

# **Structural Engineering II (CE302) Project**

Semester V  
B. Tech  
Civil Engineering

IIT Guwahati



Title - Analysis and Design of G+1 Building

**Submitted by-**

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# Analysis and Design of G+1 Building

## **Project Overview:**

Our project revolves around the implementation of STAAD.Pro CONNECT Edition, a renowned software tool for structural analysis and design, to conduct a thorough analysis of a G+1 building. In this project, we embark on the journey of utilizing this robust software to scrutinize the structural aspects of a Ground plus one (G+1) building, a critical endeavor in the realm of civil engineering.

## **Project Description:**

The aim of this project is to design a Doublestory Building (G+1) for residential purpose, taking earthquake load into consideration. To gain practical hands-on experience in structural analysis and design using various structural design softwares like STAAD, SAP 2000, ETABS, etc. .

Also it is important to analyze effect of various loads on Beams and column because loads from walls and beams are transformed to beams, rotation of beams take place. Since, beams are rigidly connected to column, the rotation of column also take place. Thus any load applied any where on beam is shared by entire network of beam and columns

Through this project, we aim to apply the theoretical knowledge we've acquired, gain proficiency in using the software, understand safety and compliance considerations, and develop our problem-solving skills. This learning experience is designed to enhance our readiness for future academic and professional pursuits in the field of civil engineering.

## **Software used**

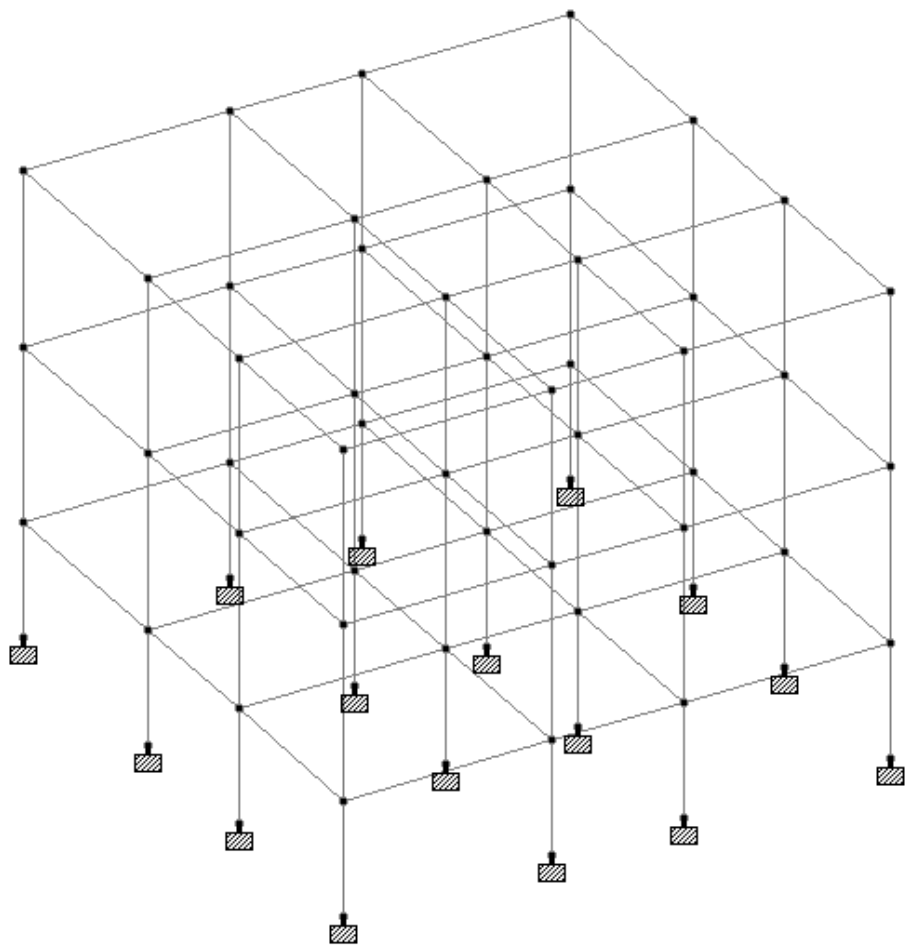
**STAAD Pro :** It is a structural design oriented program with a user-interactive interface which allows for the user to work on it extremely easily. It can be used for modelling, designing and analyzing various structures and structural configurations.

This software enables structural engineers to automate their undertakings by evacuating the repetitive and lengthy procedures of the manual methods.

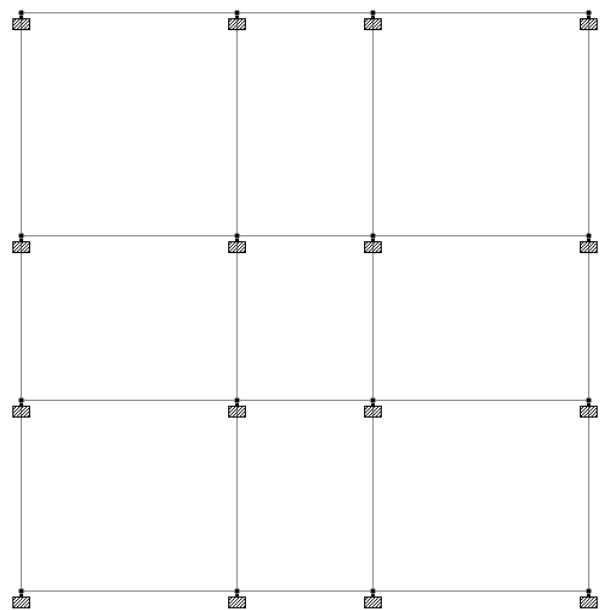
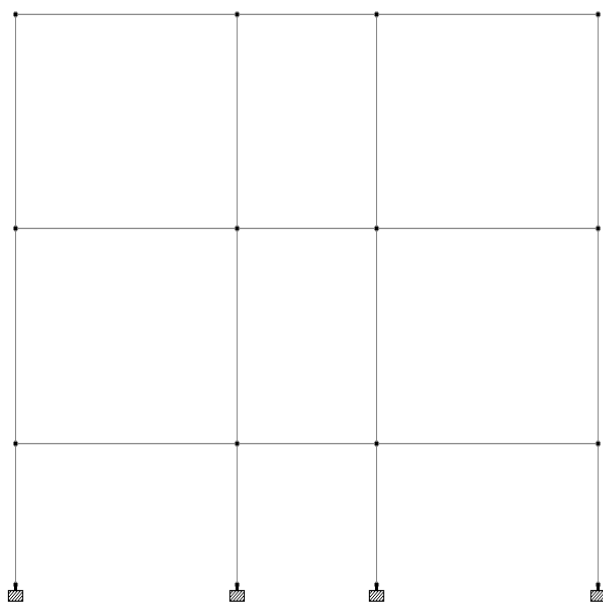
## **Key Project Steps in Staad pro:**

1. **Model Creation:** Geometry of the building, including dimensions, columns, beams, slabs, and other structural elements.
2. **Material Properties:** Assign material properties to each structural element. Specify the material type, such as concrete or steel, and input relevant material properties like density, modulus of elasticity, and Poisson's ratio.
3. **Supports and Constraints:** Define support conditions. Specify how the structure is supported, such as fixed supports at the base or other types of supports depending on the structural system.
4. **Loading Conditions:** Apply the loads to the model. This includes dead loads, live loads, wind loads, seismic loads and any other relevant loads based on the building code and project requirements.
5. **Load Combinations:** Define load combinations to consider different load scenarios. Building codes typically provide guidelines on how to combine various loads for analysis.
6. **Analysis Type:** Choose the appropriate analysis type based on the structure and loading conditions. Common analysis types include linear static, linear dynamic, and non-linear analyses.
7. **Run Analysis:** Run the analysis to obtain results such as member forces, support reactions, displacements, and internal forces.
8. **Review Results:** Review the analysis results to ensure that the structure meets the required safety and performance criteria. Check for any warning messages or errors.
9. **Documentation:** Generate reports and documentation summarizing the analysis and design results. This documentation is crucial for communication with stakeholders and regulatory authorities.

Dimension – 9.960m x 6.640m x 10.140m



Isometric View

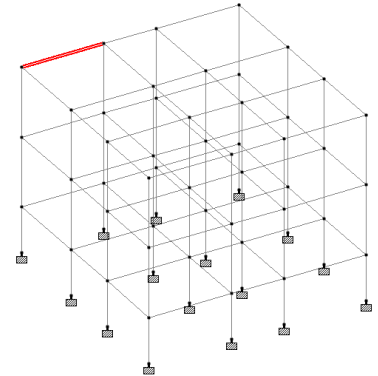
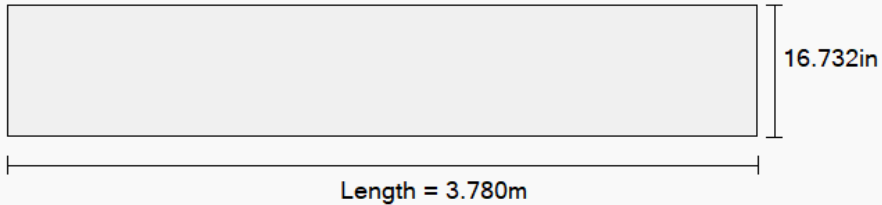


Front View

Top View

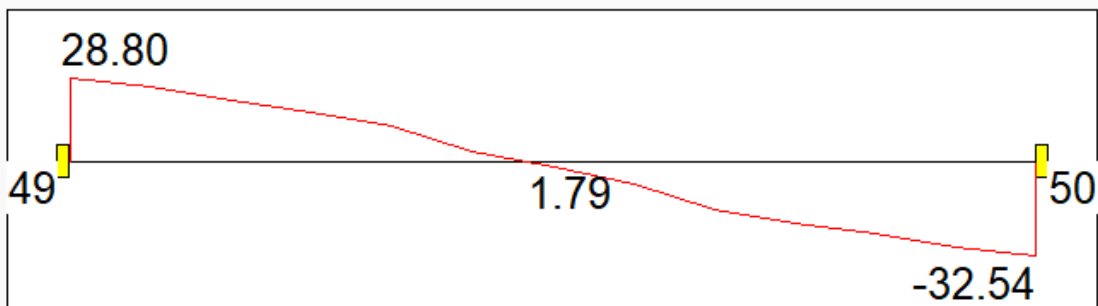
## Analysis of One Beam Member

Beam no. = 81. Section: Rect 16.73x9.84



## Shear Force Diagram

Beam No = 81



### Section Forces

Dist. m	Fy kN	Mz kip-in
2.205	-8.002	-147.393
2.520	-16.254	-112.925
2.835	-20.973	-61.687
3.150	-25.222	3.365
3.465	-29.706	80.590
3.780	-32.542	167.363

