Sheeting structure verification

Input data

Project
Task : GEO5 Project, CIVL455
Date : 1/7/2013

Settings
(input for current task)

Materials and standards
Concrete structures : ACI 318-11

Excavations
Active earth pressure calculation : Coulomb
Passive earth pressure calculation : Coulomb
Earthquake analysis : Mononobe-Okabe
Consider reduction of the modulus of subsoil reaction for a braced sheeting
Verification methodology : Safety factors

<table>
<thead>
<tr>
<th>Safety factors</th>
<th>Permanent design situation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Safety factor for internal stability of anchors : SFa = 1.50 [–]</td>
<td></td>
</tr>
</tbody>
</table>

Geometry of structure
Structure length = 5.00 m

Type of structure: Sheet pile Ian 436 x 130 x 7.5 mm
Coeff. of press. reduc. in front of wall = 1.00

Area of cross-section A = 1.14E-02 m²/m
Moment of inertia I = 6.64E-05 m⁴/m
Elastic modulus E = 210000.00 MPa
Shear modulus G = 81000.00 MPa

Modulus of subsoil reaction determined according to the Schmitt theory.

Soil parameters

clay (CL, CI)
Unit weight : \( \gamma = 2 \) kN/m³
Stress-state : effective
Angle of internal friction : \( \varphi_{ef} = 3 \) kPa
Cohesion of soil : \( c_{ef} = 4 \) kPa
Angle of friction struc.-soil : \( \delta = 5 \) kPa
Soil : cohesive
Poisson's ratio : \( \nu = 6 \)
Oedometric modulus : \( E_{oed} = 7 \) MPa
Saturated unit weight : \( \gamma_{sat} = 8 \) kN/m³

Well graded sand (SW), dense
Unit weight : \( \gamma = 20.00 \) kN/m³
Stress-state : effective
Angle of internal friction : \( \varphi_{ef} = 39.50^\circ \)
Cohesion of soil: \( c_{ef} = 0.00 \text{kPa} \)
Angle of friction struc.-soil: \( \delta = 39.50^\circ \)
Soil: cohesionless
Oedometric modulus: \( E_{oed} = 96.00 \text{MPa} \)
Saturated unit weight: \( \gamma_{sat} = 22.50 \text{kN/m}^3 \)

**Excavation**
Soil in front of wall is excavated to a depth of 3.00 m.

**Terrain profile**
Terrain behind the structure is flat.

**Water influence**
GWT behind the structure lies at a depth of 3.50 m
GWT in front of the structure lies at a depth of 3.50 m
Subgrade at the heel is not permeable.

**Input anchors**

<table>
<thead>
<tr>
<th>Number</th>
<th>New anchor</th>
<th>Depth ( z ) [m]</th>
<th>Length ( l ) [m]</th>
<th>Root ( l_k ) [m]</th>
<th>Slope ( \alpha ) [°]</th>
<th>Spacing ( b ) [m]</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>YES</td>
<td>1.50</td>
<td>9</td>
<td>10</td>
<td>11</td>
<td>1.00</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Number</th>
<th>Diameter ( d ) [mm]</th>
<th>Area ( A ) [mm²]</th>
<th>Modulus ( E ) [MPa]</th>
<th>Post-stressing</th>
<th>Force ( F ) [kN]</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>12</td>
<td>210000.00</td>
<td>30.00</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Global settings**
Number of FEs to discretise wall = 20

**Settings of the stage of construction**
Design situation: permanent