News Letter

Volume 3, Issue 4 December 2018

The First International Conference on Press-in Engineering 19~20 September 2018

【Special Issue for ICPE 2018】

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IPA News Letter Volume 3, Issue 4 December 2018

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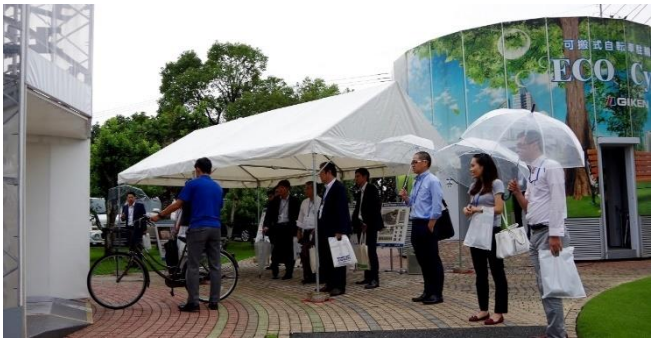

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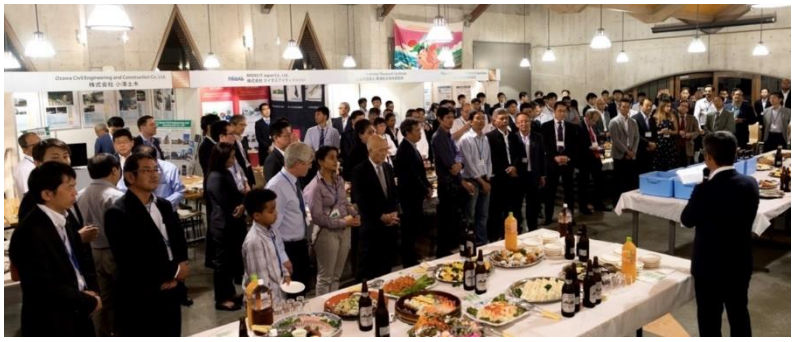

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Reception

Remarks of ICPE 2018

Dr. Osamu Kusakabe

Chair of ICPE Organizing Committee
President of IPA, Japan

Planning and organizing an international conference is always a big challenge and an exciting experience for any field of community, in particular, community related to fast growing technology. The technology must be attractive and promising enough for society and researchers. The community must be mature enough in terms of the quality of its activity and the scale of community with an international spectrum.

The International Press-in Association, IPA, has made such a challenge to hold an international conference for the first time of its 11 years history, carefully judging from previous activities and responses from industry. The objectives of international conference are multiple. The organizer offers a forum of exchanging and sharing experiences among the community, by gathering case histories from various parts of the world, by summarizing technical developments and research outcomes and by publishing the conference proceedings as a record as well as future references. The participants present their research outcomes and exchange the views and opinions with peers, and acquires update technical knowledge and recent trend of industry, through which the participants make a new network among the community. The city of conference venue welcomes participants from various parts of the world and provides the participants unique and interesting places to visit with tourist attractions. This conference venue was selected to be in the city of Kochi, the birthplace of Silent Piler, the ideal place to hold the conference for the first time.

In response to our call for papers, the organizing committee had received over 100 abstracts, and after rigorous review process 80 papers from 13 countries have been selected for publication and presented in the conference. The organizing committee was overwhelmed by a number of participants, as many as over 400 participants from 17 countries. These facts are a clear indication of the strong and positive interest of the Press-in technology among construction industry today, as well as promising potential of Press-in technology in the future.

IPA has had a great privilege to have very distinguished participants in the conference from prestigious learnt societies and institutions both internationally and domestically, including the current President and Secretary General of International Society of Soil Mechanics and Geotechnical Engineering and one past President, the current Chair and Secretary General of Asian Civil Engineering Coordinating Council and one Past Chair, the current President of Japan Society of Civil Engineers and three past Presidents, and the current President of Japanese Geotechnical Society and three past Presidents. This will further enhance IPA recognition and give IPA higher credibility in construction industry.

We have selected two major themes in this conference: disaster mitigation and advanced construction machinery. We were extremely fortunate to have two distinguished keynote speakers Professor Fumihiko Imamura, a worldwide well-known scientist and engineer in the field of Tsunami Disaster, who described the tsunami disaster occurred in East Japan Earthquake on March 11, 2011 and introduced newly developed sophisticated simulation methods, and Mr. Kenjiro Shimada from Komatsu Ltd., a world leader of construction machinery industry, who introduced latest unmanned control construction machines. IPA strongly believes that advanced construction machinery plays a vital role for mitigating natural disasters and also is a key for the success and high productivity as well as high profitability of construction projects.

Two organized sessions, “i-construction” convened by Professor K. Tateyama and “Dialogue among operators and researchers” convened by Mr. T. Nozaki, attracted a large audience, which has contributed to fill the gap between design office and construction site. This conference would not have been possible without all the supports we have received during the course of preparation. In particular, I would like to record my special thanks to Mr. Ozaki, the Governor of Kochi Prefecture, who enthusiastically supported the idea of having this conference in the city of Kochi, and to Professor Isobe, the President of Kochi University of Technology, who generously offered this wonderful venue for the conference.

I would like to take this opportunity to express my gratitude to all the organizations and institutions for their generous supports and to all the members of the international advisory board and of the organizing committee for their dedicated efforts for making this conference possible and very successful. This issue of IPA Newsletter extensively covers the articles during the two days conference on what we have learned, what we have discussed and, more importantly, how enjoyable and memorable the conference was.

Award Ceremony report

Dr. Eng. PE Masaaki Terashi

Chair of IPA Award Committee, Japan

It is my great pleasure and honor to report the Award Ceremony held during the opening session. The IPA currently has five awards; Outstanding project award, Innovative technology award, Distinguished research award, Life-long Contribution award, and ICPE best paper award. The aim of each may be found in the September, 2018 issue.
The first recipients of ICPE Best Paper Award and Life-long Contribution Award were introduced by the Award Committee and the plaques/trophies were presented to recipients by Dr. Osamu Kusakabe, the IPA president.

- **ICPE Best Paper Award**

The ICPE Scientific Working Group chaired by Dr. K. Ueno reviewed all the submitted papers and nominated 9 research papers and 8 project papers. The nominated papers were all of high quality and informative. The Award Committee in collaboration with the Working Group selected three best research papers and three project papers.

The winners for the research papers were;
Gillow, M., Haigh, S., Ishihara, Y., Ogawa, N., and Okada, K.: *Water Jetting for Sheet Piling*
Taenaka, S, White, D.J., and Randolph, M.F.: *Stress Changes due to Shape Effects in the Construction Process of Pile Walls*
Kunasegaram, V., Takemura, J., Ishihama, Y., and Ishihara, Y.: *Stability of Self-Standing High Stiffness-Steel Pipe Sheet Pile Walls Embedded in Soft Rocks*

The winners for the project papers were;
Arai, M., Sugio, S., Murayama, K., Kunitomi, H., and Kimura, Y.: *Case Study of Underwater Press-in Method of Steel Sheet Piles under Restricted Headroom beneath a Railroad Bridge*
Kasahara, K., Sanagawa,T., Nishioka,H., Sasaoka,R., and Nakata, Y.: *Seismic Reinforcement for Foundation Utilizing Sheet Piles and Soil Improvement*
Kitamura, M. and Kamimura, S.: *Cantilevered Road Retaining Wall Constructed of 2,000 mm Diameter Steel Tubular Piles Installed by the Gyro Press Method with the GRB system*

- **Life-long Contribution Award**

Life-long Contribution Award is aimed to recognize and honor individuals who have made great contributions to the advancement of the press-in engineering for a long period of time. The following distinguished professionals were the first recipients of this prestigious award.

Mr. Akio Kitamura, the president of Giken Ltd. and the honorary president of the International Press-in Association
Mr. Akio Kitamura invented the world's first Silent Piler, noise and vibration free piling machine in 1975. Through innovation over the last 40 years, considering environmental, spatial, and geological constraints on pile installation, he made the impossible, possible. He also took initiative in the creation of the IPA as international community of the Press-in Engineering.

Late Mr. Yasuo Kakiuchi and Mr. Takaharu Kakiuchi, Former and current chairman of the Kakiuchi Ltd.
Late Mr. Yasuo Kakiuchi dedicated to materialize the idea of Silent Piling proposed by Mr. Kitamura in 1970s. Since then he and his successor Mr. Takaharu Kakiuchi have played an essential role of producing a series of Silent Pilers which helped a wide acceptance of Silent Piler in piling works in domestic and overseas projects.

Dr. Malcolm David Bolton, Emeritus Professor of the University of Cambridge, Ph.D. and a FREng.
Professor Malcolm David Bolton has contributed to the advancement of the Press-in engineering through various research activities for a long period of time, including Cambridge-Giken collaborative research projects since 1994. He has also contributed to the International Press-in Association as the first President for 10 years since IPA was founded in 2007 at the Churchill College, University of Cambridge.

Invited Lecture 1

Lessons of the 2011 Tohoku Earthquake and Tsunami with Low Frequency and high Impact and Developing Numerical Modeling for Future Disaster Risk Reduction

Prof. Guixuan Wang

Civil Engineering Technology Research and Development Center
Dalian University, Dalian, Liaoning, China PR

A tsunami is classified as a low-frequency and high-impact natural hazard. Reducing tsunami vulnerabilities, managing risks, and limiting its effects can be difficult and challenging due to the lack of information and experience. The lecture of Professor F. Imamura, Director of IRIDeS (International Research Institute of Disaster Science) aimed to introduce the lesson from the 2011 Tohoku earthquake mainly and develop numerical modeling for future disaster risk reduction.

