"THRUST BLOCKS AS A MEANS OF LATERAL SUPPORT FOR EXCAVATIONS".
FROM PREDICTION TO REALITY

Marc Cabrera

THE GEOTECHNICAL PROBLEM
• Response of shallow embedded foundations under equivalent prop loading
• The stiffness provided by raking props and thrust blocks when small displacements are permitted
• The complex soil-structure interaction
• Establish clear guidelines for the use of thrust blocks in a variety of ground conditions

METHODOLOGY
• MODELLING
  • Centrifuge Modelling
  • FEM
• PRACTICE
  • Monitoring field data
  • Field test
WORK TO DATE

• 12 Centrifuge test in sands

• Design of the field test

CENTRIFUGE MODELLING

Acutronic 661 Geotechnical Centrifuge

CENTRIFUGE MODELLING

• The Test Configuration
CENTRIFUGE MODELLING

• The Actuator

• The Displacement Transfer Connection

LEAD SCREW

GENERAL RESULTS

Ultimate Capacity
F=5MN ; d=150mm

TEST CARRIED OUT

• CONSTANT DEPTH 2.4m

• Prop angles used: 20°, 30°, 40°
ANALYSIS AT ULTIMATE CAPACITY

ANALYSIS LIMITING DISPLACEMENTS

ANALYSIS OF WIDTH INFLUENCE
SUMMARY OF CENTRIFUGE TESTS

- At ultimate capacity
  - Force
    - increases with prop angle
    - depends on the volume of the thrust block.
  - Displacement
    - increases with prop angle
    - there is no simple relationship with the geometry of the thrust block.

- For prop angle of 20°
  - The 3-D effects are important, at initial displacements.
  - The area of the base face is important at large displacements.

- For displacements < 10 mm the thrust block capacity is governed by width and depth.
FIELD TEST LOCATION
• 214-219 OXFORD STREET, LONDON.
• KELTBRAY

DESIGN OF THE FIELD TEST

MATERIAL FOR THE FIELD TEST
THE FIELD TEST RESULTS EXPECTED

Plane Strain Upper Bound Method

Formula:

\[ F_s = \frac{1}{2} \gamma \cdot W \cdot \beta \cdot \alpha \cdot \gamma \]

Ultimate Capacity

\[ \alpha = 20^\circ \]

G4: F=1400 kN \( \delta_{ult}=146\text{mm} \)

FT: F=900 kN \( \delta_{ult}=? \)

THE FIELD TEST RESULTS EXPECTED

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CONCLUSIONS

• Some realistic magnitudes of prop axial loads acting as a lateral support for excavations.
• Relative contribution of front and base face.
• Some relations between volume of concrete and maximum load reach.
• Some realistic magnitudes of the stiffness needed to reach the desired load.

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