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ANNEXURE

SANTA CLARA			
S.NO	VILLA NO	S.NO	VILLA NO
1	1	31	31
2	2	32	32
3	3	33	33
4	4	34	34
5	5	35	35
6	6	36	36
7	7	37	37
8	8	38	38
9	9	39	39
10	10	40	40
11	11	41	41
12	12	42	42
13	13	43	43
14	14	44	44
15	15	45	45
16	16	46	46
17	17	47	47
18	18	48	48
19	19	49	49
20	20	50	50
21	21	51	51
22	22	52	52
23	23	53	53
24	24	54	54
25	25	55	55
26	26	56	56
27	27	57	57
28	28	58	58
29	29	59	59
30	30	60	60
		61	61

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PAGE NO. 1

```
*****************************************************
*                                                   *
*           STAAD.Pro CONNECT Edition               *
*           Version  22.12.00.142                   *
*           Proprietary Program of                  *
*           Bentley Systems, Inc.                   *
*           Date=    AUG 29, 2025                   *
*           Time=    22: 6:17                       *
*                                                   *
*  Licensed to: only @::LAVteam::®                  *
*****************************************************
```

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     1. STAAD SPACE
INPUT  FILE:  C:\Users\ADMIN\Desktop\Villa-10\VILLA_Santa_Clara.STD
     2. START JOB INFORMATION
     3. JOB NAME VILLA-SANTA CLARA
     4. JOB CLIENT DAC
     5. JOB NO V_10_2025-2026
     6. JOB REV 00
     7. ENGINEER NAME APLS
     8. ENGINEER DATE 7/18/2025
     9. END JOB INFORMATION
    10. INPUT WIDTH 79
    11. UNIT FEET KIP
    12. JOINT COORDINATES
    13. 1 0 0 0; 4 0 0 9.51444; 9 0 0 22.1457; 14 0 0 34.1207; 16 0 -3.44488 0
    14. 20 0 -3.44488 9.51444; 24 0 -3.44488 22.1457; 28 0 -3.44488 34.1207
    15. 30 0 -10.0066 0; 34 0 -10.0066 9.51444; 37 0 -10.0066 22.1457
    16. 40 0 -10.0066 34.1207; 42 0 10.3346 0; 46 0 10.3346 9.51444
    17. 50 0 10.3346 22.1457; 54 0 10.3346 34.1207; 57 0 20.6693 0
    18. 61 0 20.6693 9.51444; 65 0 20.6693 22.1457; 69 0 20.6693 34.1207
    19. 81 0 28.5433 9.51444; 82 0 28.5433 22.1457
    20. MEMBER INCIDENCES
    21. 4 1 4; 12 4 9; 20 9 14; 26 16 20; 32 20 24; 39 24 28; 42 30 16; 43 34 20
    22. 46 37 24; 53 40 28; 54 16 1; 55 20 4; 62 28 14; 63 24 9; 73 42 46; 79 46 50
    23. 86 50 54; 91 1 42; 92 4 46; 97 9 50; 100 14 54; 105 57 61; 111 61 65
    24. 118 65 69; 133 42 57; 137 46 61; 139 50 65; 143 54 69; 162 61 81; 163 65 82
    25. 166 82 81
    26. UNIT METER KN
    27. DEFINE MATERIAL START
    28. ISOTROPIC CONCRETE
    29. E 2.17184E+07
    30. POISSON 0.17
    31. DENSITY 23.5615
    32. ALPHA 5.5E-06
    33. DAMP 0.05
    34. TYPE CONCRETE
    35. STRENGTH FCU 27578.9
    36. END DEFINE MATERIAL
    37. MEMBER PROPERTY AMERICAN
    38. 42 43 46 53 TO 55 62 63 91 92 97 100 133 137 139 143 162 -
```



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STAAD SPACE -- PAGE NO. 2

```
 39. 163 PRIS YD 0.2 ZD 0.305
 40. 26 32 39 166 PRIS YD 0.381 ZD 0.2
 41. 73 79 86 105 111 118 PRIS YD 0.458 ZD 0.2
 42. MEMBER PROPERTY AMERICAN
 43. 4 12 20 PRIS YD 0.2 ZD 0.2
 44. CONSTANTS
 45. MATERIAL CONCRETE ALL
 46. SUPPORTS
 47. 30 34 37 40 FIXED
 48. DEFINE IS1893 2016 LOAD
 49. ZONE 0.16 RF 3 I 1.2 SS 1 ST 4 DM 0.05
 50. SELFWEIGHT 1

**WARNING: WALL AREA command should be present with ST = 4. Ref Clause 7.6.2b.
 51. MEMBER WEIGHT
 52. 4 12 20 26 32 39 73 79 86 105 111 118 166 UNI -10 0 0
 53. 4 12 20 26 32 39 73 79 86 105 111 118 166 UNI -10 0 0
 54. DEFINE WIND LOAD

*** NOTE: If any floor diaphragm is present in the model Wind Load definition
          should be defined after Floor Diaphragm definition. Otherwise wind
          load generation may be unsuccessful during analysis.

