



Structural Analysis & Design Software



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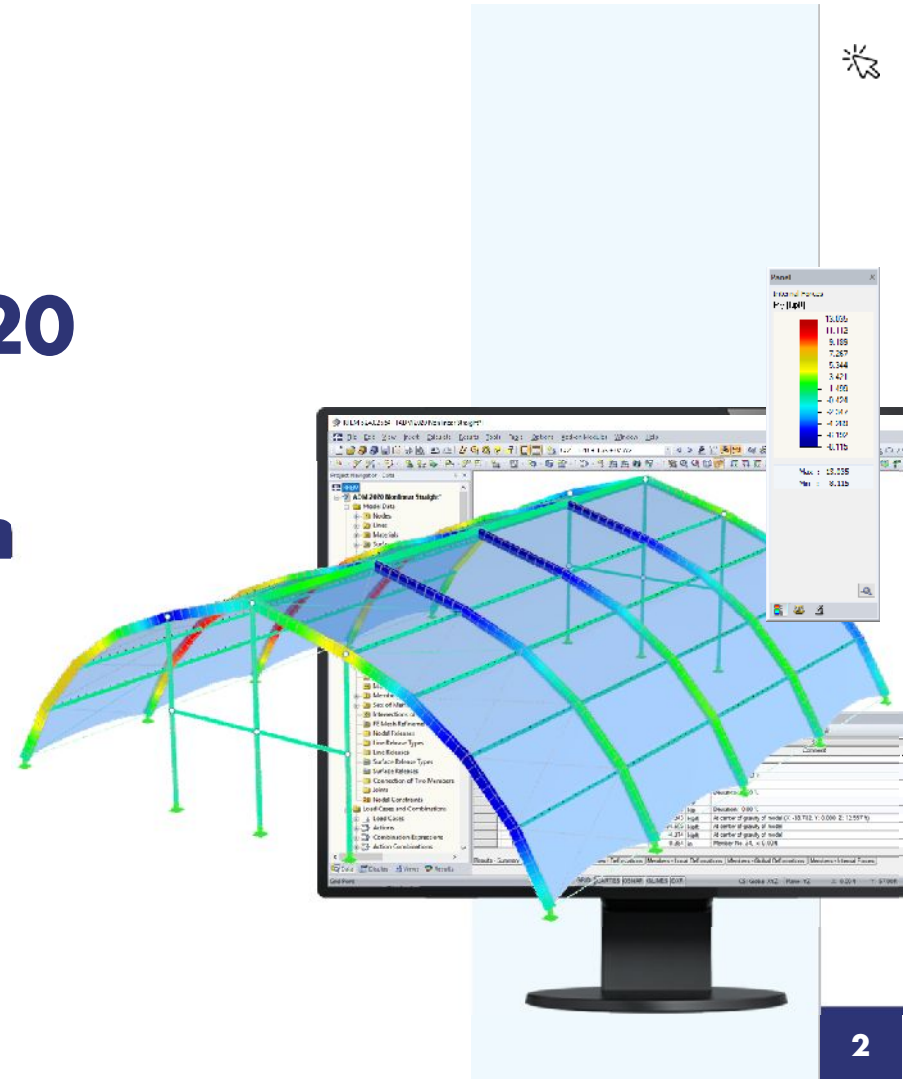
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Webinar

