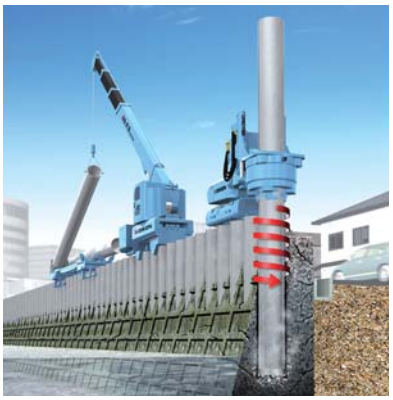
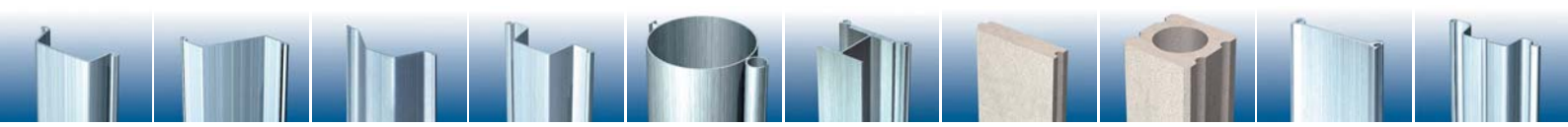
Construction Revolution

Press-in Method Variations

SILENT PILING TECHNOLOGIES





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SILENT PILING TECHNOLOGIES

Contents

Features of Press-in Method

When making a brief statement about the features of Press-in Method, "Implant Structure can be constructed under any working conditions while preserving the Five Construction Principles". Features of construction conditions are defined based on the "Five Construction Principles" and they are indicated in the following tables. Besides, Press-in Method has design features in evaluation for pile performance. This is an epoch-making approach that structural design is directly referred to results of pile load tests at site based on the principles of Press-in Method which can build structures by applying static load. Since 1994, GIKEN has been conducting academic studies through collaborative research with the Engineering Faculty, Cambridge University, U.K..

Environmental Protection

Vibration-Free, Noise-Free,
In Press-in Method, piles are installed by static load without noise and vibration so that construction work doesn't disturb neighbour residents' daily life.

Minimum Working Extent
It is possible to minimise Influence range of construction works by light-weighted and compact press-in machines and specially developed systemised equipment.

No Physical Influence on Surrounding Environment
It is possible to minimise physical influence to surrounding environment such as settlement and any damage on neighbouring structures.

Extreme Reduction of Environmental Burden
The systemised equipment eliminates temporary works which are the curse of environmental destruction in construction works so that environmental burden is extremely reduced.

Safety

Stable and Strong Wall Structure
Highly reliable and highly strong wall structures are available, since factory produced high quality piles are continuously and directly pressed-in.

No Machine Overturning
There is no risk of machine overturning, since press-in machine main body and system equipment grip piles which have been completely driven into ground.

Safety Mechanism with Hydraulic System
Since pile being pressed-in is securely held with hydraulic jacking force, piles are easily handled not to contact with surrounding structure and even long piles can be installed safely.

Radio Control System
Since the press-in machine main body is operated by radio control, operator and other workers can secure safe working conditions even under physically restricted working conditions.

Speed

The Simplest Work Processes
It is possible to complete construction works without ancillary equipment in the shortest duration, even if there is strict working restrictions or piling alignment is very complicated.

Self-Walking Machinery
It is possible to significantly reduce construction duration, since all systemised machinery have respective self-walking functions which provide efficient and rational working condition.

No Working Hour Limitation
Since Silent Piler is a pollution-free piling machine, it is possible to rapidly complete construction works at restricted areas where any consequential negative influence is prohibited and at night when great level of noise emission is prohibited.

Multiple Units Operations
Since system equipment is light weighted and compact, it is possible to use multiple units at the same time. It can be used for emergency work such as disaster recovery work.

Economy

Standardisation of Pile Material
On-site works get to be efficient and economical by standardising pile material to factory made material which is the most appropriate for each structure design.

Construction Cost Reduction by KASETSU (Temporary Work)-Less
Construction cost is greatly reduced, since it does not require ancillary facilities necessary for conventional piling works such as temporary platform, earth works, road diversion, scaffolding and other necessary works.

Labour-Saving & Energy Saving
Construction works can be carried out with the set of energy-saving equipment and minimum manpower.

No Disturbance to Urban Function
There is no disturbance to active traffics and existing bridges so that construction works never disturb urban function, because Press-in Method can minimise working extent.

Aesthetics

The Simple Systemised Construction
The construction work can be carried out sleekly and efficiently by selecting the most appropriate construction system to meet the construction purposes.

Easy Handlings
The pile top elevation and pile alignment can be controlled accurately and freely enough to successfully construct complicated wall structures such as curve alignments, corner alignments and cofferdams.

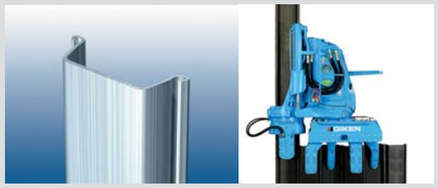
High Quality Pile Wall Structure
High quality Implant Structure is available, since those wall structures are formed by pressed-in piles which are pushed into ground.

Harmonised Finish with Scenery
Structures can be harmonised into surrounding scenery to construct cultural structures by applying decoration panels on piles or wall structures after piling work.

Press-in Method

Constructing pressed-in continuous pile walls which are the most suitable for construction purposes, functions of structure, quality of structure and surrounding scenery

U Sheet Pile



H Sheet Pile

Z Sheet Pile

Concrete Sheet Pile

Hat Type Sheet Pile

PC Pile

Zero Sheet Pile (Hat Type)

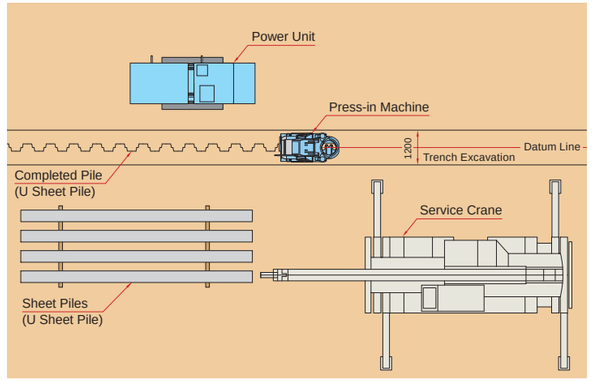
Straight Web Sheet Pile (Ring Method)

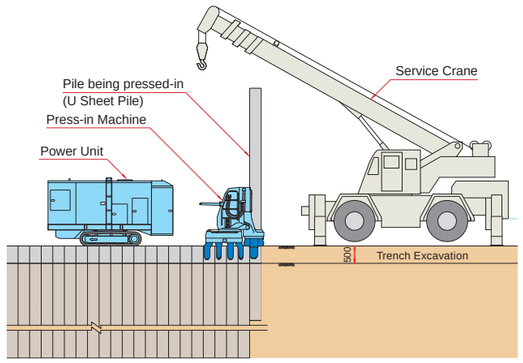
Tubular Sheet Pile

Trench Sheet Pile

Standard Machine Layout

The Press-in Principle utilises the reaction force derived from fully installed piles, which are anchored to the ground and regarded as a united part of the Earth to install subsequent piles with hydraulic system. Hence, Silent Piler is very small and light weighted, and can self-walk on top of piles. For sheet piling work, it requires just one service crane for pitch sheet piles





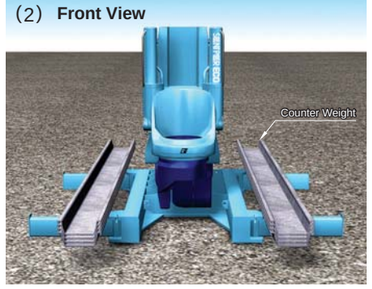
Initial Press-in

At the very beginning of press-in work, if there is no completed pile, "Reaction Stand" is usually used for initial piling work. Press-in Machine is horizontally set onto the Reaction Stand and then counter weights are loaded onto the Reaction Stand. It depends on soil conditions and pile length how heavy the counter weight should be. Then the first pile is pressed-in utilising all weights of machine and counter weight as reaction. After installing the first pile, the installed pile becomes the first reaction pile for installing second pile. Once Press-in Machine completely sits on reaction piles and Reaction Stand is removed as well as counter weight, the initial piling work is completed.

