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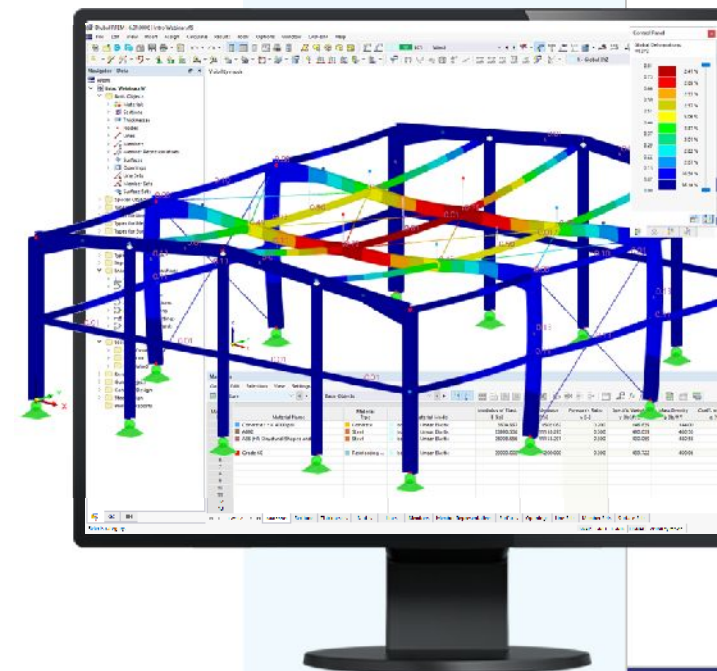


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Webinar

# AISC 360-16 Steel Design in RFEM 6



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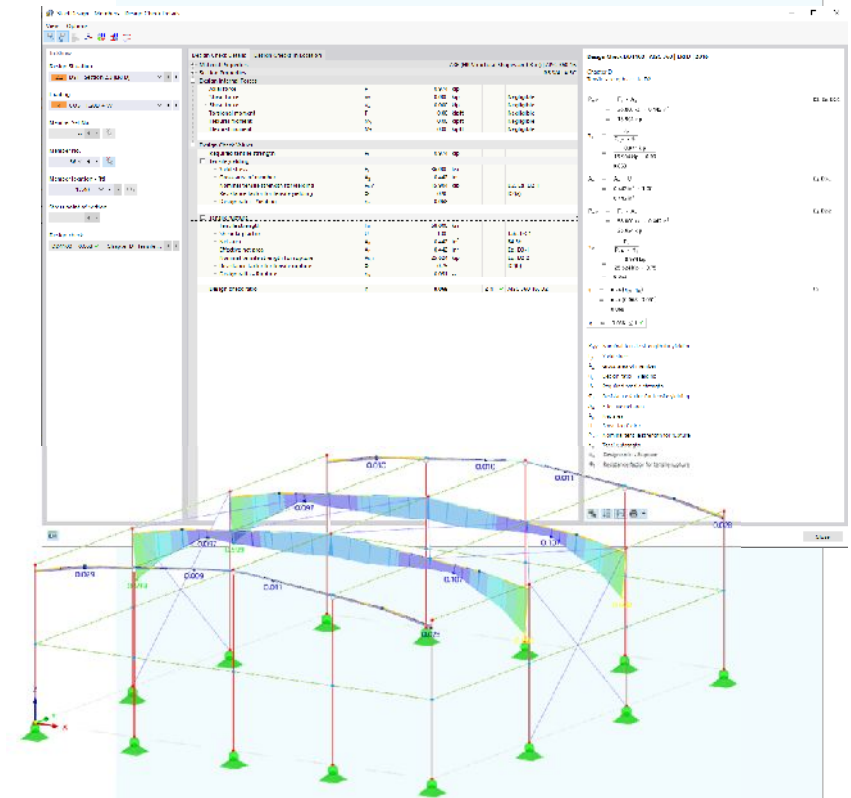


