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Message
From the Director

Michael Doubrovsky

Professor, Odessa National Maritime University

My first acquaintance with Press-in technology and GIKEN LTD. dates back to the 16th International Conference on Soil Mechanics and Geotechnical Engineering held in Osaka in 2005. Another memorial event took place in 2007 in Cambridge where I had the honor to participate in the inaugural meeting and ceremony of IPA creation. Since that time, we in Odessa National Maritime University - the only university in Ukraine provided education and researches on maritime engineering (onshore and offshore construction and development projects) – did our best to promote Press-in Method both in teaching and in consulting activity. During several last years, our students have applied the main approaches of the Giken technologies in their bachelors' and master's diploma theses. My Ph.D. students displayed an interest in the study of possibilities of Press-in methods in their researches related to onshore and offshore engineering. Participation of the Giken delegation on the annual International Exhibition/Conference InterTransPort in 2016 was met with a huge interest in number representatives of contractors, designers, consultants and researchers from both Ukraine and other countries. It was particularly reflected by presenting several interesting papers and reports from Ukraine to the First International Conference on Press-in Engineering (ICPE) in 2018 in Kochi.

The most perspective directions of this technology implementation in Ukraine, on my mind, are cities historical areas reconstruction, improvement of seashore slopes stability, development of urban civil engineering projects for several large cities located on hills in the conditions of high level of groundwater (saturated soils, etc.), seaports development projects (Giken GRB system application). Due to environmental and some technological advantageous the Press-in Method has good chances to be called-for in the Ukrainian construction market. Another opportunity to contribute to the Press-in promotion activity is preparation/dissemination of IPA booklets translated into Ukrainian/Russian languages (we provided such activity since 2015 when translated "Implanted Structure" brochure has been published). Such activity can be in use for the large area of countries of the former Soviet Union. The next similar action may be translation and technical/scientific editing of the new English version of the IPA handbook on Press-in retaining structures. I look forward to facilitating the Press-in Method implementation at the East-European construction practice and its development from both technical and scientific points of view.

◆ A brief CV of Prof. Michael Doubrovsky

Michael Doubrovsky is a professor and Head of Department "Sea, River Ports and Waterways" at the Odessa National Maritime University. Subjects of his researches are retaining walls, sheet pilings and piled structures. Besides the delivery of lectures, he actively provides geotechnical consulting for coastal and port projects in Ukraine and other maritime European countries. He is a member of Ukrainian and International Societies for Soil mechanics and Geotechnical Engineering. He is also full a member of such scientific bodies as the Academy of Civil Engineering and Transport Academy of Ukraine.

Special Contribution

Contribution of geotechnical engineering towards recovery from damage caused by the 2011 Tohoku earthquake - Summary of the 2019 Ishihara Lecture in Rome -

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ABSTRACT: The 2011 Tohoku earthquake with the moment magnitude of 9.0 caused unexpected and disastrous damage over the entire Tohoku and Kanto Regions of Japan. While tsunami damage has been widely known, liquefaction affected people's properties as well. The post-earthquake reconstruction of communities addressed many geotechnical issues, and the present paper attempts to introduce them to readers within the limited page allocation.

Keywords: 2011 Tohoku earthquake, damage, tsunami, liquefaction, reconstruction

INTRODUCTION

Mitigation of natural disasters is one of the major missions of civil engineering. This mission is becoming increasingly more important in the recent decades because people and public sectors have started to desire more safety for the welfare and continuity of their value. In other words, the value of the modern community after economic development substantially relies on the capability of individuals and the value of human resources is remarkably more important than that under lower level of development in less developed communities. In the latter, individuals are often considered to be replaceable labor. In this respect, the target of disaster mitigation used to be limited to important structures in pre-modern times whereas the current target is the general public.

Geotechnical hazards typically occur during earthquakes and heavy rains exemplified by slope failures and collapse of subsoil as shown by liquefaction. Therein, an entire district or area is uniformly affected and the geotechnical disaster mitigation has to address the general public. This nature of geotechnical disaster mitigation accounts for the reason why it used to attract minor public concern in the 20th Century when the value of people was lower, and why it has become more valuable among people only in the recent few decades.

The first two decades of the 21st Century experienced several natural disasters that affected the geotechnical bases of human community, resulting in the loss of safe living conditions and local industrial bases. Examples of such events were the seismically-induced slope failures in Pakistan in 2005 (Mw=7.6) and in China in 2008 (Mw=7.9) that directly destroyed human settlements and transportation networks while generating flood risks due to breaching of natural dams. Another example is subsoil liquefaction in residential districts underlain by young sandy deposits that occurred in New Zealand in 2010 and 2011 together with eastern Japan in 2011. The collapse of foundation ground under existing houses made complete loss in values of personal real estate, affecting the continuity of the damaged community.

Tsunami is another kind of natural disaster that profoundly affects the continuity of a human community. In case of extremeness, it affects entire nation as exemplified by the events in the Indian Ocean (2004) and Tohoku District of Japan (2011). It is possible herein for geotechnical engineering to mitigate the disaster by offering good and appropriate technology such as construction of sea walls and refugee embankment.

In 2019, the author was granted with an honorable opportunity to deliver the "Ishihara" Lecture during the 7th International Conference on Earthquake Geotechnical Engineering that took place in Rome (Towhata, 2019). The content of this lecture consisted of the achievements of geotechnical engineering, whether or not the author was involved, that attempted to help the community recover from the induced seismic damage. Mitigation of future disaster of a similar kind was another important aim. The present paper is intended to summarize the lecture, while adding some points that have been found valuable after the lecture. Note that the topics concerning rainfall-induced disaster are excluded from this paper due to page limitation although they are important as well for the continuity of human communities.

SEISMOLOGICAL ASPECTS OF THE 2011 TOHOKU EARTHQUAKE

The 2011 Tohoku earthquake registered the seismic magnitude of Mw=9.0 and caused damage over the Pacific Coast region of the Tohoku District (Fig. 1). The induced damage was due to strong and elongated ground shaking such as exemplified by slope instability, collapse of building structures together with their non-structural members, and subsoil liquefaction as well as those due to tsunami in the coastal region. Noteworthy was the nation-wide loss of logistics due to destroyed transportation routes and the economic aftermath such as energy shortage.

People's doubt on safety of nuclear power plants and the consequent closure of most reactors were of substantial economic influence. Although they are important as well, the present paper cannot touch upon them due to page limitation. The seismic aftermath was characterized by the long duration of aftershocks (Fig. 2). Because strong aftershocks continued for many months and there was a fear that another big "one" was coming soon, it was difficult to resume the recovery efforts immediately after the earthquake. Another difficulty came from the long duration time of strong shaking (Fig. 3) because of the huge seismic energy (Mw=9.0) and a need for revised design codes was felt. Another issue is the coseismic subsidence in the coastal area (Fig. 4). Because the subsidence exceeded 1 meter in the epicentral area, tsunami height relative to the ground level became higher by the same amount than the original expectation.

Fig. 1. Tohoku Region and location of Sendai City

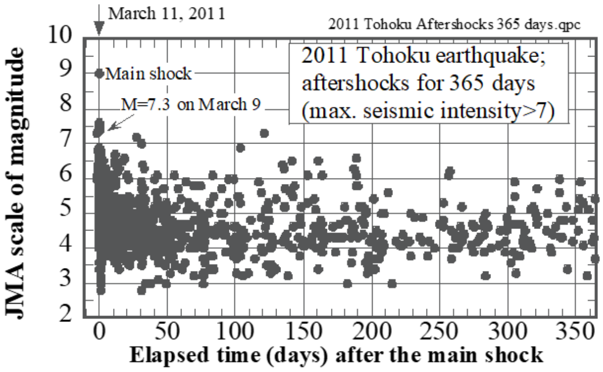

Fig. 2. Aftershocks in Tohoku Region (data by Japan Meteorological Agency; intensity>3)

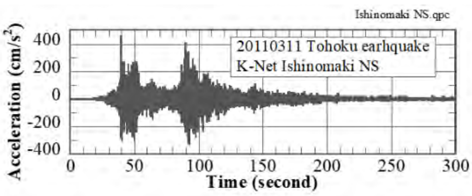

Fig. 3. K-Net acceleration record of Tohoku earthquake at Ishinomaki

Fig. 4. Lowered ground level due to coseismic subsidence in Bansekiura near Sendai City

GEOTECHNICAL DAMAGE

Tsunami is a phenomenon of water but mitigation of tsunami damage is closely related with geotechnical engineering. Fig. 5 demonstrates the shape of a sea wall destroyed by incoming tsunami. Sea water overtopped the wall and scoured the landside foot of the embankment. After the wall was lost during the first tsunami attack, the following tsunami attacks were able to flow into land without much resistance. This implies the need for scour-resistant design of sea walls. It is noteworthy, further, that the former tsunami disaster in Banda Aceh in Sumatra, Indonesia, in 2004 was characterized conversely by the effects of retreating water whose flow concentrated at the weakest points of sea barriers, as eyewitnesses told the author during his reconnaissance.