Lecturer: Prof. F. Imamura

First of all, historical data of earthquake and tsunami in Tohoku were introduced and the 11 March 2011 Heisei Tohoku disaster was unfolded as the triple tragedy and damages including the earthquake, tsunamis and other damages. Then, the mission is proposed to establish “practical” disaster management studies for the primary mitigation of future tsunamis. Hereinto, disaster management cycle is very important and necessary, and interdisciplinary science integrating health science, human- behavior science, social science, civil engineering, architecture and urban planning is required to support the planning at each area. And, after field survey and collecting data, a new modeling of tsunami by adding sediment transport and floating material was proposed. As other type of modeling for tsunami mitigation, evacuation of pedestrian and cars has been developed through comparing the available information/ data on behavior at that time.

With the wonderful lecture, we can find that the 2011 Tohoku earthquake tsunami disaster devastated the Pacific coast of northeastern part of Japan, Sanriku, Miyagi, Fukushima and Ibaragi, where the earthquake followed by tsunamis have took place in the past. And, the people in the world are also being threatened by tsunamis. Recently, a powerful earthquake and tsunami killed 384 people in central Sulawesi in the 28 September 2018. This research of developing numerical modeling has great significance to the future disaster risk reduction. Those numerical modeling are crucial in preparing for a powerful tsunami because it is not feasible to predict accurately the maximum possible magnitude of tsunamis, even though predictions are useful in the protection against such tsunamis. However, we need to continue an effort to evaluate of the past countermeasures to identify the crucial issues to solve the problems and improve the application.

Chair: Prof. Masahiko Isobe

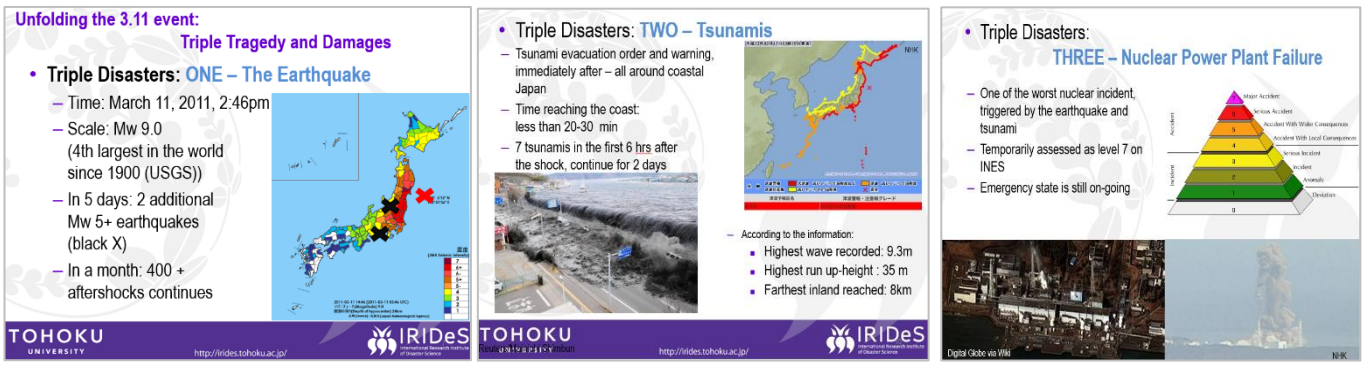


Figure 1: Examples of Presentation Material

Invited Lecture 2

State-of-the-Art Construction Sites Realized with ICT Construction Machines

Mr. Yasumasa Kimura

Secretary General, ICPE2018 Organizing Committee
Operating Officer, GIKEN LTD., Japan

The 2nd invited lecture "State-of-the-Art Construction Sites Realized with ICT Construction Machines" was given by Mr. Kenjiro Shimada, Team leader of Komatsu Ltd (Chair: Dr. Masanori Hamada, Professor Emeritus of Waseda University) on the first day of the International Conference on Press-in Engineering 2018 (ICPE2018), Kochi. In summary, it was on the innovative solutions to various issues in the current construction industry by using excavators and bulldozers functionalized with ICT (Information Communication Technology). At the beginning of the lecture, the following problems peculiar to construction sites were mentioned.

1. Many human resources are necessary due to various processes (i.e. measurement and design) until their completion.
2. Various potential risks connecting to an industrial injury are still involved in construction sites.
3. Particularly, repeated similar works (i.e. temporary molding, inspection and molding) are required in earthworks.
4. The number of skilled workers is decreasing due to an aging society with fewer children.

Mr. Kenjiro Shimada

Item 4 is an issue unique to Japan at present, however, many countries like China are expected to face the same problem in the near future. The mitigation of these problems by state-of-the-art technologies, being ICT, IoT and intelligent smart control, the mechanism of the solution and simulation in cases where the ICT excavators and ICT bulldozers are utilized on site via video in this lecture. The lecture can be roughly classified in two parts: the first is to describe the technology to exchange location information in real time via the connection amongst various communication apparatus, construction machinery and enormous 3-D data collected by GPS and drones in the cloud, whilst the second is to explain the technology of the machine control by using the same data of both the design stage and the actual earthwork. Also, the system is explained so that inexperienced persons can acquire the machine control skill equivalent to mature operators, in the short term.

The need for excavators and bulldozers, which are a relatively large amount of production in the construction machine industry, by Komatsu Ltd. as a leading company explained, made me feel that this effort is linked to next generation technology (i.e. full automation operation). It is a well-known fact that the current location information by GPS is not enough to enable all construction to be conducted by full automation. In the near future, the location information should be able to become more accurate due to the increase of satellites and the technology information.

In the Q&A session, an audience asked Mr. Shimada whether engineers engaged in automation should have the basic knowledge of measurement or not? He answered that Komatsu has employed and educated a lot of engineers who have knowledge about several process of construction because we could not know what technologies and solutions are required at the job site, if we do not have these engineers.

- **Comments from Session Chair, Prof. Hamada:**

In recent years, there are growing needs to utilize ICT in the construction industry to increase productivity, reliability, and to eliminate labor shortage. By the newly developed machine control technology for ICT construction equipment, by combining the GNSS (Global Navigation Satellite System) positioning technology and the electrical control technology of components, it will enable operators to become as productive highly skilled operators. At the same time, productivity and work progress are processed into data and sent via internet to be consolidated in site management system, visualizing everyday progress without having to leave the office. Komatsu has commercialized these technologies which are immensely contributing to the industry. The speaker introduced the development of the ICT Bulldozer, ICT Hydraulic Excavator and the solution service called "SMART CONSTRUCTION" innovating the construction model of job site. The speaker mentioned his concluding remarks as follows; SMART CONSTRUCTION service and ICT construction machine, such as ICT Bulldozer and ICT Hydraulic excavator, have provided a solution to the issues of the construction industry such as labor shortage, reduction of skilled operators. Furthermore, it has brought economic benefits to the customers by maximizing their business efficiency. As a result, both of the customers and the constructers have gained a high reputation in and outside the country.

State-of-the-Art Report:
Cambridge-Giken Collaborative Working On Pile-soil Interaction Mechanisms

Ms. Hongjuan He

IPA Secretariat, Japan

The session of the State-of-the-Art report is one of the highlights in any conference. The First ICPE organized one session for the State-of-the-Art report entitled "Cambridge-Giken Collaborative Working on Pile-soil Interaction Mechanisms" delivered by Mr. Yukihiro Ishihara (GIKEN LTD.) and Dr. Stuart Haigh (University of Cambridge) in the morning on the day 2. The written version of the State-of-the-Art Report included in the conference Proceedings contains a comprehensive coverage of the research outcomes on various topics over 23 years in 22 pages with 64 references.

Photo 1 Dr. Stuart Haigh

Photo 2 Mr. Yukihiro Ishihara

In the session, after a brief history of the research collaboration between the two parties, they delivered the following four topics selected from the 23 years research collaboration topics. Dr. Haigh presented the first two topics and Mr. Ishihara delivered the rest.

(1) Outline of the collaboration

They explained that their collaboration started in 1994 based on a strong awareness of Mr. Kitamura, President of GIKEN. It was initially led by Prof. Malcolm Bolton and Mr. Nagayama and then succeeded by the speakers. Basically, two students join the summer testing projects in Kochi every summer. Various topics have been dealt with, which are categorized into 1) pile-soil interaction mechanism during press-in piling, 2) performance of pressed-in piles and 3) performance of pressed-in structures.

Photo 3 The view of the presentation

(2) Water jetting

It is often the case to use water-jetting as an aid to press-in piling in dense sandy soils. Based on the results from more than 20 field tests in dense sand, they proposed the concept of "stick-slip mechanism", based on the observation that the piling made no progress for prolong periods before sudden, rapid movement during pile installation. They recommended that the optimal conditions for pile jetting would utilize small diameter nozzles with only modest water flowrates. The paper entitled "Water jetting for sheet piling" was separately presented in a general session in the conference.

(3) Preload wall

They presented the field test data on the effectiveness of a unique preloading method, called "Implant preload (IP)", where a sheet pile is embedded with an inclination angle of 5degrees and then the excavation is carried out and the preloading is applied. After backfilling the preload is removed. They explained the mechanism of high stiffness of IP wall.

(4) Use of press-in piling data to estimate subsurface information

Silent piler has a function of collecting various data during pile installation. They explained the procedure how to estimate CPT q_t, soil type and SPT N from press-in data and also the procedure to estimate SPT N from rotary cutting press-in. To demonstrate the accuracy of these methods, they presented the direct comparison of several field data and the estimates.

With large audience attended, the excellent the State of the Art Repot brought the conference the end of the technical sessions prior to the closing ceremony.

