



Structural & MEP Engineering (S3DA)

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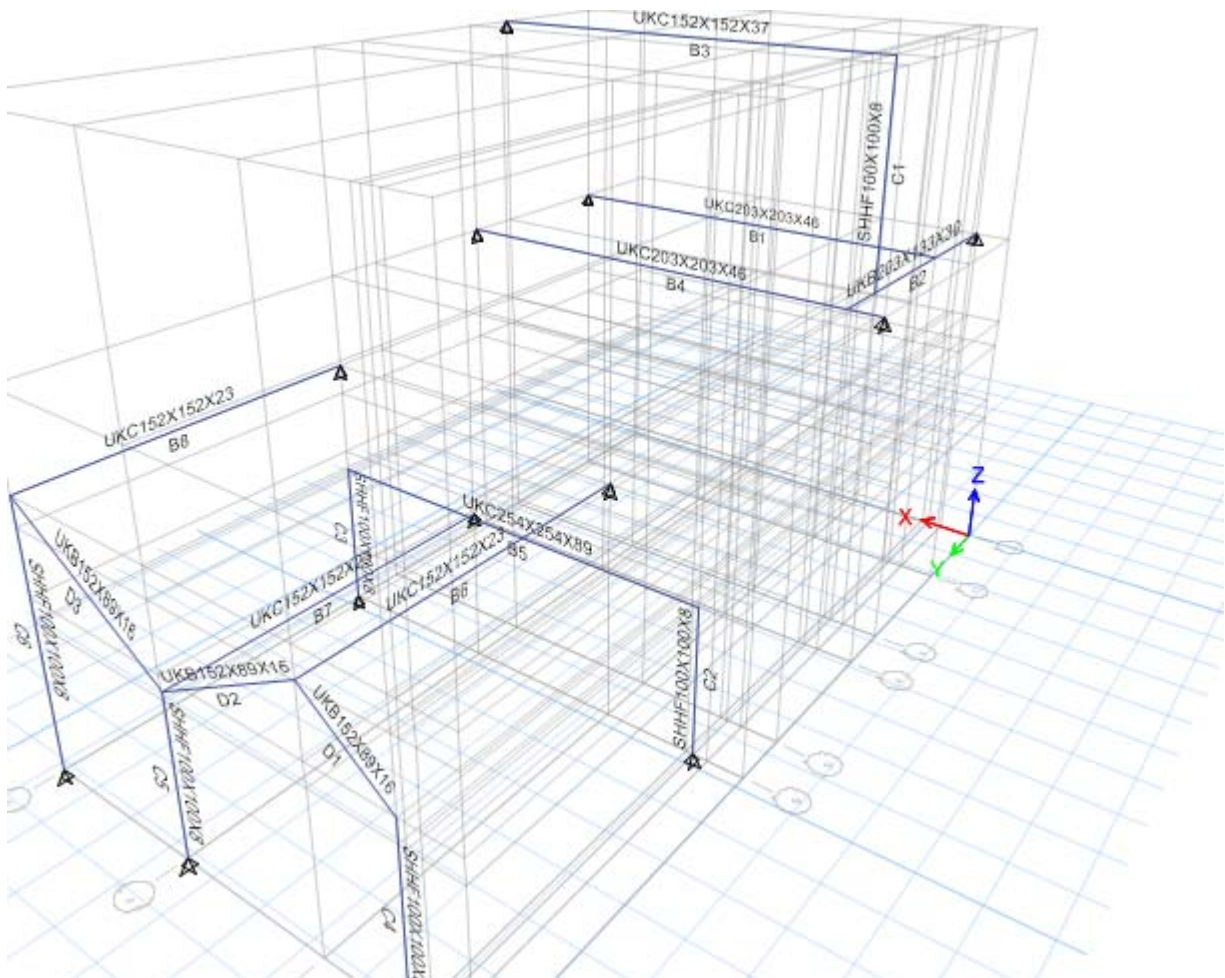
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CALCULATION REPORT

REAR EXTENSION AND LOFT CONVERSION

56 KENILWORTH AVE.
11 JUL 20

"Building Control must check and approve all structural calculations (including relevant design drawings where applicable) prepared by S3DA DESIGN prior to works commencing on site. S3DA DESIGN will not accept liability for any losses arising from incorrect or absent design information in instances where Building Control have either (a) not been appointed prior to works commencing, or (b) failed to validate the design information prior to works commencing on site."



Introduction

This design is to provide confirmation of structural design and arrangement of steel beams, floor joists, roof trusses/rafters and lintels. The design is in accordance with the current British codes of practice BS 5950 .

Dead and live load assigned on beams. The software (ETABS) is used for calculation. The structure calculated under standard combinations that specified in BS standard (1.4 DL+1.6LL).

The coefficient assigned safety and all elements have enough capacity under specified loads (self-weight, live load, dead load).

NOTES:

General

- All work to be carried out in accordance with the structural calculations together with the Architects drawings and specifications.
- **No construction or fabrication work to be started until these calculations have been approved by the Building Control.**
- All dimensions given in the calculations are estimated from drawings and should not be used for construction purposes.

Steelwork

- Steelwork contractor must verify all dimensions on site before commencing any work or making any shop drawings. No dimensions to be scaled from drawings. Any discrepancies must be reported to the Engineer.
- All steel beams where seated on masonry to have concrete padstones beneath beam ends. Padstones based on engineering calculation and to match width of wall. Concrete to all pad stones to have a minimum strength of 30 N/mm². Steel beams to have a minimum end bearing of 150mm where span of beam is parallel to wall unless noted otherwise on the details.
- Steelwork to be Mild Steel Grade S275, wire brushed to remove all oil, rust, mill scale etc. and painted with two coats of Zinc Phosphate or similar approved.
- Steelwork to be fire protected to Architects details and the satisfaction of the Building Inspector.

Health and Safety

As part of the design process the following risks have been identified for the contractor.

- As the roof construction and its support has been assumed. This should be confirmed on site prior to fabrication of the steel. If the roof is found to be carrying any water tanks local to proposed beams then the design will have to be modified.
- Elements designed in these calculations are heavier than the manual handling limit of 25 Kg and therefore the contractor will have to assess the lifting requirements.
- Contractor to be responsible to ensure that all works are carried out in a safe and workmanlike manner, to provide satisfactory temporary propping to maintain the stability of all the existing structural elements throughout the duration of the proposed works.
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- Ensure gap between new steel beams and existing masonry is packed tight. Some cosmetic cracking may occur after temporary propping is taken away as the beam deflects slightly under the new loading. Make good any cracking.
- Any walls that are supporting steelwork that are found not to be load bearing masonry or of poor construction should be reported to the Engineer.
- The CDM Regulations 2015 are applicable for all domestic and non-domestic projects.
- Under the CDM Regulations the Client has certain responsibilities, including the appointment of the Principal Contractor and a Principal Designer where more than one contractor is involved. A construction phase plan should be provided for all contracts and a health and safety file should be provided for projects where more than one contractor is involved.
- The Client has a responsibility to notify the HSE where any project is scheduled to take longer than 30 working days, have more than 20 workers working simultaneously or exceed 500 person days.
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- Asbestos may be present in older buildings. Asbestos should be dealt with in accordance with the Control of Asbestos Regulations. If major refurbishment work is being carried out then a demolition / refurbishment survey should be undertaken.

MATERIALS

1.1 Steelwork

All steelwork is to be S275 to BS 4360 or equivalent to EN code except hollow sections where on S355 is available.

1.2 Brickwork

Brickwork assumed to be constructed from units with a minimum crushing strength of 20 N/mm² laid in grade (iii) mortar to BS 5628 or equivalent.

Characteristic compressive strength = 5.8 N/mm² (Table 2)

Maximum local bearing stress to BS 5628 = $1.5 \times 5.8/3.5 = 2.48$ N/mm²

Internal brickwork taken as 20 N/mm² units laid in grade (iv) mortar.

Maximum local bearing stress to BS 5628 = $1.5 \times 5.2/3.5 = 2.22$ N/mm²

1.3 Blockwork

Blockwork is grade (iv) assumed to be constructed from units with a minimum crushing strength of 2.9 N/mm² laid in mortar to BS 5628 or equivalent. Characteristic compressive strength $f_k = 2.8$ N/mm² (Table 2)

Maximum local bearing stress to BS 5628 = $1.5 \times 2.8/3.5 = 1.2$ N/mm²

1.1 Timber

Timber assumed to be class strength C24

Modification factor K3 for duration of loading :-

Medium term = 1.25 (dead + snow, dead + temporary imposed)

Short term = 1.50 (dead + imposed + snow + wind to class C)

Modification factor for load sharing K8 = 1.1 (joists, rafters, stud walls with members at 610 mm centres maximum)

Modification factor to minimum modulus of elasticity for trimmer joists and lintels K9(from Table 18)=1.14 (2 joists) , 1.21 (3 joists), 1.24 (4 joists)

1 Structure Data

This chapter provides model geometry information, including items such as story levels, point coordinates, and element connectivity.

1.1 Story Data

Table 1.1 - Story Data

Name	Height mm	Elevation mm	Master Story	Similar To	Splice Story
Story6	3000	8000	No	None	No
Story5	1300	5000	No	None	No
Story4	400	3700	No	None	No
Story3	900	3300	No	None	No
Story2	300	2400	No	None	No
Story1	2100	2100	No	None	No
Base	0	0	No	None	No

2 Properties

This chapter provides property information for materials, frame sections, shell sections, and links.

2.1 Materials

Table 2.1 - Material Properties - Summary

Name	Type	E MPa	ν	Unit Weight kN/m ³	Design Strengths
A416Gr270	Tendon	196500.6	0	76.9729	Fy=1689.91 MPa, Fu=1861.58 MPa
A615Gr60	Rebar	199947.98	0.3	76.9729	Fy=413.69 MPa, Fu=620.53 MPa
S275	Steel	210000	0.3	76.9729	Fy=275 MPa, Fu=430 MPa
S355	Steel	210000	0.3	76.9729	Fy=355 MPa, Fu=510 MPa

2.2 Frame Sections

Table 2.2 - Frame Sections - Summary

Name	Material	Shape
SHHF100X100X8	S355	Steel Tube
UKB152X89X16	S275	Steel I/Wide Flange
UKB203X133X30	S275	Steel I/Wide Flange
UKC152X152X23	S275	Steel I/Wide Flange
UKC152X152X37	S275	Steel I/Wide Flange
UKC203X203X46	S275	Steel I/Wide Flange
UKC254X254X89	S275	Steel I/Wide Flange

3 Assignments

This chapter provides a listing of the assignments applied to the model.

3.1 Joint Assignments

Table 3.1 - Joint Assignments - Summary

Story	Label	Unique Name	Diaphragm	Restraints
Story6	4	21	From Area	
Story6	5	22	From Area	UX; UY; UZ
Story5	1	18	From Area	UX; UY; UZ
Story5	2	19	From Area	
Story5	3	20	From Area	UX; UY; UZ
Story5	4	23	From Area	
Story5	6	15	From Area	UX; UY; UZ
Story5	7	17	From Area	
Story5	8	16	From Area	UX; UY; UZ
Story4	11	9	From Area	UX; UY; UZ
Story4	15	10	From Area	
Story3	10	5	From Area	UX; UY; UZ
Story3	13	6	From Area	
Story2	10-1	7	From Area	UX; UY; UZ
Story2	12	12	From Area	
Story2	14-1	8	From Area	
Story1	9	1	From Area	
Story1	11	2	From Area	
Base	9	3	From Area	UX; UY; UZ
Base	11	4	From Area	UX; UY; UZ
Base	12	11	From Area	UX; UY; UZ
Base	14	13	From Area	UX; UY; UZ
Base	15	14	From Area	UX; UY; UZ

3.2 Frame Assignments

Table 3.2 - Frame Assignments - Summary

Story	Label	Unique Name	Design Type	Length mm	Analysis Section	Design Section	Max Station Spacing mm	Min Number Stations	Releases
Story6	C1	17	Column	3000	SHHF100X100X 8	SHHF100X100X 8		3	Yes
Story4	C6	12	Column	3700	SHHF100X100X 8	SHHF100X100X 8		3	No
Story2	C4	7	Column	2400	SHHF100X100X 8	SHHF100X100X 8		3	No
Story2	C5	10	Column	2200	SHHF100X100X 8	SHHF100X100X 8		3	No
Story1	C2	2	Column	2100	SHHF100X100X 8	SHHF100X100X 8		3	Yes
Story1	C3	3	Column	2100	SHHF100X100X 8	SHHF100X100X 8		3	Yes
Story6	B3	16	Beam	6100	UKC152X152X3 7	UKC152X152X3 7	500		Yes
Story5	B1	15	Beam	6100	UKC203X203X4 6	UKC203X203X4 6	500		Yes
Story5	B2	14	Beam	4400	UKB203X133X30	UKB203X133X30	500		Yes
Story5	B4	13	Beam	6600	UKC203X203X4 6	UKC203X203X4 6	500		Yes
Story4	B8	6	Beam	4800	UKC152X152X2 3	UKC152X152X2 3	500		Yes
Story3	B6	4	Beam	4800	UKC152X152X2 3	UKC152X152X2 3	500		Yes

Story	Label	Unique Name	Design Type	Length mm	Analysis Section	Design Section	Max Station Spacing mm	Min Number Stations	Releases
Story2	B7	5	Beam	4800	UKC152X152X23	UKC152X152X23	500		Yes
Story1	B5	1	Beam	5900	UKC254X254X89	UKC254X254X89	500		Yes
Story4	D3	11	Brace	2830.2	UKB152X89X16	UKB152X89X16		3	No
Story3	D1	8	Brace	1500	UKB152X89X16	UKB152X89X16		3	No
Story3	D2	9	Brace	2459.7	UKB152X89X16	UKB152X89X16		3	No

4 Loads

This chapter provides loading information as applied to the model.

4.1 Load Patterns

Table 4.1 - Load Patterns

Name	Type	Self Weight Multiplier
Dead	Dead	1
Live	Live	0

Loading

DEAD LOAD CONSTRUCTION

CAVITY WALL BRICK/ BLOCK

Material	Thickness (mm)	Weight (kN/m ²)
Brickwork clay;	100;	2.200
insulation ;	100;	0.100
Blockwork lightweight ;	100;	1.300
Plasterboard & skim;	20;	0.200
Totals;	320;	3.800

SOLID 215 MM BRICK WALL

Material	Thickness (mm)	Weight (kN/m ²)
Brickwork clay;	210;	4.600
Plasterboard & skim;	20;	0.200
Totals;	230;	4.800

INTERNAL 100 MM BRICK WALL

Material	Thickness (mm)	Weight (kN/m ²)
Brickwork clay;	100;	2.200
Plasterboard & skim;	30;	0.300
Totals;	130;	2.500

INTERNAL 100 MM BLOCK WALL

Material	Thickness (mm)	Weight (kN/m ²)
BLOCK;	100;	1.300
Plasterboard;	40;	0.400
Totals;	140;	1.700

INTERNAL 100 MM BLOCK WALL

Material	Thickness (mm)	Weight (kN/m ²)
BLOCK;	140;	1.800
Plasterboard;	40;	0.400

Totals;	180;	2.200
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FACADE & CHEEKS

Material	Thickness (mm)	Weight (kN/m²)
cladding tile;	20;	0.560
battens;	50;	0.020
insulation ;	;	0.100
timber framing;	100;	0.080
plasterboard;	12;	0.200
12 mm ply/OSB;	10;	0.140
Totals;	192;	1.100

DWARF WALL

Material	Thickness (mm)	Weight (kN/m²)
Insulated plasterboard;	12;	0.130
studs;	100;	0.150
insulation between studs;	;	0.120
Totals;	112;	0.400

PITCH ROOF

Material	Thickness (mm)	Weight (kN/m²)
tiles considering 35 degree pitch;	30;	0.650
rafters, felt, insulation etc. considering ; 35 degree pitch	150;	0.400
plasterboard;	10;	0.250
Totals;	190;	1.300

FLAT ROOF

Material	Thickness (mm)	Weight (kN/m²)
joists & boarding, finishes;	150;	0.350
plasteboard;	12;	0.250
Totals;	162;	0.600

TIMBER FLOOR

Material	Thickness (mm)	Weight (kN/m²)
joists & boarding, finishes;	150;	0.350
plasteboard;	12;	0.250
Totals;	162;	0.600

LIVE LOAD ON THE FLOOR

Material	Thickness (mm)	Weight (kN/m²)
imposed loading;	;	1.500
partition ;	;	0.500

Totals;	0;	2.000
<u>LIVE LOAD ON THE PITCH AND FLAT ROOF</u>		
Material	Thickness	Weight
	(mm)	(kN/m²)
imposed loading;	;	0.750
Totals;	0;	0.750

Applied load:**B1**

Dead load: floor $(4.3/2)*0.6$ + pitched roof $(4/2)*1.3$ + dwarf wall $(1.2*0.4) = 4.4$ kn/m

Live load: usable floor $(2.8/2)*2$ + storage area $(1.5/2)*0.5$ + pitched roof $(4/2)*0.75 = 4.7$ kn/m

Point load from bay: 4 kn assign on the distance: 1.7m

B2

Load from B9 and B10 (ridge beam) via C1 will assign by software and will be shown by diagram

B3

Dead load: flat roof $(4/2)*0.6$ + pitched roof $(2/2)*1.3 = 2.5$ kn/m

Live load: flat roof $(4/2)*0.75$ + pitched roof $(2/2)*0.75 = 2.3$ kn/m

B4

Dead load: floor $(5.5/2)*0.6 = 1.7$ kn/m

Live load: floor $(5.5/2)*2 = 5.5$ kn/m

Load from B8 will assign by software and will be shown by diagram

B5

Dead load: first floor $(3.9/2)*0.6$ + second floor $(2.8/2)*0.6$ + flat roof $(4/2)*0.6$ + wall above $(2.9*4.8)$ + dormer wall $(3.4*1.1) = 20.9$ kn/m

Dead point load from B2, B4: 7kn, 7.9kn assign on the distance 1.3m and 5.9m

Live load: first floor $(3.9/2)*2$ + second floor $(2.8/2)*2$ + flat roof $(4/2)*0.75 = 8.2$ kn/m

Live point load from B2, B4: 4kn, 4.3kn assign on the distance 1.3m and 5.9m

Load from B3 will assign by software and will be shown by diagram

B6

Dead load: pitched roof $(4/2)*1.3 = 2.6$ kn/m

Live load: pitched roof $(4/2)*0.75 = 1.5$ kn/m

B7

Dead load: pitched roof $(4.5/2)*1.3 = 2.9$ kn/m

Live load: pitched roof $(4.5/2)*0.75 = 1.7$ kn/m

B8

Dead load: pitched roof $(4.6/2)*1.3 = 3$ kn/m

Live load: pitched roof $(4.6/2)*0.75 = 1.8 \text{ kn/m}$

D1, D2

Load from B6 will assign by software and will be shown by diagram

D3

Load from B8 will assign by software and will be shown by diagram

4.2 Applied Loads

4.2.1 Line Loads

Table 4.2 - Frame Loads - Point

Story	Label	Unique Name	Design Type	Load Pattern	Load Type	Direction	Relative Distance	Absolute Distance mm	Force kN
Story1	B5	1	Beam	Dead	Force	Gravity	0.59322	3500	7.4
Story1	B5	1	Beam	Live	Force	Gravity	0.59322	3500	4.1

Table 4.3 - Frame Loads - Distributed

Story	Label	Unique Name	Design Type	Load Pattern	Load Type	Direction	Relative Distance Start	Relative Distance End	Absolute Distance Start mm	Absolute Distance End mm	Force at Start kN/m	Force at End kN/m
Story6	B3	16	Beam	Dead	Force	Gravity	0	1	0	6100	2.5	2.5
Story5	B1	15	Beam	Dead	Force	Gravity	0	1	0	6100	4.4	4.4
Story5	B4	13	Beam	Dead	Force	Gravity	0	1	0	6600	1.7	1.7
Story4	B8	6	Beam	Dead	Force	Gravity	0	1	0	4800	3	3
Story3	B6	4	Beam	Dead	Force	Gravity	0	1	0	4800	2.6	2.6
Story2	B7	5	Beam	Dead	Force	Gravity	0	1	0	4800	2.9	2.9
Story1	B5	1	Beam	Dead	Force	Gravity	0	1	0	5900	20.9	20.9
Story6	B3	16	Beam	Live	Force	Gravity	0	1	0	6100	2.3	2.3
Story5	B1	15	Beam	Live	Force	Gravity	0	1	0	6100	4.7	4.7
Story5	B4	13	Beam	Live	Force	Gravity	0	1	0	6600	5.5	5.5
Story4	B8	6	Beam	Live	Force	Gravity	0	1	0	4800	1.8	1.8
Story3	B6	4	Beam	Live	Force	Gravity	0	1	0	4800	1.5	1.5
Story2	B7	5	Beam	Live	Force	Gravity	0	1	0	4800	1.7	1.7
Story1	B5	1	Beam	Live	Force	Gravity	0	1	0	5900	8.2	8.2

4.3 Load Cases

Table 4.4 - Load Cases - Summary

Name	Type
Dead	Linear Static
Live	Linear Static

4.4 Load Combinations

Table 4.5 - Load Combinations

Name	Load Case/Combo	Scale Factor	Type	Auto
DStIS1	Dead	1.4	Linear Add	Yes
DStIS2	Dead	1.4	Linear Add	Yes
DStIS2	Live	1.6		No
DStID1	Dead	1	Linear Add	Yes
DStID2	Dead	1	Linear Add	Yes

Name	Load Case/Combo	Scale Factor	Type	Auto
DStID2	Live	1		No

5 Analysis Results

This chapter provides analysis results.

5.1 Point Results

Table 5.1 - Joint Reactions

Story	Joint Label	Unique Name	Load Case/Combo	FX kN	FY kN	FZ kN	MX kN-m	MY kN-m	MZ kN-m
Story6	5	22	Dead	0	0	8.6569	0	0	0
Story6	5	22	Live	0	0	6.9575	0	0	0
Story6	5	22	DSttS1	0	0	12.1196	0	0	0
Story6	5	22	DSttS2	0	0	23.2516	0	0	0
Story6	5	22	DSttD1	0	0	8.6569	0	0	0
Story6	5	22	DSttD2	0	0	15.6144	0	0	0
Story5	1	18	Dead	0	0	11.7815	0	0	0
Story5	1	18	Live	0	0	10.4082	0	0	0
Story5	1	18	DSttS1	0	0	16.494	0	0	0
Story5	1	18	DSttS2	0	0	33.1471	0	0	0
Story5	1	18	DSttD1	0	0	11.7815	0	0	0
Story5	1	18	DSttD2	0	0	22.1896	0	0	0
Story5	3	20	Dead	0	0	14.7981	0	0	0
Story5	3	20	Live	0	0	14.335	0	0	0
Story5	3	20	DSttS1	0	0	20.7173	0	0	0
Story5	3	20	DSttS2	0	0	43.6533	0	0	0
Story5	3	20	DSttD1	0	0	14.7981	0	0	0
Story5	3	20	DSttD2	0	0	29.1331	0	0	0
Story5	6	15	Dead	0	0	19.8161	0	0	0
Story5	6	15	Live	0	0	28.316	0	0	0
Story5	6	15	DSttS1	0	0	27.7426	0	0	0
Story5	6	15	DSttS2	0	0	73.0482	0	0	0
Story5	6	15	DSttD1	0	0	19.8161	0	0	0
Story5	6	15	DSttD2	0	0	48.1321	0	0	0
Story5	8	16	Dead	0	0	8.1433	0	0	0
Story5	8	16	Live	0	0	18.9833	0	0	0
Story5	8	16	DSttS1	0	0	11.4006	0	0	0
Story5	8	16	DSttS2	0	0	41.7738	0	0	0
Story5	8	16	DSttD1	0	0	8.1433	0	0	0
Story5	8	16	DSttD2	0	0	27.1265	0	0	0
Story4	11	9	Dead	0	0.1158	7.6552	0	0	0
Story4	11	9	Live	0	0.0646	4.275	0	0	0
Story4	11	9	DSttS1	0	0.1621	10.7172	0	0	0
Story4	11	9	DSttS2	0	0.2654	17.5572	0	0	0
Story4	11	9	DSttD1	0	0.1158	7.6552	0	0	0
Story4	11	9	DSttD2	0	0.1804	11.9302	0	0	0
Story3	10	5	Dead	0	0.0126	6.7757	0	0	0
Story3	10	5	Live	0	0.0069	3.6	0	0	0
Story3	10	5	DSttS1	0	0.0177	9.486	0	0	0
Story3	10	5	DSttS2	0	0.0287	15.246	0	0	0
Story3	10	5	DSttD1	0	0.0126	6.7757	0	0	0
Story3	10	5	DSttD2	0	0.0195	10.3757	0	0	0
Story2	10-1	7	Dead	0	0.1322	7.4177	0	0	0
Story2	10-1	7	Live	0	0.072	4.0375	0	0	0
Story2	10-1	7	DSttS1	0	0.1851	10.3847	0	0	0
Story2	10-1	7	DSttS2	0	0.3003	16.8447	0	0	0
Story2	10-1	7	DSttD1	0	0.1322	7.4177	0	0	0
Story2	10-1	7	DSttD2	0	0.2042	11.4552	0	0	0
Base	9	3	Dead	0	0	67.6412	0	0	0
Base	9	3	Live	0	0	25.8512	0	0	0

Story	Joint Label	Unique Name	Load Case/Combo	FX kN	FY kN	FZ kN	MX kN-m	MY kN-m	MZ kN-m
Base	9	3	DSttS1	0	0	94.6977	0	0	0
Base	9	3	DSttS2	0	0	136.0596	0	0	0
Base	9	3	DSttD1	0	0	67.6412	0	0	0
Base	9	3	DSttD2	0	0	93.4924	0	0	0
Base	11	4	Dead	0	0	69.0447	0	0	0
Base	11	4	Live	0	0	26.6288	0	0	0
Base	11	4	DSttS1	0	0	96.6625	0	0	0
Base	11	4	DSttS2	0	0	139.2686	0	0	0
Base	11	4	DSttD1	0	0	69.0447	0	0	0
Base	11	4	DSttD2	0	0	95.6734	0	0	0
Base	12	11	Dead	0.6009	-0.0001	4.997	0	0	0
Base	12	11	Live	0.304	-4.028E-05	2.2233	0	0	0
Base	12	11	DSttS1	0.8412	-0.0001	6.9958	0	0	0
Base	12	11	DSttS2	1.3276	-0.0002	10.5531	0	0	0
Base	12	11	DSttD1	0.6009	-0.0001	4.997	0	0	0
Base	12	11	DSttD2	0.9049	-0.0001	7.2203	0	0	0
Base	14	13	Dead	-0.5693	-0.1563	11.5363	0	0	0
Base	14	13	Live	-0.2909	-0.0851	5.6495	0	0	0
Base	14	13	DSttS1	-0.7971	-0.2188	16.1508	0	0	0
Base	14	13	DSttS2	-1.2626	-0.3549	25.19	0	0	0
Base	14	13	DSttD1	-0.5693	-0.1563	11.5363	0	0	0
Base	14	13	DSttD2	-0.8603	-0.2414	17.1858	0	0	0
Base	15	14	Dead	-0.0315	-0.1043	8.5112	0	0	0
Base	15	14	Live	-0.013	-0.0583	4.2147	0	0	0
Base	15	14	DSttS1	-0.0441	-0.146	11.9156	0	0	0
Base	15	14	DSttS2	-0.065	-0.2393	18.6591	0	0	0
Base	15	14	DSttD1	-0.0315	-0.1043	8.5112	0	0	0
Base	15	14	DSttD2	-0.0446	-0.1626	12.7258	0	0	0

5.2 Line Results

Table 5.2 - Column Forces

Story	Column	Unique Name	Load Case/Combo	Station m	P kN	V2 kN	V3 kN	T kN-m	M2 kN-m	M3 kN-m	Element	Element Station m	Location
Story6	C1	17	Dead	0	-9.4469	0	0	0	0	0	17	0	
Story6	C1	17	Dead	1.4191	-9.1323	0	0	0	0	0	17	1.4191	
Story6	C1	17	Dead	2.8382	-8.8177	0	0	0	0	0	17	2.8382	
Story6	C1	17	Live	0	-7.0725	0	0	0	0	0	17	0	
Story6	C1	17	Live	1.4191	-7.0725	0	0	0	0	0	17	1.4191	
Story6	C1	17	Live	2.8382	-7.0725	0	0	0	0	0	17	2.8382	
Story6	C1	17	DSttS1	0	-13.2257	0	0	0	0	0	17	0	
Story6	C1	17	DSttS1	1.4191	-12.7852	0	0	0	0	0	17	1.4191	
Story6	C1	17	DSttS1	2.8382	-12.3448	0	0	0	0	0	17	2.8382	
Story6	C1	17	DSttS2	0	-24.5417	0	0	0	0	0	17	0	
Story6	C1	17	DSttS2	1.4191	-24.1012	0	0	0	0	0	17	1.4191	
Story6	C1	17	DSttS2	2.8382	-23.6608	0	0	0	0	0	17	2.8382	
Story6	C1	17	DSttD1	0	-9.4469	0	0	0	0	0	17	0	
Story6	C1	17	DSttD1	1.4191	-9.1323	0	0	0	0	0	17	1.4191	
Story6	C1	17	DSttD1	2.8382	-8.8177	0	0	0	0	0	17	2.8382	
Story6	C1	17	DSttD2	0	-16.5194	0	0	0	0	0	17	0	
Story6	C1	17	DSttD2	1.4191	-16.2048	0	0	0	0	0	17	1.4191	
Story6	C1	17	DSttD2	2.8382	-15.8902	0	0	0	0	0	17	2.8382	
Story4	C6	12	Dead	0	-8.5112	0.0315	0.1043	0	0	0	12	0	
Story4	C6	12	Dead	1.7738	-8.118	0.0315	0.1043	0	-0.185	-0.0559	12	1.7738	
Story4	C6	12	Dead	3.5476	-7.7247	0.0315	0.1043	0	-0.3701	-0.1118	12	3.5476	