(1)

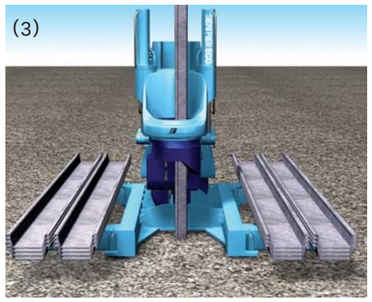
Set Press-in Machine Main Body
and Reaction Stand horizontally

(2) **Front View**



Set counter weights

(3)



Pitch the first pile and start pressing-in

(4) **Side View**

Install prescribed number of piles

(5)

Remove counter weights

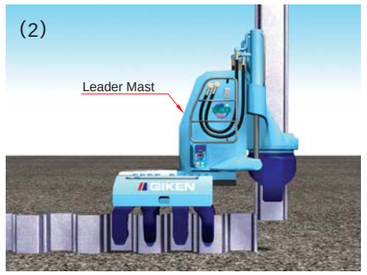
(6)

Remove Reaction Stand
and the initial piling is completed

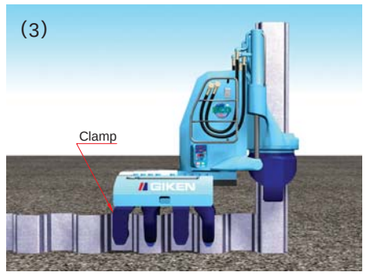
Press-in Working Procedure / Self-Walking

After pressing-in a pile into the prescribed depth, move the Leader Mast forward and hold the next pile, and then start pressing-in. When the pile is installed enough to support the press-in machine main body, open the Clamps, and then uplift the press-in machine. Move the Saddle forward. Make the press-in machine downward, then close the Clamps after confirming machine position to secure new reaction base. Then re-start pressing-in the pile. These processes are repeated. The process to move Press-in machine forward is called Self-walking.

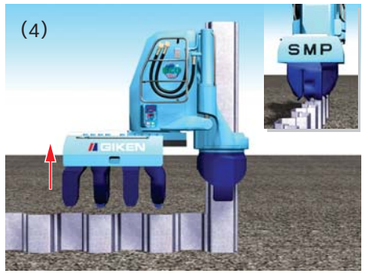
Press in pile to prescribed depth



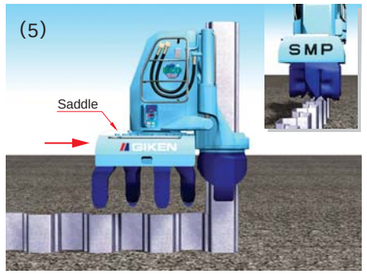
Pitch next pile and start pressing in



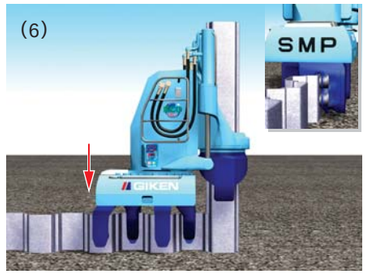
Press in pile until it is sufficiently stable



Open Clamps and then raise Silent Piler



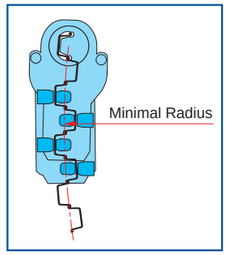
Move Saddle forward and change clamp positions



Lower Silent Piler and close Clamps

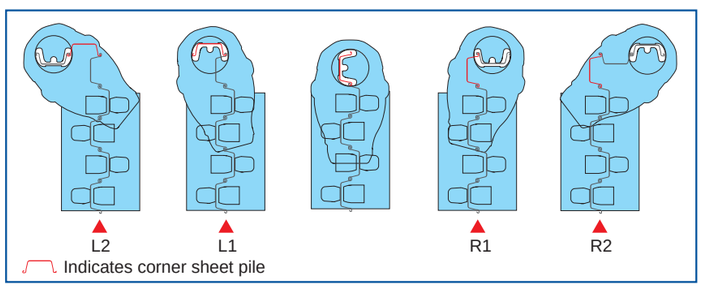
Curve Installation

Chuck rotation, mast revolution and clamp right-left mechanism are equipped on the press-in machine main body. These functions enable to install piles on curved or complicated alignments. The minimal piling radius differs from the pile sections and press-in machine models.

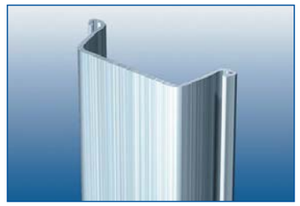


Corner Installation

The press-in machine (U-Piler) has "Corner Four (C4)" function which can install 2 piles for both sides on perpendicular alignment from a machine position. The 2 piles are installed on the pile alignment and another 2 piles are installed as dummy piles for reaction piles. This Corner 4 function make piling work at narrow site condition safe and efficient for cofferdam works.



U Sheet Pile Press-in Method — U Piler



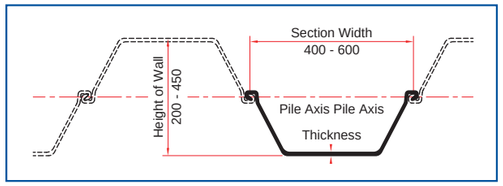
ECO82

SW150

U Sheet Pile

The U Sheet Pile was the world's first rolled sheet pile developed in Germany in 1902 and has been used more than a century. There are normal sheet pile (400 mm) superior to be re-used, and up to wide type sheet piles (750 mm) which have higher section modulus per steel weight and has better cost performance.

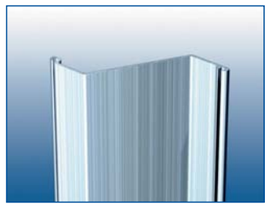
Standard Cross-Section



Sectional Performance

Model	Section Width	Height of Wall	Thickness	Per 1 m of Wall			
				Mass per Unit Length	Sectional Area	Moment of Inertia	Section Modulus
	mm	mm	mm	kg/m²	cm²/m	cm⁴/m	cm³/m
II	400	200	10.5	120	153.0	8740	874
III		250	13.0	150	191.0	16800	1340
IV		340	15.5	190	242.5	38600	2270
V_L	500	400	24.3	210	267.6	63000	3150
VI_L		450	27.6	240	306.0	86000	3820
II_W	600	260	10.3	103	131.2	13000	1000
III_W		360	13.4	136	173.2	32400	1800
IV_W		420	18.0	177	225.5	56700	2700

Z Sheet Pile Press-in Method — Z Piler



ECO700S

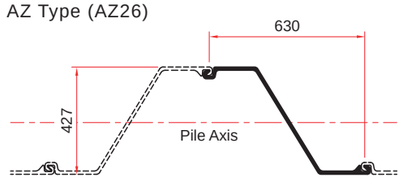
ECO1400S

Z-Type Sheet Pile

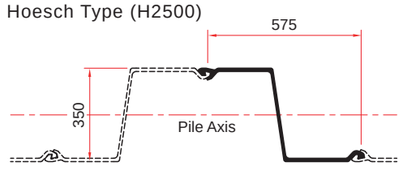
Z sheet pile was developed in Germany in 1926 and has the shape in which interlock part is located out of the neutral axis to the most exterior edge. In Europe, it was shifted to full-fledged broad wide since 1990 and the cross section performance per steel weight remarkably exceeds U Type sheet pile, Some Silent Pilers designed for European and US markets can install double Z sheet piles, up to the maximum width of 1416 mm.

Standard Cross-Section

AZ Type (AZ26)



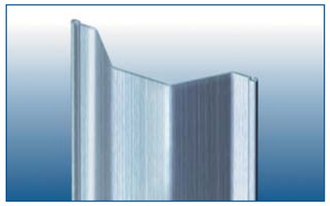
Hoesch Type (H2500)

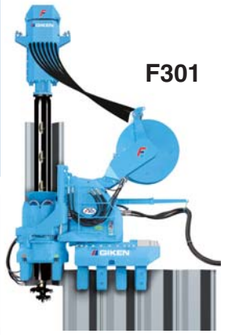


Hat Type Sheet Pile Press-in Method

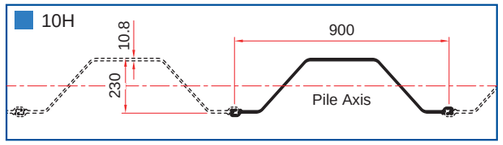
Hat Type Sheet Pile 900

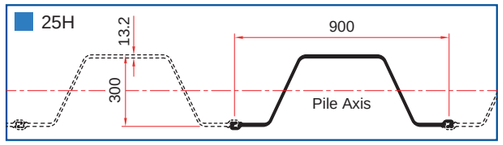
The section modulus of Hat Type Sheet Pile 900 exceeds U Type Sheet Piles which were mainly used for bank protection, pier and temporary retaining wall. It has been developed for wider applications for permanent structure and it has better drivability, structural reliability and economical impact. ECO900 is developed as a dedicated press-in machine, and can install the piles with better drivability and installation quality by greater reaction base and dual press-in points.