Session A-1: Pile Performance

Chair: Prof. Ken Gavin

Subsurface Engineering, Faculty of Civil Engineering and Geosciences
Technical University of Delft, Netherlands

In total five excellent papers were presented in the section. Three papers described comprehensive field studies, whilst two used geotechnical centrifuges to examine physical mechanisms governing foundation behavior.

<Field Study>

The first field study was “A Study on Bearing Capacity of Steel Sheet Pile with Closed Section at Bottom Supported in Intermediate Layer by Press-In Method” by Toda, K. et al. The paper provides comprehensive records of the site conditions, installation methodology; including the jetting water pressures and press-in force with depth and the results of static load tests to establish the axial bearing capacity. The test piles were instrumented with strain gauges along their length that allowed separation of shaft and base resistance. The tests were designed to investigate the effect of embedding the piles in an intermediate layer, where the standard penetration test, SPT N value of ≈30 was lower than the value > 50 usually adopted as the bearing layer. Comparison of mobilized resistance with those predicted using the local code showed that the bearing resistance mobilized was higher than that predicted. The ratio of over-prediction for the intermediate bearing layer was comparable to similar experience in the usual bearing layer suggesting that it is a suitable bearing stratum.

In the second field study “The Countermeasure for Press-in Method on Lengthy SPSPs and the Confirmation of the Bearing Capacity Obtained by Pile Loading Test”, Dung, L.A. et al. describe the procedures for installation of steel pile sheet piles (SPSPs) in very dense soils using a water jetting method. Given the lack of design guidance to assess the vertical and lateral capacity and stiffness a test programme on instrumented piles was undertaken. It was shown that grouting resulted in capacities that were comparable to those of piles installed without water jetting.

In the third field study, Kawabata, N. et al. consider the very interesting topic of time effects in their paper “Bearing Capacity Recovery Rate of Square Steel Tubular Pipe Piles Based on Loading Test Results”. Whilst the installation force for press-in piles is often seen a measure of the pile axial capacity, from field tests they found that an average set-up rate of 2.3 for a range of sites including sandy and clayey profiles.

<Laboratory Study>

In the first laboratory study, Panchal, J.P. et al. present a comprehensive study on “Centrifuge Modelling of the Influence of Size and Geometry of Hybrid Foundations on Bearing Capacity”. The impetus for the research is the redevelopment of commercial development sites in large cities where piles from previous buildings may remain in the ground. The authors investigate the use of sheet piles (arranged in groups) as a viable alternative to installing new cast in-situ concrete piles into a site where foundation designers are faced with congestion and difficulty to match pile positions with the building footprint. Samples of overconsolidated clay were prepared in the geotechnical centrifuge. The pile types considered included conventional rough and smooth circular solid shafted piles (comparable to conventional steel and concrete piles). Three sheet pile variations were studied with circular and square sections, with and without perforations. The tests revealed that square sheet piles developed comparatively higher axial capacity than circular sections. The authors conclude that the difference is caused by higher plugging experienced by the square sections in which the ribs are more closely spaced and the shape would promote plugging.

In the second laboratory study, Novela, H. et al. investigate “Centrifuge Modelling of Circular Shallow Foundation Reinforced with a Thin Sleeve”. The sleeve is designed to provide lateral confinement to a circular surface foundation. The results demonstrate that the use of the sleeve resulted in similar bearing capacities to a surface footing with the same diameter of the embedded sleeve.

The photo of Session A-1

Session A-2: Pile performance

Chair: Associate Prof. Katsutoshi Ueno

Dr (Eng), Department of Civil and Environmental Engineering,
Tokushima University, Japan

Session A-2 Pile performance discussed on pile performance against lateral load. The session consisted of the following five presentations:

- 0409 Effects of Grain Size and Density as Pre Bored Pile Filler Material on Bending Moment Due to Lateral Loading
  Purnama, A.Y., Yasufuku, N. & Rifa'i, A.
- 0410 Evaluation of Bearing Capacity of a Small-Diameter Spiral Pile Subjected to Combined Load Using Model Tests
  Nakagawa, S., Yamauchi, R., Isobe, K. & Tomisawa, K.
- 0411 Study on the Horizontal Bearing Performance of Steel Tubular Piles Installed by the Gyropress Method and the Press-in Method Assisted with Water Jetting
  Suzuki, N. & Kimura, Y.
- 0412 Behavior of a Large Diameter Piles Subjected to Moment and Lateral Loads
  Kunasegaram, V., Hsiao, W.H., Seki, S. & Takemura, J.
- 0407 Innovative Design and Technology Solutions for Development of Port and Offshore Pressed-in Piled Structures
  Doubrovsky, M., Gerashchenko, A., Dobrov, I. & Dubrovska, O.

The presentation photo of paper 0409

In paper 0409, the authors experimentally investigated the performance of integral abutment against cyclic lateral loading. Top layer of bearing stratum underneath the integral abutment was enclosed by a pre-bored ring filled with different types of filler materials: loose to dense sands with different grain size distributions. The results show that integrated abutment filled with dense sand provided higher bending moments in the pile.

Paper 0410 examined performance of a small-diameter spiral pile subjected to combined loads at some arbitrary angles, experimentally. Comparisons of performance between spiral pile and straight pile were presented. Friction angles between ground and pile, and lateral ground reaction coefficients for both spiral pile and straight pile were evaluated by inverse calculations. The authors concluded that there were not much effects on the bearing capacity in the horizontal direction in dry sand.

In paper 0411, the authors compiled the results of static horizontal loading tests of steel tubular piles installed by the Gyropress Method and the Press-in Method assisted with water jetting, and evaluated their horizontal bearing performances. The authors concluded that the coefficients of horizontal subgrade reaction k_H calculated from the displacements at the loading point were somewhat larger values than that of design values in the case of Gyropress method. While for Water Jet method, the average of measured k_H was regarded fairly consistent with designed values.

In paper 0412, the influence of embedment depth and embedded medium on the behaviour of laterally loaded large diameter steel tubular piles was investigated. Two failure modes of the pile foundation were observed: ground failure and pile structural failure depending on the embedment depth and ground strength. Based on the results of centrifuge model tests under cyclic lateral loading, the authors concluded that the determinations of the rational embedment depth considering given conditions are the most critical step in the design of this type of pile foundation.

Paper 0407 suggested innovative design and technology solutions for deep water piled clusters and structures. Large diameter casing installed both above and below the sea bottom level supported by piles through deep water. When connection of all pipe piles with large diameter casing provides their joint work and favorable distribution of stresses and deformations in pile clusters, the developed relieves and decreases stresses in the piles. To fulfill the authors' concept, a series of physical model tests and numerical analysis were conducted.

Session B-1 Pile wall / Sheet pile wall

Chair: Associate Prof. Jiro Takemura

Department of Civil and Environmental Engineering
Chair of TC-1 IPA
Tokyo Institute of Technology, Japan

The following five papers were resented by the underlined authors in B-1. All provide the outcomes of the basic and practical researches, contributing the development and enhancement of press-in technology for various civil engineering problems.

No. 501 "Stability of Self-Standing High Stiffness-Steel Pipe Sheet Pile Walls Embedded in Soft Rocks", V. Kunasaegaram (Tokyo Tech), J. Takemura, Y. Ishihama, and Y. Ishihara.
No. 502 "Evaluation of Deformation Behavior of Self-Standing Wall Using Large Diameter Steel Pipe Piles into Hard Ground", Y. Ishihama (Nippon Steel and Sumitomo Metal Corp.), K. Fujiwata, J. Takemura and V. Kunasaegaram.
No. 503 "Issues for the Reduction of the Embedded Length of Cantilevered Steel Tubular Retaining Wall Pressed into Stiff Ground", N. Suzuki (Giken Ltd.) and K. Kajino
No. 509 "Evaluation of Effectiveness of PFS method Using 3D Finite Element Method", K. Tanaka (Kajima Corp.), M. Kimizu, J. Otani and T. Nakai
No. 610 "The Effect of Underground Short Piles with High Rigidity on Shear Stress and Displacement along Ground Failure Surface", Y. Otani and T. Uchimura (Saitama University)

The first three papers (Nos. **501, 502, 503**) are related products from the study of **IPA TC1** (**Technical Committee on Application of Self-retaining Tubular Steel Pile Wall to Stiff Ground**). Development of novel installation technique, like GYROPRESS Method, could allow to make use of large diameter steel tubular piles in hard ground, such as dense gravel, soft rock and medium hard rock. For relatively large height wall, the large stiffness self-standing wall are preferably used for stiff embedment ground, since the wall displacement caused by the ground deformation can be minimized. However, the current design method of self-standing wall has been developed for the relatively flexible wall embedded into soft grounds. Therefore simple application of the current design method to the large diameter tubular steel pile wall embedded in stiff ground may require unnecessary embedment depth, or increase a risk of failure. However, the behavior of large diameter tubular pile self–standing wall has not been well understood due to the difficulties of conducting large scale tests to observe the critical behavior. In **Paper 503** after showing case records of the application of self-retaining tubular steel pile wall to stiff grounds, several critical issues are discussed for developing the rational design method of this type wall. In the research of **Paper 501**, a centrifuge modeling technique was developed to simulate the loading process of self-standing wall embedded in soft rock from the design loading conditions to the ultimate failure conditions. From a series of centrifuge model tests, rigid body type rotational failure mechanism was observed for the targeted condition and it was confirmed that a small increment of embedment depth, e.g., 0.5m significantly increase the wall stability. Arguing the overestimation of embedme nt depth by the current design method, **Paper 502** presented the results of a simple design model using bi-linear elasto-plastic beam-spring method, which could implement all important factors in the model. The applicability of the method was firstly confirmed by comparing the centrifuge model results and then the effects of embedment depth were discussed from the parametric study. All three papers suggest the possibility of reducing the wall embedment depth into the hard ground from the one obtained by the current design methods. However, there are several issues which should be solved for establishing the rational and economical design. The determination of horizontal sub-grade reaction of hard ground is one of the critical issues.

