

## Combined Core Pillar Concept for Earthquake Resistant Building

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**Abstract :** The main aim of this paper is to introduce "Combined Core Pillar Concept" for earthquake resistant design of a building . A 12 storey building model of height 43m is taken in which this concept is applied .All other methods which has been used in this model are - building with friction isolator (FI) , with rubber bearing (RB) , with shearwall (fixed base), with shearwall having base as rubber bearing and friction isolator, with cross bracing & with k-type bracing . A comparative study of the model with these different techniques is done with the help of software SAP 2000.The method used for the analysis is RESPONSE SPECTRUM METHOD . Here the design spectra recommended by Indian Standard Code IS 1893-2002(PART I) is used. From comparative study the Combined Core Pillar concept is found to be most effective.

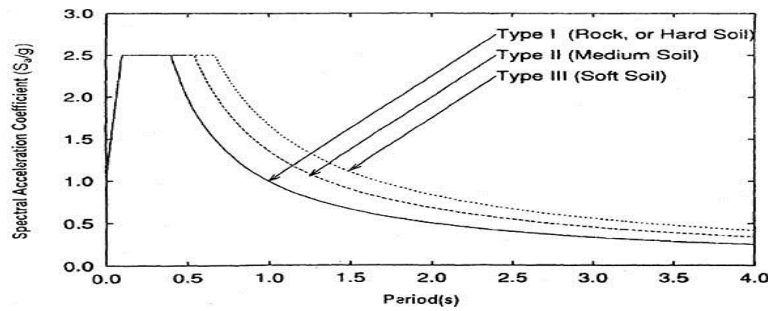
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### I. Introduction

The main challenge in earthquake resistant design is to reduce the earthquake forces so that an economic & safe design of members of the structure can be done. Basically two criterias must be fulfilled the strength criteria & the deflection criteria. To resist the earthquake forces many methods have been used in buildings like use of shearwalls at appropriate positions in the buildings, use of bracings (cross bracing , k-type bracing etc). In all these cases the value of base shear , base moments are high & according to these values the different components of building are designed, obviously the sectional requirement of the components in these cases are high to resist such high forces. Since in seismic analysis of a building base shear is distributed to the different floors according to the floor heights & then these floor forces are distributed among the lateral force resisting elements at that floor so if the base shear is high then the sectional requirement of these components will also high. So to reduce the base shear & the inertia forces induced in the structure due to earthquake, base isolation technique is frequently used in practice. In base isolation technique the base of the structure is isolated so that the fundamental period of the structure is shifted out of the dangerous resonance range & concentration of the deformation demand at the isolation system. But I have used a different method to shift the fundamental period of the structure that is "COMBINED CORE PILLAR CONCEPT". So to compare response of building with different techniques used , a parametric study on reinforced concrete (RC) building is done. For this purpose the different techniques used in a same model are :

1. RC building model with fixed column base.
2. RC building model with Rubber bearing (RB) column base .
3. RC building model with friction isolated(FI) column base.
4. RC building model with shearwalls at corners having fixed base.
5. RC building model with shearwalls at corners with rubber bearings base.
6. RC building model with shearwalls at corners with friction isolator as base.
7. RC building model with cross bracings.
8. RC building model with k-type bracings.
9. RC building model with combined core pillar concept having hinged base of core steel column.
10. RC building model with combined core pillar concept having fixed base of core steel column.

**Design Spectra:**



This is the DESIGN SPECTRA recommended by IS 1893-PART(I). From this, type II (medium soil) is selected for the analysis purpose. On the basis of the fundamental time period of the structure the value of ( $S_a/g$ ) can be selected from this curve according to the soil type selected for the analysis. Here the empirical relation is also presented recommended by the code.

**For rocky, or hard soil sites**

$$\frac{S_a}{g} = \begin{cases} 1 + 15 T, & 0.00 \leq T \leq 0.10 \\ 2.50 & 0.10 \leq T \leq 0.40 \\ 1.00/T & 0.40 \leq T \leq 4.00 \end{cases}$$

**For medium soil sites**

$$\frac{S_a}{g} = \begin{cases} 1 + 15 T, & 0.00 \leq T \leq 0.10 \\ 2.50 & 0.10 \leq T \leq 0.55 \\ 1.36/T & 0.55 \leq T \leq 4.00 \end{cases}$$

**For soft soil sites**

$$\frac{S_a}{g} = \begin{cases} 1 + 15 T, & 0.00 \leq T \leq 0.10 \\ 2.50 & 0.10 \leq T \leq 0.67 \\ 1.67/T & 0.67 \leq T \leq 4.00 \end{cases}$$

**ZONE FACTOR:**

**Table 2 Zone Factor, Z**  
( Clause 6.4.2 )

Seismic Zone	II	III	IV	V
Seismic Intensity	Low	Moderate	Severe	Very Severe
Z	0.10	0.16	0.24	0.36

From this seismic zone v is selected for the analysis of building model using RESPONSE SPECTRUM METHOD.

DAMPING: The design spectra is for 5% damping which has been used in the analysis.

**II. Modeling Of Building And Result Analysis:**

To evaluate the seismic response of the building, elastic analyses were performed by the response spectrum method using the computer program SAP2000. The seismic analyses of the building are carried out separately in the longitudinal and transverse directions. However seismic responses only for x-direction are comparatively presented in this paper for the sake of brevity. Floor plan of 12 storey building is 12x18m. Degree of freedom at the base nodes are fixed for fixed base case and for base isolation, the friction isolators & rubber isolator is used. The parameters selected to define the utilized rubber & friction isolators in SAP2000 program are as follows:

Non-linear link type: Rubber Bearing->

1. U1 linear effective stiffness = 1500000 KN/m
2. U2 & U3 linear effective stiffness: 800 KN/m
3. U2 & U3 nonlinear stiffness : 2500 KN/m
4. U2 & U3 yield strength : 80 KN
5. U2 & U3 post yield stiffness ratio: 0.1

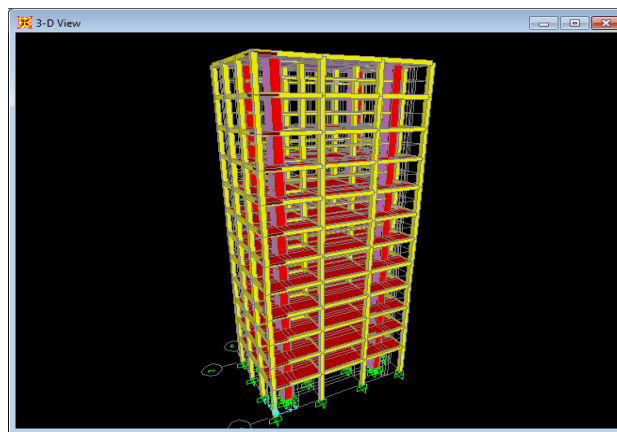
Non-linear link type friction isolator->

1. U1 linear effective stiffness : 15000000 KN/m.
2. U2 & U3 non linear stiffness: 15000KN/m
3. U2 & U3 friction coefficient, slow: 0.03, fast:0.05
4. Rate parameter: 40
5. U2 & U3 radius of sliding surface: 2.23

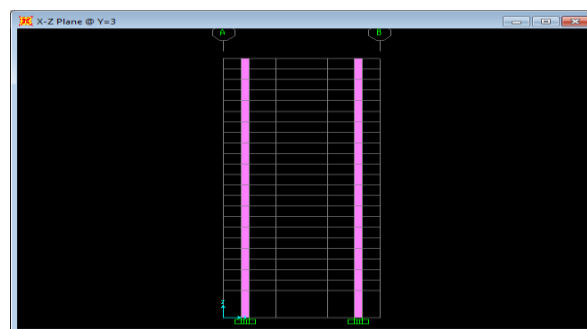
Columns and beams are modeled with frame elements, slabs and structural walls are modeled with shell elements. Slab has been considered as a rigid diaphragm in each storey level . In the analysis Young's modulus and the unit weight of concrete are taken to be 28000MPa and 25 KN/m<sup>3</sup> respectively. The damping ratio is assumed as 5% in all modes. The reference peak ground acceleration is taken to be .4g that is recommended in IS code. Thus it is assumed that the building is suited in high seismicity zone. Seismic analysis of the building accounting for the influence of the local ground conditions is carried out with the help of the design spectra of IS code.

Figures of model with different techniques are shown below:

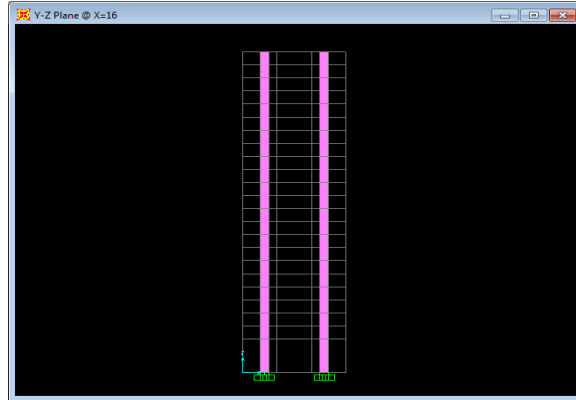
1. RC building model with combined core pillar concept having hinged base of core steel column = model 1
2. RC building model with combined core pillar concept having fixed base of core steel column = model2
3. RC building model with fixed column base = model 3
4. RC building model with Rubber bearing (RB)column base = model 4
5. RC building model with friction isolated(FI) column base = model 5
6. RC building model with shearwalls at corners having fixed base = model 6
7. RC building model with shearwalls at corners with rubber bearings at base = model 7
8. RC building model with shearwalls at corners with friction isolator at base = model 8
9. RC building model with cross bracings = model 9
10. RC building model with k-type bracings = model 10



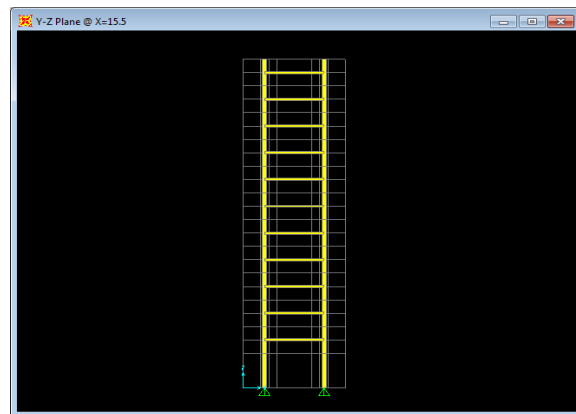
MODEL 1(a)



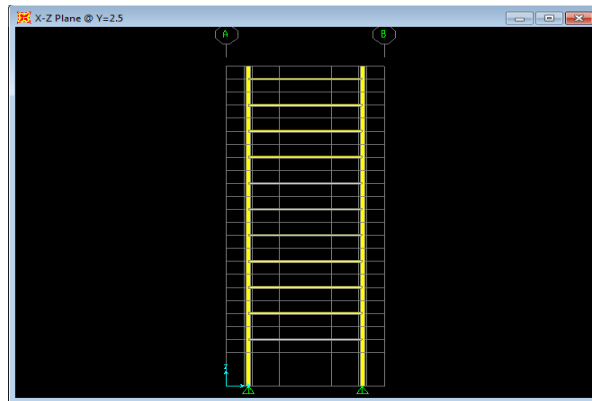
MODEL 1(b)



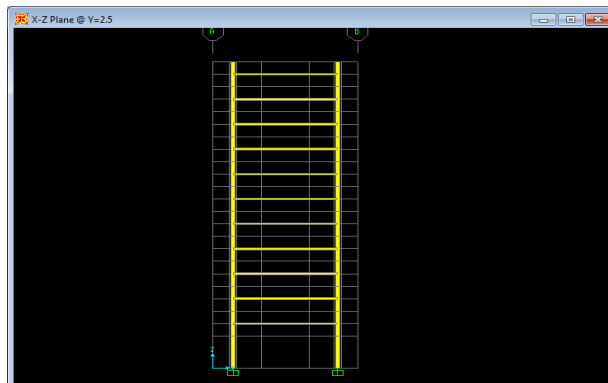
MODEL 1(c)



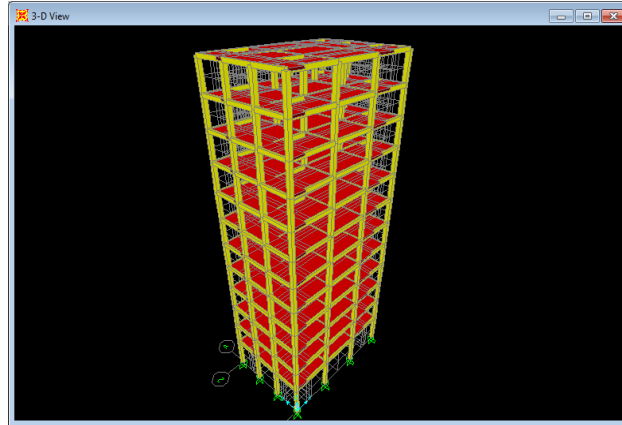
MODEL 1(d)



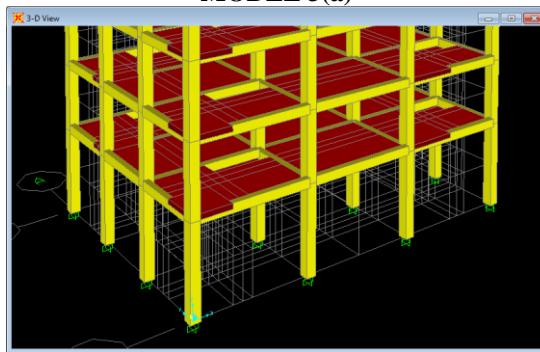
MODEL 1(e)



