# AD 405:
# Vibration assessment of transient response factors

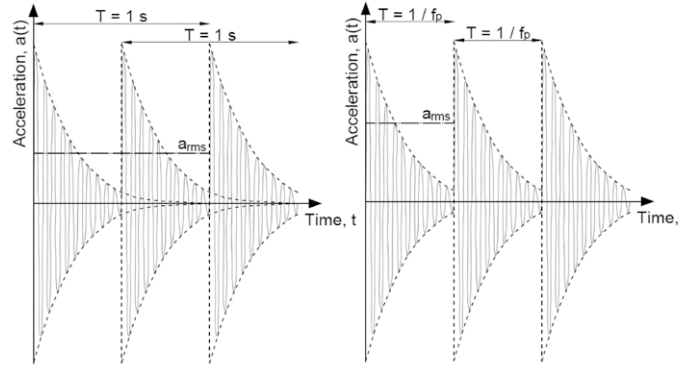
This advisory desk note clarifies advice given in SCI P354: Design of floors for vibration: a new approach, regarding the calculation of the transient response factor of a floor system. The transient response factor $R$ is given by equation (38) in the publication as the weighted root mean square (rms) acceleration, $a_{w,rms}$, divided by 0.005 $ms^{-2}$. A generic formula to calculate the weighted rms acceleration is given as equation (12) in section 2.4.1.

$$a_{w,rms} = \sqrt{\frac{1}{T}\int_0^T a_w(t)^2 dt}$$

For the calculation of $a_{w,rms}$, values are needed for the time period under consideration, $T$, and the acceleration function, $a_w(t)$. For transient vibration analysis, the weighted acceleration function, $a_w(t)$, can be found in section 6.3.3, as equation (34). A superposition formula is provided to calculate the acceleration of each impulse by summing the acceleration responses of each mode of vibration of the floor.

In section 2.4.1 and 6.3.3 different values for the time period $T$ to be considered are given. In section 2.4.1, it is suggested that a time period of $T = 1$ s should be used, while in section 6.3.3 it is recommended to take $T = 1/f_p$ when calculating the rms acceleration using equation (12). For an average walking pace of $f_p = 2$ Hz that would lead to a time period of $T = 0.5$ s.

Both of these recommendations refer to a single step. The time period $T = 1$ s does not represent two steps, but instead allows for the time that it takes for the acceleration caused by a single step to fade out, which may overlap with other steps. The time period $T = 1/f_p$ represents the time between two steps.




The difference between the two assumptions can be better understood with the figure above.

SCI recommends $T = 1/f_p$ to be used for the calculation of the transient response factors. This ignores the response at the tail end of the step, but this is generally small compared to the initial acceleration caused by the step. As seen in the figure above, using $T = 1/f_p$ leads to a marginally higher rms acceleration, and is therefore on the safe side.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