Story	Column	Unique Name	Load Case/Combo	Station m	P kN	V2 kN	V3 kN	T kN-m	M2 kN-m	M3 kN-m	Element	Element Station m	Location
Story4	C6	12	Live	0	-4.2147	0.013	0.0583	0	0	0	12	0	
Story4	C6	12	Live	1.7738	-4.2147	0.013	0.0583	0	-0.1034	-0.0231	12	1.7738	
Story4	C6	12	Live	3.5476	-4.2147	0.013	0.0583	0	-0.2068	-0.0463	12	3.5476	
Story4	C6	12	DStIS1	0	-11.9156	0.0441	0.146	0	0	0	12	0	
Story4	C6	12	DStIS1	1.7738	-11.3651	0.0441	0.146	0	-0.259	-0.0783	12	1.7738	
Story4	C6	12	DStIS1	3.5476	-10.8146	0.0441	0.146	0	-0.5181	-0.1566	12	3.5476	
Story4	C6	12	DStIS2	0	-18.6591	0.065	0.2393	0	0	0	12	0	
Story4	C6	12	DStIS2	1.7738	-18.1086	0.065	0.2393	0	-0.4245	-0.1153	12	1.7738	
Story4	C6	12	DStIS2	3.5476	-17.5581	0.065	0.2393	0	-0.849	-0.2306	12	3.5476	
Story4	C6	12	DStID1	0	-8.5112	0.0315	0.1043	0	0	0	12	0	
Story4	C6	12	DStID1	1.7738	-8.118	0.0315	0.1043	0	-0.185	-0.0559	12	1.7738	
Story4	C6	12	DStID1	3.5476	-7.7247	0.0315	0.1043	0	-0.3701	-0.1118	12	3.5476	
Story4	C6	12	DStID2	0	-12.7258	0.0446	0.1626	0	0	0	12	0	
Story4	C6	12	DStID2	1.7738	-12.3326	0.0446	0.1626	0	-0.2884	-0.0791	12	1.7738	
Story4	C6	12	DStID2	3.5476	-11.9394	0.0446	0.1626	0	-0.5769	-0.1581	12	3.5476	
Story2	C4	7	Dead	0	-4.997	-0.6009	0.0001	0	0	0	7	0	
Story2	C4	7	Dead	1.2	-4.731	-0.6009	0.0001	0	-0.0001	0.721	7	1.2	
Story2	C4	7	Dead	2.4	-4.465	-0.6009	0.0001	0	-0.0002	1.4421	7	2.4	
Story2	C4	7	Live	0	-2.2233	-0.304	4.028E-05	0	0	0	7	0	
Story2	C4	7	Live	1.2	-2.2233	-0.304	4.028E-05	0	-4.834E-05	0.3648	7	1.2	
Story2	C4	7	Live	2.4	-2.2233	-0.304	4.028E-05	0	-0.0001	0.7296	7	2.4	
Story2	C4	7	DStIS1	0	-6.9958	-0.8412	0.0001	0	0	0	7	0	
Story2	C4	7	DStIS1	1.2	-6.6234	-0.8412	0.0001	0	-0.0001	1.0095	7	1.2	
Story2	C4	7	DStIS1	2.4	-6.251	-0.8412	0.0001	0	-0.0002	2.0189	7	2.4	
Story2	C4	7	DStIS2	0	-10.5531	-1.3276	0.0002	0	0	0	7	0	
Story2	C4	7	DStIS2	1.2	-10.1806	-1.3276	0.0002	0	-0.0002	1.5931	7	1.2	
Story2	C4	7	DStIS2	2.4	-9.8082	-1.3276	0.0002	0	-0.0004	3.1862	7	2.4	
Story2	C4	7	DStID1	0	-4.997	-0.6009	0.0001	0	0	0	7	0	
Story2	C4	7	DStID1	1.2	-4.731	-0.6009	0.0001	0	-0.0001	0.721	7	1.2	
Story2	C4	7	DStID1	2.4	-4.465	-0.6009	0.0001	0	-0.0002	1.4421	7	2.4	
Story2	C4	7	DStID2	0	-7.2203	-0.9049	0.0001	0	0	0	7	0	
Story2	C4	7	DStID2	1.2	-6.9543	-0.9049	0.0001	0	-0.0001	1.0858	7	1.2	
Story2	C4	7	DStID2	2.4	-6.6883	-0.9049	0.0001	0	-0.0003	2.1716	7	2.4	
Story2	C5	10	Dead	0	-11.5363	0.5693	0.1563	0	0	0	10	0	
Story2	C5	10	Dead	1.0238	-11.3093	0.5693	0.1563	0	-0.16	-0.5829	10	1.0238	
Story2	C5	10	Dead	2.0476	-11.0823	0.5693	0.1563	0	-0.3199	-1.1658	10	2.0476	
Story2	C5	10	Live	0	-5.6495	0.2909	0.0851	0	0	0	10	0	
Story2	C5	10	Live	1.0238	-5.6495	0.2909	0.0851	0	-0.0871	-0.2979	10	1.0238	
Story2	C5	10	Live	2.0476	-5.6495	0.2909	0.0851	0	-0.1743	-0.5957	10	2.0476	
Story2	C5	10	DStIS1	0	-16.1508	0.7971	0.2188	0	0	0	10	0	
Story2	C5	10	DStIS1	1.0238	-15.833	0.7971	0.2188	0	-0.224	-0.8161	10	1.0238	
Story2	C5	10	DStIS1	2.0476	-15.5153	0.7971	0.2188	0	-0.4479	-1.6321	10	2.0476	
Story2	C5	10	DStIS2	0	-25.19	1.2626	0.3549	0	0	0	10	0	
Story2	C5	10	DStIS2	1.0238	-24.8723	1.2626	0.3549	0	-0.3634	-1.2926	10	1.0238	
Story2	C5	10	DStIS2	2.0476	-24.5546	1.2626	0.3549	0	-0.7268	-2.5853	10	2.0476	
Story2	C5	10	DStID1	0	-11.5363	0.5693	0.1563	0	0	0	10	0	
Story2	C5	10	DStID1	1.0238	-11.3093	0.5693	0.1563	0	-0.16	-0.5829	10	1.0238	
Story2	C5	10	DStID1	2.0476	-11.0823	0.5693	0.1563	0	-0.3199	-1.1658	10	2.0476	
Story2	C5	10	DStID2	0	-17.1858	0.8603	0.2414	0	0	0	10	0	
Story2	C5	10	DStID2	1.0238	-16.9589	0.8603	0.2414	0	-0.2471	-0.8808	10	1.0238	
Story2	C5	10	DStID2	2.0476	-16.7319	0.8603	0.2414	0	-0.4942	-1.7615	10	2.0476	
Story1	C2	2	Dead	0	-67.6412	0	0	0	0	0	2	0	
Story1	C2	2	Dead	0.9199	-67.4373	0	0	0	0	0	2	0.9199	

Story	Column	Unique Name	Load Case/Combo	Station m	P kN	V2 kN	V3 kN	T kN-m	M2 kN-m	M3 kN-m	Element	Element Station m	Location
Story1	C2	2	Dead	1.8397	-67.2334	0	0	0	0	0	2	1.8397	
Story1	C2	2	Live	0	-25.8512	0	0	0	0	0	2	0	
Story1	C2	2	Live	0.9199	-25.8512	0	0	0	0	0	2	0.9199	
Story1	C2	2	Live	1.8397	-25.8512	0	0	0	0	0	2	1.8397	
Story1	C2	2	DStIS1	0	-94.6977	0	0	0	0	0	2	0	
Story1	C2	2	DStIS1	0.9199	-94.4122	0	0	0	0	0	2	0.9199	
Story1	C2	2	DStIS1	1.8397	-94.1267	0	0	0	0	0	2	1.8397	
Story1	C2	2	DStIS2	0	-	136.0596	0	0	0	0	2	0	
Story1	C2	2	DStIS2	0.9199	-	135.7741	0	0	0	0	2	0.9199	
Story1	C2	2	DStIS2	1.8397	-	135.4887	0	0	0	0	2	1.8397	
Story1	C2	2	DStID1	0	-67.6412	0	0	0	0	0	2	0	
Story1	C2	2	DStID1	0.9199	-67.4373	0	0	0	0	0	2	0.9199	
Story1	C2	2	DStID1	1.8397	-67.2334	0	0	0	0	0	2	1.8397	
Story1	C2	2	DStID2	0	-93.4924	0	0	0	0	0	2	0	
Story1	C2	2	DStID2	0.9199	-93.2885	0	0	0	0	0	2	0.9199	
Story1	C2	2	DStID2	1.8397	-93.0846	0	0	0	0	0	2	1.8397	
Story1	C3	3	Dead	0	-69.0447	0	0	0	0	0	3	0	
Story1	C3	3	Dead	0.9199	-68.8407	0	0	0	0	0	3	0.9199	
Story1	C3	3	Dead	1.8397	-68.6368	0	0	0	0	0	3	1.8397	
Story1	C3	3	Live	0	-26.6288	0	0	0	0	0	3	0	
Story1	C3	3	Live	0.9199	-26.6288	0	0	0	0	0	3	0.9199	
Story1	C3	3	Live	1.8397	-26.6288	0	0	0	0	0	3	1.8397	
Story1	C3	3	DStIS1	0	-96.6625	0	0	0	0	0	3	0	
Story1	C3	3	DStIS1	0.9199	-96.377	0	0	0	0	0	3	0.9199	
Story1	C3	3	DStIS1	1.8397	-96.0916	0	0	0	0	0	3	1.8397	
Story1	C3	3	DStIS2	0	-	139.2686	0	0	0	0	3	0	
Story1	C3	3	DStIS2	0.9199	-	138.9831	0	0	0	0	3	0.9199	
Story1	C3	3	DStIS2	1.8397	-	138.6976	0	0	0	0	3	1.8397	
Story1	C3	3	DStID1	0	-69.0447	0	0	0	0	0	3	0	
Story1	C3	3	DStID1	0.9199	-68.8407	0	0	0	0	0	3	0.9199	
Story1	C3	3	DStID1	1.8397	-68.6368	0	0	0	0	0	3	1.8397	
Story1	C3	3	DStID2	0	-95.6734	0	0	0	0	0	3	0	
Story1	C3	3	DStID2	0.9199	-95.4695	0	0	0	0	0	3	0.9199	
Story1	C3	3	DStID2	1.8397	-95.2656	0	0	0	0	0	3	1.8397	

Table 5.3 - Beam Forces

Story	Beam	Unique Name	Load Case/Combo	Station m	P kN	V2 kN	V3 kN	T kN-m	M2 kN-m	M3 kN-m	Element	Element Station m	Location
Story6	B3	16	Dead	0.05	0	-8.6569	0	0	0	0	16	0.05	
Story6	B3	16	Dead	0.5154	0	-7.325	0	0	0	3.7189	16	0.5154	
Story6	B3	16	Dead	0.9808	0	-5.9932	0	0	0	6.8179	16	0.9808	
Story6	B3	16	Dead	1.4462	0	-4.6614	0	0	0	9.2972	16	1.4462	
Story6	B3	16	Dead	1.9115	0	-3.3296	0	0	0	11.1566	16	1.9115	
Story6	B3	16	Dead	2.3769	0	-1.9977	0	0	0	12.3962	16	2.3769	
Story6	B3	16	Dead	2.8423	0	-0.6659	0	0	0	13.016	16	2.8423	
Story6	B3	16	Dead	3.3077	0	0.6659	0	0	0	13.016	16	3.3077	
Story6	B3	16	Dead	3.7731	0	1.9977	0	0	0	12.3962	16	3.7731	
Story6	B3	16	Dead	4.2385	0	3.3296	0	0	0	11.1566	16	4.2385	
Story6	B3	16	Dead	4.7038	0	4.6614	0	0	0	9.2972	16	4.7038	
Story6	B3	16	Dead	5.1692	0	5.9932	0	0	0	6.8179	16	5.1692	

Story	Beam	Unique Name	Load Case/Combo	Station m	P kN	V2 kN	V3 kN	T kN-m	M2 kN-m	M3 kN-m	Element	Element Station m	Location
Story6	B3	16	Dead	5.6346	0	7.325	0	0	0	3.7189	16	5.6346	
Story6	B3	16	Dead	6.1	0	8.6569	0	0	0	0	16	6.1	
Story6	B3	16	Live	0.05	0	-6.9575	0	0	0	0	16	0.05	
Story6	B3	16	Live	0.5154	0	-5.8871	0	0	0	2.9888	16	0.5154	
Story6	B3	16	Live	0.9808	0	-4.8167	0	0	0	5.4795	16	0.9808	
Story6	B3	16	Live	1.4462	0	-3.7463	0	0	0	7.4721	16	1.4462	
Story6	B3	16	Live	1.9115	0	-2.676	0	0	0	8.9665	16	1.9115	
Story6	B3	16	Live	2.3769	0	-1.6056	0	0	0	9.9628	16	2.3769	
Story6	B3	16	Live	2.8423	0	-0.5352	0	0	0	10.461	16	2.8423	
Story6	B3	16	Live	3.3077	0	0.5352	0	0	0	10.461	16	3.3077	
Story6	B3	16	Live	3.7731	0	1.6056	0	0	0	9.9628	16	3.7731	
Story6	B3	16	Live	4.2385	0	2.676	0	0	0	8.9665	16	4.2385	
Story6	B3	16	Live	4.7038	0	3.7463	0	0	0	7.4721	16	4.7038	
Story6	B3	16	Live	5.1692	0	4.8167	0	0	0	5.4795	16	5.1692	
Story6	B3	16	Live	5.6346	0	5.8871	0	0	0	2.9888	16	5.6346	
Story6	B3	16	Live	6.1	0	6.9575	0	0	0	0	16	6.1	
Story6	B3	16	DStIS1	0.05	0	-12.1196	0	0	0	0	16	0.05	
Story6	B3	16	DStIS1	0.5154	0	-10.2551	0	0	0	5.2064	16	0.5154	
Story6	B3	16	DStIS1	0.9808	0	-8.3905	0	0	0	9.5451	16	0.9808	
Story6	B3	16	DStIS1	1.4462	0	-6.5259	0	0	0	13.016	16	1.4462	
Story6	B3	16	DStIS1	1.9115	0	-4.6614	0	0	0	15.6192	16	1.9115	
Story6	B3	16	DStIS1	2.3769	0	-2.7968	0	0	0	17.3547	16	2.3769	
Story6	B3	16	DStIS1	2.8423	0	-0.9323	0	0	0	18.2224	16	2.8423	
Story6	B3	16	DStIS1	3.3077	0	0.9323	0	0	0	18.2224	16	3.3077	
Story6	B3	16	DStIS1	3.7731	0	2.7968	0	0	0	17.3547	16	3.7731	
Story6	B3	16	DStIS1	4.2385	0	4.6614	0	0	0	15.6192	16	4.2385	
Story6	B3	16	DStIS1	4.7038	0	6.5259	0	0	0	13.016	16	4.7038	
Story6	B3	16	DStIS1	5.1692	0	8.3905	0	0	0	9.5451	16	5.1692	
Story6	B3	16	DStIS1	5.6346	0	10.2551	0	0	0	5.2064	16	5.6346	
Story6	B3	16	DStIS1	6.1	0	12.1196	0	0	0	0	16	6.1	
Story6	B3	16	DStIS2	0.05	0	-23.2516	0	0	0	0	16	0.05	
Story6	B3	16	DStIS2	0.5154	0	-19.6744	0	0	0	9.9886	16	0.5154	
Story6	B3	16	DStIS2	0.9808	0	-16.0973	0	0	0	18.3124	16	0.9808	
Story6	B3	16	DStIS2	1.4462	0	-12.5201	0	0	0	24.9714	16	1.4462	
Story6	B3	16	DStIS2	1.9115	0	-8.9429	0	0	0	29.9657	16	1.9115	
Story6	B3	16	DStIS2	2.3769	0	-5.3658	0	0	0	33.2952	16	2.3769	
Story6	B3	16	DStIS2	2.8423	0	-1.7886	0	0	0	34.96	16	2.8423	
Story6	B3	16	DStIS2	3.3077	0	1.7886	0	0	0	34.96	16	3.3077	
Story6	B3	16	DStIS2	3.7731	0	5.3658	0	0	0	33.2952	16	3.7731	
Story6	B3	16	DStIS2	4.2385	0	8.9429	0	0	0	29.9657	16	4.2385	
Story6	B3	16	DStIS2	4.7038	0	12.5201	0	0	0	24.9714	16	4.7038	
Story6	B3	16	DStIS2	5.1692	0	16.0973	0	0	0	18.3124	16	5.1692	
Story6	B3	16	DStIS2	5.6346	0	19.6744	0	0	0	9.9886	16	5.6346	
Story6	B3	16	DStIS2	6.1	0	23.2516	0	0	0	0	16	6.1	
Story6	B3	16	DStID1	0.05	0	-8.6569	0	0	0	0	16	0.05	
Story6	B3	16	DStID1	0.5154	0	-7.325	0	0	0	3.7189	16	0.5154	
Story6	B3	16	DStID1	0.9808	0	-5.9932	0	0	0	6.8179	16	0.9808	
Story6	B3	16	DStID1	1.4462	0	-4.6614	0	0	0	9.2972	16	1.4462	
Story6	B3	16	DStID1	1.9115	0	-3.3296	0	0	0	11.1566	16	1.9115	
Story6	B3	16	DStID1	2.3769	0	-1.9977	0	0	0	12.3962	16	2.3769	
Story6	B3	16	DStID1	2.8423	0	-0.6659	0	0	0	13.016	16	2.8423	
Story6	B3	16	DStID1	3.3077	0	0.6659	0	0	0	13.016	16	3.3077	
Story6	B3	16	DStID1	3.7731	0	1.9977	0	0	0	12.3962	16	3.7731	
Story6	B3	16	DStID1	4.2385	0	3.3296	0	0	0	11.1566	16	4.2385	
Story6	B3	16	DStID1	4.7038	0	4.6614	0	0	0	9.2972	16	4.7038	

Story	Beam	Unique Name	Load Case/Combo	Station m	P kN	V2 kN	V3 kN	T kN-m	M2 kN-m	M3 kN-m	Element	Element Station m	Location
Story6	B3	16	DStID1	5.1692	0	5.9932	0	0	0	6.8179	16	5.1692	
Story6	B3	16	DStID1	5.6346	0	7.325	0	0	0	3.7189	16	5.6346	
Story6	B3	16	DStID1	6.1	0	8.6569	0	0	0	0	16	6.1	
Story6	B3	16	DStID2	0.05	0	-15.6144	0	0	0	0	16	0.05	
Story6	B3	16	DStID2	0.5154	0	-13.2122	0	0	0	6.7077	16	0.5154	
Story6	B3	16	DStID2	0.9808	0	-10.8099	0	0	0	12.2975	16	0.9808	
Story6	B3	16	DStID2	1.4462	0	-8.4077	0	0	0	16.7693	16	1.4462	
Story6	B3	16	DStID2	1.9115	0	-6.0055	0	0	0	20.1231	16	1.9115	
Story6	B3	16	DStID2	2.3769	0	-3.6033	0	0	0	22.359	16	2.3769	
Story6	B3	16	DStID2	2.8423	0	-1.2011	0	0	0	23.477	16	2.8423	
Story6	B3	16	DStID2	3.3077	0	1.2011	0	0	0	23.477	16	3.3077	
Story6	B3	16	DStID2	3.7731	0	3.6033	0	0	0	22.359	16	3.7731	
Story6	B3	16	DStID2	4.2385	0	6.0055	0	0	0	20.1231	16	4.2385	
Story6	B3	16	DStID2	4.7038	0	8.4077	0	0	0	16.7693	16	4.7038	
Story6	B3	16	DStID2	5.1692	0	10.8099	0	0	0	12.2975	16	5.1692	
Story6	B3	16	DStID2	5.6346	0	13.2122	0	0	0	6.7077	16	5.6346	
Story6	B3	16	DStID2	6.1	0	15.6144	0	0	0	0	16	6.1	
Story5	B1	15	Dead	0	0	-14.7981	0	0	0	0	15	0	
Story5	B1	15	Dead	0.4692	0	-12.5215	0	0	0	6.4096	15	0.4692	
Story5	B1	15	Dead	0.9385	0	-10.2448	0	0	0	11.7509	15	0.9385	
Story5	B1	15	Dead	1.4077	0	-7.9682	0	0	0	16.024	15	1.4077	
Story5	B1	15	Dead	1.8769	0	-5.6916	0	0	0	19.2288	15	1.8769	
Story5	B1	15	Dead	2.3462	0	-3.4149	0	0	0	21.3653	15	2.3462	
Story5	B1	15	Dead	2.8154	0	-1.1383	0	0	0	22.4335	15	2.8154	
Story5	B1	15	Dead	3.2846	0	1.1383	0	0	0	22.4335	15	3.2846	
Story5	B1	15	Dead	3.7538	0	3.4149	0	0	0	21.3653	15	3.7538	
Story5	B1	15	Dead	4.2231	0	5.6916	0	0	0	19.2288	15	4.2231	
Story5	B1	15	Dead	4.6923	0	7.9682	0	0	0	16.024	15	4.6923	
Story5	B1	15	Dead	5.1615	0	10.2448	0	0	0	11.7509	15	5.1615	
Story5	B1	15	Dead	5.6308	0	12.5215	0	0	0	6.4096	15	5.6308	
Story5	B1	15	Dead	6.1	0	14.7981	0	0	0	0	15	6.1	
Story5	B1	15	Live	0	0	-14.335	0	0	0	0	15	0	
Story5	B1	15	Live	0.4692	0	-12.1296	0	0	0	6.209	15	0.4692	
Story5	B1	15	Live	0.9385	0	-9.9242	0	0	0	11.3832	15	0.9385	
Story5	B1	15	Live	1.4077	0	-7.7188	0	0	0	15.5225	15	1.4077	
Story5	B1	15	Live	1.8769	0	-5.5135	0	0	0	18.627	15	1.8769	
Story5	B1	15	Live	2.3462	0	-3.3081	0	0	0	20.6967	15	2.3462	
Story5	B1	15	Live	2.8154	0	-1.1027	0	0	0	21.7315	15	2.8154	
Story5	B1	15	Live	3.2846	0	1.1027	0	0	0	21.7315	15	3.2846	
Story5	B1	15	Live	3.7538	0	3.3081	0	0	0	20.6967	15	3.7538	
Story5	B1	15	Live	4.2231	0	5.5135	0	0	0	18.627	15	4.2231	
Story5	B1	15	Live	4.6923	0	7.7188	0	0	0	15.5225	15	4.6923	
Story5	B1	15	Live	5.1615	0	9.9242	0	0	0	11.3832	15	5.1615	
Story5	B1	15	Live	5.6308	0	12.1296	0	0	0	6.209	15	5.6308	
Story5	B1	15	Live	6.1	0	14.335	0	0	0	0	15	6.1	
Story5	B1	15	DStIS1	0	0	-20.7173	0	0	0	0	15	0	
Story5	B1	15	DStIS1	0.4692	0	-17.53	0	0	0	8.9734	15	0.4692	
Story5	B1	15	DStIS1	0.9385	0	-14.3428	0	0	0	16.4513	15	0.9385	
Story5	B1	15	DStIS1	1.4077	0	-11.1555	0	0	0	22.4335	15	1.4077	
Story5	B1	15	DStIS1	1.8769	0	-7.9682	0	0	0	26.9203	15	1.8769	
Story5	B1	15	DStIS1	2.3462	0	-4.7809	0	0	0	29.9114	15	2.3462	
Story5	B1	15	DStIS1	2.8154	0	-1.5936	0	0	0	31.407	15	2.8154	
Story5	B1	15	DStIS1	3.2846	0	1.5936	0	0	0	31.407	15	3.2846	
Story5	B1	15	DStIS1	3.7538	0	4.7809	0	0	0	29.9114	15	3.7538	
Story5	B1	15	DStIS1	4.2231	0	7.9682	0	0	0	26.9203	15	4.2231	

Story	Beam	Unique Name	Load Case/Combo	Station m	P kN	V2 kN	V3 kN	T kN-m	M2 kN-m	M3 kN-m	Element	Element Station m	Location
Story5	B1	15	DS1S1	4.6923	0	11.1555	0	0	0	22.4335	15	4.6923	
Story5	B1	15	DS1S1	5.1615	0	14.3428	0	0	0	16.4513	15	5.1615	
Story5	B1	15	DS1S1	5.6308	0	17.53	0	0	0	8.9734	15	5.6308	
Story5	B1	15	DS1S1	6.1	0	20.7173	0	0	0	0	15	6.1	
Story5	B1	15	DS1S2	0	0	-43.6533	0	0	0	0	15	0	
Story5	B1	15	DS1S2	0.4692	0	-36.9374	0	0	0	18.9078	15	0.4692	
Story5	B1	15	DS1S2	0.9385	0	-30.2215	0	0	0	34.6644	15	0.9385	
Story5	B1	15	DS1S2	1.4077	0	-23.5056	0	0	0	47.2696	15	1.4077	
Story5	B1	15	DS1S2	1.8769	0	-16.7897	0	0	0	56.7235	15	1.8769	
Story5	B1	15	DS1S2	2.3462	0	-10.0738	0	0	0	63.0261	15	2.3462	
Story5	B1	15	DS1S2	2.8154	0	-3.3579	0	0	0	66.1774	15	2.8154	
Story5	B1	15	DS1S2	3.2846	0	3.3579	0	0	0	66.1774	15	3.2846	
Story5	B1	15	DS1S2	3.7538	0	10.0738	0	0	0	63.0261	15	3.7538	
Story5	B1	15	DS1S2	4.2231	0	16.7897	0	0	0	56.7235	15	4.2231	
Story5	B1	15	DS1S2	4.6923	0	23.5056	0	0	0	47.2696	15	4.6923	
Story5	B1	15	DS1S2	5.1615	0	30.2215	0	0	0	34.6644	15	5.1615	
Story5	B1	15	DS1S2	5.6308	0	36.9374	0	0	0	18.9078	15	5.6308	
Story5	B1	15	DS1S2	6.1	0	43.6533	0	0	0	0	15	6.1	
Story5	B1	15	DS1D1	0	0	-14.7981	0	0	0	0	15	0	
Story5	B1	15	DS1D1	0.4692	0	-12.5215	0	0	0	6.4096	15	0.4692	
Story5	B1	15	DS1D1	0.9385	0	-10.2448	0	0	0	11.7509	15	0.9385	
Story5	B1	15	DS1D1	1.4077	0	-7.9682	0	0	0	16.024	15	1.4077	
Story5	B1	15	DS1D1	1.8769	0	-5.6916	0	0	0	19.2288	15	1.8769	
Story5	B1	15	DS1D1	2.3462	0	-3.4149	0	0	0	21.3653	15	2.3462	
Story5	B1	15	DS1D1	2.8154	0	-1.1383	0	0	0	22.4335	15	2.8154	
Story5	B1	15	DS1D1	3.2846	0	1.1383	0	0	0	22.4335	15	3.2846	
Story5	B1	15	DS1D1	3.7538	0	3.4149	0	0	0	21.3653	15	3.7538	
Story5	B1	15	DS1D1	4.2231	0	5.6916	0	0	0	19.2288	15	4.2231	
Story5	B1	15	DS1D1	4.6923	0	7.9682	0	0	0	16.024	15	4.6923	
Story5	B1	15	DS1D1	5.1615	0	10.2448	0	0	0	11.7509	15	5.1615	
Story5	B1	15	DS1D1	5.6308	0	12.5215	0	0	0	6.4096	15	5.6308	
Story5	B1	15	DS1D1	6.1	0	14.7981	0	0	0	0	15	6.1	
Story5	B1	15	DS1D2	0	0	-29.1331	0	0	0	0	15	0	
Story5	B1	15	DS1D2	0.4692	0	-24.6511	0	0	0	12.6186	15	0.4692	
Story5	B1	15	DS1D2	0.9385	0	-20.1691	0	0	0	23.1341	15	0.9385	
Story5	B1	15	DS1D2	1.4077	0	-15.687	0	0	0	31.5465	15	1.4077	
Story5	B1	15	DS1D2	1.8769	0	-11.205	0	0	0	37.8558	15	1.8769	
Story5	B1	15	DS1D2	2.3462	0	-6.723	0	0	0	42.062	15	2.3462	
Story5	B1	15	DS1D2	2.8154	0	-2.241	0	0	0	44.1651	15	2.8154	
Story5	B1	15	DS1D2	3.2846	0	2.241	0	0	0	44.1651	15	3.2846	
Story5	B1	15	DS1D2	3.7538	0	6.723	0	0	0	42.062	15	3.7538	
Story5	B1	15	DS1D2	4.2231	0	11.205	0	0	0	37.8558	15	4.2231	
Story5	B1	15	DS1D2	4.6923	0	15.687	0	0	0	31.5465	15	4.6923	
Story5	B1	15	DS1D2	5.1615	0	20.1691	0	0	0	23.1341	15	5.1615	
Story5	B1	15	DS1D2	5.6308	0	24.6511	0	0	0	12.6186	15	5.6308	
Story5	B1	15	DS1D2	6.1	0	29.1331	0	0	0	0	15	6.1	
Story5	B2	14	Dead	0	0	-11.7815	0	0	0	0	14-1	0	
Story5	B2	14	Dead	0.4	0	-11.6638	0	0	0	4.6891	14-1	0.4	
Story5	B2	14	Dead	0.8	0	-11.5462	0	0	0	9.3311	14-1	0.8	
Story5	B2	14	Dead	1.2	0	-11.4286	0	0	0	13.926	14-1	1.2	
Story5	B2	14	Dead	1.6	0	-11.311	0	0	0	18.474	14-1	1.6	
Story5	B2	14	Dead	1.6	0	3.4871	0	0	0	18.474	14-2	0	
Story5	B2	14	Dead	2.1	0	3.6341	0	0	0	16.6937	14-2	0.5	
Story5	B2	14	Dead	2.6	0	3.7811	0	0	0	14.8399	14-2	1	
Story5	B2	14	Dead	3.1	0	3.9281	0	0	0	12.9126	14-2	1.5	