ADM 2020 Member Design in RFEM



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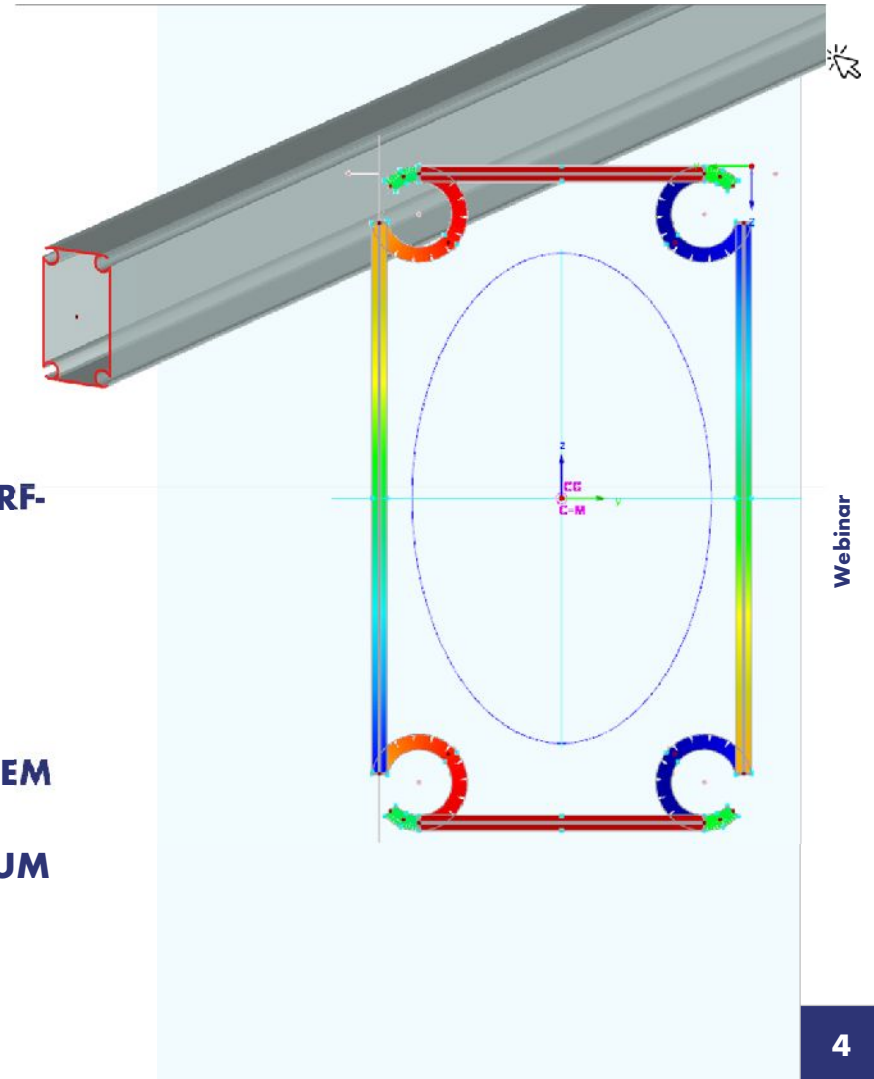
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 - 05 Review of structural analysis results in RFEM
 - 06 Aluminum member design in RF-ALUMINUM ADM acc. to ADM 2020

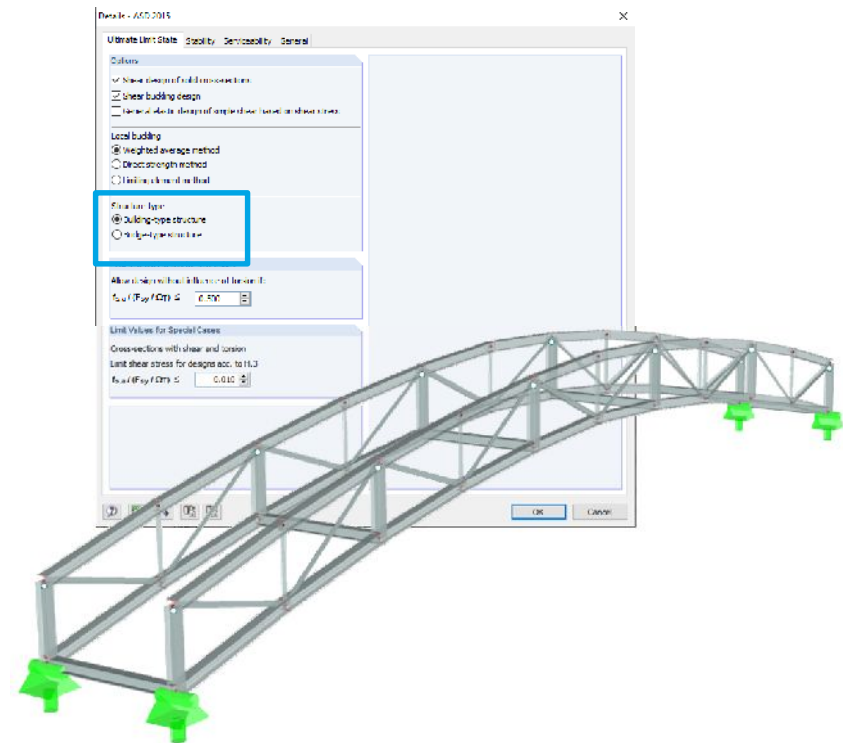




Aluminum Design Manual 2020 Updates

Chapter B – Design Requirements

- **Bridge-Type Structures [ADM 2015 Sect. B.2.2]**
 - Removed this section entirely
 - ADM 1967 addressed both bridges and buildings w/ different safety factors
 - AASHTO published LRFD Specification in 1994 including aluminum bridge design
 - ASD design for bridges remained in ADM even though no longer permitted





