



Structural Analysis & Design Software



www.dlubal.com



Amy Heilig, PE
Presenter

CEO - USA Office



Alex Bacon, EIT
Moderator

Technical Support Engineer



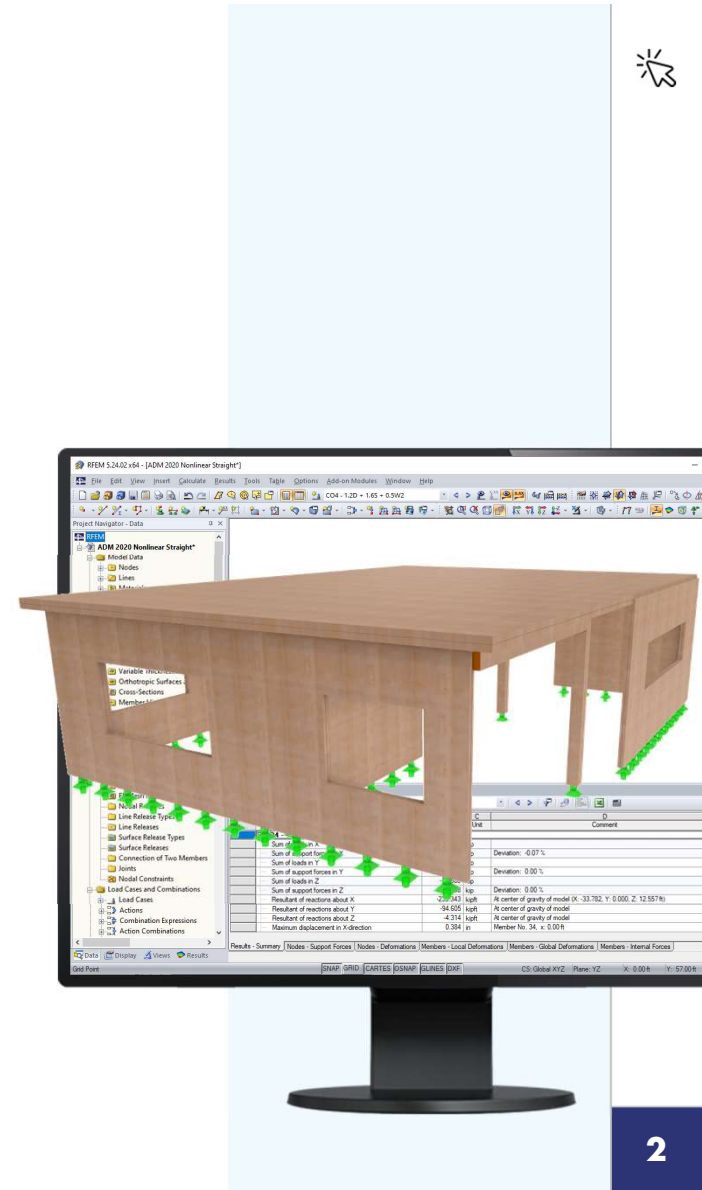
Cisca Tjoa, PE
Moderator

Technical Support Engineer



Webinar

2018 NDS CLT Design in RFEM 6



Questions During the Presentation

GoToWebinar Control Panel Desktop

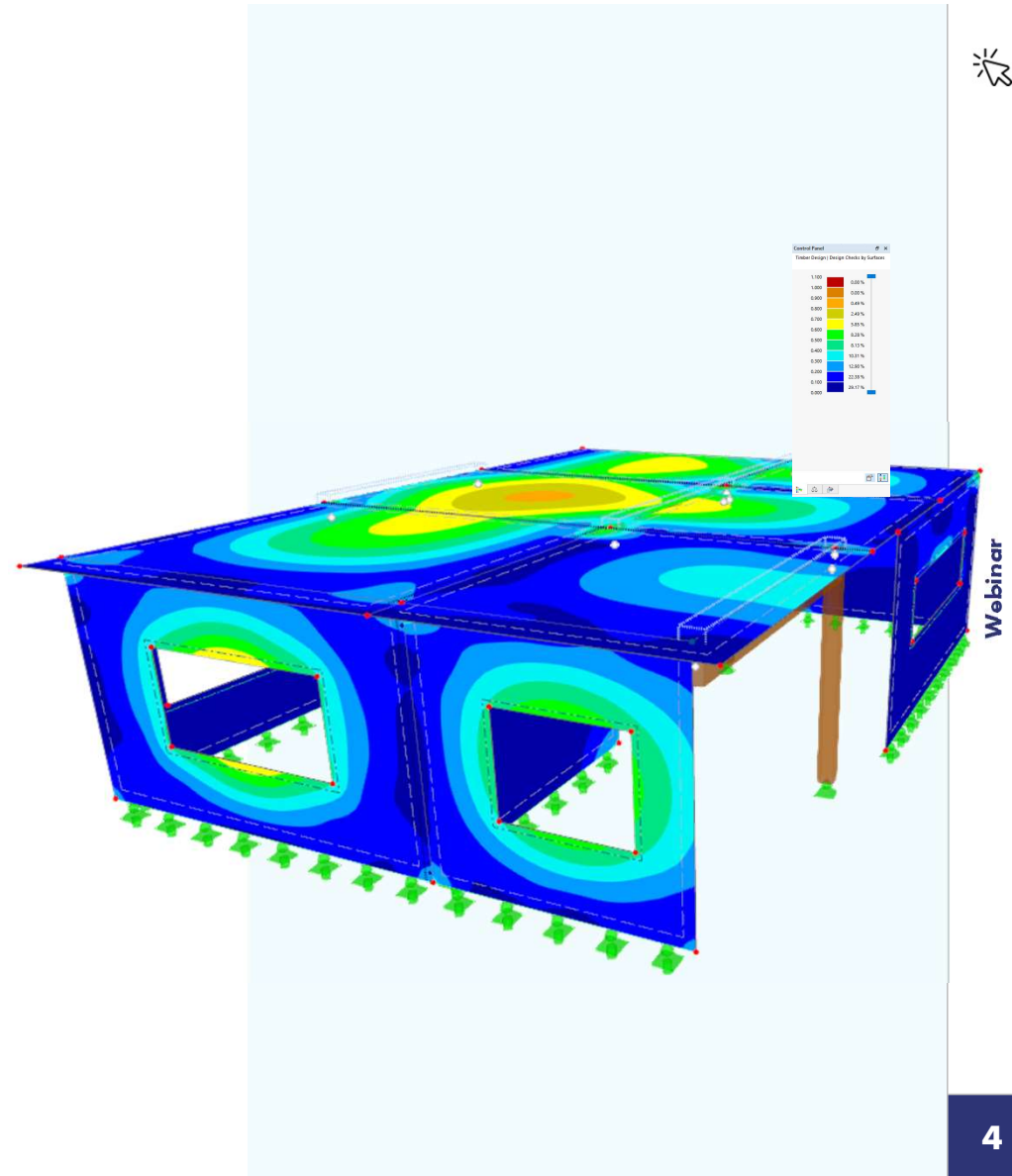


The screenshot shows the GoToWebinar desktop control panel interface. It features a vertical sidebar on the left with icons for audio, chat, and hand raising. The main window is divided into sections: 'Audio' with options for 'Computer audio' (selected) and 'Phone call', a 'MUTED' status, and a volume slider; 'Questions' with a text input field containing '[Enter a question for staff]' and a 'Send' button; and a footer with 'Webinar ID: 373-901-987' and the 'GoToWebinar' logo. Three callout boxes with arrows point to specific features: 'Show or hide control panel' points to the sidebar, 'Adjust audio settings' points to the audio section, and 'Ask questions' points to the question input field.