Story	Beam	Unique Name	Load Case/Combo	Station m	P kN	V2 kN	V3 kN	T kN-m	M2 kN-m	M3 kN-m	Element	Element Station m	Location
Story5	B2	14	Dead	3.6	0	4.0752	0	0	0	10.9117	14-2	2	
Story5	B2	14	Dead	3.6	0	13.5221	0	0	0	10.9117	14-3	0	
Story5	B2	14	Dead	4	0	13.6397	0	0	0	5.4794	14-3	0.4	
Story5	B2	14	Dead	4.4	0	13.7573	0	0	0	0	14-3	0.8	
Story5	B2	14	Live	0	0	-10.4082	0	0	0	0	14-1	0	
Story5	B2	14	Live	0.4	0	-10.4082	0	0	0	4.1633	14-1	0.4	
Story5	B2	14	Live	0.8	0	-10.4082	0	0	0	8.3265	14-1	0.8	
Story5	B2	14	Live	1.2	0	-10.4082	0	0	0	12.4898	14-1	1.2	
Story5	B2	14	Live	1.6	0	-10.4082	0	0	0	16.6531	14-1	1.6	
Story5	B2	14	Live	1.6	0	3.9268	0	0	0	16.6531	14-2	0	
Story5	B2	14	Live	2.1	0	3.9268	0	0	0	14.6897	14-2	0.5	
Story5	B2	14	Live	2.6	0	3.9268	0	0	0	12.7263	14-2	1	
Story5	B2	14	Live	3.1	0	3.9268	0	0	0	10.7629	14-2	1.5	
Story5	B2	14	Live	3.6	0	3.9268	0	0	0	8.7995	14-2	2	
Story5	B2	14	Live	3.6	0	10.9993	0	0	0	8.7995	14-3	0	
Story5	B2	14	Live	4	0	10.9993	0	0	0	4.3997	14-3	0.4	
Story5	B2	14	Live	4.4	0	10.9993	0	0	0	0	14-3	0.8	
Story5	B2	14	DStIS1	0	0	-16.494	0	0	0	0	14-1	0	
Story5	B2	14	DStIS1	0.4	0	-16.3294	0	0	0	6.5647	14-1	0.4	
Story5	B2	14	DStIS1	0.8	0	-16.1647	0	0	0	13.0635	14-1	0.8	
Story5	B2	14	DStIS1	1.2	0	-16.0001	0	0	0	19.4965	14-1	1.2	
Story5	B2	14	DStIS1	1.6	0	-15.8354	0	0	0	25.8636	14-1	1.6	
Story5	B2	14	DStIS1	1.6	0	4.8819	0	0	0	25.8636	14-2	0	
Story5	B2	14	DStIS1	2.1	0	5.0877	0	0	0	23.3711	14-2	0.5	
Story5	B2	14	DStIS1	2.6	0	5.2936	0	0	0	20.7758	14-2	1	
Story5	B2	14	DStIS1	3.1	0	5.4994	0	0	0	18.0776	14-2	1.5	
Story5	B2	14	DStIS1	3.6	0	5.7052	0	0	0	15.2764	14-2	2	
Story5	B2	14	DStIS1	3.6	0	18.9309	0	0	0	15.2764	14-3	0	
Story5	B2	14	DStIS1	4	0	19.0955	0	0	0	7.6711	14-3	0.4	
Story5	B2	14	DStIS1	4.4	0	19.2602	0	0	0	0	14-3	0.8	
Story5	B2	14	DStIS2	0	0	-33.1471	0	0	0	0	14-1	0	
Story5	B2	14	DStIS2	0.4	0	-32.9825	0	0	0	13.2259	14-1	0.4	
Story5	B2	14	DStIS2	0.8	0	-32.8178	0	0	0	26.386	14-1	0.8	
Story5	B2	14	DStIS2	1.2	0	-32.6532	0	0	0	39.4802	14-1	1.2	
Story5	B2	14	DStIS2	1.6	0	-32.4885	0	0	0	52.5085	14-1	1.6	
Story5	B2	14	DStIS2	1.6	0	11.1648	0	0	0	52.5085	14-2	0	
Story5	B2	14	DStIS2	2.1	0	11.3706	0	0	0	46.8746	14-2	0.5	
Story5	B2	14	DStIS2	2.6	0	11.5765	0	0	0	41.1379	14-2	1	
Story5	B2	14	DStIS2	3.1	0	11.7823	0	0	0	35.2982	14-2	1.5	
Story5	B2	14	DStIS2	3.6	0	11.9881	0	0	0	29.3556	14-2	2	
Story5	B2	14	DStIS2	3.6	0	36.5298	0	0	0	29.3556	14-3	0	
Story5	B2	14	DStIS2	4	0	36.6945	0	0	0	14.7107	14-3	0.4	
Story5	B2	14	DStIS2	4.4	0	36.8591	0	0	0	0	14-3	0.8	
Story5	B2	14	DStID1	0	0	-11.7815	0	0	0	0	14-1	0	
Story5	B2	14	DStID1	0.4	0	-11.6638	0	0	0	4.6891	14-1	0.4	
Story5	B2	14	DStID1	0.8	0	-11.5462	0	0	0	9.3311	14-1	0.8	
Story5	B2	14	DStID1	1.2	0	-11.4286	0	0	0	13.926	14-1	1.2	
Story5	B2	14	DStID1	1.6	0	-11.311	0	0	0	18.474	14-1	1.6	
Story5	B2	14	DStID1	1.6	0	3.4871	0	0	0	18.474	14-2	0	
Story5	B2	14	DStID1	2.1	0	3.6341	0	0	0	16.6937	14-2	0.5	
Story5	B2	14	DStID1	2.6	0	3.7811	0	0	0	14.8399	14-2	1	
Story5	B2	14	DStID1	3.1	0	3.9281	0	0	0	12.9126	14-2	1.5	
Story5	B2	14	DStID1	3.6	0	4.0752	0	0	0	10.9117	14-2	2	
Story5	B2	14	DStID1	3.6	0	13.5221	0	0	0	10.9117	14-3	0	
Story5	B2	14	DStID1	4	0	13.6397	0	0	0	5.4794	14-3	0.4	

Story	Beam	Unique Name	Load Case/Combo	Station m	P kN	V2 kN	V3 kN	T kN-m	M2 kN-m	M3 kN-m	Element	Element Station m	Location
Story5	B2	14	DStID1	4.4	0	13.7573	0	0	0	0	14-3	0.8	
Story5	B2	14	DStID2	0	0	-22.1896	0	0	0	0	14-1	0	
Story5	B2	14	DStID2	0.4	0	-22.072	0	0	0	8.8523	14-1	0.4	
Story5	B2	14	DStID2	0.8	0	-21.9544	0	0	0	17.6576	14-1	0.8	
Story5	B2	14	DStID2	1.2	0	-21.8368	0	0	0	26.4159	14-1	1.2	
Story5	B2	14	DStID2	1.6	0	-21.7192	0	0	0	35.1271	14-1	1.6	
Story5	B2	14	DStID2	1.6	0	7.4139	0	0	0	35.1271	14-2	0	
Story5	B2	14	DStID2	2.1	0	7.5609	0	0	0	31.3834	14-2	0.5	
Story5	B2	14	DStID2	2.6	0	7.7079	0	0	0	27.5661	14-2	1	
Story5	B2	14	DStID2	3.1	0	7.855	0	0	0	23.6754	14-2	1.5	
Story5	B2	14	DStID2	3.6	0	8.002	0	0	0	19.7112	14-2	2	
Story5	B2	14	DStID2	3.6	0	24.5214	0	0	0	19.7112	14-3	0	
Story5	B2	14	DStID2	4	0	24.639	0	0	0	9.8791	14-3	0.4	
Story5	B2	14	DStID2	4.4	0	24.7566	0	0	0	0	14-3	0.8	
Story5	B4	13	Dead	0	0	-19.8161	0	0	0	0	13-1	0	
Story5	B4	13	Dead	0.5	0	-18.7402	0	0	0	9.6391	13-1	0.5	
Story5	B4	13	Dead	0.5	0	-4.9829	0	0	0	9.6391	13-2	0	
Story5	B4	13	Dead	0.9692	0	-3.9732	0	0	0	11.7403	13-2	0.4692	
Story5	B4	13	Dead	1.4385	0	-2.9635	0	0	0	13.3678	13-2	0.9385	
Story5	B4	13	Dead	1.9077	0	-1.9538	0	0	0	14.5214	13-2	1.4077	
Story5	B4	13	Dead	2.3769	0	-0.9441	0	0	0	15.2013	13-2	1.8769	
Story5	B4	13	Dead	2.8462	0	0.0656	0	0	0	15.4074	13-2	2.3462	
Story5	B4	13	Dead	3.3154	0	1.0753	0	0	0	15.1398	13-2	2.8154	
Story5	B4	13	Dead	3.7846	0	2.085	0	0	0	14.3983	13-2	3.2846	
Story5	B4	13	Dead	4.2538	0	3.0947	0	0	0	13.183	13-2	3.7538	
Story5	B4	13	Dead	4.7231	0	4.1044	0	0	0	11.494	13-2	4.2231	
Story5	B4	13	Dead	5.1923	0	5.1141	0	0	0	9.3312	13-2	4.6923	
Story5	B4	13	Dead	5.6615	0	6.1238	0	0	0	6.6946	13-2	5.1615	
Story5	B4	13	Dead	6.1308	0	7.1336	0	0	0	3.5842	13-2	5.6308	
Story5	B4	13	Dead	6.6	0	8.1433	0	0	0	0	13-2	6.1	
Story5	B4	13	Live	0	0	-28.316	0	0	0	0	13-1	0	
Story5	B4	13	Live	0.5	0	-25.566	0	0	0	13.4705	13-1	0.5	
Story5	B4	13	Live	0.5	0	-14.5667	0	0	0	13.4705	13-2	0	
Story5	B4	13	Live	0.9692	0	-11.9859	0	0	0	19.7002	13-2	0.4692	
Story5	B4	13	Live	1.4385	0	-9.4052	0	0	0	24.7189	13-2	0.9385	
Story5	B4	13	Live	1.9077	0	-6.8244	0	0	0	28.5266	13-2	1.4077	
Story5	B4	13	Live	2.3769	0	-4.2436	0	0	0	31.1233	13-2	1.8769	
Story5	B4	13	Live	2.8462	0	-1.6629	0	0	0	32.5091	13-2	2.3462	
Story5	B4	13	Live	3.3154	0	0.9179	0	0	0	32.6839	13-2	2.8154	
Story5	B4	13	Live	3.7846	0	3.4987	0	0	0	31.6477	13-2	3.2846	
Story5	B4	13	Live	4.2538	0	6.0794	0	0	0	29.4005	13-2	3.7538	
Story5	B4	13	Live	4.7231	0	8.6602	0	0	0	25.9423	13-2	4.2231	
Story5	B4	13	Live	5.1923	0	11.241	0	0	0	21.2732	13-2	4.6923	
Story5	B4	13	Live	5.6615	0	13.8217	0	0	0	15.3931	13-2	5.1615	
Story5	B4	13	Live	6.1308	0	16.4025	0	0	0	8.3021	13-2	5.6308	
Story5	B4	13	Live	6.6	0	18.9833	0	0	0	0	13-2	6.1	
Story5	B4	13	DStIS1	0	0	-27.7426	0	0	0	0	13-1	0	
Story5	B4	13	DStIS1	0.5	0	-26.2363	0	0	0	13.4947	13-1	0.5	
Story5	B4	13	DStIS1	0.5	0	-6.9761	0	0	0	13.4947	13-2	0	
Story5	B4	13	DStIS1	0.9692	0	-5.5625	0	0	0	16.4364	13-2	0.4692	
Story5	B4	13	DStIS1	1.4385	0	-4.1489	0	0	0	18.7149	13-2	0.9385	
Story5	B4	13	DStIS1	1.9077	0	-2.7353	0	0	0	20.33	13-2	1.4077	
Story5	B4	13	DStIS1	2.3769	0	-1.3217	0	0	0	21.2819	13-2	1.8769	
Story5	B4	13	DStIS1	2.8462	0	0.0919	0	0	0	21.5704	13-2	2.3462	
Story5	B4	13	DStIS1	3.3154	0	1.5055	0	0	0	21.1957	13-2	2.8154	

Story	Beam	Unique Name	Load Case/Combo	Station m	P kN	V2 kN	V3 kN	T kN-m	M2 kN-m	M3 kN-m	Element	Element Station m	Location
Story5	B4	13	DStIS1	3.7846	0	2.919	0	0	0	20.1576	13-2	3.2846	
Story5	B4	13	DStIS1	4.2538	0	4.3326	0	0	0	18.4562	13-2	3.7538	
Story5	B4	13	DStIS1	4.7231	0	5.7462	0	0	0	16.0916	13-2	4.2231	
Story5	B4	13	DStIS1	5.1923	0	7.1598	0	0	0	13.0636	13-2	4.6923	
Story5	B4	13	DStIS1	5.6615	0	8.5734	0	0	0	9.3724	13-2	5.1615	
Story5	B4	13	DStIS1	6.1308	0	9.987	0	0	0	5.0178	13-2	5.6308	
Story5	B4	13	DStIS1	6.6	0	11.4006	0	0	0	0	13-2	6.1	
Story5	B4	13	DStIS2	0	0	-73.0482	0	0	0	0	13-1	0	
Story5	B4	13	DStIS2	0.5	0	-67.1419	0	0	0	35.0475	13-1	0.5	
Story5	B4	13	DStIS2	0.5	0	-30.2828	0	0	0	35.0475	13-2	0	
Story5	B4	13	DStIS2	0.9692	0	-24.74	0	0	0	47.9567	13-2	0.4692	
Story5	B4	13	DStIS2	1.4385	0	-19.1972	0	0	0	58.2651	13-2	0.9385	
Story5	B4	13	DStIS2	1.9077	0	-13.6544	0	0	0	65.9726	13-2	1.4077	
Story5	B4	13	DStIS2	2.3769	0	-8.1115	0	0	0	71.0792	13-2	1.8769	
Story5	B4	13	DStIS2	2.8462	0	-2.5687	0	0	0	73.5849	13-2	2.3462	
Story5	B4	13	DStIS2	3.3154	0	2.9741	0	0	0	73.4898	13-2	2.8154	
Story5	B4	13	DStIS2	3.7846	0	8.5169	0	0	0	70.7939	13-2	3.2846	
Story5	B4	13	DStIS2	4.2538	0	14.0597	0	0	0	65.497	13-2	3.7538	
Story5	B4	13	DStIS2	4.7231	0	19.6025	0	0	0	57.5994	13-2	4.2231	
Story5	B4	13	DStIS2	5.1923	0	25.1454	0	0	0	47.1008	13-2	4.6923	
Story5	B4	13	DStIS2	5.6615	0	30.6882	0	0	0	34.0014	13-2	5.1615	
Story5	B4	13	DStIS2	6.1308	0	36.231	0	0	0	18.3011	13-2	5.6308	
Story5	B4	13	DStIS2	6.6	0	41.7738	0	0	0	0	13-2	6.1	
Story5	B4	13	DStID1	0	0	-19.8161	0	0	0	0	13-1	0	
Story5	B4	13	DStID1	0.5	0	-18.7402	0	0	0	9.6391	13-1	0.5	
Story5	B4	13	DStID1	0.5	0	-4.9829	0	0	0	9.6391	13-2	0	
Story5	B4	13	DStID1	0.9692	0	-3.9732	0	0	0	11.7403	13-2	0.4692	
Story5	B4	13	DStID1	1.4385	0	-2.9635	0	0	0	13.3678	13-2	0.9385	
Story5	B4	13	DStID1	1.9077	0	-1.9538	0	0	0	14.5214	13-2	1.4077	
Story5	B4	13	DStID1	2.3769	0	-0.9441	0	0	0	15.2013	13-2	1.8769	
Story5	B4	13	DStID1	2.8462	0	0.0656	0	0	0	15.4074	13-2	2.3462	
Story5	B4	13	DStID1	3.3154	0	1.0753	0	0	0	15.1398	13-2	2.8154	
Story5	B4	13	DStID1	3.7846	0	2.085	0	0	0	14.3983	13-2	3.2846	
Story5	B4	13	DStID1	4.2538	0	3.0947	0	0	0	13.183	13-2	3.7538	
Story5	B4	13	DStID1	4.7231	0	4.1044	0	0	0	11.494	13-2	4.2231	
Story5	B4	13	DStID1	5.1923	0	5.1141	0	0	0	9.3312	13-2	4.6923	
Story5	B4	13	DStID1	5.6615	0	6.1238	0	0	0	6.6946	13-2	5.1615	
Story5	B4	13	DStID1	6.1308	0	7.1336	0	0	0	3.5842	13-2	5.6308	
Story5	B4	13	DStID1	6.6	0	8.1433	0	0	0	0	13-2	6.1	
Story5	B4	13	DStID2	0	0	-48.1321	0	0	0	0	13-1	0	
Story5	B4	13	DStID2	0.5	0	-44.3062	0	0	0	23.1096	13-1	0.5	
Story5	B4	13	DStID2	0.5	0	-19.5496	0	0	0	23.1096	13-2	0	
Story5	B4	13	DStID2	0.9692	0	-15.9592	0	0	0	31.4405	13-2	0.4692	
Story5	B4	13	DStID2	1.4385	0	-12.3687	0	0	0	38.0866	13-2	0.9385	
Story5	B4	13	DStID2	1.9077	0	-8.7782	0	0	0	43.048	13-2	1.4077	
Story5	B4	13	DStID2	2.3769	0	-5.1877	0	0	0	46.3246	13-2	1.8769	
Story5	B4	13	DStID2	2.8462	0	-1.5973	0	0	0	47.9165	13-2	2.3462	
Story5	B4	13	DStID2	3.3154	0	1.9932	0	0	0	47.8236	13-2	2.8154	
Story5	B4	13	DStID2	3.7846	0	5.5837	0	0	0	46.0459	13-2	3.2846	
Story5	B4	13	DStID2	4.2538	0	9.1742	0	0	0	42.5835	13-2	3.7538	
Story5	B4	13	DStID2	4.7231	0	12.7646	0	0	0	37.4363	13-2	4.2231	
Story5	B4	13	DStID2	5.1923	0	16.3551	0	0	0	30.6044	13-2	4.6923	
Story5	B4	13	DStID2	5.6615	0	19.9456	0	0	0	22.0877	13-2	5.1615	
Story5	B4	13	DStID2	6.1308	0	23.5361	0	0	0	11.8862	13-2	5.6308	
Story5	B4	13	DStID2	6.6	0	27.1265	0	0	0	0	13-2	6.1	

Story	Beam	Unique Name	Load Case/Combo	Station m	P kN	V2 kN	V3 kN	T kN-m	M2 kN-m	M3 kN-m	Element	Element Station m	Location
Story4	B8	6	Dead	0	-0.1158	-7.6552	0	0	0	0	6	0	
Story4	B8	6	Dead	0.475	-0.1158	-6.1241	0	0	0	3.2726	6	0.475	
Story4	B8	6	Dead	0.95	-0.1158	-4.5931	0	0	0	5.8179	6	0.95	
Story4	B8	6	Dead	1.425	-0.1158	-3.0621	0	0	0	7.636	6	1.425	
Story4	B8	6	Dead	1.9	-0.1158	-1.531	0	0	0	8.7269	6	1.9	
Story4	B8	6	Dead	2.375	-0.1158	0	0	0	0	9.0905	6	2.375	
Story4	B8	6	Dead	2.85	-0.1158	1.531	0	0	0	8.7269	6	2.85	
Story4	B8	6	Dead	3.325	-0.1158	3.0621	0	0	0	7.636	6	3.325	
Story4	B8	6	Dead	3.8	-0.1158	4.5931	0	0	0	5.8179	6	3.8	
Story4	B8	6	Dead	4.275	-0.1158	6.1241	0	0	0	3.2726	6	4.275	
Story4	B8	6	Dead	4.75	-0.1158	7.6552	0	0	0	0	6	4.75	
Story4	B8	6	Live	0	-0.0646	-4.275	0	0	0	0	6	0	
Story4	B8	6	Live	0.475	-0.0646	-3.42	0	0	0	1.8276	6	0.475	
Story4	B8	6	Live	0.95	-0.0646	-2.565	0	0	0	3.249	6	0.95	
Story4	B8	6	Live	1.425	-0.0646	-1.71	0	0	0	4.2643	6	1.425	
Story4	B8	6	Live	1.9	-0.0646	-0.855	0	0	0	4.8735	6	1.9	
Story4	B8	6	Live	2.375	-0.0646	0	0	0	0	5.0766	6	2.375	
Story4	B8	6	Live	2.85	-0.0646	0.855	0	0	0	4.8735	6	2.85	
Story4	B8	6	Live	3.325	-0.0646	1.71	0	0	0	4.2643	6	3.325	
Story4	B8	6	Live	3.8	-0.0646	2.565	0	0	0	3.249	6	3.8	
Story4	B8	6	Live	4.275	-0.0646	3.42	0	0	0	1.8276	6	4.275	
Story4	B8	6	Live	4.75	-0.0646	4.275	0	0	0	0	6	4.75	
Story4	B8	6	DSI1S1	0	-0.1621	-10.7172	0	0	0	0	6	0	
Story4	B8	6	DSI1S1	0.475	-0.1621	-8.5738	0	0	0	4.5816	6	0.475	
Story4	B8	6	DSI1S1	0.95	-0.1621	-6.4303	0	0	0	8.1451	6	0.95	
Story4	B8	6	DSI1S1	1.425	-0.1621	-4.2869	0	0	0	10.6904	6	1.425	
Story4	B8	6	DSI1S1	1.9	-0.1621	-2.1434	0	0	0	12.2176	6	1.9	
Story4	B8	6	DSI1S1	2.375	-0.1621	0	0	0	0	12.7267	6	2.375	
Story4	B8	6	DSI1S1	2.85	-0.1621	2.1434	0	0	0	12.2176	6	2.85	
Story4	B8	6	DSI1S1	3.325	-0.1621	4.2869	0	0	0	10.6904	6	3.325	
Story4	B8	6	DSI1S1	3.8	-0.1621	6.4303	0	0	0	8.1451	6	3.8	
Story4	B8	6	DSI1S1	4.275	-0.1621	8.5738	0	0	0	4.5816	6	4.275	
Story4	B8	6	DSI1S1	4.75	-0.1621	10.7172	0	0	0	0	6	4.75	
Story4	B8	6	DSI2S2	0	-0.2654	-17.5572	0	0	0	0	6	0	
Story4	B8	6	DSI2S2	0.475	-0.2654	-14.0458	0	0	0	7.5057	6	0.475	
Story4	B8	6	DSI2S2	0.95	-0.2654	-10.5343	0	0	0	13.3435	6	0.95	
Story4	B8	6	DSI2S2	1.425	-0.2654	-7.0229	0	0	0	17.5133	6	1.425	
Story4	B8	6	DSI2S2	1.9	-0.2654	-3.5114	0	0	0	20.0152	6	1.9	
Story4	B8	6	DSI2S2	2.375	-0.2654	0	0	0	0	20.8492	6	2.375	
Story4	B8	6	DSI2S2	2.85	-0.2654	3.5114	0	0	0	20.0152	6	2.85	
Story4	B8	6	DSI2S2	3.325	-0.2654	7.0229	0	0	0	17.5133	6	3.325	
Story4	B8	6	DSI2S2	3.8	-0.2654	10.5343	0	0	0	13.3435	6	3.8	
Story4	B8	6	DSI2S2	4.275	-0.2654	14.0458	0	0	0	7.5057	6	4.275	
Story4	B8	6	DSI2S2	4.75	-0.2654	17.5572	0	0	0	0	6	4.75	
Story4	B8	6	DSI1D1	0	-0.1158	-7.6552	0	0	0	0	6	0	
Story4	B8	6	DSI1D1	0.475	-0.1158	-6.1241	0	0	0	3.2726	6	0.475	
Story4	B8	6	DSI1D1	0.95	-0.1158	-4.5931	0	0	0	5.8179	6	0.95	
Story4	B8	6	DSI1D1	1.425	-0.1158	-3.0621	0	0	0	7.636	6	1.425	
Story4	B8	6	DSI1D1	1.9	-0.1158	-1.531	0	0	0	8.7269	6	1.9	
Story4	B8	6	DSI1D1	2.375	-0.1158	0	0	0	0	9.0905	6	2.375	
Story4	B8	6	DSI1D1	2.85	-0.1158	1.531	0	0	0	8.7269	6	2.85	
Story4	B8	6	DSI1D1	3.325	-0.1158	3.0621	0	0	0	7.636	6	3.325	
Story4	B8	6	DSI1D1	3.8	-0.1158	4.5931	0	0	0	5.8179	6	3.8	
Story4	B8	6	DSI1D1	4.275	-0.1158	6.1241	0	0	0	3.2726	6	4.275	
Story4	B8	6	DSI1D1	4.75	-0.1158	7.6552	0	0	0	0	6	4.75	

Story	Beam	Unique Name	Load Case/Combo	Station m	P kN	V2 kN	V3 kN	T kN-m	M2 kN-m	M3 kN-m	Element	Element Station m	Location
Story4	B8	6	DStID2	0	-0.1804	-11.9302	0	0	0	0	6	0	
Story4	B8	6	DStID2	0.475	-0.1804	-9.5441	0	0	0	5.1001	6	0.475	
Story4	B8	6	DStID2	0.95	-0.1804	-7.1581	0	0	0	9.0669	6	0.95	
Story4	B8	6	DStID2	1.425	-0.1804	-4.7721	0	0	0	11.9003	6	1.425	
Story4	B8	6	DStID2	1.9	-0.1804	-2.386	0	0	0	13.6004	6	1.9	
Story4	B8	6	DStID2	2.375	-0.1804	0	0	0	0	14.1671	6	2.375	
Story4	B8	6	DStID2	2.85	-0.1804	2.386	0	0	0	13.6004	6	2.85	
Story4	B8	6	DStID2	3.325	-0.1804	4.7721	0	0	0	11.9003	6	3.325	
Story4	B8	6	DStID2	3.8	-0.1804	7.1581	0	0	0	9.0669	6	3.8	
Story4	B8	6	DStID2	4.275	-0.1804	9.5441	0	0	0	5.1001	6	4.275	
Story4	B8	6	DStID2	4.75	-0.1804	11.9302	0	0	0	0	6	4.75	
Story3	B6	4	Dead	0	-0.0126	-6.7757	0	0	0	0	4	0	
Story3	B6	4	Dead	0.48	-0.0126	-5.4206	0	0	0	2.9271	4	0.48	
Story3	B6	4	Dead	0.96	-0.0126	-4.0654	0	0	0	5.2038	4	0.96	
Story3	B6	4	Dead	1.44	-0.0126	-2.7103	0	0	0	6.8299	4	1.44	
Story3	B6	4	Dead	1.92	-0.0126	-1.3551	0	0	0	7.8056	4	1.92	
Story3	B6	4	Dead	2.4	-0.0126	0	0	0	0	8.1309	4	2.4	
Story3	B6	4	Dead	2.88	-0.0126	1.3551	0	0	0	7.8056	4	2.88	
Story3	B6	4	Dead	3.36	-0.0126	2.7103	0	0	0	6.8299	4	3.36	
Story3	B6	4	Dead	3.84	-0.0126	4.0654	0	0	0	5.2038	4	3.84	
Story3	B6	4	Dead	4.32	-0.0126	5.4206	0	0	0	2.9271	4	4.32	
Story3	B6	4	Dead	4.8	-0.0126	6.7757	0	0	0	0	4	4.8	
Story3	B6	4	Live	0	-0.0069	-3.6	0	0	0	0	4	0	
Story3	B6	4	Live	0.48	-0.0069	-2.88	0	0	0	1.5552	4	0.48	
Story3	B6	4	Live	0.96	-0.0069	-2.16	0	0	0	2.7648	4	0.96	
Story3	B6	4	Live	1.44	-0.0069	-1.44	0	0	0	3.6288	4	1.44	
Story3	B6	4	Live	1.92	-0.0069	-0.72	0	0	0	4.1472	4	1.92	
Story3	B6	4	Live	2.4	-0.0069	0	0	0	0	4.32	4	2.4	
Story3	B6	4	Live	2.88	-0.0069	0.72	0	0	0	4.1472	4	2.88	
Story3	B6	4	Live	3.36	-0.0069	1.44	0	0	0	3.6288	4	3.36	
Story3	B6	4	Live	3.84	-0.0069	2.16	0	0	0	2.7648	4	3.84	
Story3	B6	4	Live	4.32	-0.0069	2.88	0	0	0	1.5552	4	4.32	
Story3	B6	4	Live	4.8	-0.0069	3.6	0	0	0	0	4	4.8	
Story3	B6	4	DStIS1	0	-0.0177	-9.486	0	0	0	0	4	0	
Story3	B6	4	DStIS1	0.48	-0.0177	-7.5888	0	0	0	4.098	4	0.48	
Story3	B6	4	DStIS1	0.96	-0.0177	-5.6916	0	0	0	7.2853	4	0.96	
Story3	B6	4	DStIS1	1.44	-0.0177	-3.7944	0	0	0	9.5619	4	1.44	
Story3	B6	4	DStIS1	1.92	-0.0177	-1.8972	0	0	0	10.9279	4	1.92	
Story3	B6	4	DStIS1	2.4	-0.0177	0	0	0	0	11.3832	4	2.4	
Story3	B6	4	DStIS1	2.88	-0.0177	1.8972	0	0	0	10.9279	4	2.88	
Story3	B6	4	DStIS1	3.36	-0.0177	3.7944	0	0	0	9.5619	4	3.36	
Story3	B6	4	DStIS1	3.84	-0.0177	5.6916	0	0	0	7.2853	4	3.84	
Story3	B6	4	DStIS1	4.32	-0.0177	7.5888	0	0	0	4.098	4	4.32	
Story3	B6	4	DStIS1	4.8	-0.0177	9.486	0	0	0	0	4	4.8	
Story3	B6	4	DStIS2	0	-0.0287	-15.246	0	0	0	0	4	0	
Story3	B6	4	DStIS2	0.48	-0.0287	-12.1968	0	0	0	6.5863	4	0.48	
Story3	B6	4	DStIS2	0.96	-0.0287	-9.1476	0	0	0	11.7089	4	0.96	
Story3	B6	4	DStIS2	1.44	-0.0287	-6.0984	0	0	0	15.368	4	1.44	
Story3	B6	4	DStIS2	1.92	-0.0287	-3.0492	0	0	0	17.5634	4	1.92	
Story3	B6	4	DStIS2	2.4	-0.0287	0	0	0	0	18.2952	4	2.4	
Story3	B6	4	DStIS2	2.88	-0.0287	3.0492	0	0	0	17.5634	4	2.88	
Story3	B6	4	DStIS2	3.36	-0.0287	6.0984	0	0	0	15.368	4	3.36	
Story3	B6	4	DStIS2	3.84	-0.0287	9.1476	0	0	0	11.7089	4	3.84	
Story3	B6	4	DStIS2	4.32	-0.0287	12.1968	0	0	0	6.5863	4	4.32	
Story3	B6	4	DStIS2	4.8	-0.0287	15.246	0	0	0	0	4	4.8	