 55. TYPE 1 WIND 1
 56. <! STAAD PRO GENERATED DATA DO NOT MODIFY !!!
 57. CUSTOM:PARAMS
 58. !> END GENERATED DATA BLOCK
 59. INT 1.1 1.1 1.15 1.15 1.2 HEIG  1.5  3  4.5  6  8.5
 60. EXP 1 JOINT 1 4 9 14 16 20 24 28 30 34 37 40 42 46 50 54 57 61 65 69 81 82
 61. LOAD 1 LOADTYPE SEISMIC-H  TITLE EQX
 62. 1893 LOAD X 1
 63. LOAD 2 LOADTYPE SEISMIC-H  TITLE EQX
 64. 1893 LOAD X -1.
 65. LOAD 3 LOADTYPE SEISMIC-V  TITLE EQZ
 66. 1893 LOAD Z 1
 67. LOAD 4 LOADTYPE SEISMIC-V  TITLE EQZ
 68. 1893 LOAD Z -1.
 69. LOAD 5 LOADTYPE WIND  TITLE WIND +X
 70. WIND LOAD X 1 TYPE 1
 71. LOAD 6 LOADTYPE WIND  TITLE WIND -X
 72. WIND LOAD -X 1 TYPE 1
```

STAAD SPACE -- PAGE NO. 3

```
  73. LOAD 7 LOADTYPE WIND  TITLE WIND +Z
  74. WIND LOAD Z 1 TYPE 1
*WARNING- NO MEMBERS LOADED FOR A WIND LOAD GENERATION.
  75. LOAD 8 LOADTYPE WIND  TITLE WIND -Z
  76. WIND LOAD -Z 1 TYPE 1
*WARNING- NO MEMBERS LOADED FOR A WIND LOAD GENERATION.
  77. LOAD 9 LOADTYPE DEAD  TITLE DL
  78. SELFWEIGHT Y -1
  79. MEMBER LOAD
  80. 4 12 20 26 32 39 73 79 86 105 111 118 166 UNI GY -10
  81. LOAD 10 LOADTYPE LIVE  TITLE LL
  82. MEMBER LOAD
  83. 4 12 20 26 32 39 73 79 86 105 111 118 166 UNI GY -10
  84. LOAD COMB 11 1.5(DL+IL)
  85. 9 1.5 10 1.5
  86. LOAD COMB 12 1.2(DL+IL+ELX)
  87. 9 1.5 10 1.2
  88. LOAD COMB 13 1.2(DL+IL-ELX)
  89. 9 1.2 10 1.2
  90. LOAD COMB 14 1.2(DL+IL+ELZ)
  91. 9 1.2 10 1.2
  92. LOAD COMB 15 1.2(DL+IL-ELZ)
  93. 9 1.2 10 1.2
  94. LOAD COMB 16 1.2(DL+IL+WLX)
  95. 9 1.2 10 1.2 5 1.2
  96. LOAD COMB 17 1.2(DL+IL-WLX)
