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EXPERIMENT E6/0,2 WITH LATERAL PASSIVE PRESSURE ROTATION ABOUT THE TOE

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Abstract: *The paper gives information on a repeated long-term experiment E6/0,2 with lateral pressure at rest and passive pressure during wall rotation about the top towards into tested granular mass. The experiment was successfully finished in the last year 2011 and (together with a previous experiment E5/0,2) it should prove gained results which appear distinct from a theory of EUROCODE 7-1 contemporaneously used. Both experiments monitored and registered both pressure components and mass deformation and displacements into the sandy mas.*

Keywords: ***Lateral earth pressure, pressure at rest, passive pressure, physical experiments, ideally non-cohesive sand, mass deformation, slip surface, bi-component pressure sensor.***

1. Introduction

A basic research of earth/lateral pressure based on physical and numerical experiments has begun in 1998 at the institute of the authors and it has continued. The physical research should prove behaviour of ideally non-cohesive granular mass during three basic types of structure movement towards active and passive directions The first research period in 1998-2000 aimed on active pressure and in 2001-2002 on the first long/term experiment with passive pressure (E3/0.2) but during this the first side glass tables cracked. Despite it the experiment went off successfully to finish. In the course of the second period was developed experimental equipment on the second and the third (contemporary) stages. The first experiment with passive pressure E3/0,2 (2001-2) was repeated like experiment E5/0,2 (2010) in a frame of the second research period such as a long-term operation test of the new experimental equipment. It brought similar results however, with lower pressure values. The experiment E5/0,2 had to be repeated and this, the last carried out experiment E6/0,2 is presented in the paper.

2. Experimental equipment

The actual advanced equipment (see Figs 1a,b) has the same size and it is fully controlled by two computers (the first for front wall movement and data monitoring and registration, the second for visual monitoring and photo registration) and reaches up very suitable characterizations: max. *active* wall movement of 300 mm, max. *passive* wall movement of 242 mm, arbitrarily *slow* front wall movement of velocity from of 3.684 to of >0 mm/min. i.e. arbitrarily slow movement, max. pressing force cca 2870 kN, 5 bi-component pressure sensors in front moved wall, 1 three-component sensor and 5 bi-component pressure sensors in back solid wall, 2 potential movement sensors, 1 optoelectronic movement sensor, 1 impulse summator, max. recording frequency 1000 Hz. The equipment can afford a huge quantity of data of 803 MB/day.

Deformation of the sample and displacements into it are monitored visually. Slip surfaces and uplifts of the sample mass are monitored through the right transparent side due to red strips into the mass (see Fig.1). Locations of the strips are registered a stabile photo camera about per day during the front wall movement. Also, the locations of the strips are measured manually in the time intervals. Displacements of black little globes located in front sample part in net of 50/50 mm are monitored by cameras set through the transparent left side. Visual registration data of cameras are stored separately

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in the second separate computer. A detailed description of the equipment can be found in Koudelka P. and Bryscejn J. (2010).

3. Experiment E6/0,2

The basic physical research for the more advanced theory and its development has continued from April 8, 2010 to be completed the experiments with pressure at rest and passive pressure, i.e. double repeated long-term experiments for rotations about the top and the toe and for translative motion. The firstly, the experiments E5/0,2 and E6/0,2 with rotation about the top and an ideally non-cohesive sand have been begun using a velocity of wall toe movement of 0.005 mm/min. (near to natural processes - 50 times faster than finger nail growth or 53 times faster than continental drift). The following repeated experiment E6/0,2 was entered 25.3.2011 on and finished successfully on 19.12.2011. A history of the experiment E6/0,2 see in Table 1in the paper. A detailed description of the equipment function during the experiment (operation test) can be found in Koudelka P., Valach J. and Bryscejn J. (2011). Contemporarily (in March 2012), the first experiment with *passive* rotation *about the toe* E5/0,1 is running from 28.2.2012. More detailed description see in the paper and references.

4. Results

The experiment brought an extreme quantity of basic NextView data of *1.508 GB* (time data and sensor data without visual monitoring data and photos). The data quantity needs a special technology (software, approaches etc.) of which development is running. At all events, size of experimental results does not make it possible to transfer data in a suitable format and to analyze them in short time and of course, to present the complete results in one paper. Complete analyses and evaluations of particular aspects of the granular mass behaviour in detail will be present step by step further. A digest of the results see in the paper.

Fig. 1: View at right sides of the samples (granular masses of the same sand of size of 0.3 mm.
a) Experiment E6/0,2 after toe movement of 212.3 mm (left).
b) Experiment E5/0,2 after toe movement of 226.9 mm (right).

5. Conclusion

In spite of the analyses of data are not carried out a preliminary conclusion appears possible. Granular mass of the experiment E6/0,2 behaved similarly to the experiment E5/0,2. It can be seen obviously in figures of Figs. 1a,b which make it possible to compare visible mass changes (slip surfaces including) after experiments.

Both pressure results of the repeated experiments E5/0,2 and E6/0,2 appear similar too. Differences are in an interval of a temperature influence and could be caused also a bit of incorrectness of the masses.

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