection.

The steelwork contractor shall be competent in the design and erection of steel structures. It is recommended that steel shop drawings be forwarded to this office for review prior to fabrication.

All steelwork design has been based on steel of Australian mill origin. The substitution for imported or unidentified steel is not permitted.

All steelwork to comply with the following codes:- AS 4100-1998, AS 4600 and AS 2327.2. All welding to comply with AS 1554-parts 1 & 2.

Unless indicated otherwise all fillet welds shall be 6mm and continuous all round for the full extent of the edges in contact. Unless noted otherwise, where plates are less than 6mm use weld to suit the material thickness.

Unless specified otherwise, the steelworker shall be responsible for the supply of all H.D. bolts and nuts, cleats and all other nuts, bolts and washers required for the erection of the steelwork.

Unless noted otherwise, holes for H.D. bolts shall be 6mm over size and for all other bolts shall not be more than 2mm oversize.

Unless noted otherwise, all bolts shall be grade - 8.8/S.

Unless noted otherwise, the ends of all tubular members to be sealed with 3mm nominal thickness plates and continuous fillet weld.

The steelworker shall coordinate with the concrete contractor for all footing setdowns and rebates.

Unless otherwise noted, column base plates and spreader plates shall be uniformly supported by non-shrink grout beds under the plates

Surface Treatment

Protect all steel work against corrosion in accordance with the corrosion protection requirements of the National Code Construction Series (NCC) 2019 Volume Two Clause 3.4.4.4 Corrosion Protection. Visual steelwork to be painted to architect's painting schedule.

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GENERAL TIMBER SPECIFICATIONS

General Notes

Structural drawings shall be read in conjunction with the architect's drawings and all associated specifications and reports.

Refer to the architect's drawings for all dimensions, levels, set-downs etc. and subsequently checked on-site by the builder prior to fabrication.

Do not scale from the structural drawings.

It is the builder's responsibility to ensure that no part of the structure is overstressed during construction and that the structure is maintained in a stable condition.

Timber Framing Construction Notes

All work shall comply with the following standards, in addition every species of timber shall comply with the Australian standard for the species, except where specified: -

- AS 1684 AS 1684 national timber framing code
- AS 1720 Timber structures
- AS 1748 Timber – stress graded
- AS 2858 Timber – softwood – visually stress graded for structural purposes
- AS 2878 Timber - classification into strength groups
- AS 3519 Timber – machine proof grading
- AS 4440 installation of nail plated timber trusses

Proprietary products shall be supplied and installed in accordance with the manufacturer's specifications.

Timber shall be straight grained, sound and in long lengths free from large and loose knots, shakes, borer holes, sapwood, gum veins, wavy edges and other defects.

Sizes specified or shown on the drawings are normal sizes unless specified as finished sizes.

Timber which have been graded to the relevant Australian standard shall be used, unless specified otherwise in a relevant standard.

The moisture content of seasoned timber shall be within the range of 11% to 15% unless specified otherwise in a relevant standard.

Fastening such as nails, screws, bolts nuts and washers, fixing hooks, straps, ETC., shall, unless otherwise specified, be of steel and shall be galvanized. Where exposed to view, heads shall be countersunk and concealed.

Laminated timbers shall comply with AS 1328

Poles shall comply with AS 2209.

Preservative treatment of timber, specified or required by law, shall comply with

AS 1604

Steel fasteners, if exposed to weather or used in external timbers such as weatherboards and decking, or if in contact with chemically treated timbers, shall be hot dip galvanized in accordance with AS 4750 & AS 4751, to 300 G/M2 coating mass.

Fasteners for timber engineering purposes, including bolts, coach screws, split ring connectors, shear plate connectors, tooth plate connectors, and nail plate connectors, shall be of galvanized steel, to AS 1720 unless otherwise specified.

Steel nails shall be to AS 2334, wood screws shall be to AS 1476, coach screws shall be to AS 1393, and shall be appropriate for the purpose.

All work shall be in accordance with the requirements of the relevant Australian standard, and the best trade practice, and shall include all materials and operations necessary such as framing, trimming, assembling, joining, fixing, finishing, and the like.

Timber which is to be permanently incorporated into the works shall not be used for any temporary purpose.

Timber shall be used in single lengths whenever possible. Any joints which are necessary shall be made over supports, unless otherwise shown or specified, and in such a manner so as not unduly weaken the structure.

Timber shall be provided with adequate support to resist lateral and uplift forces as well as vertical downward loads.

All necessary fixings, fastenings, anchors, nails, screws, bolts, straps, and the like of approved types, sufficient to transmit the loads and stresses imposed, shall be provided to ensure the rigidity of the assembly. Timbers shall be drilled for fastenings where appropriate and where necessary to prevent splitting. All fasteners shall have appropriate edge and end distances to prevent splitting.

All bolts shall be provided with a washer, of the size specified in AS 1720, under the bolt head and under the nut.

All timber framing shall be adequately propped during construction until all permanent structural support is complete.

