APPLICATION OF MICROPILES TO THE STABILIZATION OF A DEFLECTED OLD TENEMENT HOUSE

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Old Tenement House

- In densely built city centre there is located four-storey old tenement house, which over the years has a tendency to lean out.

- Reasons for deflection:
  - increased bearing pressure due to constructing the additional storey
  - weak soils of non-uniform thickness
  - subsidence due to mining
Displacements of the Building

- Piłsudski street -
  (seen in Fig. 1)

2.9mm/m (A-C)
0.8mm/m (B2-C)
4.8mm/m (A-B1)

7.8mm/m (A-C)
13.4mm/m (B2-C)
4.9mm/m (A-B1)

20.4mm/m (A-C)
14.3mm/m (B2-C)
27.9mm/m (A-B1)

13.2mm/m (A-C)
8.7mm/m (B2-C)
10.9mm/m (A-B1)

7.4mm/m (A-C)
7.9mm/m (B2-C)
11.1mm/m (A-B1)

max deflections

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Deflections reach 122 mm/m
Subsurface Exploration
Subsurface Exploration

\[ R_d = 95 - 111 \text{ kN/m} \]
\[ E = 12.5 \text{ MPa} \]

\[ R_d = 830 \text{ kN/m} \]
\[ E = 100 \text{ MPa} \]
Bearing Pressure Calculations

FEM model of the basement storey

Bearing pressure 100-600 kN/m
Locally 750 kN/m
Need for Stabilization

- Good condition of the building
- Steel anchors in walls embrace the building
- Further deformations due to mining may appear
- Weak soils may subside excessively
- Loads must be transferred to stronger strata by uderpinning
Initially three technologies were considered:
- jet-grouted columns
- drilled micropiles with HPI-clay bits for jet-grouting
- jacked micropiles

Mining may cause concave or convex shape of the ground surface
To ensure good stabilization underpinning must resist both compressive and pulling out forces
Underpinning elements must be well anchored in the structure of the building
Final solution: Titan micropiles drilled through foundation walls with high pressure grouting
Layout of underpinning

- 157 micropiles
- Spacing 1 m
- Inclination 2°-5°
- Diameter of the grout body D = 0.3 m
- Length 11-13 m
- Titan hollow bars 52/26
- Drill bits Ø130mm HPI-clay bit for jet-grouting
- Injection pressure 15 MPa
Execution of underpinning
Thank you for your attention