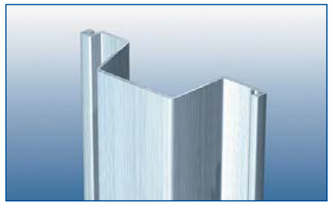
Standard Cross-Section





Model	Per 1 Sheet				Per 1 m of Wall			
	Mass per Unit Length	Sectional Area	Moment of Inertia	Section Modulus	Mass per Unit Length	Sectional Area	Moment of Inertia	Section Modulus
	kg/m	cm^2	cm^4	cm^3	kg/m^2	cm^2/m	cm^4/m	cm^3/m
10H	86.4	110.0	9430	812	96.0	122.2	10500	902
25H	113.0	144.4	22000	1450	126.0	160.4	24400	1610

Zero Clearance Method — Zero Piler

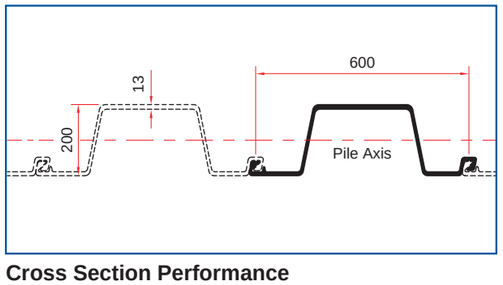


JZ100

Zero Sheet Pile

This is the pile material co-developed by Sumitomo Metal Industries, Ltd. and GIKEN LTD. in 1996 for sheet piling with zero clearance to existing structures or boundaries. This has an asymmetrical Interlock and has the Hat shape. Hence, the interlock efficiency of Zero Sheet Pile is 100 % like Z-Type Sheet Pile. Zero Clearance Method is carried out with the Zero Piler dedicated for Zero Sheet Pile.

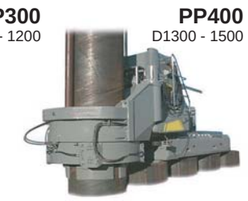
Standard Cross-Section



Cross Section Performance

Model	Per 1 Sheet				Per 1 m of Wall			
	Mass per Unit Length	Sectional Area	Moment of Inertia	Section Modulus	Mass per Unit Length	Sectional Area	Moment of Inertia	Section Modulus
	kg/m	cm^2	cm^4	cm^3	kg/m^2	cm^2/m	cm^4/m	cm^3/m
NS-SP-J	87.3	111.2	7250	705	145	185.3	12090	1175

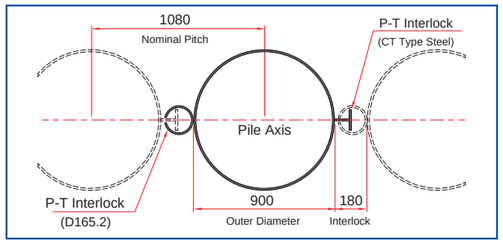
Tubular Sheet Pile Press-in Method — Tubular Piler

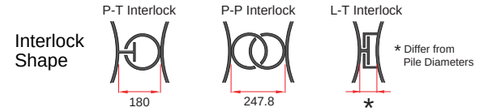


Tubular Sheet Pile

Tubular sheet piles have high strength and longer durability. It is suitable for construction works of flood/tidal wave countermeasure of river, and reinforcement of bridge foundation. By selecting proper pile diameter and thickness, it is able to flexibly meet design requirements to construct various structures for different purposes. Currently Silent Piler can install tubular sheet pile sections from 500 to 1,500 mm diameters.

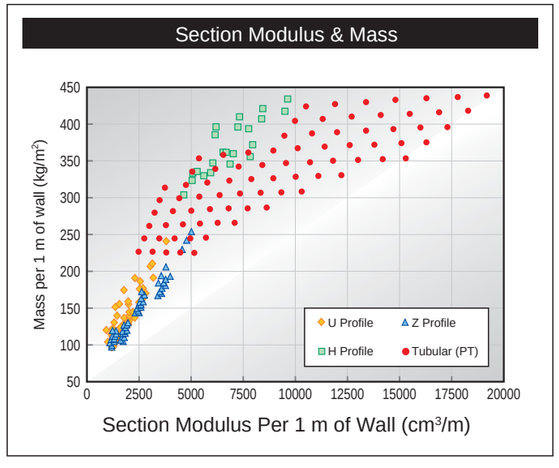
Standard Cross-Section (D900 mm, P-T Interlock)

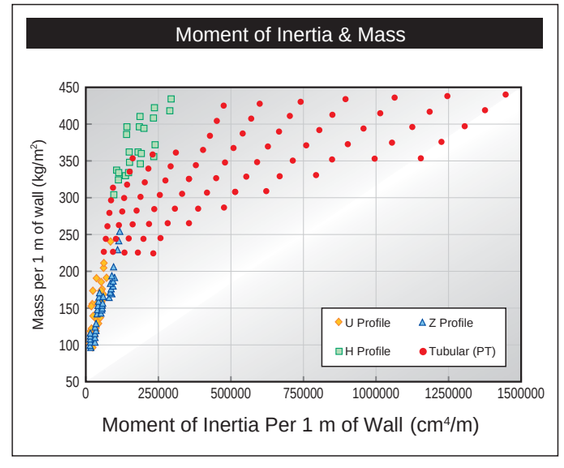




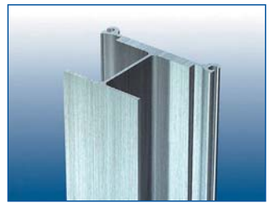
Cross Section Comparison with Major Piles

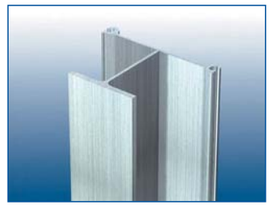
Typical four pile sections of major press-in pile are distributed by section performance and steel weight on the following figures. With respect to U sheet pile and Z sheet pile, H sheet pile and tubular sheet pile clearly indicate higher section performance. Even though the section performance of tubular sheet pile gets higher, the steel weight doesn't increase like H sheet pile does. The tubular sheet pile is the best pile in terms of cost, if there is no problem in wall thickness. It is important to select appropriate pile depending on the purpose and construction design.





H Sheet Pile Press-in Method — H Piler



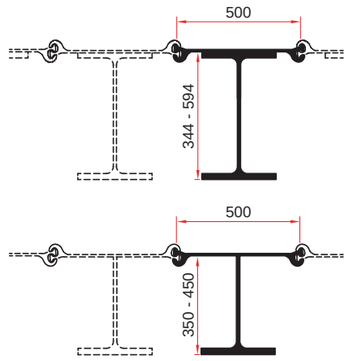


HP150

H Sheet Pile

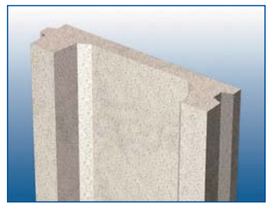
The H sheet pile is used for deep foundation for urban development. It has high strength and rigidity with thinner wall thickness. Double interlock type is superior in water cutoff performance and single interlock type is applicable for curve alignment installation. The current H Piler can install up to 600 mm height.

Standard Cross-Section



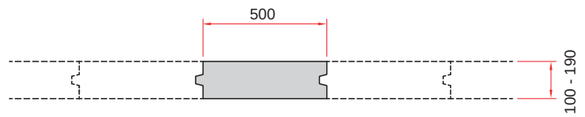
Concrete Sheet Pile Press-in Method — Concrete Piler

CP50

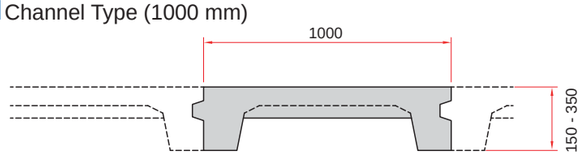


CP80

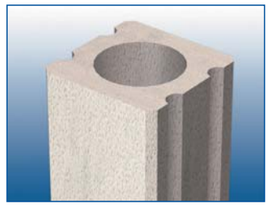
Flat Type (500 mm)



Channel Type (1000 mm)

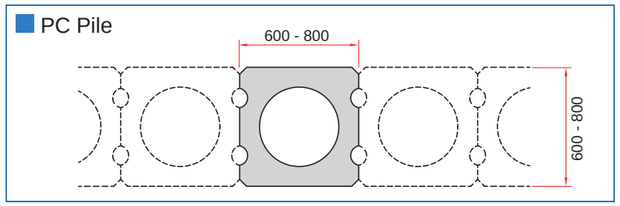


PC Pile Press-in Method — PC Piler

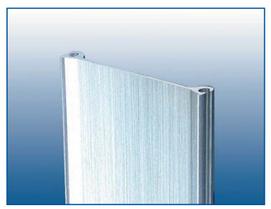


CHP130

PC Pile



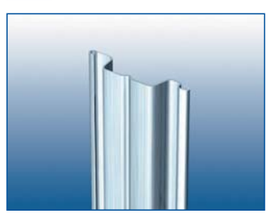
Straight Web Sheet Pile Press-in Method (Ring Method) — Straight Web Sheet Pile Dedicated Press-in Machine



Straight Web Sheet Pile Dedicated Press-in Machine

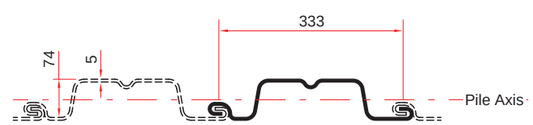
Ring Method is described on Page 19

Trench Sheet Pile Press-in Method — Trench Piler



STP30

Trench Sheet Pile



Environmentally-Friendly Press-in Machine

Standard Adoption of Biodegradable Hydraulic Oil

In order for Press-in Method to preserve the Five Construction Principles, biodegradable oil, "Piler Eco Oil" and "Piler Eco Grease" have been adopted to new Silent Piler models as standard specification since 2002. They are naturally dissolved and do not damage ecologic system, if they are flown out into water or soil in any possibility. GIKEN has jointly-developed with a Japanese petroleum manufacturer. Petroleum-derived oil is not used for the base oil. They have proven to have high lubricating property and longer life as well as safety. The biodegradable performance has been cleared the standard of the Japan Environment Association by the test, Biochemical Oxygen Consumption Method by Bacterium (BOD Method): CECD301C, Rapid Toxicity Test: JIS K0120 by Japanese killifish, and received Eco-Mark certification. In addition, environment-responsive paint, TX-Free, which does not contain toluene, xylene and lead-based pigment, is also adopted on the machine body.

