$f\_m\_1 := 4.22Hz$ Egensvining fra modeshape 1

$f\_m\_2 := 6.59Hz$ Egensvining fra modeshape 2

$f\_m\_3 := 16.88Hz$ Egensvining fra modeshape 3

$f\_w\_1 := 1.55Hz$ bevægelsesfrekvensen for personen

$h\_1 := 1$ $h\_2 := 2$ $h\_3 := 3$ $h\_4 := 4$ harmonisk lastkomponent

$f := 1.55 \cdot 2$

$0.41 \cdot (f - 0.95) = 0.882$

$F\_h := 700N \cdot [0.41 \cdot (f - 0.95)] = 617.05 \cdot N$ gennemsnitlige vægt af person

$\zeta\_m := 1.5\%$

$m\_m := 36960kg = 3.696 \times 10^{4} \cdot kg$ modal massen

$f\_h\_1 := h\_1 \cdot f\_w\_1 = 1.55 \cdot Hz$ Harmonisk lastfrekvens fra den 1.harmoniske lastkomponent og bevægelsesfrekvens f_w_1

$f\_h\_2 := h\_2 \cdot f\_w\_1 = 3.1 \cdot Hz$ Harmonisk lastfrekvens fra den 2.harmoniske lastkomponent og bevægelsesfrekvens f_w_1

$f\_h\_3 := h\_3 \cdot f\_w\_1 = 4.65 \cdot Hz$ Harmonisk lastfrekvens fra den 3. harmoniske lastkomponent og bevægelsesfrekvens f_w_1

$f\_h\_3 := h\_4 \cdot f\_w\_1 = 6.2 \cdot Hz$ Harmonisk lastfrekvens fra den 4, harmoniske lastkomponent og bevægelsesfrekvensen f_w_1

$q := 1848 \frac{kg}{m} \cdot 10 \frac{m}{s^2}$ $L := 20m$

$E := 38GPa$

$I := 0.056m^4$

$\mu\_t\_m\_1 := \frac{5}{384} \cdot \frac{q \cdot L^4}{E \cdot I} = 18.09210526 \cdot mm$

$5.74 \cdot 10^{(-4)} = 0.000574$

$Q := 36960kg \cdot 10 \frac{m}{s^2}$

$y := \frac{20m}{2}$

$\mu\_e\_m\_1 := \sin\left(\frac{\pi \cdot y}{L}\right) = 1$

$\rho\_h\_m := 1$

For a particular footfall rate, f_w, it is required to calculate the respons
each of the first four harmonics:

Firstly, for each harmonic h, from $h = 1$ to $h = 4$.

1. Calculate the harmonic forcing frequency, f_h:

   $f_h = hf_w$

2. Calculate the harmonic force, F_h, at this harmonic frequency f

   For each mode, m

3. Calculate the real and imaginary acceleration ($a_{real,h,m}$, $a_{imag,h,}$

   $F_h = DLF.P$

   where DLF is calculated from Table 4.3 (Design value) and P e
   weight of the walker.

   $$a_{real,h,m} = \left(\frac{f_h}{f_m}\right)^2 \frac{F_h \mu_{r,m} \mu_{e,m} \rho_{h,m}}{\hat{m}_m} \frac{A_m}{A_m^2 + B_m^2}$$

   $$a_{imag,h,m} = \left(\frac{f_h}{f_m}\right)^2 \frac{F_h \mu_{r,m} \mu_{e,m} \rho_{h,m}}{\hat{m}_m} \frac{B_m}{A_m^2 + B_m^2}$$

$$A\_m := 1 - \left(\frac{f\_h\_1}{f\_m\_1}\right)^2 = 0.865$$

$$B\_m := 2 \cdot \zeta\_m \cdot \frac{f\_h\_1}{f\_m\_1} = 0.011$$

$$\alpha\_real\_h\_m\_1 := \left(\frac{f\_h\_1}{f\_m\_1}\right)^2 \cdot \frac{F\_h \cdot \mu\_t\_m\_1 \cdot \mu\_e\_m\_1 \cdot \rho\_h\_m}{m\_m} \cdot \frac{A\_m}{(A\_m)^2 + (B\_m)^2} = 0.0000470959\,m \cdot \frac{m}{s^2}$$

real acceleration ved modeshape 1

$$\alpha\_imag\_h\_m\_1 := \left(\frac{f\_h\_1}{f\_m\_1}\right)^2 \cdot \frac{F\_h \cdot \mu\_t\_m\_1 \cdot \mu\_e\_m\_1 \cdot \rho\_h\_m}{m\_m} \cdot \frac{B\_m}{(A\_m)^2 + (B\_m)^2} = 0.0000005999\,m \cdot \frac{m}{s^2}$$

where $A_m = 1 - \left(\frac{f_h}{f_m}\right)^2$, $B_m = 2\zeta_m \frac{f_h}{f_m}$, $\rho_{h,m}$ is from

ζ_m can be estimated from Table A2 and f_m, $\hat{m}_m$ and μ are foun
described in Appendix A.

4. Sum the real and imaginary responses in all modes to yield th
imaginary acceleration to this harmonic force, a_h:

$$a_{real,h} = \sum_m a_{real,h,m}; \qquad a_{imag,h} = \sum_m a_{imag,h,m}$$

5. Find the magnitude of this acceleration $|a_h|$ which is the total
modes to this harmonic (at this frequency):

$$|a_h| = \sqrt{a_{real,h}^2 + a_{imag,h}^2}$$

e in each mode to

(4.3)

from Table 4.3:

$_n$) in each mode:

equals the static

(4.4)

ı equation 4.2

d using methods

ıe total real and

(4.5)

. response in all

(4.6)