The disaster in 2011 showed a very difficult feature of tsunami disaster mitigation. The coast of Tohoku Region experienced big tsunami disasters in 1896, 1933 and 1960 prior to 2011 (Fig. 6). The memory of the gigantic event in AD 869 had been gone after many centuries. Following the 1933 disaster, many local communities decided to relocate their sites to higher places where the risk of tsunami was obviously negligible. Then the problem was the inconvenience of daily life because people were living mainly on fishing in the sea. Thereafter, the national government constructed high sea walls to protect many local communities. Fig. 7 shows one of them in the Tohni-Hongo Township. The height of this wall was designed by considering the tsunami height in 1896 that was the highest in the known history. Then, people felt safe and came back to the coastal area behind the new wall. It was unfortunate that the tsunami in 2011 was even higher than the wall and the community was destroyed (Fig. 8). If the community had remained in the high places, nobody would have been killed in 2011, although living on fishing would have been inconvenient. This tragedy shows that empiricism cannot always give us perfect safety and that we have to overcome a dilemma between safety during rare natural disasters and convenience in daily life.

Fig. 5. Damaged seawall near the Abukuma River mouth

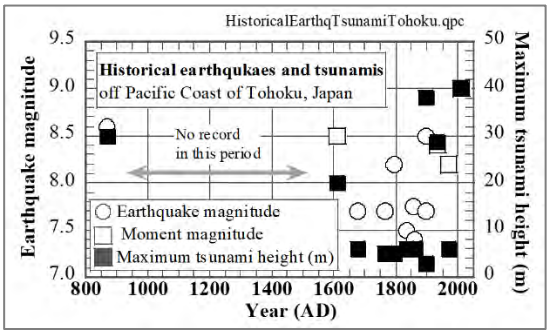

Fig. 6. History of devastating tsunami in east coast of Tohoku Region

Fig. 7. Sea wall in Tohni-Hongo that was constructed prior the disaster in 2011

Fig. 8. Destroyed community behind seawall (Tohni-Hongo Township)

Subsoil liquefaction was a significant problem in the residential areas and river levees. It happened in young cohesionless loose and water-saturated subsoil that underwent strong seismic shaking. Such liquefaction-prone soil was distributed in man-made islands in Tokyo Bay as well as along rivers where abandoned channels and former lakes had been filled with sandy soil for agricultural and residential developments. The significant extent of those damage was in clear contrast with the reasonably good performance of engineered foundation of important structures. This means that the lack of soil improvement budget was the cause of liquefaction disaster.

Figure 9 indicates a house that tilted due to subsoil liquefaction and extreme softening. Affected houses were located on recent reclaimed land and, generally, the responsibility for the poor quality of the land belongs to the owner of the land (owner of the house) or the architect as the representative of the owner. In other words, the legal liability is not with the contractor or developer. Due to this, the owners who were hardly experts of construction business and soil mechanics claimed the product liability of developers and contractors to whom, nowadays, more liability is assumed. It is still difficult, however, to assume 100% liability to them because the man-made island can be affected by the behavior of the underlying natural ground whose deficit is not necessarily the responsibility of the developers/contractors. Another possible problem in this regard is that ground improvement would have raised the land price upon purchase. The dilemma between safety and price of residential land is yet to be overcome.

Fig. 10 is a typical damage of embedded lifeline that was affected by liquefaction. Noteworthy is that liquefaction damage of lifeline is possible to occur not only in such liquefaction-prone ground as man-made islands but also in terrace geomorphology which hardly liquefies. Therein, the problem is the quality of backfill soil where compaction is desired but difficult in practice. See liquefaction in backfill in Fig. 11.

Considering the significant liquefaction effect, two actions were taken by engineering communities. The first one was development of a practical method to assess the liquefaction vulnerability of residential land and it consisted of the establishment of qualified evaluator of residential land (Towhata and Nakamura, 2015) as well as a new method of hazard assessment (Towhata et al., 2016a). The second action was through the governmental support to reconstruct liquefaction-resistant residential areas. In spite of the principle that recovery from natural disaster damage in personal properties is a responsibility of the owners and that public fund should not be spent on value increase of personal properties, the national government decided to provide supports because of the vast extent of damage on reliability of the urban environment which is public. The requirement was that public space (streets and avenues with lifelines) should be worked on together with the private space. The idea of "together" comes from the fact that liquefaction occurred equally in both public and private subsoils and future safety is achieved only through the overall ground improvement. Land owners were requested to shoulder 50% of the cost that was needed to improve their own land. Moreover, to improve both public and private lands at the same time, residents of the target area were required to unanimously agree on the project and payment. This requirement was not easy and many affected areas could not achieve it. As far as the author experienced, the major difficulties were as what follows;

- Very senior people are not interested in spending money on safety during future natural disaster. They prefer to keep their money for their descendants.
- Some people have retired and are living on a limited amount of pension money. They cannot afford the project.
- Others have already improved their home land by paying a substantial cost for such technology as compaction grouting and formation of micro piles under houses. Naturally, they do not wish to spend further money on repetition of ground improvement.

Accordingly, in Urayasu City, which the author was working for as a technical advisor, only 3 districts with approximately 470 families in total were able to achieve the unanimous agreement.

Fig. 9. Tilting of house situated on liquefied subsoil in Kashima City

Fig. 10. Floating damage of water pipeline in Itako City

Fig. 11. Backfill liquefaction effects on embedded pipeline; note that no liquefaction happened in the farm land (Naganuma City in Fukushima)

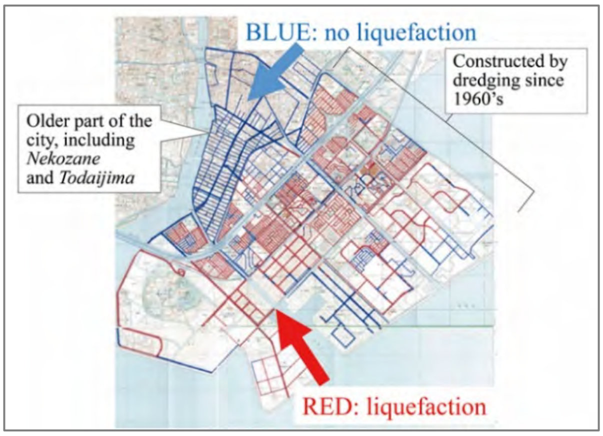

Fig. 12. Effects of soil age on liquefaction susceptibility of subsoil; example in Urayasu City

One of the important novel findings after the liquefaction reconnaissance was that the age of sandy soil significantly affected the proneness to liquefaction. Fig. 12 illustrates the distribution of liquefaction in Urayasu City. This city started its history as a small fishermen's village that was situated on a small sandbar (peninsula) at a river mouth. Shown by blue color in Fig. 12, this part of the city already existed in the 13th Century, according to local legends, and the subsoil here is probably as old as 1000 years or more. No liquefaction damage is known in this part of the city. In contrast, the remaining parts of the city are resting on very young man-made islands that were constructed after late 1960s. Significant liquefaction happened there unless soil improvement had been locally practiced; see red part in Fig. 12.

Seeing such age effect at many places, the author and his group worked on many case histories during the earthquake in 2011. The factor of safety against liquefaction was calculated at many places by using available bore hole data and nearby seismic records. It was found that the border of the factor of safety between liquefied and unliquefied sites, which is equal to 1.0 in principle, decreases with increasing soil age (Fig. 13), suggesting that aged soil has additional liquefaction resistance that is not accounted for in existing design codes. As a consequence, aged soil was less prone to liquefaction in spite of the factor of safety less than unity. Fig. 14 illustrates the increase in liquefaction resistance with soil age. While data from many other literatures are plotted together, the authors' output is illustrated by shaded rectangles and practice can increase the liquefaction resistance by 40% if age is 400 years or more (for details, refer to Towhata et al., 2016b).

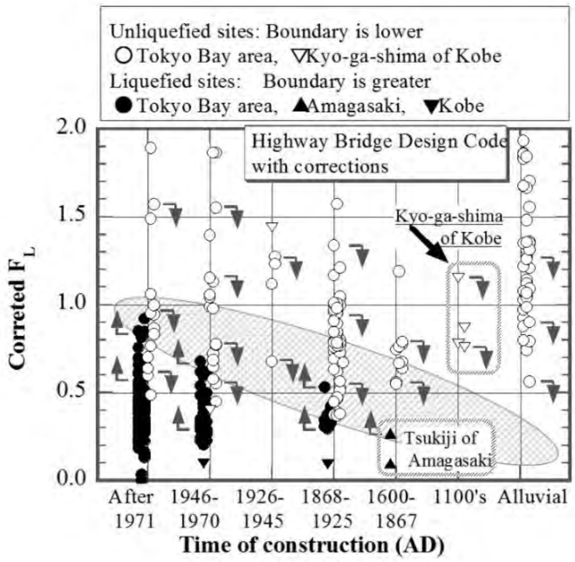

Fig. 13. Variation of assessed factor of safety with age of soil

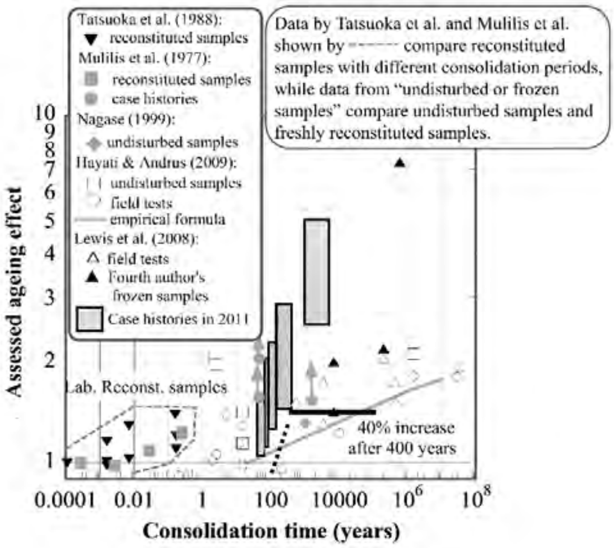

Fig. 14. Effect of soil age on increase in liquefaction resistance of sand; note that the quantitative trend in this figure is valid to Japan only (Towhata, 2018)