Story	Beam	Unique Name	Load Case/Combo	Station m	P kN	V2 kN	V3 kN	T kN-m	M2 kN-m	M3 kN-m	Element	Element Station m	Location
Story3	B6	4	DSIID1	0	-0.0126	-6.7757	0	0	0	0	4	0	
Story3	B6	4	DSIID1	0.48	-0.0126	-5.4206	0	0	0	2.9271	4	0.48	
Story3	B6	4	DSIID1	0.96	-0.0126	-4.0654	0	0	0	5.2038	4	0.96	
Story3	B6	4	DSIID1	1.44	-0.0126	-2.7103	0	0	0	6.8299	4	1.44	
Story3	B6	4	DSIID1	1.92	-0.0126	-1.3551	0	0	0	7.8056	4	1.92	
Story3	B6	4	DSIID1	2.4	-0.0126	0	0	0	0	8.1309	4	2.4	
Story3	B6	4	DSIID1	2.88	-0.0126	1.3551	0	0	0	7.8056	4	2.88	
Story3	B6	4	DSIID1	3.36	-0.0126	2.7103	0	0	0	6.8299	4	3.36	
Story3	B6	4	DSIID1	3.84	-0.0126	4.0654	0	0	0	5.2038	4	3.84	
Story3	B6	4	DSIID1	4.32	-0.0126	5.4206	0	0	0	2.9271	4	4.32	
Story3	B6	4	DSIID1	4.8	-0.0126	6.7757	0	0	0	0	4	4.8	
Story3	B6	4	DSIID2	0	-0.0195	-10.3757	0	0	0	0	4	0	
Story3	B6	4	DSIID2	0.48	-0.0195	-8.3006	0	0	0	4.4823	4	0.48	
Story3	B6	4	DSIID2	0.96	-0.0195	-6.2254	0	0	0	7.9686	4	0.96	
Story3	B6	4	DSIID2	1.44	-0.0195	-4.1503	0	0	0	10.4587	4	1.44	
Story3	B6	4	DSIID2	1.92	-0.0195	-2.0751	0	0	0	11.9528	4	1.92	
Story3	B6	4	DSIID2	2.4	-0.0195	0	0	0	0	12.4509	4	2.4	
Story3	B6	4	DSIID2	2.88	-0.0195	2.0751	0	0	0	11.9528	4	2.88	
Story3	B6	4	DSIID2	3.36	-0.0195	4.1503	0	0	0	10.4587	4	3.36	
Story3	B6	4	DSIID2	3.84	-0.0195	6.2254	0	0	0	7.9686	4	3.84	
Story3	B6	4	DSIID2	4.32	-0.0195	8.3006	0	0	0	4.4823	4	4.32	
Story3	B6	4	DSIID2	4.8	-0.0195	10.3757	0	0	0	0	4	4.8	
Story2	B7	5	Dead	0	-0.1322	-7.4177	0	0	0	0	5	0	
Story2	B7	5	Dead	0.475	-0.1322	-5.9341	0	0	0	3.171	5	0.475	
Story2	B7	5	Dead	0.95	-0.1322	-4.4506	0	0	0	5.6374	5	0.95	
Story2	B7	5	Dead	1.425	-0.1322	-2.9671	0	0	0	7.3991	5	1.425	
Story2	B7	5	Dead	1.9	-0.1322	-1.4835	0	0	0	8.4561	5	1.9	
Story2	B7	5	Dead	2.375	-0.1322	0	0	0	0	8.8085	5	2.375	
Story2	B7	5	Dead	2.85	-0.1322	1.4835	0	0	0	8.4561	5	2.85	
Story2	B7	5	Dead	3.325	-0.1322	2.9671	0	0	0	7.3991	5	3.325	
Story2	B7	5	Dead	3.8	-0.1322	4.4506	0	0	0	5.6374	5	3.8	
Story2	B7	5	Dead	4.275	-0.1322	5.9341	0	0	0	3.171	5	4.275	
Story2	B7	5	Dead	4.75	-0.1322	7.4177	0	0	0	0	5	4.75	
Story2	B7	5	Live	0	-0.072	-4.0375	0	0	0	0	5	0	
Story2	B7	5	Live	0.475	-0.072	-3.23	0	0	0	1.726	5	0.475	
Story2	B7	5	Live	0.95	-0.072	-2.4225	0	0	0	3.0685	5	0.95	
Story2	B7	5	Live	1.425	-0.072	-1.615	0	0	0	4.0274	5	1.425	
Story2	B7	5	Live	1.9	-0.072	-0.8075	0	0	0	4.6028	5	1.9	
Story2	B7	5	Live	2.375	-0.072	0	0	0	0	4.7945	5	2.375	
Story2	B7	5	Live	2.85	-0.072	0.8075	0	0	0	4.6028	5	2.85	
Story2	B7	5	Live	3.325	-0.072	1.615	0	0	0	4.0274	5	3.325	
Story2	B7	5	Live	3.8	-0.072	2.4225	0	0	0	3.0685	5	3.8	
Story2	B7	5	Live	4.275	-0.072	3.23	0	0	0	1.726	5	4.275	
Story2	B7	5	Live	4.75	-0.072	4.0375	0	0	0	0	5	4.75	
Story2	B7	5	DSIIS1	0	-0.1851	-10.3847	0	0	0	0	5	0	
Story2	B7	5	DSIIS1	0.475	-0.1851	-8.3078	0	0	0	4.4395	5	0.475	
Story2	B7	5	DSIIS1	0.95	-0.1851	-6.2308	0	0	0	7.8924	5	0.95	
Story2	B7	5	DSIIS1	1.425	-0.1851	-4.1539	0	0	0	10.3587	5	1.425	
Story2	B7	5	DSIIS1	1.9	-0.1851	-2.0769	0	0	0	11.8386	5	1.9	
Story2	B7	5	DSIIS1	2.375	-0.1851	0	0	0	0	12.3318	5	2.375	
Story2	B7	5	DSIIS1	2.85	-0.1851	2.0769	0	0	0	11.8386	5	2.85	
Story2	B7	5	DSIIS1	3.325	-0.1851	4.1539	0	0	0	10.3587	5	3.325	
Story2	B7	5	DSIIS1	3.8	-0.1851	6.2308	0	0	0	7.8924	5	3.8	
Story2	B7	5	DSIIS1	4.275	-0.1851	8.3078	0	0	0	4.4395	5	4.275	
Story2	B7	5	DSIIS1	4.75	-0.1851	10.3847	0	0	0	0	5	4.75	

Story	Beam	Unique Name	Load Case/Combo	Station m	P kN	V2 kN	V3 kN	T kN-m	M2 kN-m	M3 kN-m	Element	Element Station m	Location
Story2	B7	5	DStIS2	0	-0.3003	-16.8447	0	0	0	0	5	0	
Story2	B7	5	DStIS2	0.475	-0.3003	-13.4758	0	0	0	7.2011	5	0.475	
Story2	B7	5	DStIS2	0.95	-0.3003	-10.1068	0	0	0	12.802	5	0.95	
Story2	B7	5	DStIS2	1.425	-0.3003	-6.7379	0	0	0	16.8026	5	1.425	
Story2	B7	5	DStIS2	1.9	-0.3003	-3.3689	0	0	0	19.203	5	1.9	
Story2	B7	5	DStIS2	2.375	-0.3003	0	0	0	0	20.0031	5	2.375	
Story2	B7	5	DStIS2	2.85	-0.3003	3.3689	0	0	0	19.203	5	2.85	
Story2	B7	5	DStIS2	3.325	-0.3003	6.7379	0	0	0	16.8026	5	3.325	
Story2	B7	5	DStIS2	3.8	-0.3003	10.1068	0	0	0	12.802	5	3.8	
Story2	B7	5	DStIS2	4.275	-0.3003	13.4758	0	0	0	7.2011	5	4.275	
Story2	B7	5	DStIS2	4.75	-0.3003	16.8447	0	0	0	0	5	4.75	
Story2	B7	5	DStID1	0	-0.1322	-7.4177	0	0	0	0	5	0	
Story2	B7	5	DStID1	0.475	-0.1322	-5.9341	0	0	0	3.171	5	0.475	
Story2	B7	5	DStID1	0.95	-0.1322	-4.4506	0	0	0	5.6374	5	0.95	
Story2	B7	5	DStID1	1.425	-0.1322	-2.9671	0	0	0	7.3991	5	1.425	
Story2	B7	5	DStID1	1.9	-0.1322	-1.4835	0	0	0	8.4561	5	1.9	
Story2	B7	5	DStID1	2.375	-0.1322	0	0	0	0	8.8085	5	2.375	
Story2	B7	5	DStID1	2.85	-0.1322	1.4835	0	0	0	8.4561	5	2.85	
Story2	B7	5	DStID1	3.325	-0.1322	2.9671	0	0	0	7.3991	5	3.325	
Story2	B7	5	DStID1	3.8	-0.1322	4.4506	0	0	0	5.6374	5	3.8	
Story2	B7	5	DStID1	4.275	-0.1322	5.9341	0	0	0	3.171	5	4.275	
Story2	B7	5	DStID1	4.75	-0.1322	7.4177	0	0	0	0	5	4.75	
Story2	B7	5	DStID2	0	-0.2042	-11.4552	0	0	0	0	5	0	
Story2	B7	5	DStID2	0.475	-0.2042	-9.1641	0	0	0	4.8971	5	0.475	
Story2	B7	5	DStID2	0.95	-0.2042	-6.8731	0	0	0	8.7059	5	0.95	
Story2	B7	5	DStID2	1.425	-0.2042	-4.5821	0	0	0	11.4265	5	1.425	
Story2	B7	5	DStID2	1.9	-0.2042	-2.291	0	0	0	13.0589	5	1.9	
Story2	B7	5	DStID2	2.375	-0.2042	0	0	0	0	13.603	5	2.375	
Story2	B7	5	DStID2	2.85	-0.2042	2.291	0	0	0	13.0589	5	2.85	
Story2	B7	5	DStID2	3.325	-0.2042	4.5821	0	0	0	11.4265	5	3.325	
Story2	B7	5	DStID2	3.8	-0.2042	6.8731	0	0	0	8.7059	5	3.8	
Story2	B7	5	DStID2	4.275	-0.2042	9.1641	0	0	0	4.8971	5	4.275	
Story2	B7	5	DStID2	4.75	-0.2042	11.4552	0	0	0	0	5	4.75	
Story1	B5	1	Dead	0.05	0	-66.1307	0	0	0	0	1	0.05	
Story1	B5	1	Dead	0.5429	0	-55.4013	0	0	0	29.9489	1	0.5429	
Story1	B5	1	Dead	1.0357	0	-44.6719	0	0	0	54.6098	1	1.0357	
Story1	B5	1	Dead	1.5286	0	-33.9425	0	0	0	73.9827	1	1.5286	
Story1	B5	1	Dead	2.0214	0	-23.2131	0	0	0	88.0674	1	2.0214	
Story1	B5	1	Dead	2.5143	0	-12.4837	0	0	0	96.8641	1	2.5143	
Story1	B5	1	Dead	3.0071	0	-1.7543	0	0	0	100.3728	1	3.0071	
Story1	B5	1	Dead	3.5	0	8.9751	0	0	0	98.5934	1	3.5	Before
Story1	B5	1	Dead	3.5	0	16.3751	0	0	0	98.5934	1	3.5	After
Story1	B5	1	Dead	3.97	0	26.6069	0	0	0	88.4926	1	3.97	
Story1	B5	1	Dead	4.44	0	36.8387	0	0	0	73.5829	1	4.44	
Story1	B5	1	Dead	4.91	0	47.0705	0	0	0	53.8642	1	4.91	
Story1	B5	1	Dead	5.38	0	57.3023	0	0	0	29.3366	1	5.38	
Story1	B5	1	Dead	5.85	0	67.5341	0	0	0	0	1	5.85	
Story1	B5	1	Live	0.05	0	-25.4412	0	0	0	0	1	0.05	
Story1	B5	1	Live	0.5429	0	-21.3998	0	0	0	11.543	1	0.5429	
Story1	B5	1	Live	1.0357	0	-17.3583	0	0	0	21.0941	1	1.0357	
Story1	B5	1	Live	1.5286	0	-13.3169	0	0	0	28.6533	1	1.5286	
Story1	B5	1	Live	2.0214	0	-9.2755	0	0	0	34.2207	1	2.0214	
Story1	B5	1	Live	2.5143	0	-5.2341	0	0	0	37.7963	1	2.5143	
Story1	B5	1	Live	3.0071	0	-1.1926	0	0	0	39.38	1	3.0071	
Story1	B5	1	Live	3.5	0	2.8488	0	0	0	38.9719	1	3.5	Before

Story	Beam	Unique Name	Load Case/Combo	Station m	P kN	V2 kN	V3 kN	T kN-m	M2 kN-m	M3 kN-m	Element	Station m	Location
Story1	B5	1	Live	3.5	0	6.9488	0	0	0	38.9719	1	3.5	After
Story1	B5	1	Live	3.97	0	10.8028	0	0	0	34.8003	1	3.97	
Story1	B5	1	Live	4.44	0	14.6568	0	0	0	28.8173	1	4.44	
Story1	B5	1	Live	4.91	0	18.5108	0	0	0	21.0229	1	4.91	
Story1	B5	1	Live	5.38	0	22.3648	0	0	0	11.4171	1	5.38	
Story1	B5	1	Live	5.85	0	26.2188	0	0	0	0	1	5.85	
Story1	B5	1	DStIS1	0.05	0	-92.5829	0	0	0	0	1	0.05	
Story1	B5	1	DStIS1	0.5429	0	-77.5618	0	0	0	41.9285	1	0.5429	
Story1	B5	1	DStIS1	1.0357	0	-62.5406	0	0	0	76.4538	1	1.0357	
Story1	B5	1	DStIS1	1.5286	0	-47.5195	0	0	0	103.5757	1	1.5286	
Story1	B5	1	DStIS1	2.0214	0	-32.4983	0	0	0	123.2944	1	2.0214	
Story1	B5	1	DStIS1	2.5143	0	-17.4772	0	0	0	135.6098	1	2.5143	
Story1	B5	1	DStIS1	3.0071	0	-2.456	0	0	0	140.5219	1	3.0071	
Story1	B5	1	DStIS1	3.5	0	12.5652	0	0	0	138.0307	1	3.5	Before
Story1	B5	1	DStIS1	3.5	0	22.9252	0	0	0	138.0307	1	3.5	After
Story1	B5	1	DStIS1	3.97	0	37.2497	0	0	0	123.8896	1	3.97	
Story1	B5	1	DStIS1	4.44	0	51.5742	0	0	0	103.016	1	4.44	
Story1	B5	1	DStIS1	4.91	0	65.8987	0	0	0	75.4099	1	4.91	
Story1	B5	1	DStIS1	5.38	0	80.2233	0	0	0	41.0712	1	5.38	
Story1	B5	1	DStIS1	5.85	0	94.5478	0	0	0	0	1	5.85	
Story1	B5	1	DStIS2	0.05	0	-	133.2889	0	0	0	0	0.05	
Story1	B5	1	DStIS2	0.5429	0	-	111.8014	0	0	0	60.3973	0.5429	
Story1	B5	1	DStIS2	1.0357	0	-90.314	0	0	0	110.2043	1	1.0357	
Story1	B5	1	DStIS2	1.5286	0	-68.8265	0	0	0	149.421	1	1.5286	
Story1	B5	1	DStIS2	2.0214	0	-47.3391	0	0	0	178.0476	1	2.0214	
Story1	B5	1	DStIS2	2.5143	0	-25.8517	0	0	0	196.0839	1	2.5143	
Story1	B5	1	DStIS2	3.0071	0	-4.3642	0	0	0	203.5299	1	3.0071	
Story1	B5	1	DStIS2	3.5	0	17.1232	0	0	0	200.3858	1	3.5	Before
Story1	B5	1	DStIS2	3.5	0	34.0432	0	0	0	200.3858	1	3.5	After
Story1	B5	1	DStIS2	3.97	0	54.5341	0	0	0	179.5701	1	3.97	
Story1	B5	1	DStIS2	4.44	0	75.0251	0	0	0	149.1237	1	4.44	
Story1	B5	1	DStIS2	4.91	0	95.516	0	0	0	109.0465	1	4.91	
Story1	B5	1	DStIS2	5.38	0	116.0069	0	0	0	59.3386	1	5.38	
Story1	B5	1	DStIS2	5.85	0	136.4978	0	0	0	0	1	5.85	
Story1	B5	1	DStID1	0.05	0	-66.1307	0	0	0	0	1	0.05	
Story1	B5	1	DStID1	0.5429	0	-55.4013	0	0	0	29.9489	1	0.5429	
Story1	B5	1	DStID1	1.0357	0	-44.6719	0	0	0	54.6098	1	1.0357	
Story1	B5	1	DStID1	1.5286	0	-33.9425	0	0	0	73.9827	1	1.5286	
Story1	B5	1	DStID1	2.0214	0	-23.2131	0	0	0	88.0674	1	2.0214	
Story1	B5	1	DStID1	2.5143	0	-12.4837	0	0	0	96.8641	1	2.5143	
Story1	B5	1	DStID1	3.0071	0	-1.7543	0	0	0	100.3728	1	3.0071	
Story1	B5	1	DStID1	3.5	0	8.9751	0	0	0	98.5934	1	3.5	Before
Story1	B5	1	DStID1	3.5	0	16.3751	0	0	0	98.5934	1	3.5	After
Story1	B5	1	DStID1	3.97	0	26.6069	0	0	0	88.4926	1	3.97	
Story1	B5	1	DStID1	4.44	0	36.8387	0	0	0	73.5829	1	4.44	
Story1	B5	1	DStID1	4.91	0	47.0705	0	0	0	53.8642	1	4.91	
Story1	B5	1	DStID1	5.38	0	57.3023	0	0	0	29.3366	1	5.38	
Story1	B5	1	DStID1	5.85	0	67.5341	0	0	0	0	1	5.85	
Story1	B5	1	DStID2	0.05	0	-91.5719	0	0	0	0	1	0.05	
Story1	B5	1	DStID2	0.5429	0	-76.8011	0	0	0	41.4919	1	0.5429	
Story1	B5	1	DStID2	1.0357	0	-62.0302	0	0	0	75.7039	1	1.0357	
Story1	B5	1	DStID2	1.5286	0	-47.2594	0	0	0	102.636	1	1.5286	
Story1	B5	1	DStID2	2.0214	0	-32.4886	0	0	0	122.2882	1	2.0214	
Story1	B5	1	DStID2	2.5143	0	-17.7177	0	0	0	134.6604	1	2.5143	

Story	Beam	Unique Name	Load Case/Combo	Station m	P kN	V2 kN	V3 kN	T kN-m	M2 kN-m	M3 kN-m	Element	Element Station m	Location
Story1	B5	1	DSIID2	3.0071	0	-2.9469	0	0	0	139.7528	1	3.0071	
Story1	B5	1	DSIID2	3.5	0	11.8239	0	0	0	137.5653	1	3.5	Before
Story1	B5	1	DSIID2	3.5	0	23.3239	0	0	0	137.5653	1	3.5	After
Story1	B5	1	DSIID2	3.97	0	37.4097	0	0	0	123.2929	1	3.97	
Story1	B5	1	DSIID2	4.44	0	51.4955	0	0	0	102.4001	1	4.44	
Story1	B5	1	DSIID2	4.91	0	65.5813	0	0	0	74.8871	1	4.91	
Story1	B5	1	DSIID2	5.38	0	79.6671	0	0	0	40.7537	1	5.38	
Story1	B5	1	DSIID2	5.85	0	93.7529	0	0	0	0	1	5.85	

5.3 Modal Results

Table 5.4 - Modal Periods and Frequencies

Case	Mode	Period sec	Frequency cyc/sec	Circular Frequency rad/sec	Eigenvalue rad ² /sec ²
Modal	1	-13639840	0	0	0
Modal	2	8414228.503	0	7.467E-07	0
Modal	3	-6746011.699	0	-9.314E-07	0
Modal	4	6737965.413	0	9.325E-07	0
Modal	5	5798716.252	0	1.084E-06	0
Modal	6	-5185298.957	0	-1.212E-06	0
Modal	7	4709864.993	0	1.334E-06	0
Modal	8	4007280.801	0	1.568E-06	0
Modal	9	-3810758.276	0	-1.649E-06	0
Modal	10	3330377.475	0	1.887E-06	0
Modal	11	3330377.475	0	1.887E-06	0
Modal	12	3291760.559	0	1.909E-06	0

Table 5.5 - Modal Participating Mass Ratios (Part 1 of 2)

Case	Mode	Period sec	UX	UY	UZ	Sum UX	Sum UY	Sum UZ
Modal	1	-13639840	0.0015	0.0023	0	0.0015	0.0023	0
Modal	2	8414228.503	0.2607	0.0056	0	0.2622	0.0079	0
Modal	3	-6746011.699	0.0067	0.5197	0	0.2688	0.5276	0
Modal	4	6737965.413	0.1493	0.0036	0	0.4182	0.5311	0
Modal	5	5798716.252	0.0151	0.0006	0	0.4333	0.5318	0
Modal	6	-5185298.957	0.0081	0.029	0	0.4413	0.5608	0
Modal	7	4709864.993	0.1723	0.017	0	0.6136	0.5778	0
Modal	8	4007280.801	0.0153	0.0053	0	0.6289	0.5831	0
Modal	9	-3810758.276	0.0465	0.0285	0	0.6754	0.6117	0
Modal	10	3330377.475	0.1076	0.0168	0	0.783	0.6285	0
Modal	11	3330377.475	0.0002	0.0618	0	0.7832	0.6903	0
Modal	12	3291760.559	0.0005	0.2339	0	0.7836	0.9242	0

Table 5.5 - Modal Participating Mass Ratios (Part 2 of 2)

Case	Mode	RX	RY	RZ	Sum RX	Sum RY	Sum RZ
Modal	1	0.3447	0.0008	0.0303	0.3447	0.0008	0.0303
Modal	2	0.1449	0.2162	0.0289	0.4895	0.217	0.0592
Modal	3	0.0492	0.0055	0.0138	0.5388	0.2225	0.073
Modal	4	0.2791	0.1144	0.2001	0.8178	0.337	0.2731
Modal	5	0.0257	0.0015	0.0266	0.8436	0.3385	0.2997
Modal	6	0.0201	0.0068	0.0529	0.8637	0.3453	0.3526
Modal	7	0.0098	0.011	0.3605	0.8735	0.3562	0.7131
Modal	8	0.0005	0.0307	0.0016	0.874	0.3869	0.7147

Case	Mode	RX	RY	RZ	Sum RX	Sum RY	Sum RZ
Modal	9	0.0044	0.0799	0.0136	0.8784	0.4668	0.7283
Modal	10	0.0201	0.1404	0.0402	0.8985	0.6072	0.7685
Modal	11	0.0181	0.0776	0.0331	0.9166	0.6848	0.8016
Modal	12	0.0029	0.0516	0.0025	0.9196	0.7364	0.804

Table 5.6 - Modal Load Participation Ratios

Case	Item Type	Item	Static %	Dynamic %
Modal	Acceleration	UX	326.58	78.36
Modal	Acceleration	UY	82.62	92.42
Modal	Acceleration	UZ	0	0

Table 5.7 - Modal Direction Factors

Case	Mode	Period sec	UX	UY	UZ	RZ
Modal	1	-13639840	0.015	0.968	0	0.017
Modal	2	8414228.503	0.823	0.158	0	0.019
Modal	3	-6746011.699	0.022	0.92	0	0.058
Modal	4	6737965.413	0.512	0.414	0	0.074
Modal	5	5798716.252	0.021	0.041	0	0.938
Modal	6	-5185298.957	0.101	0.039	0	0.86
Modal	7	4709864.993	0.534	0.07	0	0.397
Modal	8	4007280.801	0.14	0.101	0	0.759
Modal	9	-3810758.276	0.242	0.187	0	0.571
Modal	10	3330377.475	0.199	0.283	0	0.518
Modal	11	3330377.475	0.077	0.274	0	0.649
Modal	12	3291760.559	0.078	0.35	0	0.572

6 Design Data

This chapter provides design data and results.

6.1 Steel Frame Design

Table 6.1 - Steel Frame Preferences - BS 5950-2000

Item	Value
Multi-Response Design	Step-by-Step - All
Frame Type	Moment Frame
Consider Deflection?	Yes
DL Ratio	120
SDL+LL Ratio	120
LL Ratio	360
Total Ratio	240
Total Camber Limit	240
Pattern Live Load Factor	0.75
D/C Ratio Limit	0.95

Table 6.2 - Steel Frame Overwrites - BS 5950-2000 (Part 1 of 4)

Story	Label	Unique Name	Design Type	Design Section	Frame Type	Check Deflection ?	Deflection Type	DL Ratio	SDL+LL Ratio	LL Ratio	Total Ratio
Story6	C1	17	Column	SHHF100X100X8	Moment Frame	Yes	Ratio	120	120	360	240
Story4	C6	12	Column	SHHF100X100X8	Moment Frame	Yes	Ratio	120	120	360	240
Story2	C4	7	Column	SHHF100X100X8	Moment Frame	Yes	Ratio	120	120	360	240
Story2	C5	10	Column	SHHF100X100X8	Moment Frame	Yes	Ratio	120	120	360	240
Story1	C2	2	Column	SHHF100X100X8	Moment Frame	Yes	Ratio	120	120	360	240
Story1	C3	3	Column	Program Determined	Moment Frame	Yes	Ratio	120	120	360	240
Story6	B3	16	Beam	UKC152X152X37	Moment Frame	Yes	Ratio	120	120	360	240
Story5	B1	15	Beam	Program Determined	Moment Frame	Yes	Ratio	120	120	360	240
Story5	B2	14	Beam	UKB203X133X30	Moment Frame	Yes	Ratio	120	120	360	240
Story5	B4	13	Beam	Program Determined	Moment Frame	Yes	Ratio	120	120	360	240
Story4	B8	6	Beam	UKC152X152X23	Moment Frame	Yes	Ratio	120	120	360	240
Story3	B6	4	Beam	UKC152X152X23	Moment Frame	Yes	Ratio	120	120	360	240
Story2	B7	5	Beam	UKC152X152X23	Moment Frame	Yes	Ratio	120	120	360	240
Story1	B5	1	Beam	UKC254X254X89	Moment Frame	Yes	Ratio	120	120	360	240
Story4	D3	11	Brace	UKB152X89X16	Moment Frame	Yes	Ratio	120	120	360	240
Story3	D1	8	Brace	UKB152X89X16	Moment Frame	Yes	Ratio	120	120	360	240
Story3	D2	9	Brace	UKB152X89X16	Moment Frame	Yes	Ratio	120	120	360	240

Table 6.2 - Steel Frame Overwrites - BS 5950-2000 (Part 2 of 4)

Story	Label	Unique Name	Camber Ratio	DL Absolute mm	SDL+LL Absolute mm	LL Absolute mm	Total Absolute mm	Camber Absolute mm	Camber mm	Net Area Ratio	LLRF	Unbraced Length Ratio Major
Story6	C1	17	240						0	1	1	0.946067

Story	Label	Unique Name	Camber Ratio	DL Absolute mm	SDL+LL Absolute mm	LL Absolute mm	Total Absolute mm	Camber Absolute mm	Camber mm	Net Area Ratio	LLRF	Unbraced Length Ratio Major
Story4	C6	12	240						0	1	1	0.958811
Story2	C4	7	240						0	1	1	1
Story2	C5	10	240						0	1	1	0.930727
Story1	C2	2	240						0	1	1	0.876048
Story1	C3	3	240						0	1	1	0.876048
Story6	B3	16	240						0	1	1	0.991803
Story5	B1	15	240						0	1	1	1
Story5	B2	14	240						0	1	1	1
Story5	B4	13	240						0	1	1	1
Story4	B8	6	240						0	1	1	0.989583
Story3	B6	4	240						0	1	1	1
Story2	B7	5	240						0	1	1	0.989583
Story1	B5	1	240						0	1	1	0.981356
Story4	D3	11	240						0	1	1	1
Story3	D1	8	240						0	1	1	1
Story3	D2	9	240						0	1	1	1

Table 6.2 - Steel Frame Overwrites - BS 5950-2000 (Part 3 of 4)

Story	Label	Unique Name	Unbraced Length Ratio Minor	Effective Length Factor Major	Effective Length Factor Minor	Uniform Moment Factor (m Major)	Uniform Moment Factor (m Minor)	Eqv. Uniform Moment factor (mLT)	Yield stress, Fy MPa	Compressive Capacity, Pc kN	Tensile Capacity, Pt kN	Major Bending Capacity, Mc3 kN-m
Story6	C1	17	0.946067	1	1	1	1	1	0	724.4768	1022.4	34.08
Story4	C6	12	0.958811	1	1	0.6	0.6	1	0	540.604	1022.4	34.08
Story2	C4	7	1	1	1	0.6	0.6	1	0	829.8719	1022.4	34.08
Story2	C5	10	0.930727	1	1	0.6	0.6	1	0	893.1835	1022.4	34.08
Story1	C2	2	0.876048	1	1	1	1	1	0	921.6748	1022.4	34.08
Story1	C3	3	0.876048	1	1	1	1	1	0	921.6748	1022.4	34.08
Story6	B3	16	0.991803	1	1	0.95	1	1	0	332.5298	1292.5	84.975
Story5	B1	15	1	1	1	0.95	1	1	0	653.8584	1614.25	136.675
Story5	B2	14	0.636364	1	1	0.951174	1	1	0	633.8788	1050.5	86.35
Story5	B4	13	0.924242	1	1	0.955473	1	1	0	653.8584	1614.25	136.675
Story4	B8	6	0.989583	1	1	0.948	1	1	0	287.3669	797.5	45.1116
Story3	B6	4	1	1	1	0.948	1	1	0	282.5265	797.5	45.1116
Story2	B7	5	0.989583	1	1	0.948	1	1	0	287.3669	797.5	45.1116
Story1	B5	1	0.981356	1	1	0.947643	1	1	0	1872.3825	3107.5	336.6
Story4	D3	11	1	1	1	0.58582	0.598147	1	0	185.0857	558.25	33.825
Story3	D1	8	1	1	1	0.514133	0.795918	1	0	406.969	558.25	33.825
Story3	D2	9	1	1	1	0.479623	0.600385	1	0	231.6088	558.25	33.825