GIKEN's Genuine Products

- Developed only for Silent Piler
- Excellent Biodegradability & Non Toxic Performance
- High Lubricity and Fire Retardant Properties

Label of Biodegradable Oil

Emission

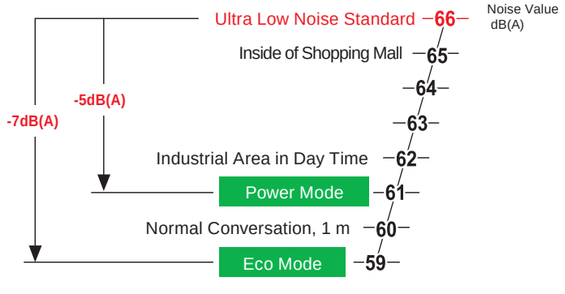
New Power Unit, Off-Road Law Compliant

The latest Power Unit models have an engine of the next generation. Full anti-pollution of exhaust gas is realised with high combustion efficiency and conforming to the new exhaust emission standard EEC97/68EC Stage IIIA and EPA/CARB Tier 3.

Ultra-Low Noise Design

The sound pressure level generated from Power Unit is reduced down to 59 dB at Eco Mode that suppresses engine speed. It is cleared with higher level than the ultra low noise standard of Japanese MILT, 66 dB.

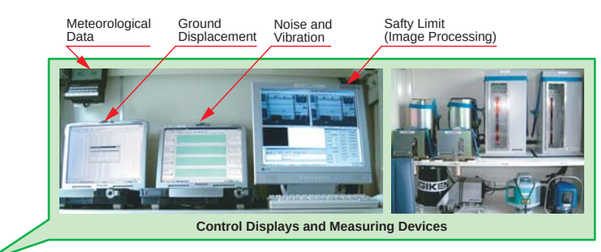
Photo shows EU200G3 engine unit of ECO400S



Eco Monitoring System

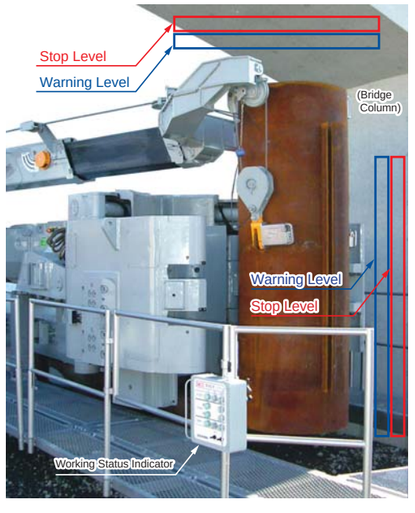
Scientific Monitoring on Safeness, Ground Displacement, Settlement, Inclination, Noise, Vibration and Meteorological Conditions

EMOS, Eco Monitoring System, is a set of system to monitor press-in machine performance for safety control and site condition control. All measured or monitored information are transferred to the EMOS vehicle, to check the on live situations such as ground displacement, noise and vibration. Such information can be used as a proof of safety countermeasures to employers and neighbours.



Systematic Control of Safety

The evolutional function of EMOS is to automatically control machine performance so that all machines work in safe zone by monitoring device and graphic programme. This safety control system changes safety fence policy from conventional barriers to the scientific risk management method. EMOS can provide high safety working conditions at which are close to exiting buildings, power cables or active railway, and can optimise the working area. It eventually enables to carry out construction works fast with lower cost.



Monitoring Camera

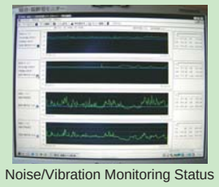
Safety Monitor

Working Status Indicator

- Warning levels and Stop levels are set in 4 areas.
- Warning or auto stop depending on the influence to existing structure.
- When warning/stop level is detected, image at abnormal detection is recorded on the computer.

EMOS Measurement Status

Safety Monitoring Status



Noise/Vibration Monitoring Status

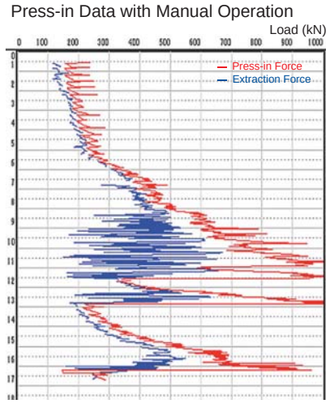
Site Presentation

Scientific Press-in Quality Control

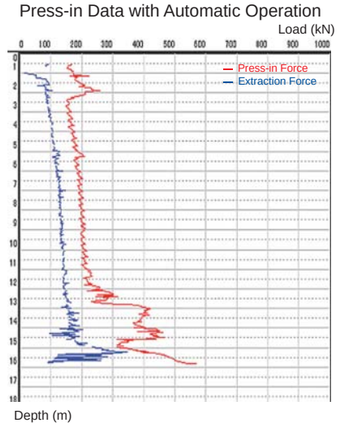
Automatic Press-in Operation System

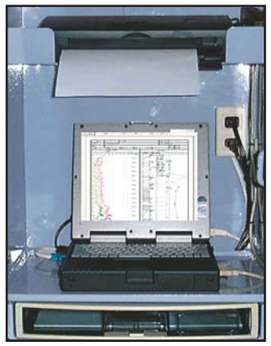
In Press-in Method, piles are repeatedly pressed-in and extracted during installation in order to reduce penetration resistance. This installation procedure is necessary to construct high quality wall structures. It is important to determine the most effective combination of press-in stroke, extraction stroke and maximum press-in force in every ground conditions and pile lengths. The scientifically ideal operation is available by Automatic Press-in Operation System which can provide the best combination of operation variables. The data of press-in operation below show the difference between manual operation and automatic operation at the same ground condition.

Press-in Data with Manual Operation



Press-in Data with Automatic Operation



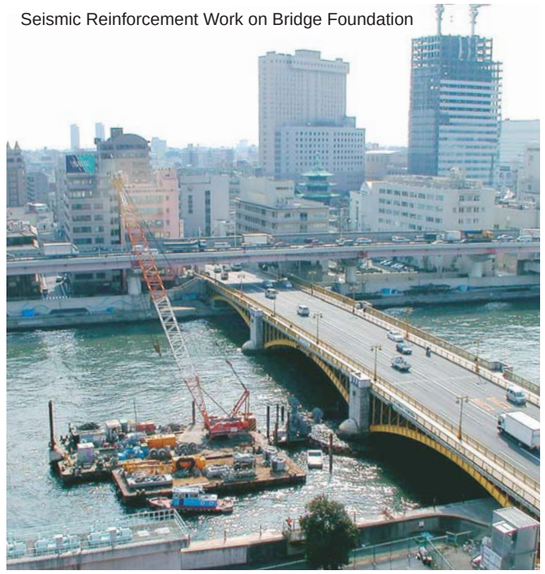


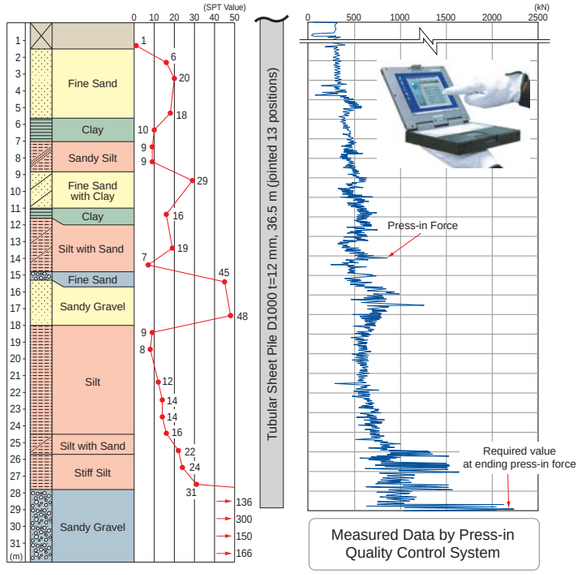
The press-in condition can be monitored in real time with a lap top computer connected to Power Unit.

Press-in Quality Control System

In Press-in Method, each pile is pushed into the ground by static load, and forms pile foundation. It can be considered that load tests for superstructures are carried during piling work. It is possible to monitor real time conditions of press-in force, skin friction of pile, toe resistance of pile, penetration depth and operation time, because Silent Piler controls pile behavior by hydraulic system. Since such records are highly related to finished quality of foundation, it is possible to plan a rational design which emphasises actual performance of pressed-in piles. This is a remarkable feature of pressed-in pile and it is going to be the major design trend as "Performance-Oriented Design". Press-in Quality Control System can control piling performance based on such measured information and it can be the proof of pile quality.

