RISA Webinar

Foundation Design including Retaining Walls

Presenter: Deborah Penko, P.E.
RISAFoundation Ver. 4.0
RISA-3D Ver. 10.0
RISAFloor Ver. 6.0

RISA PROGRAMS
New Features in RISAFoundation

• Retaining Walls
• New Codes
  ACI 318-11 concrete design
  Canadian design code: CSA 23.3-2004
  Saudi design code: SBC 304-2007
• Optimize footings for Uplift, Overturning & Sliding
NEW! Retaining Walls

- Soil Loading & Exterior loads
- Cantilever or Supported walls
- Stem Wall & Footing Wall design
- Overturning & Sliding Checks
- Loading Diagram
- Axial, Shear & Moment Diagrams
- Reinforcement design
Enter the Coefficient of Internal Friction $\varphi$ and Backfill angle $\Theta$

$K$ will be calculated for you

Based on Rankine theory

$$K_0 := 1 - \sin(\phi)$$

$$K_a := \cos(\theta) \frac{\cos(\phi) - \sqrt{(\cos(\theta))^2 - (\cos(\phi))^2}}{\cos(\theta) + \sqrt{(\cos(\theta))^2 - (\cos(\phi))^2}}$$

$$K_p := \cos(\theta) \frac{\cos(\theta) + \sqrt{(\cos(\theta))^2 - (\cos(\phi))^2}}{\cos(\theta) - \sqrt{(\cos(\theta))^2 - (\cos(\phi))^2}}$$

Soil Pressure
Input Calculated loads

DL  Dead Load - Weight of Concrete & Soil
LL  Live Load - Surcharge
HL  Hydrostatic Loads - Any lateral pressure & hydrostatic loads
Modeling loads on Retaining walls

Draw loads to the centerline of the wall
Point Loads and Line Loads
Loads are applied to the top of the wall
Overturning

\[
OSF := \frac{M_{\text{Resisting}}}{M_{\text{Overturning}}}
\]

\[
OT_{UC} := \frac{SF}{OSF}
\]

Results

Retaining Walls
Sliding Resistance = Friction Resistance + Passive Soil Resistance

Friction Resistance = Total Weight \( \mu \)

Passive Soil Resistance = \( \frac{1}{2} K_p \cdot \delta_{toe} \cdot \delta_{toe, soil} \)

SSF = \( \frac{\text{Sliding Resistance}}{\text{Sliding Force}} \)

Sliding UC = \( \frac{SF}{SSF} \)

Retaining Walls
Shear Check - Concrete

ACI 318 equation:

\[ V_c = 2 \cdot A \cdot \sqrt{f_{ce} \cdot b_w \cdot d} \]

Retaining Walls
Shear Friction Check

\[ v_n = A_v f_y f_r \cdot \mu \]

\[ \mu = 1.0 \cdot \lambda \quad \text{Rough} \]
\[ \mu = 0.6 \cdot \lambda \quad \text{Smooth} \]

Retaining Walls
Retaining Wall Footing Checks

- Maximum Soil Pressure
- Flexural Design
- Shear Checks

Retaining Walls
Let’s see Retaining walls in action!
Additional Resources

- Release Notes
- www.risanews.com
- support@risa.com
- User’s Guides available at www.risa.com

Presenter: Deborah Brisbin, P.E.
Questions?

Please let us know if you have questions.

We will answer as many questions as time permits during the webinar.

Once the webinar is closed, we will post all Q&A’s, the PowerPoint slides and the models used today to our website: www.risa.com

For further information, contact us at: info@risa.com

Thank you for Attending!