GROUND IMPROVEMENT TO MITIAGTE LIQUEFACTION RISK IN EXISTING RESIDENATIAL AREAS

To cope with the vast extent of liquefaction damage in residential areas, the national government set up a public support package by which the cost for ground improvement is supported to individuals. This was an exceptional action but is sometimes carried out in the recent times after "big" natural disasters. What is special herein is that public support is provided to improve the quality (value) of private lands, which is not allowed under normal conditions. From liquefaction viewpoints, the liquefaction in public space (streets in urban areas) and private land cannot be discriminated; both types of subsoil liquefy together and affect urban environment. From this perspective, two kinds of subsoil were improved together with 100% public fund in the public space and 50%-50% sharing between the public and land owners in private land.

The ground improvement projects were carried out under the responsibility of local governments, while cost was partially paid by local citizens in the target areas. Payment by citizens meant that citizens who were not necessarily civil engineers trusted the local governments and provided money. Thus, citizens were clients. Due to this, the projects had the following special features;

- No technical challenge because clients wished 100% success and were not interested in technological research and development
- Reliability of technology that has been verified through practice
- Ground improvement under existing houses
- No substantial damage in or disturbance to daily life of residents
- Reasonable financial burden to people

- Unanimous agreement of local communities on the project; public money should not be spent on ground improvement under single house.

Accordingly, there were only two possible methods of ground improvement; lowering of ground water level (Suwa et al., 2014; Yasuda, 2016) and construction of underground walls of grid shape (Suzuki et al., 1995). The latter method reduces the cyclic deformation of subsoil during earthquake shaking and thus reduces the possibility of liquefaction; see Fig. 15. Obviously, the first option is substantially less costly than the second one. About ten municipalities started to achieve unanimous agreement of residents in target areas. Some of them failed because residents did not wish to spend their money on future safety. Several municipalities achieved agreement and chose ground water lowering that was less expensive and did not even need personal expenditures (Fig. 16). Urayasu City unfortunately could not take this option because the city rests on 40-meter thick soft alluvial clay that caused significant consolidation problem from 1970s to 1990s and even nowadays. It was feared that additional consolidation settlement might be triggered by drainage and ground water lowering. Challenge had to be avoided in the framework of the people's project. Therefore, to carry out the second option of underground wall (soil-cement mixing) in a very narrow space between houses (Fig. 17), a small and light-weighted jet-grouting machine was developed (Fig. 18).

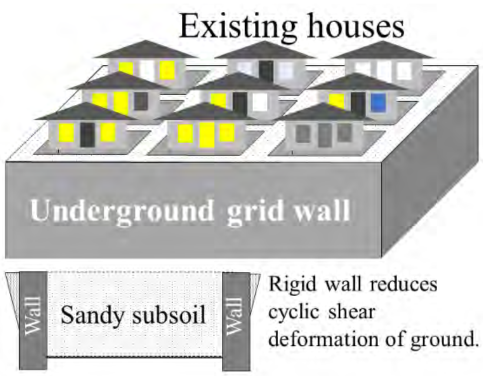

Fig. 15. Mitigation of liquefaction risk by installed underground walls of grid shape in narrow space among houses

Fig. 16. Ongoing drainage and lowering of ground water level in Kuki City (photograph by Prof. Koseki)

Fig. 17. Narrow space between houses in Urayasu City

Fig. 18. Newly-developed small and light-weighted jet-grouting machine

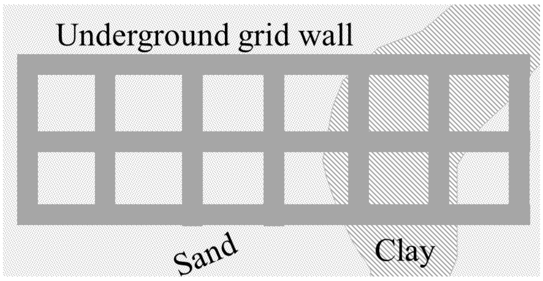

Fig. 19. Conceptual plan of installed grid wall in residential block

Fig. 20. Hindrance of jet grouting by unforeseen buried plastic drain

Figure 19 shows the idea of grid wall in a residential area. It was thought important that all the families in a target block of town unanimously agree on the project so that a complete set of grid wall might be installed. If any one family declines, the grid will be incomplete and its integrity during strong ground shaking will be of question. Noteworthy is that completeness of grid requires jet grouting even in clayey subsoil that may be encountered in a part of the target area.

When preliminary work started in early 2017, clay mass was encountered. As mentioned earlier, the area of Urayasu City is situated in a river mouth where different kinds of soil deposited in waterways at different geological times, leading to mottled pattern of soil-type distribution. This situation was made more complicated during the land reclamation works which put different types of soil at different places at different times. Although construction of liquefaction mitigation measure in clay did not make sense, the overall stability of grid wall required it. Then two problems occurred;

- Clay deposit did not allow uniform jet grouting; grout flowed away only through favorable channels or came out of the ground surface directly,
- Unforeseen plastic drains, that had been installed during land construction in 1970s or earlier in order to promote consolidation, twined around the grouting device and stopped the operation (Fig. 20).

Due to these two problems, the project was forced to stop for half a year and countermeasures were investigated. After trials and errors in the field, it was decided to take the following options;

- Higher jet pressure is applied to remove clay and drain from the device,
- Jet grouting is repeated two times to further ensure the successful work,
- The device is carefully inspected during jet grouting in order to detect possible twining of plastic drain,
- If drain twines, it is removed from the device and jet grouting is executed once more.

Fig. 21. Collected specimen of solidified clayey soil after modified working procedure

The improved procedure was adopted and drilled cores collected from the site were inspected to demonstrate 100% satisfaction (Fig. 21). Only one problem was the elongated construction period. Residents did not like it and voting showed that only one community with 33 families still agreed unanimously on the project. Thus, the ground improvement was finally executed in a very small scale in spite of the original idea (Fig. 22).

Fig. 22. Ongoing ground improvement by small jet grouting device in a very narrow space among houses

This chapter takes example of Rikuzen-Takata City in Iwate Prefecture that was inundated by tsunami up to the elevation of 10 to 17 meters. Considering this extent of inundation, the reconstruction project decided to construct a new sea wall of 12.5-meter height associated with elevating the ground surface level to 7-12 meters by earth filling as well. The volume of filled soil and the area of thus elevated ground are 114.2 million cubic meters and 3.03 square km, respectively (Figs. 23 and 24). One fear is that nine years have passed after the disaster and some people have moved out of the city, while others have got new houses at the top of hills (Fig. 25). Those people may not come to live in the newly elevated land. Because the population has decreased, it is not clear whether or not the newly elevated city will be fully occupied by residents in near future. Last and not least, it should be borne in mind that the ground level is likely to settle down by more than 1 meter during the fault rupturing (Fig. 26). Hence, the tsunami, which comes later, becomes higher than the expectation by this amount relative to the sunken ground.

Fig. 23. Ongoing reconstruction of Rikuzen-Takata City

Fig. 24. Vast size of elevated ground in Rikuzen-Takata City

Fig. 25. New residential area at hill top

Fig. 26. Tectonic subsidence in Onagawa Harbor near Sendai where ground level is lower than the previous level by more than one meter

CONCLUSION

This paper attempts to summarize the author's "Ishihara Lecture" that was delivered in Rome in June 2019 during the 7th International Conference on Earthquake Geotechnical Engineering under the auspices of ISSMGE Technical Committee 203 on earthquake problems. While the lecture covered many topics such as tsunami disaster, subsoil liquefaction, coseismic subsidence of earth crust, model tests on improvement of seismic resistance of infrastructures and the nuclear accident of the Fukushima No.1 Power Plant in addition to the contents of this paper, the author limits his scope herein to geotechnical issues. It may be understood in this paper that substantial damage occurred to people's lives and properties and responses to the disaster required new geotechnical efforts.

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◆ A brief CV of Prof. Ikuo Towhata

Ikuo Towhata obtained his doctoral degree from the Civil Engineering Department of the University of Tokyo in 1982. Currently, he is a professor emeritus of that school and is a visiting professor at Kanto Gakuin University in Yokohama. He has been majoring mitigation of geotechnical disasters caused by earthquakes and slope failures through laboratory tests, shaking model test, mathematical/numerical analyses and field investigation. He is also interested in microscopic observation of soil mechanics phenomena such as development of shear band and ageing. In addition to academia, he is working for an architectural office and a geotechnical consultant firm. He is the author of an "encyclopedia" book entitled Geotechnical Earthquake Engineering published by Springer in 2008.