Seismic Reinforcement Work on Bridge Foundation

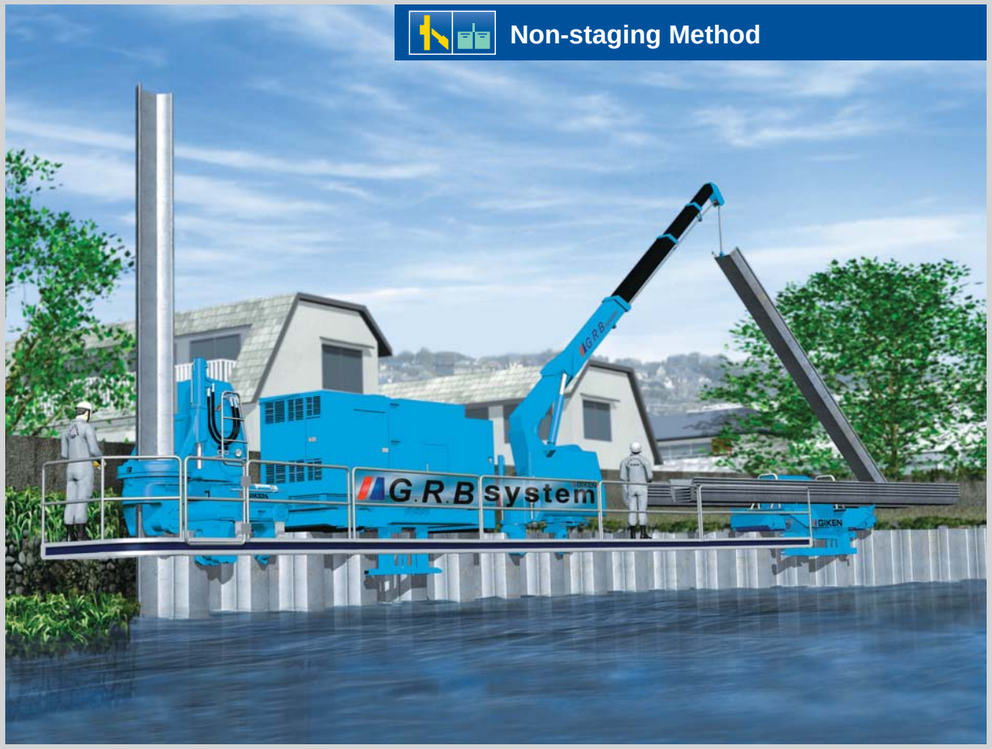




Measured Data by Press-in Quality Control System

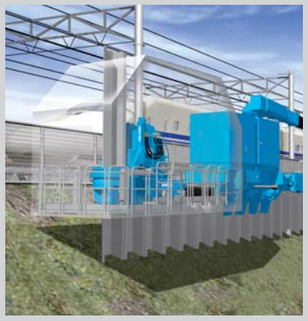
Press-in System

Constructing Press-in Continuous Pile Wall by Temporary-Work-Less methods with overcoming restricted site condition.



Narrow Access Method

Overhead Clearance Method



Rail Safe Method

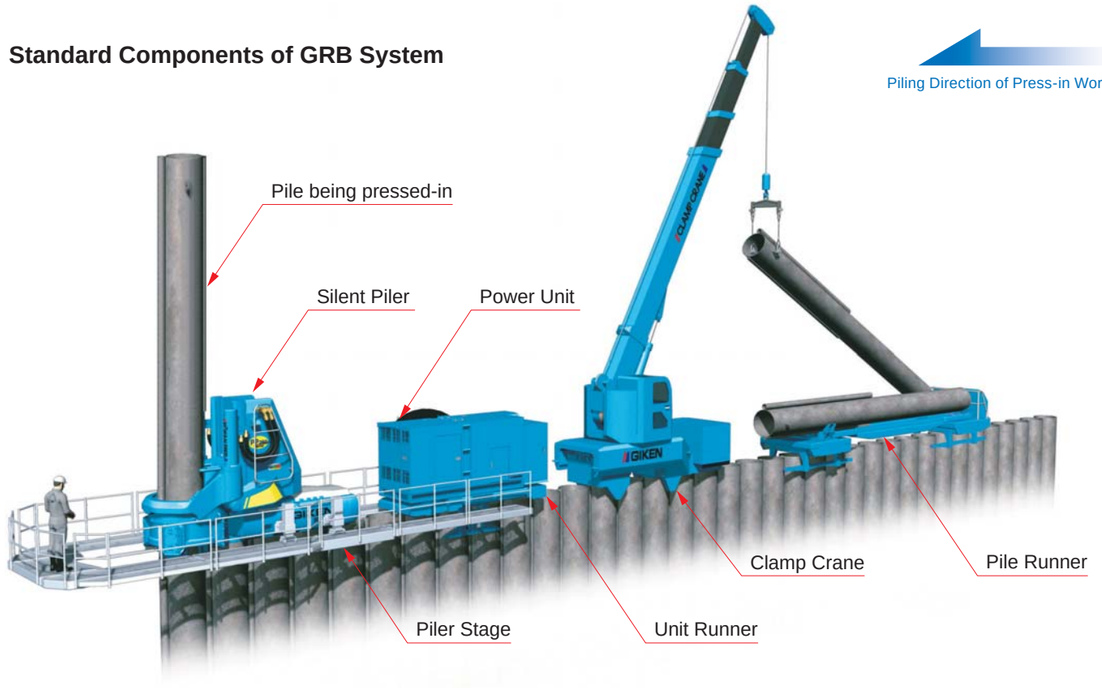
Ring Method

GRB System

Giken Reaction Base System

Press-in machines utilises reaction force from installed piles integrated with the Earth and carry out piling work on top of installed piles. With further development based on the principle of "reaction based mechanism", "GRB System" was developed as a press-in system which carries out all piling procedures such as pile transportation, pile pitching and press-in work on top of installed piles.
GRB System consists of Silent Piler in the front, Power Unit as a power source, Clamp Crane to pitch piles and Pile Runner to convey piles from work base platform.

Standard Components of GRB System



Kasetsu-less Work

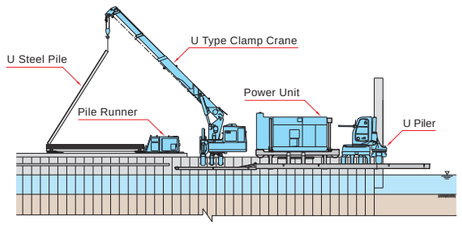
Since conventional piling methods require other heavy equipment with piling rig, massive temporary facilities are needed depending on site conditions. However, temporary works are not necessary in principle, because they are construction works for construction works of main structure. If a construction method requires high cost and long time for temporary works, the method has a problem in fundamental concept, and it will never fulfill the Five Construction Principles. On the other hand, GRB System doesn't require temporary working platforms or road diversion even at unstable ground condition, narrow location, on water, on slope, and other restricted site conditions, since it carries out all piling works on top of installed piles. GRB System satisfies the Five Construction Principles at high levels by providing solutions to construct just permanent structure.
Accordingly, GRB System can achieve fundamental purposes of construction works without any negative influence to neighbours and active traffics even in emergency restoration works of river embankment or very narrow site conditions.

Build up Implant Structure Bank Protection with Kasetsu-less Construction

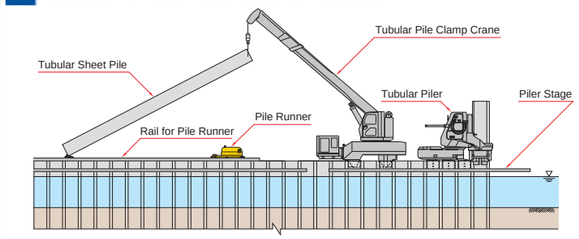
Non-Staging Method

Conventional construction works at waterfront usually require massive temporary works such as construction of working platforms. However GRB System can execute construction works of just objective structure without disturbing active vessel traffics and vehicle traffics.

U Sheet Pile Press-in Method

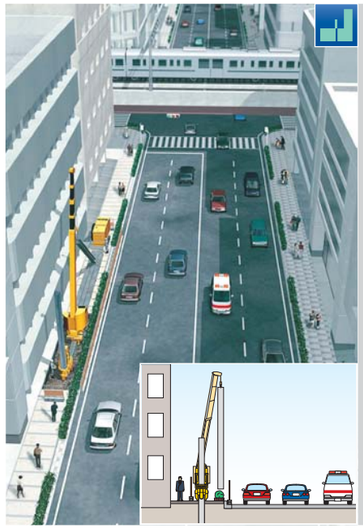


Tubular Sheet Pile Press-in Method



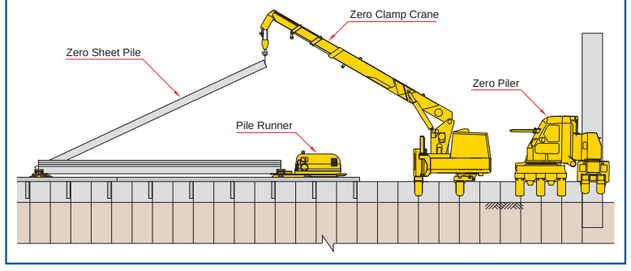
Narrow Access Method

During the progression of rapid urbanisation, back-alley area where construction machines are unable to get in and area where the impact of traffic closure is too significant to start construction are left from development plans. Since Narrow Access Method requires workings space with just for the machine width, construction works such as sewage and footpath can be carried out as scheduled even at very narrow locations.



