

The problem that follows provides a sample calculation which identifies 6.14% transmissibility at 60Hz. Please note: Ancillary nomographs, definitions, assumptions and calculations were omitted for simplicity.

Solution:

Shape Factor:

$$\text{Square: } sf = \frac{(L)}{(4)(t)} = \frac{1}{(4)(1.25)} = \frac{1}{5} = .2$$

Static Deflection:

$$\begin{aligned} \text{Compressive Modulus:} &= \frac{Cs \text{ (See Fig. 1)}}{(\text{Assumed Percent Deflection}) / 100} = \frac{14.05}{(.2) / 100} = \frac{14.05}{.002} = 7025 \\ &= \frac{7025}{100} = 70.25 \text{ psi} \end{aligned}$$

Compressive Modulus Corrected for Shape Factor:

$$\begin{aligned} &= (\text{Compressive Modulus}) (1 + (2)(sf^2)) = (70.25) (1 + (2)(.04)) = (70.25) (1.08) \\ &= 75.87 \text{ psi} \end{aligned}$$

$$\text{Static Deflection: } = \frac{(\text{Load Per Isolator})(t)}{(\text{Corrected Compressive Modulus})(\text{Area})} = \frac{(15)(1.25)}{(75.87)(1)} = \frac{18.75}{75.87} = .247$$

$$\text{Percent Deflection: } = \frac{\text{Static Deflection}}{t} \times 100 = \frac{.247}{1.25} \times 100 = 19.76\%$$

System Natural Frequency:

Assume a Natural Frequency of 9 Hz

E_{od} is Dynamic Compressive Modulus

K is Compressive Stiffness

pi = 3.1416

$$\begin{aligned} E_{od} &= G_d \times 3 \quad (G_d \text{ is found in Figure 2 and is equal to 48.4 for this sample}) = 48.4 \times 3 \\ &= 145.2 \text{ psi} \end{aligned}$$

$$\begin{aligned} K &= ((E_{od})(1 + (2) sf^2)) \times \frac{\text{Area}}{t} = ((145.2)(1.08)) \times \frac{1}{1.25} \\ &= 156.816 \times .8 = 125.4528 \text{ lbs per inch} \end{aligned}$$

$$\begin{aligned} \text{Natural Frequency} &= \frac{1}{2(\pi)} \times \sqrt{\frac{K \times 386}{\text{Load per Isolator}}} = \frac{1}{6.2832} \times \sqrt{\frac{125.4538 \times 386}{15}} \\ &= .1592 \times \sqrt{3228.31872} = .1592 \times 56.818 = 9.04 \text{ Hz} \end{aligned}$$

Transmissibility:

Tangent of Delta is @ Excitation Frequency found in figure 3.

$$\text{Tangent of Delta} = .48085825$$

$$\text{Frequency Ratio} = \frac{\text{Excitation Frequency}}{\text{System Natural Frequency}} = \frac{60 \text{ Hz}}{9.04 \text{ Hz}} = 6.64$$

$$\begin{aligned} \text{Transmissibility} &= \sqrt{\frac{1 + \text{Tangent of Delta}^2}{(1 - (\text{Frequency Ratio})^2) \left[\frac{G_d \text{ @ Natural Frequency}}{G_d \text{ @ Excitation Frequency}} \right]^2 + (\text{Tangent of Delta})^2}} \\ &= \sqrt{\frac{1 + .48085825^2}{(1 - (44.04976) \left[\frac{48.4}{112} \right]^2) + (.23112)} = \sqrt{\frac{1.4808}{190.219 + .23112}} = \sqrt{\frac{1.4808}{190.45}} \\ &= .0814 \end{aligned}$$

$$\text{Percent Isolation} = (1 - \text{Transmissibility}) \times 100 = 1 - .0814 \times 100 = 93.86\%$$