  97. 10 1.2 6 1.2
  98. LOAD COMB 18 1.2(DL+IL+WLZ)
  99. 9 1.2 10 1.2 7 1.2
 100. LOAD COMB 19 1.2(DL+IL-WLZ)
 101. 9 1.2 10 1.2 8 1.2
 102. LOAD COMB 20 1.5(DL+ELX)
 103. 9 1.5 10 1.5
 104. LOAD COMB 21 1.5(DL-ELX)
 105. 9 1.5 10 1.5
 106. LOAD COMB 22 1.5(DL+ELZ)
 107. 9 1.5 10 1.5
 108. LOAD COMB 23 1.5(DL-ELZ)
 109. 10 1.5
 110. LOAD COMB 24 1.5(DL+WLX)
 111. 10 1.5 5 1.5
 112. LOAD COMB 25 1.5(DL-WLX)
 113. 10 1.5 6 1.5
 114. LOAD COMB 26 1.5(DL+WLZ)
 115. 10 1.5 7 1.5
 116. LOAD COMB 27 1.5(DL-WLZ)
 117. 10 1.5 8 1.5
```



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```
118. LOAD COMB 28 0.9 DL+ELX
119. 10 0.9
120. LOAD COMB 29 0.9 DL-ELX
121. 10 0.9
122. LOAD COMB 30 0.9 DL+ELZ
123. 10 0.9
124. LOAD COMB 31 0.9 DL-ELZ
125. 10 0.9
126. LOAD COMB 32 0.9 DL+WLX
127. 10 0.9 5 1.5
128. LOAD COMB 33 0.9 DL-WLX
129. 10 0.9 6 1.5
130. LOAD COMB 34 0.9 DL+WLZ
131. 10 0.9 7 1.5
132. LOAD COMB 35 0.9 DL-WLZ
133. 10 0.9 8 1.5
134. PERFORM ANALYSIS PRINT ALL


         P R O B L E M   S T A T I S T I C S
         -----------------------------------

  NUMBER OF JOINTS          22  NUMBER OF MEMBERS       31
  NUMBER OF PLATES           0  NUMBER OF SOLIDS         0
  NUMBER OF SURFACES         0  NUMBER OF SUPPORTS       4

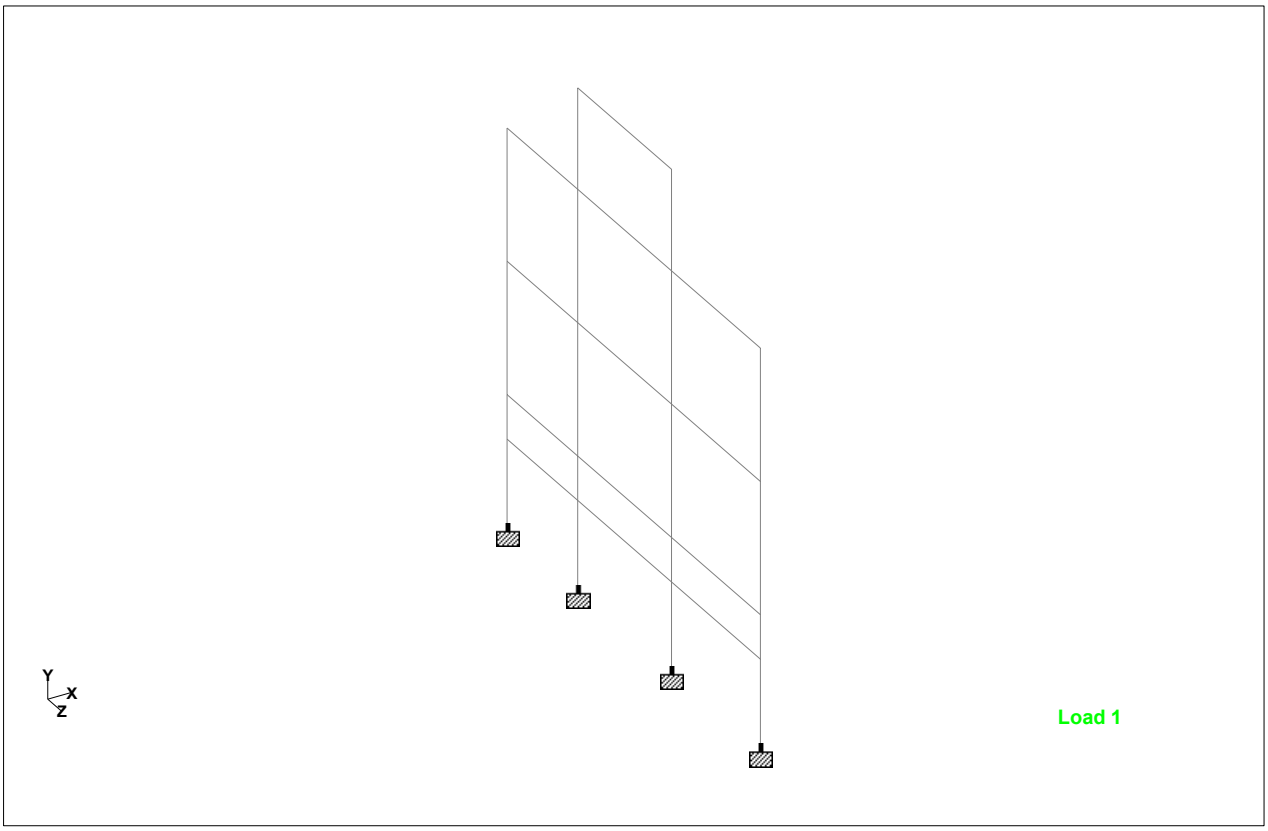
        Using 64-bit analysis engine.

        SOLVER USED IS THE IN-CORE ADVANCED MATH SOLVER

TOTAL       PRIMARY LOAD CASES =    10, TOTAL DEGREES OF FREEDOM =     108
TOTAL LOAD COMBINATION  CASES =    25  SO FAR.
```