Paper 509 is also an outcome from IPA technical committee (**TC3: Technical Committee on Expansion of Applicability and Assessment of Dynamic Behavior of PFS Method**). A 3D FEM analysis was conducted to simulate a field test of embankment on the soft clay reinforced by PFS (Partially Floating Sheet-pile) wall. The calculated settlements and excess pore pressures underneath the embankment agreed well with the observation, but the calculated horizontal displacement at the embankment toe were a little larger, showing the common difference between numerical results and observation on this type of ground deformation. The authors also discuss the importance of the determination of allowable horizontal displacement in the design and the performance PFC reinforced embankment under earthquake. **Pater 610** presents a basic study about the reinforcement of potential failure plane by short rigid piles installed using press-in rod, which could reduce the total pile length significantly. Direct shear tests were performed for dry sand with various lengths and arrangements of piles using medium size shear box apparatus. From the relatively simple tests, typical shear behavior of slip plane reinforced by the short piles were discussed with the effects of pile reinforcement conditions.

Session B-2: Pile Wall/Sheet Pile Wall

Chair : Associate Prof. Kiyonobu KASAMA

Department of Civil and Environmental Engineering
Tokyo Institute of Technology, Japan

This session “Pile was/Sheet pile wall” started from 16:45 on the second day of conference with a number of audience. The brief summary and discussion of each presentation are as follows.

Mr. Takeuchi, T who is one of authors for paper No. 505, “Earthquake Behavior of Cylindrical Underground Structure and Verification of Analytical Model” reports the numerical result of earthquake response analysis for cylindrical underground structure for bicycle parking. The actual acceleration and strain measured at the inside of the structure caused by are introduced compared with the numerical results predicted by numerical analysis. It can be characterized that the underground structure has enough seismic stability under level 2 earthquake.

Mr. Michino, M who is one of authors for paper No. 506, “Development of High Performance Composite Wall “J-WALL II”” reports the strength property and construction workability of hat-shaped sheet pile with T-shape steel connector, which is used to bond concreate used for main construction. The connect and bend strengths between hat-shaped sheet pile with T-shape steel connector and reinforced concrete are carefully investigated. It can be characterized that the total construction cost reduces because the composite structure of hat-shaped sheet pile and concrete structure can be used as a permanent structure although the initial cost slightly increases due to T-shaped steel connector.

Ms. Ogawa, N who is one of authors for paper No. 507, “A Large-Scale Model Experiment on the Effect of Sheet Pile Wall on Reducing the Damage of Oil Tank Due to Liquefaction” reports the effectiveness of sheet pile on for liquefaction countermeasure below the tank by a large-size model test, which can simulate a vertical seepage flow in the ground. It is emphasized that the reduction of effective stress during liquefaction is simulated by this testing apparatus. There are several questions and comments about mechanism of sheet pile to reduce the inclination of model tank. As a future plan, the test apparatus will be used to clarify the reduction of strength parameter under the liquefaction.

Mr. Oka, M who is one of authors for paper No. 508, “Reinforcement of River Embankment against the Nankai Trough Earthquake” reports the numerical and experimental results of seismic behavior for the river embankment reinforced by sheet piles at the both edges of crest. It is confirmed that the natural period of the river embankment changes and also the seismic settlement decreases due to the installation of sheet piles. There are several questions about the mechanism to change the natural period of river embankment by installing sheet pile and the effectiveness of pile installation at the lower edges of embankment instead of both edges of crest.

All presentations emphasized the effectiveness of pile wall and sheet pile wall by means of model experiments and numerical simulations on the earthquake and liquefaction countermeasures.

Photo 1 Mr. Takeuchi is answering the question

Photo 2 The audience

Session B-3: Pile Wall/Sheet Pile Wall

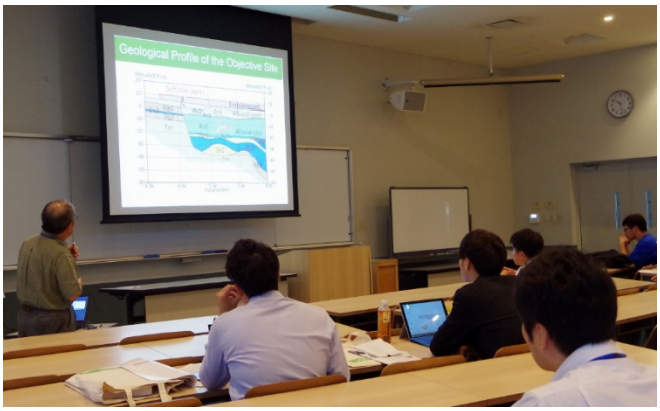
Chair: Prof. Jun Otani

Department of Civil and Environmental Engineering
Chair of TC-3, IPA
Kumamoto University, Japan

This session was held as following schedule:
Date: September 20, 2018
Place: Room K 102, Kochi University of Technology

Presentations:

1. Centrifuge Model Tests and Image Analysis of a Levee with Partial Floating Sheet-pile Method
   by Hizen, D (Tokushima University), Kijima, & N., Ueno, K.
2. Seismic Assessment of Steel Sheet Pile Reinforcement Effect on River Embankment Constructed on a Soft Clay Ground
   by Nakai, K. (Nagoya University), Noda, T., Taenaka, S. Ishihara Y., & Ogawa, N.
3. Seismic Behavior of the River Embankment Improved with the Steel Sheet Piling Method
   by Yamamoto, S. (Kyushu University), Kasama, K., K.Ohno, M. & Tanabe, Y.
4. Reactive Measure Effects on River Dyke Instability and Adjacent Residences on Soft Clay Deposits after the Tohoku-Pacific Ocean Earthquake of 2011
   by Yasuhara, K. (Ibaraki University), Yang, X.S., Horikawa, T. & Yamane, H.
5. Reduction in Liquefaction Induced Settlement of River Levee by Enhancing Horizontal Stress with Sheet Piles
   by Okumura, M. (Ehime University), Inoue, T., Jin-nouchi, N. & Ono, K.



The photo of Presentation in Session B-3

The contents of this session were about steel sheet pile. The 1st paper was the centrifuge model test for the countermeasure of ground settlement with sheet pile method under soft ground and they did a series of the model test including normal sheet pile method and that of partial floating type (PFS) and they discussed about the effectiveness of the PFS method. One of the interesting points was the use of image analysis on the purpose of not only visualization of the behavior but also its quantitative discussion. For the centrifuge model test, the modeling of the model is fundamental issue, especially the soil structure interaction with sheet pile. The 2nd paper showed us the results of dynamic FEM modeling of the sheet pile countermeasure method for the soft ground with possible liquefaction. The results were very interesting for all the audience and the progress of this study is expected. The 3rd paper was the contents of data analysis for the behavior of sheet piles after 2016 Kumamoto Earthquake. All the data were valuable for all the audience but more precise and quantitative analysis was expected. The 4th paper was the real countermeasures at the site after 2011 Tohoku-Pacific Ocean Earthquake. They have done a series of numerical simulation for the real behavior and the effectiveness of the countermeasure which ~~is~~ the sheet pile method was convinced. The 5th paper was a new proposal of the countermeasures with sheet piles to reduce liquefaction induced settlement of river levee. They have done a series of centrifuge model test for the dynamic loading. All the presentations were very interesting for the development of the sheet pile method, especially for the case of earthquake. And all the presentations were mostly done by relatively younger researchers including graduate students, so that this seems good for the sustainability of human resources for the IPA.

C-1: Tsunami/Landslide

Chair: Prof. Michael Doubrovsky

Department of "Sea, River Ports and Waterways"
Odessa National Maritime University, Ukraine

On this session, as it was scheduled by the program, six papers were presented. In spite of the session title "Tsunami/Landslide", mainly comprehensive studies of the tsunami resistance problem were considered and discussed.

Some of the reports were devoted to coastal levees construction and to the role of implant piling elements as an important countermeasure against seismic and tsunami actions. To these interesting papers, we may ascribe such studies as:

- 0601. "Comparison of Pile-type and Gravity-type Coastal Levees in Terms of Resilience to Tsunami" by Y. Ishihara, K. Okada, M. Hamada. The paper introduced a newly developed experimental apparatus ('Tsunami Simulator'), in which surge and reflux tsunami can be simulated to investigate into the behavior of structures a part of which is embedded in the ground.
- 0602. "3-D Behaviour of Coastal Dyke Installed by Double Sheet-piles with Partition Wall" by K.Fujiwara, S. Taenaka, K. Takahama, A. Yashima. Authors studied the influence of the partition walls on coastal dyke deformations. Study on Seismic Countermeasures by Steel Pile Diaphragm Wall in Coastal Levee.
- 0604. "Study on Seismic Countermeasures by Steel Pile Diaphragm Wall in Coastal Levee" by K. Lee, Y. Okajima, S. Akiba, T. Kodaka. In this paper, the authors mainly described the difference in calculated behavior of the levee due to analytical modeling methods about components of the coastal levee such as sands embankment, wave-dissipating block, and concrete revetment.