Case-History

Potential Use of Gyro Piler in ASEAN Countries

Teik Lim Goh

Director
Atsunew Giken Pte. Ltd. (Singapore)

The Gyropress Method uses a newly developed press-in piling machine, so called “Gyro Piler” where rotary function is incorporated to allow tubular piles with cutting bits attached on pile toe to be inserted into a ground vertically or at varying lateral angle at both sides. In Japan where the press-in piling method is originated, the Gyropress Method has been widely applied for disaster prevention and infrastructure construction in urban area. Though the Gyropress Method has yet to be adopted in ASEAN Countries, the potential of this advanced technology to be adopted in the local construction market has been the talking point for geotechnical engineers.

1. Seawall Construction for Road Development at Marina Coastal Expressway, Singapore

Marina Coastal Expressway (MCE) connects Kallang-Paya Lebar Expressway (KPE) and East Coast Parkway (ECP) in the east to the Ayer Rajah Expressway (AYE) in the west, with direct connections to Marina South and Straits View areas (Fig. 1). With the development of Marina Bay Financial Centre and Gardens by the Bay, MCE caters for the expected increase in traffic volume around the Marina Bay area. The dual five-lane, 5km long expressway will support the large number of commuters who travel to offices, homes and attractions in the Marina Bay area.

Fig. 1. C481 of Marina Coastal Expressway [S’pore]

Fig. 2. Proposed Seawall & Future Reclamation

Contract 481 involves the construction of about 0.5km seawall to allow reclamation to take place in marine condition at Marina Wharf (Fig. 2 & Fig. 3). Gravity Cofferdam Seawall consisting of box type tubular sheet piles wall (Fig. 4) socketed into firm ground has been proposed for construction before the portion of sea is reclaimed with sand fill.

Fig. 3. Marina Coastal Expressway after Reclamation

Fig. 4. Tubular Sheet Piles installed by Giken Kokan Piler

The seabed varies with water depth ranging from 8m to 18m. Furthermore, the site is located in difficult soil conditions where there exists a thick soft marine clay deposit (Kallang Formation) under the seabed. The concept of having “implant” seawall derives from similar concept of “implant” tooth has been adopted. Gravity box tubular sheet piles wall socketed into Old Alluvium (OA) layer has been constructed to provide the robustness to the overall seawall structure (Fig. 5).

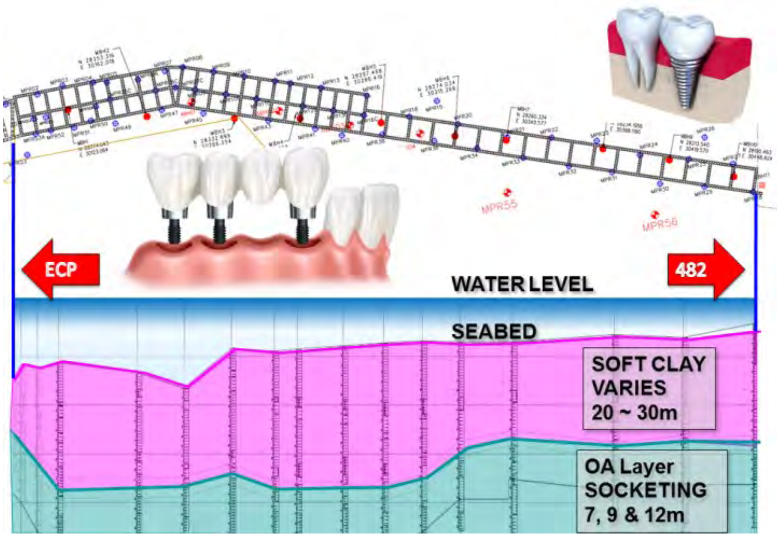


Fig. 5. Implant Seawall on thick Marine Clay Deposit

Under the site condition above water, it would have been normal to construct temporary staging at much effort, far and above that is necessary for the required construction works. This is unavoidable as the current conventional piling method has to rely on a flat working platform to sit their machineries.

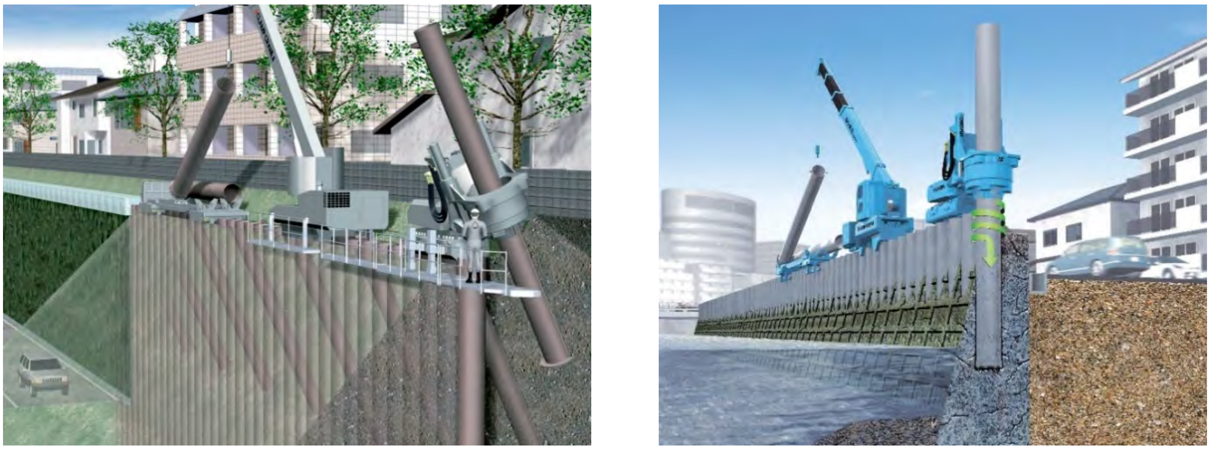
Therefore, the press-in piling technology has been effectively used in this project as it allows the machine to self-walk over previous installed tubular sheet piles during pile driving operation. 1169 nos. of 1200mm diameter tubular sheet piles have been installed successfully by using two Tubular Piler machines for duration of almost one year (Figs. 6).

Figs. 6. GIKEN Kokan Piler & Tubular Sheet Piles

2. How Gyropress Method can be adopted instead?

Gyro Piler has a lateral tilting function which enables to install batter piles and anchor piles at an inclined angle with a set of rotational cutting bit at the pile tip (Fig. 7). The press-in machine has been developed to allow the raker and strut-free piles to be installed from the same position, allowing the construction of a robust structure through hard layer or obstacles (Figs. 8).

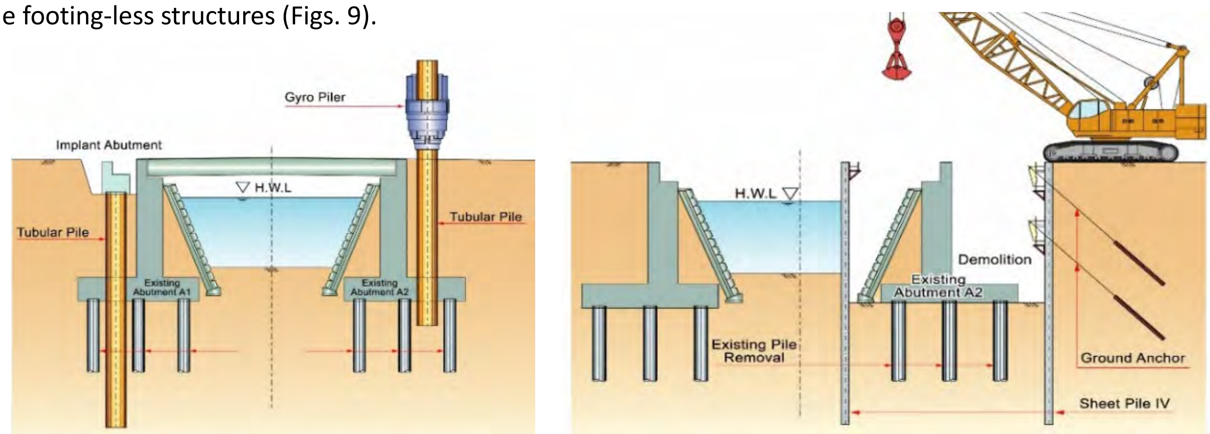
Figs. 7. Installation of Raker Pipe Pile with Rotational Cutting Bit using Gyro Piler



Figs. 8. Installation of Strut-free Piles for Construction of Robust Structure through Obstacles

3. Concept of Implant Structure

The Implant Structure is made of modular prefabricated structural elements and installed into the ground using the press-in piling method. It functions both as a foundation pile and act ultimately as the body of a structure. During construction, no extensive temporary work is necessary. It is a structural revolution which changes the current footing-based approach into the footing-less structures (Figs. 9).



Figs. 9. Comparison using Concept of Implant Structure versus Conventional Approach

4. Conclusions

This new concept of construction further adds engineering value to the overall construction. It reinforces the existing structures and minimizes the construction activities involved. The procedure of works is systematic and imposes less environmental problem to the surrounding. Even if any existing structures obstruct the construction of a new structure, it can still be solved by demolishing only a small affected part of the existing structure.

