Modulus of elasticity in composite beam design

What are $E_c(S)$, $E_c(D)$, and $E_c(V)$ in composite beam design?

**Answer:** Values for $E_c(S)$, $E_c(D)$, and $E_c(V)$ are given as follows:

- $E_c(S)$ is the modulus of elasticity for strength design.
  - For LRFD, $E_c(S)$ is taken directly as the modulus of elasticity of the material assigned to the composite section.
  - For ASD, $E_c(S)$ is calculated as $33 \times \gamma_c^{1.5} \times f_c^e$ (ksi), where $\gamma_c$ is the weight per unit volume (kips/in$^3$) of the material assigned to the composite section.

- $E_c(D)$ is the deflection modulus of elasticity, given as $E_c(S)$ / (creep factor), where the creep factor is specified in the Preference menu.

- $E_c(V)$ is the vibration modulus of elasticity, given as $1.35 \times E_c(S)$. This amplification coefficient is suggested in AISC Guide 11, page 12.

Since these modular ratio are different, transformed inertia varies between strength, deflection, and vibration analysis.