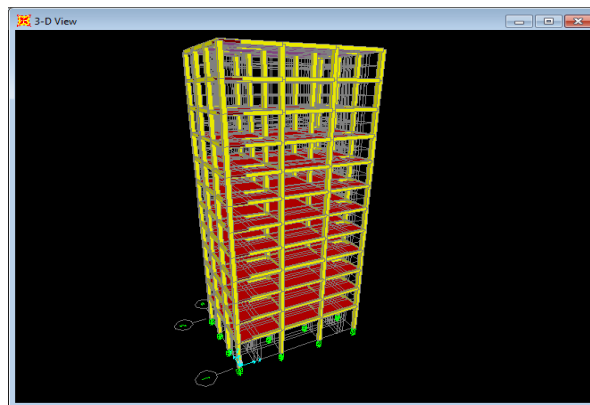
MODEL 2



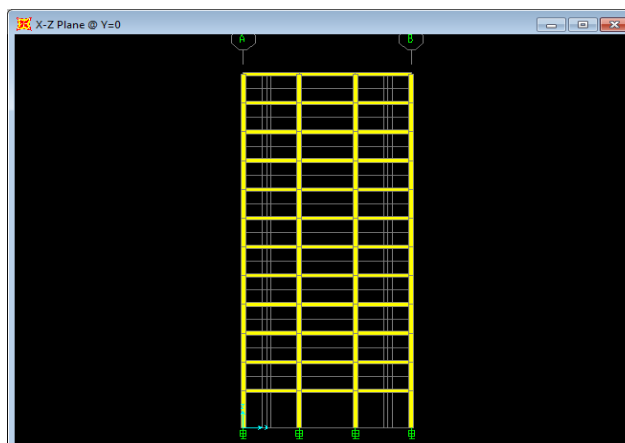
MODEL 3(a)



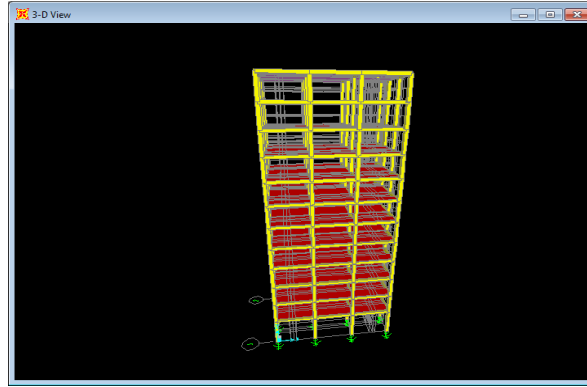
MODEL 3(b)



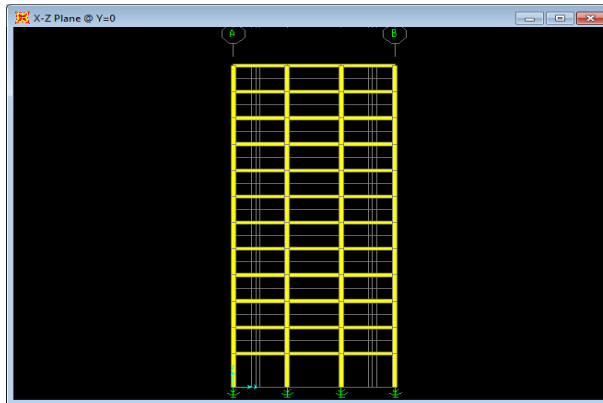
MODEL 4(a)



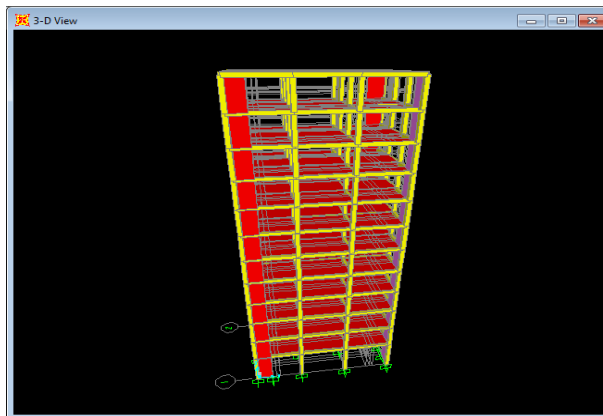
MODEL 4(b)



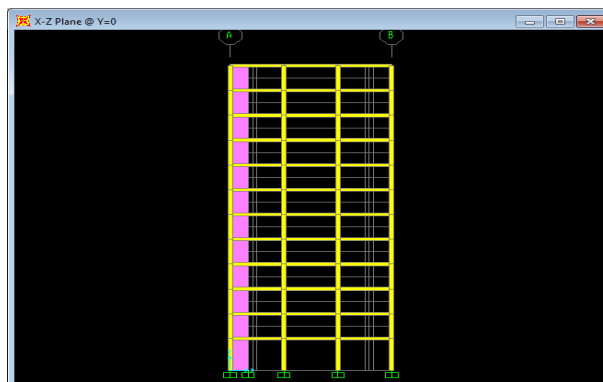
MODEL 5(a)



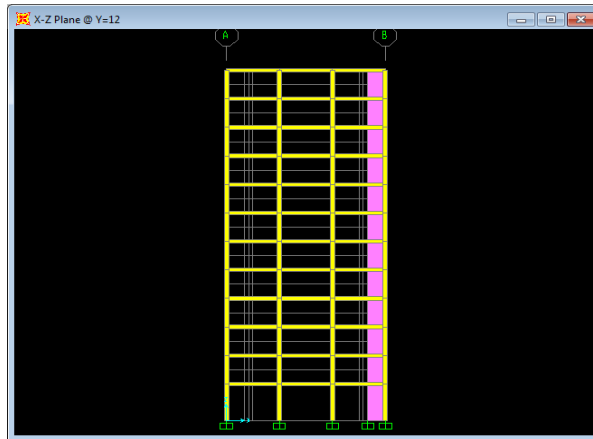
MODEL 5(b)



MODEL 6(a)



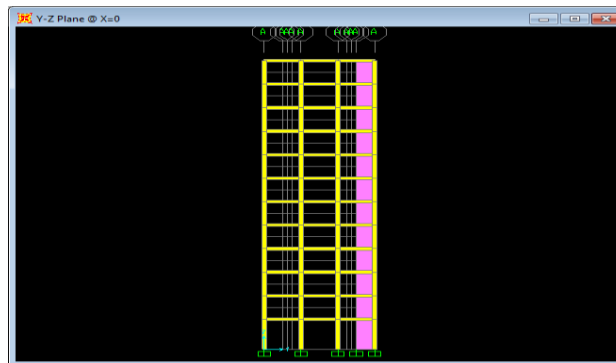
MODEL 6(b)



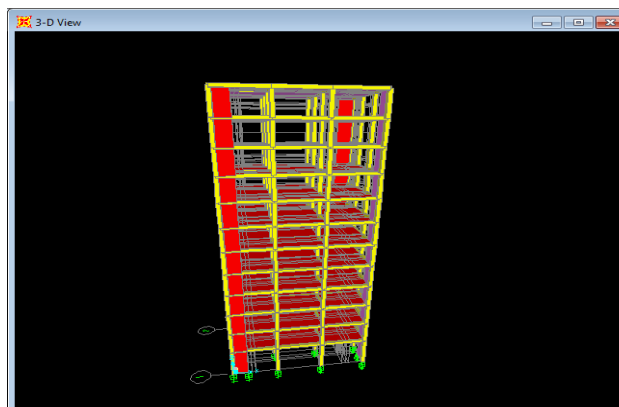
MODEL 6(c)



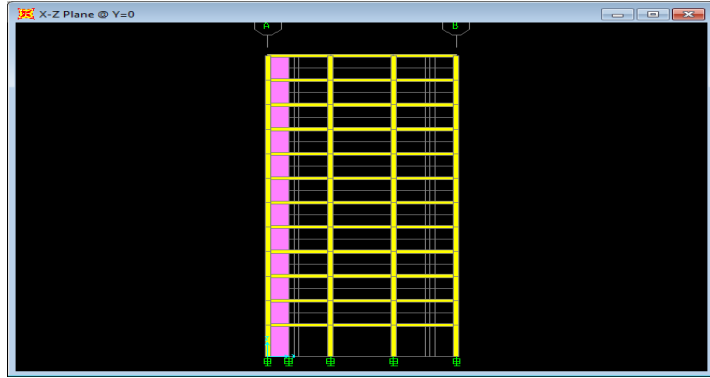
MODEL 6(d)



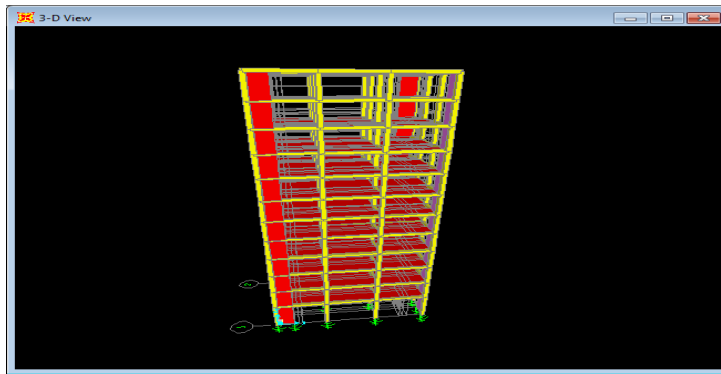
MODEL 6(e)



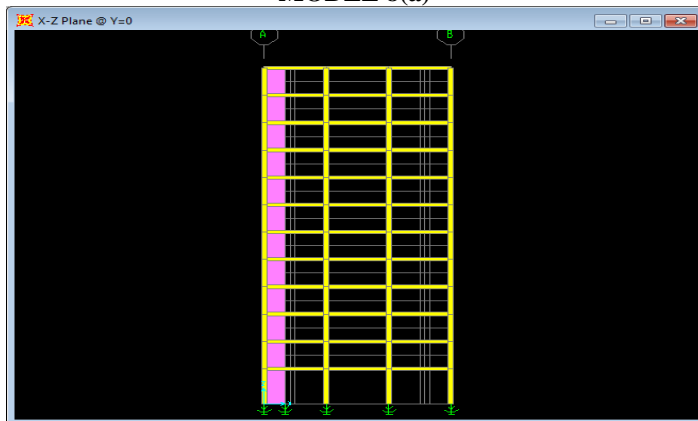
MODEL 7(a)



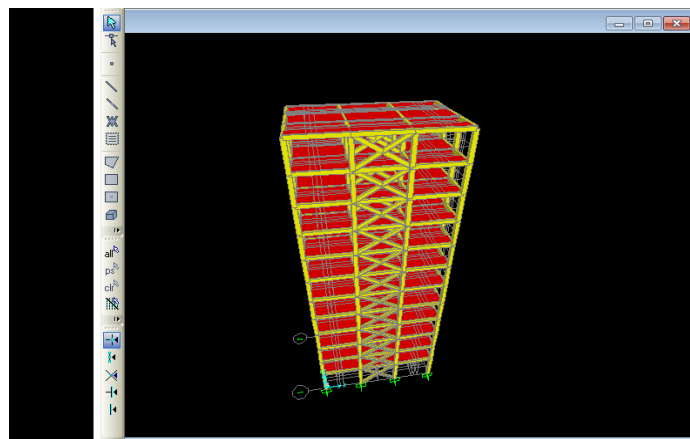
MODEL 7(b)



MODEL 8(a)

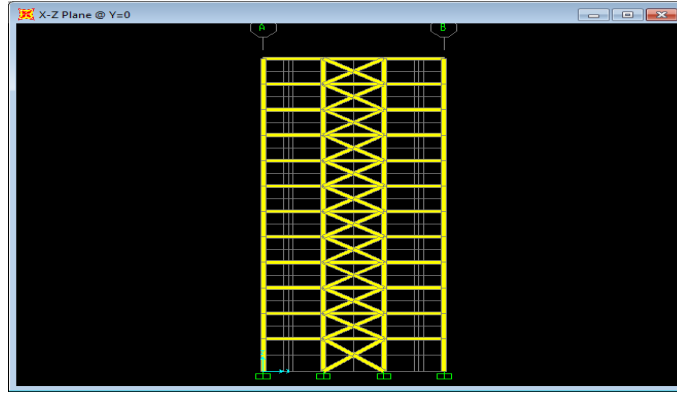


MODEL 8(b)

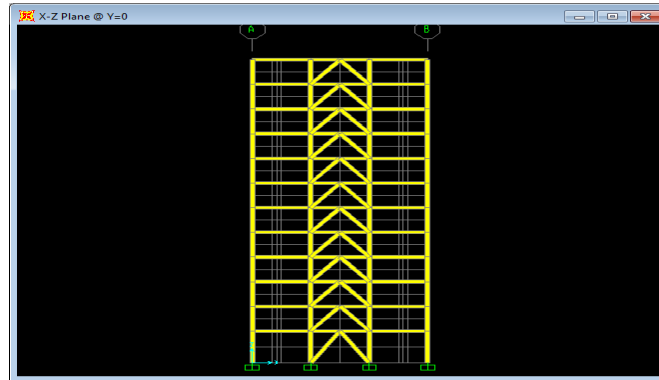


MODEL 9(a)





MODEL 9(b)



MODEL 10

Results Of Model 3:

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Table: Base Reactions, Part 1 of 4