Figs. 10. The Gyropress Method

The Gyropress Method (Fig. 10) adopts the superiority of press-in piling technique with the following advantages:

a) The Gyro Piler grips on reaction piles, rotating and pressing down a new pile into soil and allows the press-in machine to travel forward in the direction of wall construction and causes minimum disturbance (silent & less vibration) to the surrounding environment which makes the piling technique efficient to infiltrate into congested area .
b) Even if the soil is hard or an obstacle (e.g. concrete structure) is encountered below ground, the Gyro Piler can still penetrated the obstacle by special cutting bits at the pile tip.
c) The rotation and downward force are applied to the pipe pile to be pressed-in at ground surface, making it possible even when the overhead clearance is limited (e.g. under a bridge or viaduct).
d) The Gyro Piler has a lateral tilting function which enables the installation of batter piles and anchor piles for a high modulus and robust retaining walls.

Acknowledgement

1. Main Contractor of MCE481 Project - Hock Lian Seng Infrastructure Limited (Singapore)
2. Geotechnical Consultant of MCE481 Project – AGS Consultants Pte. Ltd. (Singapore)
3. Giken Seisakusho Asia Pte., Ltd. (Singapore)
4. National University of Singapore (Singapore)

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◆ A brief CV of Dr. Teik Lim Goh

Teik Lim Goh has his early education in University of Malaya (KL, Malaysia). After graduation, he joined Ove-Arup (KL) as a consulting engineer. He came to National University Singapore to further his doctorate study, researching on a deep excavation topic in soft ground. He started practicing as a geotechnical engineer in SembCorp Engineers & Constructors, specializing in deep excavation work for the construction of cut-and-cover road tunnel in Singapore (Kallang & Paya Lebar Expressway | Contract 421). He has then joined Giken Seisakusho Asia as a Technical Manager, and soon thereafter has been promoted as General Manager, in-charge of Asia region in promoting the use of Silent Piler. In 2011, he established his own company, Atsunew Giken to specialize in sub-contracting of Silent Piler work. He is a registered professional engineer in Singapore & Malaysia.

Reports

2019 Promotional Activities of Press-in Technology in Malaysia

Nor Azizi Yusoff

Research Center for Soft Soil (RECESS)
Universiti Tun Hussein Onn Malaysia (UTHM), Malaysia

The construction industry, by its very nature, is a big user of natural resources in which triggering a great concern over environmental issue such as the climate change. Surely, the construction world should be evolved and revolutionize with a better construction practice. In answering these urgent needs, Several activities were initiated in Malaysia to widespread the concept of Press-in engineering and to disperse these sustainable agenda to this country.

Our first activity was initiated after the fasting month of Ramadhan. The Hari Raya Gathering was initiated on the 13th June 2019 by Research Centre for Soft Soils (RECESS), Universiti Tun Hussein Onn Malaysia. As the Head of this research centre, I took this opportunity to gather the researchers and industrial partners to communicate and promote a good relationship between university and the society. We are honoured by having our guest of honour YB. Datuk Dr. Shahruddin bin Mohd Salleh, the Deputy Minister of Federal Territories of Malaysia to officiate our gathering. In addition, Datuk Ir. Hj. Abdullah Isnin, Director General, Department of Irrigation and Drainage (DID) and Universiti Tun Hussein Onn Malaysia (UTHM) Vice Chancellor, Professor Datuk Ts. Dr. Wahid Razzaly, RECESS fellow researchers and students, UTHM top management and staff also attended the gathering. During the gathering, Mr. Heng Li and Mr. Takata from Giken Sesisakusho Asia (Singapore) Pte. Ltd. delivered a simple explanation of this technology to the honourable Deputy Minister and others.

Photo 1. Mr. Heng Li shared his experience on Press-in technology to the honorable Deputy Minister and UTHM Vice Chancellor

Science is an important subject that teaches us about ourselves and everything around us. However, it does not appeal to everyone. In an effort to cultivate interest and instil love in science and technology amongst Malaysians, the country has launched this National Science Week 2019 for the last few years. I took this opportunity to share Press-in technology and my R&D activities at RECESS, UTHM with students at Bukit Gambir Secondary School in conjunction with this National Science Week. I believed that the university is responsible to enhance student's interest in science, technology, engineering and mathematics (STEM) among the younger generation. Press-in technology will be a great example on how science, technology and innovation could facilitate a sustainable nation and construction industry. It is also interesting to share UTHM and RECESS experience in working together with IPA and Giken in promoting the application of this sustainable technology in Malaysia.

Photo 2. Some of the attendees had a photo session with the honorable Deputy Minister and UTHM Vice Chancellor after the event

Photo 3. School children and teacher had a group photo in front of RECESS booth

Photo 4. Sharing Press-in technology with teacher and students of Bukit Gambir Secondary School

My next program is to deliver a technical talk at Institution of Engineers Malaysia (IEM) Terengganu branch. I was commenced on the 15th August 2019 at the Institution of Engineers Malaysia (IEM), Terengganu branch seminar room. The technical talk was initiated by Ir. Nina Imelda M. Sulanah attracted close to 20 participants to attend the technical session. Most of the attendees are professional engineers in civil engineering field. Two lectures entitle 'Silent piling technology: Introduction and overview' and 'Silent piling technology: recent applications and research in Malaysia' were delivered during that session. At the same occasion, Mdm. Tuan Norhayati presented her paper entitle 'Vibration monitoring on building due to construction activities and human walking'. Both presentations were made in order to promote more sustainable construction activity in Terengganu.

Photo 5. A group photo after IEM Terengganu Technical Talk

My next trip was in September 2019. I had a series of presentation in Kuala Lumpur, Malaysia under the arrangement made by Research Centre for Soft Soil (RECESS), Institute of Integrated Engineering, Universiti Tun Hussein Onn Malaysia. The event demonstrated (RECESS) commitment in facilitating Construction Research Institute of Malaysia (CREAM) with the cutting-edge technology such as Press-in piling technology from Japan and YJACK pile load test method. The meeting was held at CREAM office, *Sunway Putra Tower, Kuala Lumpur.* CREAM aspired to be globally recognized as the leading institute for Research and Development (R&D) that drives quality, innovation, technology and skills towards achieving sustainability in the construction industry. The meeting could be a driver in a research collaboration between CREAM, IPA, RECESS and

Photo 6. Conduction a presentation related to Press-in technology during a technical session

UTHM in the near future. I would like to acknowledge CREAM's CEO, Dato' Ir Rozaimi and Dr. Hj. Mohd Khairolden for this opportunity. Thank you too for Giken Seisakusho Asia (Singapore) Pte. Ltd., Koye (Malaysia) Sdn. Bhd. and YJACK Technology Sdn. Bhd. in supporting the meeting with a sharing session of Press-in and YJACK technology success stories in Malaysia and Singapore.

Photo 7. A group photo with CREAM CEO after the meeting

Photo 8. Mr. Takata of Giken Asia (Singapore) presented a presentation to CREAM

On the same day, the next engagement was with Tenaga National Berhad (TNB). The meeting was headed by TNB Chief Engineer, Grid Solution Expertise Department, Ir. Muhamad Shukri Rahimi and attended by several TNB engineers, UTHM, Giken Seisakusho Asia (Singapore) Pte. Ltd., YJACK Technology (Malaysia) Sdn. Bhd. and KOYE (Malaysia) Sdn. Bhd. For record, Tenaga Nasional Berhad is the largest electricity utility in Malaysia and also one of the largest electricity companies in Asia with core business of providing electricity to the country's businesses, homes and industries. The company is 69 years of existence and Malaysia's leading electricity utility with a presence throughout Peninsular Malaysia, Sabah and Labuan. At this event, Giken, YJACK, KOYE and RECESS, UTHM shared our experience in Press-in, YJACK pile load test and other research and development initiative at RECESS, UTHM technologies to Tenaga Nasional Berhad (TNB). Thank you for the opportunity.

Photo 9. A group photo with TNB staff after the meeting session

In summary, the collaboration between universities and the industry is increasingly perceived as a vehicle to enhance innovation through knowledge exchange. I believed the working culture and a great partnership between International Press-in Association (IPA), Research Centre for Soft Soils (RECESS), Universiti Tun Hussein Onn Malaysia (UTHM) together with our industrial partners such as Giken Seisakusho Asia Pte. Ltd., KOYE (Malaysia) Pte. Ltd. and Construction Research Institute of Malaysia (CREAM) may be able to enhance the implementation of sustainable piling technology such as Press-in technology in the near future. These may lead to a revolution of construction industry in Malaysia to be a more environmentally friendly and sustainable.

Photo 10. Mr. Takata of Giken Asia (Singapore) presented a Press-in technology introduction to TNB staff

Reports
From IPA's US Regional Office

Tsunenobu Nozaki

General Manager
Giken America Corporation

The IPA's regional offices were established in Japan, the Netherlands, Singapore and here in the USA in March 2019 in line with the worldwide expansion of IPA activities. The US office was established within the New York office of Giken America Corporation. The New York office is the 2nd regional office of Giken America Corporation in the USA, which was also established in March 2019. The activities of the IPA in the USA are being carried out by our senior advisor Mr Takefumi Takuma and myself. We are backed by one of the IPA directors, Mr Kenichi Soga who is Chancellor's Professor at the University of California, Berkeley. The IPA regional office covers the North and South America markets, although we are currently focusing on the US market. Our activities are mostly participating in seminars/conferences, submitting technical papers and introducing the global trend of the Press-in Method to people in the construction industry. In the USA, there are a number of construction seminars, conferences and exhibitions held throughout the country all year round by numerous organizers. Some of the organizations are leading figures in the US construction industry and even have an influence globally. Some of the major organizations are DFI (Deep Foundations Institute), ASCE (American Society of Civil Engineers) and PDCA (Pile Driving Contractors Association). We at IPA are also committee members of these organizations and often disseminate the Press-in Method information via their events.

