Recent publications related to PRESS-IN Technology (2015-2016)

Model Test and Full-Scale Field Test on Vertical and Horizontal Resistance of Hatted Tubular Pile

Ishihara, Y., Ogawa, N., Okada, K., Inomata, K., Yamane, T. and Kitamura, A.

Proceedings of the Third International Conference Geotec Hanoi 2016 - Geotechnics for Sustainable Infrastructure Development, pp. 131-139, 2016.

Abstract: The hatted tubular pile consists of a tubular pile with a hat part rigidly connected to the pile at around the ground surface, and is expected to generate higher vertical and horizontal resistance. It can be constructed by the Press-in Method, where a static jacking force is used to install piles while the reaction force is obtained from the previously installed piles. This paper introduces the model test on the vertical resistance of the hatted tubular pile and the full-scale field test on the vertical and horizontal resistance of it. Based on the results of these tests, methods to estimate the vertical capacity and the horizontal resistance of the hatted tubular pile are investigated into.

Pull-out Resistance of A Large Diameter Steel Tubular Pile Installed by Rotary Cutting Press-in

Ishihara, Y., Okada, K., Yokotobi, T. and Kitamura, A.

Proceedings of the Third International Conference Geotec Hanoi 2016 - Geotechnics for Sustainable Infrastructure Development, pp. 141-147, 2016.

Abstract: The 'press-in' method is a piling technique that installs piles with a static jacking force. The applicable ground conditions of this method have been significantly expanded by 'rotary cutting press-in', where a vertical jacking force and a rotational torque are applied at the same time onto a pile with cutting teeth on its base. Recently, a new rotary cutting press-in machine was developed so that a pile with a diameter of as large as 2500mm can be dealt with. This paper introduced the result of the pull-out test of a steel tubular pile with the diameter of 2500mm, which was installed by rotary cutting press-in. In addition, the design method based on SPT was confirmed to provide a reasonable estimation for the pull-out resistance (shaft capacity) of this large diameter pile.

Experimental Study on Tsunami Mitigation Effect of Breakwater with Arrays of Steel Tubular Piles

Suzuki, N., Ishihara, Y. and Isobe, M.

Journal of Social Safety Science, No. 29, 2016.11, pp. 7-14, 2016.

Abstract: This paper presents experimental data to clarify Tsunami mitigation effect of the breakwater with arrays of steel tubular piles and the load of Tsunami. The model experiments were conducted to give a better understanding of the influence of the distance between the piles, the number of the row and the relative height of Tsunami. It turned out that the transmissivity of Tsunami is proportional to the distance between the piles. In particular, the greater number of the row reduced Tsunami load acting on each row of piles, with smaller load on the rows in the downstream side. Furthermore, in estimating the Tsunami load, the drag coefficient C_d was confirmed to be applied for multiple rows, whereas revised Tanimoto expression and reduction coefficient C_G was confirmed to be applied for a single row. (In Japanese)

Experimental Study on Influence of Porosity and Material of Pile-type Porous Tide Barrier on Its Tsunami Mitigation Effect

Suzuki, N., Ishihara, Y. and Isobe, M.

Journal of Japan Society of Civil Engineers, Ser. B3 (Ocean Engineering), Vol. 72, No.2, pp. I-491-I-496, 2016.

Abstract: Since the Great East Japan Earthquake, tenacity has been required for structures against Tsunami. Especially for the tsunami with extraordinary power, it is more realistic to adopt the multifaceted protection rather than a single structure. In this context, pile-type porous vertical barrier is expected to be effective. In this paper, a simple theoretical

explanation on its tsunami mitigation effect was provided, and the model experiments were conducted to examine the influence of the porosity ratio and the material of the barrier. The results showed that the wave force on the barrier and the height of the tsunami behind the barrier in the trade-off relationship and are the functions of the loss coefficient, which is expressed by the friction factor and the porosity ratio. It was demonstrated that the effective barrier can be designed by choosing the adequate value of the loss coefficient. Finally, a case study of designing the barrier was introduced, by applying the experimental results to the full-scale case based on the Froude law. (In Japanese)

Influence of Surging and Jack-in Pile Installation Methods on Pile Performance Observed in Model Load Tests in Dry Sand Grounds

Moriyasu, S., Meguro, H., Matsumoto, T., Kobayashi, S. and Shimono, S.

Proceedings of 19 Southeast Asian Geotechnical Society (SEAGC), Kuala Lumpur, Malaysia, pp. 621-626, 2016.

Abstract: In this paper, an attempt was made to experimentally investigate the relationship between the pile installation method and bearing performance by comparing two different installation methods, jack-in and surging. The term "surging" stands for the cyclic push-in and pull-out movement of the pile during installation. The experiments were carried out using model ground of densely and loosely packed dry sand. It was found that the surging causes a reduction in the total penetration resistance (pile head load) of the pile due to a large decrease in shaft resistance, although the base resistance increases compared to installation by the jack-in method. It was demonstrated though experiments in different ground conditions that the degree of impact of the surging is strongly related to the relative density of the ground.

Estimating Base Resistance and N value in Rotary Press-in

Ishihara, Y., Haigh, S. K. and Bolton, M. D.

Soils and Foundations, Vol. 55, No. 4, pp. 788-797, 2015.

Abstract: In the Press-in Method, press-in machines use static jacking force to install prefabricated piles, while gaining a reaction force by grasping several of the previously installed piles. The emergence of this piling technique in 1975 solved problems in urban piling construction such as noise and vibration associated with the piling work, restricted construction conditions due to the existing structures, and so on. Among a variety of press-in methods, rotary press-in is a relatively new technique to install tubular piles into hard ground by applying axial and rotational jacking force at the same time. An additional feature of the Press-in Method is that it allows continuous measurement of penetration depth and jacking force during piling work. The concept of a PPT, Pile Penetration Test, has been developed to apply this feature to improving the efficiency of piling work and foundation design. This paper highlights the technique to estimate base resistance and N value from the data acquired during rotary press-in.

Measuring Horizontal Stresses during Jacked Pile Installation

Burali d'Arezzo, F., Haigh, S. K., Talesnick, M. and Ishihara, Y.

Proceedings of the Institution of Civil Engineers – Geotechnical Engineering, 168 (4), pp. 306-318, 2015.

Abstract: Jacking is an installation technique for displacement piles which is commonly used onshore in urban environments owing to its low noise and vibration. During pile jacking, stress changes occur in the soil which are substantial close to the pile, but also extend a significant radial distance. These stresses are difficult to measure accurately owing to arching around stress sensors. In the field, stress measurements are commonly made by means of an adjacent pile whose stiffness changes the stress field within the soil. Accurate measurements of stresses due to the installation of a single pile under laboratory conditions are needed in order to quantify this error. In this paper, null gauges that do not suffer from membrane deflection are used to measure horizontal stress changes during the jacked installation of a cylindrical pile in dry sand. Stresses are measured by means of both an adjacent pre-installed square pile and in-soil sensors. The paper also presents a comparison between the centrifuge results and the radial stress distribution estimated using conventional methods, such as Boussinesq's elastic analysis and elasto-plastic spherical cavity expansion.

※ Full paper in a pdf form is available upon request to IPA members. Those who wish to have a copy of the full paper, please contact the secretariat.