OutputCase	CaseType	StepType	StepNum	GlobalFX KN	GlobalFY KN	GlobalFZ KN	GlobalMX KN-m	GlobalMY KN-m
DEAD	NonStatic	Max		-7.638E-14	2.687E-14	36700.000	220200.0000	-330300.00
DEAD	NonStatic	Min		-7.638E-14	2.687E-14	36700.000	220200.0000	-330300.00
MODAL	LinModal	Mode	1.000000	-3727.872	-6.173E-07	1.931E-04	0.0000	-12784.6426
MODAL	LinModal	Mode	2.000000	-6.668E-08	-3911.137	-1.974E-06	14041.6336	-3.346E-05
MODAL	LinModal	Mode	3.000000	-6.049E-08	2.984E-08	-2.148E-06	2.295E-05	-4.200E-05
MODAL	LinModal	Mode	4.000000	-1.923E-04	1.896E-05	-71248.341	-427490.09	641234.9882
MODAL	LinModal	Mode	5.000000	51.580	2.228E-05	9.437E-03	-0.2656	-447507.35
MODAL	LinModal	Mode	6.000000	-1.012E-04	-184.836	-6.045E-03	-341531.22	0.2917
MODAL	LinModal	Mode	7.000000	6.316E-03	-1.546E-04	0.013	-0.1136	0.5881
MODAL	LinModal	Mode	8.000000	4.307E-04	2.340E-04	29589.967	177539.4486	-266310.221
MODAL	LinModal	Mode	9.000000	-120.677	-3.083E-04	0.056	0.9911	399349.3715
MODAL	LinModal	Mode	10.000000	-0.019	-12.260	-0.181	-115030.382	-1.1474
MODAL	LinModal	Mode	11.000000	0.016	-1.752E-05	-0.082	1.5258	6.1440
MODAL	LinModal	Mode	12.000000	4.444E-03	-9.998E-06	-35018.752	-210111.812	315169.4451
RS	LinRespSpec	Max		1768.715	2.904E-07	9.166E-05	9.393E-04	6065.5910

Table: Base Reactions, Part 2 of 4

OutputCase	StepType	StepNum	GlobalM2 KN-m	GlobalX m	GlobalY m	GlobalZ m	XCentroidFX m	YCentroidFX m
DEAD	Max		6.395E-13	0.00000	0.00000	0.00000	8.086E+15	7.255E1
DEAD	Min		6.395E-13	0.00000	0.00000	0.00000	8.086E+15	7.255E1
MODAL	Mode	1.000000	22367.8308	0.00000	0.00000	0.00000	6.00000	6.00000
MODAL	Mode	2.000000	-35200.2299	0.00000	0.00000	0.00000	23.93074	8.73721
MODAL	Mode	3.000000	35626.2780	0.00000	0.00000	0.00000	-2.73302	1.724E+11
MODAL	Mode	4.000000	0.0015	0.00000	0.00000	0.00000	-2380330.30	7.03417
MODAL	Mode	5.000000	-309.4810	0.00000	0.00000	0.00000	8.99944	6.00003
MODAL	Mode	6.000000	-1663.5226	0.00000	0.00000	0.00000	653.00654	48.43830
MODAL	Mode	7.000000	715.3244	0.00000	0.00000	0.00000	12.24026	26557.80992
MODAL	Mode	8.000000	0.0093	0.00000	0.00000	0.00000	2193219.332	-15.90523
MODAL	Mode	9.000000	724.0568	0.00000	0.00000	0.00000	8.99965	5.99998
MODAL	Mode	10.000000	-110.2236	0.00000	0.00000	0.00000	21.40689	5.96930
MODAL	Mode	11.000000	-244.6204	0.00000	0.00000	0.00000	28.00621	-27375.3475
MODAL	Mode	12.000000	-0.0385	0.00000	0.00000	0.00000	29099.35250	8.45568
RS	Max		10612.2928	0.00000	0.00000	0.00000	4.27000	2.78363

Table: Base Reactions, Part 3 of 4

OutputCase	StepType	StepNum	ZCentroidFY m	XCentroidFY m	YCentroidFY m	ZCentroidFY m	XCentroidFY m	YCentroidFY m
DEAD	Max		0.00000	1.32231	-8.688E+15	0.00000	9.00000	6.00000
DEAD	Min		0.00000	1.32231	-8.688E+15	0.00000	9.00000	6.00000
MODAL	Mode	1.000000	0.00000	22.15371	39.11919	0.00000	18933846.38	10.24110
MODAL	Mode	2.000000	0.00000	9.00000	6.00000	0.00000	-16.90282	-2352215315
MODAL	Mode	3.000000	0.00000	8.168E+11	7.84933	0.00000	19.51876	10.73210
MODAL	Mode	4.000000	0.00000	5.72858	1318968.55	0.00000	9.00000	6.00000
MODAL	Mode	5.000000	0.00000	-9.54169	-141.20074	0.00000	47429511.6	-28.13845
MODAL	Mode	6.000000	0.00000	9.00000	6.00004	0.00000	48.28806	56548082.1
MODAL	Mode	7.000000	0.00000	-5709584.4	-3.57530	0.00000	-45.86914	-9.02457
MODAL	Mode	8.000000	0.00000	10.28741	-489705.23	0.00000	9.00000	5.99999
MODAL	Mode	9.000000	0.00000	13.57357	-7.01484	0.00000	-7151082.1	17.73137
MODAL	Mode	10.000000	0.00000	8.99981	6.00192	0.00000	-6.18210	633562.454
MODAL	Mode	11.000000	0.00000	38448892.9	-1948.34363	0.00000	74.95315	-18.68379
MODAL	Mode	12.000000	0.00000	99.93198	19795332.1	0.00000	9.00002	5.99998
RS	Max		0.00000	10.22792	18.55288	0.00000	8983056.87	4.86032

Table: Base Reactions, Part 4 of 4

OutputCase	StepType	StepNum	ZCentroidFZ m
DEAD	Max		0.00000
DEAD	Min		0.00000

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Table: Base Reactions, Part 4 of 4, Cont.

OutputCase	StepType	StepNum	ZCentroidFZ m
MODAL	Mode	1.000000	0.00000
MODAL	Mode	2.000000	0.00000
MODAL	Mode	3.000000	0.00000
MODAL	Mode	4.000000	0.00000
MODAL	Mode	5.000000	0.00000
MODAL	Mode	6.000000	0.00000
MODAL	Mode	7.000000	0.00000
MODAL	Mode	8.000000	0.00000
MODAL	Mode	9.000000	0.00000
MODAL	Mode	10.000000	0.00000
MODAL	Mode	11.000000	0.00000
MODAL	Mode	12.000000	0.00000
RS	Max		0.00000

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Table: Modal Periods And Frequencies

OutputCase	StepType	StepNum	Period Sec	Frequency Cyc/sec	CircFreq rad/sec	Eigenvalue rad <sup>2</sup> /sec <sup>2</sup>
MODAL	Mode	1.000000	0.732199	1.3657E+00	8.5813E+00	7.3638E+01
MODAL	Mode	2.000000	0.714854	1.3989E+00	8.7895E+00	7.7255E+01
MODAL	Mode	3.000000	0.624668	1.6008E+00	1.0058E+01	1.0117E+02
MODAL	Mode	4.000000	0.159090	6.2858E+00	3.9495E+01	1.5598E+03
MODAL	Mode	5.000000	0.143440	6.9715E+00	4.3803E+01	1.9187E+03
MODAL	Mode	6.000000	0.125793	7.9496E+00	4.9949E+01	2.4949E+03
MODAL	Mode	7.000000	0.117894	8.4822E+00	5.3295E+01	2.8404E+03
MODAL	Mode	8.000000	0.101793	9.8239E+00	6.1725E+01	3.8100E+03
MODAL	Mode	9.000000	0.091918	1.0879E+01	6.8357E+01	4.6726E+03
MODAL	Mode	10.000000	0.085886	1.1643E+01	7.3157E+01	5.3520E+03
MODAL	Mode	11.000000	0.079541	1.2572E+01	7.8993E+01	6.2398E+03
MODAL	Mode	12.000000	0.079491	1.2580E+01	7.9042E+01	6.2477E+03

BASE REACTIONS		
RS Lin Resp. Spec.(max)		
GLOBAL FX (KN)	GLOBAL MY (KN-m)	GLOBAL MZ (KN-m)
1768.715	6065.591	10612.2928

Results Of Model 4:

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Table: Base Reactions, Part 1 of 4

OutputCase	CaseType	StepType	StepNum	GlobalFX KN	GlobalFY KN	GlobalFZ KN	GlobalMX KN-m	GlobalMY KN-m
DEAD	LinStatic			5.329E-15	-5.274E-15	25360.000	152160.0000	-228240.000
MODAL	LinModal	Mode	1.000000	198.482	3.661E-08	2.188E-07	-3.819E-06	409.7863
MODAL	LinModal	Mode	2.000000	1.066E-07	200.750	7.860E-07	-474.1884	1.806E-06
MODAL	LinModal	Mode	3.000000	1.157E-08	1.616E-07	2.167E-06	3.958E-05	-6.275E-06
MODAL	LinModal	Mode	4.000000	2.626E-04	3.394E-04	63590.748	381544.4988	-572316.74
MODAL	LinModal	Mode	5.000000	18.266	-2.618E-06	8.060E-05	6.279E-04	-408270.05
MODAL	LinModal	Mode	6.000000	-1.304E-04	-1.326E-04	676.062	4056.3695	-6084.5576
MODAL	LinModal	Mode	7.000000	-4.602E-04	-97.414	1.253E-03	-79187.6005	-0.0112
MODAL	LinModal	Mode	8.000000	-1020.107	7.354E-04	2.993E-03	0.0098	11253.8613
MODAL	LinModal	Mode	9.000000	8.496E-04	2.066E-04	-6.080E-03	-0.0573	0.0519
MODAL	LinModal	Mode	10.000000	-2.681E-04	99.826	-6.579E-03	294945.4767	0.0577
MODAL	LinModal	Mode	11.000000	-1.812E-03	1.929E-03	393.376	2360.2740	-3540.3616
MODAL	LinModal	Mode	12.000000	-92.267	4.381E-03	-0.014	-0.0959	3457.8734
RS	LinRespSpec	Max		400.226	2.076E-07	4.587E-06	2.874E-05	826.3133

Table: Base Reactions, Part 2 of 4

OutputCase	StepType	StepNum	GlobalMZ KN-m	GlobalX m	GlobalY m	GlobalZ m	XCentroidFX m	YCentroidFY m
DEAD			-7.816E-14	0.00000	0.00000	0.00000	-1.085E+16	-46.33333
MODAL	Mode	1.000000	-1190.8939	0.00000	0.00000	0.00000	9.00000	6.00000
MODAL	Mode	2.000000	1806.7462	0.00000	0.00000	0.00000	13.09609	10.23203
MODAL	Mode	3.000000	1853.4592	0.00000	0.00000	0.00000	128.73476	-4.898E+10
MODAL	Mode	4.000000	0.0014	0.00000	0.00000	0.00000	-831094.61	6.69084
MODAL	Mode	5.000000	-109.5963	0.00000	0.00000	0.00000	9.00001	5.99999
MODAL	Mode	6.000000	2.493E-04	0.00000	0.00000	0.00000	81376732.1	5.36216
MODAL	Mode	7.000000	-876.7238	0.00000	0.00000	0.00000	-0.08299	5.08221
MODAL	Mode	8.000000	6120.6508	0.00000	0.00000	0.00000	9.00000	6.00000
MODAL	Mode	9.000000	5784.3851	0.00000	0.00000	0.00000	1.66469	-6039724.8
MODAL	Mode	10.000000	898.4389	0.00000	0.00000	0.00000	5.57779	4.01126
MODAL	Mode	11.000000	0.0323	0.00000	0.00000	0.00000	91593.50270	8.31727
MODAL	Mode	12.000000	553.6422	0.00000	0.00000	0.00000	8.99981	6.00003
RS	Max		2401.3568	0.00000	0.00000	0.00000	18.14789	11.80089

Table: Base Reactions, Part 3 of 4

OutputCase	StepType	StepNum	ZCentroidFX m	XCentroidFY m	YCentroidFZ m	ZCentroidFY m	XCentroidFZ m	YCentroidFX m
DEAD			0.00000	61.97895	4.333E+15	0.00000	9.00000	6.00000
MODAL	Mode	1.000000	0.00000	-5.47189	14.13245	0.00000	-1872574169	-17.45036
MODAL	Mode	2.000000	0.00000	9.00000	6.00000	0.00000	-2.29740	-603268722
MODAL	Mode	3.000000	0.00000	7963924611	16.70981	0.00000	2.29565	18.26681
MODAL	Mode	4.000000	0.00000	9.41410	-286967.405	0.00000	9.00000	6.00000
MODAL	Mode	5.000000	0.00000	11.74337	37.79795	0.00000	5065363649	7.79083
MODAL	Mode	6.000000	0.00000	3.39285	659977.032	0.00000	9.00000	5.99999
MODAL	Mode	7.000000	0.00000	9.00003	6.00002	0.00000	8.90737	-63219764.
MODAL	Mode	8.000000	0.00000	9.72249	10.07360	0.00000	-3760027.1	3.26831
MODAL	Mode	9.000000	0.00000	3160878.399	6.01181	0.00000	8.54118	9.42807
MODAL	Mode	10.000000	0.00000	9.00000	6.00000	0.00000	8.77359	-44829991.
MODAL	Mode	11.000000	0.00000	8.94107	-2823910.81	0.00000	8.99994	6.00005
MODAL	Mode	12.000000	0.00000	8.17140	8.22211	0.00000	251833.6353	6.98740
RS	Max		0.00000	10.74213	28.49712	0.00000	3775917953	35.10183

Table: Base Reactions, Part 4 of 4

OutputCase	StepType	StepNum	ZCentroidFZ m
DEAD			0.00000
MODAL	Mode	1.000000	0.00000
MODAL	Mode	2.000000	0.00000
MODAL	Mode	3.000000	0.00000
MODAL	Mode	4.000000	0.00000

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Table: Base Reactions, Part 4 of 4, Cont.

