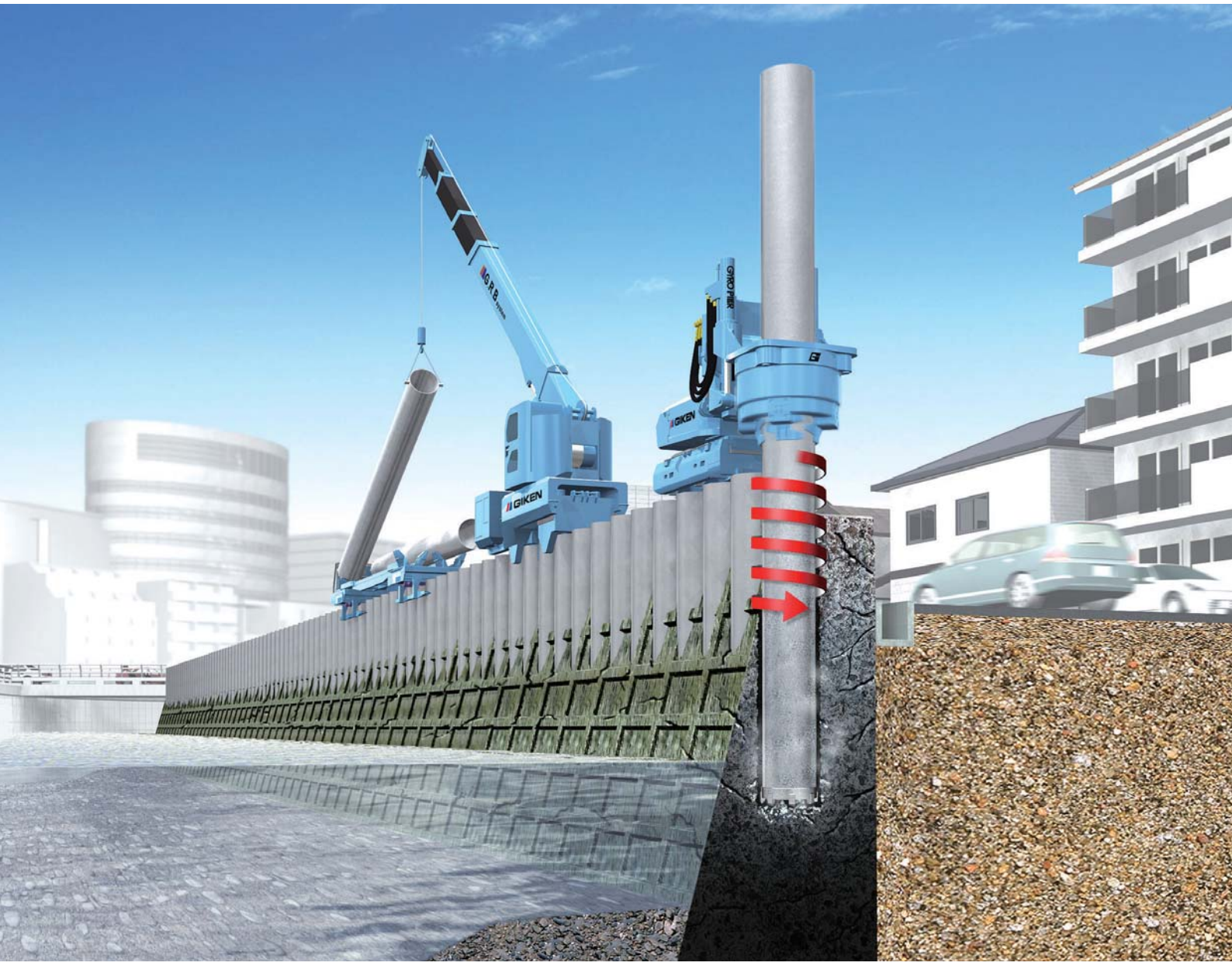
Construction Revolution

Self-Walking Rotary Press-in Method for Tubular Piles with Tip Bit

Gyropress Method



GIKEN

Introduction

Social infrastructures, such as roads, rivers, bridges, and levees, protect our life and property, and provide comfortable and cultural life. However, it is required to re-evaluate many of them in terms of "objective", "function" and "location" due to physical degrading by long time use, rapid urbanisation and changes in public demand.

Despite such requirement, many of these social infrastructures are concrete constructions, which are very difficult to be dismantled, removed, or added additional functions. The major factors are that they are constructed without plans of dismantling and removal, and that there are many physical restrictions for such works because of congested building urbanization.

Gyropress Method resolves these problems by its new concepts of construction method and structure design. This method enables to install tubular piles with cutting bits attached on piles toe by rotary jack-in system without removing existing underground structures. The installed piles form the both foundation structure and building structure. This method is developed based on the "advantages of the press-in principle" which have over 30 year achievements, and enables to carry out structure regeneration works and reinforcement works with preserving the "Five Construction Principles".

Structures constructed by Gyropress Method can be dismantled and removed. It means, it is possible to plan future functional improvements, restorations to original environment (restoration of nature), relocation, and recycling of construction materials at the design stage.