— Aluminum Design Manual 2020 Updates (cont'd)

Chapter F – Flexural Strength

■ Direct Strength Method [Sect. F.3.2]

- 2015 ADM referred to Sect. B.5.5.5
- Required all elements to be classified under “Uniform Compression” or “Flexural Compression”
- 2020 ADM lists flexural strength eqns. directly
- Simplification not requiring further classification

F.3.2 Direct Strength Method 2015

$$M_{nlb} = F_b S_{xc} \quad (\text{F.3-2})$$

where F_b is determined in accordance with Section B.5.5.5.

F.3.2 Direct Strength Method 2020

The nominal flexural strength for local buckling M_{nlb} shall be determined as

LIMIT STATE	$M_{x/y}$	λ_{eq}	Slenderness Limits
yielding	M_{np}	$\lambda_{eq} \leq \lambda_1$	$\lambda_1 = \frac{B_p - F_{cy}}{D_p}$
inelastic buckling	$M_{np} - \left(M_{np} - \frac{\pi^2 E S_{xc}}{C_p^2} \right) \frac{(\lambda_{eq} - \lambda_1)}{(C_p - \lambda_1)}$	$\lambda_1 < \lambda_{eq} < \lambda_2$	
post-buckling	$\frac{S_{xc} k_2 \sqrt{B_p E}}{\lambda_{eq}}$	$\lambda_{eq} \geq \lambda_2$	$\lambda_2 = C_p$

where $\lambda_{eq} = \pi \sqrt{\frac{E}{F_e}}$ (F.3-2)

F_e = the elastic local buckling stress of the cross section determined by analysis



— Aluminum Design Manual 2020 Updates (cont'd)

Chapter F – Flexural Strength

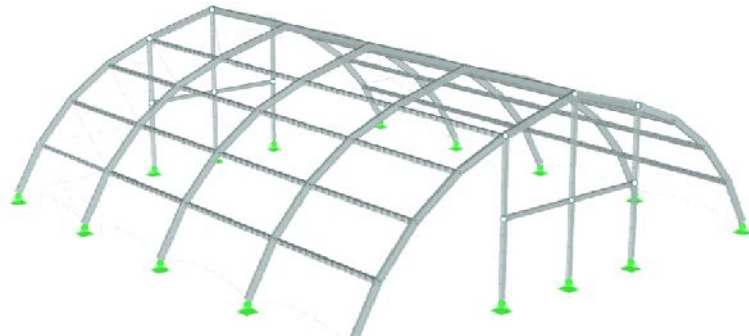
- **Bending Coefficient, C_b [Sect. F.4.1]**
 - Guide to Stability Design Criteria for Metal Structures, 6th Edition (Wiley, 2010)
 - Combined 2015 ADM doubly and singly symmetric shapes w/ R_m variable

$$C_b = \frac{12.5 M_{\max}}{2.5 M_{\max} + 3 M_A + 4 M_B + 3 M_C} \quad (F.4-2) \quad 2015$$

$$C_b = \frac{4 M_{\max}}{\sqrt{M_{\max}^2 + 4 M_A^2 + 7 M_B^2 + 4 M_C^2}} R_m \leq 3.0 \quad (F.4-2) \quad 2020$$

$R_m = 1.0$ except for unbraced lengths of singly-symmetric members subjected to double-curvature bending from transverse loading,

$$R_m = 0.5 + 2 \left(\frac{I_x}{I_y} \right)^2$$





Aluminum Design Manual 2020 Updates (cont'd)

Chapter F – Flexural Strength

Single Angles [Sect. F.5]

- Consistent with AISI 360-16 changes
- Lateral torsional buckling strength, M_e , Sect. F.5.1 and F.5.2 revised
- Bending about geometric axes [Sect. F.5.1]
- Bending about the principal axes [Sect. F.5.2]
- Simplifications in Sect. F.5.2 major axis bending for equal and unequal leg angles



(3) If the leg tip is in compression, lateral-torsional buckling strength determined by Section F.5c with **2015**

$$M_e = \frac{0.82Eb^4tC_b}{L_b^2} \left[\sqrt{1 + 0.78(L_b t / b^2)^2} - 1 \right] \quad (\text{F.5-4})$$

