

PROJECT :

CLIENT :

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Three Story Seismic Analysis

Determine Base Shear (Derived from ASCE 7-10 Sec. 12.8)

$$\begin{aligned}
 V &= \text{MAX}\{ \text{MIN}[S_{D1}I/(RT), S_{DS}I/R], 0.01, 0.5S_1I/R \} W \\
 &= \text{MAX}\{ \text{MIN}[0.53W, 0.23W], 0.01W, 0.06W \} \quad \wedge \\
 &= 0.23 W, (\text{SD}) \quad (\text{for } S_1 \geq 0.6 g \text{ only}) \\
 &= 0.16 W, (\text{ASD}) = 35.83 \text{ kips}
 \end{aligned}$$

Where

$$\begin{aligned}
 S_{DS} &= 1.489 \quad (\text{ASCE 7-10 Sec 11.4.4}) \\
 S_{D1} &= 0.832 \quad (\text{ASCE 7-10 Sec 11.4.4}) \\
 S_1 &= 0.832 \quad (\text{ASCE 7-10 Sec 11.4.1}) \\
 R &= 6.5 \quad (\text{ASCE 7-10 Tab 12.2-1}) \\
 I &= 1 \quad (\text{ASCE 7-10 Tab 11.5-1}) \\
 C_t &= 0.02 \quad (\text{ASCE 7-10 Tab 12.8-2}) \\
 h_n &= 27.5 \text{ ft} \\
 x &= 0.75 \quad (\text{ASCE 7-10 Tab 12.8-2}) \\
 T &= C_t(h_n)^x = 0.240 \text{ sec}, (\text{ASCE 7-10 Sec 12.8.2.1})
 \end{aligned}$$

Calculate Vertical Distribution of Forces & Allowable Elastic Drift (ASCE 7-10, Sec 12.8.3 & 12.8.6)

Level	W_x	h_x	h_x^k	$W_x h_x^k$	F_x , ASD (12.8-11)	$\delta_{xe, \text{allowable, ASD}}$
Roof	34.606	27.5	27.5	952	9.7 (0.28 W_x)	0.4
3RD	99.215	18.5	18.5	1835	18.7 (0.19 W_x)	0.4
2ND	85.17	8.5	8.5	724	7.4 (0.09 W_x)	0.4
	219.0			3511	35.8	

Where

$$\begin{aligned}
 k &= 1 \quad \text{for } T \leq 0.5 \\
 k &= 0.5 T + 0.75 \quad \text{for } T @ (0.5, 2.5) \\
 k &= 2 \quad \text{for } T \geq 2.5
 \end{aligned}$$

$$\begin{aligned}
 \delta_{xe, \text{allowable, ASD}} &= \Delta_a I / (1.4 C_d), (\text{ASCE 7-10 Sec 12.8.6}) \\
 C_d &= 4, (\text{ASCE 7-10 Tab 12.2-1}) \\
 \Delta_a &= 0.02 \text{ hsx}, (\text{ASCE 7-10 Tab 12.12-1})
 \end{aligned}$$

Calculate Diaphragm Forces (ASCE 7-10, Sec 12.10.1.1)

Level	W_x	ΣW_x	F_x	ΣF_x	F_{px} , ASD, (12.10-1)
Roof	34.6	34.6	9.7	9.7	9.7 (0.28 W_x)
3RD	99.2	133.8	18.7	28.4	21.1 (0.21 W_x)
2ND	85.2	219.0	7.4	35.8	18.1 (0.21 W_x)
	219.0		35.8		

Where

$$\begin{aligned}
 F_{\min} &= 0.2 S_{DS} I W_x / 1.4, \text{ ASD} \\
 F_{\max} &= 0.4 S_{DS} I W_x / 1.4, \text{ ASD}
 \end{aligned}$$