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- 01 Structure modeling and loading workflow in RFEM 6
- 02 Considerations for AISC 360-16 Ch. C - Direct Analysis Method
- 03 Data input for Steel Design Add-on
- 04 Review of analysis and design results

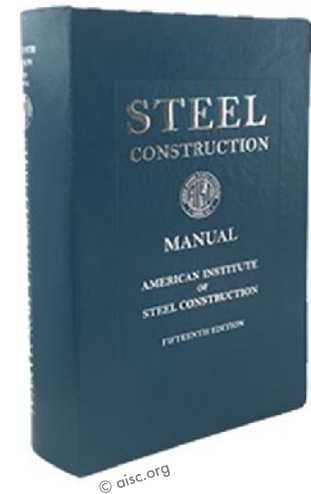




# AISC 360-16 Ch. C – Design for Stability

## General Stability Requirements (Sect. C1)

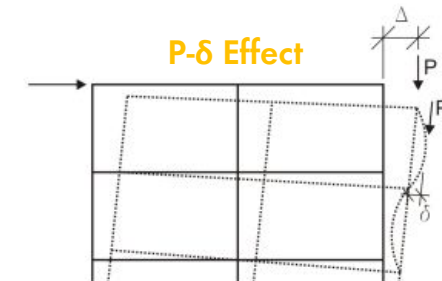
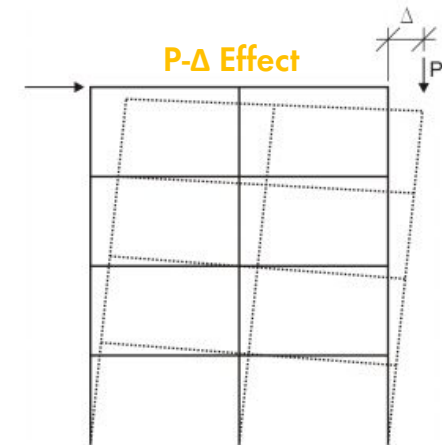
1. Flexural, shear, and axial member deformation
2. Second-order effects ( $P-\Delta$ ,  $P-\delta$ )
3. Geometric imperfections
4. Stiffness reduction due to inelasticity
5. Uncertainty in stiffness and strength



# AISC 360-16 Ch. C – Design for Stability (cont'd)

## General Analysis Requirements – Second-Order Analysis (Sect. C2.1.b)

- P- $\Delta$  Effect
  - Effects of axial forces on the bending stiffness considered
  - Considered w/ second-order analysis in RFEM
  - Deformed system stiffness matrix for each iteration
  
- P- $\delta$  Effect
  - Destabilizing effect of member curvature subject to compression and flexure
  - Criteria to neglect P- $\delta$  (Sect. C2.1.b)
  - Considered w/ second-order analysis in RFEM





# AISC 360-16 Ch. C – Design for Stability (cont'd)

## Consideration of Initial System Imperfections (Sect. C2.2)

- Column out-of-plumbness; out-of-straightness (Ch. E - Compression)
- Direct Modeling (Sect. C2.2a)
  - Initial displacements due to loading and buckling modes
- Use of Notional Loads (Sect. C2.2b)