OutputCase	StepType	StepNum	ZCentroidFZ m
MODAL	Mode	5.000000	0.00000
MODAL	Mode	6.000000	0.00000
MODAL	Mode	7.000000	0.00000
MODAL	Mode	8.000000	0.00000
MODAL	Mode	9.000000	0.00000
MODAL	Mode	10.000000	0.00000
MODAL	Mode	11.000000	0.00000
MODAL	Mode	12.000000	0.00000
RS	Max		0.00000

**Combined Core Pillar Concept for Earthquake Resistant Building**

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Table: Modal Periods And Frequencies

OutputCase	StepType	StepNum	Period Sec	Frequency Cyc/sec	CircFreq rad/sec	Eigenvalue rad2/sec2
MODAL	Mode	1.000000	3.180451	3.1442E-01	1.9756E+00	3.9029E+00
MODAL	Mode	2.000000	3.162469	3.1621E-01	1.9868E+00	3.9474E+00
MODAL	Mode	3.000000	2.747009	3.6403E-01	2.2873E+00	5.2317E+00
MODAL	Mode	4.000000	0.170826	5.8539E+00	3.6781E+01	1.3529E+03
MODAL	Mode	5.000000	0.152020	6.5781E+00	4.1331E+01	1.7083E+03
MODAL	Mode	6.000000	0.134341	7.4437E+00	4.6770E+01	2.1875E+03
MODAL	Mode	7.000000	0.133982	7.4637E+00	4.6896E+01	2.1992E+03
MODAL	Mode	8.000000	0.133197	7.5077E+00	4.7172E+01	2.2252E+03
MODAL	Mode	9.000000	0.133047	7.5161E+00	4.7225E+01	2.2302E+03
MODAL	Mode	10.000000	0.132359	7.5552E+00	4.7471E+01	2.2535E+03
MODAL	Mode	11.000000	0.131822	7.5860E+00	4.7664E+01	2.2719E+03
MODAL	Mode	12.000000	0.131707	7.5926E+00	4.7706E+01	2.2758E+03

BASE REACTIONS		
RS Lin Resp. spec.(max)		
GLOBAL FX (KN)	GLOBAL MY (KN-m)	GLOBAL MZ(KN-m)
400.226	826.313	2401.356

**Results Of Model 5:**

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Table: Base Reactions, Part 1 of 4

OutputCase	CaseType	StepType	StepNum	GlobalFX KN	GlobalFY KN	GlobalFZ KN	GlobalMX KN-m	GlobalMY KN-m
DEAD	LinStatic			-1.998E-15	4.052E-15	25360.000	152160.0000	-228240.000
MODAL	LinModal	Mode	1.000000	188.580	2.665E-08	2.966E-07	-4.013E-06	396.1997
MODAL	LinModal	Mode	2.000000	7.718E-08	190.642	7.833E-07	-470.0702	1.026E-07
MODAL	LinModal	Mode	3.000000	-2.112E-08	-1.318E-07	-1.951E-06	-3.723E-05	8.315E-06
MODAL	LinModal	Mode	4.000000	-1.047E-04	-1.624E-04	-70447.610	-422665.67	634028.4885
MODAL	LinModal	Mode	5.000000	-3.691	3.589E-06	-2.714E-05	2.051E-04	443664.8417
MODAL	LinModal	Mode	6.000000	2.799E-06	-6.742E-06	-968.075	-5808.4661	8712.6775
MODAL	LinModal	Mode	7.000000	1.727E-04	63.352	-4.979E-04	15450.9122	0.0035
MODAL	LinModal	Mode	8.000000	953.312	-8.954E-04	-5.255E-03	-0.3332	-11906.5421
MODAL	LinModal	Mode	9.000000	1.501E-03	-4.115E-04	5.334E-03	0.2882	-0.0496
MODAL	LinModal	Mode	10.000000	1.032E-03	-2.266E-03	-502.678	-3016.1012	4524.0891
MODAL	LinModal	Mode	11.000000	-91.102	4.291E-03	-0.028	0.4530	3465.7439
MODAL	LinModal	Mode	12.000000	1.919E-03	-769.203	-0.018	4704.4861	0.1394
RS	LinRespSpec	Max		390.294	4.579E-07	1.834E-06	6.410E-05	819.9979

Table: Base Reactions, Part 2 of 4

OutputCase	StepType	StepNum	GlobalMZ KN-m	GlobalX m	GlobalY m	GlobalZ m	XCentroidFX m	YCentroidFY m
DEAD			3.464E-14	0.00000	0.00000	0.00000	2.479E+16	54.66667
MODAL	Mode	1.000000	-131.4787	0.00000	0.00000	0.00000	9.00000	6.00000
MODAL	Mode	2.000000	1715.7798	0.00000	0.00000	0.00000	14.01533	11.52848
MODAL	Mode	3.000000	-1760.9183	0.00000	0.00000	0.00000	68.46891	-2.549E+10
MODAL	Mode	4.000000	-7.481E-04	0.00000	0.00000	0.00000	-1756426.89	7.53086
MODAL	Mode	5.000000	22.1459	0.00000	0.00000	0.00000	9.00002	5.99999
MODAL	Mode	6.000000	-2.443E-04	0.00000	0.00000	0.00000	3549967438	-14.35083
MODAL	Mode	7.000000	570.1639	0.00000	0.00000	0.00000	-1.21517	6.71631
MODAL	Mode	8.000000	-5719.8910	0.00000	0.00000	0.00000	9.00000	6.00000
MODAL	Mode	9.000000	5461.8383	0.00000	0.00000	0.00000	2.71383	-3233230.3
MODAL	Mode	10.000000	-0.0296	0.00000	0.00000	0.00000	189069.2019	10.81965
MODAL	Mode	11.000000	546.6488	0.00000	0.00000	0.00000	8.99974	6.00004
MODAL	Mode	12.000000	-6922.8397	0.00000	0.00000	0.00000	4.71627	8.47761
RS	Max		2341.7648	0.00000	0.00000	0.00000	18.62685	13.91072

Table: Base Reactions, Part 3 of 4

OutputCase	StepType	StepNum	ZCentroidFX m	XCentroidFY m	YCentroidFY m	ZCentroidFZ m	XCentroidFZ m	YCentroidFZ m
DEAD			0.00000	-18.19178	-4.358E+15	0.00000	9.00000	6.00000
MODAL	Mode	1.000000	0.00000	-9.10008	14.84742	0.00000	-1335641643	-13.52774
MODAL	Mode	2.000000	0.00000	9.00000	6.00000	0.00000	-0.13103	-60010834
MODAL	Mode	3.000000	0.00000	9277244438	17.57092	0.00000	4.26205	19.08384
MODAL	Mode	4.000000	0.00000	9.46562	-497481.56	0.00000	9.00000	6.00000
MODAL	Mode	5.000000	0.00000	13.98612	2.50306	0.00000	1.635E+10	-7.55805
MODAL	Mode	6.000000	0.00000	42.19077	-10134099.7	0.00000	9.00000	6.00001
MODAL	Mode	7.000000	0.00000	9.00002	6.00000	0.00000	7.09124	-31033179.1
MODAL	Mode	8.000000	0.00000	12.38958	14.45292	0.00000	-2265614.50	63.39925
MODAL	Mode	9.000000	0.00000	-1480094.77	-1.39630	0.00000	9.30555	54.03018
MODAL	Mode	10.000000	0.00000	8.11888	-2243038.44	0.00000	8.99997	6.00006
MODAL	Mode	11.000000	0.00000	7.67685	8.29097	0.00000	121806.8262	-15.92086
MODAL	Mode	12.000000	0.00000	9.00000	6.00001	0.00000	7.54457	-254564.300
RS	Max		0.00000	19.27119	30.72895	0.00000	2764310251	27.88997

Table: Base Reactions, Part 4 of 4

OutputCase	StepType	StepNum	ZCentroidFZ m
DEAD			0.00000
MODAL	Mode	1.000000	0.00000
MODAL	Mode	2.000000	0.00000
MODAL	Mode	3.000000	0.00000
MODAL	Mode	4.000000	0.00000

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Table: Base Reactions, Part 4 of 4, Cont.

OutputCase	StepType	StepNum	ZCentroidFZ m
MODAL	Mode	5.000000	0.00000
MODAL	Mode	6.000000	0.00000
MODAL	Mode	7.000000	0.00000
MODAL	Mode	8.000000	0.00000
MODAL	Mode	9.000000	0.00000
MODAL	Mode	10.000000	0.00000
MODAL	Mode	11.000000	0.00000
MODAL	Mode	12.000000	0.00000
RS	Max		0.00000

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Table: Modal Periods And Frequencies

OutputCase	StepType	StepNum	Period Sec	Frequency Cyc/sec	CircFreq rad/sec	Eigenvalue rad <sup>2</sup> /sec <sup>2</sup>
MODAL	Mode	1.000000	3.262922	3.0647E-01	1.9256E+00	3.7081E+00
MODAL	Mode	2.000000	3.245251	3.0814E-01	1.9361E+00	3.7485E+00
MODAL	Mode	3.000000	2.818305	3.5482E-01	2.2294E+00	4.9703E+00
MODAL	Mode	4.000000	0.160284	6.2389E+00	3.9200E+01	1.5367E+03
MODAL	Mode	5.000000	0.144346	6.9278E+00	4.3529E+01	1.8947E+03
MODAL	Mode	6.000000	0.135331	7.3893E+00	4.6428E+01	2.1556E+03
MODAL	Mode	7.000000	0.134879	7.4140E+00	4.6584E+01	2.1700E+03
MODAL	Mode	8.000000	0.134151	7.4543E+00	4.6837E+01	2.1937E+03
MODAL	Mode	9.000000	0.133984	7.4636E+00	4.6895E+01	2.1991E+03
MODAL	Mode	10.000000	0.132771	7.5318E+00	4.7324E+01	2.2395E+03
MODAL	Mode	11.000000	0.132654	7.5384E+00	4.7365E+01	2.2435E+03
MODAL	Mode	12.000000	0.131985	7.5766E+00	4.7605E+01	2.2663E+03

BASE REACTIONS		
RS Lin Resp. Spec. (max)		
GLOBAL FX (KN)	GLOBAL MY (KN-m)	GLOBAL MZ (KN-m)
390.294	820	2341.7648

**Results Of Model 6:**

*Combined Core Pillar Concept for Earthquake Resistant Building*

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Table: Base Reactions, Part 1 of 4

OutputCase	CaseType	StepType	StepNum	GlobalFX KN	GlobalFY KN	GlobalFZ KN	GlobalMX KN-m	GlobalMY KN-m
DEAD	LinStatic			1.089E-11	1.279E-11	27510.000	165060.0000	-247590.000
MODAL	LinModal	Mode	1.000000	-28066.766	-397.643	-9.226E-03	1012.8721	-80771.8693
MODAL	LinModal	Mode	2.000000	-408.319	28811.200	-4.800E-04	-84709.3925	-1256.7610
MODAL	LinModal	Mode	3.000000	-1.744E-04	-2.355E-06	114.954	689.4252	-1034.3506
MODAL	LinModal	Mode	4.000000	6.498E-04	3.120E-05	80080.518	480483.1840	-720724.71
MODAL	LinModal	Mode	5.000000	96.427	-139.808	1.656E-04	-61159.7357	-542987.78
MODAL	LinModal	Mode	6.000000	113.913	282.821	6.541E-03	423801.4220	-152075.776
MODAL	LinModal	Mode	7.000000	-0.014	3.387E-03	13474.119	80844.5153	-121268.477
MODAL	LinModal	Mode	8.000000	5.361E-03	-9.628E-04	-69402.557	-416415.57	624622.8741
MODAL	LinModal	Mode	9.000000	-363.163	212.888	0.131	85667.9962	712850.7307
MODAL	LinModal	Mode	10.000000	310.542	293.373	0.158	382853.6312	147346.8155
MODAL	LinModal	Mode	11.000000	0.034	-0.013	15090.677	90544.9771	-135815.710
MODAL	LinModal	Mode	12.000000	-0.017	0.012	-70491.149	-422949.93	634415.8087
RS	LinRespSpec	Max		2492.468	6.463	8.200E-04	23.0891	7172.8529