Dist. m	Fy kN	Mz kip-in
0.000	28.802	104.813

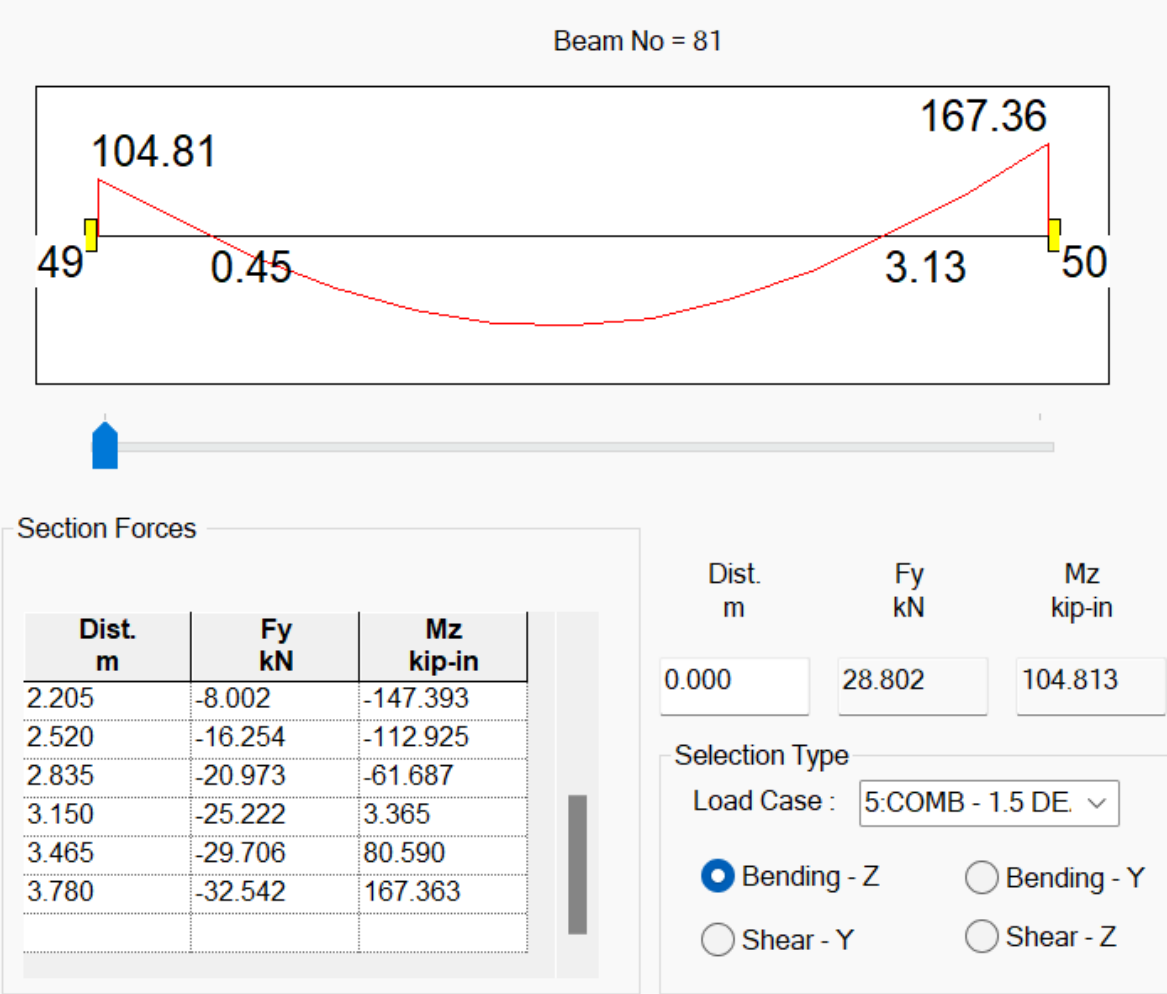
Selection Type

Load Case : 5:COMB - 1.5 DE

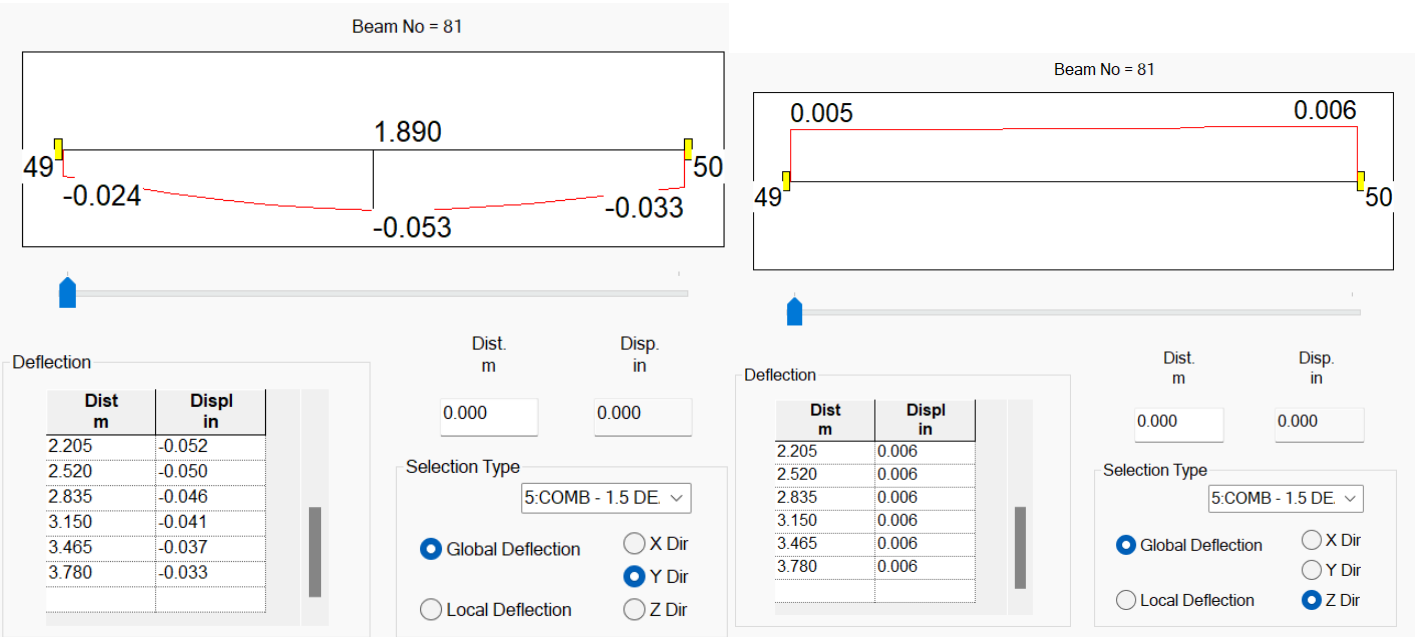
☐ Bending - Z ☐ Bending - Y

☒ Shear - Y ☐ Shear - Z

Bending Moment Diagram



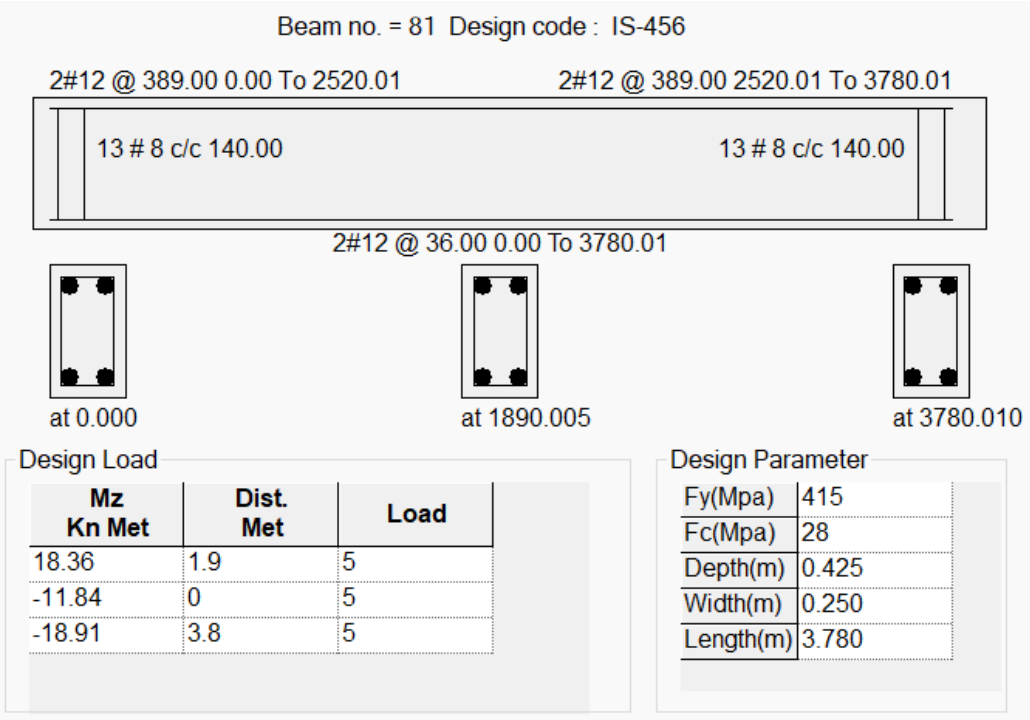
Deflection Diagram



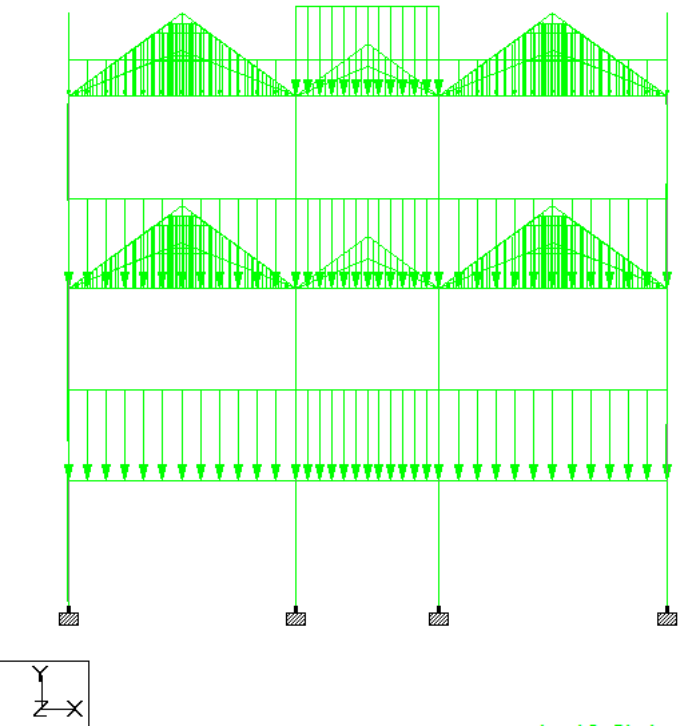
Deflection in y-direction

Deflection in z - direction

# Concrete Design of Beam

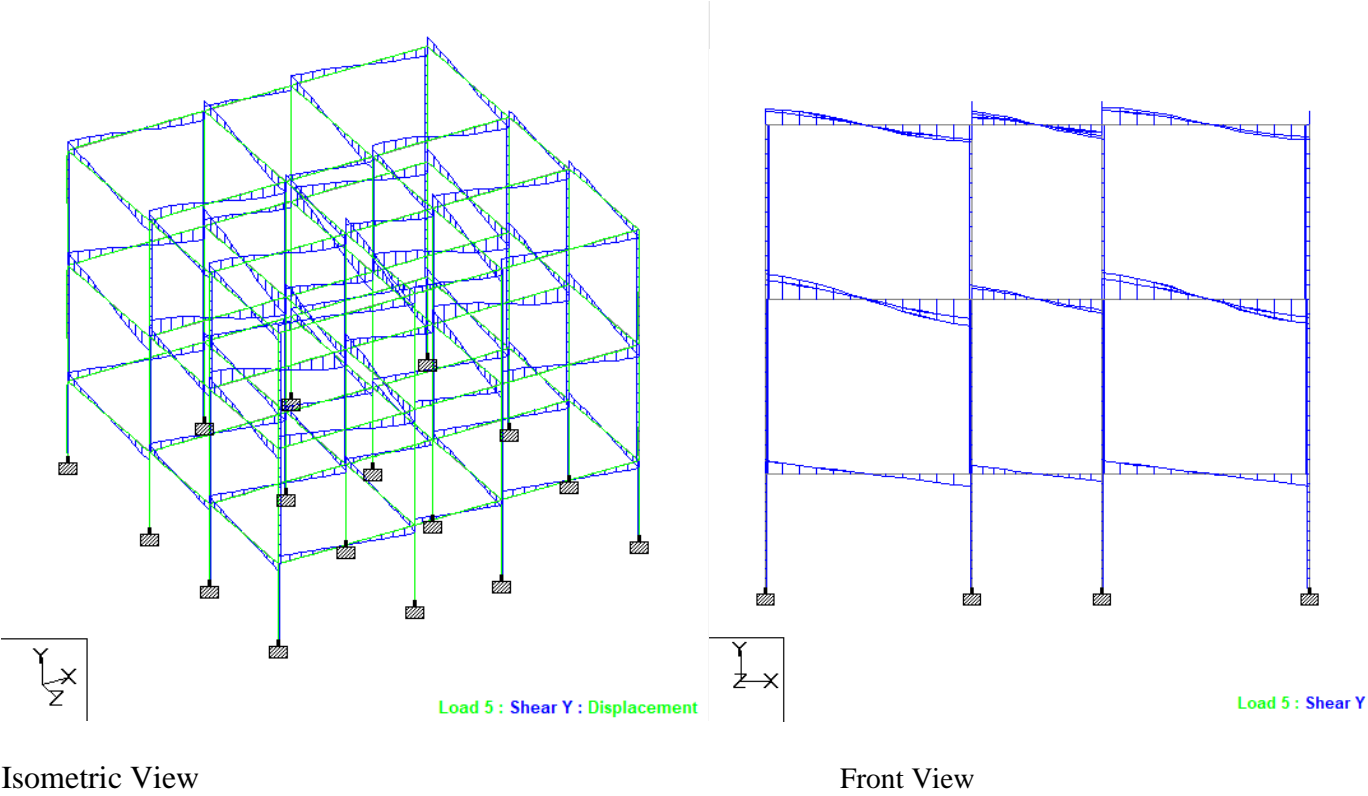


## Loading Diagram (Front View)

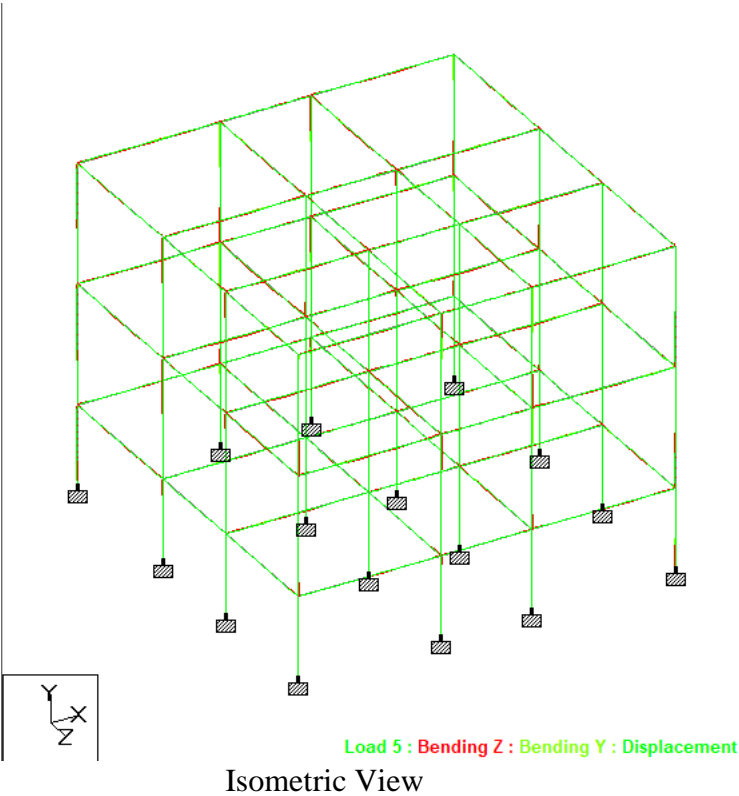


Loading Combination : 1.5DL+ 1.5LL

Shear Force and Bending Moment Diagram of whole structure



Shear force in y direction



Bending Moment in y & z direction

## Sections

Prop	Name	Area	I <sub>yy</sub>	I <sub>zz</sub>	J	Material	Source
		(in <sup>2</sup> )	(in <sup>4</sup> )	(in <sup>4</sup> )	(in <sup>4</sup> )		
1	Rect 11.81x11.81	139.500	1,621.681	1,621.681	2,736.587	CONCRETE	Parametric
2	Rect 16.73x9.84	164.687	1,329.503	3,842.264	3,366.883	CONCRETE	Parametric

## Materials

Mat	Name	E	ν	Density	α
		(kip/in <sup>2</sup> )		(kip/in <sup>3</sup> )	(/°F)
1	CONCRETE	3,150.001	0.170	0.000	0.000

## Supports

Node	X	Y	Z	rX	rY	rZ
	(kip/in)	(kip/in)	(kip/in)	(kip-ft/deg)	(kip-ft/deg)	(kip-ft/deg)
17	Fixed	Fixed	Fixed	Fixed	Fixed	Fixed
18	Fixed	Fixed	Fixed	Fixed	Fixed	Fixed
19	Fixed	Fixed	Fixed	Fixed	Fixed	Fixed
20	Fixed	Fixed	Fixed	Fixed	Fixed	Fixed
21	Fixed	Fixed	Fixed	Fixed	Fixed	Fixed
22	Fixed	Fixed	Fixed	Fixed	Fixed	Fixed
23	Fixed	Fixed	Fixed	Fixed	Fixed	Fixed
24	Fixed	Fixed	Fixed	Fixed	Fixed	Fixed
25	Fixed	Fixed	Fixed	Fixed	Fixed	Fixed
26	Fixed	Fixed	Fixed	Fixed	Fixed	Fixed
27	Fixed	Fixed	Fixed	Fixed	Fixed	Fixed
28	Fixed	Fixed	Fixed	Fixed	Fixed	Fixed
29	Fixed	Fixed	Fixed	Fixed	Fixed	Fixed
30	Fixed	Fixed	Fixed	Fixed	Fixed	Fixed
31	Fixed	Fixed	Fixed	Fixed	Fixed	Fixed
32	Fixed	Fixed	Fixed	Fixed	Fixed	Fixed

## Basic Load Cases

### Primary Load Cases

Number	Name	Type
1	SLX	Seismic-V
2	SLZ	Seismic-V
3	DL	Dead
4	LL	Live

## SelfWeights

L/C	Direction	Factor	Assigned Geometry
3	Y	-1.000	ALL



**Beam Loads**

L/C	Beam	Type	Direction	Fa	Da (m)	Fb	Db (m)	Ecc. (m)
3	1	UNI (lbf/ft)	GY	- 513.914	0.000	0.000	0.000	0.000
	2	UNI (lbf/ft)	GY	- 513.914	0.000	0.000	0.000	0.000
	3	UNI (lbf/ft)	GY	- 513.914	0.000	0.000	0.000	0.000
	4	UNI (lbf/ft)	GY	- 513.914	0.000	0.000	0.000	0.000
	5	UNI (lbf/ft)	GY	- 513.914	0.000	0.000	0.000	0.000
	6	UNI (lbf/ft)	GY	- 513.914	0.000	0.000	0.000	0.000
	7	UNI (lbf/ft)	GY	- 513.914	0.000	0.000	0.000	0.000
	8	UNI (lbf/ft)	GY	- 513.914	0.000	0.000	0.000	0.000
	9	UNI (lbf/ft)	GY	- 513.914	0.000	0.000	0.000	0.000
	10	UNI (lbf/ft)	GY	- 513.914	0.000	0.000	0.000	0.000
	11	UNI (lbf/ft)	GY	- 513.914	0.000	0.000	0.000	0.000