SIMPLY SUPPORTED STEEL BEAM

To AS4100

MARK :	FB1	Type	UB	Section	250UB37
Span		5400 mm			
lex		5400 mm			
ley	top flange	2700 mm			
	bot flange	5400 mm			
lez		5400 mm			

CONNECTION

Bolts	No.	2	Size	M 16	Grade	8.8/S
		Bending loads result in bolts in	Shear			Axial loads result in bolts in Shear
Cleat	10	Grade	G 300			
f Vfn	59.3 kN	f Ntf	104.0 kN	f Vb	68.8 kN	

SECTION PROPERTIES

D	256.00 mm
B	146.00 mm
A	4750 (mm2)
Ix	5.57E+07 mm4
Zex	4.86E+05 mm3
J	1.58E+05 mm3
fy	320 mPa
Iy	5.66E+06 mm4
Zey_min	1.16E+05 mm3
kf	1.00

LOADING ARRANGEMENT

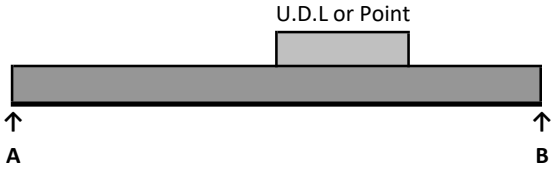
Number of Load cases 5

Beams bending about Major axis

LOAD CASES

CASE	DESCRIPTION	LIMIT STATE
LC1	G	Serviceabilty
LC2	Q [Q = Max. (1.5kPa/1.8kN)]	Serviceabilty
LC3	G+0.4Q	Serviceabilty
LC4	1.2G+1.5Q (Note: Balcony = 2.0kPa)	Strength
LC5	Vibration (1kN)	Serviceabilty

5 UD loads over full span,
3 UD Loads over part span,
3 Point Loads.



Load positions defined from end A

Loads are Ultimate Limit State for strength and Serviceabilty Limit State for serviceability
Compession loads +ve, tension loads -ve

LOAD TYPE	LOAD DESCRIPTION		LOAD CASE LC1	LC2	LC3	LC4	LC5
U.D.L.	Self-weight	w (kN/m)	0.37		0.37	0.44	
	Balcony 1.9m@1.0kPa	w (kN/m)	1.90	3.80	3.42	7.98	
	Mezz. roof 1.1m@0.4kPa	w (kN/m)	0.44	0.28	0.44	0.94	
	Mezz. slab 0.2m@25.0kPa	w (kN/m)	6.13	2.10	6.97	10.50	
		w (kN/m)					
U.D.L. PART SPAN		w (kN/m)					
		start (mm)					
		end (mm)					
		w (kN/m)					
		start (mm)					
		end (mm)					
		w (kN/m)					
		start (mm)					
		end (mm)					
POINT LOADS	End wall beam	P (kN)	3.27		3.27	3.92	
		@ (mm)	2670		2670	2670	
	Mezz. roof	P (kN)	1.39	0.87	1.39	2.96	
		@ (mm)	2700	2700	2700	2700	
		P (kN)					
		@ (mm)					
	Vibration	P (kN)					1.00
		@ (mm)					2700

RESULTS							
SHEAR	R @ A	(KN)	26.2	17.1	32.6	57.1	0.5
	R @ B	(KN)	26.2	17.1	32.5	57.0	0.5
	V* max	(KN)	26.2	17.1	32.6	57.1	0.5
	fV	(kN)	283.0	283.0	283.0	283.0	283.0
BENDING	M*	(KNm)	38.5	23.7	47.1	81.7	1.4
	f Mb	(kNm)	101.7	101.7	101.7	101.7	101.7
DEFLECTION	actual	(mm)	10.1	6.4	12.5		0.3
		ratio L /	533	846	433		18337
	allow.	(mm)	10.8	9.0	13.5		1.0
		ratio L /	500	600	400		5400
CONNECTION							
Bolts	V	(kN)	13.1	8.6	16.3	28.5	0.3
	f Vfn	(kN)	59.3	59.3	59.3	59.3	59.3
	f Ntf	(kN)	104.0	104.0	104.0	104.0	104.0
	f Vb	(kN)	68.8	68.8	68.8	68.8	68.8
	Capacity ratio		0.22	0.14	0.27	0.48	0.00

SIMPLY SUPPORTED STEEL BEAM WITH OVERHANG

To AS4100

MARK :	**BB1**	Type	**PFC**	Section	230PFC
SPAN L			2630 mm		
SPAN A			550 mm		
lex			2630 mm		
ley	top flange		2630 mm		
	bot flange		2630 mm		
lez			2630 mm		

CONNECTION

Bolts	No.	2	Size	M 16	Grade	8.8/S
		Bending loads result in bolts in	Shear		Axial loads result in bolts in	Shear
Cleat	10	Grade	G 300			
f Vfn	59.3 kN	f Ntf	104.0 kN	f Vb	69.9 kN	