Table 6.2 - Steel Frame Overwrites - BS 5950-2000 (Part 4 of 4)

Story	Label	Unique Name	Minor Bending Capacity, Mc2 kN-m	Buckling Resistance Moment, Mb kN-m	Major Shear Capacity, Pv2 kN	Minor Shear Capacity, Pv3 kN	D/C Ratio Limit
Story6	C1	17	34.08	34.861	306.72	306.72	0.95
Story4	C6	12	34.08	34.861	306.72	306.72	0.95
Story2	C4	7	34.08	34.861	306.72	306.72	0.95
Story2	C5	10	34.08	34.861	306.72	306.72	0.95
Story1	C2	2	34.08	34.861	306.72	306.72	0.95
Story1	C3	3	34.08	34.861	306.72	306.72	0.95
Story6	B3	16	30.1788	52.0236	213.576	527.3532	0.95
Story5	B1	15	50.1808	88.6192	241.4016	665.1612	0.95

Story	Label	Unique Name	Minor Bending Capacity, Mc2 kN-m	Buckling Resistance Moment, Mb kN-m	Major Shear Capacity, Pv2 kN	Minor Shear Capacity, Pv3 kN	D/C Ratio Limit
Story5	B2	14	18.9768	62.155	218.3808	381.7757	0.95
Story5	B4	13	50.1808	88.6192	241.4016	665.1612	0.95
Story4	B8	6	14.4547	27.9386	145.8468	307.3831	0.95
Story3	B6	4	14.4547	27.7325	145.8468	307.3831	0.95
Story2	B7	5	14.4547	27.9386	145.8468	307.3831	0.95
Story1	B5	1	125.073	269.283	442.3799	1316.895	0.95
Story4	D3	11	6.6818	18.2653	113.157	202.848	0.95
Story3	D1	8	8.3523	27.6491	113.157	202.848	0.95
Story3	D2	9	6.6818	20.3365	113.157	202.848	0.95

Table 6.3 - Steel Column Envelope

Label	Story	Section	Moment Interaction Check	PMM Combo	V22 Ratio	V33 Ratio	Class	Cont. Plate cm ²	Dbl. Plate mm	B/C Ratio Major	B/C Ratio Minor
C1	Story6	SHHF100X100X8	0.034 = 0.034 + 0 + 0	DStIS2	0	0	Class 1				
C6	Story4	SHHF100X100X8	0.057 = 0.032 + 0.007 + 0.018	DStIS2	0.0002119	0.001	Class 1				
C4	Story2	SHHF100X100X8	0.103 = 0.012 + 0.091 + 0	DStIS2	0.004	0	Class 1				
C5	Story2	SHHF100X100X8	0.121 = 0.024 + 0.076 + 0.021	DStIS2	0.004	0.001	Class 1				
C2	Story1	SHHF100X100X8	0.148 = 0.148 + 0 + 0	DStIS2	0	0	Class 1				
C3	Story1	SHHF100X100X8	0.151 = 0.151 + 0 + 0	DStIS2	0	0	Class 1				

Table 6.4 - Steel Beam Envelope

Label	Story	Section	Moment Interaction Check	PMM Combo	V22 Ratio	V33 Ratio	Class	Conn. V I-End kN	Conn. V J-End kN
B3	Story6	UKC152X152X37	0.672 = 0 + 0.672 + 0	DStIS2	0.109	0	Class 1	0	0
B1	Story5	UKC203X203X46	0.747 = 0 + 0.747 + 0	DStIS2	0.181	0	Class 2	0	0
B2	Story5	UKB203X133X30	0.845 = 0 + 0.845 + 0	DStIS2	0.169	0	Class 1	0	0
B4	Story5	UKC203X203X46	0.83 = 0 + 0.83 + 0	DStIS2	0.303	0	Class 2	0	0
B8	Story4	UKC152X152X23	0.747 = 0.001 + 0.746 + 0	DStIS2	0.12	0	Class 3	0	0
B6	Story3	UKC152X152X23	0.66 = 1.017E-04 + 0.66 + 0	DStIS2	0.105	0	Class 3	0	0
B7	Story2	UKC152X152X23	0.717 = 0.001 + 0.716 + 0	DStIS2	0.115	0	Class 3	0	0
B5	Story1	UKC254X254X89	0.756 = 0 + 0.756 + 0	DStIS2	0.309	0	Class 1	0	0

Table 6.5 - Steel Brace Envelope

Label	Story	Section	Moment Interaction Check	PMM Combo	V22 Ratio	V33 Ratio	Class	Conn. P I-End kN	Conn. P J-End kN
D3	Story4	UKB152X89X16	0.112 = 0.003 + 0.101 + 0.008	DStIS2	0.007	0.0001286	Class 1	0	0
D1	Story3	UKB152X89X16	0.277 = 0.017 + 0.26 + 0	DStIS2	0.062	0	Class 1	0	0
D2	Story3	UKB152X89X16	0.37 = 0.016 + 0.354 + 0	DStIS2	0.045	0.0001408	Class 1	0	0

Table 6.6 - Steel Frame Summary - BS 5950-2000 (Part 1 of 2)

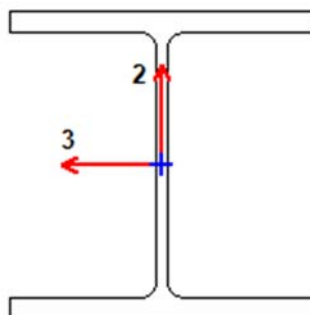
Story	Label	Unique Name	Design Type	Design Section	Status	PMM Combo	PMM Ratio	P Ratio	M Major Ratio	M Minor Ratio
Story6	C1	17	Column	SHHF100X100X8	No Message	DStIS2(C)	0.034	0.034	0	0
Story4	C6	12	Column	SHHF100X100X8	No Message	DStIS2(C)	0.057	0.032	0.007	0.018
Story2	C4	7	Column	SHHF100X100X8	No Message	DStIS2(C)	0.103	0.012	0.091	0
Story2	C5	10	Column	SHHF100X100X8	No Message	DStIS2(C)	0.121	0.024	0.076	0.021
Story1	C2	2	Column	SHHF100X100X8	No Message	DStIS2(C)	0.148	0.148	0	0
Story1	C3	3	Column	SHHF100X100X8	No Message	DStIS2(C)	0.151	0.151	0	0
Story6	B3	16	Beam	UKC152X152X37	No Message	DStIS2(C)	0.672	0	0.672	0
Story5	B1	15	Beam	UKC203X203X46	No Message	DStIS2(C)	0.747	0	0.747	0
Story5	B2	14	Beam	UKB203X133X30	No Message	DStIS2(C)	0.845	0	0.845	0
Story5	B4	13	Beam	UKC203X203X46	No Message	DStIS2(C)	0.83	0	0.83	0
Story4	B8	6	Beam	UKC152X152X23	No Message	DStIS2(C)	0.747	0.001	0.746	0
Story3	B6	4	Beam	UKC152X152X23	No Message	DStIS2(C)	0.66	0.0001017	0.66	0
Story2	B7	5	Beam	UKC152X152X23	No Message	DStIS2(C)	0.717	0.001	0.716	0
Story1	B5	1	Beam	UKC254X254X89	No Message	DStIS2(C)	0.756	0	0.756	0
Story4	D3	11	Brace	UKB152X89X16	No Message	DStIS2(C)	0.112	0.003	0.101	0.008
Story3	D1	8	Brace	UKB152X89X16	No Message	DStIS2(C)	0.277	0.017	0.26	0
Story3	D2	9	Brace	UKB152X89X16	No Message	DStIS2(C)	0.37	0.016	0.354	0

Table 6.6 - Steel Frame Summary - BS 5950-2000 (Part 2 of 2)

Story	Label	Unique Name	V Major Combo	V Major Ratio	V Minor Combo	V Minor Ratio
Story6	C1	17	DStIS2	0	DStIS2	0
Story4	C6	12	DStIS2	0.0002119	DStIS2	0.001
Story2	C4	7	DStIS2	0.004	DStIS2	0
Story2	C5	10	DStIS2	0.004	DStIS2	0.001
Story1	C2	2	DStIS2	0	DStIS2	0
Story1	C3	3	DStIS2	0	DStIS2	0
Story6	B3	16	DStIS2	0.109	DStIS2	0
Story5	B1	15	DStIS2	0.181	DStIS2	0
Story5	B2	14	DStIS2	0.169	DStIS2	0
Story5	B4	13	DStIS2	0.303	DStIS2	0
Story4	B8	6	DStIS2	0.12	DStIS2	0
Story3	B6	4	DStIS2	0.105	DStIS2	0
Story2	B7	5	DStIS2	0.115	DStIS2	0
Story1	B5	1	DStIS2	0.309	DStIS2	0
Story4	D3	11	DStIS2	0.007	DStIS2	0.0001286
Story3	D1	8	DStIS2	0.062	DStIS2	0
Story3	D2	9	DStIS2	0.045	DStIS2	0.0001408

ETABS Steel Frame Design

BS 5950-2000 Steel Section Check (Envelope Details)



Element Details

Level	Element	Unique Name	Section	Combo	Location	Frame Type	Classification
Story1	B5	1	UKC254X254X89	DStIS2	3007.1	Moment Resisting Frame	Class 2

Section Properties

A (cm ²)	I ₃₃ (cm ⁴)	r ₃₃ (mm)	W _{el33} (cm ³)	A _{v3} (cm ²)	W _{pl33} (cm ³)
113	14268	112.4	1096.3	73.9	1224

J (cm ⁴)	I ₂₂ (cm ⁴)	r ₂₂ (mm)	W _{el22} (cm ³)	A _{v2} (cm ²)	W _{pl22} (cm ³)	C _w (cm ⁶)
102	4857	65.6	379	26.8	575	716627.1

Material Properties

E (MPa)	f _y (MPa)
210000	275

LLRF and Demand/Capacity Ratio

L (mm)	LLRF	Stress Ratio Limit
5900.0	1	0.95

Demand/Capacity (D/C) Ratio (4.8.3.3.1-2)

D/C Ratio	Axial Ratio	Flexural Ratio _{Major}	Flexural Ratio _{Minor}
0.756	0 +	0.756 +	0

Stress Check forces and Moments

Location (mm)	N (kN)	M ₃₃ (kN-m)	M ₂₂ (kN-m)	V ₂ (kN)	V ₃ (kN)
3007.1	0	203.5299	0	-4.3642	0

Axial Force & Biaxial Moment Design Factors (4.8.3.3.1-2)

	L Factor	K	m Factor	m_{LT}
Major Bending	0.981	1	0.948	1
Minor Bending	0.981	1	1	

Axial Force and Capacities

N Force (kN)	N_t Strength (kN)	N_c Strength (kN)	N_c Major (kN)	N_c Minor (kN)
0	3107.5	1872.3825	2823.719	1872.3825

Moments and Capacities

	M Moment (kN-m)	M_c Capacity (kN-m)	M_b Strength (kN-m)
Major Bending	203.5299	336.6	269.283
Minor Bending	0	125.073	

Shear Design

	F_v Force (kN)	N_v Strength (kN)	Stress Ratio
Major Shear	136.4978	442.3799	0.309
Minor Shear	0	1316.895	0

Element Details

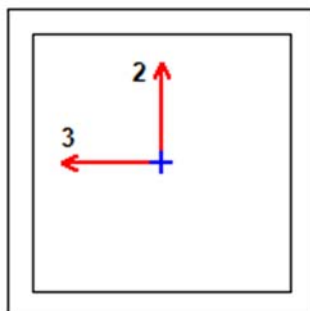
Level	Element	Unique Name	Element Type	Section
Story1	B5	1	Moment Resisting Frame	UKC254X254X89

DEFLECTION DESIGN

Deflection Type	L	Deflection Value	Deflection Limit	Deflection Ratio	Load Combo	Station Location	Check Status
	mm	mm	mm			mm	
Dead Load	5900	11.6	49.2	0.236	DS1D2	3007.1	OK
Super DL + Live Load	5900	4.5	49.2	0.092	DS1D2	3007.1	OK
Live Load	5900	4.5	16.4	0.277	DS1D2	3007.1	OK
Total Load	5900	16.1	24.6	0.656	DS1D2	3007.1	OK
Total - Camber	5900	16.1	24.6	0.656	DS1D2	3007.1	OK

ETABS Steel Frame Design

BS 5950-2000 Steel Section Check (Envelope Details)



Element Details

Level	Element	Unique Name	Section	Combo	Location	Frame Type	Classification
Story1	C3	3	SHHF100X100X8	DStIS2	0	Moment Resisting Frame	Class 2

Section Properties

A (cm ²)	I ₃₃ (cm ⁴)	r ₃₃ (mm)	W _{el33} (cm ³)	A _{v3} (cm ²)	W _{pl33} (cm ³)
28.8	400	37.3	80	16	98.2

J (cm ⁴)	I ₂₂ (cm ⁴)	r ₂₂ (mm)	W _{el22} (cm ³)	A _{v2} (cm ²)	W _{pl22} (cm ³)	C _w (cm ⁶)
646	400	37.3	80	16	98.2	

Material Properties

E (MPa)	f _y (MPa)
210000	355

LLRF and Demand/Capacity Ratio

L (mm)	LLRF	Stress Ratio Limit
2100.0	1	0.95

Demand/Capacity (D/C) Ratio (4.8.3.3.1-2)

D/C Ratio	Axial Ratio	Flexural Ratio _{Major}	Flexural Ratio _{Minor}
0.151	0.151 +	0 +	0

Stress Check forces and Moments

Location (mm)	N (kN)	M ₃₃ (kN-m)	M ₂₂ (kN-m)	V ₂ (kN)	V ₃ (kN)
0	-139.2686	0	0	0	0

Axial Force & Biaxial Moment Design Factors (4.8.3.3.1-2)

	L Factor	K	m Factor	m_{LT}
Major Bending	0.876	1	1	1
Minor Bending	0.876	1	1	

Axial Force and Capacities

N Force (kN)	N_t Strength (kN)	N_c Strength (kN)	N_c Major (kN)	N_c Minor (kN)
139.2686	1022.4	921.6748	921.6748	921.6748

Moments and Capacities

	M Moment (kN-m)	M_c Capacity (kN-m)	M_b Strength (kN-m)
Major Bending	0	34.08	34.861
Minor Bending	0	34.08	

Shear Design

	F_v Force (kN)	N_v Strength (kN)	Stress Ratio
Major Shear	0	306.72	0
Minor Shear	0	306.72	0

Element Details

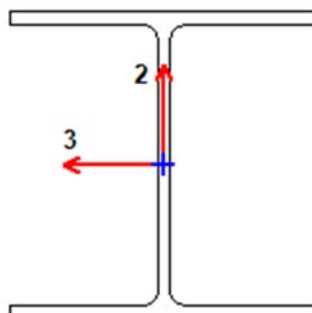
Level	Element	Unique Name	Element Type	Section
Story1	C3	3	Moment Resisting Frame	SHHF100X100X8

DEFLECTION DESIGN

Deflection Type	L mm	Deflection Value mm	Deflection Limit mm	Deflection Ratio	Load Combo	Station Location mm	Check Status
Dead Load	2100	0	17.5	0	DS1D2	1839.7	OK
Super DL + Live Load	2100	0	17.5	0	DS1D2	1839.7	OK
Live Load	2100	0	5.8	0	DS1D2	1839.7	OK
Total Load	2100	0	8.8	0	DS1D2	1839.7	OK
Total - Camber	2100	0	8.8	0	DS1D2	1839.7	OK

ETABS Steel Frame Design

BS 5950-2000 Steel Section Check (Envelope Details)



Element Details

Level	Element	Unique Name	Section	Combo	Location	Frame Type	Classification
Story3	B6	4	UKC152X152X2 3	DStIS2	2400	Moment Resisting Frame	Class 3

Section Properties

A (cm ²)	I ₃₃ (cm ⁴)	r ₃₃ (mm)	W _{el33} (cm ³)	A _{v3} (cm ²)	W _{pl33} (cm ³)
29	1250	65.7	164	17.2	182

J (cm ⁴)	I ₂₂ (cm ⁴)	r ₂₂ (mm)	W _{el22} (cm ³)	A _{v2} (cm ²)	W _{pl22} (cm ³)	C _w (cm ⁶)
4.6	400	37.1	52.6	8.8	80	21177

Material Properties

E (MPa)	f _y (MPa)
210000	275

LLRF and Demand/Capacity Ratio

L (mm)	LLRF	Stress Ratio Limit
4800.0	1	0.95

Demand/Capacity (D/C) Ratio (4.8.3.3.1-2)

D/C Ratio	Axial Ratio	Flexural Ratio _{Major}	Flexural Ratio _{Minor}
0.66	1.017E-04 +	0.66 +	0

Stress Check forces and Moments

Location (mm)	N (kN)	M ₃₃ (kN-m)	M ₂₂ (kN-m)	V ₂ (kN)	V ₃ (kN)
2400	-0.0287	18.2952	0	0	0

Axial Force & Biaxial Moment Design Factors (4.8.3.3.1-2)

	L Factor	K	m Factor	m_{LT}
Major Bending	1	1	0.948	1
Minor Bending	1	1	1	

Axial Force and Capacities

N Force (kN)	N_t Strength (kN)	N_c Strength (kN)	N_c Major (kN)	N_c Minor (kN)
0.0287	797.5	282.5265	634.9041	282.5265

Moments and Capacities

	M Moment (kN-m)	M_c Capacity (kN-m)	M_b Strength (kN-m)
Major Bending	18.2952	45.1116	27.7325
Minor Bending	0	14.4547	

Shear Design

	F_v Force (kN)	N_v Strength (kN)	Stress Ratio
Major Shear	15.246	145.8468	0.105
Minor Shear	0	307.3831	0

Element Details

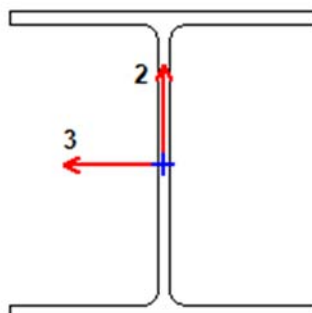
Level	Element	Unique Name	Element Type	Section
Story3	B6	4	Moment Resisting Frame	UKC152X152X2 3

DEFLECTION DESIGN

Deflection Type	L	Deflection Value	Deflection Limit	Deflection Ratio	Load Combo	Station Location	Check Status
	mm	mm	mm			mm	
Dead Load	4800	7.4	40	0.184	DS1D2	2400	OK
Super DL + Live Load	4800	3.9	40	0.098	DS1D2	2400	OK
Live Load	4800	3.9	13.3	0.294	DS1D2	2400	OK
Total Load	4800	11.3	20	0.565	DS1D2	2400	OK
Total - Camber	4800	11.3	20	0.565	DS1D2	2400	OK

ETABS Steel Frame Design

BS 5950-2000 Steel Section Check (Envelope Details)



Element Details

Level	Element	Unique Name	Section	Combo	Location	Frame Type	Classification
Story4	B8	6	UKC152X152X23	DStIS2	2375	Moment Resisting Frame	Class 3

Section Properties

A (cm ²)	I ₃₃ (cm ⁴)	r ₃₃ (mm)	W _{el33} (cm ³)	A _{v3} (cm ²)	W _{pl33} (cm ³)
29	1250	65.7	164	17.2	182

J (cm ⁴)	I ₂₂ (cm ⁴)	r ₂₂ (mm)	W _{el22} (cm ³)	A _{v2} (cm ²)	W _{pl22} (cm ³)	C _w (cm ⁶)
4.6	400	37.1	52.6	8.8	80	21177

Material Properties

E (MPa)	f _y (MPa)
210000	275

LLRF and Demand/Capacity Ratio

L (mm)	LLRF	Stress Ratio Limit
4800.0	1	0.95

Demand/Capacity (D/C) Ratio (4.8.3.3.1-2)

D/C Ratio	Axial Ratio	Flexural Ratio _{Major}	Flexural Ratio _{Minor}
0.747	0.001 +	0.746 +	0

Stress Check forces and Moments

Location (mm)	N (kN)	M ₃₃ (kN-m)	M ₂₂ (kN-m)	V ₂ (kN)	V ₃ (kN)
2375	-0.2654	20.8492	0	0	0

Axial Force & Biaxial Moment Design Factors (4.8.3.3.1-2)

	L Factor	K	m Factor	m_{LT}
Major Bending	0.99	1	0.948	1
Minor Bending	0.99	1	1	

Axial Force and Capacities

N Force (kN)	N_t Strength (kN)	N_c Strength (kN)	N_c Major (kN)	N_c Minor (kN)
0.2654	797.5	287.3669	639.0328	287.3669

Moments and Capacities

	M Moment (kN-m)	M_c Capacity (kN-m)	M_b Strength (kN-m)
Major Bending	20.8492	45.1116	27.9386
Minor Bending	0	14.4547	

Shear Design

	F_v Force (kN)	N_v Strength (kN)	Stress Ratio
Major Shear	17.5572	145.8468	0.12
Minor Shear	0	307.3831	0

Element Details

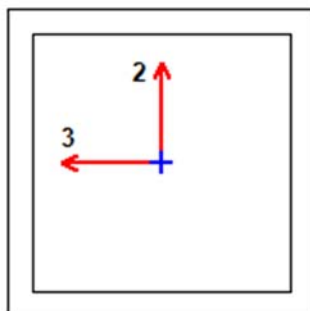
Level	Element	Unique Name	Element Type	Section
Story4	B8	6	Moment Resisting Frame	UKC152X152X2 3

DEFLECTION DESIGN

Deflection Type	L	Deflection Value	Deflection Limit	Deflection Ratio	Load Combo	Station Location	Check Status
	mm	mm	mm			mm	
Dead Load	4800	8.1	40	0.202	DSIID2	2375	OK
Super DL + Live Load	4800	4.5	40	0.113	DSIID2	2375	OK
Live Load	4800	4.5	13.3	0.338	DSIID2	2375	OK
Total Load	4800	12.6	20	0.629	DSIID2	2375	OK
Total - Camber	4800	12.6	20	0.629	DSIID2	2375	OK

ETABS Steel Frame Design

BS 5950-2000 Steel Section Check (Envelope Details)



Element Details

Level	Element	Unique Name	Section	Combo	Location	Frame Type	Classification
Story2	C4	7	SHHF100X100X8	DStIS2	2400	Moment Resisting Frame	Class 2

Section Properties

A (cm ²)	I ₃₃ (cm ⁴)	r ₃₃ (mm)	W _{el33} (cm ³)	A _{v3} (cm ²)	W _{pl33} (cm ³)
28.8	400	37.3	80	16	98.2

J (cm ⁴)	I ₂₂ (cm ⁴)	r ₂₂ (mm)	W _{el22} (cm ³)	A _{v2} (cm ²)	W _{pl22} (cm ³)	C _w (cm ⁶)
646	400	37.3	80	16	98.2	

Material Properties

E (MPa)	f _y (MPa)
210000	355

LLRF and Demand/Capacity Ratio

L (mm)	LLRF	Stress Ratio Limit
2400.0	1	0.95

Demand/Capacity (D/C) Ratio (4.8.3.3.1-2)

D/C Ratio	Axial Ratio	Flexural Ratio _{Major}	Flexural Ratio _{Minor}
0.103	0.012 +	0.091 +	8.517E-06

Stress Check forces and Moments

Location (mm)	N (kN)	M ₃₃ (kN-m)	M ₂₂ (kN-m)	V ₂ (kN)	V ₃ (kN)
2400	-9.8082	3.1862	-0.0004	-1.3276	0.0002

Axial Force & Biaxial Moment Design Factors (4.8.3.3.1-2)

	L Factor	K	m Factor	m_{LT}
Major Bending	1	1	0.6	1
Minor Bending	1	1	0.6	

Axial Force and Capacities

N Force (kN)	N_t Strength (kN)	N_c Strength (kN)	N_c Major (kN)	N_c Minor (kN)
9.8082	1022.4	829.8719	829.8719	829.8719

Moments and Capacities

	M Moment (kN-m)	M_c Capacity (kN-m)	M_b Strength (kN-m)
Major Bending	3.1862	34.08	34.861
Minor Bending	0.0004	34.08	

Shear Design

	F_v Force (kN)	N_v Strength (kN)	Stress Ratio
Major Shear	1.3276	306.72	0.004
Minor Shear	0.0002	306.72	0

Element Details

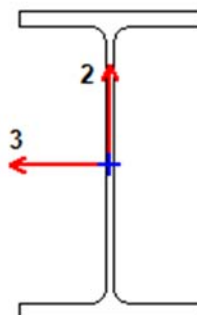
Level	Element	Unique Name	Element Type	Section
Story2	C4	7	Moment Resisting Frame	SHHF100X100X8

DEFLECTION DESIGN

Deflection Type	L	Deflection Value	Deflection Limit	Deflection Ratio	Load Combo	Station Location	Check Status
	mm	mm	mm			mm	
Dead Load	2400	0	20	0	DSIID2	2400	OK
Super DL + Live Load	2400	0	20	0	DSIID2	2400	OK
Live Load	2400	0	6.7	0	DSIID2	2400	OK
Total Load	2400	0	10	0	DSIID2	2400	OK
Total - Camber	2400	0	10	0	DSIID2	2400	OK

ETABS Steel Frame Design

BS 5950-2000 Steel Section Check (Envelope Details)



Element Details

Level	Element	Unique Name	Section	Combo	Location	Frame Type	Classification
Story3	D1	8	UKB152X89X16	DSIS2	1500	Moment Resisting Frame	Class 2

Section Properties

A (cm ²)	I ₃₃ (cm ⁴)	r ₃₃ (mm)	W _{el33} (cm ³)	A _{v3} (cm ²)	W _{pl33} (cm ³)
20.3	834	64.1	109.4	11.4	123

J (cm ⁴)	I ₂₂ (cm ⁴)	r ₂₂ (mm)	W _{el22} (cm ³)	A _{v2} (cm ²)	W _{pl22} (cm ³)	C _w (cm ⁶)
3.6	89.8	21	20.2	6.9	31.2	4688

Material Properties

E (MPa)	f _y (MPa)
210000	275

LLRF and Demand/Capacity Ratio

L (mm)	LLRF	Stress Ratio Limit
1500.0	1	0.95

Demand/Capacity (D/C) Ratio (4.8.3.3.1-2)

D/C Ratio	Axial Ratio	Flexural Ratio _{Major}	Flexural Ratio _{Minor}
0.277	0.017 +	0.26 +	7.059E-05

Stress Check forces and Moments

Location (mm)	N (kN)	M ₃₃ (kN-m)	M ₂₂ (kN-m)	V ₂ (kN)	V ₃ (kN)
1500	-6.7501	7.1919	0.0005	-6.7875	-0.0002

Axial Force & Biaxial Moment Design Factors (4.8.3.3.1-2)

	L Factor	K	m Factor	m_{LT}
Major Bending	1	1	0.514	1
Minor Bending	1	1	0.796	

Axial Force and Capacities

N Force (kN)	N_t Strength (kN)	N_c Strength (kN)	N_c Major (kN)	N_c Minor (kN)
6.7501	558.25	406.969	551.0794	406.969

Moments and Capacities

	M Moment (kN-m)	M_c Capacity (kN-m)	M_b Strength (kN-m)
Major Bending	7.1919	33.825	27.6491
Minor Bending	0.0005	8.3523	

Shear Design

	F_v Force (kN)	N_v Strength (kN)	Stress Ratio
Major Shear	7.05	113.157	0.062
Minor Shear	0.0002	202.848	0

Element Details

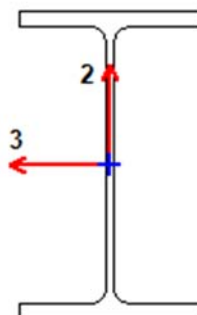
Level	Element	Unique Name	Element Type	Section
Story3	D1	8	Moment Resisting Frame	UKB152X89X16

DEFLECTION DESIGN

Deflection Type	L	Deflection Value	Deflection Limit	Deflection Ratio	Load Combo	Station Location	Check Status
	mm	mm	mm			mm	
Dead Load	1500	0	12.5	0	DS1D2	1500	OK
Super DL + Live Load	1500	0	12.5	0	DS1D2	1500	OK
Live Load	1500	0	4.2	0	DS1D2	1500	OK
Total Load	1500	0	6.3	0	DS1D2	1500	OK
Total - Camber	1500	0	6.3	0	DS1D2	1500	OK

ETABS Steel Frame Design

BS 5950-2000 Steel Section Check (Envelope Details)



Element Details

Level	Element	Unique Name	Section	Combo	Location	Frame Type	Classification
Story3	D2	9	UKB152X89X16	DSIS2	2459.7	Moment Resisting Frame	Class 2

Section Properties

A (cm ²)	I ₃₃ (cm ⁴)	r ₃₃ (mm)	W _{el33} (cm ³)	A _{v3} (cm ²)	W _{pl33} (cm ³)
20.3	834	64.1	109.4	11.4	123

J (cm ⁴)	I ₂₂ (cm ⁴)	r ₂₂ (mm)	W _{el22} (cm ³)	A _{v2} (cm ²)	W _{pl22} (cm ³)	C _w (cm ⁶)
3.6	89.8	21	20.2	6.9	31.2	4688

Material Properties

E (MPa)	f _y (MPa)
210000	275

LLRF and Demand/Capacity Ratio

L (mm)	LLRF	Stress Ratio Limit
2459.7	1	0.95

Demand/Capacity (D/C) Ratio (4.8.3.3.1-2)

D/C Ratio	Axial Ratio	Flexural Ratio _{Major}	Flexural Ratio _{Minor}
0.37	0.016 +	0.354 +	7.29E-06

Stress Check forces and Moments

Location (mm)	N (kN)	M ₃₃ (kN-m)	M ₂₂ (kN-m)	V ₂ (kN)	V ₃ (kN)
2459.7	-3.766	7.1919	0.0001	-4.5635	0.0286

Axial Force & Biaxial Moment Design Factors (4.8.3.3.1-2)

	L Factor	K	m Factor	m_{LT}
Major Bending	1	1	0.48	1
Minor Bending	1	1	0.6	

Axial Force and Capacities

N Force (kN)	N_t Strength (kN)	N_c Strength (kN)	N_c Major (kN)	N_c Minor (kN)
3.766	558.25	231.6088	530.8513	231.6088

