Chart 1: Young's modulus, E against density, ρ

This chart guides selection of materials for light, stiff, components. The contours show the longitudinal wave speed in m/s; natural vibration frequencies are proportional to this quantity. The guide lines show the loci of points for which

(a) $E/\rho = C$ (minimum weight design of stiff ties; minimum deflection in centrifugal loading, etc.)
(b) $E^{1/2}/\rho = C$ (minimum weight design of stiff beams, shafts and columns)
(c) $E^{1/3}/\rho = C$ (minimum weight design of stiff plates)

The value of the constant C increases as the lines are displaced upwards and to the left. Materials offering the greatest stiffness-to-weight ratio lie towards the upper left-hand corner.

Other moduli are obtained approximately from E using

(a) $\nu = 1/3$; $G = 3/8E$; $K \approx E$ (metals, ceramics, glasses and glassy polymers)
or (b) $\nu \approx 1/2$; $G \approx 1/3E$; $K \approx 10E$ (elastomers, rubbery polymers)

where ν is Poisson's ratio, G the shear modulus and K the bulk modulus.