Table 19.2-1 Values of G/G_o and v_s/v_{so}

	Value of v_s/v_{so}			Value of G/G_o		
	$S_{DS}/2.5$			$S_{DS}/2.5$		
Site Class	≤0.1	0.4	≥0.8	≤0.1	0.4	≥0.8
A	1.00	1.00	1.00	1.00	1.00	1.00
B	1.00	0.97	0.95	1.00	0.95	0.90
C	0.97	0.87	0.77	0.95	0.75	0.60
D	0.95	0.71	0.32	0.90	0.50	0.10
E	0.77	0.22	[a]	0.60	0.05	[a]
F	[a]	[a]	[a]	[a]	[a]	[a]

Note: Use straight-line interpolation for intermediate values of $S_{DS}/2.5$.
[a]Should be evaluated from site specific analysis

Table 19.2-2 Values of α_θ

r_m/v_sT	α_θ
<0.05	1.0
0.15	0.85
0.35	0.7
0.5	0.6

with the soil strain levels associated with the design earthquake motion. The average shear modulus (G) for the soils beneath the foundation at large strain levels and the associated shear wave velocity (v_s) needed in these computations shall be determined from Table 19.2-1 where

v_{so} = the average shear wave velocity for the soils beneath the foundation at small strain levels (10^{-3} percent or less)
$G_o = \gamma v^2_{so}/g$ = the average shear modulus for the soils beneath the foundation at small strain levels
γ = the average unit weight of the soils

Alternatively, for structures supported on mat foundations that rest at or near the ground surface or are embedded in such a way that the side wall contact with the soil is not considered to remain effective during the design ground motion, the effective period of the structure is permitted to be determined from

$$\tilde{T} = T\sqrt{1+\frac{25\alpha r_a \bar{h}}{v_s^2 T^2}\left(1+\frac{1.12 r_a \bar{h}^2}{\alpha_\theta r_m^3}\right)} \quad (19.2\text{-}5)$$

where

α = the relative weight density of the structure and the soil defined by

$$\alpha = \frac{\bar{W}}{\gamma A_o \bar{h}} \quad (19.2\text{-}6)$$

r_a and r_m = characteristic foundation lengths defined by

$$r_a = \sqrt{\frac{A_o}{\pi}} \quad (19.2\text{-}7)$$

and

$$r_m = 4\sqrt{\frac{4I_o}{\pi}} \quad (19.2\text{-}8)$$

where

A_o = the area of the load-carrying foundation
I_o = the static moment of inertia of the load-carrying foundation about a horizontal centroidal axis normal to the direction in which the structure is analyzed
α_θ = dynamic foundation stiffness modifier for rocking as determined from Table 19.2-2
v_s = shear wave velocity
T = fundamental period as determined in Section 12.8.2

19.2.1.2 Effective Damping

The effective damping factor for the structure-foundation system ($\tilde{\beta}$) shall be computed as follows:

$$\tilde{\beta} = \beta_o \frac{0.05}{\left(\frac{\tilde{T}}{T}\right)^3} \quad (19.2\text{-}9)$$

where

β_o = the foundation damping factor as specified in Fig. 19.2-1

For values of $\frac{S_{DS}}{2.5}$ between 0.10 and 0.20 the values of β_o shall be determined by linear interpolation vbetween the solid lines and the dashed lines of Fig. 19.2-1.

The quantity r in Fig. 19.2-1 is a characteristic foundation length that shall be determined as follows:

$$\text{For } \frac{\bar{h}}{L_0} \le 0.5,\ r = r_a \quad (19.2\text{-}10)$$

$$\text{For } \frac{\bar{h}}{L_0} \ge 1,\ r = r_m \quad (19.2\text{-}11)$$