Design Criteria:

$S_s := 1.25$ $S_1 := 0.5$ $S_{DS} := 0.83$ $S_{D1} := 0.42$

$R := 3.0$ $I := 1.0$ $T := 2.37$ $T_L := 6$

Calculate Approximate Period:

Height of building: $h_n := 20$

Table 12.8-2 parameters: $C_t := 0.02$ $x := 0.75$

Approximate Fundamental Period (12.8-7): $T_a := C_t \cdot h_n^{\,x} = 0.189$

Upper Limit Coefficient (Table 12.8-1): $C_u := 1.4$

Design Period (12.8.2):

$T_d := \min\left(T, T_a \cdot C_u\right) = 0.265$

Static Base Shear Coeficient (12.8.1.1):

$$C_s := \frac{S_{DS}}{\frac{R}{I}} = 0.277$$

$$C_{s\_max} := \frac{S_{D1}}{T_d \cdot \frac{R}{I}} = 0.529$$

$$C_{s\_min} := \text{if}\left(S_1 \geq 0.6, \frac{0.5 \cdot S_1}{\frac{R}{I}}, 0.01\right) = 0.01$$

$C_s := \min\left(C_{s\_max}, \max\left(C_s, C_{s\_min}\right)\right) = 0.277$

Seismic Mass:

$W := 108.864\,\text{kip}$

Static Base Shear (12.8.1):

$V := C_s \cdot W = 30.119\,\text{kip}$

Scaling Factors:

$SF_{min} := \frac{1}{\frac{R}{I}} = 0.333$ ASCE 7-05 section12.9.2

$V_{dynamic\_X} := 21.862 kip$ Taken from unscaled dynamic analysis X Axis

$V_{dynamic\_Y} := 21.665 kip$ Taken from unscaled dynamic analysis Y Axis

$$SF_X := \max\left(SF_{min}, if\left(V_{dynamic\_X} < 0.85 \cdot V, \frac{0.85 \cdot V}{V_{dynamic\_X}}, \frac{V}{V_{dynamic\_X}}\right)\right) = 1.171$$

$$SF_Y := \max\left(SF_{min}, if\left(V_{dynamic\_Y} < 0.85 \cdot V, \frac{0.85 \cdot V}{V_{dynamic\_Y}}, \frac{V}{V_{dynamic\_Y}}\right)\right) = 1.182$$

Verification:

Scaling Factor: $\frac{V}{V_{dynamic\_X}} = 1.378$

Minimum Scaling Factor per (12.9.4): $0.85 \cdot \frac{V}{V_{dynamic\_X}} = 1.171$

Dynamic Base shear: $V_{dynamic\_X} = 21.862\,kip$

Minimum Allowable Base Shear if dynamic V is less than static: $0.85 \cdot V = 25.601\,kip$

Base shear with Scaling Factor Applied: $V_{dynamic\_X} \cdot SF_X = 25.601\,kip$