SECTION PROPERTIES

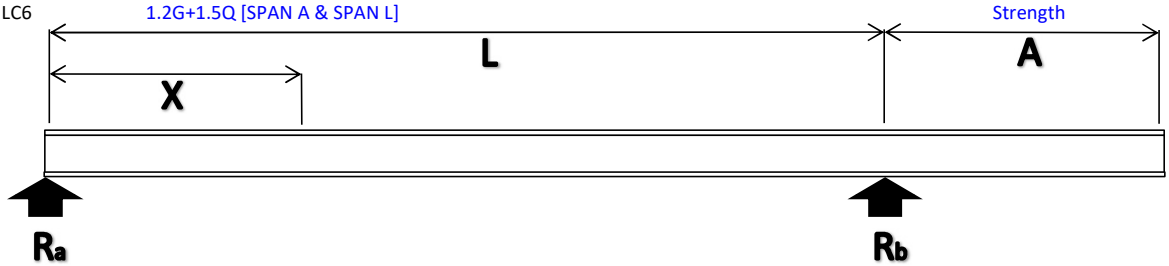
A	3200 (mm2)
Ix	2.68E+07 mm4
rx	91.40 mm
Zex	2.71E+05 mm3
J	1.08E+05 mm3
fy	300 mPa
Iy	1.76E+06 mm4
Zey_min	5.04E+04 mm3
ry	23.50 mm
Iw	1.50E+10 mm4
kf	1.00

LOADING ARRANGEMENT

Number of Load cases	6
Beams bending about	Major axis

LOAD CASES

CASE	DESCRIPTION	LIMIT STATE
LC1	G [SPAN A & SPAN L]	Serviceabilty
LC2	Q [Span L = 1.5kPa]	Serviceabilty
LC3	Q [Span A = 1.5kPa or 1.8kN]	Serviceabilty
LC4	G+0.4Q [SPAN A & SPAN L]	Serviceabilty
LC5	1.2G+1.5Q [SPAN L]	Strength
LC6	1.2G+1.5Q [SPAN A & SPAN L]	Strength



Loads are Ultimate Limit State for strength and Serviceabilty Limit State for serviceability
Compession loads +ve, tension loads -ve

LOAD TYPE	LOAD DESCRIPTION			LOAD CASE LC1	LC2	LC3	LC4	LC5	LC6
U.D.L.	Self-weight	w	(kN/m)	0.25			0.25	0.30	0.30
OVER	Balustrade 1.2m@0.4kPa	w	(kN/m)	0.48			0.48	0.58	0.58
SPAN	Deck 1.0m@0.4kPa	w	(kN/m)	0.40	1.50		1.00	2.73	2.73
L & A		w	(kN/m)						
		w	(kN/m)						
U.D.L.		w	(kN/m)						
OVER		w	(kN/m)						
SPAN		w	(kN/m)						
L		w	(kN/m)						
U.D.L.		w	(kN/m)						
OVER		w	(kN/m)						
SPAN		w	(kN/m)						
A		w	(kN/m)						
POINT	Vibration (1.8kN)	P	(kN)			1.80			2.70
LOAD		P	(kN)						
END SPAN		P	(kN)						
A		P	(kN)						
		P	(kN)						
POINT		x	(mm)						
LOAD		P	(kN)						
SPAN		x	(mm)						
L		P	(kN)						
		x	(mm)						
		P	(kN)						
		x	(mm)						

RESULTS									
SHEAR		*Ra*	(KN)	1.4	1.9	-0.4	2.2	4.5	4.0
-ve Upward Reaction		*Rb*	(KN)	2.2	2.9	2.2	3.3	6.9	10.2
+ve Downward Reaction		V* max	(KN)	1.5	2.1	1.8	2.4	4.9	5.5
		fV	(kN)	258.0	258.0	258.0	258.0	258.0	258.0
BENDING	M* *About Midpoint Span L*		(KNm)	0.9	1.2	-0.5	1.4	2.8	2.1
	M* *About Support Rb*		(KNm)	0.2	0.2	1.0	0.3	0.5	2.0
		f Mb	(kNm)	44.4	44.4	-44.4	44.4	44.4	44.4
DEFLECTION		Cantilever	(mm)	-0.1	-0.1	0.1	-0.1		
-ve Upward			ratio L /	-7871	-5910	5108	-5135		
+ve Downward		Allowable	(mm)	3.0	3.0	3.0	3.0		
			ratio L /	183	183	183	183		
		Midspan	(mm)	0.1	0.2	-0.1	0.2		
			ratio L /	22445	16855	-32938	14645		
		Allowable	(mm)	8.0	8.0	8.0	8.0		
			ratio L /	329	329	329	329		

CONNECTION

Bolts	V	(kN)	0.8	1.0	0.9	1.2	2.5	2.8
	N	(kN)	0.0	0.0	0.0	0.0	0.0	0.0
	f Vfn	(kN)	59.3	59.3	59.3	59.3	59.3	59.3
	f Ntf	(kN)	104.0	104.0	104.0	104.0	104.0	104.0
	f Vb	(kN)	69.9	69.9	69.9	69.9	69.9	69.9
	Capacity ratio		0.01	0.02	0.02	0.02	0.04	0.05

SIMPLY SUPPORTED TIMBER BEAM To AS1720.1

MARK : FB2

SECTION: SOFTWOOD SEASONED HYSPAN LVL LVL

SIZE: 200 x 126

SPAN: 3800 mm

MEMBER SIZE:

Depth, d	200 mm			
Breadth, b	126 mm			
MATERIAL PROPERTIES:		BASIC WORKING STRESSES:		
Strength Group	SD6		E	13200 MPa
Joint Group	JD4		G	660 MPa
Density	620 kg/m3		f_b	45 MPa
SECTION PROPERTIES:			f_c	42 MPa
Area	25200 mm2		f_t	24 MPa
Z	8.40E+05 mm3		f_p	10 MPa
I	8.40E+07 mm4		f_s	4.6 MPa

