ヤング係数測定方法
（The method for measuring young’s modulus）

■ 静的弾性係数

（Static method of measuring Young's modulus of elasticity）

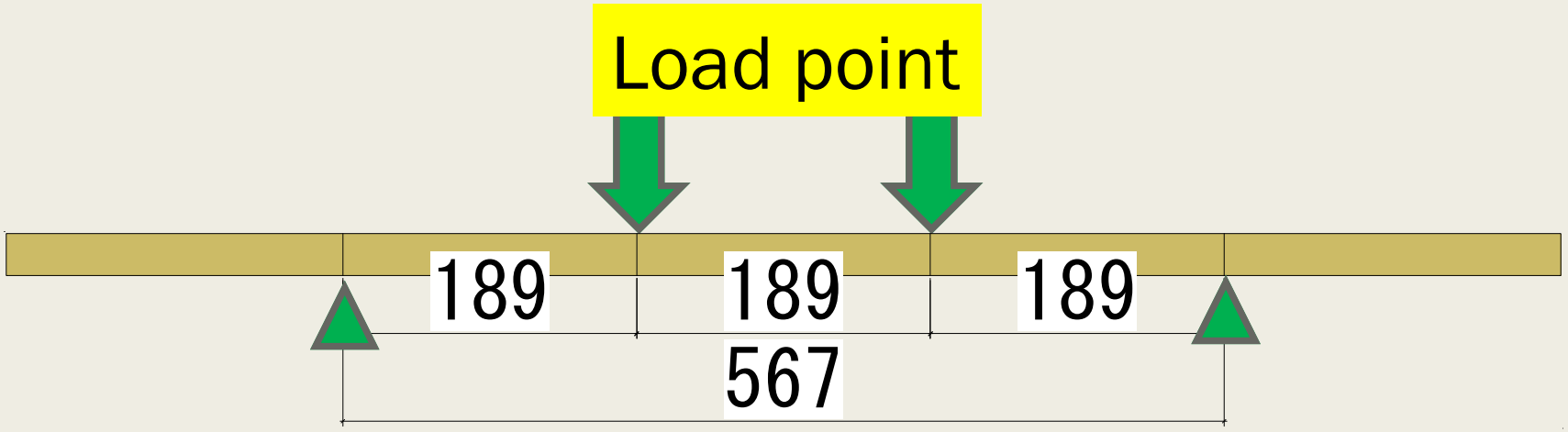
→destructive

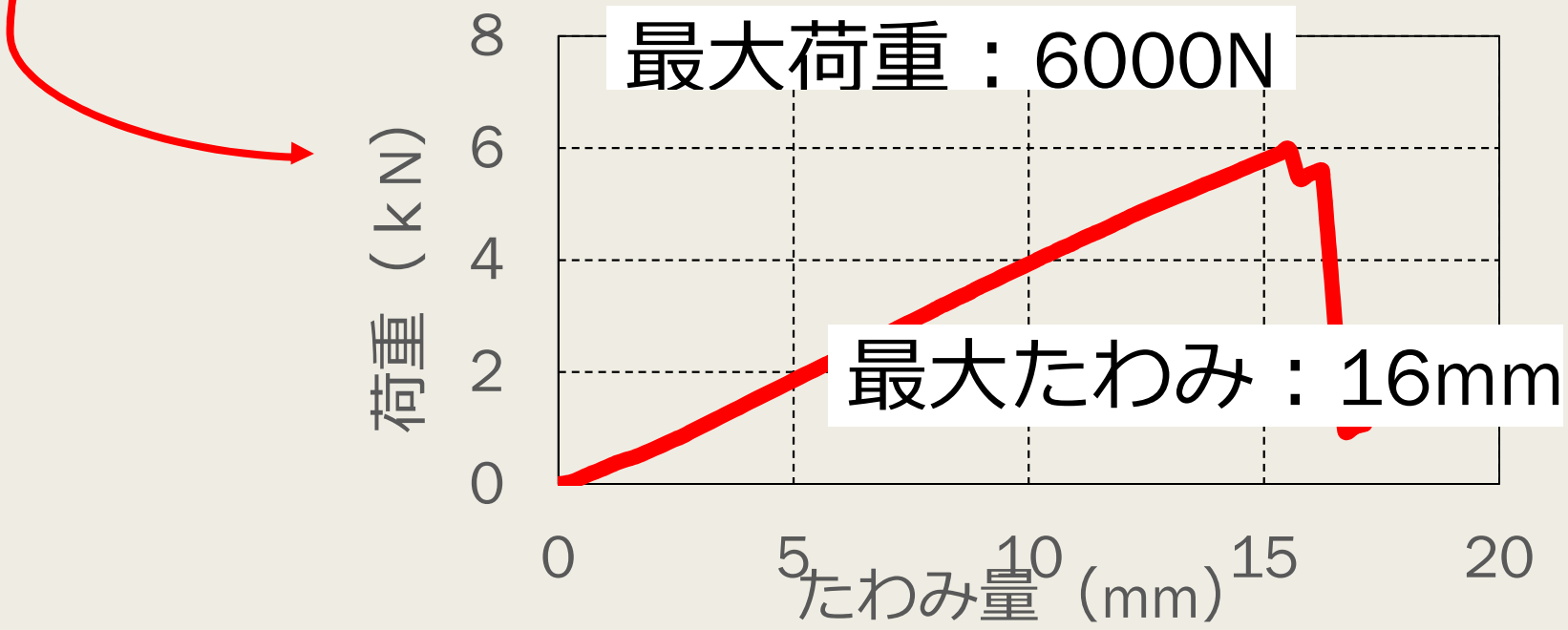
■ 動的弾性係数

（Dynamic method of measuring Young's modulus of elasticity ）

→non-destructive

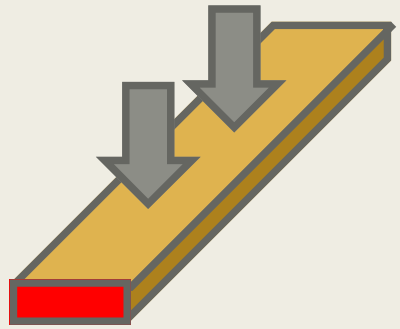
Static method





Young's modulus in bending

$$E = \frac{a(3L^2 - 4a^2)(F_2 - \mathrm{F_1})}{48I(w_2 - w_1)}$$