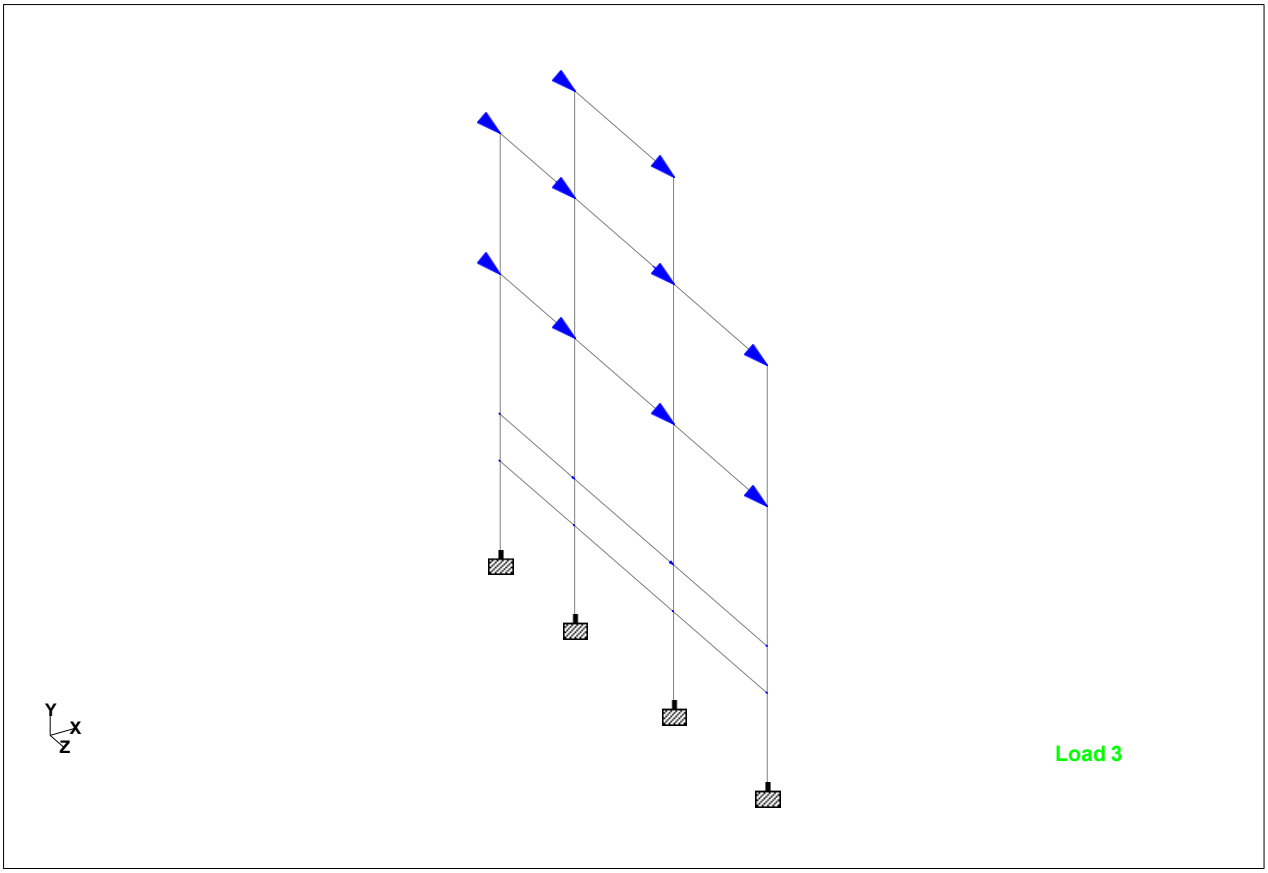


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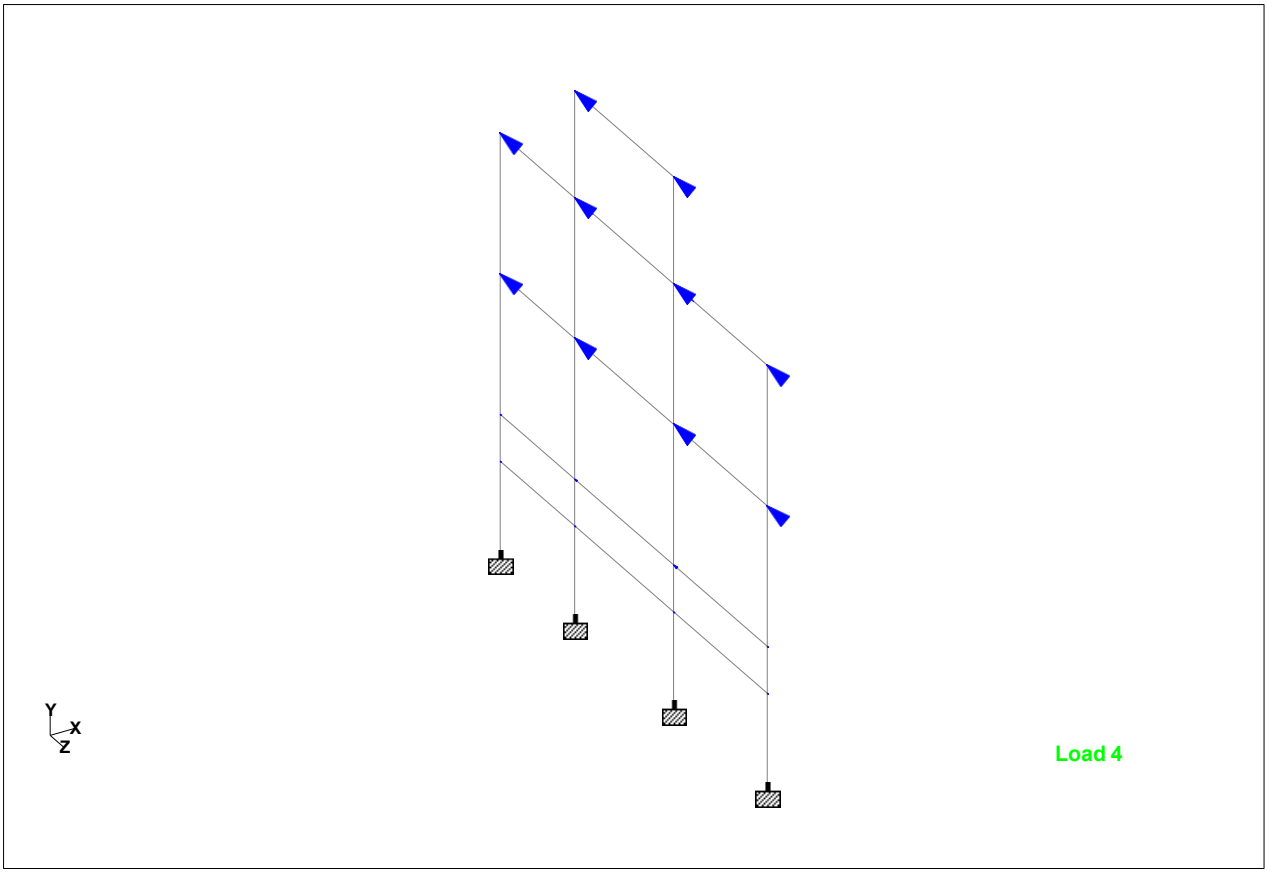
Whole Structure (Input data was modified after picture taken)