	12	UNI (lbf/ft)	GY	- 513.914	0.000	0.000	0.000	0.000
	13	UNI (lbf/ft)	GY	- 513.914	0.000	0.000	0.000	0.000
	14	UNI (lbf/ft)	GY	- 513.914	0.000	0.000	0.000	0.000
	15	UNI (lbf/ft)	GY	- 513.914	0.000	0.000	0.000	0.000
	16	UNI (lbf/ft)	GY	- 513.914	0.000	0.000	0.000	0.000
	17	UNI (lbf/ft)	GY	- 513.914	0.000	0.000	0.000	0.000
	18	UNI (lbf/ft)	GY	- 513.914	0.000	0.000	0.000	0.000
	19	UNI (lbf/ft)	GY	- 513.914	0.000	0.000	0.000	0.000
	20	UNI (lbf/ft)	GY	- 513.914	0.000	0.000	0.000	0.000
	21	UNI (lbf/ft)	GY	- 513.914	0.000	0.000	0.000	0.000
	22	UNI (lbf/ft)	GY	- 513.914	0.000	0.000	0.000	0.000
	23	UNI (lbf/ft)	GY	- 513.914	0.000	0.000	0.000	0.000
	24	UNI (lbf/ft)	GY	- 513.914	0.000	0.000	0.000	0.000
	41	UNI (lbf/ft)	GY	- 513.914	0.000	0.000	0.000	0.000
	42	UNI (lbf/ft)	GY	- 513.914	0.000	0.000	0.000	0.000
	43	UNI (lbf/ft)	GY	- 513.914	0.000	0.000	0.000	0.000
	44	UNI (lbf/ft)	GY	- 513.914	0.000	0.000	0.000	0.000
	45	UNI (lbf/ft)	GY	- 513.914	0.000	0.000	0.000	0.000
	46	UNI (lbf/ft)	GY	- 513.914	0.000	0.000	0.000	0.000

L/C	Beam	Type	Direction	Fa	Da (m)	Fb	Db (m)	Ecc. (m)
3	47	UNI (lbf/ft)	GY	- 513.914	0.000	0.000	0.000	0.000
	48	UNI (lbf/ft)	GY	- 513.914	0.000	0.000	0.000	0.000
	49	UNI (lbf/ft)	GY	- 513.914	0.000	0.000	0.000	0.000
	50	UNI (lbf/ft)	GY	- 513.914	0.000	0.000	0.000	0.000
	51	UNI (lbf/ft)	GY	- 513.914	0.000	0.000	0.000	0.000
	52	UNI (lbf/ft)	GY	- 513.914	0.000	0.000	0.000	0.000
	53	UNI (lbf/ft)	GY	- 513.914	0.000	0.000	0.000	0.000
	54	UNI (lbf/ft)	GY	- 513.914	0.000	0.000	0.000	0.000
	55	UNI (lbf/ft)	GY	- 513.914	0.000	0.000	0.000	0.000
	56	UNI (lbf/ft)	GY	- 513.914	0.000	0.000	0.000	0.000
	57	UNI (lbf/ft)	GY	- 513.914	0.000	0.000	0.000	0.000
	58	UNI (lbf/ft)	GY	- 513.914	0.000	0.000	0.000	0.000
	59	UNI (lbf/ft)	GY	- 513.914	0.000	0.000	0.000	0.000
	60	UNI (lbf/ft)	GY	- 513.914	0.000	0.000	0.000	0.000
	61	UNI (lbf/ft)	GY	- 513.914	0.000	0.000	0.000	0.000
	62	UNI (lbf/ft)	GY	- 513.914	0.000	0.000	0.000	0.000
	63	UNI (lbf/ft)	GY	- 513.914	0.000	0.000	0.000	0.000
	64	UNI (lbf/ft)	GY	- 513.914	0.000	0.000	0.000	0.000
	96	UNI (lbf/ft)	GY	- 513.914	0.000	0.000	0.000	0.000
	99	UNI (lbf/ft)	GY	- 513.914	0.000	0.000	0.000	0.000
	100	UNI (lbf/ft)	GY	- 513.914	0.000	0.000	0.000	0.000
	103	UNI (lbf/ft)	GY	- 513.914	0.000	0.000	0.000	0.000
	81	UNI (lbf/ft)	GY	- 205.566	0.000	0.000	0.000	0.000
	82	UNI (lbf/ft)	GY	- 205.566	0.000	0.000	0.000	0.000
	83	UNI (lbf/ft)	GY	- 205.566	0.000	0.000	0.000	0.000
	84	UNI (lbf/ft)	GY	- 205.566	0.000	0.000	0.000	0.000
	87	UNI (lbf/ft)	GY	- 205.566	0.000	0.000	0.000	0.000
	91	UNI (lbf/ft)	GY	- 205.566	0.000	0.000	0.000	0.000
	94	UNI (lbf/ft)	GY	- 205.566	0.000	0.000	0.000	0.000
	98	UNI (lbf/ft)	GY	- 205.566	0.000	0.000	0.000	0.000
	101	UNI (lbf/ft)	GY	- 205.566	0.000	0.000	0.000	0.000