MEMBER DETAILS:

Member Application All members in houses & secondary elements in other structures

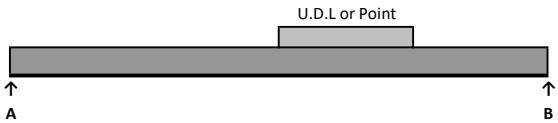
Ø	0.95		
ρ_b	1.04		
Edge Restraint Spacing			
Top edge	600 mm		
Bottom edge	3800 mm		
Torsion	3800 mm		
Load applied to	Top edge		
Load Sharing			
n_{com}	1	g_{31}	1.00
n_{mem}	1	g_{32}	1.00
s	45 mm		

LOADING ARRANGEMENT

Number of Load cases 6

LOAD CASES

CASE	DESCRIPTION	k_1 factor	LIMIT STATE	j_2 factor
LC1	G	1.00	Serviceability	2.00
LC2	Q (1.5kPa)	1.00	Serviceability	1.00
LC3	Q (1.8kN)	1.00	Serviceability	1.00
LC4	G+0.4Q	1.00	Serviceability	2.00
LC5	1.2G+0.4Q	0.57	Strength	
LC6	1.2G+1.5Q	0.80	Strength	



5 UD loads over full span,
3 UD Loads over part span,
3 Point Loads.
Load positions defined from end A
Loads are Ultimate Limit State for strength and Serviceabilty Limit State for serviceability

LOAD TYPE	LOAD DESCRIPTION			LOAD CASE LC1	LC2	LC3	LC4	LC5	LC6
	Self-weight	w	(kN/m)	0.15			0.21	0.18	0.14
	Mezz. Wall 3.2m@0.4kPa	w	(kN/m)	1.28			1.28	1.54	1.54
U.D.L.	Mezz. Roof 1.9m@0.4kPa	w	(kN/m)	0.76	0.48	0.48	0.95	1.10	1.62
		w	(kN/m)						
		w	(kN/m)						
		w	(kN/m)						
		start	(mm)						
		end	(mm)						
U.D.L.		w	(kN/m)						
PART		start	(mm)						
SPAN		end	(mm)						
		w	(kN/m)						
		start	(mm)						
		end	(mm)						
		P	(kN)						
		@	(mm)						
POINT		P	(kN)						
LOADS		@	(mm)						
		P	(kN)						
		@	(mm)						
		P	(kN)						
		@	(mm)						
MODIFICATION FACTORS	(see Table G1)	k_1		1.00	1.00	1.00	1.00	0.57	0.80
		k_4		1.00	1.00	1.00	1.00	1.00	1.00
		k_6		1.00	1.00	1.00	1.00	1.00	1.00
		k_7		1.00	1.00	1.00	1.00	1.00	1.00
		k_9		1.00	1.00	1.00	1.00	1.00	1.00
		S_1		0.00	0.00	0.00	0.00	0.00	0.00
		k_{12}		1.00	1.00	1.00	1.00	1.00	1.00
		j_2		2.00	1.00	1.00	2.00	0.00	0.00
RESULTS									
LIMIT STATE				Serviceability	Serviceability	Serviceability	Serviceability	Strength	Strength
SHEAR	R @ A	(KN)		4.2	0.9	0.9	4.6	5.4	6.3
	R @ B	(KN)		4.2	0.9	0.9	4.6	5.4	6.3
	V* max	(KN)		4.2	0.9	0.9	4.6	5.4	6.3
	ΦV	(kN)		73.4	73.4	73.4	73.4	41.8	58.7
BENDING	M*	(KNm)		4.0	0.9	0.9	4.4	5.1	6.0
	ΦM	(kNm)		35.6	35.6	35.6	35.6	20.3	28.5
BEARING	End bearing req'd	(mm)		3.5	0.8	0.8	3.9	7.9	6.5
DEFLECTION	actual	(mm)		10.7	1.2	1.2	11.9		
		ratio L /		354	3272	3272	319		
	allow.	(mm)		12.0	9.0	9.0	12.0		
		ratio L /		317	422	422	317		

SIMPLY SUPPORTED TIMBER BEAM To AS1720.1

MARK : RB1

SECTION: SOFTWOOD SEASONED PINE, Radiata F7

SIZE: 185 x 84

SPAN: 2350 mm

MEMBER SIZE:

Depth, d	185 mm			
Breadth, b	84 mm			
MATERIAL PROPERTIES:		BASIC WORKING STRESSES:		
Strength Group	SD6		E	7900 MPa
Joint Group	JD4		G	530 MPa
Density	550 kg/m3		f_b	18 MPa
SECTION PROPERTIES:			f_c	13 MPa
Area	15540 mm2		f_t	9 MPa
Z	4.79E+05 mm3		f_p	10 MPa
I	4.43E+07 mm4		f_s	1.9 MPa

MEMBER DETAILS:

Member Application All members in houses & secondary elements in other structures