Moments and Capacities

	M Moment (kN-m)	M_c Capacity (kN-m)	M_b Strength (kN-m)
Major Bending	7.1919	33.825	20.3365
Minor Bending	0.0001	6.6818	

Shear Design

	F_v Force (kN)	N_v Strength (kN)	Stress Ratio
Major Shear	5.0448	113.157	0.045
Minor Shear	0.0286	202.848	1.408E-04

Element Details

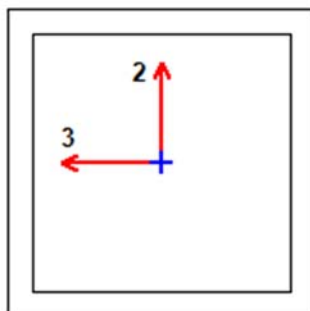
Level	Element	Unique Name	Element Type	Section
Story3	D2	9	Moment Resisting Frame	UKB152X89X16

DEFLECTION DESIGN

Deflection Type	L mm	Deflection Value mm	Deflection Limit mm	Deflection Ratio	Load Combo	Station Location mm	Check Status
Dead Load	2459.7	0	20.5	0	DS1D2	2459.7	OK
Super DL + Live Load	2459.7	0	20.5	0	DS1D2	2459.7	OK
Live Load	2459.7	0	6.8	0	DS1D2	2459.7	OK
Total Load	2459.7	0	10.2	0	DS1D2	2459.7	OK
Total - Camber	2459.7	0	10.2	0	DS1D2	2459.7	OK

ETABS Steel Frame Design

BS 5950-2000 Steel Section Check (Envelope Details)



Element Details

Level	Element	Unique Name	Section	Combo	Location	Frame Type	Classification
Story2	C5	10	SHHF100X100X8	DStIS2	2047.6	Moment Resisting Frame	Class 2

Section Properties

A (cm ²)	I ₃₃ (cm ⁴)	r ₃₃ (mm)	W _{el33} (cm ³)	A _{v3} (cm ²)	W _{pl33} (cm ³)
28.8	400	37.3	80	16	98.2

J (cm ⁴)	I ₂₂ (cm ⁴)	r ₂₂ (mm)	W _{el22} (cm ³)	A _{v2} (cm ²)	W _{pl22} (cm ³)	C _w (cm ⁶)
646	400	37.3	80	16	98.2	

Material Properties

E (MPa)	f _y (MPa)
210000	355

LLRF and Demand/Capacity Ratio

L (mm)	LLRF	Stress Ratio Limit
2200.0	1	0.95

Demand/Capacity (D/C) Ratio (4.8.3.2)

D/C Ratio	Axial Ratio	Flexural Ratio _{Major}	Flexural Ratio _{Minor}
0.121	0.024 +	0.076 +	0.021

Stress Check forces and Moments

Location (mm)	N (kN)	M ₃₃ (kN-m)	M ₂₂ (kN-m)	V ₂ (kN)	V ₃ (kN)
2047.6	-24.5546	-2.5853	-0.7268	1.2626	0.3549

Axial Force & Biaxial Moment Design Factors (4.8.3.2)

	L Factor	K	m Factor	m_{LT}
Major Bending	0.931	1	0.6	1
Minor Bending	0.931	1	0.6	

Axial Force and Capacities

N Force (kN)	N_t Strength (kN)	N_c Strength (kN)	N_c Major (kN)	N_c Minor (kN)
24.5546	1022.4	893.1835	893.1835	893.1835

Moments and Capacities

	M Moment (kN-m)	M_c Capacity (kN-m)	M_b Strength (kN-m)
Major Bending	2.5853	34.08	34.861
Minor Bending	0.7268	34.08	

Shear Design

	F_v Force (kN)	N_v Strength (kN)	Stress Ratio
Major Shear	1.2626	306.72	0.004
Minor Shear	0.3549	306.72	0.001

Element Details

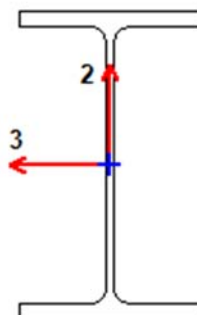
Level	Element	Unique Name	Element Type	Section
Story2	C5	10	Moment Resisting Frame	SHHF100X100X8

DEFLECTION DESIGN

Deflection Type	L	Deflection Value	Deflection Limit	Deflection Ratio	Load Combo	Station Location	Check Status
	mm	mm	mm			mm	
Dead Load	2200	0	18.3	0	DSIID2	2047.6	OK
Super DL + Live Load	2200	0	18.3	0	DSIID2	2047.6	OK
Live Load	2200	0	6.1	0	DSIID2	2047.6	OK
Total Load	2200	0	9.2	0	DSIID2	2047.6	OK
Total - Camber	2200	0	9.2	0	DSIID2	2047.6	OK

ETABS Steel Frame Design

BS 5950-2000 Steel Section Check (Envelope Details)



Element Details

Level	Element	Unique Name	Section	Combo	Location	Frame Type	Classification
Story4	D3	11	UKB152X89X16	DSIS2	0	Moment Resisting Frame	Class 2

Section Properties

A (cm ²)	I ₃₃ (cm ⁴)	r ₃₃ (mm)	W _{el33} (cm ³)	A _{v3} (cm ²)	W _{pl33} (cm ³)
20.3	834	64.1	109.4	11.4	123

J (cm ⁴)	I ₂₂ (cm ⁴)	r ₂₂ (mm)	W _{el22} (cm ³)	A _{v2} (cm ²)	W _{pl22} (cm ³)	C _w (cm ⁶)
3.6	89.8	21	20.2	6.9	31.2	4688

Material Properties

E (MPa)	f _y (MPa)
210000	275

LLRF and Demand/Capacity Ratio

L (mm)	LLRF	Stress Ratio Limit
2830.2	1	0.95

Demand/Capacity (D/C) Ratio (4.8.3.3.1-2)

D/C Ratio	Axial Ratio	Flexural Ratio _{Major}	Flexural Ratio _{Minor}
0.112	0.003 +	0.101 +	0.008

Stress Check forces and Moments

Location (mm)	N (kN)	M ₃₃ (kN-m)	M ₂₂ (kN-m)	V ₂ (kN)	V ₃ (kN)
0	-0.5955	-1.847	-0.0732	-0.8301	-0.0261

Axial Force & Biaxial Moment Design Factors (4.8.3.3.1-2)

	L Factor	K	m Factor	m_{LT}
Major Bending	1	1	0.586	1
Minor Bending	1	1	0.598	

Axial Force and Capacities

N Force (kN)	N_t Strength (kN)	N_c Strength (kN)	N_c Major (kN)	N_c Minor (kN)
0.5955	558.25	185.0857	521.4093	185.0857

Moments and Capacities

	M Moment (kN-m)	M_c Capacity (kN-m)	M_b Strength (kN-m)
Major Bending	1.847	33.825	18.2653
Minor Bending	0.0732	6.6818	

Shear Design

	F_v Force (kN)	N_v Strength (kN)	Stress Ratio
Major Shear	0.8301	113.157	0.007
Minor Shear	0.0261	202.848	1.286E-04

Element Details

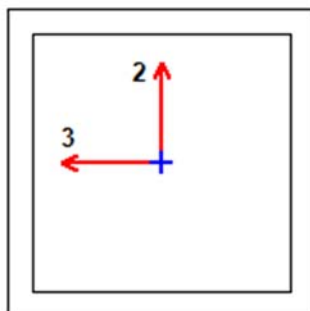
Level	Element	Unique Name	Element Type	Section
Story4	D3	11	Moment Resisting Frame	UKB152X89X16

DEFLECTION DESIGN

Deflection Type	L mm	Deflection Value mm	Deflection Limit mm	Deflection Ratio	Load Combo	Station Location mm	Check Status
Dead Load	2830.2	0	23.6	0	DS1D2	2830.2	OK
Super DL + Live Load	2830.2	0	23.6	0	DS1D2	2830.2	OK
Live Load	2830.2	0	7.9	0	DS1D2	2830.2	OK
Total Load	2830.2	0	11.8	0	DS1D2	2830.2	OK
Total - Camber	2830.2	0	11.8	0	DS1D2	2830.2	OK

ETABS Steel Frame Design

BS 5950-2000 Steel Section Check (Envelope Details)



Element Details

Level	Element	Unique Name	Section	Combo	Location	Frame Type	Classification
Story4	C6	12	SHHF100X100X8	DStIS2	3547.6	Moment Resisting Frame	Class 2

Section Properties

A (cm ²)	I ₃₃ (cm ⁴)	r ₃₃ (mm)	W _{el33} (cm ³)	A _{v3} (cm ²)	W _{pl33} (cm ³)
28.8	400	37.3	80	16	98.2

J (cm ⁴)	I ₂₂ (cm ⁴)	r ₂₂ (mm)	W _{el22} (cm ³)	A _{v2} (cm ²)	W _{pl22} (cm ³)	C _w (cm ⁶)
646	400	37.3	80	16	98.2	

Material Properties

E (MPa)	f _y (MPa)
210000	355

LLRF and Demand/Capacity Ratio

L (mm)	LLRF	Stress Ratio Limit
3700.0	1	0.95

Demand/Capacity (D/C) Ratio (4.8.3.3.1-2)

D/C Ratio	Axial Ratio	Flexural Ratio _{Major}	Flexural Ratio _{Minor}
0.057	0.032 +	0.007 +	0.018

Stress Check forces and Moments

Location (mm)	N (kN)	M ₃₃ (kN-m)	M ₂₂ (kN-m)	V ₂ (kN)	V ₃ (kN)
3547.6	-17.5581	-0.2306	-0.849	0.065	0.2393

Axial Force & Biaxial Moment Design Factors (4.8.3.3.1-2)

	L Factor	K	m Factor	m_{LT}
Major Bending	0.959	1	0.6	1
Minor Bending	0.959	1	0.6	

Axial Force and Capacities

N Force (kN)	N_t Strength (kN)	N_c Strength (kN)	N_c Major (kN)	N_c Minor (kN)
17.5581	1022.4	540.604	540.604	540.604

Moments and Capacities

	M Moment (kN-m)	M_c Capacity (kN-m)	M_b Strength (kN-m)
Major Bending	0.2306	34.08	34.861
Minor Bending	0.849	34.08	

Shear Design

	F_v Force (kN)	N_v Strength (kN)	Stress Ratio
Major Shear	0.065	306.72	2.119E-04
Minor Shear	0.2393	306.72	0.001

Element Details

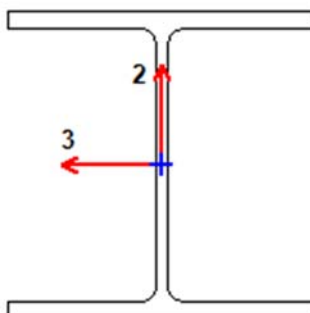
Level	Element	Unique Name	Element Type	Section
Story4	C6	12	Moment Resisting Frame	SHHF100X100X8

DEFLECTION DESIGN

Deflection Type	L	Deflection Value	Deflection Limit	Deflection Ratio	Load Combo	Station Location	Check Status
	mm	mm	mm			mm	
Dead Load	3700	0	30.8	0	DSIID2	3547.6	OK
Super DL + Live Load	3700	0	30.8	0	DSIID2	3547.6	OK
Live Load	3700	0	10.3	0	DSIID2	3547.6	OK
Total Load	3700	0	15.4	0	DSIID2	3547.6	OK
Total - Camber	3700	0	15.4	0	DSIID2	3547.6	OK

ETABS Steel Frame Design

BS 5950-2000 Steel Section Check (Envelope Details)



Element Details

Level	Element	Unique Name	Section	Combo	Location	Frame Type	Classification
Story5	B4	13	UKC203X203X46	DStIS2	2846.2	Moment Resisting Frame	Class 2

Section Properties

A (cm ²)	I ₃₃ (cm ⁴)	r ₃₃ (mm)	W _{el33} (cm ³)	A _{v3} (cm ²)	W _{pl33} (cm ³)
58.7	4568	88.2	449.6	37.3	497

J (cm ⁴)	I ₂₂ (cm ⁴)	r ₂₂ (mm)	W _{el22} (cm ³)	A _{v2} (cm ²)	W _{pl22} (cm ³)	C _w (cm ⁶)
22.2	1548	51.4	152.1	14.6	231	142896.5

Material Properties

E (MPa)	f _y (MPa)
210000	275

LLRF and Demand/Capacity Ratio

L (mm)	LLRF	Stress Ratio Limit
6600.0	1	0.95

Demand/Capacity (D/C) Ratio (4.8.3.3.1-2)

D/C Ratio	Axial Ratio	Flexural Ratio _{Major}	Flexural Ratio _{Minor}
0.83	0 +	0.83 +	0

Stress Check forces and Moments

Location (mm)	N (kN)	M ₃₃ (kN-m)	M ₂₂ (kN-m)	V ₂ (kN)	V ₃ (kN)
2846.2	0	73.5849	0	-2.5687	0

Axial Force & Biaxial Moment Design Factors (4.8.3.3.1-2)

	L Factor	K	m Factor	m_{LT}
Major Bending	1	1	0.955	1
Minor Bending	0.924	1	1	

Axial Force and Capacities

N Force (kN)	N_t Strength (kN)	N_c Strength (kN)	N_c Major (kN)	N_c Minor (kN)
0	1614.25	653.8584	1265.8988	653.8584

Moments and Capacities

	M Moment (kN-m)	M_c Capacity (kN-m)	M_b Strength (kN-m)
Major Bending	73.5849	136.675	88.6192
Minor Bending	0	50.1808	

Shear Design

	F_v Force (kN)	N_v Strength (kN)	Stress Ratio
Major Shear	73.0482	241.4016	0.303
Minor Shear	0	665.1612	0

Element Details

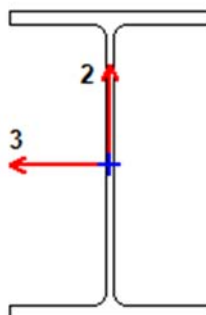
Level	Element	Unique Name	Element Type	Section
Story5	B4	13	Moment Resisting Frame	UKC203X203X4 6

DEFLECTION DESIGN

Deflection Type	L mm	Deflection Value mm	Deflection Limit mm	Deflection Ratio	Load Combo	Station Location mm	Check Status
Dead Load	6600	7.5	55	0.136	DS1D2	3315.4	OK
Super DL + Live Load	6600	15.7	55	0.285	DS1D2	3315.4	OK
Live Load	6600	15.7	18.3	0.854	DS1D2	3315.4	OK
Total Load	6600	23.1	27.5	0.84	DS1D2	3315.4	OK
Total - Camber	6600	23.1	27.5	0.84	DS1D2	3315.4	OK

ETABS Steel Frame Design

BS 5950-2000 Steel Section Check (Envelope Details)



Element Details

Level	Element	Unique Name	Section	Combo	Location	Frame Type	Classification
Story5	B2	14	UKB203X133X30	DStIS2	1600	Moment Resisting Frame	Class 2

Section Properties

A (cm ²)	I ₃₃ (cm ⁴)	r ₃₃ (mm)	W _{el33} (cm ³)	A _{v3} (cm ²)	W _{pl33} (cm ³)
38.2	2896	87.1	280.1	21.4	314

J (cm ⁴)	I ₂₂ (cm ⁴)	r ₂₂ (mm)	W _{el22} (cm ³)	A _{v2} (cm ²)	W _{pl22} (cm ³)	C _w (cm ⁶)
10.3	385	31.7	57.5	13.2	88.2	37343.5

Material Properties

E (MPa)	f _y (MPa)
210000	275

LLRF and Demand/Capacity Ratio

L (mm)	LLRF	Stress Ratio Limit
4400.0	1	0.95

Demand/Capacity (D/C) Ratio (4.8.3.3.1-2)

D/C Ratio	Axial Ratio	Flexural Ratio _{Major}	Flexural Ratio _{Minor}
0.845	0 +	0.845 +	0

Stress Check forces and Moments

Location (mm)	N (kN)	M ₃₃ (kN-m)	M ₂₂ (kN-m)	V ₂ (kN)	V ₃ (kN)
1600	0	52.5085	0	11.1648	0

Axial Force & Biaxial Moment Design Factors (4.8.3.3.1-2)

	L Factor	K	m Factor	m_{LT}
Major Bending	1	1	0.951	1
Minor Bending	0.636	1	1	

Axial Force and Capacities

N Force (kN)	N_t Strength (kN)	N_c Strength (kN)	N_c Major (kN)	N_c Minor (kN)
0	1050.5	633.8788	958.4597	633.8788

Moments and Capacities

	M Moment (kN-m)	M_c Capacity (kN-m)	M_b Strength (kN-m)
Major Bending	52.5085	86.35	62.155
Minor Bending	0	18.9768	

Shear Design

	F_v Force (kN)	N_v Strength (kN)	Stress Ratio
Major Shear	36.8591	218.3808	0.169
Minor Shear	0	381.7757	0

Element Details

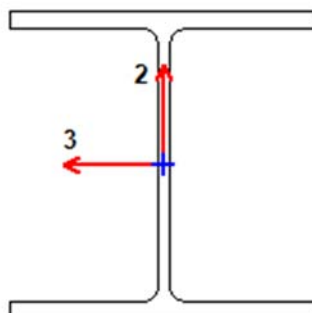
Level	Element	Unique Name	Element Type	Section
Story5	B2	14	Moment Resisting Frame	UKB203X133X3 0

DEFLECTION DESIGN

Deflection Type	L	Deflection Value	Deflection Limit	Deflection Ratio	Load Combo	Station Location	Check Status
	mm	mm	mm			mm	
Dead Load	4400	5.6	36.7	0.151	DS†ID2	2100	OK
Super DL + Live Load	4400	4.8	36.7	0.132	DS†ID2	2100	OK
Live Load	4400	4.8	12.2	0.396	DS†ID2	2100	OK
Total Load	4400	10.4	18.3	0.567	DS†ID2	2100	OK
Total - Camber	4400	10.4	18.3	0.567	DS†ID2	2100	OK

ETABS Steel Frame Design

BS 5950-2000 Steel Section Check (Envelope Details)



Element Details

Level	Element	Unique Name	Section	Combo	Location	Frame Type	Classification
Story5	B1	15	UKC203X203X46	DStIS2	3284.6	Moment Resisting Frame	Class 2

Section Properties

A (cm ²)	I ₃₃ (cm ⁴)	r ₃₃ (mm)	W _{el33} (cm ³)	A _{v3} (cm ²)	W _{pl33} (cm ³)
58.7	4568	88.2	449.6	37.3	497

J (cm ⁴)	I ₂₂ (cm ⁴)	r ₂₂ (mm)	W _{el22} (cm ³)	A _{v2} (cm ²)	W _{pl22} (cm ³)	C _w (cm ⁶)
22.2	1548	51.4	152.1	14.6	231	142896.5

Material Properties

E (MPa)	f _y (MPa)
210000	275

LLRF and Demand/Capacity Ratio

L (mm)	LLRF	Stress Ratio Limit
6100.0	1	0.95

Demand/Capacity (D/C) Ratio (4.8.3.3.1-2)

D/C Ratio	Axial Ratio	Flexural Ratio _{Major}	Flexural Ratio _{Minor}
0.747	0 +	0.747 +	0

Stress Check forces and Moments

Location (mm)	N (kN)	M ₃₃ (kN-m)	M ₂₂ (kN-m)	V ₂ (kN)	V ₃ (kN)
3284.6	0	66.1774	0	3.3579	0

Axial Force & Biaxial Moment Design Factors (4.8.3.3.1-2)

	L Factor	K	m Factor	m_{LT}
Major Bending	1	1	0.95	1
Minor Bending	1	1	1	

Axial Force and Capacities

N Force (kN)	N_t Strength (kN)	N_c Strength (kN)	N_c Major (kN)	N_c Minor (kN)
0	1614.25	653.8584	1326.9974	653.8584

Moments and Capacities

	M Moment (kN-m)	M_c Capacity (kN-m)	M_b Strength (kN-m)
Major Bending	66.1774	136.675	88.6192
Minor Bending	0	50.1808	

Shear Design

	F_v Force (kN)	N_v Strength (kN)	Stress Ratio
Major Shear	43.6533	241.4016	0.181
Minor Shear	0	665.1612	0

Element Details

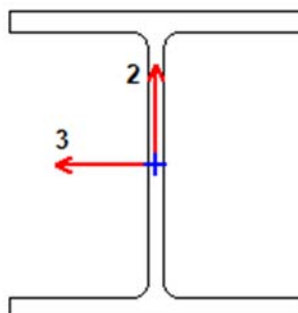
Level	Element	Unique Name	Element Type	Section
Story5	B1	15	Moment Resisting Frame	UKC203X203X4 6

DEFLECTION DESIGN

Deflection Type	L	Deflection Value	Deflection Limit	Deflection Ratio	Load Combo	Station Location	Check Status
	mm	mm	mm			mm	
Dead Load	6100	9	50.8	0.177	DS1D2	3284.6	OK
Super DL + Live Load	6100	8.7	50.8	0.172	DS1D2	3284.6	OK
Live Load	6100	8.7	16.9	0.515	DS1D2	3284.6	OK
Total Load	6100	17.7	25.4	0.698	DS1D2	2815.4	OK
Total - Camber	6100	17.7	25.4	0.698	DS1D2	2815.4	OK

ETABS Steel Frame Design

BS 5950-2000 Steel Section Check (Envelope Details)



Element Details

Level	Element	Unique Name	Section	Combo	Location	Frame Type	Classification
Story6	B3	16	UKC152X152X3 7	DStIS2	3307.7	Moment Resisting Frame	Class 2

Section Properties

A (cm ²)	I ₃₃ (cm ⁴)	r ₃₃ (mm)	W _{el33} (cm ³)	A _{v3} (cm ²)	W _{pl33} (cm ³)
47	2210	68.6	273.2	29.6	309

J (cm ⁴)	I ₂₂ (cm ⁴)	r ₂₂ (mm)	W _{el22} (cm ³)	A _{v2} (cm ²)	W _{pl22} (cm ³)	C _w (cm ⁶)
19.2	706	38.8	91.5	12.9	140	39842.5

Material Properties

E (MPa)	f _y (MPa)
210000	275

LLRF and Demand/Capacity Ratio

L (mm)	LLRF	Stress Ratio Limit
6100.0	1	0.95

Demand/Capacity (D/C) Ratio (4.8.3.3.1-2)

D/C Ratio	Axial Ratio	Flexural Ratio _{Major}	Flexural Ratio _{Minor}
0.672	0 +	0.672 +	0

Stress Check forces and Moments

Location (mm)	N (kN)	M ₃₃ (kN-m)	M ₂₂ (kN-m)	V ₂ (kN)	V ₃ (kN)
3307.7	0	34.96	0	1.7886	0

Axial Force & Biaxial Moment Design Factors (4.8.3.3.1-2)

	L Factor	K	m Factor	m_{LT}
Major Bending	0.992	1	0.95	1
Minor Bending	0.992	1	1	

Axial Force and Capacities

N Force (kN)	N_t Strength (kN)	N_c Strength (kN)	N_c Major (kN)	N_c Minor (kN)
0	1292.5	332.5298	877.0211	332.5298

Moments and Capacities

	M Moment (kN-m)	M_c Capacity (kN-m)	M_b Strength (kN-m)
Major Bending	34.96	84.975	52.0236
Minor Bending	0	30.1788	

Shear Design

	F_v Force (kN)	N_v Strength (kN)	Stress Ratio
Major Shear	23.2516	213.576	0.109
Minor Shear	0	527.3532	0

Element Details

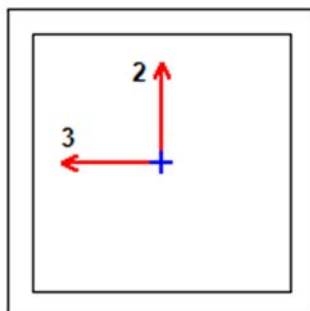
Level	Element	Unique Name	Element Type	Section
Story6	B3	16	Moment Resisting Frame	UKC152X152X3 7

DEFLECTION DESIGN

Deflection Type	L mm	Deflection Value mm	Deflection Limit mm	Deflection Ratio	Load Combo	Station Location mm	Check Status
Dead Load	6100	10.6	50.8	0.209	DS1D2	3307.7	OK
Super DL + Live Load	6100	8.5	50.8	0.168	DS1D2	2842.3	OK
Live Load	6100	8.5	16.9	0.504	DS1D2	2842.3	OK
Total Load	6100	19.2	25.4	0.754	DS1D2	3307.7	OK
Total - Camber	6100	19.2	25.4	0.754	DS1D2	3307.7	OK

ETABS Steel Frame Design

BS 5950-2000 Steel Section Check (Envelope Details)



Element Details

Level	Element	Unique Name	Section	Combo	Location	Frame Type	Classification
Story6	C1	17	SHHF100X100X8	DStIS2	0	Moment Resisting Frame	Class 2

Section Properties

A (cm ²)	I ₃₃ (cm ⁴)	r ₃₃ (mm)	W _{el33} (cm ³)	A _{v3} (cm ²)	W _{pl33} (cm ³)
28.8	400	37.3	80	16	98.2

J (cm ⁴)	I ₂₂ (cm ⁴)	r ₂₂ (mm)	W _{el22} (cm ³)	A _{v2} (cm ²)	W _{pl22} (cm ³)	C _w (cm ⁶)
646	400	37.3	80	16	98.2	

Material Properties

E (MPa)	f _y (MPa)
210000	355

LLRF and Demand/Capacity Ratio

L (mm)	LLRF	Stress Ratio Limit
3000.0	1	0.95

Demand/Capacity (D/C) Ratio (4.8.3.3.1-2)

D/C Ratio	Axial Ratio	Flexural Ratio _{Major}	Flexural Ratio _{Minor}
0.034	0.034 +	0 +	0

Stress Check forces and Moments

Location (mm)	N (kN)	M ₃₃ (kN-m)	M ₂₂ (kN-m)	V ₂ (kN)	V ₃ (kN)
0	-24.5417	0	0	0	0

Axial Force & Biaxial Moment Design Factors (4.8.3.3.1-2)

	L Factor	K	m Factor	m_{LT}
Major Bending	0.946	1	1	1
Minor Bending	0.946	1	1	

Axial Force and Capacities

N Force (kN)	N_t Strength (kN)	N_c Strength (kN)	N_c Major (kN)	N_c Minor (kN)
24.5417	1022.4	724.4768	724.4768	724.4768

Moments and Capacities

	M Moment (kN-m)	M_c Capacity (kN-m)	M_b Strength (kN-m)
Major Bending	0	34.08	34.861
Minor Bending	0	34.08	

Shear Design

	F_v Force (kN)	N_v Strength (kN)	Stress Ratio
Major Shear	0	306.72	0
Minor Shear	0	306.72	0

Element Details

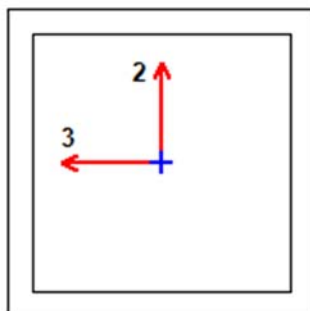
Level	Element	Unique Name	Element Type	Section
Story6	C1	17	Moment Resisting Frame	SHHF100X100X8

DEFLECTION DESIGN

Deflection Type	L	Deflection Value	Deflection Limit	Deflection Ratio	Load Combo	Station Location	Check Status
	mm	mm	mm			mm	
Dead Load	3000	0	25	0	DS1D2	2838.2	OK
Super DL + Live Load	3000	0	25	0	DS1D2	2838.2	OK
Live Load	3000	0	8.3	0	DS1D2	2838.2	OK
Total Load	3000	0	12.5	0	DS1D2	2838.2	OK
Total - Camber	3000	0	12.5	0	DS1D2	2838.2	OK

ETABS Steel Frame Design

BS 5950-2000 Steel Section Check (Envelope Details)



Element Details

Level	Element	Unique Name	Section	Combo	Location	Frame Type	Classification
Story1	C2	2	SHHF100X100X8	DStIS2	0	Moment Resisting Frame	Class 2

Section Properties

A (cm ²)	I ₃₃ (cm ⁴)	r ₃₃ (mm)	W _{el33} (cm ³)	A _{v3} (cm ²)	W _{pl33} (cm ³)
28.8	400	37.3	80	16	98.2

J (cm ⁴)	I ₂₂ (cm ⁴)	r ₂₂ (mm)	W _{el22} (cm ³)	A _{v2} (cm ²)	W _{pl22} (cm ³)	C _w (cm ⁶)
646	400	37.3	80	16	98.2	

Material Properties

E (MPa)	f _y (MPa)
210000	355

LLRF and Demand/Capacity Ratio

L (mm)	LLRF	Stress Ratio Limit
2100.0	1	0.95

Demand/Capacity (D/C) Ratio (4.8.3.3.1-2)

D/C Ratio	Axial Ratio	Flexural Ratio _{Major}	Flexural Ratio _{Minor}
0.148	0.148 +	0 +	0

Stress Check forces and Moments

Location (mm)	N (kN)	M ₃₃ (kN-m)	M ₂₂ (kN-m)	V ₂ (kN)	V ₃ (kN)
0	-136.0596	0	0	0	0

Axial Force & Biaxial Moment Design Factors (4.8.3.3.1-2)

	L Factor	K	m Factor	m_{LT}
Major Bending	0.876	1	1	1
Minor Bending	0.876	1	1	

Axial Force and Capacities

N Force (kN)	N_t Strength (kN)	N_c Strength (kN)	N_c Major (kN)	N_c Minor (kN)
136.0596	1022.4	921.6748	921.6748	921.6748

Moments and Capacities

	M Moment (kN-m)	M_c Capacity (kN-m)	M_b Strength (kN-m)
Major Bending	0	34.08	34.861
Minor Bending	0	34.08	

Shear Design

	F_v Force (kN)	N_v Strength (kN)	Stress Ratio
Major Shear	0	306.72	0
Minor Shear	0	306.72	0

Element Details

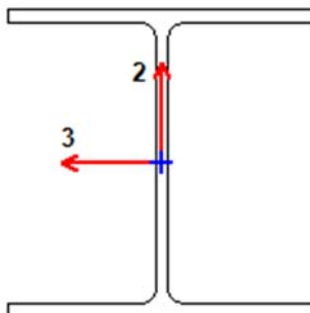
Level	Element	Unique Name	Element Type	Section
Story1	C2	2	Moment Resisting Frame	SHHF100X100X8