L/C	Beam	Type	Direction	Fa	Da (m)	Fb	Db (m)	Ecc. (m)
3	102	UNI (lb/ft)	GY	205.566	0.000	0.000	0.000	0.000
	104	UNI (lb/ft)	GY	205.566	0.000	0.000	0.000	0.000

### Floor Loads

L/C	Direction	Load (psi)	Min X (m)	Max X (m)	Min Y (m)	Max Y (m)	Min Z (m)	Max Z (m)
3	GY	-0.526	0.000	0.000	3.100	6.500	0.000	0.000
4	GY	-0.290	0.000	0.000	3.100	6.500	0.000	0.000

### Seismic Loads

L/C	Code	Direction	Factor	DEC	ACC
1	Indian IS:1893 2002	X	1.000	0.000	0.000
2	Indian IS:1893 2002	Z	1.000	0.000	0.000

### Seismic Load Definitions

#### Indian (IS:1893) Seismic Load Definition

Parameters	Values
Year	2002/2005
ZONE	0.360
RF	5.000
I	1.000
SS	2.000
ST	1.000
DM	0.050
ACCIDENTAL	No

### Selfweight

	Factor
Selfweight	1.000

### Beam Weights

Type	Weight (kN)	Da (m)	Db (m)	d (m)	Beams
Distributed	0.191	0.000	0.000	0.000	1 To 24 41 To 64 96 99 100 103
	0.076	0.000	0.000	0.000	81 To 84 87 91 94 98 101 102 104

### Combination Load Cases

Comb.	Combination L/C Name	Primary	Primary L/C Name	Factor
5	COMB - 1.5 Dead + 1.5 Live	3	DL	1.500

Comb.	Combination L/C Name	Primary	Primary L/C Name	Factor
5	COMB - 1.5 Dead + 1.5 Live	4	LL	1.500

### Beam Force Detail

Beam	L/C	d (m)	Axial	Shear		Torsion	Bending	
			Fx (kN)	Fy (kN)	Fz (kN)	Mx (kip-in)	My (kip-in)	Mz (kip-in)
1	1	3.780	0.167	-14.311	-0.131	0.123	-1.870	210.467
	2	3.780	0.129	-0.015	-0.116	-1.485	-2.142	0.246
	3	3.780	-0.506	-19.564	0.004	0.211	0.064	98.826
	4	3.780	-0.403	0.081	0.002	0.092	0.035	-0.703
	5	3.780	-1.364	-29.224	0.009	0.453	0.148	147.184
2	1	2.400	0.000	-21.436	-0.178	0.124	-1.891	227.667
	2	2.400	0.220	0.000	0.000	0.000	-1.056	0.060
	3	2.400	-0.243	-12.004	0.000	0.000	0.013	60.845
	4	2.400	-0.171	0.000	0.000	0.000	0.011	-1.003
	5	2.400	-0.621	-18.006	0.000	0.000	0.037	89.764
3	1	3.780	-0.167	-14.311	-0.131	0.123	-2.518	268.312
	2	3.780	0.129	0.015	0.116	1.485	1.726	-0.253
	3	3.780	-0.506	-18.249	-0.004	-0.211	-0.072	76.826
	4	3.780	-0.403	-0.081	-0.002	-0.092	-0.037	2.022
	5	3.780	-1.364	-27.496	-0.009	-0.453	-0.163	118.272
4	1	3.920	0.127	-0.123	0.112	1.602	2.138	1.914
	2	3.920	0.154	-13.958	0.127	0.004	1.908	215.402
	3	3.920	-0.548	-20.486	-0.002	-0.217	-0.040	111.475
	4	3.920	-0.428	0.097	-0.002	-0.089	-0.027	-1.072
	5	3.920	-1.465	-30.582	-0.006	-0.458	-0.100	165.604
5	1	3.920	0.047	-0.034	0.190	0.814	3.323	0.530
	2	3.920	0.237	-14.935	0.089	0.005	1.426	230.630
	3	3.920	-1.109	-20.439	-0.001	0.150	-0.017	111.742
	4	3.920	-0.731	0.167	-0.001	0.086	-0.014	-1.879
	5	3.920	-2.760	-30.408	-0.003	0.354	-0.046	164.795
6	1	3.920	-0.047	0.034	0.190	0.814	3.323	-0.530
	2	3.920	0.237	-14.935	-0.089	-0.005	-1.426	230.630
	3	3.920	-1.109	-20.439	0.001	-0.150	0.017	111.742
	4	3.920	-0.731	0.167	0.001	-0.086	0.014	-1.879
	5	3.920	-2.760	-30.408	0.003	-0.354	0.046	164.795
7	1	3.920	-0.127	0.123	0.112	1.602	2.138	-1.914
	2	3.920	0.154	-13.958	-0.127	-0.004	-1.908	215.402
	3	3.920	-0.548	-20.486	0.002	0.217	0.040	111.475
	4	3.920	-0.428	0.097	0.002	0.089	0.027	-1.072
	5	3.920	-1.465	-30.582	0.006	0.458	0.100	165.604
8	1	3.780	0.260	-15.460	-0.092	0.062	-1.394	227.503

			Axial	Shear		Torsion	Bending	
Beam	L/C	d (m)	Fx (kN)	Fy (kN)	Fz (kN)	Mx (kip-in)	My (kip-in)	Mz (kip-in)
8	2	3.780	0.008	-0.003	-0.193	-0.815	-3.252	0.053
	3	3.780	-1.163	-19.483	0.003	-0.206	0.042	98.479
	4	3.780	-0.727	0.147	0.002	-0.065	0.027	-1.324
	5	3.780	-2.835	-29.003	0.007	-0.406	0.103	145.732
9	1	2.400	0.000	-23.208	-0.159	0.057	-1.689	246.485
	2	2.400	0.041	0.000	0.000	0.000	-0.654	0.014
	3	2.400	-0.495	-12.004	0.000	0.000	0.003	59.536
	4	2.400	-0.303	0.000	0.000	0.000	0.004	-1.749
	5	2.400	-1.197	-18.006	0.000	0.000	0.010	86.680
10	1	3.780	-0.260	-15.460	-0.092	0.062	-1.695	289.713
	2	3.780	0.008	0.003	0.193	0.815	3.202	-0.052
	3	3.780	-1.163	-18.330	-0.003	0.206	-0.049	79.204
	4	3.780	-0.727	-0.147	-0.002	0.065	-0.030	3.607
	5	3.780	-2.835	-27.717	-0.007	0.406	-0.120	124.217
11	1	2.885	0.215	-0.138	-0.022	0.096	0.578	1.782
	2	2.885	0.102	-16.810	0.135	0.003	1.693	212.221
	3	2.885	-0.281	-14.057	-0.001	0.087	-0.021	66.461
	4	2.885	-0.195	-0.054	-0.001	-0.004	-0.014	-0.056
	5	2.885	-0.714	-21.166	-0.002	0.124	-0.053	99.607
12	1	2.885	0.115	-0.035	-0.019	0.058	0.240	0.459
	2	2.885	0.124	-18.030	0.121	0.002	1.532	227.635
	3	2.885	-0.540	-13.894	-0.001	0.074	-0.006	63.691
	4	2.885	-0.341	-0.082	-0.001	-0.010	-0.007	-0.182
	5	2.885	-1.322	-20.964	-0.002	0.096	-0.021	95.265
13	1	2.885	-0.115	0.035	-0.019	0.058	0.240	-0.459
	2	2.885	0.124	-18.030	-0.121	-0.002	-1.532	227.635
	3	2.885	-0.540	-13.894	0.001	-0.074	0.006	63.691
	4	2.885	-0.341	-0.082	0.001	0.010	0.007	-0.182
	5	2.885	-1.322	-20.964	0.002	-0.096	0.021	95.265
14	1	2.885	-0.215	0.138	-0.022	0.096	0.578	-1.782
	2	2.885	0.102	-16.810	-0.135	-0.003	-1.693	212.221
	3	2.885	-0.281	-14.057	0.001	-0.087	0.021	66.461
	4	2.885	-0.195	-0.054	0.001	0.004	0.014	-0.056
	5	2.885	-0.714	-21.166	0.002	-0.124	0.053	99.607
15	1	3.780	0.245	-15.512	0.089	0.064	1.346	228.298
	2	3.780	0.024	-0.001	-0.199	-0.769	-3.340	0.015
	3	3.780	-1.191	-19.390	0.001	-0.008	0.014	96.897
	4	3.780	-0.715	0.137	0.001	0.071	0.012	-1.167
	5	3.780	-2.860	-28.878	0.002	0.095	0.040	143.595
16	1	2.400	0.000	-23.292	0.155	0.069	1.645	247.379
	2	2.400	0.019	0.000	0.000	0.000	-0.613	0.001

			Axial	Shear		Torsion	Bending	
Beam	L/C	d (m)	Fx (kN)	Fy (kN)	Fz (kN)	Mx (kip-in)	My (kip-in)	Mz (kip-in)
16	3	2.400	-0.524	-12.004	0.000	0.000	0.002	59.061
	4	2.400	-0.295	0.000	0.000	0.000	0.003	-1.687
	5	2.400	-1.227	-18.006	0.000	0.000	0.007	86.060
17	1	3.780	-0.245	-15.512	0.089	0.064	1.626	290.663
	2	3.780	0.024	0.001	0.199	0.769	3.302	-0.017
	3	3.780	-1.191	-18.423	-0.001	0.008	-0.006	80.735
	4	3.780	-0.715	-0.137	-0.001	-0.071	-0.008	3.426
	5	3.780	-2.860	-27.841	-0.002	-0.095	-0.020	126.241
18	1	3.335	0.119	-0.126	-0.118	-1.096	-1.596	2.081
	2	3.335	-0.043	-17.620	0.159	0.008	2.675	289.491
	3	3.335	-0.329	-15.987	0.003	0.242	0.043	59.062
	4	3.335	-0.280	-0.092	0.001	0.103	0.011	1.837
	5	3.335	-0.913	-24.117	0.005	0.517	0.080	91.348
19	1	3.335	0.049	-0.028	-0.207	-0.556	-3.050	0.469
	2	3.335	-0.096	-18.856	0.116	0.010	1.851	309.641
	3	3.335	-0.658	-16.128	0.001	-0.180	0.011	61.297
	4	3.335	-0.491	-0.156	0.000	-0.097	0.001	3.112
	5	3.335	-1.724	-24.427	0.001	-0.415	0.018	96.614
20	1	3.335	-0.049	0.028	-0.207	-0.556	-3.050	-0.469
	2	3.335	-0.096	-18.856	-0.116	-0.010	-1.851	309.641
	3	3.335	-0.658	-16.128	-0.001	0.180	-0.011	61.297
	4	3.335	-0.491	-0.156	0.000	0.097	-0.001	3.112
	5	3.335	-1.724	-24.427	-0.001	0.415	-0.018	96.614
21	1	3.335	-0.119	0.126	-0.118	-1.096	-1.596	-2.081
	2	3.335	-0.043	-17.620	-0.159	-0.008	-2.675	289.491
	3	3.335	-0.329	-15.987	-0.003	-0.242	-0.043	59.062
	4	3.335	-0.280	-0.092	-0.001	-0.103	-0.011	1.837
	5	3.335	-0.913	-24.117	-0.005	-0.517	-0.080	91.348
22	1	3.780	0.131	-14.845	0.111	0.120	1.604	218.410
	2	3.780	-0.162	0.019	-0.126	-1.398	-2.294	-0.313
	3	3.780	-0.543	-19.487	0.000	-0.056	0.003	97.534
	4	3.780	-0.396	0.075	0.000	-0.035	0.001	-0.600
	5	3.780	-1.409	-29.118	0.000	-0.136	0.006	145.401
23	1	2.400	0.000	-22.265	0.158	0.128	1.679	236.472
	2	2.400	-0.280	0.000	0.000	0.000	-1.004	-0.076
	3	2.400	-0.279	-12.004	0.000	0.000	-0.004	60.393
	4	2.400	-0.165	0.000	0.000	0.000	0.001	-0.965
	5	2.400	-0.665	-18.006	0.000	0.000	-0.005	89.142
24	1	3.780	-0.131	-14.845	0.111	0.120	2.119	278.231
	2	3.780	-0.162	-0.019	0.126	1.398	1.937	0.322
	3	3.780	-0.543	-18.326	0.000	0.056	0.006	78.113