Several papers considered peculiarities of jacked-in piles behavior in coastal structures regarding tsunami action. These researches are reflected in such reports as:

- 0603. "A Comparison between the Dynamic Behaviour of Flexible Dual Row Walls Founded in Dry and Liquefiable Sands" by S. S. C. Madabhushi, S. K. Haigh. The authors considered results of dynamic testing of small-scale centrifuge models of the dual row wall systems, founded in dry and liquefiable sands, also they discussed a modified approach to inferring the wall displacements from the accelerations and discrete displacement measurements.
- 0605. "Estimation of External Force Acting on Steel Pile of Steel Pile Reinforced Breakwater" by K. Hikichi, Y. Kikuchi, T. Hyodo, A. Mohri, K. Akita, N. Shoji, S. Taenaka, S. Moriyasu, S. Oikawa. Installing a row of piles behind the caisson with backfilling, the space between the caisson and piles with rubbles was proposed as one of the reinforcing methods against tsunami. It was found that the external forces acting on the piles dominate in the vicinity of the backfilling part by gradually compressing the backfilling part by displacement of the caisson.
- 0606. "Evaluating the Efficiency of Jacked-in Piles as Tsunami Defences" by A. Dobrisan, S.K. Haigh, Y. Ishihara. A new type of seawall made of adjoining large, jacked-in, steel pipe piles was studied. It was found that current Japanese codes provide appropriate predictions of wave force for the case of seawalls needing to withstand overtopping waves. Steel pile walls seem an effective seawall solution due to their high embedment and capacity to dissipate wave energy through yielding.

General impression on presented papers ~~is~~ was rather positive due to actual problems studied at a high level of modern experimental and numerical methods. It should be underlined high research activity and interesting results achieved by Dr. Ishihara, Dr. Haigh, and their co-authors. There was an interesting discussion after presenting papers #601, 603, 604, 606. Also, I would like to wish to some young researchers to be more flexible and reactive in scientific discussions and disputes provided in English.

The photo of presentation in Session C-1

Session C-2: Tsunami/Landslide

Chair: Dr. Stuart Haigh

Senior Lecturer, Engineering Department
Cambridge University, UK

The Session C-2: Tsunami/Landslide of the conference contained four excellent papers covering a range of topics including strengthening of coastal protection structures and prevention of scour around foundations. The standard of presentations was very high and stimulated interesting discussion on a variety of topics.

The photo of Session C-2

Paper 0607: Study on Reinforcement of Fishery Harbor Wharf against the Nankai Trough Earthquake

Prof. Kojiro Okabayashi from National Institute of Technology, Kochi College presented this interesting comparison between experimental results from dynamic centrifuge modelling and numerical simulations of the use of retrofit measures to protect coastal structures from earthquake-induced liquefaction. The results showed a good agreement between experimental results and numerical simulation. It was shown that using pressed-in sheet-pile walls and counterforts, the extent of liquefaction within the fishery wharfs was substantially reduced, with ground deformations reducing from 2.1m to 0.5m when these retrofit measures were used. This improved performance is vital given the importance of fishing ports to post-earthquake disaster relief and reconstruction.

Paper 0608: A Preliminary Investigation on Scour Mitigation at Bridge Piers Using Combined Riprap and Sacrificial Piles

Mr. Chen Wang of Tongji University, China, presented this combined numerical and experimental investigation on the prevention of scour around bridge piers during periods of high flow. This paper received the best presentation award for this session. The paper demonstrated how rip-rap could be used to reduce scour owing to the high flow velocities needed to move the very large particles and how sacrificial piles could distort the water-flow field around a bridge pier, reducing scour in vital areas. It was shown that these techniques, both individually and when combined all reduced the size of the stable scour hole formed and that the numerical code used was able to adequately predict the performance of the systems in a variety of geometries.

Paper 0609: Drainage Effect for Embankment by Drainpipe Reinforcement

Mr. Yasutaka Ito of Kyushu University presented this work on the use of spiral-bladed drain pipes (SDPR) to reinforce earth embankments to prevent their failure in both earthquakes and during periods of heavy rain. The SDPR have a dual effect in both mechanically reinforcing the soil and in lowering the water-table increasing stability. The spiral blades on the SDPR also ease their installation as they can be screwed into the embankment without much heavy equipment. The work presented showed that these slot drains substantially lowered the water-table within embankments, increasing their factor of safety against failure.

Paper 0611: Pull-out Experiments of Flip-Type End Anchors Buried or Pushed in Model Ground of Dry Sand

Mr. Shota Yoshida of Daisho Co., Ltd. presented this work on self-deploying flip-type ground anchors of different sizes. He showed that while all anchors exhibited good capacity within the ground, the movement required to mobilize the resistance varied considerably, with small anchors requiring substantially higher displacements. An analytical model of this system was presented allowing the anchor capacity to be predicted and there was substantial discussion on the influence of changes in dilation angle due to stress level on the results of these experiments and their extrapolation to larger anchors for which dilation may be lower.

Session D-1: Piling Process/ Use of Piling Data

Chair: Mr. Yukihiro Ishihara

Manager, Press-in Technologies Support Department
GIKEN LTD., Japan

The photo of Session D-1

This session dealt with researches on the pile-soil interaction mechanisms that are necessary to understand the process of press-in piling as well as to utilize the piling data to estimate subsurface information. Phenomena generated as a result of the pile-soil interaction include soil plugging, arching, change of penetration resistance due to different penetration rates (rate effect) or different pile specifications (scale effect and shape effect), etc. Several of these were discussed in the following five presentations in this session. (The presenter is highlighted with underlines.)

1) Installation Behavior of Open Ended and Closed Ended Piles with Torque Application

Galindo, P. G., Davidson, C. & Brown, M. J.

1G model tests were conducted to investigate the effect of rotation on plugging and penetration resistance in sand. The vertical load was significantly reduced by rotation in both closed and open ended piles, while the torque was not influenced. *IFR* was reduced by rotation, which seems to contradict with the reduction of the vertical load. It was discussed that it will be necessary to observe when the soil column stops or restarts rotating, in order to understand the effect of rotation on plugging more in detail.

2) Stress Changes due to Shape Effects in the Construction Process of Pile Walls

Taenaka, S., White, D. J. & Randolph, M. F.

Centrifuge model tests were carried out to investigate the effect of shape of a pile on the horizontal stress in sand, by using model piles with different shapes including an H-shaped one. The 'switch-on' mechanism, in which the horizontal stress sharply increases due to the closure of the pile section, was confirmed. Difficulties in centrifuge modelling were discussed, including the bending stiffness of the pile material and the measurement of the horizontal stiffness. The latter was explained to have been judged as a minor problem by comparing with the results of numerical analysis.

3) Effect of Pile Diameter on Plugging Phenomenon of Open-ended Piles

Kanbe, M., Kikuchi, Y., Hyodo, T., Otsubo, H. & Yamazaki, H.

1G model tests were conducted to investigate the effect of diameter and thickness of an open ended pile on the soil plugging in sand. For the same ratio of the thickness to the diameter, the plugging condition was almost identical regardless of the diameter. 1-*IFR* were identical with the plugging ratio (ratio of inside shaft resistance to base resistance) for loose sand, but were greater for medium and dense sand. It was discussed that the direct measurement of the inside shaft resistance will be necessary to avoid ignoring the outside shaft resistance, especially for the denser cases.

4) Things Measured by Cone Penetration Tests other than Material Properties

Kawai, T., Kubota, K., Kim, J. K., Kazama, M. & Noda, T.

Numerical analyses were conducted by FEM (GEOASIA) to demonstrate the complexity of the penetration mechanism of CPT. To simulate the penetration, various displacement ratios (ratio of vertical to horizontal displacement) were superimposed at the interface of the soil and the cone apex. Analysis with the displacement ratio of 0.5, which is smaller than the values reported in the past experimental researches, revealed the combined effects of boundary conditions and deformation characteristics. Discussions were made on analysis methods and the dissolution of the contour color.

5) Case Study on Estimation of Ground Information with the Use of Construction Data in Press-in Method

Okada, K., Ogawa, N. & Ishihara, Y.

Piling data in standard press-in, press-in with augering and rotary cutting press-in were collected and utilized for estimating subsurface information (SPT *N*) based on the methods compiled by IPA (2017). The estimated results in standard press-in and rotary cutting press-in were highly dependent on the plugging condition (*IFR*). A method to incorporate the effect of the diameter of an auger head was proposed, and was confirmed to provide moderate results. It was discussed that, for standard press-in, it will be appropriate to estimate CPT rather than SPT.

Session D-2: Piling Process/ Use of Piling Data

Chair: Prof. C F Leung

Department of Civil and Environmental Engineering
National University of Singapore, Singapore

Session D-2 covers the topic of piling process with presenters from United Kingdom, Ukraine, Kazakhstan and Japan. A total of 5 papers were presented at the session. Highlights of the proceedings of the session are presented as follows.

Photo 1 Presentation by Ms. Marla

Earlier at the conference plenary session, the paper entitled "Water jetting for sheet piling" authored by Ms. Marla Gillow and co-authored by researchers from Cambridge University of United Kingdom and GIKEN LTD. of Japan was announced to be a winner of the Best Research Paper Award. Ms Gillow made the presentation on the investigation of mechanism of using water jetting in facilitating the installation of sheet piles. This extensive study covers the experimental studies conducted in the field in Japan and numerical back analyses performed using finite element analyses. A key finding has been established that the jet pressure is the most important factor affecting the ease of installation in dense sand. It is worthy to note that the Ms Gillow also received the best presenter award of the session.

Professor Michael Doubrovsky, a Board member of International Press-in Association, from the Odessa Maritime University of Ukraine, presented the paper entitled "Piling Technology in Ukraine: Some Recent Development" on the various piling methods with emphasis on the recent development of press-in technology in his country. Besides authors from Ukraine, the paper is co-authored with a researcher in Norway. The advantages of limitation of the piling methods were highlighted in the presentation.