If the leg tip is in tension, lateral-torsional buckling strength determined by Section F.3c with

$$M_e = \frac{0.82Eb^4tC_b}{L_b^2} \left[\sqrt{1 + 0.78(L_b t / b^2)^2} + 1 \right] \quad (\text{F.5-5})$$

(3) If the leg tip is in compression, lateral-torsional buckling strength determined by Section F.5c with **2020**

$$M_e = \frac{0.73Eb^4tC_b}{L_b^2} \left[\sqrt{1 + 0.88(L_b t / b^2)^2} - 1 \right] \quad (\text{F.5-4})$$

If the leg tip is in tension, lateral-torsional buckling strength determined by Section F.5c with

$$M_e = \frac{0.73Eb^4tC_b}{L_b^2} \left[\sqrt{1 + 0.88(L_b t / b^2)^2} + 1 \right] \quad (\text{F.5-5})$$

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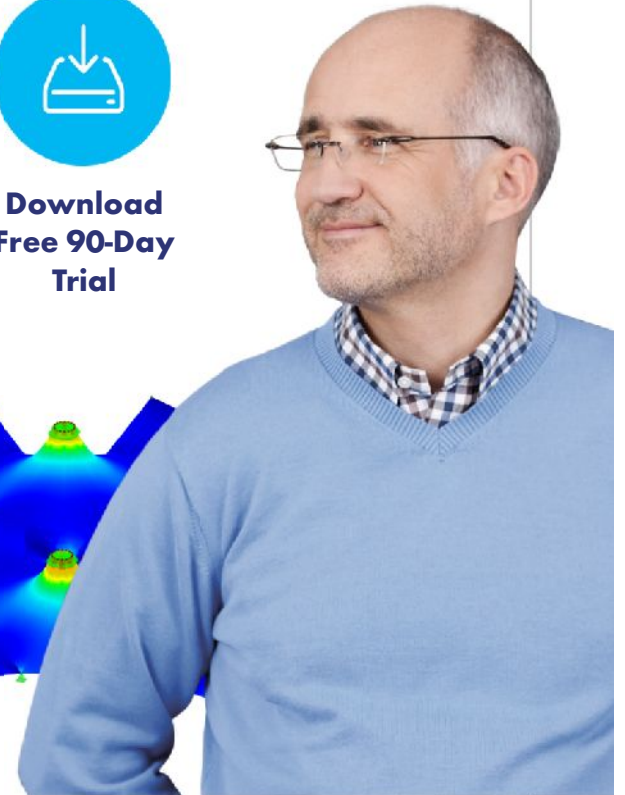
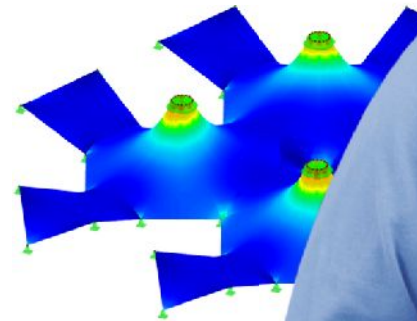
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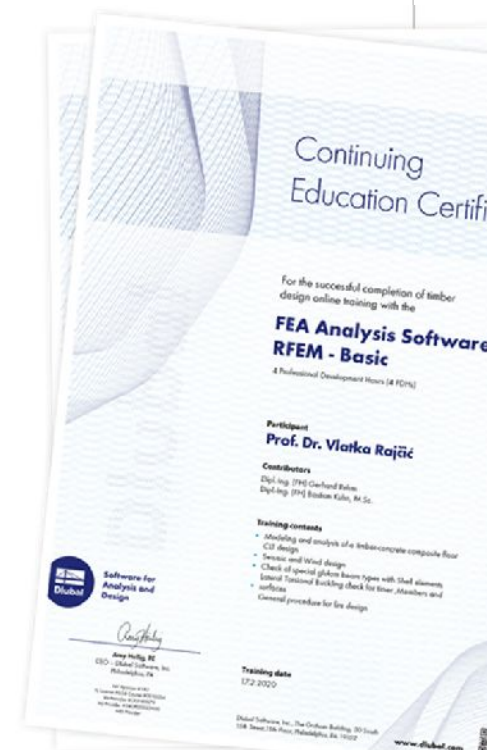


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