DEFLECTION DESIGN

Deflection Type	L mm	Deflection Value mm	Deflection Limit mm	Deflection Ratio	Load Combo	Station Location mm	Check Status
Dead Load	2100	0	17.5	0	DS1D2	1839.7	OK
Super DL + Live Load	2100	0	17.5	0	DS1D2	1839.7	OK
Live Load	2100	0	5.8	0	DS1D2	1839.7	OK
Total Load	2100	0	8.8	0	DS1D2	1839.7	OK
Total - Camber	2100	0	8.8	0	DS1D2	1839.7	OK

ETABS Steel Frame Design

BS 5950-2000 Steel Section Check (Envelope Details)



Element Details

Level	Element	Unique Name	Section	Combo	Location	Frame Type	Classification
Story2	B7	5	UKC152X152X23	DStIS2	2375	Moment Resisting Frame	Class 3

Section Properties

A (cm ²)	I ₃₃ (cm ⁴)	r ₃₃ (mm)	W _{el33} (cm ³)	A _{v3} (cm ²)	W _{pl33} (cm ³)
29	1250	65.7	164	17.2	182

J (cm ⁴)	I ₂₂ (cm ⁴)	r ₂₂ (mm)	W _{el22} (cm ³)	A _{v2} (cm ²)	W _{pl22} (cm ³)	C _w (cm ⁶)
4.6	400	37.1	52.6	8.8	80	21177

Material Properties

E (MPa)	f _y (MPa)
210000	275

LLRF and Demand/Capacity Ratio

L (mm)	LLRF	Stress Ratio Limit
4800.0	1	0.95

Demand/Capacity (D/C) Ratio (4.8.3.3.1-2)

D/C Ratio	Axial Ratio	Flexural Ratio _{Major}	Flexural Ratio _{Minor}
0.717	0.001 +	0.716 +	0

Stress Check forces and Moments

Location (mm)	N (kN)	M ₃₃ (kN-m)	M ₂₂ (kN-m)	V ₂ (kN)	V ₃ (kN)
2375	-0.3003	20.0031	0	0	0

Axial Force & Biaxial Moment Design Factors (4.8.3.3.1-2)

	L Factor	K	m Factor	m_{LT}
Major Bending	0.99	1	0.948	1
Minor Bending	0.99	1	1	

Axial Force and Capacities

N Force (kN)	N_t Strength (kN)	N_c Strength (kN)	N_c Major (kN)	N_c Minor (kN)
0.3003	797.5	287.3669	639.0328	287.3669

Moments and Capacities

	M Moment (kN-m)	M_c Capacity (kN-m)	M_b Strength (kN-m)
Major Bending	20.0031	45.1116	27.9386
Minor Bending	0	14.4547	

Shear Design

	F_v Force (kN)	N_v Strength (kN)	Stress Ratio
Major Shear	16.8447	145.8468	0.115
Minor Shear	0	307.3831	0

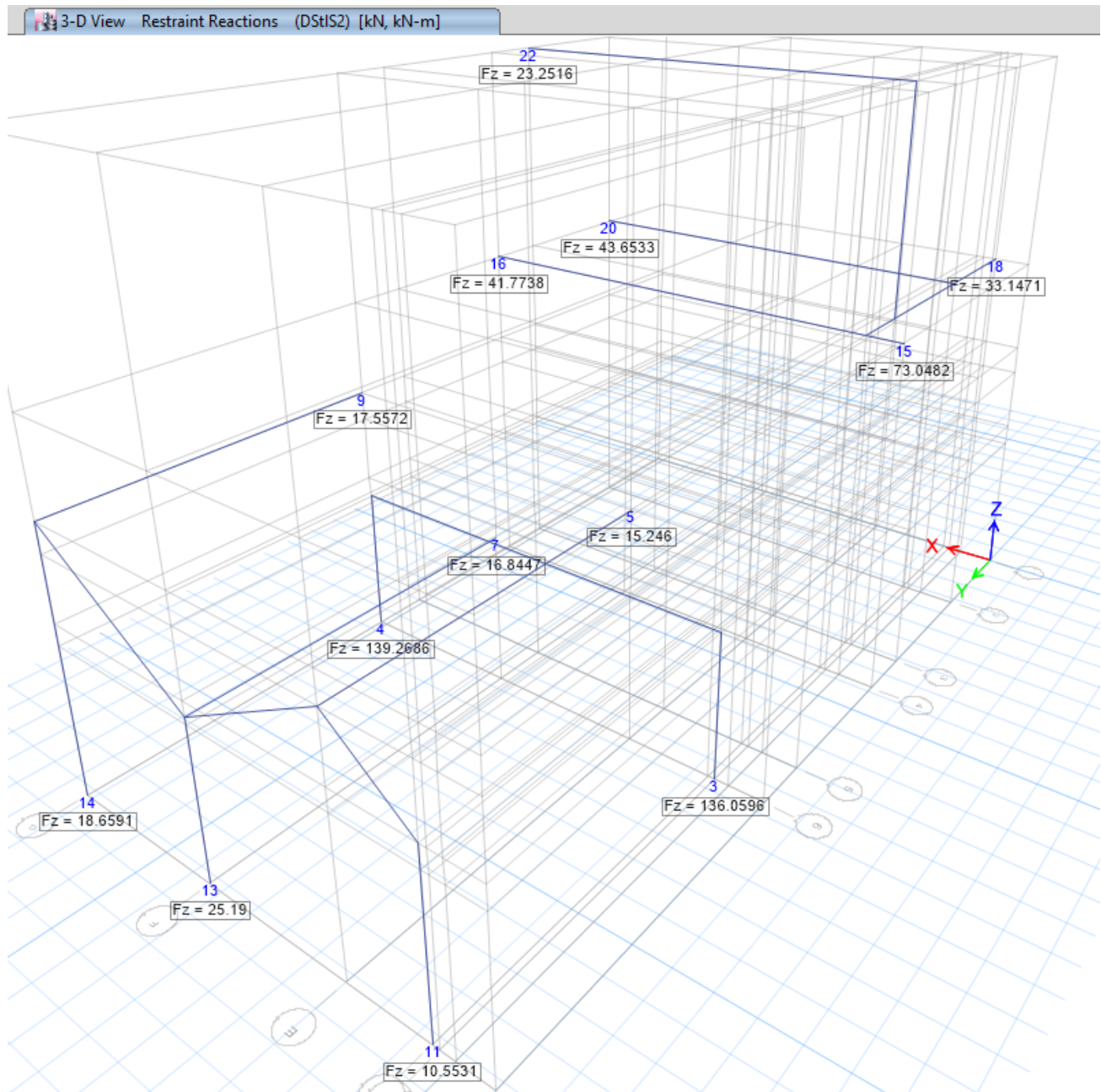
Element Details

Level	Element	Unique Name	Element Type	Section
Story2	B7	5	Moment Resisting Frame	UKC152X152X2 3

DEFLECTION DESIGN

Deflection Type	L	Deflection Value	Deflection Limit	Deflection Ratio	Load Combo	Station Location	Check Status
	mm	mm	mm			mm	
Dead Load	4800	7.8	40	0.196	DS1D2	2375	OK
Super DL + Live Load	4800	4.3	40	0.106	DS1D2	2375	OK
Live Load	4800	4.3	13.3	0.319	DS1D2	2375	OK
Total Load	4800	12.1	20	0.604	DS1D2	2375	OK
Total - Camber	4800	12.1	20	0.604	DS1D2	2375	OK

PADSTONE CALCULATION



Padstone type 1:

Max reaction under the factored load= 34 kn

Use padstone 330*100*100depth

Padstone type 1:

Max reaction under the factored load= 74 kn

Use padstone 6500*100*215depth

Padstone Calculator 1

COMPLIES WITH LATEST EUROPEAN DESIGN CODES

structural calculations for padstones

Beam End Reaction = **34.00** kN (factored)
Factored Load at End of Beam

Variable Load Safety Factor = 1.5
Permanent Load Safety Factor = 1.35

Characteristic strength of masonry = **2.8** N/mm² (Brickwork usually = 4.5 N/mm²)

(3.6N Blockwork usually = 2.6 N/mm²)

Width of beam end bearing = **150** mm

(A Engineering Brick = 13.2 N/mm²)

Length of beam end bearing = **100** mm

(B Engineering Brick = 10.5 N/mm²)

(Weak Brickwork = approx 2.8 N/mm²)

(7.3N Blockwork usually = 4.2 N/mm²)

(10.4N Blockwork usually = 5.4 N/mm²)

$\gamma_m = 3.0$

Bearing Factor = **1.25**

Results

Maximum Bearing Stress = **1.17** N/mm²

Actual Bearing Stress = **2.27** N/mm²

Padstone Required

Padstone Results

Characteristic strength of Padstone = **30.0** N/mm² (A Engineering Brick = 13.2 N/mm²)

(B Engineering Brick = 10.5 N/mm²)

width of padstone **100** mm

(Concrete C15 = 15 N/mm²)

Length of Padstone = **330** mm

(Concrete C30 = 30 N/mm²)

(Concrete C40 = 40 N/mm²)

(Steel Plate = 275 N/mm²)

Allowable padstone stress = **12.50** N/mm²

Stress under beam end bearing = **1.03** N/mm²

Therefore Padstone Stress OK

Allowable masonry stress = **1.17** N/mm²

Stress under padstone = **1.03** N/mm²

Therefore Masonry Stress OK

Padstone Calculator 2

COMPLIES WITH LATEST EUROPEAN DESIGN CODES

structural calculations for padstones

Beam End Reaction = **74.00** kN (factored)
Factored Load at End of Beam

Variable Load Safety Factor = 1.5
Permanent Load Safety Factor = 1.35

Characteristic strength of masonry = **2.8** N/mm² (Brickwork usually = 4.5 N/mm²)
(3.6N Blockwork usually = 2.6 N/mm²)
Width of beam end bearing = **150** mm (A Engineering Brick = 13.2 N/mm²)
Length of beam end bearing = **100** mm (B Engineering Brick = 10.5 N/mm²)
(Weak Brickwork = approx 2.8 N/mm²)
(7.3N Blockwork usually = 4.2 N/mm²)
(10.4N Blockwork usually = 5.4 N/mm²)

$\gamma_m = 3.0$

Bearing Factor = **1.25**

Results

Maximum Bearing Stress = **1.17** N/mm²
Actual Bearing Stress = **4.93** N/mm²

Padstone Required

Padstone Results

Characteristic strength of Padstone = **30.0** N/mm² (A Engineering Brick = 13.2 N/mm²)
(B Engineering Brick = 10.5 N/mm²)
width of padstone **100** mm (Concrete C15 = 15 N/mm²)
Length of Padstone = **650** mm (Concrete C30 = 30 N/mm²)
(Concrete C40 = 40 N/mm²)
(Steel Plate = 275 N/mm²)

Allowable padstone stress = **12.50** N/mm²
Stress under beam end bearing = **1.14** N/mm² **Therefore Padstone Stress OK**
Allowable masonry stress = **1.17** N/mm²
Stress under padstone = **1.14** N/mm² **Therefore Masonry Stress OK**

CONTENT:

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Introduction

This design is to provide confirmation of structural design of steel beams, floor joists and rafters. The design is in accordance with the current British codes of practice BS 5950 and BS5268

Dead and live load assigned on beams. The software (Tedds) is used for calculation. The structure calculated under standard combinations that specified in BS standard (1.4 DL+1.6LL).

The coefficient assigned safety and all elements have enough capacity under specified loads (self-weight, live load, dead load).

TIMBER JOIST DESIGN (BS5268-2:2002) – J1

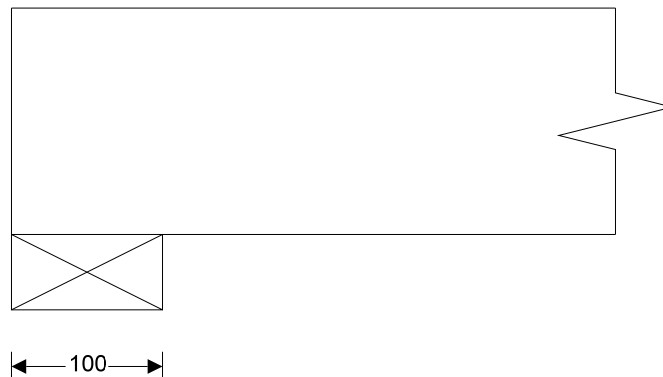
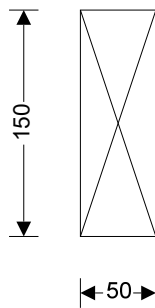
Tedds calculation version 1.1.04

Joist details

Joist breadth;	$b = 50 \text{ mm}$
Joist depth;	$h = 150 \text{ mm}$
Joist spacing;	$s = 400 \text{ mm}$
Timber strength class;	C24
Service class of timber;	1

**Span details**

Number of spans;	$N_{\text{span}} = 1$
Length of bearing;	$L_b = 100 \text{ mm}$
Effective length of span;	$L_{s1} = 2800 \text{ mm}$

**Section properties**

Second moment of area;	$I = b \times h^3 / 12 = 14062500 \text{ mm}^4$
Section modulus;	$Z = b \times h^2 / 6 = 187500 \text{ mm}^3$

Loading details

Joist self weight;	$F_{\text{swt}} = b \times h \times \rho_{\text{char}} \times g_{\text{acc}} = 0.03 \text{ kN/m}$
Dead load;	$F_{\text{d_udl}} = 0.60 \text{ kN/m}^2$
Imposed UDL(Long term);	$F_{\text{i_udl}} = 1.50 \text{ kN/m}^2$
Imposed point load (Medium term);	$F_{\text{i_pt}} = 1.40 \text{ kN}$

Modification factors

Service class for bending parallel to grain	$K_{2m} = 1.00$
Service class for compression	$K_{2c} = 1.00$
Service class for shear parallel to grain	$K_{2s} = 1.00$
Service class for modulus of elasticity	$K_{2e} = 1.00$
Section depth factor;	$K_7 = 1.08$
Load sharing factor;	$K_8 = 1.10$

Consider long term loads

Load duration factor;
 Maximum bending moment;
 Maximum shear force;
 Maximum support reaction;
 Maximum deflection;

$$K_3 = 1.00$$

$$M = 0.848 \text{ kNm}$$

$$V = 1.212 \text{ kN}$$

$$R = 1.212 \text{ kN}$$

$$\delta = 4.763 \text{ mm}$$

Check bending stress

Bending stress;
 Permissible bending stress;
 Applied bending stress;

$$\sigma_m = 7.500 \text{ N/mm}^2$$

$$\sigma_{m_adm} = \sigma_m \times K_{2m} \times K_3 \times K_7 \times K_8 = 8.904 \text{ N/mm}^2$$

$$\sigma_{m_max} = M / Z = 4.525 \text{ N/mm}^2$$

PASS - Applied bending stress within permissible limits**Check shear stress**

Shear stress;
 Permissible shear stress;
 Applied shear stress;

$$\tau = 0.710 \text{ N/mm}^2$$

$$\tau_{adm} = \tau \times K_{2s} \times K_3 \times K_8 = 0.781 \text{ N/mm}^2$$

$$\tau_{max} = 3 \times V / (2 \times b \times h) = 0.242 \text{ N/mm}^2$$

PASS - Applied shear stress within permissible limits**Check bearing stress**

Compression perpendicular to grain (no wane);
 Permissible bearing stress;
 Applied bearing stress;

$$\sigma_{cp1} = 2.400 \text{ N/mm}^2$$

$$\sigma_{c_adm} = \sigma_{cp1} \times K_{2c} \times K_3 \times K_8 = 2.640 \text{ N/mm}^2$$

$$\sigma_{c_max} = R / (b \times L_b) = 0.242 \text{ N/mm}^2$$

PASS - Applied bearing stress within permissible limits**Check deflection**

Permissible deflection;
 Bending deflection (based on E_{mean});
 Shear deflection;
 Total deflection;

$$\delta_{adm} = \min(L_{s1} \times 0.003, 14 \text{ mm}) = 8.400 \text{ mm}$$

$$\delta_{bending} = 4.562 \text{ mm}$$

$$\delta_{shear} = 0.201 \text{ mm}$$

$$\delta = \delta_{bending} + \delta_{shear} = 4.763 \text{ mm}$$

PASS - Actual deflection within permissible limits**Consider medium term loads**

Load duration factor;
 Maximum bending moment;
 Maximum shear force;
 Maximum support reaction;
 Maximum deflection;

$$K_3 = 1.25$$

$$M = 1.240 \text{ kNm}$$

$$V = 1.772 \text{ kN}$$

$$R = 1.772 \text{ kN}$$

$$\delta = 5.910 \text{ mm}$$

Check bending stress

Bending stress;
 Permissible bending stress;
 Applied bending stress;

$$\sigma_m = 7.500 \text{ N/mm}^2$$

$$\sigma_{m_adm} = \sigma_m \times K_{2m} \times K_3 \times K_7 \times K_8 = 11.130 \text{ N/mm}^2$$

$$\sigma_{m_max} = M / Z = 6.616 \text{ N/mm}^2$$

PASS - Applied bending stress within permissible limits**Check shear stress**

Shear stress;
 Permissible shear stress;
 Applied shear stress;

$$\tau = 0.710 \text{ N/mm}^2$$

$$\tau_{adm} = \tau \times K_{2s} \times K_3 \times K_8 = 0.976 \text{ N/mm}^2$$

$$\tau_{max} = 3 \times V / (2 \times b \times h) = 0.354 \text{ N/mm}^2$$

PASS - Applied shear stress within permissible limits**Check bearing stress**

Compression perpendicular to grain (no wane);

$$\sigma_{cp1} = 2.400 \text{ N/mm}^2$$

Permissible bearing stress;

$$\sigma_{c_adm} = \sigma_{cp1} \times K_{2c} \times K_3 \times K_8 = \mathbf{3.300 \text{ N/mm}^2}$$

Applied bearing stress;

$$\sigma_{c_max} = R / (b \times L_b) = \mathbf{0.354 \text{ N/mm}^2}$$

PASS - Applied bearing stress within permissible limits**Check deflection**

Permissible deflection;

$$\delta_{adm} = \min(L_{s1} \times 0.003, 14 \text{ mm}) = \mathbf{8.400 \text{ mm}}$$

Bending deflection (based on E_{mean});

$$\delta_{bending} = \mathbf{5.616 \text{ mm}}$$

Shear deflection;

$$\delta_{shear} = \mathbf{0.294 \text{ mm}}$$

Total deflection;

$$\delta = \delta_{bending} + \delta_{shear} = \mathbf{5.910 \text{ mm}}$$

PASS - Actual deflection within permissible limits**TIMBER JOIST DESIGN (BS5268-2:2002) – FRJ1**

Tedds calculation version 1.1.04

Joist details

Joist breadth;

$$b = \mathbf{50 \text{ mm}}$$

Joist depth;

$$h = \mathbf{175 \text{ mm}}$$

Joist spacing;

$$s = \mathbf{400 \text{ mm}}$$

Timber strength class;

$$\mathbf{C24}$$

Service class of timber;

$$\mathbf{1}$$

**Span details**

Number of spans;

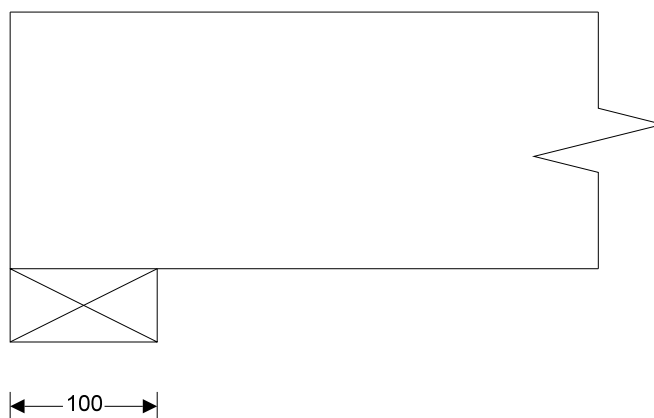
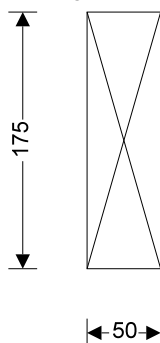
$$N_{span} = \mathbf{1}$$

Length of bearing;

$$L_b = \mathbf{100 \text{ mm}}$$

Effective length of span;

$$L_{s1} = \mathbf{4000 \text{ mm}}$$

**Section properties**

Second moment of area;

$$I = b \times h^3 / 12 = \mathbf{22330729 \text{ mm}^4}$$

Section modulus;

$$Z = b \times h^2 / 6 = \mathbf{255208 \text{ mm}^3}$$

Loading details

Joist self weight;

$$F_{swt} = b \times h \times \rho_{char} \times g_{acc} = \mathbf{0.03 \text{ kN/m}}$$

Dead load;

$$F_{d_udl} = \mathbf{0.60 \text{ kN/m}^2}$$

Imposed UDL(Medium term);

$$F_{i_udl} = \mathbf{0.75 \text{ kN/m}^2}$$

Imposed point load (Short term);

$$F_{i_pt} = \mathbf{0.90 \text{ kN}}$$

Modification factors

Service class for bending parallel to grain

$$K_{2m} = \mathbf{1.00}$$

Service class for compression

$$K_{2c} = \mathbf{1.00}$$

Service class for shear parallel to grain

$$K_{2s} = \mathbf{1.00}$$

Service class for modulus of elasticity

$$K_{2e} = \mathbf{1.00}$$

Section depth factor;

$$K_7 = \mathbf{1.06}$$

Load sharing factor;

$$K_8 = \mathbf{1.10}$$

Consider medium term loads

Load duration factor;

$$K_3 = \mathbf{1.25}$$

Maximum bending moment;

$$M = \mathbf{1.140 \text{ kNm}}$$

Maximum shear force;

$$V = \mathbf{1.140 \text{ kN}}$$

Maximum support reaction;

$$R = \mathbf{1.140 \text{ kN}}$$

Maximum deflection;

$$\delta = \mathbf{8.110 \text{ mm}}$$

Check bending stress

Bending stress;

$$\sigma_m = \mathbf{7.500 \text{ N/mm}^2}$$

Permissible bending stress;

$$\sigma_{m_adm} = \sigma_m \times K_{2m} \times K_3 \times K_7 \times K_8 = \mathbf{10.942 \text{ N/mm}^2}$$

Applied bending stress;

$$\sigma_{m_max} = M / Z = \mathbf{4.467 \text{ N/mm}^2}$$

PASS - Applied bending stress within permissible limits**Check shear stress**

Shear stress;

$$\tau = \mathbf{0.710 \text{ N/mm}^2}$$

Permissible shear stress;

$$\tau_{adm} = \tau \times K_{2s} \times K_3 \times K_8 = \mathbf{0.976 \text{ N/mm}^2}$$

Applied shear stress;

$$\tau_{max} = 3 \times V / (2 \times b \times h) = \mathbf{0.195 \text{ N/mm}^2}$$

PASS - Applied shear stress within permissible limits**Check bearing stress**

Compression perpendicular to grain (no wane);

$$\sigma_{cp1} = \mathbf{2.400 \text{ N/mm}^2}$$

Permissible bearing stress;

$$\sigma_{c_adm} = \sigma_{cp1} \times K_{2c} \times K_3 \times K_8 = \mathbf{3.300 \text{ N/mm}^2}$$

Applied bearing stress;

$$\sigma_{c_max} = R / (b \times L_b) = \mathbf{0.228 \text{ N/mm}^2}$$

PASS - Applied bearing stress within permissible limits**Check deflection**

Permissible deflection;

$$\delta_{adm} = \min(L_{s1} \times 0.003, 14 \text{ mm}) = \mathbf{12.000 \text{ mm}}$$

Bending deflection (based on E_{mean});

$$\delta_{bending} = \mathbf{7.879 \text{ mm}}$$

Shear deflection;

$$\delta_{shear} = \mathbf{0.232 \text{ mm}}$$

Total deflection;

$$\delta = \delta_{bending} + \delta_{shear} = \mathbf{8.110 \text{ mm}}$$

PASS - Actual deflection within permissible limits**Consider short term loads**

Load duration factor;

$$K_3 = \mathbf{1.50}$$

Maximum bending moment;

$$M = \mathbf{1.440 \text{ kNm}}$$

Maximum shear force;

$$V = \mathbf{1.440 \text{ kN}}$$

Maximum support reaction;

$$R = \mathbf{1.440 \text{ kN}}$$

Maximum deflection;

$$\delta = \mathbf{9.001 \text{ mm}}$$

Check bending stress

Bending stress;

$$\sigma_m = 7.500 \text{ N/mm}^2$$

Permissible bending stress;

$$\sigma_{m_adm} = \sigma_m \times K_{2m} \times K_3 \times K_7 \times K_8 = 13.131 \text{ N/mm}^2$$

Applied bending stress;

$$\sigma_{m_max} = M / Z = 5.643 \text{ N/mm}^2$$

PASS - Applied bending stress within permissible limits**Check shear stress**

Shear stress;

$$\tau = 0.710 \text{ N/mm}^2$$

Permissible shear stress;

$$\tau_{adm} = \tau \times K_{2s} \times K_3 \times K_8 = 1.172 \text{ N/mm}^2$$

Applied shear stress;

$$\tau_{max} = 3 \times V / (2 \times b \times h) = 0.247 \text{ N/mm}^2$$

PASS - Applied shear stress within permissible limits**Check bearing stress**

Compression perpendicular to grain (no wane);

$$\sigma_{cp1} = 2.400 \text{ N/mm}^2$$

Permissible bearing stress;

$$\sigma_{c_adm} = \sigma_{cp1} \times K_{2c} \times K_3 \times K_8 = 3.960 \text{ N/mm}^2$$

Applied bearing stress;

$$\sigma_{c_max} = R / (b \times L_b) = 0.288 \text{ N/mm}^2$$

PASS - Applied bearing stress within permissible limits**Check deflection**

Permissible deflection;

$$\delta_{adm} = \min(L_{s1} \times 0.003, 14 \text{ mm}) = 12.000 \text{ mm}$$

Bending deflection (based on E_{mean});

$$\delta_{bending} = 8.708 \text{ mm}$$

Shear deflection;

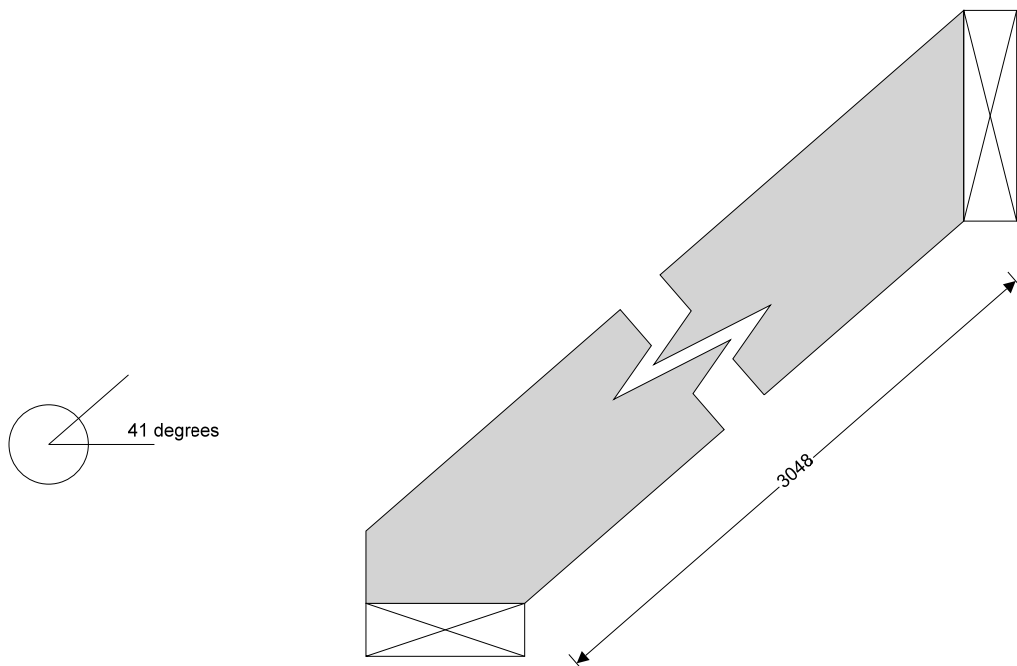
$$\delta_{shear} = 0.293 \text{ mm}$$

Total deflection;

$$\delta = \delta_{bending} + \delta_{shear} = 9.001 \text{ mm}$$

PASS - Actual deflection within permissible limits**TIMBER RAFTER DESIGN (BS5268-2:2002) – PRR1**

TEDDS calculation version 1.0.03

**Rafter details**

Breadth of timber sections;

$$b = 50 \text{ mm}$$

Depth of timber sections;
 Rafter spacing;
 Rafter slope;
 Clear span of rafter on horizontal;
 Clear span of rafter on slope;
 Rafter span;
 Timber strength class;

$h = 150$ mm
 $s = 400$ mm
 $\alpha = 41.0$ deg
 $L_{clh} = 2300$ mm
 $L_{cl} = L_{clh} / \cos(\alpha) = 3048$ mm
Single span
C16

Section properties

Cross sectional area of rafter;
 Section modulus;
 Second moment of area;
 Radius of gyration;

$A = b \times h = 7500$ mm²
 $Z = b \times h^2 / 6 = 187500$ mm³
 $I = b \times h^3 / 12 = 14062500$ mm⁴
 $r = \sqrt{I / A} = 43.3$ mm

Loading details

Rafter self weight;
 Dead load on slope;
 Imposed load on plan;
 Imposed point load;

$F_j = b \times h \times \rho_{char} \times g_{acc} = 0.02$ kN/m
 $F_d = 1.00$ kN/m²
 $F_u = 0.75$ kN/m²
 $F_p = 0.90$ kN

Modification factors

Section depth factor;
 Load sharing factor;

$K_7 = (300 \text{ mm} / h)^{0.11} = 1.08$
 $K_8 = 1.10$

Consider long term load condition

Load duration factor;
 Total UDL perpendicular to rafter;
 Notional bearing length;
 Effective span;

$K_3 = 1.00$
 $F = F_d \times \cos(\alpha) \times s + F_j \times \cos(\alpha) = 0.319$ kN/m
 $L_b = F \times L_{cl} / [2 \times (b \times \sigma_{cp1} \times K_8 - F)] = 4$ mm
 $L_{eff} = L_{cl} + L_b = 3052$ mm