◆a：荷重-支点間距離（mm）The distance between a support point and a load point

◆L：支点間距離（mm）The distance between support points

◆I：断面二次モーメント（mm^4）Cross-sectional secondary moment

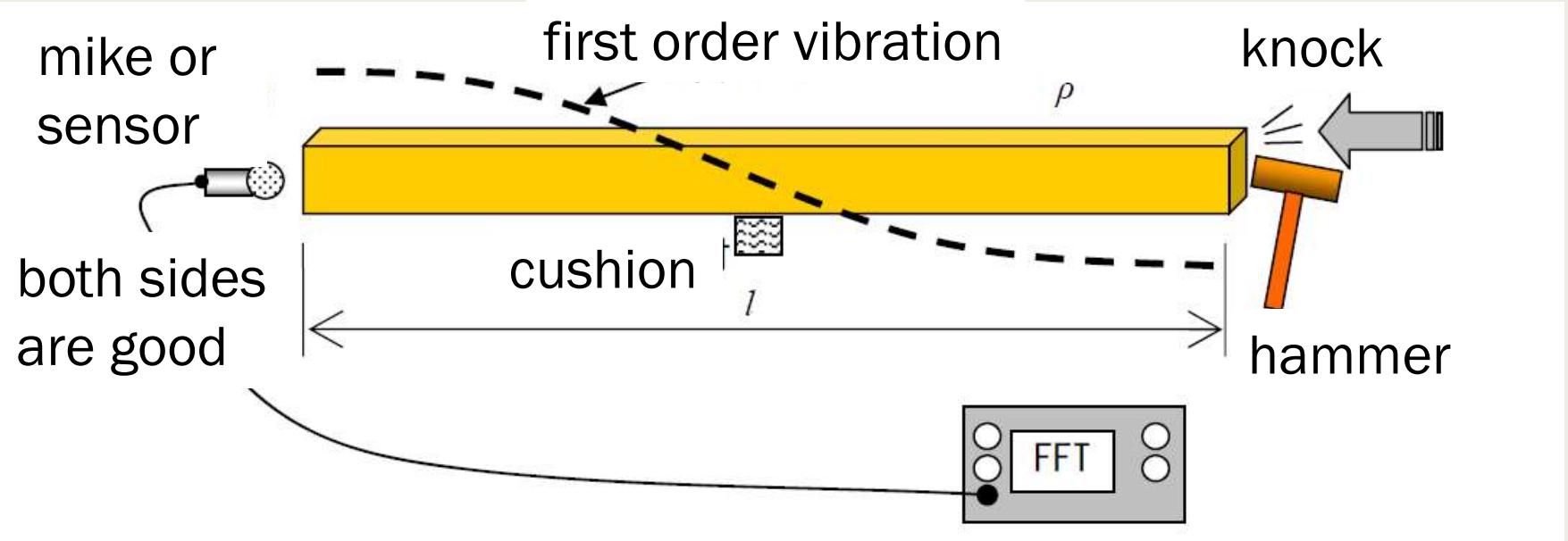
◆F_2ーF_1：最大荷重の4割値と1割値の差（N）

0.4×Pmax-0.1×Pmax

◆w_2ーw_1：F_2ーF_1に対応するたわみ量（mm）

The deflection correspond to "F2-F1"

dynamic method(E_{fr})

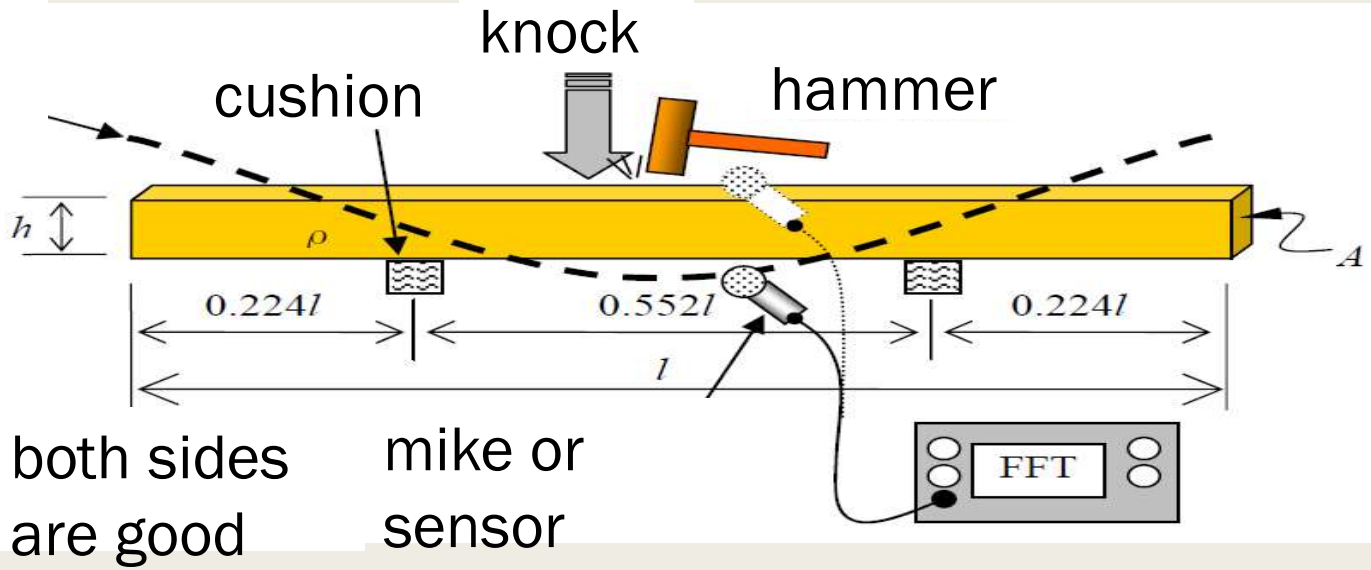


$$E_{fr}=4\times f^2\times l^2\times \rho$$

- ◆f：基本振動数 number of vibration（Hz）
- ◆l：棒の長さ length of timber（m）
- ◆ρ：棒の密度 density（kg・m^{-3}）

Modulus of dynamic elasticity(E_{afb})

first order vibration



both sides are good

mike or sensor

$$E=(2\pi fl^2/im^2)^2\rho$$

◇f：1次曲げ固有振動数 first order vibration about bending

◇l：長さ the length of the timber

◇i：断面2次半径 radius of gyration of area

◇m：constant (4.730)

- Modulus of dynamic elasticity is higher than modulus of static elasticity by 5~10%.

- That difference comes from the effect of plastic deformation.

参考文献：構造用木材の強度試験マニュアル　pp.9-10