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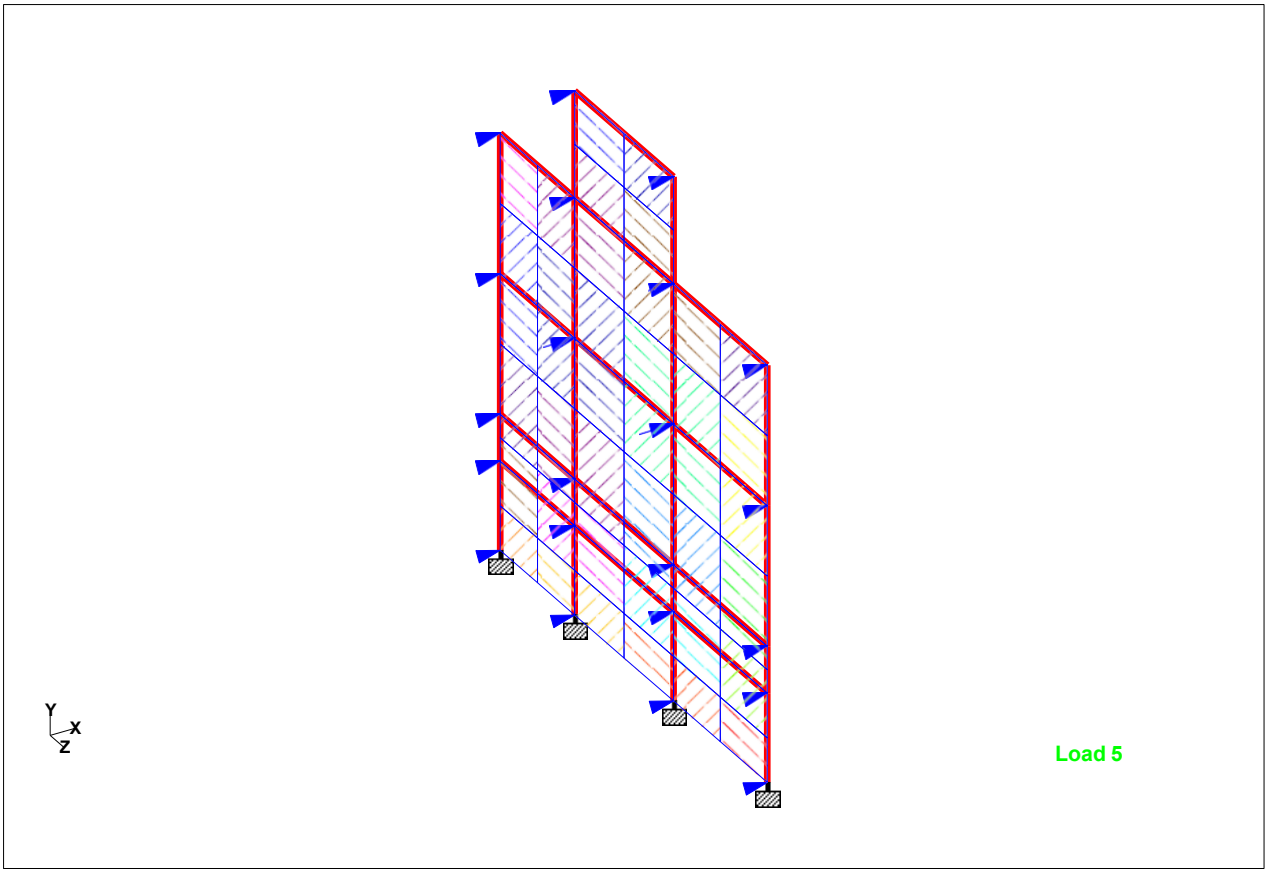
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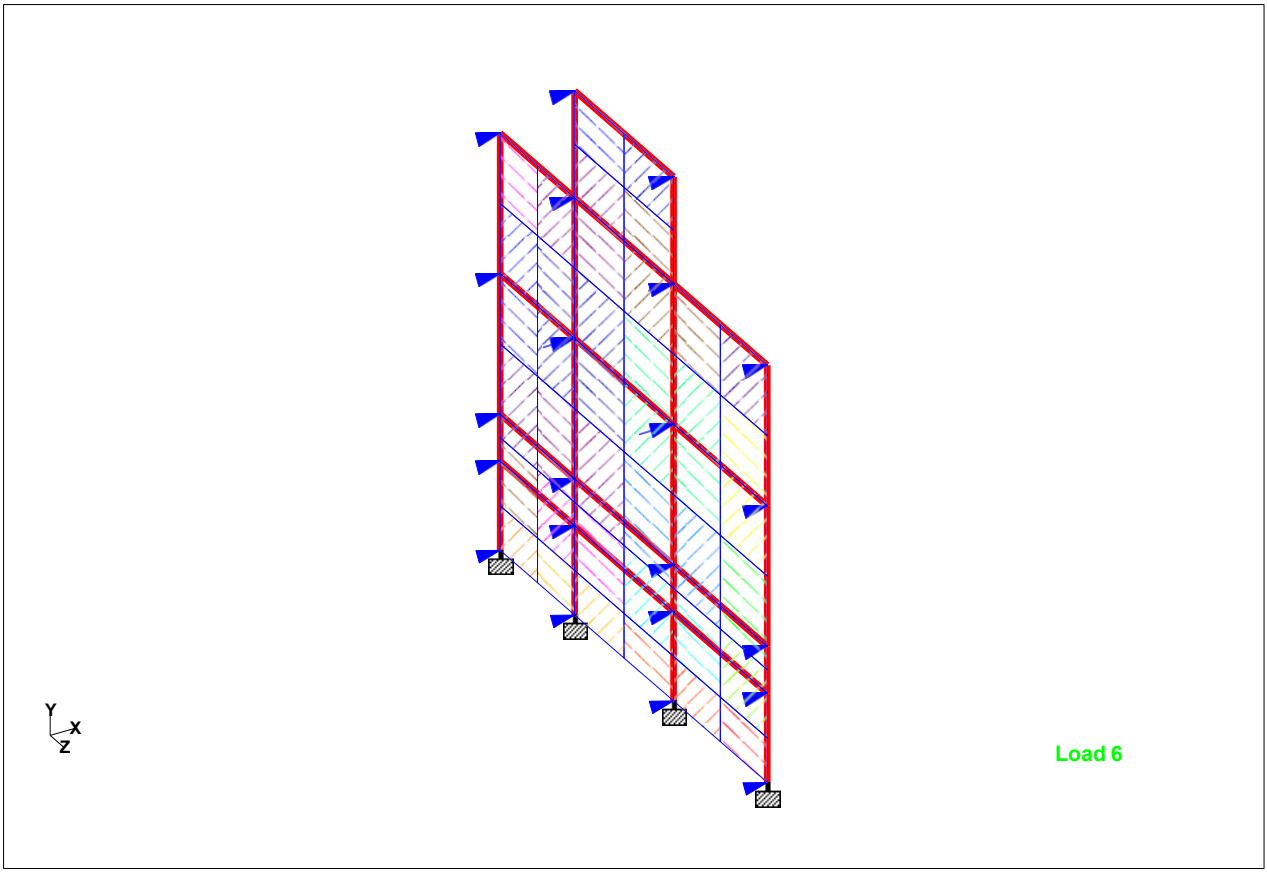