			Axial	Shear		Torsion	Bending	
Beam	L/C	d (m)	Fx (kN)	Fy (kN)	Fz (kN)	Mx (kip-in)	My (kip-in)	Mz (kip-in)
24	4	3.780	-0.396	-0.075	0.000	0.035	0.005	1.915
	5	3.780	-1.409	-27.602	0.000	0.136	0.016	120.041
25	1	2.100	-37.082	13.914	-0.110	0.597	-0.700	-85.036
	2	2.100	43.085	-0.012	-14.328	0.788	-92.037	0.126
	3	2.100	122.266	-2.786	-2.149	-0.005	-26.514	34.944
	4	2.100	12.150	0.068	0.034	-0.005	0.422	-0.901
	5	2.100	201.625	-4.077	-3.172	-0.016	-39.138	51.066
26	1	2.100	-16.110	20.855	-0.024	0.188	-0.142	-172.268
	2	2.100	46.401	-0.008	-15.309	0.506	-98.316	0.095
	3	2.100	184.718	1.317	-2.112	0.002	-26.062	-16.551
	4	2.100	20.575	-0.073	0.059	0.000	0.728	0.908
	5	2.100	307.938	1.866	-3.080	0.002	-38.001	-23.464
27	1	2.100	16.110	20.855	0.024	0.188	0.142	-172.268
	2	2.100	46.401	0.008	-15.309	-0.506	-98.316	-0.095
	3	2.100	184.718	-1.317	-2.112	-0.002	-26.062	16.551
	4	2.100	20.575	0.073	0.059	0.000	0.728	-0.908
	5	2.100	307.938	-1.866	-3.080	-0.002	-38.001	23.464
28	1	2.100	37.082	13.914	0.110	0.597	0.700	-85.036
	2	2.100	43.085	0.012	-14.328	-0.788	-92.037	-0.126
	3	2.100	122.266	2.786	-2.149	0.005	-26.514	-34.944
	4	2.100	12.150	-0.068	0.034	0.005	0.422	0.901
	5	2.100	201.625	4.077	-3.172	0.016	-39.138	-51.066
29	1	2.100	38.750	14.538	0.159	0.402	1.307	-88.875
	2	2.100	-2.229	-0.001	-20.360	-0.338	-167.832	0.007
	3	2.100	176.343	2.675	0.473	0.007	6.398	-33.482
	4	2.100	22.851	-0.114	-0.058	0.005	-0.761	1.511
	5	2.100	298.791	3.842	0.622	0.019	8.456	-47.956
30	1	2.100	16.876	21.771	0.037	0.180	0.298	-179.787
	2	2.100	-2.341	0.000	-21.730	-0.309	-179.001	0.003
	3	2.100	247.793	-1.216	0.488	0.001	6.559	15.295
	4	2.100	38.724	0.127	-0.093	0.001	-1.232	-1.588
	5	2.100	429.775	-1.633	0.592	0.004	7.991	20.561
31	1	2.100	-16.876	21.771	-0.037	0.180	-0.298	-179.787
	2	2.100	-2.341	0.000	-21.730	0.309	-179.001	-0.003
	3	2.100	247.793	1.216	0.488	-0.001	6.559	-15.295
	4	2.100	38.724	-0.127	-0.093	-0.001	-1.232	1.588
	5	2.100	429.775	1.633	0.592	-0.004	7.991	-20.561
32	1	2.100	-38.750	14.538	-0.159	0.402	-1.307	-88.875
	2	2.100	-2.229	0.001	-20.360	0.338	-167.832	-0.007
	3	2.100	176.343	-2.675	0.473	-0.007	6.398	33.482
	4	2.100	22.851	0.114	-0.058	-0.005	-0.761	-1.511

			Axial	Shear		Torsion	Bending	
Beam	L/C	d (m)	Fx (kN)	Fy (kN)	Fz (kN)	Mx (kip-in)	My (kip-in)	Mz (kip-in)
32	5	2.100	298.791	-3.842	0.622	-0.019	8.456	47.956
33	1	2.100	-38.228	14.512	-0.168	-0.640	-1.401	-88.789
	2	2.100	-6.398	0.002	-19.938	0.369	-162.524	-0.019
	3	2.100	191.757	-2.633	-1.260	0.004	-15.396	32.957
	4	2.100	25.994	0.112	0.078	0.001	0.943	-1.485
	5	2.100	326.626	-3.782	-1.772	0.008	-21.680	47.208
34	1	2.100	-16.656	21.727	-0.042	-0.402	-0.352	-179.470
	2	2.100	-6.984	0.001	-21.280	0.329	-173.339	-0.017
	3	2.100	244.514	1.251	-1.116	-0.001	-13.639	-15.738
	4	2.100	43.722	-0.132	0.131	-0.002	1.561	1.646
	5	2.100	432.354	1.679	-1.478	-0.005	-18.117	-21.137
35	1	2.100	16.656	21.727	0.042	-0.402	0.352	-179.470
	2	2.100	-6.984	-0.001	-21.280	-0.329	-173.339	0.017
	3	2.100	244.514	-1.251	-1.116	0.001	-13.639	15.738
	4	2.100	43.722	0.132	0.131	0.002	1.561	-1.646
	5	2.100	432.354	-1.679	-1.478	0.005	-18.117	21.137
36	1	2.100	38.228	14.512	0.168	-0.640	1.401	-88.789
	2	2.100	-6.398	-0.002	-19.938	-0.369	-162.524	0.019
	3	2.100	191.757	2.633	-1.260	-0.004	-15.396	-32.957
	4	2.100	25.994	-0.112	0.078	-0.001	0.943	1.485
	5	2.100	326.626	3.782	-1.772	-0.008	-21.680	-47.208
37	1	2.100	-35.706	13.430	-0.121	-0.953	-0.794	-82.102
	2	2.100	-34.459	0.009	-13.507	0.861	-81.697	-0.100
	3	2.100	132.669	-2.751	2.886	-0.001	36.644	34.506
	4	2.100	14.150	0.066	-0.058	-0.004	-0.807	-0.870
	5	2.100	220.228	-4.027	4.243	-0.007	53.756	50.454
38	1	2.100	-15.421	20.141	-0.030	-0.439	-0.199	-166.441
	2	2.100	-37.076	0.007	-14.435	0.532	-87.313	-0.075
	3	2.100	179.243	1.350	2.789	-0.007	35.313	-16.973
	4	2.100	23.823	-0.076	-0.093	-0.006	-1.318	0.944
	5	2.100	304.600	1.912	4.044	-0.018	50.992	-24.044
39	1	2.100	15.421	20.141	0.030	-0.439	0.199	-166.441
	2	2.100	-37.076	-0.007	-14.435	-0.532	-87.313	0.075
	3	2.100	179.243	-1.350	2.789	0.007	35.313	16.973
	4	2.100	23.823	0.076	-0.093	0.006	-1.318	-0.944
	5	2.100	304.600	-1.912	4.044	0.018	50.992	24.044
40	1	2.100	35.706	13.430	0.121	-0.953	0.794	-82.102
	2	2.100	-34.459	-0.009	-13.507	-0.861	-81.697	0.100
	3	2.100	132.669	2.751	2.886	0.001	36.644	-34.506
	4	2.100	14.150	-0.066	-0.058	0.004	-0.807	0.870
	5	2.100	220.228	4.027	4.243	0.007	53.756	-50.454



			Axial	Shear		Torsion	Bending	
Beam	L/C	d (m)	Fx (kN)	Fy (kN)	Fz (kN)	Mx (kip-in)	My (kip-in)	Mz (kip-in)
41	1	3.780	-0.226	-14.598	-0.502	0.130	-7.313	213.460
	2	3.780	0.522	-0.026	-0.659	-1.833	-11.737	0.437
	3	3.780	-0.804	-26.322	-0.009	-2.074	-0.161	136.774
	4	3.780	-0.593	-3.674	0.003	-1.075	0.048	21.204
	5	3.780	-2.097	-44.994	-0.009	-4.723	-0.169	236.967
42	1	2.400	0.000	-20.996	-0.734	0.148	-7.798	222.991
	2	2.400	0.906	0.000	0.000	0.000	-4.440	0.135
	3	2.400	-0.456	-14.614	0.000	0.000	-0.051	85.036
	4	2.400	-0.288	-1.440	0.000	0.000	0.012	12.232
	5	2.400	-1.115	-24.081	0.000	0.000	-0.057	145.902
43	1	3.780	0.226	-14.598	-0.502	0.130	-9.480	274.941
	2	3.780	0.522	0.026	0.659	1.833	10.315	-0.430
	3	3.780	-0.804	-24.440	0.009	2.074	0.145	105.293
	4	3.780	-0.593	-3.470	-0.003	1.075	-0.052	17.793
	5	3.780	-2.097	-41.865	0.009	4.723	0.141	184.629
44	1	3.920	0.484	-0.144	0.618	1.693	11.249	2.237
	2	3.920	-0.228	-14.219	-0.515	0.013	7.875	217.542
	3	3.920	-0.916	-27.839	0.006	2.135	0.087	156.657
	4	3.920	-0.631	-4.003	-0.002	1.065	-0.036	25.142
	5	3.920	-2.320	-47.763	0.005	4.799	0.078	272.698
45	1	3.920	0.235	-0.044	0.894	0.831	15.563	0.691
	2	3.920	-0.126	-15.396	0.381	0.012	6.112	235.704
	3	3.920	-1.122	-34.271	0.005	-1.213	0.075	200.165
	4	3.920	-1.050	-7.394	-0.001	-0.554	-0.016	46.350
	5	3.920	-3.258	-62.497	0.005	-2.651	0.088	369.773
46	1	3.920	-0.235	0.044	0.894	0.831	15.563	-0.691
	2	3.920	-0.126	-15.396	-0.381	-0.012	-6.112	235.704
	3	3.920	-1.122	-34.271	-0.005	1.213	-0.075	200.165
	4	3.920	-1.050	-7.394	0.001	0.554	0.016	46.350
	5	3.920	-3.258	-62.497	-0.005	2.651	-0.088	369.773
47	1	3.920	-0.484	0.144	0.618	1.693	11.249	-2.237
	2	3.920	-0.228	-14.219	-0.515	-0.013	-7.875	217.542
	3	3.920	-0.916	-27.839	-0.006	-2.135	-0.087	156.657
	4	3.920	-0.631	-4.003	0.002	-1.065	0.036	25.142
	5	3.920	-2.320	-47.763	-0.005	-4.799	-0.078	272.698
48	1	3.780	-0.174	-15.789	-0.393	0.058	-5.991	230.998
	2	3.780	0.078	-0.005	-0.944	-0.961	-15.902	0.091
	3	3.780	-0.993	-32.749	-0.012	0.616	-0.210	174.932
	4	3.780	-1.041	-7.125	0.002	0.433	0.033	41.288
	5	3.780	-3.051	-59.811	-0.015	1.573	-0.266	324.329
49	1	2.400	0.000	-22.749	-0.688	0.058	-7.304	241.618