Table: Base Reactions, Part 2 of 4

OutputCase	StepType	StepNum	GlobalMZ KN-m	GlobalX m	GlobalY m	GlobalZ m	XCentroidFX m	YCentroidFY m
DEAD			-3.653E-09	0.00000	0.00000	0.00000	-1.372E+14	-6.994E+11
MODAL	Mode	1.000000	164821.8091	0.00000	0.00000	0.00000	9.00000	6.00000
MODAL	Mode	2.000000	261750.7070	0.00000	0.00000	0.00000	8.99999	6.00000
MODAL	Mode	3.000000	433829.5904	0.00000	0.00000	0.00000	871162860.	751666288.
MODAL	Mode	4.000000	-1467.6720	0.00000	0.00000	0.00000	-3661882.3	689828.960
MODAL	Mode	5.000000	-1836.8213	0.00000	0.00000	0.00000	8.99974	6.00001
MODAL	Mode	6.000000	1861.9135	0.00000	0.00000	0.00000	9.00013	5.99998
MODAL	Mode	7.000000	1386.7857	0.00000	0.00000	0.00000	365833.035	-45145.030
MODAL	Mode	8.000000	3634.1836	0.00000	0.00000	0.00000	412507.835	-261889.546
MODAL	Mode	9.000000	4094.9034	0.00000	0.00000	0.00000	8.99925	5.99956
MODAL	Mode	10.000000	777.2019	0.00000	0.00000	0.00000	8.99915	5.99997
MODAL	Mode	11.000000	-284.6518	0.00000	0.00000	0.00000	-219909.808	71583.05792
MODAL	Mode	12.000000	2711.4160	0.00000	0.00000	0.00000	-279830.703	9335.68931
RS	Max		14949.7600	0.00000	0.00000	0.00000	0.81058	0.54052

Table: Base Reactions, Part 3 of 4

OutputCase	StepType	StepNum	ZCentroidFX m	XCentroidFY m	YCentroidFY m	ZCentroidFY m	XCentroidFZ m	YCentroidFZ m
DEAD			0.00000	-9.387E+11	-1.011E+14	0.00000	9.00000	6.00000
MODAL	Mode	1.000000	0.00000	9.00000	6.00000	0.00000	-6645903.4	-80613.830
MODAL	Mode	2.000000	0.00000	9.00000	6.00000	0.00000	-2029716.72	134807469.1
MODAL	Mode	3.000000	0.00000	-1.282E+11	6.035E+10	0.00000	8.99797	5.99741
MODAL	Mode	4.000000	0.00000	-32923475.	-79718444.	0.00000	9.00000	6.00000
MODAL	Mode	5.000000	0.00000	8.99994	6.00006	0.00000	3278554981	-369891928
MODAL	Mode	6.000000	0.00000	9.00000	5.99999	0.00000	23260895.70	64833729.7
MODAL	Mode	7.000000	0.00000	592148.729	893790.375	0.00000	9.00010	5.99999
MODAL	Mode	8.000000	0.00000	-2342493.28	-9084922.9	0.00000	9.00000	6.00000
MODAL	Mode	9.000000	0.00000	9.00045	6.00004	0.00000	-5459825.1	656867.566
MODAL	Mode	10.000000	0.00000	9.00029	5.99966	0.00000	-933362.46	2428185.652
MODAL	Mode	11.000000	0.00000	-165013.413	-666095.50	0.00000	8.99998	6.00006
MODAL	Mode	12.000000	0.00000	221104.9230	331808.770	0.00000	8.99994	6.00004
RS	Max		0.00000	1.53735	0.86307	0.00000	595780.008	158444.3617

Table: Base Reactions, Part 4 of 4

OutputCase	StepType	StepNum	ZCentroidFZ m
DEAD			0.00000
MODAL	Mode	1.000000	0.00000
MODAL	Mode	2.000000	0.00000
MODAL	Mode	3.000000	0.00000
MODAL	Mode	4.000000	0.00000



*Combined Core Pillar Concept for Earthquake Resistant Building*

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Table: Base Reactions, Part 4 of 4, Cont.

OutputCase	StepType	StepNum	ZCentroidFE m
MODAL	Mode	5.000000	0.000000
MODAL	Mode	6.000000	0.000000
MODAL	Mode	7.000000	0.000000
MODAL	Mode	8.000000	0.000000
MODAL	Mode	9.000000	0.000000
MODAL	Mode	10.000000	0.000000
MODAL	Mode	11.000000	0.000000
MODAL	Mode	12.000000	0.000000
RS	Max		0.000000

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Table: Modal Periods And Frequencies

OutputCase	StepType	StepNum	Period Sec	Frequency Cyc/sec	CircFreq rad/sec	Eigenvalue rad2/sec2
MODAL	Mode	1.000000	0.272056	3.6757E+00	2.3095E+01	5.3339E+02
MODAL	Mode	2.000000	0.268532	3.7240E+00	2.3398E+01	5.4748E+02
MODAL	Mode	3.000000	0.186309	5.3674E+00	3.3725E+01	1.1373E+03
MODAL	Mode	4.000000	0.148678	6.7260E+00	4.2260E+01	1.7859E+03
MODAL	Mode	5.000000	0.130645	7.6543E+00	4.8093E+01	2.3130E+03
MODAL	Mode	6.000000	0.114978	8.6973E+00	5.4647E+01	2.9863E+03
MODAL	Mode	7.000000	0.106024	9.4318E+00	5.9262E+01	3.5120E+03
MODAL	Mode	8.000000	0.090895	1.1002E+01	6.9126E+01	4.7784E+03
MODAL	Mode	9.000000	0.084305	1.1862E+01	7.4529E+01	5.5546E+03
MODAL	Mode	10.000000	0.077968	1.2826E+01	8.0587E+01	6.4943E+03
MODAL	Mode	11.000000	0.073867	1.3538E+01	8.5061E+01	7.2354E+03
MODAL	Mode	12.000000	0.072208	1.3849E+01	8.7015E+01	7.5716E+03

BASE REACTIONS		
RS Lin Resp. spec. (max)		
GLOBAL FX (KN)	GLOBAL MY (KN-m)	GLOBAL MZ (KN-m)
2492.468	7172.85	14949.76

**RESULTS OF MODEL 7:**

Table: Base Reactions, Part 1 of 4

OutputCase	CaseType	StepType	StepNum	GlobalFX KN	GlobalFY KN	GlobalFZ KN	GlobalMX KN-m	GlobalMY KN-m
DEAD	LinStatic			-3.879E-11	-1.166E-10	27510.000	165060.0000	-247590.000
MODAL	LinModal	Mode	1.000000	-247.129	-4.289	-1.597E-06	-2.1685	-506.6604
MODAL	LinModal	Mode	2.000000	-4.331	249.502	2.339E-06	-580.7239	-5.2788
MODAL	LinModal	Mode	3.000000	4.676E-08	-2.378E-07	0.069	0.4164	-0.6246
MODAL	LinModal	Mode	4.000000	1.514E-05	2.122E-06	-1225.038	-7350.2273	11025.3405
MODAL	LinModal	Mode	5.000000	-1041.728	8.025	-6.150E-05	-2145.1826	-390.2015
MODAL	LinModal	Mode	6.000000	-15.285	-1026.399	-3.022E-05	-3777.8829	-3286.2448
MODAL	LinModal	Mode	7.000000	-1.568E-05	-2.116E-05	-914.969	-5489.8307	8234.7307
MODAL	LinModal	Mode	8.000000	-4.041E-03	-3.935E-03	-72520.413	-435121.91	652683.4805
MODAL	LinModal	Mode	9.000000	-46.767	14.286	-8.354E-06	48582.1169	507486.1620
MODAL	LinModal	Mode	10.000000	-1.541E-06	1.170E-04	572.832	3436.9843	-5155.4831
MODAL	LinModal	Mode	11.000000	-563.612	20.368	-0.019	6711.4344	38029.1123
MODAL	LinModal	Mode	12.000000	-388.298	7.370	-0.031	8458.5093	2297.8560
RS	LinRespSpec	Max		474.460	0.558	6.605E-05	23.4981	972.6432

Table: Base Reactions, Part 2 of 4

OutputCase	StepType	StepNum	GlobalMZ KN-m	GlobalX m	GlobalY m	GlobalZ m	XCentroidFX m	YCentroidFX m
DEAD			-1.479E-07	0.00000	0.00000	0.00000	1.238E+12	-1.386E+11
MODAL	Mode	1.000000	1444.1694	0.00000	0.00000	0.00000	9.00000	6.00000
MODAL	Mode	2.000000	2271.5050	0.00000	0.00000	0.00000	9.00000	6.00000
MODAL	Mode	3.000000	2471.8447	0.00000	0.00000	0.00000	-2768232866	-1.596E+10
MODAL	Mode	4.000000	4662.3598	0.00000	0.00000	0.00000	641771729.	-340378541
MODAL	Mode	5.000000	6322.5890	0.00000	0.00000	0.00000	9.00000	6.00000
MODAL	Mode	6.000000	-9145.8816	0.00000	0.00000	0.00000	9.00000	6.00000
MODAL	Mode	7.000000	8376.2451	0.00000	0.00000	0.00000	-39462048.	13979696.08
MODAL	Mode	8.000000	-156.4183	0.00000	0.00000	0.00000	-2468.97959	-23755.4285
MODAL	Mode	9.000000	409.1744	0.00000	0.00000	0.00000	9.00000	6.00000
MODAL	Mode	10.000000	808.5365	0.00000	0.00000	0.00000	4037555374	433493416.
MODAL	Mode	11.000000	3564.9829	0.00000	0.00000	0.00000	9.00000	6.00000
MODAL	Mode	12.000000	2396.1176	0.00000	0.00000	0.00000	9.00000	6.00000
RS	Max		2846.9972	0.00000	0.00000	0.00000	17.62236	12.04182

Table: Base Reactions, Part 3 of 4

OutputCase	StepType	StepNum	ZCentroidFX m	XCentroidFY m	YCentroidFY m	ZCentroidFY m	XCentroidFZ m	YCentroidFZ m
DEAD			0.00000	-4.609E+10	1.599E+11	0.00000	9.00000	6.00000
MODAL	Mode	1.000000	0.00000	9.00000	6.00000	0.00000	-317218067	1357682.622
MODAL	Mode	2.000000	0.00000	9.00000	6.00000	0.00000	2256909.783	-248283100
MODAL	Mode	3.000000	0.00000	-7256407324	350741759.	0.00000	9.00023	6.00097
MODAL	Mode	4.000000	0.00000	-230924252	-155268135	0.00000	9.00000	6.00000
MODAL	Mode	5.000000	0.00000	9.00001	6.00000	0.00000	-6344765.9	34881164.2
MODAL	Mode	6.000000	0.00000	9.00000	6.00000	0.00000	-108759225	125030128.9
MODAL	Mode	7.000000	0.00000	-385419823	-301111963	0.00000	9.00001	6.00002
MODAL	Mode	8.000000	0.00000	15352.79756	-2723.96209	0.00000	9.00000	5.99999
MODAL	Mode	9.000000	0.00000	9.00001	6.00001	0.00000	6.075E+10	-5815554671
MODAL	Mode	10.000000	0.00000	1201896.381	-3279428.7	0.00000	9.00000	5.99999
MODAL	Mode	11.000000	0.00000	8.99999	6.00000	0.00000	1977237.129	-348945.76
MODAL	Mode	12.000000	0.00000	8.99999	5.99999	0.00000	73377.41477	-270105.498
RS	Max		0.00000	17.70799	11.70814	0.00000	608763910.	5639918.05

Table: Base Reactions, Part 4 of 4

OutputCase	StepType	StepNum	ZCentroidFZ m
DEAD			0.00000
MODAL	Mode	1.000000	0.00000
MODAL	Mode	2.000000	0.00000
MODAL	Mode	3.000000	0.00000
MODAL	Mode	4.000000	0.00000



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Table: Base Reactions, Part 4 of 4, Cont.

OutputCase	StepType	StepNum	ZCentroidFE m
MODAL	Mode	5.000000	0.00000
MODAL	Mode	6.000000	0.00000
MODAL	Mode	7.000000	0.00000
MODAL	Mode	8.000000	0.00000
MODAL	Mode	9.000000	0.00000
MODAL	Mode	10.000000	0.00000
MODAL	Mode	11.000000	0.00000
MODAL	Mode	12.000000	0.00000
RS	Max		0.00000

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Table: Modal Periods And Frequencies

OutputCase	StepType	StepNum	Period Sec	Frequency Cyc/sec	CircFreq rad/sec	Eigenvalue rad <sup>2</sup> /sec <sup>2</sup>
MODAL	Mode	1.000000	2.908623	3.4381E-01	2.1602E+00	4.6664E+00
MODAL	Mode	2.000000	2.894788	3.4545E-01	2.1705E+00	4.7111E+00
MODAL	Mode	3.000000	2.480104	4.0321E-01	2.5334E+00	6.4183E+00
MODAL	Mode	4.000000	0.177919	5.6205E+00	3.5315E+01	1.2471E+03
MODAL	Mode	5.000000	0.177839	5.6231E+00	3.5331E+01	1.2483E+03
MODAL	Mode	6.000000	0.175853	5.6866E+00	3.5730E+01	1.2766E+03
MODAL	Mode	7.000000	0.175801	5.6882E+00	3.5740E+01	1.2774E+03
MODAL	Mode	8.000000	0.159473	6.2707E+00	3.9400E+01	1.5523E+03
MODAL	Mode	9.000000	0.138755	7.2069E+00	4.5283E+01	2.0505E+03
MODAL	Mode	10.000000	0.131389	7.6110E+00	4.7821E+01	2.2869E+03
MODAL	Mode	11.000000	0.130337	7.6724E+00	4.8207E+01	2.3239E+03
MODAL	Mode	12.000000	0.129701	7.7100E+00	4.8444E+01	2.3468E+03

BASE REACTIONS		
RS Lin Resp. Spec.(max)		
GLOBAL FX (KN)	GLOBAL MY (KN-m)	GLOBAL MZ (KN-m)
474.46	972.643	2846.99

**RESULTS OF MODEL 8:**

*Combined Core Pillar Concept for Earthquake Resistant Building*

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Table: Base Reactions, Part 1 of 4