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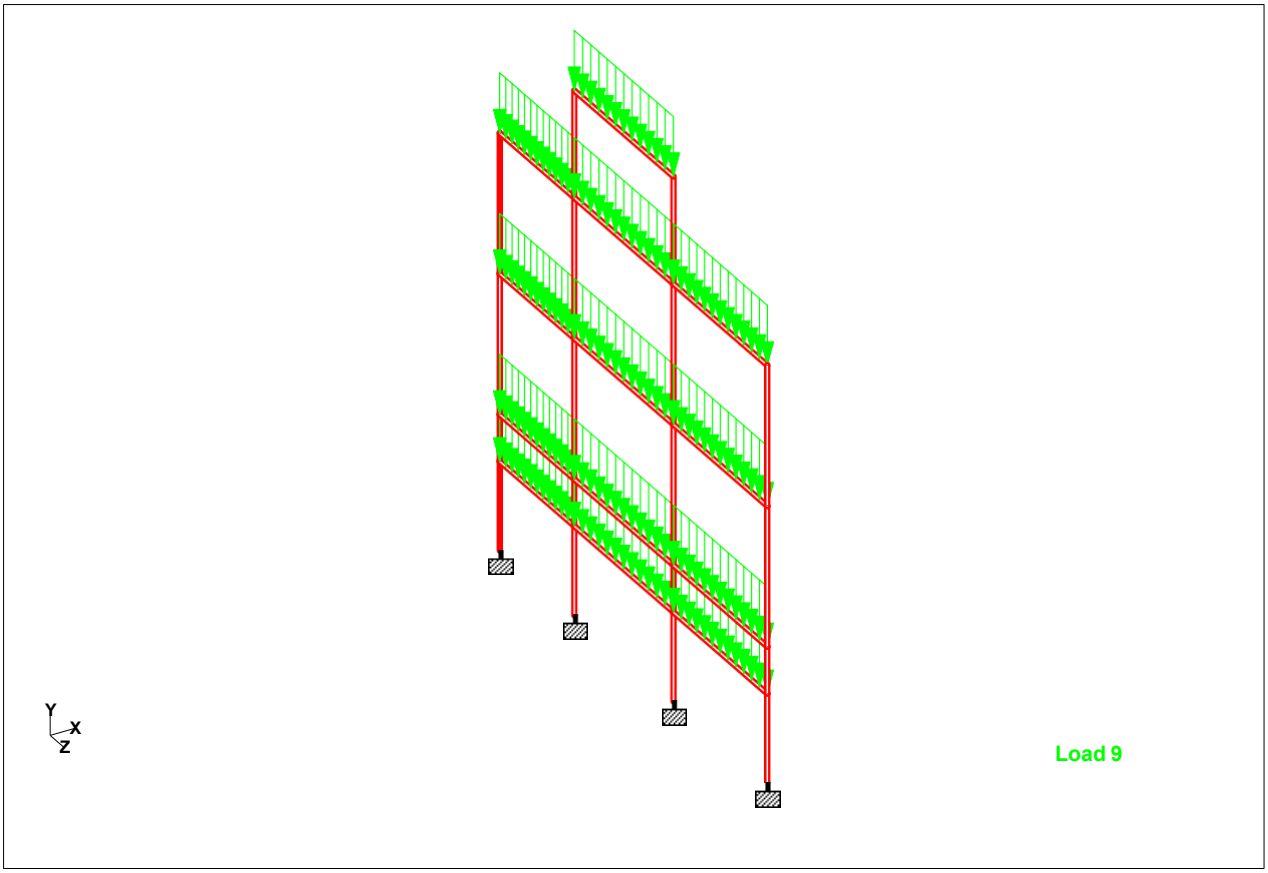
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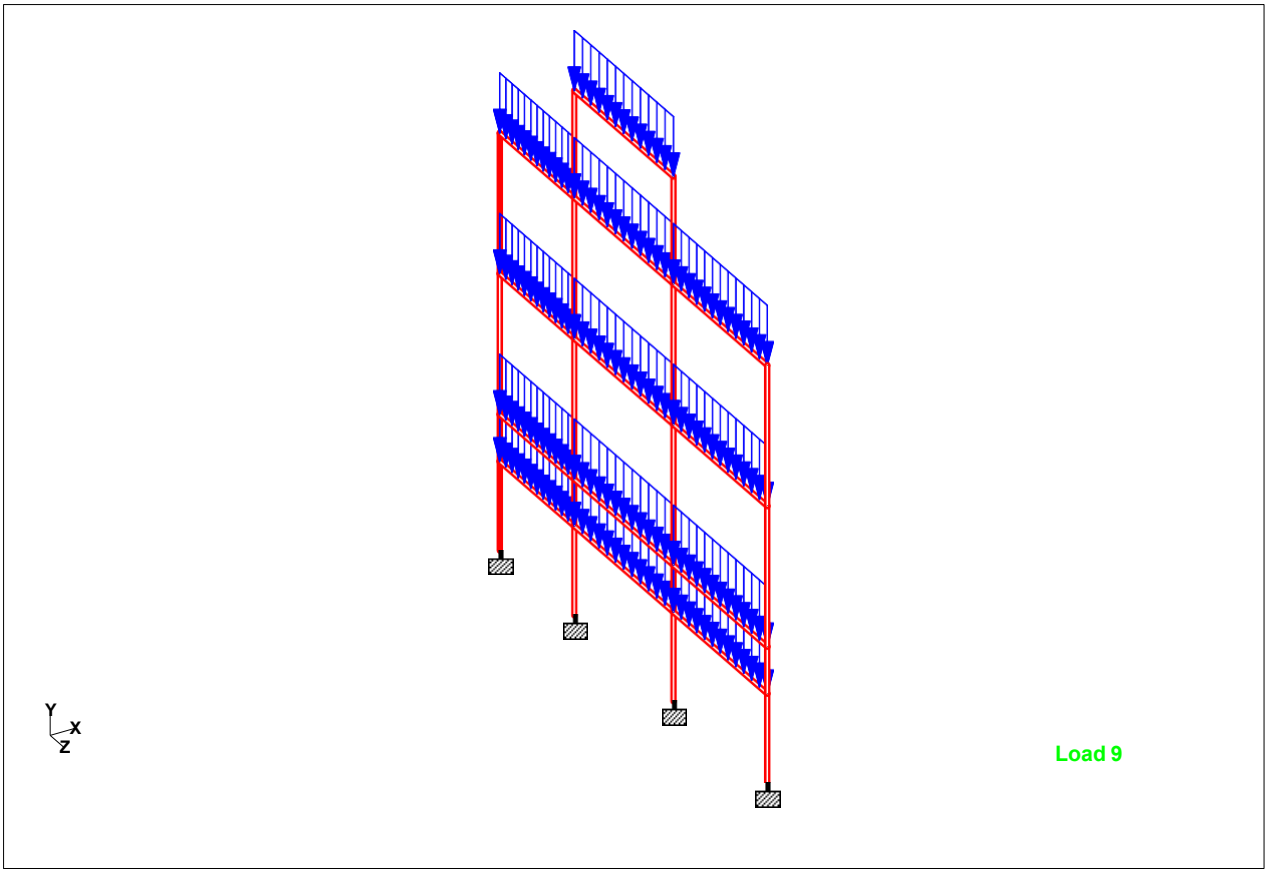