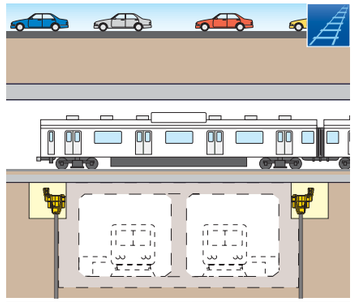
Conventional Method

Zero Clearance Method



Overhead Clearance Method

In Overhead Clearance Method, piling work can be carried out safely under overhead obstruction without disturbing active traffics, because all machines are light weighted and compact, and Silent Piler holds pile being pressed-in at the close position to the pile top elevation of design. In case the overhead clearance is very limited, a dedicated Silent Piler, Clear Piler, can be used.



Clear Piler Models

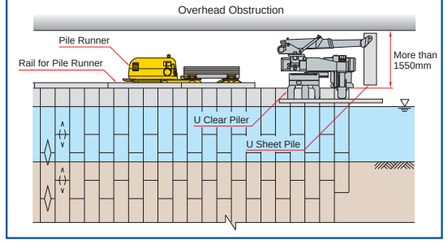
CL70

CLF120

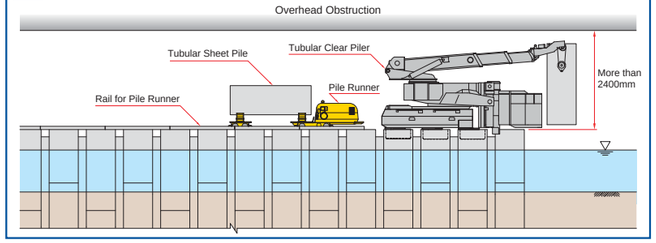
CLH150

CLP200

U Sheet Pile Press-in Method



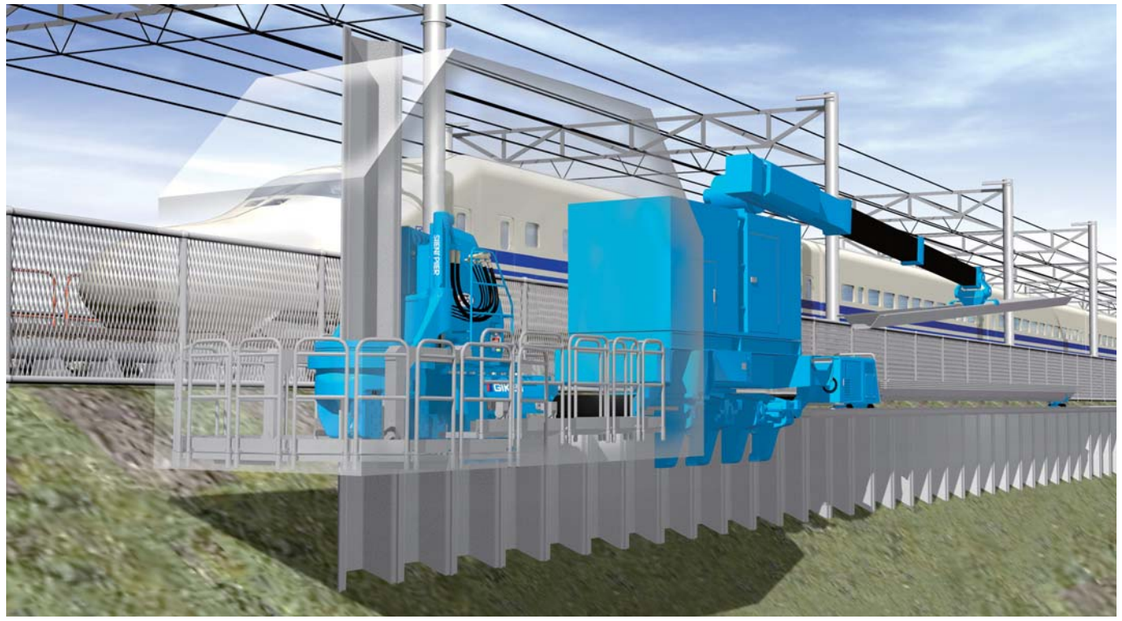
Tubular Pile Press-in Method



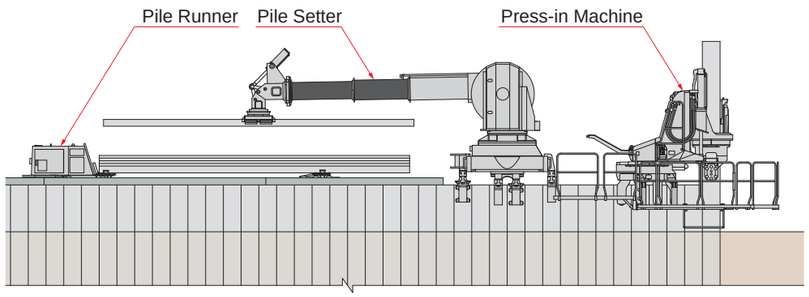
Rail Safe Method

Securing Railway Operations

The role of railway as a public transportation system is still prominent even now when main urban traffic has shifted to automobiles. It is effective for long distance transportation and logistics, and is an everyday travel means for citizens at urban area as well. Because of such demand, functions of active railways are often reviewed and improved. Rail Safe Method can safely carry out piling works close to active railway traffic lines without disturbing track schedules. The rapid construction and temporary work less construction are available with this method. If piling work is required with highly strict measures for high speed train, EMOS (refer to page 11) can provide scientific safety control measures.

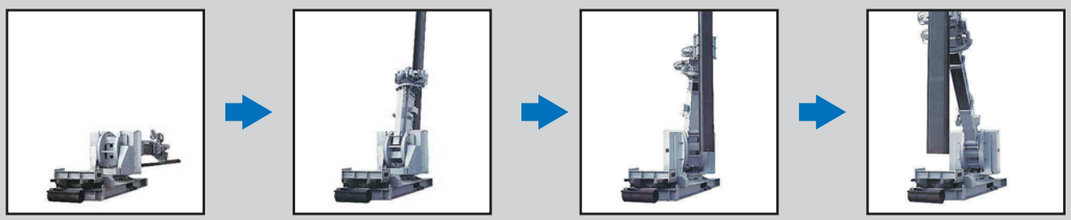


Rail Safe System



Rail Safe System is a kind of GRB System which improves safeness of piling works by the Pile Setter which renovates principles of pile pitching.

Pile Setter

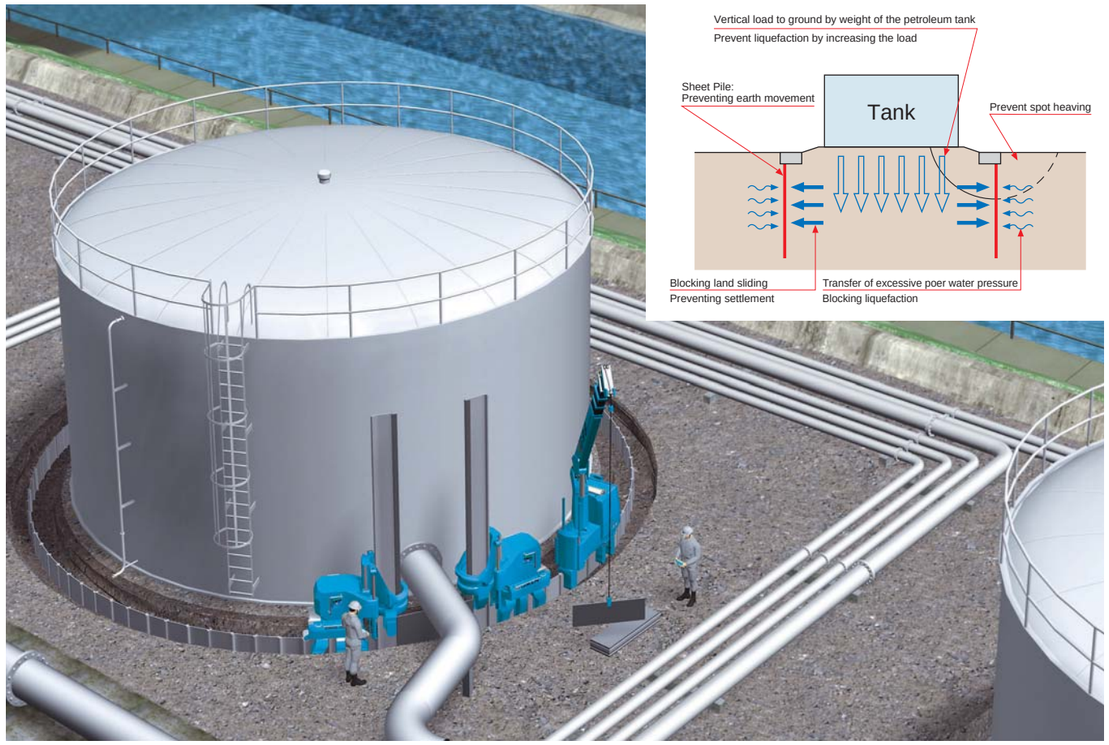


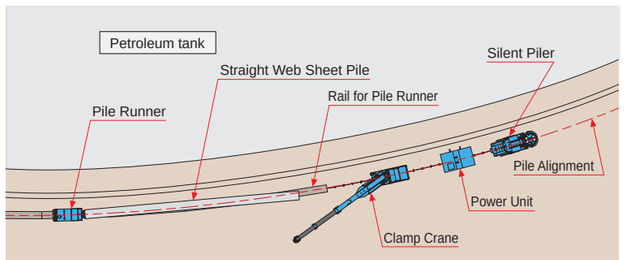
(1) Gripping a Pile
(2) Lifting up the Pile
(3) Traversing on the pile alignment
(4) Pitch the pile into press-in machine