Researchers from Kanazawa University of Japan with contribution from Nippon Steel and Sumitomo Metal Corporation presented a paper entitled 'Experimental study on influence of Different Pile Installation Methods on Performance of pile' at the session. Neat and carefully planned laboratory tests involving pile installation using jack-in, surging and vibration in dry and saturated grounds were presented. Substantial test results were reported highlighting practical implications of the test results. Extensive discussions were made among the audience concerning the measurement of pore pressure in the tests. An interesting presentation was also made by researchers from Kajima Corporation of Japan on the deployment of an innovative reinforcement cage system for cast-in-place concrete piles.

Professor Askar Zhussupbekov, from L N Gumilyov Eurasian National University of Kazakhstan, made another interesting presentation entitled "Application of Static Compression Load Test of Joint Piles in Seaport "Prorva" in the Caspian Sea Coastal Area (Western Kazakhstan)" on the case study of load tests on jointed piles in a port along Caspian Sea. He also took the opportunity to highlight the recent development in his country, a subject not so familiar to many persons in the audience.

Lively and fruitful discussions took place at the end of each presentation. Through the presentations and subsequent exchanges, the audience gained considerable knowledge on the piling process and piling practices in various countries. Old friendships were renewed and new friendships were made.

Photo 2 Question-and-answer session

Session D-3: Piling Process/Use of Piling Data

Chair: Associate Prof. Taro Uchimura

Department of Civil & Environmental Engineering
Saitama University, Japan

Session D-3 (Piling Process / Use of Piling Data) had only 4 presentations for 90 minutes session. Therefore, the time for every presentation was extended to 15 minutes in maximum. All the 4 presentations dealt with the process of pressed-in piles, the interaction among the pile, the ground, and existing underground structures.

"Experimental Study on Influence of a Pile Penetration on Deformation of a Buried Pile in Sand " (Morita, et. al.) presented model tests on interaction between a pressed-in pile and buried pile underground. Three piles were inserted into the model ground adjacent to the buried pile one by one, and the bending of pipes were observed. By assuming the pipe to be a simple elastic beam, the values of bending were translated to a force applied on the pile by insertion of the piles. The influence factors of distance between the piles and the pipe, the density of the ground, number of piles were discussed.

"Model Tests with a Transparent Soil to Observe Behavior of Buried Structures due to Neighboring Constructions" (Kobayashi, et. al.) also presented model tests on interaction between a pressed-in pile and buried pile underground. One pile was inserted into the model ground adjacent to the buried pile. A smart technique was used to investigate the deformation of the buried pipe. The ground was made of transparent silica particles, and the pore was filled with a mineral oil with high density of sucrose solution to achieve its refraction factor of light to be the same as that of the silica particles. Thus, the deformation of the buried pipe can be observed from outside of the sand box.

"Numerical Study: Effects of New Piles' Installation on Adjacent Existing Piles" (Dang, et. al.) presented a numerical analysis of a pile pressed-in near to another existing pile by using 2D DEM. The horizontal and vertical displacements caused by the installation of new pile were observed.

"An Investigation of Effect of Distance and Shape of Pile on Displacement of Gag Pile by 3D FEM Analysis" (Nagai, et. al.) presented another numerical analysis on a sheet piles inserted adjacent to an existing buried pipe. They conducted a full-scale model tests on site to measure the deformation in the buried pipes. As Dr. Nagai, the first author, was absent, the chairman made a presentation mainly on the full scale/scaled model tests as one of the coauthors. Damages on the buried pile due to adjacent new sheet pile is not serious in practice, specially there is a distance more than 30 cm. It was also observed that the force due to the new pile is applied on the existing pipe from the direction of the tip of the new pile. Besides, it was found that existence of the buried pipe does not affect the press-in force on the top of the new pile.

There are only 4 presentations for this session. But it was interesting that all of them dealt with the same research topic from respective viewpoints using different methods. As a result, the discussion was quite fruitful in this session.

The photo of Session D-3

Session E-1: Project Report

Chair: Prof. Masanori Hamada

Professor Emeritus, Waseda University, Japan
E-mail: hamada@waseda.jp

Photo 1 Chair: Prof. Hamada

Six papers were presented in this session, all of which were introducing the case studies of the constructions of retaining walls by making the use the Press-in and Gyro-press Piling Methods. In all of these cases of the constructions, there were strict limitations of the construction spaces and the impacts on the surrounding environment such as vibration and noise. The Press-in Method as well as Gyro-press Methods were adopted to solve these problems, and the constructions were successfully completed with lower cost and shorter construction time compared with the other ordinary construction methods. These case studies can provide effective and instructive information for the adoption of the piling method particularly in densely populated urban areas as well as in complex industrial plants.

The first paper “Construction of Steel Tubular Pile Water Cut-off Wall by the Gyro-Press Method and GIKEN Water Tightening System” by M. Kitamura and et al. deals with a construction of a cofferdam in order to remove a existing water pipe bridge pier. By using the Gyro-press Method and the water out-off method between piles, the construction time was largely shortened.

Photo 2 The view of session E-1

The second paper “Case Studies: Use of the Gyro-press Method in Tubular Pile Earth Retaining Walls for Foundation Works in Urban Area “by T. Imanishi and et al. introduced a case of a construction of earth retaining walls in densely congested urban area. The foundation work was successfully completed with a large reduction of the construction time the cost.

The third paper “Press-in with Augering: an Installation of Steel Sheet Piles Connected Longitudinally (Hard Ground Press-in Method) by K. Momono and et al. introduced a case of construction of earth retaining wall in an seismic reinforcement work of existing bridge. The foundation ground of the piles was very hard with of the maximum SPT N-values are 88. Therefore, an auger hosting system was adopted, and the construction was completed with low cost and short construction time.

The fourth paper “A Case Study by the Gyro-press Method in Consideration of Neighboring Residential Areas” by T. Tsukanaka reported a successful case study on the construction in narrow space between the construction site and neighboring residential areas. In this construction, there were two difficult problems. One was the clearance width between the construction yard and the neighboring residential areas, which was only 1.5m, and the other problem was stiff ground with N-values more than about 150. The Gyro-press method successfully completed the construction without any complain from the residents, since the vibration and noise could be limited in enoughly low level.

The fifth paper “A Case Study of Design Change in Press-in Method” by N. Shibata described a renovation work of an existing road and pedestrian bridge. The Press-in Method with water jetting was planned in the original design, but the Hard Ground Press-in Method was adopted, since the foundation ground of the piles was very hard with N-values more than 50. The construction was successfully completed with shorter period and lower cost. The last paper in this session is “Earthquake and Tsunami Disaster Preventive Measures for Sea Embankment at Usa Fishing Port, Kochi Prefecture” by D. Shibata et al. Noise and vibration to the neighboring residential areas and the adjacent road structures were crucial problems during the construction works. For the solution of those problems, steel pipe pile installation method was adopted for its advantages in the site applicability, workability and economic advantage. The construction was successfully completed without any environmental impacts during the construction.

Session E-2: Project Report

Chair: Dr. Dang Dang Tung

Faculty of Civil Engineering
Ho Chi Minh City University of Technology, Vietnam

I was invited to be a session chair of the First International Conference on Press-in Engineering 2018, Kochi, Japan on September 19, 2018. I would like to summarize the information of the session. I think that arrive early, start the session on time, introduce the presenters, watch the time to keep presenters on schedule, applaud at the right times, and handle the question and answer sessions promptly are important tasks for session chair to make everything smoothly. As a session chair, I should always have one question ready for the presenter if the audience does not.

I was pleasured that supporting staffs of organizing committee were well - trained and all facilities such as Projector, Laser Pointer, Microphone were available in the room. Before beginning the session, I met the presenters and put them at ease, confirmed them load their presentations onto the laptop computer. I also told them how much time they have and how I will notify them that their presentation time is almost done.

Photo 1 Presentation by Mr. Kamimura

The first paper title “Cantilevered Road Retaining Wall Constructed of 2,000 mm Diameter Steel Tubular Piles Installed by the Gyro Press Method with the GRB system” was presented by Mr. Kamimura, Manger, Construction Promotion Department, Gikenseko Corporation. This case study presented here is an experience to construct a cantilevered road retaining wall using large-diameter steel tubular piles in a short period of time, in a narrow site yard with a width of 4.5 m. The audience from Thailand Construction company was interested in the method and asked some questions to the presenter such as the depth of excavation and safe factor of the case study.

Photo 2 Presentation by Mr. Matsuzawa

Mr. Kazuyuki MATSUZAWA, Manager, Engineering Works Division, Sato Juki Corporation, Tokyo, Japan presented two papers with their titles are “Example of Construction of Sheet Pile Walls for Anti-Seismic Reinforcement of Railway Embankment” and “Example of Construction of Sheet Pile Walls Using the Cyclic Auger Method for Anti-Seismic Reinforcement of Railway Embankment”. One audience from Malaysia mentioned the cost construction and one audience from Japanese Construction company asked the author to re-explain the usefulness and effectiveness of proposed method.

There are 3 presentations from International Construction Design & Planning Department, Giken Ltd., Tokyo, Japan of “Recovery of Skin Friction of Cambridge Gault Clay with Time Effect”, “The Press-in Method with Augering - Augering Area in Relation to Retaining Wall Design”, “Retaining Wall Deflection Control in Relation to Augering Area” presented by Mr. Yuta KITANO and Mr. Tsunenobu NOZAKI. Two of audiences wanted to know how determine the index of skin friction in design stage. They commented the index of skin friction should be determined basing on considering all kinds of soil in Japan, England and Thailand.

Session E3: Project Report

Chair: Dr. Andrew McNamara

Senior Lecturer, Department of Civil Engineering
City, University of London, UK

Presentation 1: Seismic Reinforcement for Foundation Soil Utilizing Sheet Piles and Soil Improvement
The use of steel sheet piles for seismic reinforcement of bridge biers was described. Complex nonlinear static analysis was used to determine design parameters and optimize the solution of sheet piles and ground improvement in liquefiable ground. The decision to adopt a sheet piled solution was found to have yielded particular benefits including rapid construction.