OutputCase	CaseType	StepType	StepNum	GlobalFX KN	GlobalFY KN	GlobalFZ KN	GlobalMX KN-m	GlobalMY KN-m
DEAD	LinStatic			-1.686E-11	-4.879E-11	27510.000	165060.0000	-247590.000
MODAL	LinModal	Mode	1.000000	-234.331	-3.725	-1.146E-06	3.2303	-531.1031
MODAL	LinModal	Mode	2.000000	-3.759	236.489	2.389E-06	-620.4864	-7.6506
MODAL	LinModal	Mode	3.000000	2.671E-08	-1.688E-07	0.031	0.1869	-0.2803
MODAL	LinModal	Mode	4.000000	-2.663E-04	-2.719E-05	670.930	4025.5879	-6038.3659
MODAL	LinModal	Mode	5.000000	-976.591	7.766	-4.915E-05	-1747.2952	352.6491
MODAL	LinModal	Mode	6.000000	-14.482	-961.915	6.042E-04	-3699.7329	-2448.2814
MODAL	LinModal	Mode	7.000000	-2.477E-05	-1.994E-05	-508.057	-3048.3518	4572.5195
MODAL	LinModal	Mode	8.000000	6.866E-03	4.777E-03	79294.869	475769.3739	-713653.74
MODAL	LinModal	Mode	9.000000	3.923E-05	4.322E-04	-742.800	-4456.6963	6685.1620
MODAL	LinModal	Mode	10.000000	240.928	1.453	0.031	47475.7833	433293.9414
MODAL	LinModal	Mode	11.000000	-453.936	21.288	-0.076	36698.1408	320828.9279
MODAL	LinModal	Mode	12.000000	-390.865	9.584	0.060	8852.6991	28285.9777
RS	LinRespSpec	Max		460.115	0.475	1.104E-04	13.0814	1042.8380

Table: Base Reactions, Part 2 of 4

OutputCase	StepType	StepNum	GlobalMZ KN-m	GlobalX m	GlobalY m	GlobalZ m	XCentroidFX m	YCentroidFX m
DEAD			-7.381E-08	0.00000	0.00000	0.00000	2.918E+12	-2.042E+11
MODAL	Mode	1.000000	1372.4628	0.00000	0.00000	0.00000	9.00000	6.00000
MODAL	Mode	2.000000	2150.9601	0.00000	0.00000	0.00000	9.00000	6.00000
MODAL	Mode	3.000000	2339.4579	0.00000	0.00000	0.00000	-4406233717	-2.644E+10
MODAL	Mode	4.000000	-4365.6942	0.00000	0.00000	0.00000	34205056.3	-18137976.6
MODAL	Mode	5.000000	5929.4423	0.00000	0.00000	0.00000	9.00000	6.00000
MODAL	Mode	6.000000	-8570.3398	0.00000	0.00000	0.00000	9.00000	6.00000
MODAL	Mode	7.000000	7853.8874	0.00000	0.00000	0.00000	-23679039.2	8455560.91
MODAL	Mode	8.000000	87.0613	0.00000	0.00000	0.00000	-17835.4870	-7606.14759
MODAL	Mode	9.000000	-762.1670	0.00000	0.00000	0.00000	148759172.2	15962013.71
MODAL	Mode	10.000000	-1432.4837	0.00000	0.00000	0.00000	9.00000	6.00000
MODAL	Mode	11.000000	2915.2051	0.00000	0.00000	0.00000	9.00000	6.00000
MODAL	Mode	12.000000	2431.4478	0.00000	0.00000	0.00000	9.00000	6.00000
RS	Max		2760.9144	0.00000	0.00000	0.00000	18.04405	12.67905

Table: Base Reactions, Part 3 of 4

OutputCase	StepType	StepNum	ZCentroidFX m	XCentroidFY m	YCentroidFY m	ZCentroidFY m	XCentroidFZ m	YCentroidFZ m
DEAD			0.00000	-7.054E+10	4.200E+11	0.00000	9.00000	6.00000
MODAL	Mode	1.000000	0.00000	9.00000	6.00000	0.00000	-463451181	-2818841.59
MODAL	Mode	2.000000	0.00000	9.00000	6.00000	0.00000	3203000.72	-259772759
MODAL	Mode	3.000000	0.00000	-9674213957	439798875.	0.00000	9.00148	6.00224
MODAL	Mode	4.000000	0.00000	-17092991.1	-11506340.7	0.00000	8.99999	6.00001
MODAL	Mode	5.000000	0.00000	9.00001	6.00000	0.00000	7175421.48	35552569.3
MODAL	Mode	6.000000	0.00000	9.00000	6.00000	0.00000	4052369.56	-6123758.9
MODAL	Mode	7.000000	0.00000	-383411939	-299606813	0.00000	9.00001	6.00002
MODAL	Mode	8.000000	0.00000	7292.88143	-12928.7355	0.00000	9.00000	6.00000
MODAL	Mode	9.000000	0.00000	-314719.023	789597.534	0.00000	8.99995	5.99986
MODAL	Mode	10.000000	0.00000	9.00031	6.00003	0.00000	-13969413.5	1530621.095
MODAL	Mode	11.000000	0.00000	8.99995	6.00000	0.00000	4205677.59	-481068.06
MODAL	Mode	12.000000	0.00000	9.00013	5.99999	0.00000	-469970.77	147087.3614
RS	Max		0.00000	18.16809	11.95487	0.00000	909664947.	13603020.74

Table: Base Reactions, Part 4 of 4

OutputCase	StepType	StepNum	ZCentroidFZ m
DEAD			0.00000
MODAL	Mode	1.000000	0.00000
MODAL	Mode	2.000000	0.00000
MODAL	Mode	3.000000	0.00000
MODAL	Mode	4.000000	0.00000

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Table: Base Reactions, Part 4 of 4, Cont.

OutputCase	StepType	StepNum	ZCentroidFZ m
MODAL	Mode	5.000000	0.00000
MODAL	Mode	6.000000	0.00000
MODAL	Mode	7.000000	0.00000
MODAL	Mode	8.000000	0.00000
MODAL	Mode	9.000000	0.00000
MODAL	Mode	10.000000	0.00000
MODAL	Mode	11.000000	0.00000
MODAL	Mode	12.000000	0.00000
RS	Max		0.00000

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Table: Modal Periods And Frequencies

OutputCase	StepType	StepNum	Period Sec	Frequency Cyc/sec	CircFreq rad/sec	Eigenvalue rad2/sec2
MODAL	Mode	1.000000	2.987066	3.3478E-01	2.1035E+00	4.4246E+00
MODAL	Mode	2.000000	2.973436	3.3631E-01	2.1131E+00	4.4652E+00
MODAL	Mode	3.000000	2.549350	3.9226E-01	2.4646E+00	6.0744E+00
MODAL	Mode	4.000000	0.179524	5.5703E+00	3.4999E+01	1.2249E+03
MODAL	Mode	5.000000	0.179443	5.5728E+00	3.5015E+01	1.2260E+03
MODAL	Mode	6.000000	0.177384	5.6375E+00	3.5421E+01	1.2547E+03
MODAL	Mode	7.000000	0.177329	5.6392E+00	3.5432E+01	1.2554E+03
MODAL	Mode	8.000000	0.149795	6.6758E+00	4.1945E+01	1.7594E+03
MODAL	Mode	9.000000	0.132311	7.5580E+00	4.7488E+01	2.2551E+03
MODAL	Mode	10.000000	0.131836	7.5852E+00	4.7659E+01	2.2714E+03
MODAL	Mode	11.000000	0.130946	7.6367E+00	4.7983E+01	2.3024E+03
MODAL	Mode	12.000000	0.130592	7.6574E+00	4.8113E+01	2.3149E+03

BASE REACTIONS		
RS Lin Resp. Spec. (max)		
GLOBAL FX (KN)	GLOBAL MY (KN-m)	GLOBAL MZ (KN-m)
460.115	1042.84	2760.914

**RESULTS OF MODEL 9:**

*Combined Core Pillar Concept for Earthquake Resistant Building*

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Table: Base Reactions, Part 1 of 4

OutputCase	CaseType	StepType	StepNum	GlobalFX KN	GlobalFY KN	GlobalFZ KN	GlobalMX KN-m	GlobalMY KN-m
DEAD	LinStatic			1.705E-12	3.492E-14	27633.453	165800.7176	-248701.076
MODAL	LinModal	Mode	1.000000	-1.094E-07	-3918.139	-3.578E-06	14078.2281	2.826E-05
MODAL	LinModal	Mode	2.000000	-2.991E-04	5.935E-06	1.011E-03	0.0568	-0.0161
MODAL	LinModal	Mode	3.000000	7.842E-04	-2.649E-05	78921.849	473531.0700	-710296.71
MODAL	LinModal	Mode	4.000000	102145.197	-1.811E-04	1.343E-03	0.0147	345055.9376
MODAL	LinModal	Mode	5.000000	-1.439E-03	173.910	0.032	373413.1177	-0.0152
MODAL	LinModal	Mode	6.000000	1416.314	-9.266E-04	-7.509E-03	-0.6350	-585076.26
MODAL	LinModal	Mode	7.000000	-5.645E-03	3.667E-03	-24945.347	-149672.640	224507.9688
MODAL	LinModal	Mode	8.000000	0.011	-6.314E-03	-0.069	-1.1291	-0.5970
MODAL	LinModal	Mode	9.000000	0.015	-16.916	0.069	-100132.477	-1.6963
MODAL	LinModal	Mode	10.000000	-0.037	3.374E-03	35805.638	214834.9514	-322248.44
MODAL	LinModal	Mode	11.000000	1.211E-03	1.147E-05	103637.915	621827.4539	-932741.42
MODAL	LinModal	Mode	12.000000	-6.502E-03	-290.802	0.020	-344455.58	0.0438
RS	LinRespSpec	Max		2780.832	4.954E-06	4.468E-05	4.418E-04	9382.5513

Table: Base Reactions, Part 2 of 4

OutputCase	StepType	StepNum	GlobalMZ KN-m	GlobalX m	GlobalY m	GlobalZ m	XCentroidFX m	YCentroidFX m
DEAD			-1.637E-11	0.00000	0.00000	0.00000	-1.028E+16	8.00000
MODAL	Mode	1.000000	-35263.2495	0.00000	0.00000	0.00000	-17.52084	14.50371
MODAL	Mode	2.000000	-325286.67	0.00000	0.00000	0.00000	33.77804	-1003358212
MODAL	Mode	3.000000	-0.0044	0.00000	0.00000	0.00000	-66651388.	5.46756
MODAL	Mode	4.000000	-612871.19	0.00000	0.00000	0.00000	9.00000	6.00000
MODAL	Mode	5.000000	1565.1887	0.00000	0.00000	0.00000	45.33056	0.39802
MODAL	Mode	6.000000	-8497.8607	0.00000	0.00000	0.00000	9.00004	5.99998
MODAL	Mode	7.000000	0.0952	0.00000	0.00000	0.00000	6663902.88	11.18595
MODAL	Mode	8.000000	-1844.4034	0.00000	0.00000	0.00000	25.14700	255479.9693
MODAL	Mode	9.000000	-152.2371	0.00000	0.00000	0.00000	26.31309	-0.97129
MODAL	Mode	10.000000	0.1851	0.00000	0.00000	0.00000	519765.516	4.14894
MODAL	Mode	11.000000	-0.0140	0.00000	0.00000	0.00000	-52021844.	11.41165
MODAL	Mode	12.000000	-2617.1729	0.00000	0.00000	0.00000	8.80095	6.50902
RS	Max		16684.9908	0.00000	0.00000	0.00000	0.24329	0.16760

Table: Base Reactions, Part 3 of 4

OutputCase	StepType	StepNum	ZCentroidFX m	XCentroidFY m	YCentroidFY m	ZCentroidFY m	XCentroidFZ m	YCentroidFZ m
DEAD			0.00000	-44.15898	-4.119E+15	0.00000	9.00000	6.00000
MODAL	Mode	1.000000	0.00000	9.00000	6.00000	0.00000	7.84219	-1301774266
MODAL	Mode	2.000000	0.00000	-4133231539	1154.40350	0.00000	15.99104	56.21763
MODAL	Mode	3.000000	0.00000	2.63510	9191841.28	0.00000	9.00000	6.00000
MODAL	Mode	4.000000	0.00000	9.22162	8.80485	0.00000	-249095294	10.76204
MODAL	Mode	5.000000	0.00000	9.00000	5.99998	0.00000	0.41516	11745671.41
MODAL	Mode	6.000000	0.00000	9.03701	16.08351	0.00000	-77942357.	84.69883
MODAL	Mode	7.000000	0.00000	8.74994	43394.70434	0.00000	8.99999	6.00002
MODAL	Mode	8.000000	0.00000	-157045.692	5.87323	0.00000	-8.71877	16.49702
MODAL	Mode	9.000000	0.00000	9.00049	5.99820	0.00000	24.53951	-1447706.27
MODAL	Mode	10.000000	0.00000	8.97381	516094.619	0.00000	8.99994	6.00003
MODAL	Mode	11.000000	0.00000	-16.40236	-129941046	0.00000	9.00000	6.00000
MODAL	Mode	12.000000	0.00000	9.00000	6.00000	0.00000	-2.01285	-17679501.7
RS	Max		0.00000	0.28320	0.24048	0.00000	6782933.62	0.29468

Table: Base Reactions, Part 4 of 4

OutputCase	StepType	StepNum	ZCentroidFZ m
DEAD			0.00000
MODAL	Mode	1.000000	0.00000
MODAL	Mode	2.000000	0.00000
MODAL	Mode	3.000000	0.00000
MODAL	Mode	4.000000	0.00000

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Table: Base Reactions, Part 4 of 4, Cont.