			Axial	Shear		Torsion	Bending	
Beam	L/C	d (m)	Fx (kN)	Fy (kN)	Fz (kN)	Mx (kip-in)	My (kip-in)	Mz (kip-in)
49	2	2.400	0.227	0.000	0.000	0.000	-2.844	0.031
	3	2.400	-0.529	-17.224	0.000	0.000	-0.038	107.189
	4	2.400	-0.498	-2.880	0.000	0.000	0.004	23.447
	5	2.400	-1.540	-30.156	0.000	0.000	-0.051	195.953
50	1	3.780	0.174	-15.789	-0.393	0.058	-7.174	297.250
	2	3.780	0.078	0.005	0.944	0.961	15.670	-0.089
	3	3.780	-0.993	-30.235	0.012	-0.616	0.205	132.879
	4	3.780	-1.041	-6.763	-0.002	-0.433	-0.037	35.247
	5	3.780	-3.051	-55.498	0.015	-1.573	0.252	252.188
51	1	2.885	0.854	-0.157	-0.041	0.540	2.945	2.069
	2	2.885	0.562	-16.881	0.591	0.005	7.453	213.329
	3	2.885	-0.529	-17.492	0.007	0.255	0.079	88.708
	4	2.885	-0.314	-1.933	-0.001	-0.059	-0.015	12.273
	5	2.885	-1.264	-29.138	0.009	0.294	0.096	151.472
52	1	2.885	0.532	-0.045	-0.016	0.267	1.820	0.604
	2	2.885	0.709	-18.322	0.529	0.004	6.683	231.574
	3	2.885	-0.706	-20.179	-0.006	0.090	0.072	99.332
	4	2.885	-0.532	-3.847	-0.001	0.005	-0.007	23.762
	5	2.885	-1.858	-36.039	0.008	0.142	0.097	184.641
53	1	2.885	-0.532	0.045	-0.016	0.267	1.820	-0.604
	2	2.885	0.709	-18.322	-0.529	-0.004	-6.683	231.574
	3	2.885	-0.706	-20.179	-0.006	-0.090	-0.072	99.332
	4	2.885	-0.532	-3.847	0.001	-0.005	0.007	23.762
	5	2.885	-1.858	-36.039	-0.008	-0.142	-0.097	184.641
54	1	2.885	-0.854	0.157	-0.041	0.540	2.945	-2.069
	2	2.885	0.562	-16.881	-0.591	-0.005	-7.453	213.329
	3	2.885	-0.529	-17.492	-0.007	-0.255	-0.079	88.708
	4	2.885	-0.314	-1.933	0.001	0.059	0.015	12.273
	5	2.885	-1.264	-29.138	-0.009	-0.294	-0.096	151.472
55	1	3.780	-0.108	-16.068	0.349	0.069	5.334	235.107
	2	3.780	0.061	-0.002	-0.965	-0.916	-16.243	0.030
	3	3.780	-0.995	-32.396	-0.014	-0.446	-0.230	169.410
	4	3.780	-1.021	-7.094	0.001	-0.185	0.013	41.313
	5	3.780	-3.024	-59.236	-0.020	-0.946	-0.326	316.085
56	1	2.400	0.000	-23.163	0.637	0.087	6.766	246.016
	2	2.400	0.029	0.000	0.000	0.000	-2.684	0.003
	3	2.400	-0.953	-17.224	0.000	0.000	-0.035	106.610
	4	2.400	-0.480	-2.880	0.000	0.000	0.003	23.416
	5	2.400	-2.151	-30.156	0.000	0.000	-0.049	195.039
57	1	3.780	0.108	-16.068	0.349	0.069	6.349	302.474
	2	3.780	0.061	0.002	0.965	0.916	16.058	-0.031

			Axial	Shear		Torsion	Bending	
Beam	L/C	d (m)	Fx (kN)	Fy (kN)	Fz (kN)	Mx (kip-in)	My (kip-in)	Mz (kip-in)
57	3	3.780	-0.995	-30.409	0.014	0.446	0.230	136.176
	4	3.780	-1.021	-6.695	-0.001	0.185	-0.007	34.624
	5	3.780	-3.024	-55.656	0.020	0.946	0.335	256.201
58	1	3.335	0.476	-0.134	-0.649	-0.965	-9.018	2.270
	2	3.335	0.820	-17.778	0.653	0.025	10.790	294.396
	3	3.335	-0.655	-20.855	0.010	-2.497	0.167	80.170
	4	3.335	-0.419	-2.719	0.001	-1.232	0.022	12.760
	5	3.335	-1.611	-35.361	0.017	-5.593	0.284	139.394
59	1	3.335	0.245	-0.033	-0.974	-0.492	-14.291	0.566
	2	3.335	0.872	-19.272	0.496	0.023	7.878	318.984
	3	3.335	-1.806	-25.471	0.008	1.416	0.123	103.625
	4	3.335	-0.715	-5.192	0.000	0.649	0.004	24.249
	5	3.335	-3.781	-45.994	0.012	3.098	0.191	191.812
60	1	3.335	-0.245	0.033	-0.974	-0.492	-14.291	-0.566
	2	3.335	0.872	-19.272	-0.496	-0.023	-7.878	318.984
	3	3.335	-1.806	-25.471	-0.008	-1.416	-0.123	103.625
	4	3.335	-0.715	-5.192	0.000	-0.649	-0.004	24.249
	5	3.335	-3.781	-45.994	-0.012	-3.098	-0.191	191.812
61	1	3.335	-0.476	0.134	-0.649	-0.965	-9.018	-2.270
	2	3.335	0.820	-17.778	-0.653	-0.025	-10.790	294.396
	3	3.335	-0.655	-20.855	-0.010	2.497	-0.167	80.170
	4	3.335	-0.419	-2.719	-0.001	1.232	-0.022	12.760
	5	3.335	-1.611	-35.361	-0.017	5.593	-0.284	139.394
62	1	3.780	-0.230	-15.487	0.450	0.137	6.598	226.497
	2	3.780	-0.661	0.033	-0.697	-1.754	-12.285	-0.558
	3	3.780	-0.831	-26.033	-0.014	0.958	-0.234	132.277
	4	3.780	-0.582	-3.638	0.000	0.711	-0.001	21.081
	5	3.780	-2.119	-44.507	-0.021	2.505	-0.352	230.038
63	1	2.400	0.000	-22.295	0.696	0.172	7.390	236.797
	2	2.400	-1.162	0.000	0.000	0.000	-4.235	-0.169
	3	2.400	-0.803	-14.614	0.000	0.000	-0.066	84.534
	4	2.400	-0.277	-1.440	0.000	0.000	0.000	12.214
	5	2.400	-1.620	-24.081	0.000	0.000	-0.099	145.121
64	1	3.780	0.230	-15.487	0.450	0.137	8.455	291.634
	2	3.780	-0.661	-0.033	0.697	1.754	11.047	0.550
	3	3.780	-0.831	-24.549	0.014	-0.958	0.221	107.460
	4	3.780	-0.582	-3.407	0.000	-0.711	0.008	17.219
	5	3.780	-2.119	-41.935	0.021	-2.505	0.344	187.019
65	1	3.200	-22.363	13.436	-0.103	1.120	-1.418	-188.447
	2	3.200	25.447	-0.015	-13.754	1.526	-193.498	0.226
	3	3.200	81.168	-3.326	-2.477	0.032	-37.672	51.287

			Axial	Shear		Torsion	Bending	
Beam	L/C	d (m)	Fx (kN)	Fy (kN)	Fz (kN)	Mx (kip-in)	My (kip-in)	Mz (kip-in)
65	4	3.200	11.983	-0.327	-0.246	0.000	-4.732	6.558
	5	3.200	139.727	-5.481	-4.084	0.048	-63.605	86.767
66	1	3.200	-8.718	19.882	-0.022	0.422	-0.298	-281.057
	2	3.200	27.564	-0.010	-14.898	1.067	-209.216	0.162
	3	3.200	130.312	1.582	-2.770	0.021	-43.171	-24.391
	4	3.200	20.494	0.159	-0.432	0.000	-8.370	-3.327
	5	3.200	226.209	2.611	-4.804	0.031	-77.311	-41.577
67	1	3.200	8.718	19.882	0.022	0.422	0.298	-281.057
	2	3.200	27.564	0.010	-14.898	-1.067	-209.216	-0.162
	3	3.200	130.312	-1.582	-2.770	-0.021	-43.171	24.391
	4	3.200	20.494	-0.159	-0.432	0.000	-8.370	3.327
	5	3.200	226.209	-2.611	-4.804	-0.031	-77.311	41.577
68	1	3.200	22.363	13.436	0.103	1.120	1.418	-188.447
	2	3.200	25.447	0.015	-13.754	-1.526	-193.498	-0.226
	3	3.200	81.168	3.326	-2.477	-0.032	-37.672	-51.287
	4	3.200	11.983	0.327	-0.246	0.000	-4.732	-6.558
	5	3.200	139.727	5.481	-4.084	-0.048	-63.605	-86.767
69	1	3.200	-23.250	14.215	-0.152	0.730	-2.144	-199.636
	2	3.200	-1.418	0.000	-19.353	0.761	-273.917	-0.006
	3	3.200	119.702	-3.870	0.520	0.017	8.039	62.201
	4	3.200	22.752	-0.603	0.025	-0.001	0.838	12.027
	5	3.200	213.680	-6.709	0.819	0.024	13.315	111.342
70	1	3.200	-9.103	20.908	-0.036	0.348	-0.507	-295.653
	2	3.200	-1.516	0.000	-20.902	0.684	-295.647	-0.003
	3	3.200	178.486	1.883	0.607	0.012	9.849	-30.523
	4	3.200	38.936	0.293	0.057	0.000	1.626	-6.101
	5	3.200	326.133	3.263	0.996	0.018	17.213	-54.936
71	1	3.200	9.103	20.908	0.036	0.348	0.507	-295.653
	2	3.200	-1.516	0.000	-20.902	-0.684	-295.647	0.003
	3	3.200	178.486	-1.883	0.607	-0.012	9.849	30.523
	4	3.200	38.936	-0.293	0.057	0.000	1.626	6.101
	5	3.200	326.133	-3.263	0.996	-0.018	17.213	54.936
72	1	3.200	23.250	14.215	0.152	0.730	2.144	-199.636
	2	3.200	-1.418	0.000	-19.353	-0.761	-273.917	0.006
	3	3.200	119.702	3.870	0.520	-0.017	8.039	-62.201
	4	3.200	22.752	0.603	0.025	0.001	0.838	-12.027
	5	3.200	213.680	6.709	0.819	-0.024	13.315	-111.342
73	1	3.200	-22.753	14.208	-0.164	-1.341	-2.321	-199.987
	2	3.200	-3.542	0.003	-18.996	0.818	-268.930	-0.041
	3	3.200	131.352	-3.797	-1.530	0.012	-23.452	61.002
	4	3.200	25.998	-0.616	-0.157	0.000	-3.191	12.272

