

### Structural Analysis & Design Software







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### Webinar

AISI S100 / CSA S136 Cold-Formed Steel Design in RFEM 6





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### Content

- 01 Custom cross-section calculation in RSECTION
- 02 Modeling and loading review in RFEM 6
- 03 Direct Analysis Method for stability design
- 04 Direct Strength Method and Finite Strip Method advantages
- Dlubal
- 05 Design of members in Steel Design Add-on



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## **Member Buckling Behavior**

- Failure buckling modes caused by compressive stress (bending moment or axial force)
- Three buckling modes considered for thin-walled sections
  - Local buckling Elements bend with no translation at fold lines; short halfwavelength (i.e., the length at which the buckling shape repeats along the member length)
  - Global buckling lateral bending of the entire member including flexural, torsional, flexural-torsional, lateral-torsional; one long half-wavelength dependent on unbraced length
  - Distortional buckling combination of local/global failure with some translation at fold lines; half-wavelength between local/global
- Two methods to address buckling
  - Effective Width Method
  - Direct Strength Method



## **Effective Width Method vs. Direct Strength Method**

- **Effective Width Method** 
  - Effective section calculation required for each element
  - No interaction between elements for overall member behavior

#### **Direct Strength Method (RFEM Method)**

- No effective width calculations required
- No iterations required
- Gross cross-sectional properties are used
- Interaction of all elements for all stability limit states
- Compatibility and equilibrium maintained at element junctures
- Applicable to a broad range of sections
- More accurate strength prediction than effective width method



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# Finite Strip Method (FSM)

- Critical elastic stress/force is required for buckling design
- FSM is an acceptable numerical solution method for Direct Strength Method (AISI S100-16 App. 2.2)
- Simply supported member buckling analyzed with plate bending strips
- Unique buckling mode curve generated for each cross-section (local [a], distortional [b], global [c])
- 7 FSM signature graphs available in RFEM
- "Total" curve combines all modes for quick evaluation based on curve minima
- KB 1809, KB 1841, and KB 1801 on the Dlubal website



#### **Dlubal Software**

### **RFEM and Stability Design**

### Finite Strip Method (Numerical Method)

- Applicable for local, distortional, and global elastic buckling failures
- Flexural and torsional stability failure modes grouped together for global buckling regardless if option is unchecked (limitation with FSM graphs)
- Longest effective length (KL) for flexural and torsional considered together for global buckling regardless if smaller effective length is defined

### Acc. to Chapter E2 and F2.1 (Analytical Method)

- Only applicable for global buckling (FSM still used for local and distortional buckling)
- Can consider varying effective lengths independently for flexural and torsional failure modes and global buckling



# Web Crippling Design

- AISI S100-16 Sect. G5 Web Crippling w/o Holes
- AISI S100-16 Sect. H3 Combined Bending and Web Crippling
- Applicable for sections acc. to Table G5-1

   G5-4 (built-up I-beams, single web channels, C-sections, single web Zsections, hat sections)
- Member must have 0° rotation set
- "Steel" Design Supports applied to member for reference to G5 tables

Show	Design Check Details Design Checks in Location					Design Check GG6251   AISC 360   2016	
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