Modelling concrete slab on rigid inclusion reinforced soil

CIVIL • ENVIRONMENTAL • MANUFACTURING • MINING • OIL & GAS • POWER GENERATION

PROJECT DESCRIPTION

GPC

Ampuis, France

In the context of a wine cellar extension project, a 20cm thick concrete slab is to be constructed on a soil reinforced by rigid inclusions. Itasca France has been called by the design office to verify the mechanical resistance of the concrete slab and assess its settlement under a uniform load.

The inclusions will be installed in a regular pattern. A 2D *FLAC* axisymmetric model represents the "unit cell". This model considers one inclusion, the different geological layers surrounding it, and the slab on top.

Slab
Gravel layer
Silt
Sand
Inclusion

Fig.1 : 2D axisymmetric model of concrete slab on reinforced soil

ITASCA'S ROLE

The successive construction steps are taken into account: initial state, excavation of the upper layers, installation of the rigid inclusion (C16/20), refilling of the excavation with a gravel bed to the design level, casting of the concrete slab (C30/37) and application of the uniform pressure.

PROJECT RESULTS

The study mainly shows a uniform settlement of the slab under the design load. The differential settlement is negligible (Fig. 2).

Using the full stress field in the concrete slab (Fig. 3), stress resultants (Fig. 4) were computed and verified against strength envelopes given by Eurocode 2. The slab thickness is largely sufficient to sustain the applied load. Also, the normal load in the rigid inclusion - at most 80 kN - is largely below the threshold given by Eurocode 2 (130 kN).
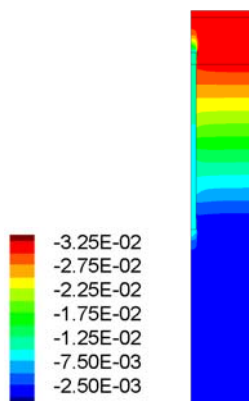
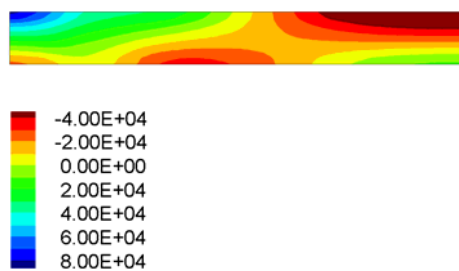*Fig.2 : Vertical displacement contour (m)*

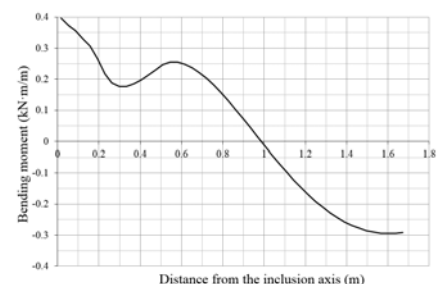*Fig.3 : Minimum principal stress contour (Pa) of the concrete slab*

Fig.4 : Distribution of the bending moment (in kN.m/m) along the concrete