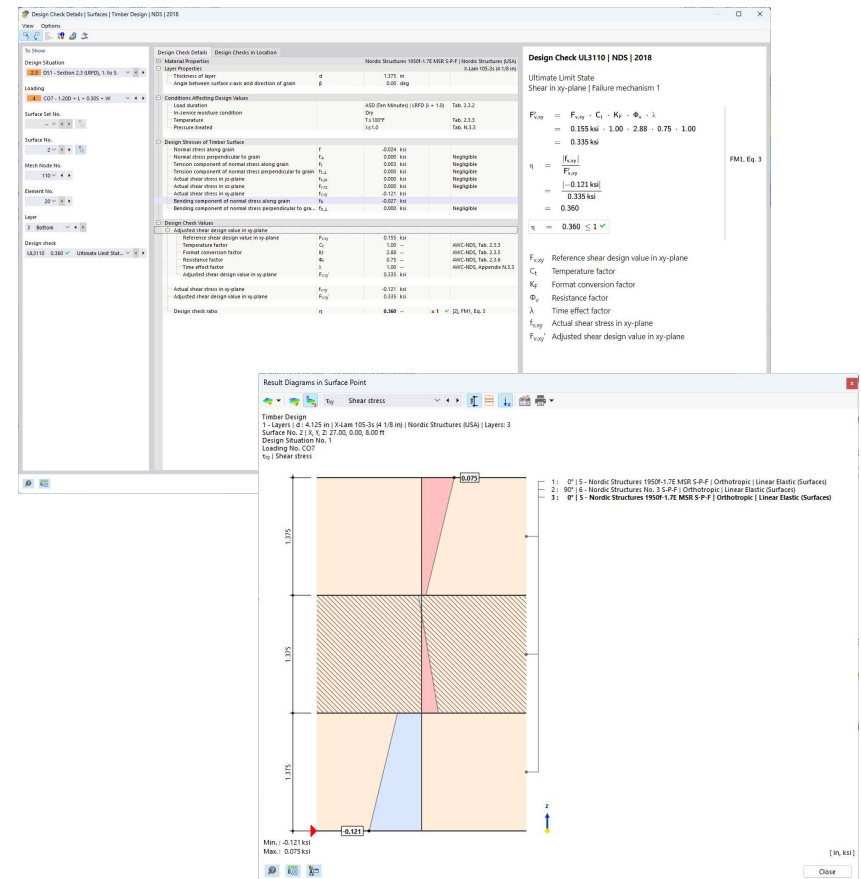
Content

- 01 CLT design updates in RFEM 6
- 02 Structure modeling and loading
- 03 CLT layup input utilizing Multilayer Surfaces Add-on
- 04 CLT design utilizing the Timber Design Add-on
- 05 Analysis and results review



New CLT Updates in RFEM 6

- Improved integration of Add-ons in RFEM 6
- Updated CLT producer library (in progress)
- Improved workflow for line releases and line hinges
- Graphical display of layer orientations
- 0.85 conservatism factor available for the bending strength in the major strength direction (PRG 320)
- CLT bending stress ratio no longer separated into bending + tens./comp. components (previously uneconomical design)
- Creep considerations for serviceability design
- Graphical envelope result (all COs) now available for separate design checks
- Calculation output including formulas, code references, and variables
- Results sections now available



Shear Failure Modes

Options for CLT

Design for failure of net section and failure in glued contact surface

Plank width

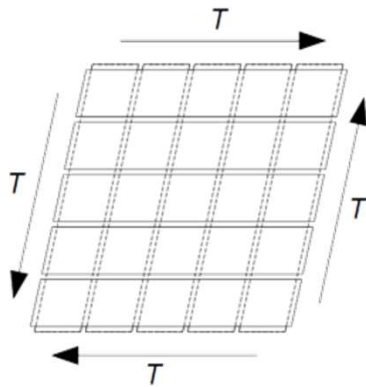
b_x 4.000 [in]

b_y 4.000 [in]

Plank width including gap

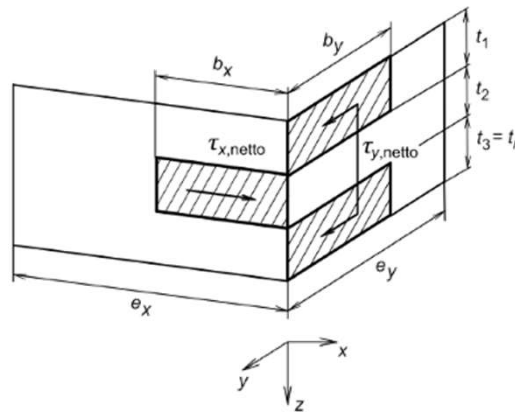
e_x 4.000 [in]

e_y 4.000 [in]



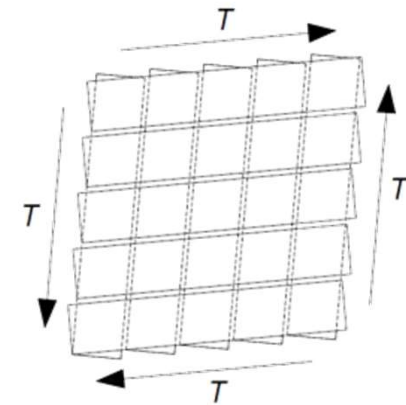
Failure Mechanism 1

Failure parallel to the grain of gross cross-section



Failure Mechanism 2

Failure perpendicular to the grain of net cross-section



Failure Mechanism 3

Failure of orthogonally crossing boards (torsion)