$$N_i = 0.002\alpha Y_i \quad (\text{Eqn. C2-1})$$

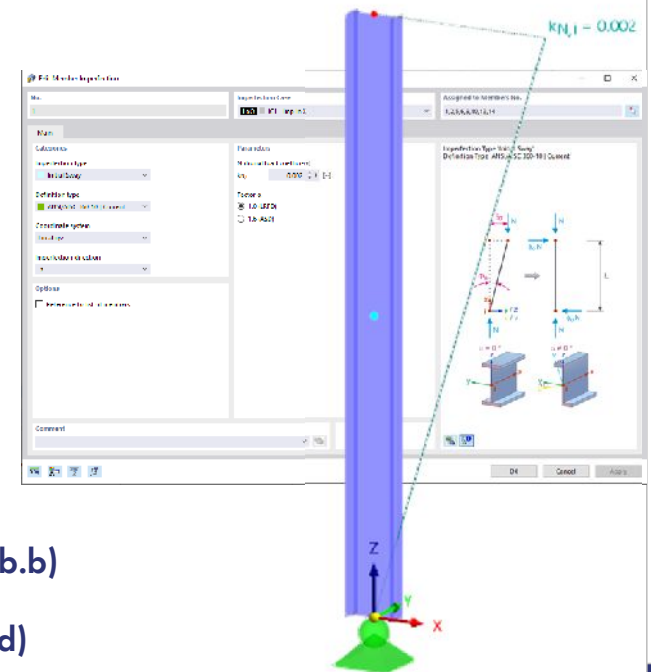
where

$\alpha = 1.0$  (LRFD);  $1.6$  (ASD)

$N_i =$  notional load applied at level  $i$ , kips (N)

$Y_i =$  factored gravity load at level  $i$ , kips (N)

- Applied in the direction for greatest destabilizing effect (Sect. C2.2b.b)
- 2<sup>nd</sup> order/1<sup>st</sup> order drift  $\leq 1.7, N_i$  for gravity only COs (Sect. C2.2b.d)





# AISC 360-16 Ch. C – Design for Stability (cont'd)

## Adjustments to Stiffness (Sect. C2.3)

- 0.80 factor for axial and flexural stiffness (Sect. C2.3.1)
  - Applied to all members to avoid artificial distortion
- Additional  $\tau_b$  factor for flexural stiffness (Sect. C2.3.2)

1. When  $\alpha P_r/P_{ns} \leq 0.5$

$$\tau_b = 1.0 \quad (\text{Eqn. C2-2a})$$

2. When  $\alpha P_r/P_{ns} > 0.5$

$$\tau_b = 4(\alpha P_r/P_{ns})[1 - (\alpha P_r/P_{ns})] \quad (\text{Eqn. C2-2b})$$

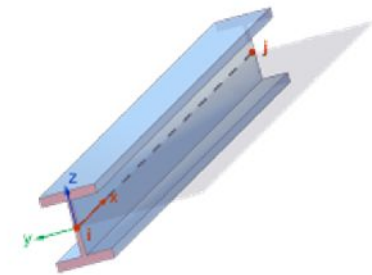
where

$\alpha = 1.0$  (LRFD);  $1.6$  (ASD)

$P_r$  = required factored axial compressive strength, kips (N)

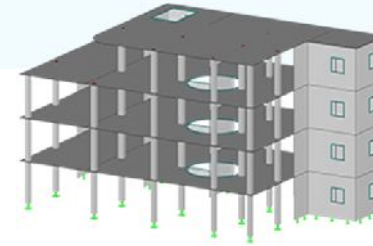
$P_{ns}$  = cross-section compressive strength,  $F_y A_g$  for nonslender,  $F_y A_e$  for slender, kips (N)

- $\tau_b = 1.0$  with additional  $N_i = 0.001 \alpha Y_i$  (Sect. C2.3.3)
- Not applicable to drifts, deflections, vibrations, periods, etc. (Comm. C2.3)

$$\begin{bmatrix} D_{11} & D_{12} & D_{13} & 0 & 0 & 0 \\ & D_{22} & D_{23} & 0 & 0 & 0 \\ & & D_{33} & 0 & 0 & 0 \\ & \text{sym.} & & D_{44} & 0 & 0 \\ & & & & D_{55} & 0 \\ & & & & & D_{66} \end{bmatrix}$$




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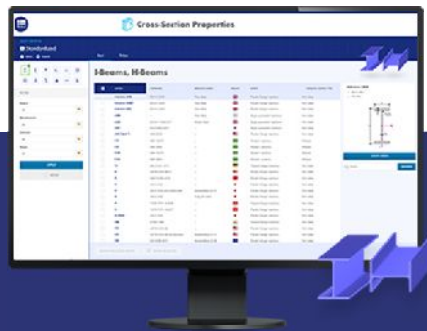
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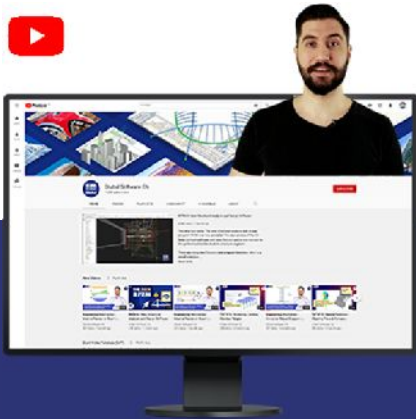