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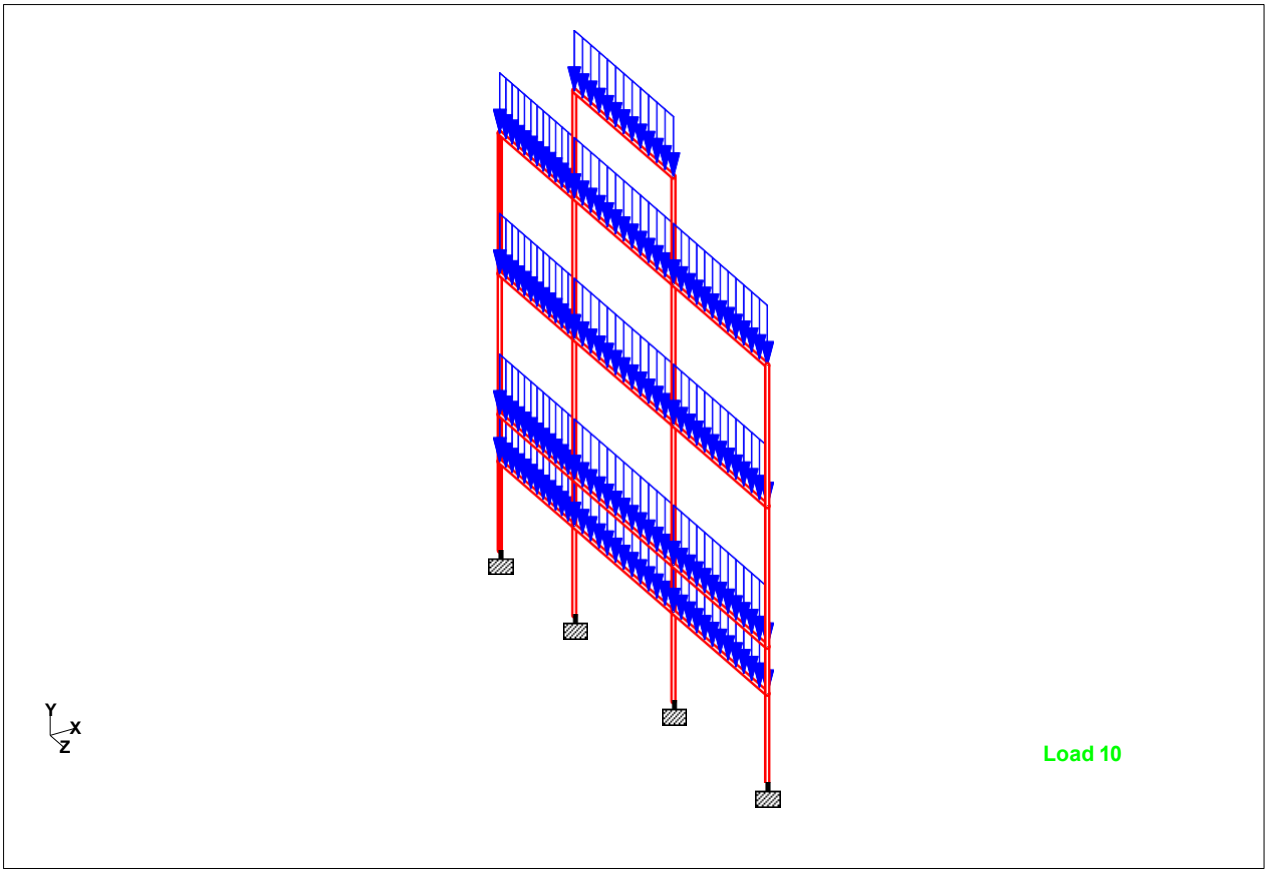
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FLOOR LOADS :