Check bending stress

Bending stress parallel to grain;
 Permissible bending stress;
 Applied bending stress;

$\sigma_m = 5.300$ N/mm²
 $\sigma_{m_adm} = \sigma_m \times K_3 \times K_7 \times K_8 = 6.292$ N/mm²
 $\sigma_{m_max} = F \times L_{eff}^2 / (8 \times Z) = 1.981$ N/mm²

PASS - Applied bending stress within permissible limits

Check compressive stress parallel to grain

Compression stress parallel to grain;
 Minimum modulus of elasticity;
 Compression member factor;
 Permissible compressive stress;
 Applied compressive stress;

$\sigma_c = 6.800$ N/mm²
 $E_{min} = 5800$ N/mm²
 $K_{12} = 0.58$
 $\sigma_{c_adm} = \sigma_c \times K_3 \times K_8 \times K_{12} = 4.339$ N/mm²
 $\sigma_{c_max} = F \times L_{eff} \times (\cot(\alpha) + 3 \times \tan(\alpha)) / (2 \times A) = 0.244$ N/mm²

PASS - Applied compressive stress within permissible limits

Check combined bending and compressive stress parallel to grain

Euler stress;
 Euler coefficient;
 Combined axial compression and bending check;

$\sigma_e = \pi^2 \times E_{min} / \lambda^2 = 11.526$ N/mm²
 $K_{eu} = 1 - (1.5 \times \sigma_{c_max} \times K_{12} / \sigma_e) = 0.982$
 $\sigma_{m_max} / (\sigma_{m_adm} \times K_{eu}) + \sigma_{c_max} / \sigma_{c_adm} = 0.377; < 1$

PASS - Combined compressive and bending stresses are within permissible limits

Check shear stress

Shear stress parallel to grain;
 Permissible shear stress;

$\tau = 0.670$ N/mm²
 $\tau_{adm} = \tau \times K_3 \times K_8 = 0.737$ N/mm²

Applied shear stress;

$$\tau_{\max} = 3 \times F \times L_{\text{eff}} / (4 \times A) = \mathbf{0.097 \text{ N/mm}^2}$$

PASS - Applied shear stress within permissible limits

Check deflection

Permissible deflection;

$$\delta_{\text{adm}} = 0.003 \times L_{\text{eff}} = \mathbf{9.155 \text{ mm}}$$

Bending deflection;

$$\delta_b = 5 \times F \times L_{\text{eff}}^4 / (384 \times E_{\text{mean}} \times I) = \mathbf{2.911 \text{ mm}}$$

Shear deflection;

$$\delta_s = 12 \times F \times L_{\text{eff}}^2 / (5 \times E_{\text{mean}} \times A) = \mathbf{0.108 \text{ mm}}$$

Total deflection;

$$\delta_{\max} = \delta_b + \delta_s = \mathbf{3.019 \text{ mm}}$$

PASS - Total deflection within permissible limits

Consider medium term load condition

Load duration factor;

$$K_3 = \mathbf{1.25}$$

Total UDL perpendicular to rafter;

$$F = [F_u \times \cos(\alpha)^2 + F_d \times \cos(\alpha)] \times s + F_j \times \cos(\alpha) = \mathbf{0.490 \text{ kN/m}}$$

Notional bearing length;

$$L_b = F \times L_{cl} / [2 \times (b \times \sigma_{cp1} \times K_8 - F)] = \mathbf{6 \text{ mm}}$$

Effective span;

$$L_{\text{eff}} = L_{cl} + L_b = \mathbf{3054 \text{ mm}}$$

Check bending stress

Bending stress parallel to grain;

$$\sigma_m = \mathbf{5.300 \text{ N/mm}^2}$$

Permissible bending stress;

$$\sigma_{m_adm} = \sigma_m \times K_3 \times K_7 \times K_8 = \mathbf{7.865 \text{ N/mm}^2}$$

Applied bending stress;

$$\sigma_{m_max} = F \times L_{\text{eff}}^2 / (8 \times Z) = \mathbf{3.046 \text{ N/mm}^2}$$

PASS - Applied bending stress within permissible limits

Check compressive stress parallel to grain

Compression stress parallel to grain;

$$\sigma_c = \mathbf{6.800 \text{ N/mm}^2}$$

Minimum modulus of elasticity;

$$E_{\min} = \mathbf{5800 \text{ N/mm}^2}$$

Compression member factor;

$$K_{12} = \mathbf{0.54}$$

Permissible compressive stress;

$$\sigma_{c_adm} = \sigma_c \times K_3 \times K_8 \times K_{12} = \mathbf{5.008 \text{ N/mm}^2}$$

Applied compressive stress;

$$\sigma_{c_max} = F \times L_{\text{eff}} \times (\cot(\alpha) + 3 \times \tan(\alpha)) / (2 \times A) = \mathbf{0.375 \text{ N/mm}^2}$$

PASS - Applied compressive stress within permissible limits

Check combined bending and compressive stress parallel to grain

Euler stress;

$$\sigma_e = \pi^2 \times E_{\min} / \lambda^2 = \mathbf{11.510 \text{ N/mm}^2}$$

Euler coefficient;

$$K_{eu} = 1 - (1.5 \times \sigma_{c_max} \times K_{12} / \sigma_e) = \mathbf{0.974}$$

Combined axial compression and bending check;

$$\sigma_{m_max} / (\sigma_{m_adm} \times K_{eu}) + \sigma_{c_max} / \sigma_{c_adm} = \mathbf{0.473; < 1}$$

PASS - Combined compressive and bending stresses are within permissible limits

Check shear stress

Shear stress parallel to grain;

$$\tau = \mathbf{0.670 \text{ N/mm}^2}$$

Permissible shear stress;

$$\tau_{\text{adm}} = \tau \times K_3 \times K_8 = \mathbf{0.921 \text{ N/mm}^2}$$

Applied shear stress;

$$\tau_{\max} = 3 \times F \times L_{\text{eff}} / (4 \times A) = \mathbf{0.150 \text{ N/mm}^2}$$

PASS - Applied shear stress within permissible limits

Check deflection

Permissible deflection;

$$\delta_{\text{adm}} = 0.003 \times L_{\text{eff}} = \mathbf{9.161 \text{ mm}}$$

Bending deflection;

$$\delta_b = 5 \times F \times L_{\text{eff}}^4 / (384 \times E_{\text{mean}} \times I) = \mathbf{4.483 \text{ mm}}$$

Shear deflection;

$$\delta_s = 12 \times F \times L_{\text{eff}}^2 / (5 \times E_{\text{mean}} \times A) = \mathbf{0.166 \text{ mm}}$$

Total deflection;

$$\delta_{\max} = \delta_b + \delta_s = \mathbf{4.649 \text{ mm}}$$

PASS - Total deflection within permissible limits

Consider short term load condition

Load duration factor;

$$K_3 = \mathbf{1.50}$$

Total UDL perpendicular to rafter;

$$F = F_d \times \cos(\alpha) \times s + F_j \times \cos(\alpha) = \mathbf{0.319 \text{ kN/m}}$$

Notional bearing length;

$$L_b = [F \times L_{cl} + F_p \times \cos(\alpha)] / [2 \times (b \times \sigma_{cp1} \times K_8 - F)] = \mathbf{7 \text{ mm}}$$

Effective span;

$$L_{\text{eff}} = L_{\text{cl}} + L_b = 3054 \text{ mm}$$

Check bending stress

Bending stress parallel to grain;

$$\sigma_m = 5.300 \text{ N/mm}^2$$

Permissible bending stress;

$$\sigma_{m_adm} = \sigma_m \times K_3 \times K_7 \times K_8 = 9.438 \text{ N/mm}^2$$

Applied bending stress;

$$\sigma_{m_max} = F \times L_{\text{eff}}^2 / (8 \times Z) + F_p \times \cos(\alpha) \times L_{\text{eff}} / (4 \times Z) = 4.751 \text{ N/mm}^2$$

PASS - Applied bending stress within permissible limits**Check compressive stress parallel to grain**

Compression stress parallel to grain;

$$\sigma_c = 6.800 \text{ N/mm}^2$$

Minimum modulus of elasticity;

$$E_{\text{min}} = 5800 \text{ N/mm}^2$$

Compression member factor;

$$K_{12} = 0.49$$

Permissible compressive stress;

$$\sigma_{c_adm} = \sigma_c \times K_3 \times K_8 \times K_{12} = 5.537 \text{ N/mm}^2$$

Applied compressive stress;

$$\sigma_{c_max} = F \times L_{\text{eff}} \times (\cot(\alpha) + 3 \times \tan(\alpha)) / (2 \times A) + F_p \times \sin(\alpha) / A = 0.323$$

N/mm²**PASS - Applied compressive stress within permissible limits****Check combined bending and compressive stress parallel to grain**

Euler stress;

$$\sigma_e = \pi^2 \times E_{\text{min}} / \lambda^2 = 11.505 \text{ N/mm}^2$$

Euler coefficient;

$$K_{eu} = 1 - (1.5 \times \sigma_{c_max} \times K_{12} / \sigma_e) = 0.979$$

Combined axial compression and bending check;

$$\sigma_{m_max} / (\sigma_{m_adm} \times K_{eu}) + \sigma_{c_max} / \sigma_{c_adm} = 0.572; < 1$$

PASS - Combined compressive and bending stresses are within permissible limits**Check shear stress**

Shear stress parallel to grain;

$$\tau = 0.670 \text{ N/mm}^2$$

Permissible shear stress;

$$\tau_{adm} = \tau \times K_3 \times K_8 = 1.106 \text{ N/mm}^2$$

Applied shear stress;

$$\tau_{max} = 3 \times F \times L_{\text{eff}} / (4 \times A) + 3 \times F_p \times \cos(\alpha) / (2 \times A) = 0.233$$

N/mm²**PASS - Applied shear stress within permissible limits****Check deflection**

Permissible deflection;

$$\delta_{adm} = 0.003 \times L_{\text{eff}} = 9.163 \text{ mm}$$

Bending deflection;

$$\delta_b = L_{\text{eff}}^3 \times (5 \times F \times L_{\text{eff}} / 384 + F_p \times \cos(\alpha) / 48) / (E_{\text{mean}} \times I) = 6.180$$

mm

Shear deflection;

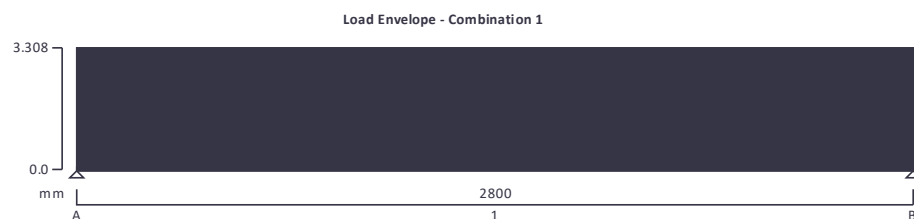
$$\delta_s = 12 \times L_{\text{eff}} \times (F \times L_{\text{eff}} + 2 \times F_p \times \cos(\alpha)) / (5 \times E_{\text{mean}} \times A) = 0.259 \text{ mm}$$

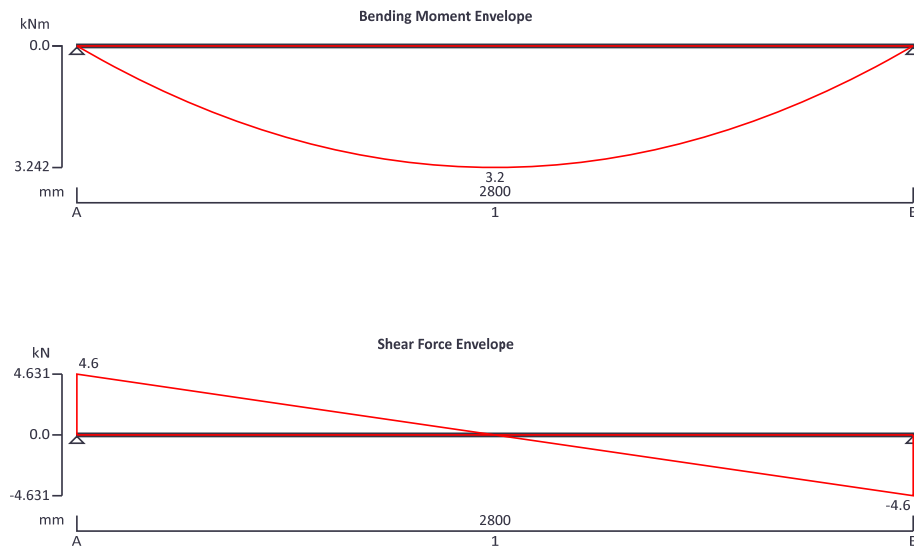
Total deflection;

$$\delta_{max} = \delta_b + \delta_s = 6.440 \text{ mm}$$

PASS - Total deflection within permissible limits**TIMBER BEAM ANALYSIS & DESIGN TO EN1995-1-1:2004 – DJ1****In accordance with EN1995-1-1:2004 + A2:2014 and Corrigendum No.1 and the recommended values**

Tedd's calculation version 1.7.02





Applied loading

Beam loads

from floor $(1.7/2) \times 0.6$

from floor $(1.7/2) \times 2$

Permanent self weight of beam $\times 1$

Permanent full UDL 0.510 kN/m

Variable full UDL 1.700 kN/m

Load combinations

Load combination 1

Support A

Permanent $\times 1.35$

Variable $\times 1.50$

Span 1

Permanent $\times 1.35$

Variable $\times 1.50$

Support B

Permanent $\times 1.35$

Variable $\times 1.50$

Analysis results

Maximum moment;

$M_{\max} = 3.242$ kNm;

$M_{\min} = 0.000$ kNm

Design moment;

$M = \max(\text{abs}(M_{\max}), \text{abs}(M_{\min})) = 3.242$ kNm

Maximum shear;

$F_{\max} = 4.631$ kN;

$F_{\min} = -4.631$ kN

Design shear;

$F = \max(\text{abs}(F_{\max}), \text{abs}(F_{\min})) = 4.631$ kN

Total load on beam;

$W_{\text{tot}} = 9.262$ kN

Reactions at support A;

$R_{A_{\max}} = 4.631$ kN;

$R_{A_{\min}} = 4.631$ kN

Unfactored permanent load reaction at support A;

$R_{A_{\text{Permanent}}} = 0.786$ kN

Unfactored variable load reaction at support A;

$R_{A_{\text{Variable}}} = 2.380$ kN

Reactions at support B;

$R_{B_{\max}} = 4.631$ kN;

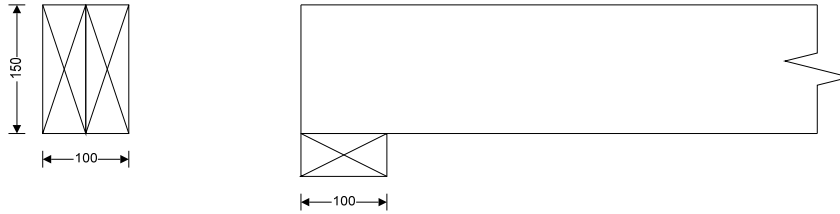
$R_{B_{\min}} = 4.631$ kN

Unfactored permanent load reaction at support B;

$R_{B_{\text{Permanent}}} = 0.786$ kN

Unfactored variable load reaction at support B;

$R_{B_{\text{Variable}}} = 2.380$ kN

**Timber section details**

Breadth of timber sections;	$b = 50 \text{ mm}$
Depth of timber sections;	$h = 150 \text{ mm}$
Number of timber sections in member;	$N = 2$
Overall breadth of timber member;	$b_b = N \times b = 100 \text{ mm}$
Timber strength class - EN 338:2016 Table 1;	C24

Member details

Load duration - cl.2.3.1.2;	Long-term
Service class of timber - cl.2.3.1.3;	1
Length of span;	$L_{s1} = 2800 \text{ mm}$
Length of bearing;	$L_b = 100 \text{ mm}$

Section properties

Cross sectional area of member;	$A = N \times b \times h = 15000 \text{ mm}^2$
Section modulus;	$W_y = N \times b \times h^2 / 6 = 375000 \text{ mm}^3$
	$W_z = h \times (N \times b)^2 / 6 = 250000 \text{ mm}^3$
Second moment of area;	$I_y = N \times b \times h^3 / 12 = 28125000 \text{ mm}^4$
	$I_z = h \times (N \times b)^3 / 12 = 12500000 \text{ mm}^4$
Radius of gyration;	$r_y = \sqrt{I_y / A} = 43.3 \text{ mm}$
	$r_z = \sqrt{I_z / A} = 28.9 \text{ mm}$

Partial factor for material properties and resistances

Partial factor for material properties - Table 2.3;	$\gamma_M = 1.300$
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Modification factors

Modification factor for load duration and moisture content - Table 3.1

	$k_{mod} = 0.700$
Deformation factor for service classes - Table 3.2;	$k_{def} = 0.600$
Depth factor for bending - exp.3.1;	$k_{h,m} = 1.000$
Depth factor for tension - exp.3.1;	$k_{h,t} = 1.000$
Bending stress re-distribution factor - cl.6.1.6(2);	$k_m = 0.700$
Crack factor for shear resistance - cl.6.1.7(2);	$k_{cr} = 0.670$
Load configuration factor - exp.6.4;	$k_{c,90} = 1.000$
System strength factor - cl.6.6;	$k_{sys} = 1.000$
Lateral buckling factor - cl.6.3.3(5);	$k_{crit} = 1.000$

Compression perpendicular to the grain - cl.6.1.5

Design compressive stress;	$\sigma_{c,90,d} = R_{A_max} / (N \times b \times L_b) = 0.463 \text{ N/mm}^2$
Design compressive strength;	$f_{c,90,d} = k_{mod} \times k_{sys} \times k_{c,90} \times f_{c,90,k} / \gamma_M = 1.346 \text{ N/mm}^2$
	$\sigma_{c,90,d} / f_{c,90,d} = 0.344$

PASS - Design compressive strength exceeds design compressive stress at bearing

Bending - cl 6.1.6

Design bending stress;	$\sigma_{m,d} = M / W_y = 8.645 \text{ N/mm}^2$
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Design bending strength;

$$f_{m,d} = k_{h,m} \times k_{mod} \times k_{sys} \times k_{crit} \times f_{m,k} / \gamma_M = \mathbf{12.923 \text{ N/mm}^2}$$

$$\sigma_{m,d} / f_{m,d} = \mathbf{0.669}$$

PASS - Design bending strength exceeds design bending stress**Shear - cl.6.1.7**

Applied shear stress;

$$\tau_d = 3 \times F / (2 \times k_{cr} \times A) = \mathbf{0.691 \text{ N/mm}^2}$$

Permissible shear stress;

$$f_{v,d} = k_{mod} \times k_{sys} \times f_{v,k} / \gamma_M = \mathbf{2.154 \text{ N/mm}^2}$$

$$\tau_d / f_{v,d} = \mathbf{0.321}$$

PASS - Design shear strength exceeds design shear stress**Deflection - cl.7.2**

Deflection limit;

$$\delta_{lim} = \min(14 \text{ mm}, 0.004 \times L_{s1}) = \mathbf{11.200 \text{ mm}}$$

Instantaneous deflection due to permanent load;

$$\delta_{instG} = \mathbf{1.516 \text{ mm}}$$

Final deflection due to permanent load;

$$\delta_{finG} = \delta_{instG} \times (1 + k_{def}) = \mathbf{2.426 \text{ mm}}$$

Instantaneous deflection due to variable load;

$$\delta_{instQ} = \mathbf{4.591 \text{ mm}}$$

Factor for quasi-permanent variable action;

$$\psi_2 = \mathbf{0.3}$$

Final deflection due to variable load;

$$\delta_{finQ} = \delta_{instQ} \times (1 + \psi_2 \times k_{def}) = \mathbf{5.417 \text{ mm}}$$

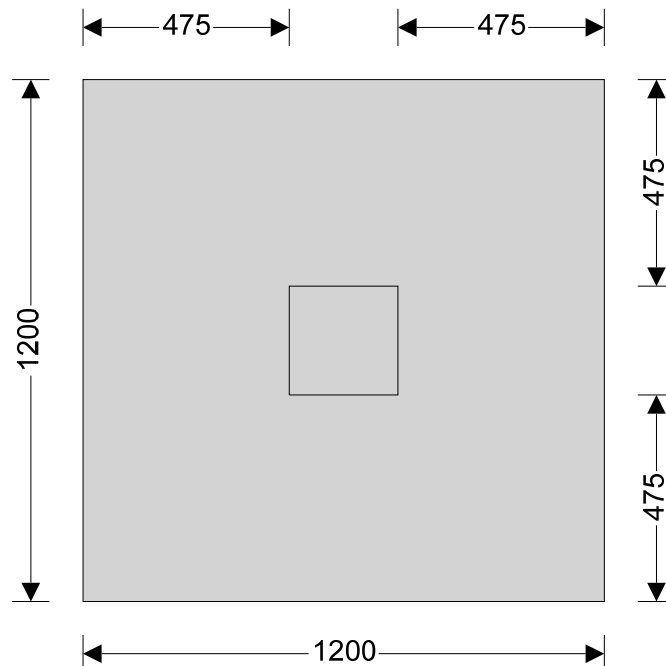
Total final deflection;

$$\delta_{fin} = \delta_{finG} + \delta_{finQ} = \mathbf{7.843 \text{ mm}}$$

$$\delta_{fin} / \delta_{lim} = \mathbf{0.700}$$

PASS - Total final deflection is less than the deflection limit**PAD FOOTING ANALYSIS AND DESIGN (BS8110-1:1997) – F1**

Tedds calculation version 2.0.07

**Pad footing details**

Length of pad footing;

$$L = \mathbf{1200 \text{ mm}}$$

Width of pad footing;

$$B = \mathbf{1200 \text{ mm}}$$

Area of pad footing;

$$A = L \times B = \mathbf{1.440 \text{ m}^2}$$

Depth of pad footing;
 Depth of soil over pad footing;
 Density of concrete;

$$h = 500 \text{ mm}$$

$$h_{\text{soil}} = 200 \text{ mm}$$

$$\rho_{\text{conc}} = 23.6 \text{ kN/m}^3$$

Column details

Column base length;
 Column base width;
 Column eccentricity in x;
 Column eccentricity in y;

$$l_A = 250 \text{ mm}$$

$$b_A = 250 \text{ mm}$$

$$e_{Px_A} = 0 \text{ mm}$$

$$e_{Py_A} = 0 \text{ mm}$$

Soil details

Density of soil;
 Design shear strength;
 Design base friction;
 Allowable bearing pressure;

$$\rho_{\text{soil}} = 20.0 \text{ kN/m}^3$$

$$\phi' = 25.0 \text{ deg}$$

$$\delta = 19.3 \text{ deg}$$

$$P_{\text{bearing}} = 100 \text{ kN/m}^2$$

Axial loading on column

Dead axial load on column;
 Imposed axial load on column;
 Wind axial load on column;
 Total axial load on column;

$$P_{GA} = 70.0 \text{ kN}$$

$$P_{QA} = 27.0 \text{ kN}$$

$$P_{WA} = 0.0 \text{ kN}$$

$$P_A = 97.0 \text{ kN}$$

Foundation loads

Dead surcharge load;
 Imposed surcharge load;
 Pad footing self weight;
 Soil self weight;
 Total foundation load;

$$F_{G_{\text{sur}}} = 5.000 \text{ kN/m}^2$$

$$F_{Q_{\text{sur}}} = 2.000 \text{ kN/m}^2$$

$$F_{\text{swt}} = h \times \rho_{\text{conc}} = 11.800 \text{ kN/m}^2$$

$$F_{\text{soil}} = h_{\text{soil}} \times \rho_{\text{soil}} = 4.000 \text{ kN/m}^2$$

$$F = A \times (F_{G_{\text{sur}}} + F_{Q_{\text{sur}}} + F_{\text{swt}} + F_{\text{soil}}) = 32.8 \text{ kN}$$

Calculate pad base reaction

Total base reaction;
 Eccentricity of base reaction in x;
 Eccentricity of base reaction in y;

$$T = F + P_A = 129.8 \text{ kN}$$

$$e_{Tx} = (P_A \times e_{Px_A} + M_{xA} + H_{xA} \times h) / T = 0 \text{ mm}$$

$$e_{Ty} = (P_A \times e_{Py_A} + M_{yA} + H_{yA} \times h) / T = 0 \text{ mm}$$

Check pad base reaction eccentricity

$$\text{abs}(e_{Tx}) / L + \text{abs}(e_{Ty}) / B = 0.000$$

Base reaction acts within middle third of base

Calculate pad base pressures

kN/m²

$$q_1 = T / A - 6 \times T \times e_{Tx} / (L \times A) - 6 \times T \times e_{Ty} / (B \times A) = 90.161$$

kN/m²

$$q_2 = T / A - 6 \times T \times e_{Tx} / (L \times A) + 6 \times T \times e_{Ty} / (B \times A) = 90.161$$

kN/m²

$$q_3 = T / A + 6 \times T \times e_{Tx} / (L \times A) - 6 \times T \times e_{Ty} / (B \times A) = 90.161$$

kN/m²

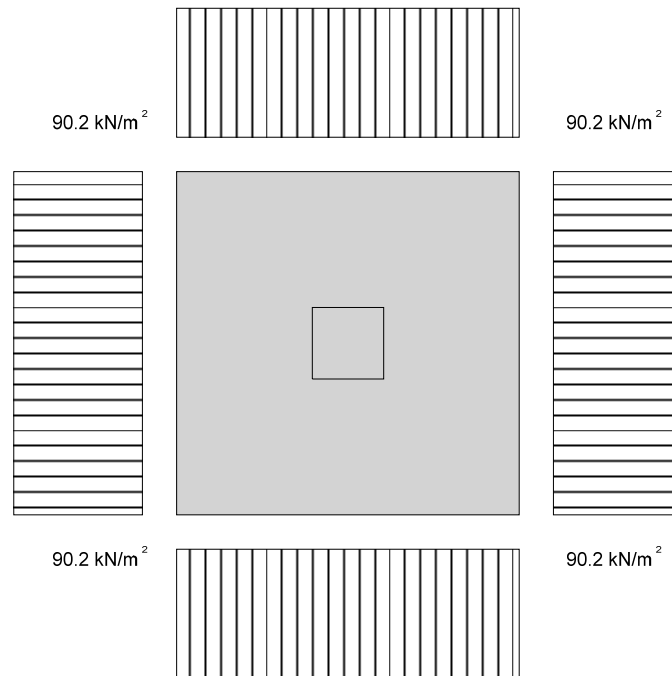
$$q_4 = T / A + 6 \times T \times e_{Tx} / (L \times A) + 6 \times T \times e_{Ty} / (B \times A) = 90.161$$

Minimum base pressure;
 Maximum base pressure;

$$q_{\text{min}} = \min(q_1, q_2, q_3, q_4) = 90.161 \text{ kN/m}^2$$

$$q_{\text{max}} = \max(q_1, q_2, q_3, q_4) = 90.161 \text{ kN/m}^2$$

PASS - Maximum base pressure is less than allowable bearing pressure



Material details

Characteristic strength of concrete;

$$f_{cu} = 30 \text{ N/mm}^2$$

Calculate pad lengths in x direction

Left hand length;

$$L_L = L / 2 + e_{PxA} = 600 \text{ mm}$$

Right hand length;

$$L_R = L / 2 - e_{PxA} = 600 \text{ mm}$$

Calculate rate of change of base pressure in x direction

Length of base reaction;

$$L_x = L = 1200 \text{ mm}$$

Rate of change of base pressure;

$$C_x = [(q_1 + q_2) - (q_3 + q_4)] / (2 \times L_x) = 0.000 \text{ kN/m}^2/\text{m}$$

Calculate pad lengths in y direction

Top length;

$$L_T = B / 2 - e_{PyA} = 600 \text{ mm}$$

Bottom length;

$$L_B = B / 2 + e_{PyA} = 600 \text{ mm}$$

Calculate rate of change of base pressure in y direction

Length of base reaction;

$$L_y = B = 1200 \text{ mm}$$

Rate of change of base pressure;

$$C_y = [(q_1 + q_3) - (q_2 + q_4)] / (2 \times L_y) = 0.000 \text{ kN/m}^2/\text{m}$$

Calculate minimum depth of unreinforced pad footing

Average pressure to left of pad footing;

$$q_L = (q_1 + q_2) / 2 - C_x \times (L_L - l_A / 2) / 2 = 90.161 \text{ kN/m}^2$$

Minimum depth to left of pad footing;

$$h_{Lmin} = (L_L - l_A / 2) \times \max(0.15 \times [(q_L / 1 \text{ kN/m}^2)^2 / (f_{cu} / 1 \text{ N/mm}^2)]^{1/4}, 1) =$$

475 mm

Average pressure to right of pad footing;

$$q_R = (q_3 + q_4) / 2 - C_x \times (L_R - l_A / 2) / 2 = 90.161 \text{ kN/m}^2$$

Minimum depth to right of pad footing;

$$h_{Rmin} = (L_R - l_A / 2) \times \max(0.15 \times [(q_R / 1 \text{ kN/m}^2)^2 / (f_{cu} / 1 \text{ N/mm}^2)]^{1/4}, 1) =$$

475 mm

Average pressure to top of pad footing;

$$q_T = (q_2 + q_4) / 2 - C_y \times (L_T - b_A / 2) / 2 = 90.161 \text{ kN/m}^2$$

Minimum depth to top of pad footing;

$$h_{Tmin} = (L_T - b_A / 2) \times \max(0.15 \times [(q_T / 1 \text{ kN/m}^2)^2 / (f_{cu} / 1 \text{ N/mm}^2)]^{1/4}, 1) =$$

475 mm

Average pressure to bottom of pad footing;

$$q_B = (q_1 + q_3) / 2 - C_y \times (L_B - b_A / 2) / 2 = 90.161 \text{ kN/m}^2$$

Minimum depth to bottom of pad footing;
475 mm

$$h_{Bmin} = (L_B - b_A/2) \times \max(0.15 \times [(q_B/1 \text{ kN/m}^2)^2 / (f_{cu}/1 \text{ N/mm}^2)]^{1/4}, 1) =$$

Minimum depth of unreinforced pad footing;

$$h_{min} = \max(h_{Lmin}, h_{Rmin}, h_{Tmin}, h_{Bmin}, 300 \text{ mm}) = \mathbf{475 \text{ mm}}$$

PASS - Unreinforced pad footing depth is greater than minimum