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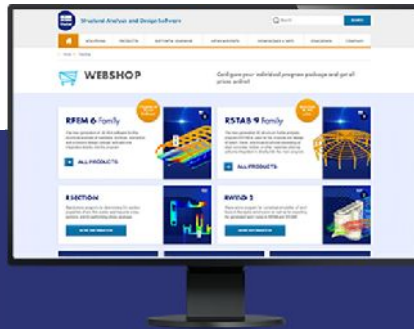
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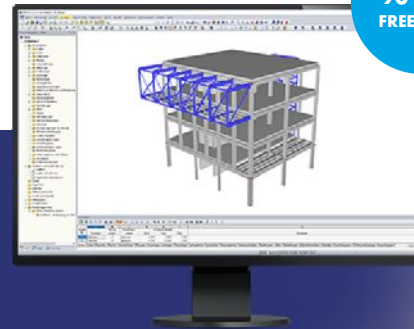
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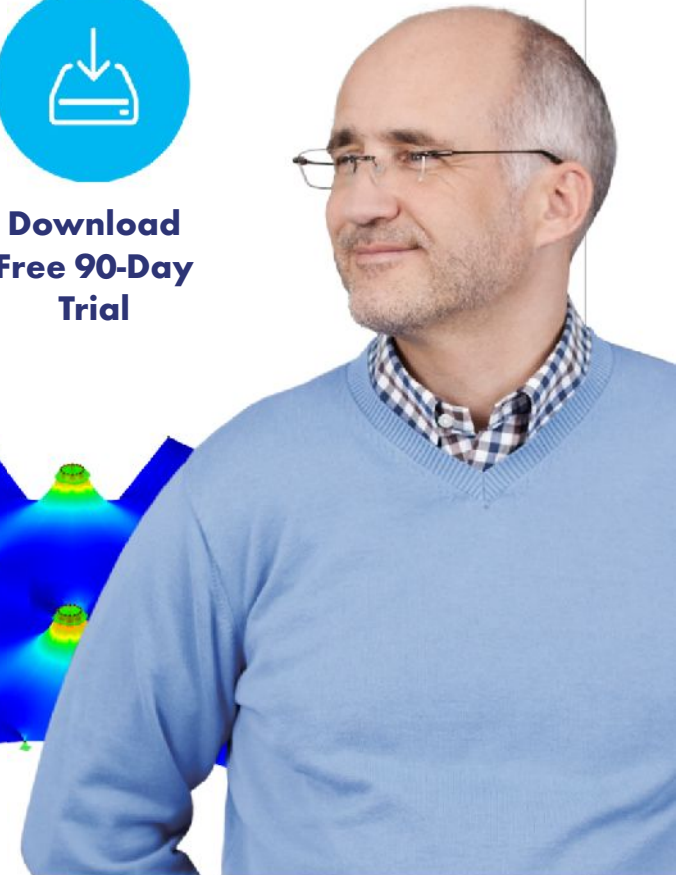
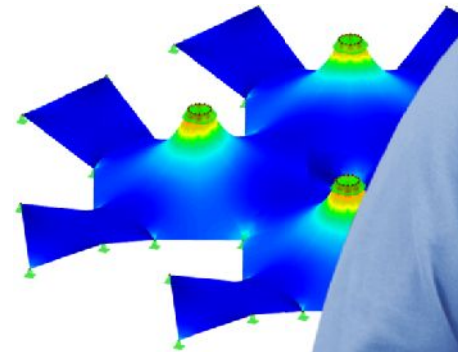
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