Presentation 2: Piling Tests and Induced Surface Settlement of Rotating Static Pressure Steel Pipe Pile in Shanghai Soft Soil
An interesting series of tests were described on rotating static pressure steel pipe piles in soft soil. The aim of the project was to investigate whether the installation of tubular piles in close proximity to sensitive infrastructure could provide a means of protection against future construction activity. The piles were installed using the press in method with a rotational force of 100kNm and a driving force of 400kN. It was found that settlements immediately around the piles were limited to 5mm suggesting that the method is well suited for use near to very sensitive infrastructure.

The photo of Presentation 2

Presentation 3: The Press In Method Assisted with Augering: Case Studies of Single U and Double X Shaped Piles in the United Kingdom
One of the main difficulties with adopting the press in method in stiff clay or other hard soils is the resistance to driving. The paper describes two successful UK projects in which techniques for reducing driving force in difficult installation conditions have been used. Both Z and U profiles sheet piles are considered. One project adopted a rotating auger that was used simultaneously with sheet pile installation whilst the use of pre-augering was also described. The influence of augering on resistance to ground movement was described and the fact that the augering operations are typically used on the excavation side of the pans means that movements associated with this are generally minimised. The paper is a good starting point for readers who understand the press in method but have reservations about its ability to operate in hard soils.

Presentation 4: Case Study of Underwater Press-in Method of Steel Sheet Piles Under Restricted Headroom Beneath a Railroad Bridge
An ingenious method for installation of steel sheet piles in restricted headroom was described. Access to install sheet piles in limited headroom is a problem that has confounded engineers for years. However, the development of a new press in machine that is capable of handling very short sections of sheet pile that can be joined as work on installation proceeds was described. The machine was described as working in a canal beneath a live railway bridge. Sheet piles were installed along the centerline of the canal to permit drainage and maintenance works. The resulting sheet piled wall was seen to be extremely watertight; a genuine triumph of inventive engineering.

Presentation 5: Design and Installation of a Permanent Sheet Pile Basement for the Manly Twenty95 Development
The final presentation was the description of a sheet piled basement near to sensitive and historic existing structures in Sydney, Australia. The Authors described a small residential development with an unusually deep basement in a heritage area of the city. The project adopted the Super Crush system of sheet pile installation using the ECO600S Silent Piler. 600mm wide U piles were installed in dense to very dense sand to support excavation depth of up to 12.5m. A bottom up basement construction technique was adopted by the contractor along with pre-auguring to assist with pile installation. This combination led to visible ground movements at the ground surface but serious damage was avoided and only patch repairs were necessary. The use of sheet piles was seen as successful owing to the ability to maximize basement space on a congested site.

I think the session could provide a good reference for the participants through the five presentations. It was also a very important learning resource for me.

Session F: Survey / Monitoring /Project evaluation

Chair: Dr. Nor Azizi Yusoff

Primary Researcher, Research Centre for Soft Soils (RECESS)
Universiti Tun Hussein Onn Malaysia (UTHM), Malaysia

The Session F of the conference is focusing on survey, monitoring and project evaluation. This session consisted of various speakers from Japan, Singapore, Malaysia and Kazakhstan.

Professor Leung Chun Fai from National University of Singapore presented his work with Dr. Goh Teik Lim on noise and vibration monitoring for silent piling in Singapore. Field measurements of noise and ground vibrations during press-in piling at 5 Singapore sites are presented. It is evident that silent piling can effectively reduce the noise and vibration levels to within the desired limits set by the authorities. Based on the findings, preliminary prediction formulation are presented in this paper. Interestingly, the correlation is not the same as those predicted using an established method revealing that the latter may not be applicable to Singapore soil conditions.

Photo 1 Presentation by Dr. Yusoff

The following presentation was made by myself. The interest of this presentation was to study the level of acceptance of silent piling technology among local authorities in Malaysia. Based on this study, it was reported that the exposure and understanding of press-in method among the local authorities is still at a low level. Most of the respondents believed that Press-in technology may be useful to overcome several environmental challenges during construction such as noise and vibration. The research model could be adopted in understanding and shaping practical strategies in promoting Press-In technology in other countries.

The third presentation was prepared by Professor Takaharu Shogaki and Mr. Daishi Okuda from National Defence Academy. The presentation was related to the load history of cedar foundation pile in the Mietsu naval facility world heritage. Historically, The Mietsu Naval Facility (MNF) was a Dutch Western-style naval base constructed in 1858. Archaeological surveys have shown that underground structural remains in this site have been preserved in good condition. As part of an engineering investigation of the remains, this study involved the measurement of the consolidation properties of a sample obtained through tube sampling. In addition, several readings of undrained shear strength were also recorded from cone penetration tests.

Later, the presentation was delivered by National Research Institute for Earth Science and Disaster Resilience (NIED). Dr. Tsuneo Ohsuma and Professor Hemanta Hazarika reported their interesting findings related to the damage caused by Puebla-Morelos Earthquake in Mexico City. This earthquake with a moment magnitude (*Mw*) of 7.1 occurred on September 19, 2017. A damage survey was conducted in the affected area and it was observed that the main damage was to masonry reinforced concrete buildings. It is interesting to note that minor damage was evident in urban buildings with modified improvement of regulatory requirements in terms of construction that were in place after the 1985 earthquake. Conversely, buildings not subject to these regulatory requirements were more heavily damaged.

Photo 2 Presentation by Prof. Askar

The final presentation was made by Professor Askar Zhussipbekov and his research team from Gumilyov Eurasian National University, Kazakhstan. The presentation basically share the experience of static compression load test of joint pile in seaport “Prorva” in the Caspian Sea coastal area. For the project, two segments precast concrete piles have been applied as foundations for “Cargo Transportation Route for of the north-eastern part of the Caspian Sea North Caspian Marine channel. The presentation shared many aspects of foundation construction in low temperature condition. In addition, several pile load test were conducted and bearing capacity and a settlement analysis at low temperature up to -10℃ were reported.

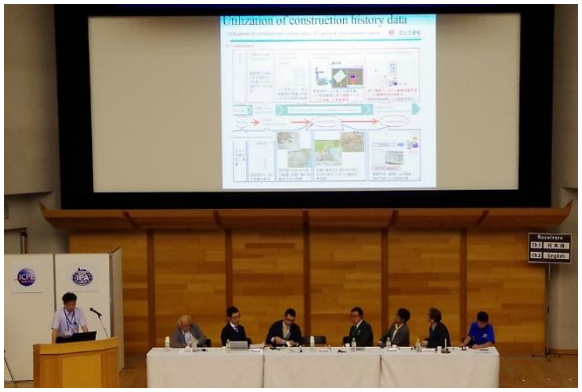
In summary, I would like to express my sincere thanks to all of you who have presented and actively participated during the session. Please use the concepts that you learnt at this conference to make this earth a better place for all.

Organized session G: i-Construction

Convener: Prof. Kazuyoshi Tateyama

Professor, Department of Civil and Environmental Engineering
Ritsumeikan University, Japan

In April of 2016, the Ministry of Land, Infrastructure and Transport started a new policy called as i-Construction, in which high wage levels, sufficient holidays and a safe labor environment are aimed to be realized through remarkable improvements in productivity to make a social system for building infrastructures stably even under depopulating society in Japan. One of the major strategies in i-Construction is an innovative improvement of construction efficiency including labor saving, shortening of construction period, improvement of safety and quality through effective use of ICT in construction.



The photo of Organized Session G

The introduction of ICT has been comparatively ahead in the construction of foundations. Various advanced technologies have been developed with ICT to evaluate the ground properties and to feedback the information to construction. It comes from the fact that underground situation cannot be seen directly and thus foundation construction had often relied on the experience of the skilled engineers and workers. Some other methodologies which can support construction site, replacing the experiences of skilled engineers were hurried to develop before their retirement under depopulating society. In the organizing session G, six advanced technologies, which have already been developed, are under development and are aimed to develop in near future, were presented in the field of foundation construction.

The first technology presented in the session is a measuring system with which the diameter of the improved columns can be measured with a newly developed unique method in high pressure injection mixing method. It will remarkably increase the reliability of the injection mixing method. The second technology is a pipe drilling method with which vertical shaft can be excavated with rotary excavation system in rock mass. Although the ICT has not been enough used for optimization of the construction, yet, the future prospect was introduced on the effective utilization of ICT for optimization in control of pile drilling machine. The third technology was a deep ground improvement method. The methods were developed some decades ago and various technological improvements have been added with advanced technologies including ICT. However, they were individually developed by each company. The author collected and analyzed vast numbers of literatures and materials to summarize the trend of the technological development of ground improvement method and pointed the direction for the next stage of development. The forth technology was a unique one to specify the center axis of the pile accurately with simple surveying method. Although the conventional method is forced to measure the pile from a couple of points whose directions are perpendicular each other, the suggested method can specify the center axis of piles by the surveying from one direction easily. It is expected to bring not only the remarkable save of time and labor but also accuracy in pile positioning.

The last two technologies are concerning Press-in Method. One is the technology of the automatic operation of press-in machine by using the date obtained during press-in piling process. The N-value can be estimated accurately from the measured data and the machine control can be optimized with the results automatically. It was explained that the time duration of construction was shortened with a newly developed method. The last presentation was the utilization of the video data for the management of press-in piling construction. The video data of construction site include various information not only quality information but also quantitative ones. The authors tried to specify the accurate movement of the piles from the video data of the construction sites. Unfortunately, the trial has not been completed to obtain the expected results, but the possibility of using video data for the management of press-in pile construction was enough confirmed.