New Creep Considerations

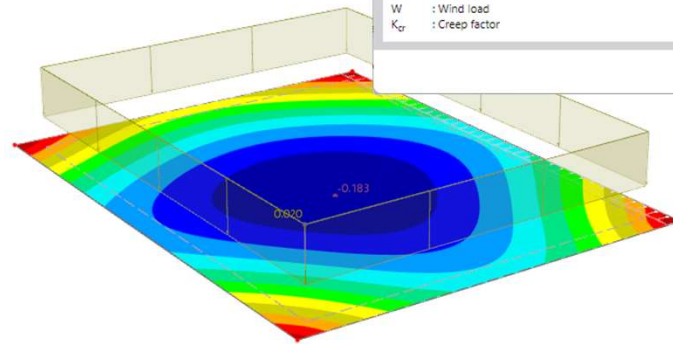
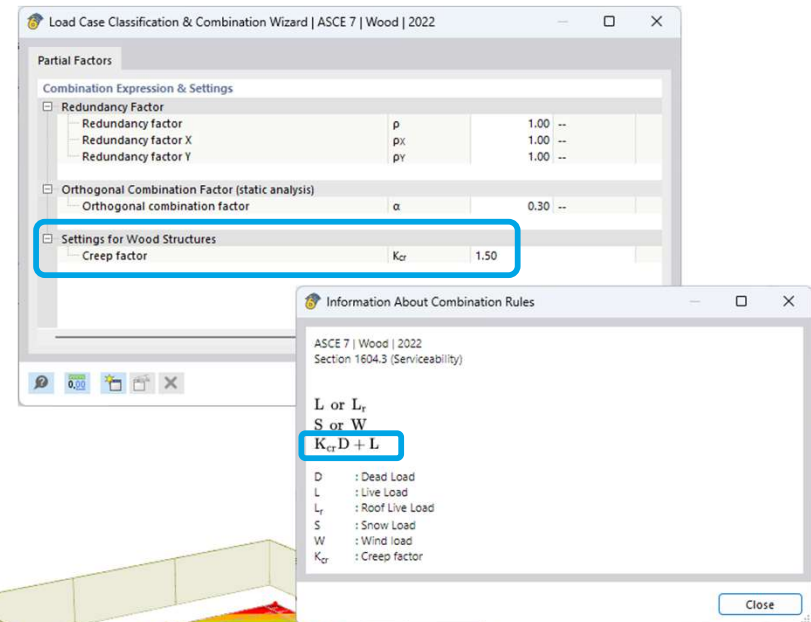
CLT Handbook – Ch. 6

2018 NDS Sect. 3.5.2 Long-Term Loading

- Time dependent deformation (creep) factor (K_{cr})

$$\Delta_T = K_{cr} \Delta_{LT} + \Delta_{ST} \quad (\text{Eqn. 3.5-1})$$

- For ASCE 7-22 | Wood combination wizard, IBC 2018 Sect. 1604.3 Design Situation (DS) created for serviceability checks
- Load Combination (CO) = $K_{cr}D + L$ within the DS to consider creep

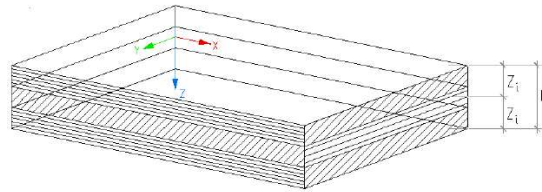


Multilayer Surfaces Add-on

1. Each layer's stiffness is defined.

$$d_i = \begin{pmatrix} d_{i,11} & d_{i,12} & 0 \\ & d_{i,22} & 0 \\ sym & & d_{i,33} \end{pmatrix} = \begin{pmatrix} \frac{E_x}{1-\nu_{xy}^2} & \frac{\nu_{xy} E_y}{1-\nu_{xy}^2} & 0 \\ \frac{\nu_{xy} E_x}{1-\nu_{xy}^2} & \frac{E_y}{1-\nu_{xy}^2} & 0 \\ sym & & G_{i,xy} \end{pmatrix}$$

2. Overall stiffness matrix is created.

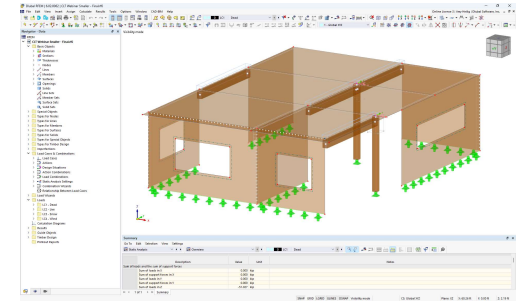


$$D_{11} = \sum_{i=1}^n \frac{z_i^3 - z_{i-1}^3}{3} d_{i,11}$$

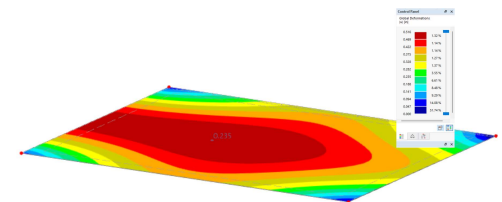
5. Stresses are distributed to each layer.