The US geo-structural industry is quite different from that in Japan and also quite unique. There are various kinds of geo-structural design standards in the industries published by the federal government. As well, there are many other design standards published by states and private organizations, which complement the federal standards. Therefore, it is very important for the IPA, in this country, to publish more comprehensive and robust technical practices and information so that they can be correlated and infused with these local design standards. Also, I feel that there is a lot of room to improve technical specifications of the Press-in Method. As well as the design standards, there are various technical specifications available in this country. However, none of these specifications cover specific technical aspects of the Press-in Method. Therefore, it is often a source of concern for engineers how to specify the Press-in Method on their projects. In order to overcome this concern, we are trying to provide comprehensive specifications of the Press-in Method.

In the USA, as well as in other countries, steel sheet piles are commonly used in construction foundations. Compared to Japan, the US market volume is approximately half, in terms of annual sheet pile consumption. Also, surprisingly in the USA, almost 100% of steel sheet piles are Z sheet piles which are installed in pairs. The reason is that steel sheet piles are normally left in place, even if they are used as a temporary structure. As for steel pipe piles, they are seldomly used as retaining walls. The general consensus is that steel pipe pile installation is associated with unbearable noise and vibration, therefore, cast in-situ concrete retaining walls are conventionally utilized. I see a huge potential here for the Press-in Method, utilizing steel pipe piles, to be used as a practical alternative to the range of heavy retaining walls.

In comparison to the Japanese market, the Press-in Method is still new in some areas of the USA. In order to disseminate Press-in Method information more effectively, we will be participating in more events in the future as well as providing information through our newsletters more often.

Below shows a typical presentation and technical document in the USA.

Fig. 1. Presentation in GeoCongress Seminar

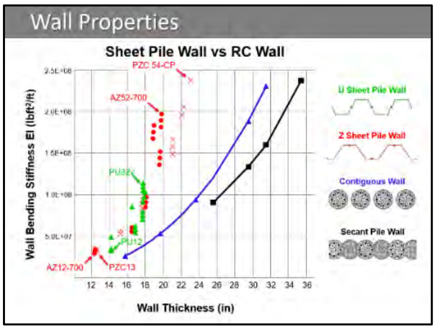

Fig. 2. Technical Report

Reports
Publications related to Press-in Technology (2017~2019)

NO.	Authors	Year of Publication	Title	Published in	Volume/Page	Language
1	Zhuang, Y.	2017	The Effect of Bottom Stabilisation on Sheet Pile Pit	M.Eng. Project Report, Cambridge University Department of Engineering	46p.	English
2	Ogawa, N., Ishihara, Y. and Kitamura, A.	2017	Experimental study on deformation of self-retaining sheet pile wall due to excavation and backside surcharge	Journal of Japan Society of Civil Engineers	Volume 73 Issue 1 pp. 62-75	Japanese
3	Takuma, T. and Kambe, S.	2017	Sustainable Slope Protection and Cut-off Wall Installation in Densely Populated Areas by the Press-in Piling Method	Proceedings of 2017 Geotechnical Frontiers Conference (ASCE GSP 279)	pp. 233-241	English
4	Takuma, T.	2017	Riverine Levee Upgrades Against Liquefaction and Seismic Impact with Double Sheet Pile Walls and Deep Soil Cement Mix Columns	Proceedings of 2017 Geo-Risk Conference (ASCE GSP 283)	pp. 67-75	English
5	Vaz, I. and Takuma, T.	2017	Advantages of Pressed-In Sheet Piles for New Orleans’ Hurricane and Storm Damage Risk Reduction System Flood Control Project	2017 DFI Annual Conference Proceedings	-	English
6	Gillow, M.	2018	Water jetting for sheet piling in sandy soils	M.Eng. Project Report, Cambridge University Department of Engineering	49p.	English
7	Takuma, T. and Sakai, T.	2018	Emergency Bridge Pier Foundation Repair with Pressed-in Piles	Proceedings of 2018 International Foundations Congress and Construction Expo	pp. 224-237	English
8	Takuma, T., DellAringa, C. and Nagano, M.	2018	Retrofitting Drainage Systems With Pressed-in Sheet Piles in Very Hard Soil in Southern California	2018 DFI Annual Conference Proceedings	pp. 222-231	English
9	Suzuki, N., Kimura, Y., Sanagawa, T. and Nishioka, H.	2019	Modeling of vertical bearing capacity of rotally press-in pile used for a railway structure	Journal of Railway Engineering, JSCE	No.23 pp. 217-222	Japanese
10	Suzuki, N. and Ishihara, Y.	2019	Case study on the application of press-in piling data to design and construction of pile foundations for reducing the expected total cost	Proceedings of International Conference on Case Histories and Soil Properties	-	English
11	Jennifer Chambers	2019	Plugging during rotary pile driving	M.Eng. Project Report, Cambridge University Department of Engineering	-	English
12	Hirose, T. and Nozaki, T.	2019	Applications of Press-in Piling Method in urban development works	Proceedings of International Conference on Case Histories & Soil Properties	-	English
13	Takuma, T., Nishimura H. and Nagano, M.	2019	Emergency Bridge Abutment Repair with Pressed-in Pipe Piles	Proceedings of 2019 ASCE Geo-Congress Conference	pp. 308-317	English

NO.	Authors	Year of Publication	Title	Published in	Volume/Page	Language
14	Takuma, T.	2019	Enhancement of Existing Levees' Resiliency Against Liquefaction and Lateral Spreading with Pressed-in Piles	Proceedings of 2019 International Conference on Natural Hazards and Infrastructure	(ID_276)	English
15	Takuma, T.	2019	Sinkhole and Landslide Mitigation with Pressed-in Piles	Proceedings of 2019 International Conference on Natural Hazards and Infrastructure	(ID_305)	English
16	Takuma, T. and Nagano, M.	2019	Emergency and Non-emergency Railroad Safe Earth Retaining Walls with Pressed-in Sheet Piles	2019 American Railway Engineering and Maintenance-of-way Association (AREMA) Annual Conference Proceedings	pp. 248-260	English
17	Takuma, T., Nozaki T. and sashi, M.	2019	Design and Construction of Permanent Sheet and Pipe Pile Basement Walls with the Press-In Piling Method	2019 DFI Annual Conference Proceedings	-	English
18	Takuma, T.	2019	Upgrading Existing Levees' Seismic Resiliency with Pressed-in Double Sheet Pile Walls	Proceedings of 7th International Symposium on Geotechnical Safety and Risk	pp. 804-809 (IS4-13)	English
19	Ishihama, Y., Takemura, J. and Kunasegaram, V	2019	Analytical evaluation of deformation behavior of cantilever type retaining wall using large diameter steel tubular piles into stiff ground	Proceedings of Geotechnics for Sustainable Infrastructure Development (GeotecHanoi 2019)	pp.91-98	English
20	Mochizuki, K., Isobe, K., Takemura, J. and Ishihama, Y	2019	Numerical simulation for centrifuge model tests on the stability of self-standing steel pipe pile retaining wall by Rigid Plastic FEM	Proceedings of Geotechnics for Sustainable Infrastructure Development (GeotecHanoi 2019)	pp.481-488	English
21	Kunasegaram, V., Otani, Y., Seki, S., Takemura, J. and Ishihama, Y	2019	Centrifuge Model Study on Cantilever Steel Tubular Pile Wall Embedded in Soft Rock	Proceedings of Geotechnics for Sustainable Infrastructure Development (GeotecHanoi 2019)	pp.1045-1053	English
22	Fujiwara,K., Nakai,K. and Ogawa, N.	2019	Quantitative evaluation of PFS (Partial Floating Sheet-pile) Method under liquefaction	Proceedings of Geotechnics for Sustainable Infrastructure Development (GeotecHanoi 2019)	pp.467-472	English
23	Kasama,K. Ohno,M. Tsukamoto, S. and Tanaka, J.	2019	Seismic Damage Investigation for River Levees Reinforced by Steel Sheet Piling Method Due to the 2016 Kumamoto Earthquake	Proceedings of Geotechnics for Sustainable Infrastructure Development (GeotecHanoi 2019)	pp.853-858	English
24	Kitano, Y. and Yamaguchi, M.	2019	A case history of piling work utilizing the Press-in method on a steep slope	Proceedings of Geotechnics for Sustainable Infrastructure Development (GeotecHanoi 2019)	pp. 845-852	English
25	Yamaguchi, M., Kimura, Y. and Morisawa, T.	2019	Rehabilitation of the coastal road retaining wall using the Press-in technology	Proceedings of Geotechnics for Sustainable Infrastructure Development (GeotecHanoi 2019)	pp. 1323-1330	English

Note: The above publications were Peer Reviewed papers but excluded the Proceedings of The First International Conference on Press-in Engineering 2018.