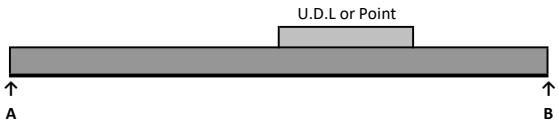
Ø	0.90		
ρ_b	0.86		
Edge Restraint Spacing			
Top edge	2350 mm		
Bottom edge	2350 mm		
Torsion	2350 mm		
Load applied to	Top edge		
Load Sharing			
n_{com}	1	g_{31}	1.00
n_{mem}	1	g_{32}	1.00
s	45 mm		

LOADING ARRANGEMENT

Number of Load cases 6

LOAD CASES

CASE	DESCRIPTION	k_1 factor	LIMIT STATE	j_2 factor
LC1	G(max)	1.00	Serviceability	2.00
LC2	Q (Q = [0.25kPa , 1.8/A+0.12 , 1.1kN] max)	1.00	Serviceability	1.00
LC3	Ws (-ve)	1.00	Serviceability	1.00
LC4	1.2G(max)+1.5Q(max)	0.57	Strength	
LC5	0.9G(min)+Wu (-ve)	0.94	Strength	
LC6	1.2G(max)+Wu (+ve)	1.00	Strength	



5 UD loads over full span,
3 UD Loads over part span,
3 Point Loads.
Load positions defined from end A
Loads are Ultimate Limit State for strength and Serviceabilty Limit State for serviceability

LOAD TYPE	LOAD DESCRIPTION		LOAD CASE LC1	LC2	LC3	LC4	LC5	LC6
	Self weight	w (kN/m)	0.08			0.10	0.00	0.10
	Roof 1.9m@0.1kPa	w (kN/m)	0.19	0.48	-0.78	0.94	-1.14	1.05
U.D.L.		w (kN/m)						
		w (kN/m)						
		w (kN/m)						
		w (kN/m) start (mm) end (mm)						
U.D.L. PART SPAN		w (kN/m) start (mm) end (mm)						
		w (kN/m) start (mm) end (mm)						
	Vibration	P (kN)		1.10				
		@ (mm)		1175				
POINT		P (kN)						
LOADS		@ (mm)						
		P (kN)						
		@ (mm)						
		P (kN)						
		@ (mm)						
MODIFICATION FACTORS	(see Table G1)	k_1	1.00	1.00	1.00	0.57	0.94	1.00
		k_4	1.00	1.00	1.00	1.00	1.00	1.00
		k_6	1.00	1.00	1.00	1.00	1.00	1.00
		k_7	1.00	1.00	1.00	1.00	1.00	1.00
		k_9	1.00	1.00	1.00	1.00	1.00	1.00
		S_1	0.00	0.00	4.96	0.00	4.96	0.00
		k_{12}	1.00	1.00	1.00	1.00	1.00	1.00
		j_2	2.00	1.00	1.00	0.00	0.00	0.00

RESULTS

LIMIT STATE			Serviceability	Serviceability	Serviceability	Strength	Strength	Strength
SHEAR	R @ A	(KN)	0.3	1.1	-0.9	1.2	-1.3	1.4
	R @ B	(KN)	0.3	1.1	-0.9	1.2	-1.3	1.4
	V* max	(KN)	0.3	1.1	-0.9	1.2	-1.3	1.4
	ΦV	(kN)	17.7	17.7	17.7	10.1	16.7	17.7
BENDING	M*	(KNm)	0.2	1.0	-0.5	0.7	-0.8	0.8
	ΦM	(kNm)	7.8	7.8	7.8	4.4	7.3	7.8
BEARING	End bearing req'd	(mm)	0.4	1.5	-1.2	2.8	-1.9	1.8
DEFLECTION	actual	(mm)	0.6	1.4	0.9			
		ratio L /	3789	1694	2664			
	allow.	(mm)	11.0	10.0	48.6			
		ratio L /	214	235	48			

SIMPLY SUPPORTED TIMBER BEAM To AS1720.1

MARK : RB2

SECTION: SOFTWOOD SEASONED PINE, Radiata F7

SIZE: 230 x 84

SPAN: 3870 mm

MEMBER SIZE:

Depth, d	230 mm			
Breadth, b	84 mm			
MATERIAL PROPERTIES:		BASIC WORKING STRESSES:		
Strength Group	SD6		E	7900 MPa
Joint Group	JD4		G	530 MPa
Density	550 kg/m3		f_b	18 MPa
SECTION PROPERTIES:			f_c	13 MPa
Area	19320 mm2		f_t	9 MPa
Z	7.41E+05 mm3		f_p	10 MPa
I	8.52E+07 mm4		f_s	1.9 MPa

MEMBER DETAILS:

Member Application All members in houses & secondary elements in other structures

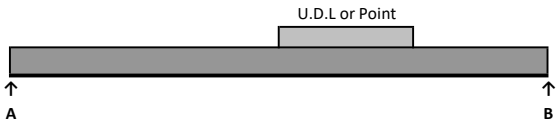
Ø	0.90		
ρ_b	0.86		
Edge Restraint Spacing			
Top edge	3870 mm		
Bottom edge	3870 mm		
Torsion	3870 mm		
Load applied to	Top edge		
Load Sharing			
n_{com}	1	g_{31}	1.00
n_{mem}	1	g_{32}	1.00
s	45 mm		