OutputCase	StepType	StepNum	ZCentroidFE m
MODAL	Mode	5.000000	0.00000
MODAL	Mode	6.000000	0.00000
MODAL	Mode	7.000000	0.00000
MODAL	Mode	8.000000	0.00000
MODAL	Mode	9.000000	0.00000
MODAL	Mode	10.000000	0.00000
MODAL	Mode	11.000000	0.00000
MODAL	Mode	12.000000	0.00000
RS	Max		0.00000

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Table: Modal Periods And Frequencies

OutputCase	StepType	StepNum	Period Sec	Frequency Cyc/sec	CircFreq rad/sec	Eigenvalue rad <sup>2</sup> /sec <sup>2</sup>
MODAL	Mode	1.000000	0.729313	1.3712E+00	8.6152E+00	7.4222E+01
MODAL	Mode	2.000000	0.208939	4.7861E+00	3.0072E+01	9.0432E+02
MODAL	Mode	3.000000	0.154497	6.4726E+00	4.0669E+01	1.6539E+03
MODAL	Mode	4.000000	0.142762	7.0047E+00	4.4012E+01	1.9370E+03
MODAL	Mode	5.000000	0.125126	7.9919E+00	5.0215E+01	2.5215E+03
MODAL	Mode	6.000000	0.111671	8.9549E+00	5.6265E+01	3.1658E+03
MODAL	Mode	7.000000	0.100796	9.9210E+00	6.2335E+01	3.8857E+03
MODAL	Mode	8.000000	0.095328	1.0490E+01	6.5911E+01	4.3443E+03
MODAL	Mode	9.000000	0.086149	1.1608E+01	7.2934E+01	5.3193E+03
MODAL	Mode	10.000000	0.082236	1.2180E+01	7.6405E+01	5.8377E+03
MODAL	Mode	11.000000	0.068566	1.4585E+01	9.1637E+01	8.3974E+03
MODAL	Mode	12.000000	0.066910	1.4946E+01	9.3905E+01	8.8182E+03

BASE REACTIONS			
RS Lin Resp. Spec. (max)			
GLOBAL FX (KN)	GLOBAL MY (KN-m)	GLOBAL MZ (KN-m)	
2780.832	9382.55	16684.99	

**RESULTS OF MODEL 10:**

*Combined Core Pillar Concept for Earthquake Resistant Building*

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Table: Base Reactions, Part 1 of 4

OutputCase	CaseType	StepType	StepNum	GlobalFX KN	GlobalFY KN	GlobalFZ KN	GlobalMX KN-m	GlobalMY KN-m
DEAD	LinStatic			3.801E-13	-2.398E-14	26880.427	161282.5633	-241923.845
MODAL	LinModal	Mode	1.000000	3.759E-08	3985.586	-9.574E-06	-14366.9800	6.165E-05
MODAL	LinModal	Mode	2.000000	4.188E-05	5.539E-05	-1.706E-03	-0.0067	0.0161
MODAL	LinModal	Mode	3.000000	55654.556	6.853E-05	8.962E-04	-0.0017	246114.4220
MODAL	LinModal	Mode	4.000000	-1.597E-04	1.835E-03	69795.586	418773.3752	-628160.23
MODAL	LinModal	Mode	5.000000	-5.383E-05	-200.862	0.027	-334075.66	0.0069
MODAL	LinModal	Mode	6.000000	224.558	2.225E-03	0.031	-0.1131	-581585.20
MODAL	LinModal	Mode	7.000000	2.981E-04	-0.013	31326.927	187963.4288	-281943.117
MODAL	LinModal	Mode	8.000000	2.783E-04	3.742E-03	-0.086	-1.1949	0.4174
MODAL	LinModal	Mode	9.000000	-5.897E-03	-3.337	-0.257	126107.8668	1.3725
MODAL	LinModal	Mode	10.000000	-7.065E-04	5.532E-03	33183.064	199099.3576	-298648.805
MODAL	LinModal	Mode	11.000000	-4.536E-04	-1.948E-04	3346.081	20076.1949	-30114.7487
MODAL	LinModal	Mode	12.000000	1.231E-03	-57.896	0.027	-3859.2622	-0.6658
RS	LinRespSpec	Max		2438.178	3.004E-06	3.903E-05	7.833E-05	10781.6702

Table: Base Reactions, Part 2 of 4

OutputCase	StepType	StepNum	GlobalMZ KN-m	GlobalX m	GlobalY m	GlobalZ m	XCentroidFX m	YCentroidFY m
DEAD			-6.310E-12	0.00000	0.00000	0.00000	-2.791E+15	10.46729
MODAL	Mode	1.000000	35870.2704	0.00000	0.00000	0.00000	85.96911	-3.83566
MODAL	Mode	2.000000	-187281.603	0.00000	0.00000	0.00000	25.25802	3872522735
MODAL	Mode	3.000000	-333927.33	0.00000	0.00000	0.00000	9.00000	6.00000
MODAL	Mode	4.000000	0.0164	0.00000	0.00000	0.00000	10849509.56	-0.63559
MODAL	Mode	5.000000	-1807.7560	0.00000	0.00000	0.00000	88.33090	76.12884
MODAL	Mode	6.000000	-1347.3346	0.00000	0.00000	0.00000	8.99998	6.00002
MODAL	Mode	7.000000	-0.1081	0.00000	0.00000	0.00000	6214933.86	-36.69890
MODAL	Mode	8.000000	-667.6535	0.00000	0.00000	0.00000	127.44467	-1194219.60
MODAL	Mode	9.000000	-30.0049	0.00000	0.00000	0.00000	-15.11273	4.84733
MODAL	Mode	10.000000	0.0636	0.00000	0.00000	0.00000	729405.053	16.47158
MODAL	Mode	11.000000	-0.0028	0.00000	0.00000	0.00000	996778.590	-2.44677
MODAL	Mode	12.000000	-521.0733	0.00000	0.00000	0.00000	10.17329	8.74332
RS	Max		14629.0704	0.00000	0.00000	0.00000	0.39424	0.26551

Table: Base Reactions, Part 3 of 4

OutputCase	StepType	StepNum	ZCentroidFX m	XCentroidFY m	YCentroidFY m	ZCentroidFY m	XCentroidFZ m	YCentroidFZ m
DEAD			0.00000	92.81481	6.147E+15	0.00000	9.00000	6.00000
MODAL	Mode	1.000000	0.00000	9.00000	6.00000	0.00000	6.43425	480482150.
MODAL	Mode	2.000000	0.00000	-439689873	6.06545	0.00000	9.41359	3.81210
MODAL	Mode	3.000000	0.00000	9.21735	14.77402	0.00000	-261239425	-1.69895
MODAL	Mode	4.000000	0.00000	9.01256	-126743.585	0.00000	9.00000	6.00000
MODAL	Mode	5.000000	0.00000	9.00000	6.00008	0.00000	-0.25956	-12440725.8
MODAL	Mode	6.000000	0.00000	8.80363	3.07368	0.00000	18591890.09	-3.31143
MODAL	Mode	7.000000	0.00000	9.08786	12173.38455	0.00000	9.00002	6.00006
MODAL	Mode	8.000000	0.00000	-267308.876	12.02353	0.00000	4.84287	13.75104
MODAL	Mode	9.000000	0.00000	9.00016	5.98978	0.00000	5.37410	-490535.14
MODAL	Mode	10.000000	0.00000	9.39926	314891.3964	0.00000	9.00004	6.00003
MODAL	Mode	11.000000	0.00000	8.75840	-44236951.	0.00000	9.00001	5.99991
MODAL	Mode	12.000000	0.00000	8.99999	6.00001	0.00000	24.73238	-156504.547
RS	Max		0.00000	0.40363	0.64726	0.00000	11444661.96	0.07442

Table: Base Reactions, Part 4 of 4

OutputCase	StepType	StepNum	ZCentroidFZ m
DEAD			0.00000
MODAL	Mode	1.000000	0.00000
MODAL	Mode	2.000000	0.00000
MODAL	Mode	3.000000	0.00000
MODAL	Mode	4.000000	0.00000



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Table: Base Reactions, Part 4 of 4, Cont.

OutputCase	StepType	StepNum	ZCentroidFZ m
MODAL	Mode	5.000000	0.00000
MODAL	Mode	6.000000	0.00000
MODAL	Mode	7.000000	0.00000
MODAL	Mode	8.000000	0.00000
MODAL	Mode	9.000000	0.00000
MODAL	Mode	10.000000	0.00000
MODAL	Mode	11.000000	0.00000
MODAL	Mode	12.000000	0.00000
RS	Max		0.00000

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Table: Modal Periods And Frequencies

OutputCase	StepType	StepNum	Period Sec	Frequency Cyc/sec	CircFreq rad/sec	Eigenvalue rad <sup>2</sup> /sec <sup>2</sup>
MODAL	Mode	1.000000	0.718114	1.3925E+00	8.7496E+00	7.6555E+01
MODAL	Mode	2.000000	0.274142	3.6477E+00	2.2919E+01	5.2530E+02
MODAL	Mode	3.000000	0.192148	5.2043E+00	3.2700E+01	1.0693E+03
MODAL	Mode	4.000000	0.162765	6.1438E+00	3.8603E+01	1.4902E+03
MODAL	Mode	5.000000	0.128977	7.7533E+00	4.8716E+01	2.3732E+03
MODAL	Mode	6.000000	0.113012	8.8487E+00	5.5598E+01	3.0911E+03
MODAL	Mode	7.000000	0.101876	9.8158E+00	6.1675E+01	3.8038E+03
MODAL	Mode	8.000000	0.098263	1.0388E+01	6.5271E+01	4.2603E+03
MODAL	Mode	9.000000	0.086577	1.1550E+01	7.2574E+01	5.2669E+03
MODAL	Mode	10.000000	0.082406	1.2135E+01	7.6247E+01	5.8136E+03
MODAL	Mode	11.000000	0.071320	1.4021E+01	8.8098E+01	7.7613E+03
MODAL	Mode	12.000000	0.071315	1.4022E+01	8.8104E+01	7.7624E+03

BASE REACTIONS		
RS Lin Resp. Spec.(max)		
GLOBAL FX (KN)	GLOBAL MY (KN-m)	GLOBAL MZ (KN-m)
2438.178	10781.67	14629

**RESULTS OF MODEL 1:**

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Table: Base Reactions, Part 1 of 4

OutputCase	CaseType	StepType	StepNum	GlobalFX KN	GlobalFY KN	GlobalFZ KN	GlobalMX KN-m	GlobalMY KN-m
DEAD	LinStatic			-8.465E-12	-9.607E-12	32043.274	192259.6442	-288389.466
MODAL	LinModal	Mode	1.000000	89.456	-6.651E-09	2.494E-07	3.055E-06	2428.4050
MODAL	LinModal	Mode	2.000000	8.670E-08	-4.933E-08	7.567E-07	2.964E-05	-5.576E-06
MODAL	LinModal	Mode	3.000000	2.216E-07	-223.250	-3.768E-06	5760.6210	4.807E-05
MODAL	LinModal	Mode	4.000000	-379.643	-2.286E-06	-1.108E-04	-1.909E-04	5394.6790
MODAL	LinModal	Mode	5.000000	-1.524E-04	-4.495E-05	-1.098E-03	0.0069	0.0151
MODAL	LinModal	Mode	6.000000	-3.420E-05	542.832	-3.768E-03	17840.8589	0.0290
MODAL	LinModal	Mode	7.000000	1078.908	8.830E-04	6.260E-03	-0.0715	2347.1648
MODAL	LinModal	Mode	8.000000	4.998E-03	-2.348E-04	-0.024	-0.1292	0.2429
MODAL	LinModal	Mode	9.000000	7.550E-05	9.301E-05	-2.366E-04	0.0292	0.0490
MODAL	LinModal	Mode	10.000000	6.708E-04	4.280E-04	-0.024	-0.0785	0.1462
MODAL	LinModal	Mode	11.000000	-1.187E-04	849.443	0.012	-2817.6046	0.0474
MODAL	LinModal	Mode	12.000000	1.653E-06	45602.064	5.690E-04	-126025.537	0.0060
RS	LinRespSpec	Max		47.605	4.170E-06	2.955E-05	3.340E-04	1240.7576

Table: Base Reactions, Part 2 of 4

OutputCase	StepType	StepNum	GlobalMZ KN-m	GlobalX m	GlobalY m	GlobalZ m	XCentroidFX m	YCentroidFX m
DEAD			2.783E-12	0.00000	0.00000	0.00000	3.800E+14	6.92216
MODAL	Mode	1.000000	-536.7332	0.00000	0.00000	0.00000	9.00000	6.00000
MODAL	Mode	2.000000	-1474.9775	0.00000	0.00000	0.00000	7.99753	3001039819
MODAL	Mode	3.000000	-2009.2494	0.00000	0.00000	0.00000	10.56434	-0.49265
MODAL	Mode	4.000000	2277.8608	0.00000	0.00000	0.00000	9.00000	6.00000
MODAL	Mode	5.000000	3812.4910	0.00000	0.00000	0.00000	7.96531	6082421.41
MODAL	Mode	6.000000	4885.4905	0.00000	0.00000	0.00000	3.04598	-8.54374
MODAL	Mode	7.000000	-6473.4382	0.00000	0.00000	0.00000	9.00000	6.00000
MODAL	Mode	8.000000	734.9125	0.00000	0.00000	0.00000	9.91217	65409.70817
MODAL	Mode	9.000000	-4485.5857	0.00000	0.00000	0.00000	10.74506	6358362.82
MODAL	Mode	10.000000	4951.7114	0.00000	0.00000	0.00000	14.04281	-4503940.1
MODAL	Mode	11.000000	7644.9814	0.00000	0.00000	0.00000	30.18842	-10.78175
MODAL	Mode	12.000000	410418.5793	0.00000	0.00000	0.00000	73.27921	-160.52512
RS	Max		285.6330	0.00000	0.00000	0.00000	4.55246	3.03504