			Axial	Shear		Torsion	Bending	
Beam	L/C	d (m)	Fx (kN)	Fy (kN)	Fz (kN)	Mx (kip-in)	My (kip-in)	Mz (kip-in)
73	5	3.200	236.025	-6.620	-2.530	0.019	-39.965	109.910
74	1	3.200	-8.907	20.836	-0.043	-0.882	-0.605	-294.846
	2	3.200	-3.892	0.002	-20.520	0.723	-290.317	-0.031
	3	3.200	170.836	1.918	-1.682	0.013	-26.692	-31.043
	4	3.200	44.118	0.292	-0.257	0.000	-5.282	-6.101
	5	3.200	322.432	3.315	-2.909	0.020	-47.962	-55.716
75	1	3.200	8.907	20.836	0.043	-0.882	0.605	-294.846
	2	3.200	-3.892	-0.002	-20.520	-0.723	-290.317	0.031
	3	3.200	170.836	-1.918	-1.682	-0.013	-26.692	31.043
	4	3.200	44.118	-0.292	-0.257	0.000	-5.282	6.101
	5	3.200	322.432	-3.315	-2.909	-0.020	-47.962	55.716
76	1	3.200	22.753	14.208	0.164	-1.341	2.321	-199.987
	2	3.200	-3.542	-0.003	-18.996	-0.818	-268.930	0.041
	3	3.200	131.352	3.797	-1.530	-0.012	-23.452	-61.002
	4	3.200	25.998	0.616	-0.157	0.000	-3.191	-12.272
	5	3.200	236.025	6.620	-2.530	-0.019	-39.965	-109.910
77	1	3.200	-21.273	12.959	-0.116	-1.714	-1.630	-182.418
	2	3.200	-20.486	0.012	-13.019	1.642	-183.055	-0.180
	3	3.200	88.907	-3.254	3.430	0.025	53.032	50.063
	4	3.200	13.971	-0.336	0.369	0.000	7.416	6.714
	5	3.200	154.316	-5.385	5.699	0.038	90.671	85.164
78	1	3.200	-8.262	19.115	-0.031	-0.923	-0.424	-270.501
	2	3.200	-22.156	0.008	-14.119	1.118	-198.161	-0.129
	3	3.200	122.115	1.614	3.902	0.021	62.746	-24.853
	4	3.200	23.738	0.158	0.641	0.000	12.827	-3.327
	5	3.200	218.779	2.658	6.814	0.031	113.359	-42.271
79	1	3.200	8.262	19.115	0.031	-0.923	0.424	-270.501
	2	3.200	-22.156	-0.008	-14.119	-1.118	-198.161	0.129
	3	3.200	122.115	-1.614	3.902	-0.021	62.746	24.853
	4	3.200	23.738	-0.158	0.641	0.000	12.827	3.327
	5	3.200	218.779	-2.658	6.814	-0.031	113.359	42.271
80	1	3.200	21.273	12.959	0.116	-1.714	1.630	-182.418
	2	3.200	-20.486	-0.012	-13.019	-1.642	-183.055	0.180
	3	3.200	88.907	3.254	3.430	-0.025	53.032	-50.063
	4	3.200	13.971	0.336	0.369	0.000	7.416	-6.714
	5	3.200	154.316	5.385	5.699	-0.038	90.671	-85.164
81	1	3.780	1.122	-6.454	-0.718	0.053	-10.516	93.168
	2	3.780	0.812	-0.021	-1.107	-0.980	-19.626	0.386
	3	3.780	4.068	-17.873	-0.004	-0.258	-0.072	90.661
	4	3.780	0.932	-3.821	-0.006	-1.551	-0.094	20.915
	5	3.780	7.500	-32.542	-0.015	-2.713	-0.249	167.363

			Axial	Shear		Torsion	Bending	
Beam	L/C	d (m)	Fx (kN)	Fy (kN)	Fz (kN)	Mx (kip-in)	My (kip-in)	Mz (kip-in)
82	1	2.400	0.000	-8.249	-1.028	0.060	-10.918	87.615
	2	2.400	1.419	0.000	0.000	0.000	-7.200	0.190
	3	2.400	2.113	-9.214	0.000	0.000	-0.030	63.570
	4	2.400	0.469	-1.440	0.000	0.000	-0.030	14.676
	5	2.400	3.873	-15.981	0.000	0.000	-0.090	117.369
83	1	3.780	-1.122	-6.454	-0.718	0.053	-13.494	122.771
	2	3.780	0.812	0.021	1.107	0.980	17.406	-0.314
	3	3.780	4.068	-15.879	0.004	0.258	0.072	57.298
	4	3.780	0.932	-3.323	0.006	1.551	0.097	12.578
	5	3.780	7.500	-28.802	0.015	2.713	0.254	104.813
84	1	3.920	0.619	-0.077	0.854	0.732	15.125	1.180
	2	3.920	1.358	-6.220	0.831	0.026	12.742	92.379
	3	3.920	4.360	-18.962	0.004	0.442	0.065	104.112
	4	3.920	1.003	-4.166	0.005	1.537	0.072	25.074
	5	3.920	8.043	-34.692	0.013	2.969	0.205	193.780
85	1	3.920	0.277	-0.026	1.259	0.349	21.667	0.410
	2	3.920	0.308	-6.807	-0.619	0.017	9.947	101.218
	3	3.920	5.010	-18.931	0.002	-0.264	0.035	109.200
	4	3.920	1.689	-7.646	0.003	-0.734	0.039	46.211
	5	3.920	10.048	-39.866	0.007	-1.497	0.111	233.115
86	1	3.920	-0.277	0.026	1.259	0.349	21.667	-0.410
	2	3.920	0.308	-6.807	-0.619	-0.017	-9.947	101.218
	3	3.920	5.010	-18.931	-0.002	0.264	-0.035	109.200
	4	3.920	1.689	-7.646	-0.003	0.734	-0.039	46.211
	5	3.920	10.048	-39.866	-0.007	1.497	-0.111	233.115
87	1	3.920	-0.619	0.077	0.854	0.732	15.125	-1.180
	2	3.920	1.358	-6.220	-0.831	-0.026	-12.742	92.379
	3	3.920	4.360	-18.962	-0.004	-0.442	-0.065	104.112
	4	3.920	1.003	-4.166	-0.005	-1.537	-0.072	25.074
	5	3.920	8.043	-34.692	-0.013	-2.969	-0.205	193.780
88	1	3.780	1.710	-6.949	-0.696	0.013	-10.657	100.380
	2	3.780	0.135	-0.004	-1.562	-0.459	-26.325	0.073
	3	3.780	4.791	-18.306	-0.005	0.219	-0.074	99.093
	4	3.780	1.656	-7.359	-0.005	0.590	-0.081	40.649
	5	3.780	9.670	-38.498	-0.015	1.213	-0.232	209.613
89	1	2.400	0.000	-8.897	-1.199	0.005	-12.735	94.490
	2	2.400	0.379	0.000	0.000	0.000	-4.640	0.042
	3	2.400	2.411	-8.224	0.000	0.000	-0.008	64.694
	4	2.400	0.821	-2.880	0.000	0.000	-0.011	27.460
	5	2.400	4.848	-16.656	0.000	0.000	-0.030	138.231
90	1	3.780	-1.710	-6.949	-0.696	0.013	-12.622	132.108

			Axial	Shear		Torsion	Bending	
Beam	L/C	d (m)	Fx (kN)	Fy (kN)	Fz (kN)	Mx (kip-in)	My (kip-in)	Mz (kip-in)
90	2	3.780	0.135	0.004	1.562	0.459	25.940	-0.054
	3	3.780	4.791	-16.329	0.005	-0.219	0.084	66.010
	4	3.780	1.656	-6.529	0.005	-0.590	0.088	26.766
	5	3.780	9.670	-34.286	0.015	-1.213	0.257	139.165
91	1	2.885	1.175	-0.078	0.287	0.563	8.565	1.114
	2	2.885	1.049	-7.092	0.970	0.012	12.234	90.176
	3	2.885	2.459	-11.130	0.004	0.130	0.061	62.556
	4	2.885	0.532	-1.853	0.002	-0.102	0.038	12.733
	5	2.885	4.487	-19.475	0.009	0.043	0.149	112.934
92	1	2.885	0.735	-0.025	0.426	0.235	8.291	0.368
	2	2.885	-2.510	-7.782	0.865	0.006	10.952	98.957
	3	2.885	2.895	-11.303	0.003	2.103	0.040	86.185
	4	2.885	0.910	-3.730	0.002	0.004	0.024	24.542
	5	2.885	5.709	-22.549	0.008	3.161	0.095	166.090
93	1	2.885	-0.735	0.025	0.426	0.235	8.291	-0.368
	2	2.885	-2.510	-7.782	-0.865	-0.006	-10.952	98.957
	3	2.885	2.895	-11.303	-0.003	-2.103	-0.040	86.185
	4	2.885	0.910	-3.730	-0.002	-0.004	-0.024	24.542
	5	2.885	5.709	-22.549	-0.008	-3.161	-0.095	166.090
94	1	2.885	-1.175	0.078	0.287	0.563	8.565	-1.114
	2	2.885	1.049	-7.092	-0.970	-0.012	-12.234	90.176
	3	2.885	2.459	-11.130	-0.004	-0.130	-0.061	62.556
	4	2.885	0.532	-1.853	-0.002	0.102	-0.038	12.733
	5	2.885	4.487	-19.475	-0.009	-0.043	-0.149	112.934
95	1	3.780	-0.109	-7.223	0.352	0.032	5.313	104.287
	2	3.780	0.094	-0.002	-1.607	-0.451	-27.032	0.038
	3	3.780	4.863	-18.333	-0.002	-3.202	-0.033	104.280
	4	3.780	1.622	-7.326	-0.002	-0.258	-0.046	40.711
	5	3.780	9.727	-38.488	-0.006	-5.189	-0.118	217.486
96	1	2.400	0.000	-9.251	0.666	0.051	7.070	98.258
	2	2.400	0.042	0.000	0.000	0.000	-4.408	0.006
	3	2.400	2.937	-17.224	0.000	0.000	-0.007	83.054
	4	2.400	0.789	-2.880	0.000	0.000	-0.010	27.434
	5	2.400	5.588	-30.156	0.000	0.000	-0.026	165.732
97	1	3.780	0.109	-7.223	0.352	0.032	6.473	137.350
	2	3.780	0.094	0.002	1.607	0.451	26.723	-0.043
	3	3.780	4.863	-16.123	0.002	3.202	0.024	67.313
	4	3.780	1.622	-6.463	0.002	0.258	0.035	26.279
	5	3.780	9.727	-33.879	0.006	5.189	0.087	140.389
98	1	3.335	0.699	-0.060	-0.922	-0.248	-12.312	1.100
	2	3.335	-0.174	-7.608	1.064	0.050	17.547	129.354

