Bearing Capacity Analysis of Helical Pile Foundation on Peat

Ferry Fatnanta
Andarsin Ongko

UNIVERSITY OF RIAU
Peat

- Dominated by Voids
- Large Amount of Water
- Low Bearing Capacity
Individual Bearing Method

\[ P_u = \sum_{n} q_{ult} A_n + \alpha H (\pi d) \]

With:
- \( P_u \): Limit Bearing Capacity
- \( q_{ult} \): Limit Bearing Capacity below Helical Plate
- \( A_n \): n-Area of Helical Plate
- \( \alpha \): Friction angle between foundation and soil
- \( H \): Length of Foundation Shaft
- \( \pi d \): Perimeter of Helical Foundation
Cylindrical Shear Method

Pu = q_{ult} A_1 + T(n - 1)s \pi D_{avg} + \alpha H(\pi D)

With:
- Pu = Limit Bearing Capacity
- Q_{ult} = Limit Bearing Capacity below Helical Plate
- A_1 = Area of Lowermost Helical Plate
- T = Soil's Shear Strength
- n = Number of Helical Plates
- s = Soil Space between Helical Plates
- D_{avg} = Average Diameter of Helical Plates
- \alpha = Friction angle between foundation and soil
- H = Length of Foundation Shaft
- \pi d = Perimeter of Helical Foundation
Research Methodology

Peat materials were taken from Rimbo Panjang, District of Kampar. Physical and mechanical properties tests of peat were done in Soil Mechanics Laboratory, Department of Civil Engineering, University of Riau.

<table>
<thead>
<tr>
<th>Test(s)</th>
<th>Unit</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water content</td>
<td>%</td>
<td>24.39</td>
</tr>
<tr>
<td>Wet density</td>
<td>gr/cm³</td>
<td>0.82</td>
</tr>
<tr>
<td>Dry density</td>
<td>gr/cm³</td>
<td>0.24</td>
</tr>
<tr>
<td>Specific gravity</td>
<td>-</td>
<td>1.58</td>
</tr>
<tr>
<td>Ash content</td>
<td>%</td>
<td>32.80</td>
</tr>
<tr>
<td>Fiber content</td>
<td>%</td>
<td>9.58</td>
</tr>
<tr>
<td>Void ratio</td>
<td>-</td>
<td>5.61</td>
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</tbody>
</table>
### Nomenclature Naming of Helical Pile Foundation

<table>
<thead>
<tr>
<th>No</th>
<th>Name</th>
<th>No</th>
<th>Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>M</td>
<td>9</td>
<td>LMS50</td>
</tr>
<tr>
<td>2</td>
<td>L</td>
<td>10</td>
<td>LL20</td>
</tr>
<tr>
<td>3</td>
<td>LM20</td>
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</tr>
<tr>
<td>5</td>
<td>LM50</td>
<td>13</td>
<td>LLL20</td>
</tr>
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<tr>
<td>8</td>
<td>LMS50</td>
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Results and Discussion

Shear Strength of Peat on Compressive Test

Shear Strength of Peat on Tensile Test
It shown the installation of helical plate was significantly able to enhance the bearing capacity of foundation. Pile foundation LMS 50 had a greater bearing capacity compared to wooden pile and non helical pile foundation, but this type had the lowest bearing capacity among the others helical piles. Followed by wooden pile, with the coarser surface. Lastly, non helical pile foundation gained the lowest bearing capacity.
Prediction and Compressive Bearing Capacity Test

Reduction Factor = 0.37
Prediction and Tensile Bearing Capacity Test

Reduction Factor = 0.37
Conclusions

From the discussion results, it could be concluded that:

1. Helical pile foundation has shown a greater bearing capacity on peat, compared to wooden pile and non helical pile foundation.

2. Correspond to error rate value, the prediction of compressive bearing capacity on helical pile foundation was more suitable by using individual bearing method. The same thing goes for prediction of tensile bearing capacity. They produced the lowest error rate value. At this paper, the lowest error rate could be reached by using reduction factor of 0.37.
Thank You