LOADING ARRANGEMENT

Number of Load cases 6

LOAD CASES

CASE	DESCRIPTION	k_1 factor	LIMIT STATE	j_2 factor
LC1	G(max)	1.00	Serviceability	2.00
LC2	Q (Q = [0.25kPa , 1.8/A+0.12 , 1.1kN] max)	1.00	Serviceability	1.00
LC3	Ws (-ve)	1.00	Serviceability	1.00
LC4	1.2G(max)+1.5Q(max)	0.57	Strength	
LC5	0.9G(min)+Wu (-ve)	0.94	Strength	
LC6	1.2G(max)+Wu (+ve)	1.00	Strength	



5 UD loads over full span,
3 UD Loads over part span,
3 Point Loads.
Load positions defined from end A
Loads are Ultimate Limit State for strength and Serviceabilty Limit State for serviceability

LOAD TYPE	LOAD DESCRIPTION		LOAD CASE LC1	LC2	LC3	LC4	LC5	LC6
	Self weight	w (kN/m)	0.10			0.13	0.09	0.13
	Roof 1.8m@0.1kPa	w (kN/m)	0.18	0.45	-0.74	0.89	-1.08	1.00
U.D.L.		w (kN/m)						
		w (kN/m)						
		w (kN/m)						
		w (kN/m) start (mm) end (mm)						
U.D.L. PART SPAN		w (kN/m) start (mm) end (mm)						
		w (kN/m) start (mm) end (mm)						
	Vibration	P (kN)		1.10				
		@ (mm)		1935				
POINT	From RB1(1)	P (kN)	0.32	1.11	-0.92	1.22	-1.34	1.36
LOADS		@ (mm)	1860	1860	1860	1860	1860	1860
	From RB1(2)	P (kN)	0.32	1.11	-0.92	1.22	-1.34	1.36
		@ (mm)	3570	3570	3570	3570	3570	3570
		P (kN)						
		@ (mm)						
MODIFICATION FACTORS	(see Table G1)	k_1	1.00	1.00	1.00	0.57	0.94	1.00
		k_4	1.00	1.00	1.00	1.00	1.00	1.00
		k_6	1.00	1.00	1.00	1.00	1.00	1.00
		k_7	1.00	1.00	1.00	1.00	1.00	1.00
		k_9	1.00	1.00	1.00	1.00	1.00	1.00
		S_1	0.00	0.00	4.96	0.00	4.96	0.00
		k_{12}	1.00	1.00	1.00	1.00	1.00	1.00
		j_2	2.00	1.00	1.00	0.00	0.00	0.00

RESULTS

LIMIT STATE			Serviceability	Serviceability	Serviceability	Strength	Strength	Strength
SHEAR	R @ A	(KN)	0.7	2.1	-2.0	2.7	-2.7	3.0
	R @ B	(KN)	1.0	3.0	-2.7	3.7	-3.8	4.1
	V* max	(KN)	1.0	3.0	-2.0	3.7	-2.7	4.1
	ΦV	(kN)	22.0	22.0	22.0	12.6	20.7	22.0
BENDING	M*	(KNm)	0.9	3.3	-2.5	3.4	-3.5	3.8
	ΦM	(kNm)	12.0	12.0	12.0	6.8	11.3	12.0
BEARING	End bearing req'd	(mm)	1.3	3.9	-2.6	8.5	-3.8	5.4
DEFLECTION	actual	(mm)	3.9	6.4	5.2			
		ratio L /	997	608	742			
	allow.	(mm)	11.0	10.0	48.6			
		ratio L /	352	387	80			

SIMPLY SUPPORTED TIMBER BEAM To AS1720.1

MARK : HR1

SECTION: SOFTWOOD SEASONED MGP10 MGP10

SIZE: 140 x 45

SPAN: 2600 mm

MEMBER SIZE:

Depth, d	140 mm			
Breadth, b	45 mm			
MATERIAL PROPERTIES:		BASIC WORKING STRESSES:		
Strength Group	SD6		E	10000 MPa
Joint Group	JD5		G	670 MPa
Density	500 kg/m3		f_b	17 MPa
SECTION PROPERTIES:			f_c	18 MPa
Area	6300 mm2		f_t	8 MPa
Z	1.47E+05 mm3		f_p	10 MPa
I	1.03E+07 mm4		f_s	2.6 MPa

MEMBER DETAILS:

Member Application All members in houses & secondary elements in other structures

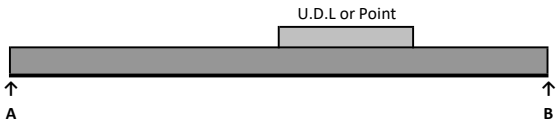
Ø	0.90		
ρ_b	0.75		
Edge Restraint Spacing			
Top edge	2600 mm		
Bottom edge	2600 mm		
Torsion	2600 mm		
Load applied to	Top edge		
Load Sharing			
n_{com}	1	g_{31}	1.00
n_{mem}	1	g_{32}	1.00
s	45 mm		