Event Reports

IPA-TC3 Steel Sheet-pile Symposium in KMUTT, Thailand, on October 31, 2019

Pastsakorn Kitiyodom

Deputy Managing Director,
Geotechnical & Foundation Engineering Co., Ltd, Thailand

"Steel Sheet-pile Symposium" was organized by Technical Committee 3, International Press in Association and King Mongkut's University of Technology Thonburi (KMUTT) on 31st October 2019 at meeting room of Civil Engineering Department, King Mongkut's University of Technology Thonburi (KMUTT), Thailand.

In this symposium, the current development and practice on steel sheet-pile method in Japan and recent research accomplishments on PFS (Partially Floating Sheet pile) method were introduced. Around 50 participants of geotechnical and structural engineers, college lecturers and students from King Mongkut's University of Technology Thonburi (KMUTT) joined this symposium.

The program of the symposium was as follows:

- Opening address, presented by Prof. Jun Otani (Kumamoto University / Chair of IPA-TC3)
- Introduction of IPA and TC, presented by Prof. Tatsunori Matsumoto (Kanazawa University / advisor of IPA-TC3)
- Introduction of IPA-TC3 and PFS (Partially floating sheet-pile) method, presented by Prof. Jun Otani (Kumamoto University / Chair of IPA-TC3)
- Site investigations on PFS method in Kumamoto Prefecture, presented by Assoc. Prof. Kiyonobu Kasama (Tokyo Institute of Technology, member of IPA-TC3)
- Results of centrifuge tests on PFS method, presented by Assoc. Prof. Tetsuo Tobita (Kansai University, member of IPA-TC3)
- Results of numerical analysis on PFS method, presented by Assoc. Prof. Kentaro Nakai (Nagoya University, member of IPA-TC3)
- Topics on sheet piling or foundation engineering in Thailand, presented by Mr. Visanu Vivatanaprasert (Altemtech Co., Ltd.)
- Steel sheet pile technology, presented by Dr. Shinji Taenaka (Nippon Steel, Secretary General of IPA-TC3)
- Researches on press-in technology, presented by Mr. Yukihiro Ishihara (Giken Ltd., member of IPA-TC3)
- Q&A session and closing speech, presented by Dr. Pastsakorn Kitiyodom (Geotechnical & Foundation Engineering Co., Ltd) and Dr. Pornkasem Jongpradist (King Mongkut's University of Technology Thonburi)

The presentation shows the result of applying Partially floating sheet-pile method (PFS) on the Kumamoto Plain. This method will be compared with conservative, floating, ground improvement method and without any countermeasure. The key issues are to find appropriate values between floating depth and width ratio of sheet pile resting on stratum and soft soil layer. Their appropriate values will reduce the construction time and cost while provide sufficient strength. To improve PFS technique, centrifuge tests and numerical analysis will be applied to determine the appropriate values. Furthermore, development of steel sheet pile technology could help to improve efficiency of steel section, cost and construction time.

Recently, in Thailand, a steel sheet-pile method has been used as a permanent structure rather than temporary work in the construction site with constraint condition. The Silent Piler plays an important role to tackle the difficult construction conditions such as small working area, strict standards of noise and vibration controls and an area with low head room.

The PFS method shows an interesting result and the technique could be applied in Thailand. However, there are still some uncertainties about difference of soil condition, performance to be designed as retaining walls and effective type of steel section.

The discussion during the symposium will help improve technique of steel sheet pile and spread the knowledge of press-in technique. The activity of International Press-in Association (IPA) also raises awareness of innovation to improve Engineering society and human life.

Fig. 1. A group photo of the participants after the symposium

Fig. 2. Opening address by Prof. Jun Otani

Fig. 3. Prof. Tatsunori Matsumoto introduces concept of IPA and TC

Fig. 4. Assoc. Prof. Kiyonobu Kasama summarizes his site investigation results on PSF method

Fig. 5. Assoc. Prof. Tetsuo Tobita explains results and concept of centrifuge technique

Fig. 6. Assoc. Prof. Kentaro Nakai shows the results of numerical analysis on PSF method

Fig. 7. Mr. Visanu Vivatanaprasert shares his experience on projects using Silent Piler in Thailand

Fig. 8. Dr. Shinji Taenaka clarifies the development of steel sheet pile section

Fig. 9. Mr. Yukihiro Ishihara explains about researches on press-in technology

Event Reports
GEOTECH HANOI 2019

Tatsunori Matsumoto

Vice President of IPA
Professor of Kanazawa University


Photo 1 Venue scenery

"GEOTEC HANOI 2019 - the 4h International Conference on Geotechnics for Sustainable Infrastructure Develop ment" was held on November 28-29, 2019 at the National Convention Center in Hanoi, Veitnam. The conference was organized by FECON Corporation, the Vietnamese Society for Soil Mechanics and Geotechnical Engineering (VSSMGE), Thuyloi University and Kokusai Kogyo Co., Ltd., patronized by ISSMGE and Japan International Cooperation Agency (JICA). 15 sponsors, 48 exhibitors and 815 experts and attendees from over 40 countries participated.

Six keynote lectures were made with respect to 6 themes: 1) "Deep foundation" by Prof. Harry Poulos (19 papers), 2) "Tunnelling and underground spaces" by Prof. Adam Bezuijen (9 papers), 3) "Ground improvement" by Prof. Masaki Kitazume (27 papers), 4) "Landslide and erosion"by Prof. Delwyn Fredlund (28 papers), 5) "Geotechnical modelling and monitoring" by Prof. Lidia Zdravkovi (37 papers) and 6) "Coastal foundation engineering" by Prof. Mark Randolph (10 papers). Furthermore, 2 special invited lectures by Prof. Charles Ng and Prof. Eun Chul Shin, and 2 invited lectures by Prof. Norikazu Shimizu and Dr. Kenji Mori were delivered.

The proceedings of the conference (edited by P. Duc Long and N. T. Dung) has been published by Springer Nature Singapore (https://doi.org/10.1007/978-981-15-2184-3_60). Eight papers relating the Press-in Engineering were presented by Japanese members of IPA. The conference was well organized. The registration system at the conference venue was the most up-to-date style, and young engineers and students supported the conference very well. It was very nice that many young engineers and researchers were awarded by the organizing committee of the conference.

Masafumi Yamaguchi

Manager of GIKEN LTD.

Photo 2 At the exhibition with Prof. Matsumoto (right)

I am pleased to convey my experience and impression of GEOTECH HANOI 2019 for readers in this short note. This international conference featured four major themes and two vital topics on sustainable development; as well as deep foundations, tunneling and underground spaces, ground improvement, geotechnical modelling and monitoring, landslide and erosion, and coastal foundation engineering. Eight papers regarding press-in engineering were submitted: one research report form IPA Director, three research reports from the IPA Technical Committee 1 (TC-1), one research report from TC-3 and two applications on the press-in technology including my report.

My application report was entitled “Rehabilitation of the Coastal Road Retaining Wall, Using the Press-in Technology” and I also made a presentation in the session “Coastal Foundation Engineering”. It was a good opportunity to inform researchers and practical engineers in Vietnam of the latest applications in Japan. I felt that those in this country were taking more interest in press-in during the conference. one of reasons might be that my presentation was awarded the best presenter award in the session?! In the exhibition hall, 60 exhibitors from all over the world showcased their latest technologies and activities: piling, ground improvement, measurement devices (mainly those for site investigation), numerical analysis and others. All the exhibitions were of interest. Actually, GIKEN, which is a Japanese company and owns press-in technology, also had a booth there and many participants visited its booth and listened to our explanations carefully.

GEOTECH HANOI is one of the most important international conferences in Vietnam. Thus, I strongly recommend people who are interested in the latest research and/or trends in the construction industry in Vietnam to participate in next one.

Young Members Column

Experiencing Press-in Technology for the First Time

Nur Liyana bte Mohd Nor

Final Year Undergraduate Student, Faculty of Civil and Environmental Engineering
Universiti Tun Hussein Onn Malaysia (UTHM), Malaysia

I'm Nur Liyana bte Mohd Nor, a final year student at Universiti Tun Hussein Onn Malaysia (UTHM). I was first introduced to Press-in technology by my final year project supervisor, Dr. Nor Azizi Yusoff who are actively promoting Press-in technology at our university and Malaysia. I decided to engage and learn this technology. I was assigned to make a case study related to Mass Rapid Transit (MRT) construction that use silent piling technology in Malaysia. For that reason, I was attached to Koye (M) Sdn. Bhd. who are the contractor for the previous MRT project and supervised by Dato' Sri Chung Kian Wai and Mr. Alvin Low.

Fig. 1. The author(left) with Mr. Alvin at the KOYE office

Fig. 2. Sheet pile work on construction site

At the early stage of the industrial attachment, I was introduced with an introduction to the construction of MRT Line 1 (SBK Line) and Line 2 (SSP Line), followed with the construction of the MRT Bukit Bintang and SSP Line MRT. Next, I was introduced with a more technical document including the soil profile of both MRT project, geotechnical site investigation, the construction site layout related to the sheet pile construction and the machine used for the installation. Later, I had been given a chance to experience real life project in Malaysia. For the start, the city drainage upgrading project in Kajang, Selangor is among the first site for me to experience. For this project, the sheet pile was needed to make a cofferdam as a temporary barrier for the project.