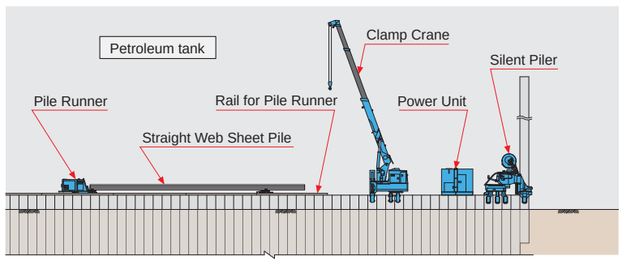
Ring Method

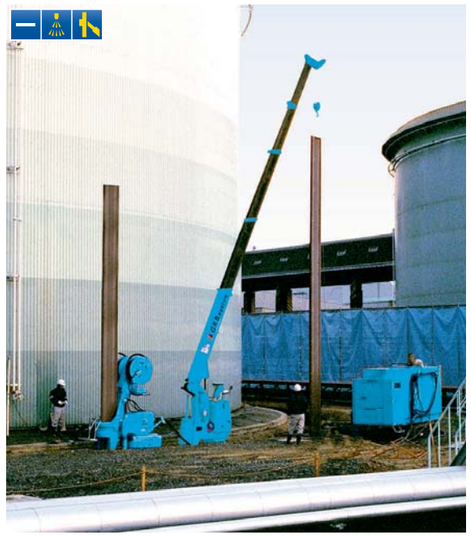
Anti-Seismic Reinforcement & Liquefaction Measures

As for facilities requiring urgent seismic countermeasures, there are storage tanks for gas and petroleum which are indispensable for daily life. However, the existing seismic reinforcement construction works require a lot of cost and long time for temporary removal of pipings and ancillary facilities. Such methods cannot preserve the Five Construction Principles. The solution is "Ring Method" by which straight web sheet piles are pressed-in circular shape and integrated to ground closing around a tank. If the surrounding ground becomes liquefaction by earthquake, the circular shape pressed-in continuous wall blocks liquefaction propagation and protects internal foundation from settlement and side flow to prevent the damage of tank. The construction work is temporary work less and space-saving, and work duration is extremely reduced as well as cost.







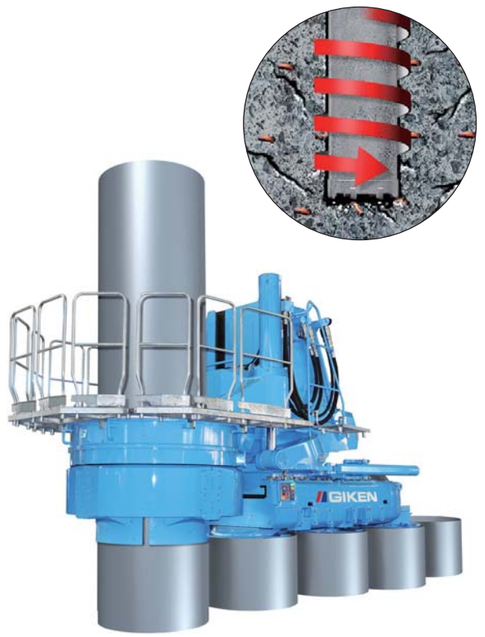


Penetration Technology

Standard Press-in

Water Jet Press-in

Hard Ground Press-in



Gyropress

Water Jet Press-in System

When applying static load onto pile at sandy ground, pile toe resistance becomes large due to the consolidation of soil particles at the toe. Also, if fine soil gets into the gap between interlocks, interlock resistance increases due to the consolidation of soil particles as the penetration depth gets deeper. Those may give damage on pile toe and interlock, and become elements which obstruct the execution of press-in work and eventually make the penetration of pile difficult.
In order to prevent such troubles, high pressure water (water jet) is attached as a driving assistance. The water can increase pored water pressure around pile toe and create temporarily status that soil particles are moved easily. At the same time, upstreaming water flow reduces skin friction of pile and reduces interlock resistance by washing out soil inside interlock. This is how penetration resistance is reduced, and why Water Jet Press-in System enables install piles with smaller press-in force without damaging pile.

Integration of Press-in Function and Water Jet Function

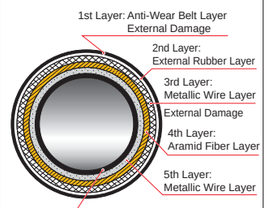
The Eco Jet System is a system in which press-in function and water jet function are integrated in order to enhance working efficiency of Water Jet Press-in Method. A specially developed water jet pump, so called Piler Jet, is ganged with Silent Piler ECO to control water flow automatically. It can minimise the influence to ground conditions and reduce water treatment works. Power source of Piler Jet is supplied from Power Unit, and water flow and water pressure are displayed in the multipurpose monitor on Silent Piler. Those are controlled by the radio controller of Silent Piler.

Main Component of Eco Jet System

System Equipment

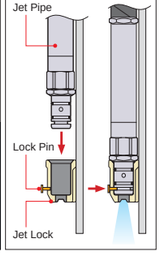
Piler Jet Reel

Piler ECO (Jet) Hose



Jet Nozzle

Jet Lock



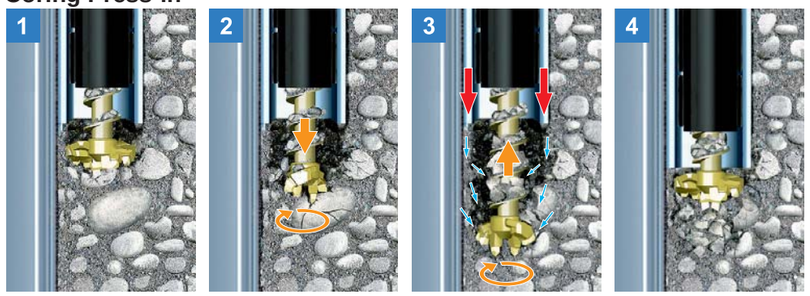
Piler Jet

Hard Ground Press-in Method

Silent Piler for Hard Ground
Super Crush Piler

Ground condition is a major restriction which must be overcome as well as physical site conditions. "Hard Ground Press-in Method" has been developed as a driving assistance for press-in works at hard ground conditions such as sandy gravel, boulders and rocks without losing superiorities of Press-in Method. With the GIKEN's original concept, "Coring Theory", an augering attachment, which is simultaneously operated with press-in machine, drills hard ground layer to prevent generating pressure bulb at pile toe, and pile is pressed-in while auger is pulled up. The augering diameter is minimised for pile installation and amount of soil displacement is also minimised.

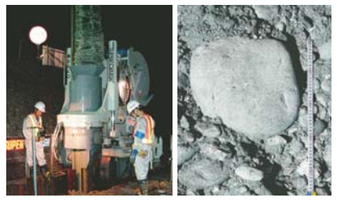
Coring Press-in



1 Start augering
2 Start crushing boulders
3 Pull up the Auger and press-in the pile at the same time
4 Completing 1 cycle Repeat from 1

What is Hard Ground?

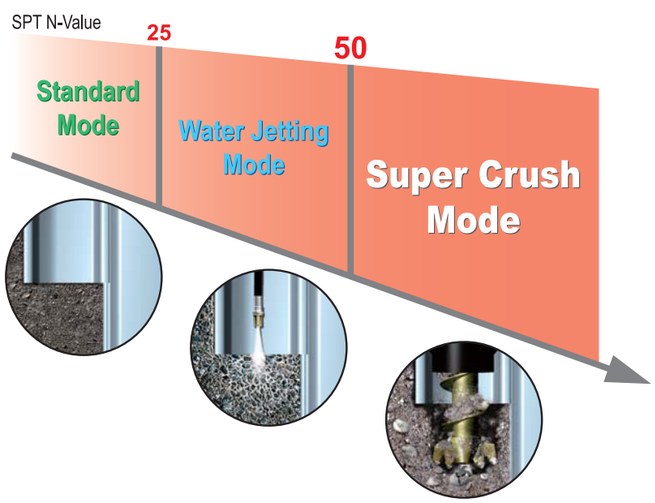
Gravel layers containing boulder and ground containing rock layers are generally called "Hard Ground". N value (SPT Value) more than 50 is generally considered as hard ground. Regardless of piling methods, sheet piling into hard ground was difficult. However, Hard Ground Press-in Method enables to install sheet piles into soft rocks such as, mudstone, sandstone and granite, and medium hard rocks.