$$\epsilon(z) = \begin{Bmatrix} \epsilon_x \\ \epsilon_y \\ \gamma_{xy} \end{Bmatrix} = \begin{Bmatrix} \frac{\partial u}{\partial x} \\ \frac{\partial v}{\partial y} \\ \frac{\partial u}{\partial y} + \frac{\partial v}{\partial x} \end{Bmatrix} + z \begin{Bmatrix} \frac{\partial \varphi_y}{\partial x} \\ -\frac{\partial \varphi_x}{\partial y} \\ \frac{\partial \varphi_y}{\partial y} - \frac{\partial \varphi_x}{\partial x} \end{Bmatrix}$$

3. Export to RFEM.



4. Internal forces are analyzed.



— Dlubal Software Information



- Videos and recorded webinars
- Events and conferences
- Knowledge Base articles
- FAQs

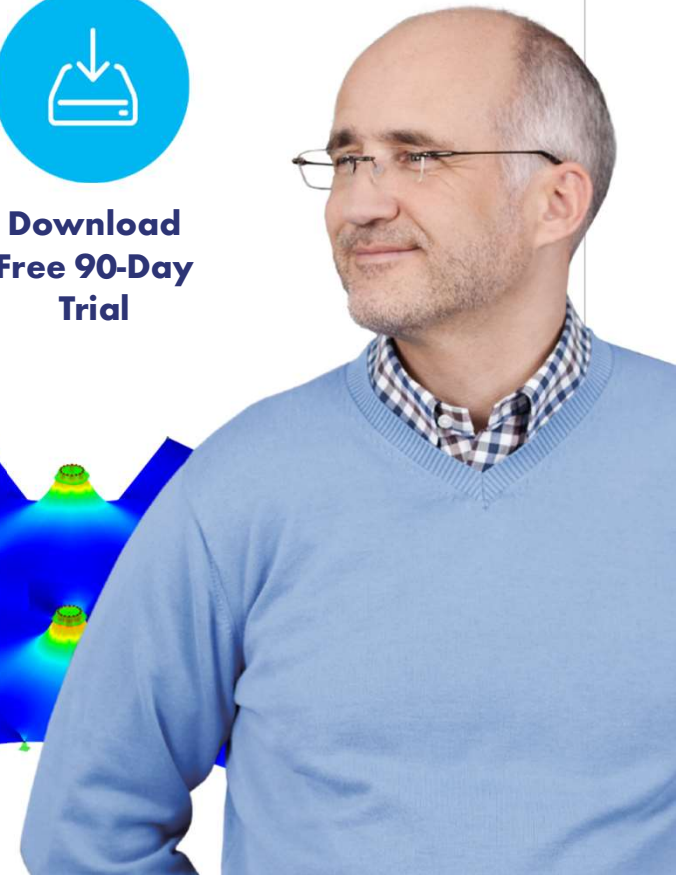
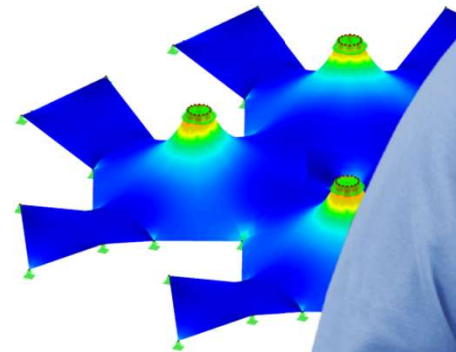
Visit website
www.dlubal.com



Register for
Online
Training



Download
Free 90-Day
Trial



Dlubal Software, Inc.
30 South 15th Street
15th Floor
Philadelphia, PA 19102

Phone: (267) 702-2815
Email: info-us@dlubal.com



Webinars and PDH

Upcoming Webinars

- 1 Register www.dlubal.com
- 2 Support & Learning → Webinars
- 3 Registration through email



PDH Certificates

- 1 Automatically emailed to participants
- 2 Available for the full presentation
- 3 Additional attendees request PDH to info-us@dlubal.com





www.dlubal.com