Fig. 3. A braced cut excavation by using a sheet pile

Fig. 4. Sheet pile installation under MRT Line

After the site visit at Kajang, I visited the yard, which is where the machineries were kept. The location of the yard was at Sungai Buloh, Selangor. During the visit at the yard, the Standard Press-in machine and Super Crush Piler can be seen in real life. For me, it is my very first time to see this. I was excited that the operator had given me a chance to experience operating these innovative machines. Now, I realize that these machines were equipped with high-end technology. All movements could be controlled by using a remote radio controller. At the same time, the machine operator also demonstrated the pile installation by using a conventional vibratory method. Based on Press-in technology and vibrohammer method, it is easy to recognize how Press-in technology could be able to provide such a low noise and vibration on the construction site.

Generally, the Press-in method does not use much human energy as the machine itself has remote to control the movement to drive the sheet pile into the ground. Once the initial piling has been set up which need to operate reaction stand to support the machine, the remote to control the operation of the pile can be used. The radio controller is applicable for all operation in Standard Mode, Water Jetting Mode as well as Super Crush Mode. I enjoy to learn this great technology. I imagine, the construction work will be more efficient and safe by using this machine. I hope I could learn more this technology in the near future.

Fig. 5. Operating the Standard Press-In machine for the first time

Fig. 6. Photo with Super Crush piler

Announcements

The Second International Conference on Press-in Engineering (ICPE) 2021, Kochi: Call for Abstracts

IPA Secretariat

ICPE 2021 will be held from 19 (Sat) to 21 (Mon) June 2021 in Kochi, Japan organized by ICPE2021 Organizing Committee and International Press-in Association (IPA). ICPE Organizing Committee are calling for abstracts as follows.

■ Submission of abstracts/full papers

1. Call for Abstracts	01 Nov 2020
2. Submission of Abstract	26 Apr 2020
3. Notice of acceptance of abstract	31 May 2020
4. Submission of full paper	30 Sep 2020
5. Submission of revised final paper	15 Jan 2021

Approximately 400 words, mailed to Assoc. Prof. Katsutoshi Ueno (E-mail: icpe2021@gmail.com)
Submitted papers shall be peer-reviewed, and one registration is required for each paper.
Note: The registration fee will be anounced on the ICPE2021 / IPA website shortly.

Announcements

2019 IPA Awards

IPA Award Committee

The Award Committee called for nomination of “Outstanding Project Award”, “Innovative Technology Award” and Distinguished Research Award” in January 2019. The committee made the decisions as follows through the strict judging. The Award ceremony was planned on the Second International Conference on Press-in Engineering (ICPE) which will be held in July 2021.

Outstanding Project Awards

Construction project of retaining wall adjacent to railway in Kyushu, Japan

Project team

Kyushu Railway Company, Japan (Project Owner),
SANKIKENSETSU, INC., Japan (Prime Contractor),
Tonichi Consultant, Japan (Design),
Kyushu Sales Office, GIKEN LTD., Japan (Planning)
Kansai Sales Office, GIKEN SEKO LTD. Japan (Pile Driving Contractor)

The reason for awarding

This was a very challenging project of installing a series of 1000 mm diameter steel tubular piles in very steep slope. The retaining wall was constructed to create a space for a new railway track. An extensive series of FEM analysis was conducted during the design stage to avoid excess movement of a large apartment building and houses that existed on the hill, which was cut to create the new space. An innovative design of a continuous beam attached to the sequence of tubular piles was adopted to improve the stiffness of the wall. The construction of the wall was executed successfully. The project deserves IPA award as it will be an excellent case study that demonstrates the use of innovative solution to create a new structure in densely populated urban area.

Innovative Technology Award

Development of “Headroom restriction clear Piler for ultra-low overhead clearance” and “steel sheet pile mechanical joint”

Development team

Japan Water Agency, Japan.
East Japan Railway Company, Japan,
TOTETSU KOGYO CO., Japan
GIKEN LTD., Japan

Outline of Innovative Technology and the reason for awarding

This project made three significant innovations:
(1) Development of an ultra-low overhead clearance silent piler. The headroom has been reduced from a height of 1365mm for a conventional Clear Piler to 1080 mm for the ultra-low headroom piler.
(2) Development of a special steel sheet pile to be fitted from lateral direction by horizontal feed joints in S-shape for the use with the ultra-low headroom piler.

(3) Application of the new equipment to the installation of a sheet pile wall under a bridge. The headroom was extremely small and the water flow velocity was up to 2 m/s.
Considering the significance of the innovations and potential future applications of the technology, this project deserves an Innovative Technology Award.



Distinguished Research Contribution Award

Recent research into the behaviour of jacked foundation piles
Co-authored by

D.J. White
Centre for Offshore Foundation Systems, University of Western Australia, Perth
Cambridge University Engineering Department, UK
A.D. Deeks
Cambridge University Engineering Department, UK

Name of publication, volume, number, pages and year of publication
Advances in Deep Foundations, pp. 3-26, 2007.

Outline of the contribution and the reason of awarding

The paper was written in 2007 as a SOA report for Press-in Engineering.
The topics covered by the paper are:
(1) Pile jacking technology and the environmental impact of pile jacking compared to alternative pile construction techniques;
(2) Recent research into the fundamental mechanisms underlying the installation and loading of displacement piles;
(3) Recent guidance for predicting the axial capacity and load-settlement response of piles, with emphasis on the differences between driven and jacked piles;
(4) Recent research into the use of H-piles, focusing on differences in behaviour of jacked and driven piles due to plugging.

The paper is very accessible providing insight for both newcomers and those experienced in jacking technology. The paper is a valuable resource and certainly worthy of an award.

Event Diary

Title	Date	Venue
■ **IPA Events** https://www.press-in.org/en/event		
The Second International Conference on Press-in Engineering, Kochi (ICPE 2021)	June 19-21, 2021	Kochi, Japan
International Society for Soil Mechanics and Geotechnical Engineering http://www.issmge.org/events		
GEOAMERICA 2020 (4th PAN AMERICAN CONFERENCE ON GEOSYNTHETICS)	April 26-29, 2020	Rio de Janeiro, Brazil
FIRST INTERNATIONAL CONFERENCE ON EMBANKMENT DAMS (ICED'2020): DAM BREACH MODELLING AND RISK DISPOSAL	June 5-7, 2020	Beijing, China
XIII INTERNATIONAL SYMPOSIUM ON LANDSLIDES (13 ISL) - CARTAGENA 2020	June 15-19, 2020	Cartagena, Colombia
INTERNATIONAL CONFERENCE ON GEOTECHNICAL ENGINEERING EDUCATION	June 24-25, 2020	Athens, Greece
TC204: GEOTECHNICAL ASPECTS OF UNDERGROUND CONSTRUCTION IN SOFT GROUND - TC204 CAMBRIDGE 2020	June 29-July 1, 2020	Cambridge, UK
■ **Deep Foundations Institute** http://www.dfi.org/dfievents.asp		
SuperPile '20	June 3-5, 2020	Missouri, USA
Deep Mixing 2020	June 15-18, 2020	Gdansk, Poland
■ **Construction Machinery Events**		
International Construction Week ICW (Malaysia) http://www.futurebuildsea.com/	June 23-25, 2020	Kuala Lumpur, Malaysia
International Conference on Construction Engineering, Construction and Culture	April 23-24, 2020	London, UK
2nd International Conference on Infrastructure and Construction https://www.scientificfederation.com/infrastructure-construction-2020/	October 15-16, 2020	Lisbon, Portugal
■ **International Geosynthetics Society** http://www.geosyntheticssociety.org/calendar/		
10th Chinese National Conference on Geosynthetics	May 27-31, 2020	Chengdu, China

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IPA News Letter

Volume 5, Issue 1 March 2020

Editorial Remarks

As the coordinator of this issue of IPA NewsLetter, it is my honor to write the Editorial Remark Column. This issue starts with an uncommon cover article which is written by our IPA Director Prof Michael Doubrovsky from Ukraine, being the first scholar from Eastern Europe writing the cover page.

The Special Contribution article of this issue is written by Prof Ikuo Towhata, Immediate Past Vice President for Asia of the International Society for Soil Mechanics and Geotechnical Engineering and Emeritus Professor of Tokyo University. Prof Towhata is a renowned expert in soil dynamics and earthquake engineering. It is indeed the great honor of IPA to have Prof Towhata to contribute his significant valuable knowledge in his expertise field.

Interesting to note that this issue has 3 articles highlighting silent piler activities and events in Southeast Asia. The employment of silent piling began over 2 decades ago in Singapore and the conventionally silent pilers are now readily accepted in practice. The article contributed by Dr. Teik Lim Goh, a very experienced silent piling engineer, focuses on the most advanced stage of silent piling development on the possible wider adoption of the much more powerful Gyro Piler employed in projects in Singapore and beyond. The other 2 articles were contributed by researchers from Malaysia and Thailand.

This article is truly international as Giken America has kindly provided an update on their activities in North America. Last but not the least, I wish readers of this issue would find the articles enjoyable to read and useful to them. The NewsLetter welcomes feedback from IPA members and other readers.

Chun Fai Leung