			Axial	Shear		Torsion	Bending	
Beam	L/C	d (m)	Fx (kN)	Fy (kN)	Fz (kN)	Mx (kip-in)	My (kip-in)	Mz (kip-in)
98	3	3.335	3.122	-13.256	-0.002	-0.511	-0.035	40.318
	4	3.335	0.664	-2.596	-0.001	-1.768	-0.014	9.049
	5	3.335	5.678	-23.779	-0.005	-3.419	-0.073	74.050
99	1	3.335	0.384	-0.016	-1.358	-0.161	-19.615	0.300
	2	3.335	-2.280	-8.352	0.814	0.033	12.929	141.893
	3	3.335	4.587	-24.943	-0.001	-0.165	-0.014	75.071
	4	3.335	1.148	-5.000	0.000	0.857	0.006	18.347
	5	3.335	8.602	-44.915	0.000	1.039	-0.011	140.127
100	1	3.335	-0.384	0.016	-1.358	-0.161	-19.615	-0.300
	2	3.335	-2.280	-8.352	-0.814	-0.033	-12.929	141.893
	3	3.335	4.587	-24.943	0.001	0.165	0.014	75.071
	4	3.335	1.148	-5.000	0.000	-0.857	-0.006	18.347
	5	3.335	8.602	-44.915	0.000	-1.039	0.011	140.127
101	1	3.335	-0.699	0.060	-0.922	-0.248	-12.312	-1.100
	2	3.335	-0.174	-7.608	-1.064	-0.050	-17.547	129.354
	3	3.335	3.122	-13.256	0.002	0.511	0.035	40.318
	4	3.335	0.664	-2.596	0.001	1.768	0.014	9.049
	5	3.335	5.678	-23.779	0.005	3.419	0.073	74.050
102	1	3.780	-0.407	-7.070	0.622	0.080	9.057	101.949
	2	3.780	-1.041	0.027	-1.183	-0.967	-20.772	-0.497
	3	3.780	4.149	-17.851	0.003	4.560	0.042	93.899
	4	3.780	0.909	-3.784	0.000	1.022	-0.016	20.803
	5	3.780	7.587	-32.453	0.004	8.373	0.040	172.053
103	1	2.400	0.000	-9.029	0.983	0.123	10.439	95.893
	2	2.400	-1.840	0.000	0.000	0.000	-6.947	-0.238
	3	2.400	2.533	-14.614	0.000	0.000	0.005	72.709
	4	2.400	0.444	-1.440	0.000	0.000	-0.007	14.688
	5	2.400	4.465	-24.081	0.000	0.000	-0.003	131.095
104	1	3.780	0.407	-7.070	0.622	0.080	11.755	134.601
	2	3.780	-1.041	-0.027	1.183	0.967	18.816	0.411
	3	3.780	4.149	-15.721	-0.003	-4.560	-0.058	58.272
	4	3.780	0.909	-3.261	0.000	-1.022	0.000	12.055
	5	3.780	7.587	-28.474	-0.004	-8.373	-0.086	105.491
105	1	3.200	-7.010	8.353	-0.077	0.557	-1.180	-134.353
	2	3.200	7.635	-0.023	-8.034	1.269	-128.386	0.360
	3	3.200	28.977	-4.147	-3.119	-0.022	-44.878	58.783
	4	3.200	5.858	-0.908	-0.664	0.014	-10.071	13.823
	5	3.200	52.252	-7.583	-5.675	-0.013	-82.424	108.910
106	1	3.200	-1.943	13.397	-0.023	0.119	-0.344	-197.681
	2	3.200	8.325	-0.015	-8.982	0.896	-142.861	0.226
	3	3.200	57.409	1.617	-4.590	-0.024	-70.510	-21.025



			Axial	Shear		Torsion	Bending	
Beam	L/C	d (m)	Fx (kN)	Fy (kN)	Fz (kN)	Mx (kip-in)	My (kip-in)	Mz (kip-in)
106	4	3.200	10.224	0.465	-1.147	0.002	-17.325	-6.973
	5	3.200	101.449	3.122	-8.606	-0.032	-131.754	-41.997
107	1	3.200	1.943	13.397	0.023	0.119	0.344	-197.681
	2	3.200	8.325	0.015	-8.982	-0.896	-142.861	-0.226
	3	3.200	57.409	-1.617	-4.590	0.024	-70.510	21.025
	4	3.200	10.224	-0.465	-1.147	-0.002	-17.325	6.973
	5	3.200	101.449	-3.122	-8.606	0.032	-131.754	41.997
108	1	3.200	7.010	8.353	0.077	0.557	1.180	-134.353
	2	3.200	7.635	0.023	-8.034	-1.269	-128.386	-0.360
	3	3.200	28.977	4.147	-3.119	0.022	-44.878	-58.783
	4	3.200	5.858	0.908	-0.664	-0.014	-10.071	-13.823
	5	3.200	52.252	7.583	-5.675	0.013	-82.424	-108.910
109	1	3.200	-7.205	8.562	-0.124	-0.121	-1.818	-138.160
	2	3.200	-0.519	0.000	-12.492	0.634	-184.945	-0.004
	3	3.200	42.430	-4.869	0.661	-0.004	9.316	66.672
	4	3.200	11.281	-1.625	0.129	0.013	2.006	24.613
	5	3.200	80.566	-9.741	1.185	0.013	16.984	136.928
110	1	3.200	-2.020	13.741	-0.038	-0.197	-0.548	-202.941
	2	3.200	-0.568	0.000	-13.797	0.570	-204.042	-0.005
	3	3.200	74.645	1.922	1.694	-0.009	27.613	-23.494
	4	3.200	19.621	0.832	0.240	0.004	3.665	-12.423
	5	3.200	141.398	4.132	2.900	-0.008	46.917	-53.877
111	1	3.200	2.020	13.741	0.038	-0.197	0.548	-202.941
	2	3.200	-0.568	0.000	-13.797	-0.570	-204.042	0.005
	3	3.200	74.645	-1.922	1.694	0.009	27.613	23.494
	4	3.200	19.621	-0.832	0.240	-0.004	3.665	12.423
	5	3.200	141.398	-4.132	2.900	0.008	46.917	53.877
112	1	3.200	7.205	8.562	0.124	-0.121	1.818	-138.160
	2	3.200	-0.519	0.000	-12.492	-0.634	-184.945	0.004
	3	3.200	42.430	4.869	0.661	0.004	9.316	-66.672
	4	3.200	11.281	1.625	0.129	-0.013	2.006	-24.613
	5	3.200	80.566	9.741	1.185	-0.013	16.984	-136.928
113	1	3.200	-6.951	8.145	-0.141	-1.260	-2.073	-132.277
	2	3.200	-0.876	0.004	-12.294	0.673	-182.833	-0.068
	3	3.200	47.581	-4.791	-1.905	-0.018	-26.952	65.698
	4	3.200	13.003	-1.659	-0.476	-0.001	-7.127	25.127
	5	3.200	90.876	-9.675	-3.571	-0.027	-51.117	136.238
114	1	3.200	-1.946	13.181	-0.046	-0.854	-0.668	-194.984
	2	3.200	-0.971	0.003	-13.560	0.593	-201.428	-0.042
	3	3.200	56.253	2.381	-2.110	-0.010	-29.329	-32.032
	4	3.200	22.361	0.834	-0.773	0.005	-11.548	-12.451

			Axial	Shear		Torsion	Bending	
Beam	L/C	d (m)	Fx (kN)	Fy (kN)	Fz (kN)	Mx (kip-in)	My (kip-in)	Mz (kip-in)
114	5	3.200	117.921	4.823	-4.325	-0.007	-61.316	-66.724
115	1	3.200	1.946	13.181	0.046	-0.854	0.668	-194.984
	2	3.200	-0.971	-0.003	-13.560	-0.593	-201.428	0.042
	3	3.200	56.253	-2.381	-2.110	0.010	-29.329	32.032
	4	3.200	22.361	-0.834	-0.773	-0.005	-11.548	12.451
	5	3.200	117.921	-4.823	-4.325	0.007	-61.316	66.724
116	1	3.200	6.951	8.145	0.141	-1.260	2.073	-132.277
	2	3.200	-0.876	-0.004	-12.294	-0.673	-182.833	0.068
	3	3.200	47.581	4.791	-1.905	0.018	-26.952	-65.698
	4	3.200	13.003	1.659	-0.476	0.001	-7.127	-25.127
	5	3.200	90.876	9.675	-3.571	0.027	-51.117	-136.238
117	1	3.200	-6.531	7.516	-0.098	-1.015	-1.530	-122.038
	2	3.200	-6.241	0.019	-7.533	1.327	-122.446	-0.288
	3	3.200	32.398	-4.064	4.355	-0.015	61.992	57.740
	4	3.200	6.831	-0.927	0.997	0.010	15.216	14.115
	5	3.200	58.843	-7.487	8.028	-0.007	115.812	107.782
118	1	3.200	-1.821	12.201	-0.033	-0.593	-0.508	-180.435
	2	3.200	-6.786	0.012	-8.405	0.912	-135.930	-0.179
	3	3.200	43.710	1.958	5.014	-0.007	68.907	-27.354
	4	3.200	11.816	0.465	1.694	0.014	25.728	-6.973
	5	3.200	83.290	3.634	10.063	0.011	141.953	-51.491
119	1	3.200	1.821	12.201	0.033	-0.593	0.508	-180.435
	2	3.200	-6.786	-0.012	-8.405	-0.912	-135.930	0.179
	3	3.200	43.710	-1.958	5.014	0.007	68.907	27.354
	4	3.200	11.816	-0.465	1.694	-0.014	25.728	6.973
	5	3.200	83.290	-3.634	10.063	-0.011	141.953	51.491
120	1	3.200	6.531	7.516	0.098	-1.015	1.530	-122.038
	2	3.200	-6.241	-0.019	-7.533	-1.327	-122.446	0.288
	3	3.200	32.398	4.064	4.355	0.015	61.992	-57.740
	4	3.200	6.831	0.927	0.997	-0.010	15.216	-14.115
	5	3.200	58.843	7.487	8.028	0.007	115.812	-107.782

### Beam Force Detail Summary

				Axial	Shear		Torsion	Bending	
	Beam	L/C	d (m)	Fx (kN)	Fy (kN)	Fz (kN)	Mx (kip-in)	My (kip-in)	Mz (kip-in)
Max Fx	34	5	0.000	439.034	1.679	-1.478	-0.005	9.346	10.075
Min Fx	32	1	0.000	-38.750	14.538	-0.159	0.402	1.656	181.330
Max Fy	50	5	0.000	-3.051	59.811	0.015	-1.573	-0.266	324.329
Min Fy	45	5	3.920	-3.258	-62.497	0.005	-2.651	0.088	369.773
Max Fz	119	5	0.000	93.468	-3.634	10.063	-0.011	-143.060	-51.446

				Axial	Shear		Torsion	Bending	
	Beam	L/C	d (m)	Fx (kN)	Fy (kN)	Fz (kN)	Mx (kip-in)	My (kip-in)	Mz (kip-in)
Min Fz	30	2	0.000	-2.341	0.000	-21.730	-0.309	224.882	-0.002
Max Mx	102	5	0.000	7.587	28.474	0.004	8.373	-0.086	105.491
Min Mx	104	5	0.000	7.587	32.453	-0.004	-8.373	0.040	172.053
Max My	70	2	0.000	-1.516	0.000	-20.902	0.684	296.337	0.002
Min My	70	2	3.200	-1.516	0.000	-20.902	0.684	-295.647	-0.003
Max Mz	45	5	3.920	-3.258	-62.497	0.005	-2.651	0.088	369.773
Min Mz	55	1	0.000	-0.108	-16.068	0.349	0.069	-6.349	-302.474

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## **Project Outcomes:**

In the course of our project, which focused on the analysis and design of a G+1 building, we have gained valuable insights into the intricate process of creating a structurally sound and safe structure. Our project encompassed an exhaustive examination of design elements and materials, meticulous load calculations, and the utilization of cutting-edge structural analysis software. We were tasked with assessing the capacity of foundational components, columns, beams, and slabs, all while ensuring unwavering compliance with building codes and regulations.

The process demanded a thorough distribution of loads, the optimization of our design based on analysis results, and the creation of comprehensive documentation necessary for both construction and regulatory approval. As a team, we recognized the critical role of professional judgment and expertise in achieving our project's goals.

Throughout this journey, we have not only developed a deep understanding of the intricacies of structural analysis but have also honed our skills in teamwork, project management, and problem-solving. We are proud to have successfully completed this project, and we believe that the knowledge and experience gained will serve us well in our academic and professional endeavors.

This project has been an enlightening and rewarding experience, and we look forward to applying the principles and lessons we've learned to future challenges in the field of civil engineering and construction.

## **Conclusion :**

In summary, the structural analysis of a G+1 building involves a thorough examination of its design and materials, calculation of various loads, and modeling using structural analysis software. Engineers assess the capacity of foundational elements, columns, beams, and slabs, ensuring compliance with building codes. The process includes load distribution, optimization based on analysis results, and the creation of comprehensive documentation for construction and regulatory approval. Professional judgment and expertise are essential to achieve a structurally sound and safe building design.