DEAD LOADS

Assuming 5''thk slab dead load	=	313 kg/sqm
Weight of floor finish, partitions etc.,	=	131 kg/sqm
Total dead load	=	444 kg/sqm

LIVE LOADS

Live load on typical floor	=	200 kg/sqm
Total load on typical floor	=	644 kg/sqm

ROOF LOADS

Assuming 5''thk slab dead load	=	313 kg/sqm
Weight of weathering course	=	273 kg/sqm
Total dead load	=	586 kg/sqm
Live load on roof with success assumed	=	150 kg/sqm
Total roof load	=	736 kg/sqm
Staircase loading liable to overcrowding	=	500 kg/sqm
Wind load considering height of building	=	200 kg/sqm

BRICK LOADS

Weight of brick per sqm	=	1890 kg/cum
Assuming beam size of 9''x24''	=	335 kg/rm
R.C.C Mix to be adopted	=	M25

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LOAD ON TYPICAL COLUMN

Slab load of stilt floor		=	9.02 ton
Slab load for five floors		=	36.08ton
Roof load		=	10.31ton
Beam load		=	12.57ton
Brick work load		=	37.50ton
Self weight of column assuming (12''x18'')		=	5.07ton
Total load on column		=	110.55ton
	Say	=	111ton

Provide 10-Y25

Safe capacity of above section = 184ton

Hence safe

TYPICAL FOUNDATION

SBC of soil = 22 Mt/sqm.
As per soil report

Area of footing required = 5.04 sqm.

Area of footing provided = 9.0 sqm.

Hence safe

TYPICAL SLAB Ly/Lx = 4.0/3.5 =1.14

Hence two way slab

Provide 5''thk slab

Provide Y10 @ 5'' C/C (shorter direction)

Provide Y10 @ 6'' C/C (longer direction)



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TYPICAL BEAM

Span	=	5.965m
Slab load	=	1805kg/m
Self weight	=	350 kg/m
Total load	=	2155kg/m
Bending moment	=	8028.01kg-m
B.M due to conc 1	=	6545.3kg-m
B.M due to conc 2	=	3145.00kg-m
Total bending moment	=	17718.31kg-m

EARTHQUAKE ANALYSIS

Calculation of horizontal seismic coefficient

As per code I.S.1893/2016	Ah	=	ZI/2R x Sa/g
Zone factor (Chennai zone)	z	=	0.16
Importance factor	I	=	1.2
Response reduction factor	R	=	5.0
Natural period			
Ta		=	0.075h
		=	0.075x18.25
		=	1.368secs
	H	=	(Ht of buildg)



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Sa/g = 1.67/t

Sa/g = 1.67/1.368 = 1.22

$$Sa/g = \frac{0.16 \times 1.2}{2 \times 5.0} \times 1.22$$

$$= 0.0233$$

CALCULATION OF BASE SHEAR/SEISMIC FORCES

Floor	Wi	Hi	Wi x Hi^2	Qi
Terrace	87.108	18.25	29012.08	11.825
5	113.483	15.25	26391.89	11.825
4	113.483	12.25	20258.05	11.825
3	113.483	9.15	9501.08	1.8718
2	113.483	6.3	4504.14	0.887
1	113.483	3.45	1350.73	0.266
Stilt	14.691	0.6	5.288	1.04×10^{-3}
EWI	442.248		E 91023.258	

Base shear V = Ah EWI

= 0.0233 x 91023.258 = 8.29ton

Seismic force per column = 8.29/4 =2.07

Seismic moment per column = 2.07x3/2 =1.39

Column provided is safe against the additional seismic moment of 1.39mt.

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CHECK FOR FOUNDATION

P/a+M/Z

111		1.39
----	±	----------
9		$(3 x3^{2)}/6$

12.33	±	0.31
		=12.64
		=1.25 x 22
		=27.5ton

Hence safe



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