Table: Base Reactions, Part 3 of 4

OutputCase	StepType	StepNum	ZCentroidFX m	XCentroidFY m	YCentroidFY m	ZCentroidFY m	XCentroidFZ m	YCentroidFZ m
DEAD			0.00000	5.68047	3.190E+14	0.00000	9.00000	6.00000
MODAL	Mode	1.000000	0.00000	10.37057	10.35921	0.00000	-9737714618	12.25320
MODAL	Mode	2.000000	0.00000	2.463E+10	8.08063	0.00000	7.36862	39.19507
MODAL	Mode	3.000000	0.00000	9.00000	6.00000	0.00000	12.75637	-1528733006
MODAL	Mode	4.000000	0.00000	17.04270	0.83492	0.00000	48676212.8	1.72036
MODAL	Mode	5.000000	0.00000	-64199077.	4.83279	0.00000	13.77745	-6.26837
MODAL	Mode	6.000000	0.00000	9.00000	6.00000	0.00000	7.70903	-4735296.4
MODAL	Mode	7.000000	0.00000	9.57873	6.04014	0.00000	-374933.72	-11.43734
MODAL	Mode	8.000000	0.00000	-4521902.7	-6.40868	0.00000	10.19472	5.43587
MODAL	Mode	9.000000	0.00000	-43065824.	6.30139	0.00000	207.19458	-123.36538
MODAL	Mode	10.000000	0.00000	4510261.08	12.77744	0.00000	6.14306	3.30093
MODAL	Mode	11.000000	0.00000	8.95999	6.00000	0.00000	-4.00860	-237923.309
MODAL	Mode	12.000000	0.00000	9.00000	6.00000	0.00000	-10.56495	-174260920
RS	Max		0.00000	5.26882	5.22727	0.00000	4913600060	6.18309

Table: Base Reactions, Part 4 of 4

OutputCase	StepType	StepNum	ZCentroidFZ m
DEAD			0.00000
MODAL	Mode	1.000000	0.00000
MODAL	Mode	2.000000	0.00000
MODAL	Mode	3.000000	0.00000
MODAL	Mode	4.000000	0.00000



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Table: Base Reactions, Part 4 of 4, Cont.

OutputCase	StepType	StepNum	ZCentroidFZ m
MODAL	Mode	5.000000	0.00000
MODAL	Mode	6.000000	0.00000
MODAL	Mode	7.000000	0.00000
MODAL	Mode	8.000000	0.00000
MODAL	Mode	9.000000	0.00000
MODAL	Mode	10.000000	0.00000
MODAL	Mode	11.000000	0.00000
MODAL	Mode	12.000000	0.00000
RS	Max		0.00000

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Table: Modal Periods And Frequencies

OutputCase	StepType	StepNum	Period Sec	Frequency Cyc/sec	CircFreq rad/sec	Eigenvalue rad2/sec2
MODAL	Mode	1.000000	2.613525	3.8263E-01	2.4041E+00	5.7797E+00
MODAL	Mode	2.000000	1.772198	5.6427E-01	3.5454E+00	1.2570E+01
MODAL	Mode	3.000000	1.680376	5.9510E-01	3.7392E+00	1.3981E+01
MODAL	Mode	4.000000	0.667218	1.4988E+00	9.4170E+00	8.8680E+01
MODAL	Mode	5.000000	0.502527	1.9899E+00	1.2503E+01	1.5633E+02
MODAL	Mode	6.000000	0.478131	2.0915E+00	1.3141E+01	1.7269E+02
MODAL	Mode	7.000000	0.294187	3.3992E+00	2.1358E+01	4.5615E+02
MODAL	Mode	8.000000	0.282011	3.5460E+00	2.2280E+01	4.9639E+02
MODAL	Mode	9.000000	0.264587	3.7795E+00	2.3747E+01	5.6393E+02
MODAL	Mode	10.000000	0.247193	4.0454E+00	2.5418E+01	6.4608E+02
MODAL	Mode	11.000000	0.242641	4.1213E+00	2.5895E+01	6.7055E+02
MODAL	Mode	12.000000	0.216764	4.6133E+00	2.8986E+01	8.4021E+02

BASE REACTIONS		
RS Lin Resp. Spec. (max)		
GLOBAL FX (KN)	GLOBAL MY (KN-m)	GLOBAL MZ (KN-m)
47.605	1240.75	285.63

**RESULTS OF MODEL 2:**

*Combined Core Pillar Concept for Earthquake Resistant Building*

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Table: Base Reactions, Part 1 of 4

OutputCase	CaseType	StepType	StepNum	GlobalFX KN	GlobalFY KN	GlobalFZ KN	GlobalMX KN-m	GlobalMY KN-m
DEAD	LinStatic			-8.814E-12	-1.029E-11	32043.274	192259.6442	-288389.466
MODAL	LinModal	Mode	1.000000	160.135	3.116E-08	1.085E-06	5.233E-06	4710.0171
MODAL	LinModal	Mode	2.000000	7.651E-07	1.076E-06	-4.980E-06	4.793E-05	-1.394E-05
MODAL	LinModal	Mode	3.000000	-7.947E-07	-388.609	-1.293E-05	10872.5363	1.776E-04
MODAL	LinModal	Mode	4.000000	785.293	-5.395E-05	1.382E-04	-0.0019	388.5624
MODAL	LinModal	Mode	5.000000	2.293E-04	-4.062E-04	6.213E-03	0.0262	-0.0642
MODAL	LinModal	Mode	6.000000	-8.063E-04	1260.407	0.016	9387.8909	-0.1614
MODAL	LinModal	Mode	7.000000	-2.755E-04	-3.141E-03	-0.013	-0.1954	0.2551
MODAL	LinModal	Mode	8.000000	-2310.669	1.313E-03	0.041	0.2741	-14714.7481
MODAL	LinModal	Mode	9.000000	3.518E-04	3.990E-04	0.017	0.1174	-0.2600
MODAL	LinModal	Mode	10.000000	-6.104E-03	-2.401E-03	-0.078	-0.3273	0.9527
MODAL	LinModal	Mode	11.000000	-7.919E-05	-2223.680	-1.551E-03	13937.3638	-0.0387
MODAL	LinModal	Mode	12.000000	-2.255E-06	-45602.064	-1.052E-04	126025.5411	-0.0012
RS	LinRespSpec	Max		62.935	7.394E-06	2.197E-04	0.0015	1592.8481

Table: Base Reactions, Part 2 of 4

OutputCase	StepType	StepNum	GlobalMZ KN-m	GlobalX m	GlobalY m	GlobalZ m	XCentroidFX m	YCentroidFX m
DEAD			-8.969E-13	0.00000	0.00000	0.00000	3.694E+14	7.27460
MODAL	Mode	1.000000	-960.8095	0.00000	0.00000	0.00000	9.00000	6.00000
MODAL	Mode	2.000000	2557.2217	0.00000	0.00000	0.00000	9.59108	-601348373
MODAL	Mode	3.000000	-3497.4769	0.00000	0.00000	0.00000	6.86212	-0.19404
MODAL	Mode	4.000000	-4711.7605	0.00000	0.00000	0.00000	9.00000	6.00000
MODAL	Mode	5.000000	-8474.1245	0.00000	0.00000	0.00000	5.96476	8531406.60
MODAL	Mode	6.000000	11343.6694	0.00000	0.00000	0.00000	10.48265	8.64125
MODAL	Mode	7.000000	-476.8724	0.00000	0.00000	0.00000	11.65952	2218426.120
MODAL	Mode	8.000000	13864.0378	0.00000	0.00000	0.00000	9.00000	6.00000
MODAL	Mode	9.000000	7212.3726	0.00000	0.00000	0.00000	9.39852	1805406.004
MODAL	Mode	10.000000	-14853.2028	0.00000	0.00000	0.00000	9.22459	-992535.95
MODAL	Mode	11.000000	-20013.1207	0.00000	0.00000	0.00000	-17.94091	24.89908
MODAL	Mode	12.000000	-410418.58	0.00000	0.00000	0.00000	7.30391	52.78742
RS	Max		377.6092	0.00000	0.00000	0.00000	3.05980	2.03982

Table: Base Reactions, Part 3 of 4

OutputCase	StepType	StepNum	ZCentroidFX m	XCentroidFY m	YCentroidFY m	ZCentroidFY m	XCentroidFZ m	YCentroidFZ m
DEAD			0.00000	6.27624	2.987E+14	0.00000	9.00000	6.00000
MODAL	Mode	1.000000	0.00000	10.23992	1.58397	0.00000	-3067661688	4.90470
MODAL	Mode	2.000000	0.00000	1941782821	6.44529	0.00000	-3.27285	-10.24511
MODAL	Mode	3.000000	0.00000	9.00000	6.00000	0.00000	13.91490	-714301750
MODAL	Mode	4.000000	0.00000	-0.82069	6.61680	0.00000	34189493.6	-14.92955
MODAL	Mode	5.000000	0.00000	15991494.77	7.25862	0.00000	10.44173	4.03908
MODAL	Mode	6.000000	0.00000	9.00000	6.00000	0.00000	10.22649	927208.755
MODAL	Mode	7.000000	0.00000	348939.589	5.83839	0.00000	20.00712	15.91413
MODAL	Mode	8.000000	0.00000	9.53763	6.96914	0.00000	80921.97218	6.70154
MODAL	Mode	9.000000	0.00000	19687520.45	7.69039	0.00000	15.01595	6.81170
MODAL	Mode	10.000000	0.00000	3643900.45	6.80255	0.00000	12.48163	4.28481
MODAL	Mode	11.000000	0.00000	9.00000	6.00000	0.00000	-24.89712	-3765840.6
MODAL	Mode	12.000000	0.00000	9.00000	6.00000	0.00000	-11.60662	-942453623
RS	Max		0.00000	3.45882	0.59108	0.00000	1036026511	1.74572

Table: Base Reactions, Part 4 of 4

OutputCase	StepType	StepNum	ZCentroidFZ m
DEAD			0.00000
MODAL	Mode	1.000000	0.00000
MODAL	Mode	2.000000	0.00000
MODAL	Mode	3.000000	0.00000
MODAL	Mode	4.000000	0.00000

Table: Base Reactions, Part 4 of 4, Cont.

OutputCase	StepType	StepNum	ZCentroidFX m
MODAL	Mode	5.000000	0.00000
MODAL	Mode	6.000000	0.00000
MODAL	Mode	7.000000	0.00000
MODAL	Mode	8.000000	0.00000
MODAL	Mode	9.000000	0.00000
MODAL	Mode	10.000000	0.00000
MODAL	Mode	11.000000	0.00000
MODAL	Mode	12.000000	0.00000
RS	Max		0.00000

Table: Modal Periods And Frequencies

OutputCase	StepType	StepNum	Period Sec	Frequency Cyc/sec	CircFreq rad/sec	Eigenvalue rad2/sec2
MODAL	Mode	1.000000	1.884778	5.3057E-01	3.3336E+00	1.1113E+01
MODAL	Mode	2.000000	1.307607	7.6476E-01	4.8051E+00	2.3089E+01
MODAL	Mode	3.000000	1.239315	8.0690E-01	5.0699E+00	2.5704E+01
MODAL	Mode	4.000000	0.535575	1.8672E+00	1.1732E+01	1.3763E+02
MODAL	Mode	5.000000	0.417322	2.3962E+00	1.5056E+01	2.2668E+02
MODAL	Mode	6.000000	0.397339	2.5167E+00	1.5813E+01	2.5006E+02
MODAL	Mode	7.000000	0.279602	3.5765E+00	2.2472E+01	5.0498E+02
MODAL	Mode	8.000000	0.251151	3.9817E+00	2.5018E+01	6.2588E+02
MODAL	Mode	9.000000	0.248659	4.0216E+00	2.5268E+01	6.3849E+02
MODAL	Mode	10.000000	0.222648	4.4914E+00	2.8220E+01	7.9638E+02
MODAL	Mode	11.000000	0.218885	4.5686E+00	2.8705E+01	8.2400E+02
MODAL	Mode	12.000000	0.216764	4.6133E+00	2.8986E+01	8.4021E+02

BASE REACTIONS		
RS Lin Resp. Spec. (max)		
GLOBAL FX (KN)	GLOBAL MY (KN-m)	GLOBAL MZ (KN-m)
62.935	1592.8481	377.6092

**III. Final Conclusion:**

1. From these results I have done a comparative study and I found that COMBINED CORE PILLAR CONCEPT is most effective.

Comparison between COMBINED CORE PILLAR CONCEPT and BASE ISOLATION(FRICTION ISOLATOR):

- (A) The base reactions are found to be less as compared to base isolation.
- (B) Base isolation systems are found useful for short period (Low Rise) structures, say less than 0.7s including soil-structure interaction but Combined Core Pillar Concept can be used from Low to high rise building.
- (C) In Torsional mode building performs well with Combined Core Pillar Concept than base isolation system used.