LOADING ARRANGEMENT

Number of Load cases 6

LOAD CASES

CASE	DESCRIPTION	k_1 factor	LIMIT STATE	j_2 factor
LC1	G	1.00	Serviceability	2.00
LC2	Q (1.5kPa)	1.00	Serviceability	1.00
LC3	Q (1.8kN)	1.00	Serviceability	1.00
LC4	G+0.4Q	1.00	Serviceability	2.00
LC5	1.2G+0.4Q	0.57	Strength	
LC6	1.2G+1.5Q	0.80	Strength	



5 UD loads over full span,
3 UD Loads over part span,
3 Point Loads.
Load positions defined from end A
Loads are Ultimate Limit State for strength and Serviceabilty Limit State for serviceability

LOAD TYPE	LOAD DESCRIPTION		LOAD CASE LC1	LC2	LC3	LC4	LC5	LC6
	Self-weight	w (kN/m)	0.03			0.04	0.04	0.03
	UDL	w (kN/m)	0.10	0.35	0.35	0.24	0.26	0.65
U.D.L.		w (kN/m)						
		w (kN/m)						
		w (kN/m)						
		w (kN/m)						
		start (mm)						
		end (mm)						
U.D.L.		w (kN/m)						
PART		start (mm)						
SPAN		end (mm)						
		w (kN/m)						
		start (mm)						
		end (mm)						
	PL	P (kN)		0.60				
		@ (mm)		1300				
POINT		P (kN)						
LOADS		@ (mm)						
		P (kN)						
		@ (mm)						
		P (kN)						
		@ (mm)						
MODIFICATION FACTORS	(see Table G1)	k_1	1.00	1.00	1.00	1.00	0.57	0.80
		k_4	1.00	1.00	1.00	1.00	1.00	1.00
		k_6	1.00	1.00	1.00	1.00	1.00	1.00
		k_7	1.00	1.00	1.00	1.00	1.00	1.00
		k_9	1.00	1.00	1.00	1.00	1.00	1.00
		S_1	16.76	16.76	16.76	16.76	16.76	16.76
		k_{12}	0.87	0.87	0.87	0.87	0.87	0.87
		j_2	2.00	1.00	1.00	2.00	0.00	0.00
RESULTS								
LIMIT STATE			Serviceability	Serviceability	Serviceability	Serviceability	Strength	Strength
SHEAR	R @ A	(KN)	0.2	0.8	0.5	0.4	0.4	0.9
	R @ B	(KN)	0.2	0.8	0.5	0.4	0.4	0.9
	V* max	(KN)	0.2	0.8	0.5	0.4	0.4	0.9
	ΦV	(kN)	9.8	9.8	9.8	9.8	5.6	7.9
BENDING	M*	(KNm)	0.1	0.7	0.3	0.2	0.3	0.6
	ΦM	(kNm)	2.0	2.0	2.0	2.0	1.1	1.6
BEARING	End bearing req'd	(mm)	0.4	1.9	1.1	0.9	1.7	2.7
DEFLECTION	actual	(mm)	1.5	4.2	2.0	3.3		
		ratio L /	1720	626	1287	799		
	allow.	(mm)	12.0	9.0	9.0	12.0		
		ratio L /	217	289	289	217		

SIMPLY SUPPORTED TIMBER BEAM To AS1720.1

MARK : P1

SECTION: SOFTWOOD SEASONED PINE, Radiata F7

SIZE: 138 x 42

SPAN: 3600 mm

MEMBER SIZE:

Depth, d	138 mm			
Breadth, b	42 mm			
MATERIAL PROPERTIES:		BASIC WORKING STRESSES:		
Strength Group	SD6		E	7900 MPa
Joint Group	JD4		G	530 MPa
Density	550 kg/m3		f_b	18 MPa
SECTION PROPERTIES:			f_c	13 MPa
Area	5796 mm2		f_t	9 MPa
Z	1.33E+05 mm3		f_p	10 MPa
I	9.20E+06 mm4		f_s	1.9 MPa

MEMBER DETAILS:

Member Application All members in houses & secondary elements in other structures

Ø	0.90		
ρ_b	0.86		

Edge Restraint Spacing

Top edge	3600 mm		
Bottom edge	3600 mm		
Torsion	3600 mm		
Load applied to	Top edge		

Load Sharing

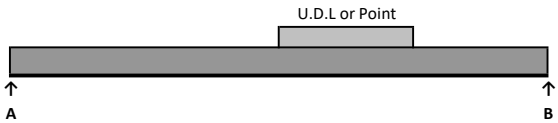
n_{com}	1	g_{31}	1.00
n_{mem}	1	g_{32}	1.00
s	45 mm		

LOADING ARRANGEMENT

Number of Load cases 6

LOAD CASES

CASE	DESCRIPTION	k_1 factor	LIMIT STATE	j_2 factor
LC1	G(max)	1.00	Serviceability	2.00
LC2	Q (Q = [0.25kPa , 1.8/A+0.12 , 1.1kN] max)	1.00	Serviceability	1.00
LC3	Ws (-ve)	1.00	Serviceability	1.00
LC4	1.2G(max)+1.5Q(max)	0.57	Strength	
LC5	0.9G(min)+Wu (-ve)	0.94	Strength	
LC6	1.2G(max)+Wu (+ve)	1.00	Strength	



5 UD loads over full span,
3 UD Loads over part span,
3 Point Loads.
Load positions defined from end A
Loads are Ultimate Limit State for strength and Serviceabilty Limit State for serviceability