Press-in into Boulder Layer(D100 - 300 mm)

Versatile Press-in Machine

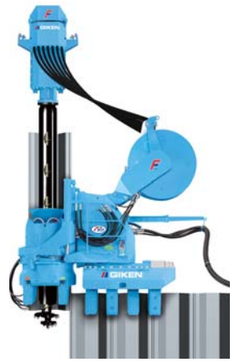
Silent Piler can adapt versatile penetration modes such as Standard Mode, Water Jetting Mode and Super Crush Mode.



Dedicated Hard Ground Press-in Machine: Super Crush Piler

SCU-400M

SCU-600M



F301

GV-ECO700S

GV-ECO1400S

SCZ-600

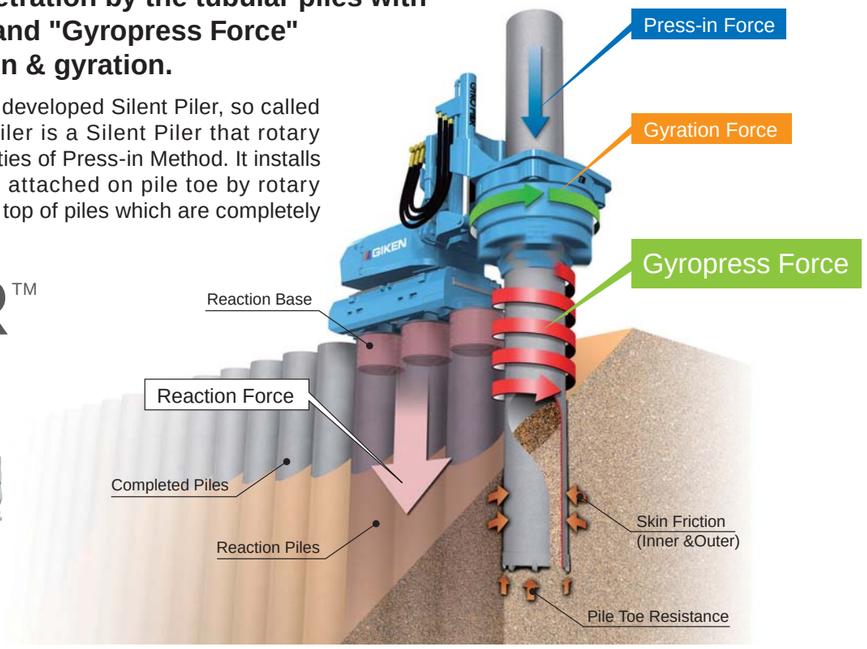
SCP260

Gyropress Method

Realisation of pile penetration by the tubular piles with gyropress coring bits and "Gyropress Force" generated from press-in & gyration.

In Gyropress Method, a newly developed Silent Piler, so called "Gyro Piler", is used. Gyro Piler is a Silent Piler that rotary function is adopted to superiorities of Press-in Method. It installs tubular piles with cutting bits attached on pile toe by rotary cutting press-in, and travels on top of piles which are completely installed (completed piles).

GYRO PILER™



Features of Gyropress (Rotary Cutting Press-in)

Press-in

- Vibration-Free, Noise-Free
- Stable Machine
- Compact Machine
- Installation Quality Checking Function
- High Accuracy & High Quality

+

Gyration

- Reduction of Skin Friction
- Reduction of Toe Resistance
- Cutting Underground Obstacles
- Prevention of Pile Deformation

Gyropress

Penetrating through Hard Ground and Concrete Obstructions
Press-in Method is available where ground condition is so hard that conventional methods cannot overcome and where there is underground obstacle such as concrete structures.

Working Under Physical Restrictions (GRB System)
Because Press-in Method can provide piling condition with minimum working area, it is the best to be selected for working under severe physical restrictions such as narrow locations and underneath overhead obstructions. In addition, it does not require temporary working platforms.

Environmentally-friendly Construction
(Controlling Soil Displacement/Environmentally-friendly considerations)
Soil displacement can be minimised by leveraging rotary cutting mechanism with special bits on the pile toe. It makes the piling work more environmentally-friendly.
Furthermore biodegradable oil and grease are adopted to the Gyro Piler. They are naturally degraded and do not damage ecologic system, if they are flown out into water or soil in any possibility.

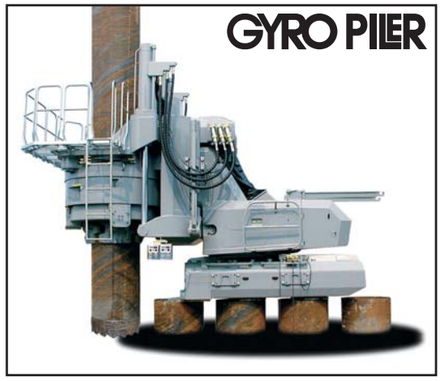
Adoption of Large-Diameter Piles allows Economical Constructions
Gyro Piler can be used for variety of pile diameter sizes, pile arrangements and the combination of batter piles. It allows to select economically optimal structure design.

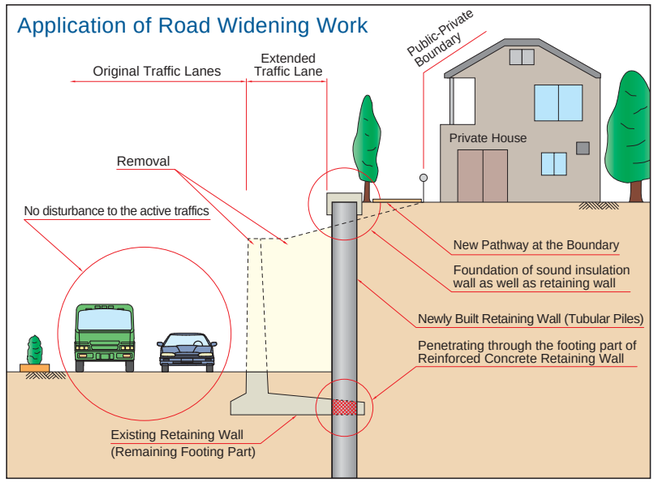
Cutting Reinforced Concrete

This shows the status of cutting and penetrating into reinforced concrete (t = 80 cm, σck = 24N/mm², D16@250 x 3 layers) by gyropressing.

Gyro Piler

What made Gyropress Principle into practical use and realised Gryopress Method is the "Gyro Piler". Gyro Piler overcomes any work restrictions and any ground conditions for wide range of construction works of Implant Structure. Furthermore, the biggest difference from normal Silent Piler is Gyro Piler has batter piling function, which makes it possible to install anchor piles while Gyro Piler sits on reaction piles. This function provides the construction design to build strong wall structure at minimum construction area.





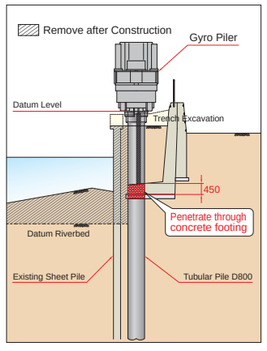
Anchor Pile (Batter Pile) Installation

- Install anchor piles at retaining wall to support retaining wall.
- GIKEN's press-in quality control system proof the pile performance.
- Minimise the land required for construction.

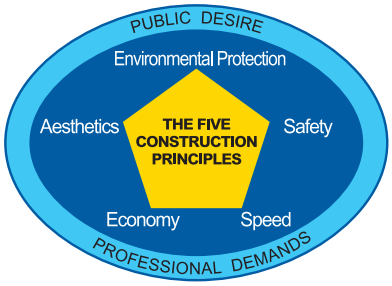
River Embankment Seismic Measures Work

Tidal Defense Work

Disaster Recovery Work



THE FIVE CONSTRUCTION PRINCIPLES



If we analyse all the parties involved in any construction work, we can categorise them into three main groups: the client, the contractor and the general public. The ideal situation is when all three parties are in agreement and satisfied with the successful outcome of the construction work. Problems arise when one of the parties becomes a victim of imbalance in this relationship. The conventional construction methods based upon principles that "more is paid for less efficient work" are no longer appropriate to present-day society. Universally acceptable construction methods must embody the Five Construction Principles.

Environmental Protection	Construction work should be environmentally friendly and free from pollution.
Safety	Construction work has to be carried out in safety and comfort with a method implementing the highest safety criteria.
Speed	Construction work should be completed in the shortest possible period of time.
Economy	Construction work must be done rationally with an inventive mind to overcome all constraints at the lowest cost.
Aesthetics	Construction work must proceed smoothly and the finished product should portray cultural and artistic flavour.

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Ver 2.4EN02 / 25 Nov 2015