After the presentations of 6 technologies, the possibility of sophistication in foundation construction through the introduction of ICT was discussed with speakers and convener.

Session H: Dialogue among Operators and Researchers

Convener: Mr. Tsunenobu Nozaki

General Manager, Construction Design & Planning Department
GIKEN LTD., Japan

Presentations:

1. Installation of Steel Pipe Sheet Pile Foundation
   by Kiyoshi Nagao (GIKEN SEKO CO., LTD.)
2. Press-in of Tubular Sheet Piles Assisted with Water Jetting
   by Kazuyuki Matsuzawa (SATO JUKI Corporation)
3. Construction Management of Installed Sheet Piles by the Press-in Method
   by Minokichi Imaoka (IZUMO GIKEN LTD.)
4. Influence on Neighboring Ground by Extracting Sheet Piles
   by Koichi Momono (GEOTECH Co. Ltd.)

Researchers:

1. Tatsunori Matsumoto (Kanazawa University)
2. Yasumasa Kimura (GIKEN LTD.)
3. Yasuhiro Tanaka (GIKEN LTD.)

Photo 1 Summary by Prof. Matsumoto

As points for a forum of debate, several construction management topics on the Press-in Method were raised by contractors based on their actual projects. After each presentation, the topic was discussed among the contractors and researchers from different perspectives, to assess the topic more scientifically.

Photo 2 Presentation by Mr. Matsuzawa

The first presentation featured “Steel Pipe Sheet Pile Foundation”. Installation tolerances and resistances were raised as typical potential problems, during installation of the foundation system. It was proposed that the risks may be mitigated by utilizing the Press-in Monitoring System, correlated with later axial load test results. By attaining the correlation between the press-in force and the ultimate load capacity, the pile design could be optimized and constructability could be improved.

The second presentation highlighted quality control, when water jetting is used. It was mentioned that the link between the necessary quality control of water jetting, geotechnical parameters and working conditions, has not been scientifically analyzed as yet. Although the pressure and flow of water jetting can automatically be adjusted in accordance with the Press-in Monitoring System, there is more experimentation required to figure out the optimum setting of the Press-in Monitoring System and serviceability of the piles.

The third presentation was based on the utilization of the Press-in Monitoring System, for unknown soil conditions. The case study showed that even with a poor geotechnical investigation report, the density and stiffness of the ground can be monitored during pile installation with the Press-in Monitoring System. Therefore, this ongoing process can be utilized for quality assurance and back analysis of the foundation design.

In the final presentation, the occurrence of ground displacement as a result of pile extraction was discussed. Since it is difficult to predict the magnitude of ground displacement caused by pile extraction, establishing proper construction management is a key factor to minimizing risks of ground displacement. The use of a ground displacement formula which calculates ground displacement due to pile extraction and various construction management practices have been introduced.

Through the session it was mutually recognized that there is still a vast amount of room for further development, to achieve better observational construction management, when using the Press-in Method.

ICPE Best Presentation Award

ICPE Scientific Working Group

The list of ICPE Best Presentation Award is as follows:
(The award winners are highlighted with underlines)

A-1 : **Panchal, J.P.**, McNamara, A.M. & Goodey, R.J.
Centrifuge Modeling of the Influence of Size and Geometry of Hybrid Foundations on Bearing Capacity. (0402)

A-2 : **Purnama, A.Y.**, Yasufuku, N. & Rifa'i, A.
Effects of Grain Size and Density as Pre Bored Pile Filler Material on Bending Moment due to Lateral Loading. (0409)

B-1 : **Tanaka, K.**, Kimizu, M., Otani, J. & Nakai, T.
Evaluation of Effectiveness of PFS Method Using 3D Finite Element Method. (0509)

B-2 : Okabayashi, K., Nakazawa, Y. & **Oka, M.**
Reinforcement of River Embankment against the Nankai Trough Earthquake. (0508)

B-3 : **Yamamoto, S.**, Kasama, K., Ohno, M. & Tanabe, Y.
Seismic Behavior of the River Embankment Improved with the Steel Sheet Piling Method. (0512)

C-1 : Madabhushi, S.S.C. & **Haigh, S.K.**
A Comparison between the Dynamic Behavior of Flexible Dual Row Walls Founded in Dry and Liquefiable Sands. (0603)

C-2 : Liang, F., **Wang, C.**, Huang, M. & Yang, X.
A Preliminary Investigation on Scour Mitigation at Bridge Pilers Using Combined Riprap and Sacrificial Piles. (0608)

D-1 : Galindo, P.G., Davidson, C. & **Brown, M.J.**
Installation Behavior of Open Ended and Close Ended Piles with Torque Application. (0706)

D-2 : **Gillow, M.**, Haigh, S.K., Ishihara, Y., Ogawa, N. & Okada, K.
Water Jetting for Sheet Piling. (0701)

D-3 : Dang, D.T., **Nguyen, M.T.** & Tran, K.M.
Numerical Study : Effects of New Piles' Installation on Adjacent Existing Piles. (0712)

E-1 : **Kitamura, M.** & Kamimura, S.
Construction of Steel Tubular Pile Water Cut-off Wall by the Gyro Press Method and GIKEN Water Tightening System. (0801)

E-2 : **Matsuzawa, K.**, Shirasaki, K., Konya, S. & Suzuki, Y.
Example of Construction of Sheet Pile Walls Using the Cyclic Auger Method for Anti-Seismic Reinforcement of Railway Embankment. (0808)

E-3 : **Arai, M.**, Sugio, S., Murayama, K. Kunitomi, H. & Kimura, Y.
Case Study of Underwater Press-in Method of Steel Sheet Piles under Restricted Headroom beneath a Railroad Bridge. (0814)

F : **Ohsumi, T.** & Hazarika, H.
Flash Report on Damage Caused in Mexico City, Mexico, by the 2017 Puebla-Morelos Earthquake. (0905)

General comments and impression from participants

- The International Conference on Press-in Engineering held in Kochi, Japan was the first conference dedicated entirely to the concept of foundations and retaining structures constructed using press-in technology. The company GIKEN Ltd has been the inventor and main advocate of this silent piling technology and it was entirely appropriate that the conference was held in the city that is home to their main office and headquarters. The conference was held over two days at the Kochi University of Technology. Although a little outside the city of Kochi, transport was provided so that all delegates could access the venue with ease. The impressive auditorium at the university was used for the keynote lectures and main presentations and there was great opportunity to listen to the presentations of papers submitted to the conference in the large number of parallel sessions. The organisers had, quite rightly, recognised that as well as providing presentations covering a wide range of technological advances and applications of press-in techniques, delegates would value ample networking opportunities. These were provided to great effect in the breaks, lunches, welcome reception and banquet. It was obvious that these opportunities were welcome and useful and there were always many discussion groups in the corridors and open areas and also with the various exhibitors and companies who were supporting the event. An added bonus was the very informative visit to the GIKEN Centre with demonstrations of a number of rigs and the opportunity to walk around the hugely impressive museum of pile drivers.

Demonstration of the Eco park
(automated underground car parking facility)

  To many people, it was perhaps surprising that such a specialist event could attract a large participation. However, the fact that it did demonstrates the high regard for the significant advances made in developing and applying press-in technology to a wide range of geotechnical and construction problems. There was strong evidence within the presentations of many effective design solutions that also bear in mind the need for a considerate approach to communities inevitably affected by construction. Controlling noise and developing compact and efficient operations are the hallmarks of this technology that GIKEN has been at pains to deliver so effectively. Overall, we were treated to a brilliantly organised conference with excellent technical content, great networking opportunities and the chance to learn of the many advances and advantages of the silent piling world.

  From Prof. Neil Taylor, Secretary General of ISSMGE (United Kingdom)

- ICPE 2018, which dealt with regional revitalization in addition to Japanese disaster prevention and i-Construction, was a meaningful conference to get an overview of current movement for natural disaster prevention and reduction. I re-realized a large degree of attention, to the conference, from around the world.

  From Mr. Kiyoshi Yamashita, Takenaka Corporation (Japan)

- ICPE 2018 is a well-organized international conference, and the invited lectures are quite impressive. It is also a great opportunity to meet nice people and get familiar with Japanese culture. As the first time to visit Japan, I am so glad to have this meaningful experience in Kochi. In addition, the technical tour during the conference is a good chance for researchers to get familiar with what is happening in engineering. I believe that the communication between people in the industry and in the academy will inspire creativity and innovation to civil engineering.

  From Mr. Chen Wang, Tongji University (China)

- Please accept my sincere congratulations on the success of the conference which was very well organized in terms of its contents. The speakers were all professionals, and the discussion was very useful.

  From Dr. Pastsakorn Kitiyodom, Geotechnical & Foundation Engineering Co., Ltd. (Thailand)

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Editorial Remarks

This issue is the special edition for ICPE 2018 (The First International Conference on Press-in Engineering) which was held on 19 and 20 September in Kochi, Japan.

ICPE will be held on a triennial base and ICPE 2018 was the first. We welcomed 418 experts who are engineers, practitioners, researchers as well as students from 17 countries. The two days conference consists of the two invited lectures, the state-of-the-art reports, the two organized sessions, such as the current stage of "i-Construction" and "Dialog between operators/practitioners", and various general sessions where 83 numbers of research papers were presented.

The reports were written by session chairs and some participants. We hope that this issue could convey the information of ICPE to IPA members who could not attended, and we believe that it will bring more thoughts to the readers.

At last, the Editorial board wants to thank you for your support throughout this year and hopes that you can continue to pay attention to our Newsletter in the coming year. Wishing you a ***Merry Charismas & Happy New Year***.

Please feel free to contact the Editorial board members below with email address or IPA Secretariat (tokyo@press-in.org) for your clarifications and/or suggestions.