LOAD TYPE	LOAD DESCRIPTION		LOAD CASE LC1	LC2	LC3	LC4	LC5	LC6
	Self weight	w (kN/m)	0.03			0.04	0.03	0.04
	Roof 0.9m@0.1kPa	w (kN/m)	0.09	0.23	-0.37	0.45	-0.54	0.50
U.D.L.		w (kN/m)						
		w (kN/m)						
		w (kN/m)						
		w (kN/m) start (mm) end (mm)						
U.D.L. PART SPAN		w (kN/m) start (mm) end (mm)						
		w (kN/m) start (mm) end (mm)						
		P (kN) @ (mm)						
POINT LOADS		P (kN) @ (mm)						
		P (kN) @ (mm)						
		P (kN) @ (mm)						
MODIFICATION FACTORS	(see Table G1)	k_1	1.00	1.00	1.00	0.57	0.94	1.00
		k_4	1.00	1.00	1.00	1.00	1.00	1.00
		k_6	1.00	1.00	1.00	1.00	1.00	1.00
		k_7	1.00	1.00	1.00	1.00	1.00	1.00
		k_9	1.00	1.00	1.00	1.00	1.00	1.00
		S_1	0.00	0.00	4.96	0.00	4.96	0.00
		k_{12}	1.00	1.00	1.00	1.00	1.00	1.00
		j_2	2.00	1.00	1.00	0.00	0.00	0.00

RESULTS

LIMIT STATE			Serviceability	Serviceability	Serviceability	Strength	Strength	Strength
SHEAR	R @ A	(KN)	0.2	0.4	-0.7	0.9	-0.9	1.0
	R @ B	(KN)	0.2	0.4	-0.7	0.9	-0.9	1.0
	V* max	(KN)	0.2	0.4	-0.7	0.9	-0.9	1.0
	ΦV	(kN)	6.6	6.6	6.6	3.8	6.2	6.6
BENDING	M*	(KNm)	0.2	0.4	-0.6	0.8	-0.8	0.9
	ΦM	(kNm)	2.2	2.2	2.2	1.2	2.0	2.2
BEARING	End bearing req'd	(mm)	0.6	1.1	-1.8	4.0	-2.6	2.6
DEFLECTION	actual	(mm)	7.3	6.8	11.1			
		ratio L /	494	532	325			
	allow.	(mm)	11.0	10.0	48.6			
		ratio L /	327	360	74			

HOLLOW SECTION STEEL COLUMN

COLUMN No. **C1**
TYPE **SHS** **SIZE** **75x75x4.0** **C350**

COLUMN HEIGHT 3000 (mm)

SECTION PROPERTIES

A	1080 (mm2)					
Ix	8.820E+05 (mm4)					
Zex	2.820E+04 (mm3)					
r	28.58 (mm)					
kf	1.00					
Lx	3000 (mm)	kx	1.00	lx	3000 (mm)	
Ly	3000 (mm)	ky	1.00	ly	3000 (mm)	

LOAD CASES

Case	Load description	Ultimate Axial load (kN)	Eccentricity ex (mm)
1	BB1	20.00	188
2			
3			

LOAD CAPACITIES

	LOAD CASE 1
AXIAL COMPRESSION	
N*	20.00 kN
λ n	124.21
α a	14.92
α b	-0.50
λ	116.75
n	0.34
ß	0.90
α c	0.44
ø	0.90
ø Ns	340.20 kN
ø Nc	149.08 kN
Capacity ratio	0.13
BENDING	
M*m	3.75 kNm
cm	1.00
Nomb	193.4
δ b	1.12
M*	4.18 kNm
ϕ	0.90
ϕ Msx	8.88 kNm
Capacity ratio	0.47
COMBINED BENDING and COMPRESSION	
ϕ Mix	7.69 kNm
Capacity ratio	0.54

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HOLLOW SECTION STEEL COLUMN

COLUMN No. C2
TYPE SHS **SIZE** 89x89x5.0 C350

COLUMN HEIGHT 3000 (mm)

SECTION PROPERTIES

A	1590 (mm2)					
Ix	1.810E+06 (mm4)					
Zex	4.910E+04 (mm3)					
r	33.74 (mm)					
kf	1.00					
Lx	3000 (mm)	kx	1.00	lx	3000 (mm)	
Ly	3000 (mm)	ky	1.00	ly	3000 (mm)	

LOAD CASES

Case	Load description	Ultimate Axial load (kN)	Eccentricity ex (mm)
1	BB1	60.00	145
2			
3			
4			
5			

LOAD CAPACITIES

	LOAD CASE 1
AXIAL COMPRESSION	
N*	60.00 kN
λ n	105.21
α a	16.73
α b	-0.50
λ	96.84
n	0.27
ß	1.05
α c	0.56
ø	0.90
ø Ns	500.85 kN
ø Nc	281.62 kN
Capacity ratio	0.21
BENDING	
M*m	8.67 kNm
cm	1.00
Nomb	397.0
δ b	1.18
M*	10.21 kNm
ϕ	0.90
ϕ Msx	15.47 kNm
Capacity ratio	0.66
COMBINED BENDING and COMPRESSION	
ϕ Mix	12.17 kNm
Capacity ratio	0.84