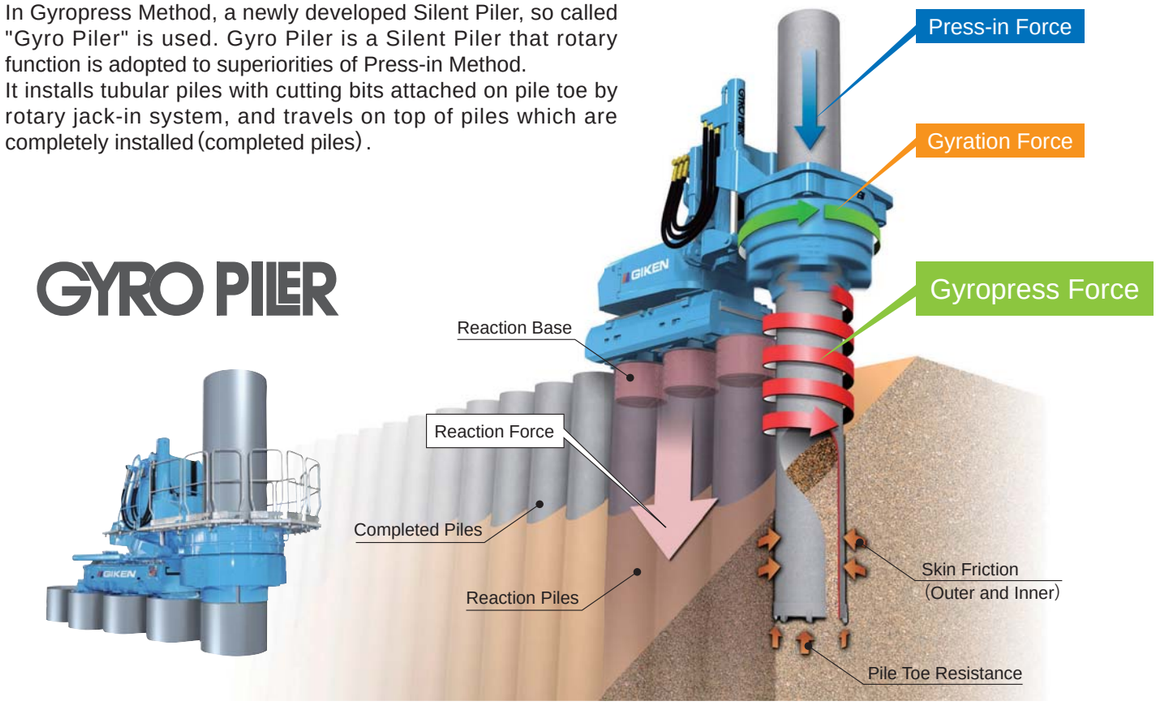
River Bank Reinforcement in central urban area by Gyropress Method

Contents

Overview of Gyropress Method

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

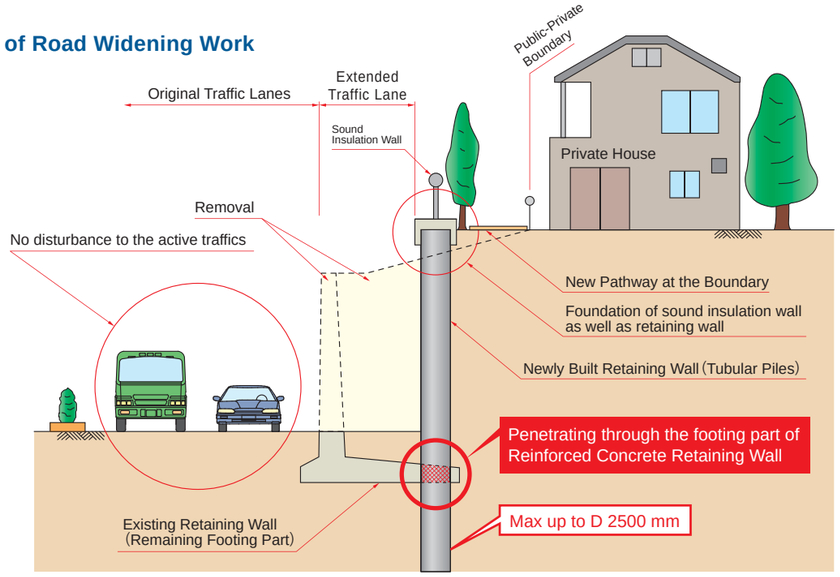
In Gyropress Method, a newly developed Silent Piler, so called "Gyro Piler" is used. Gyro Piler is a Silent Piler that rotary function is adopted to superiorities of Press-in Method.
It installs tubular piles with cutting bits attached on pile toe by rotary jack-in system, and travels on top of piles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



Epoch-making Design Concept for Regeneration and Reinforcement of Function without Removing Underground Structure.

Gyropress Method can carry out regeneration works and reinforcement works without removing underground structures. Gyro Piler can directly install structural material which eventually forms both foundation part and structural part With Gyropress Method, construction works can be carried out with less work processes and least negative impact to surrounding environment including economic activities. In addition, the completed structure has ideal level of quality.

Application of Road Widening Work



Features of Gyropress Method

◇ 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

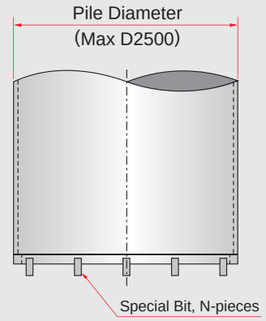
Gyro Piler can be used for variety of pile diameter sizes, pile arrangements and the combination of batter piles. It allows to select economically optimal structure design.

Construction works can be carried out with Environmentally-friendly considerations, lower cost and shorter work duration at any work conditions.

Cutting Reinforced Concrete

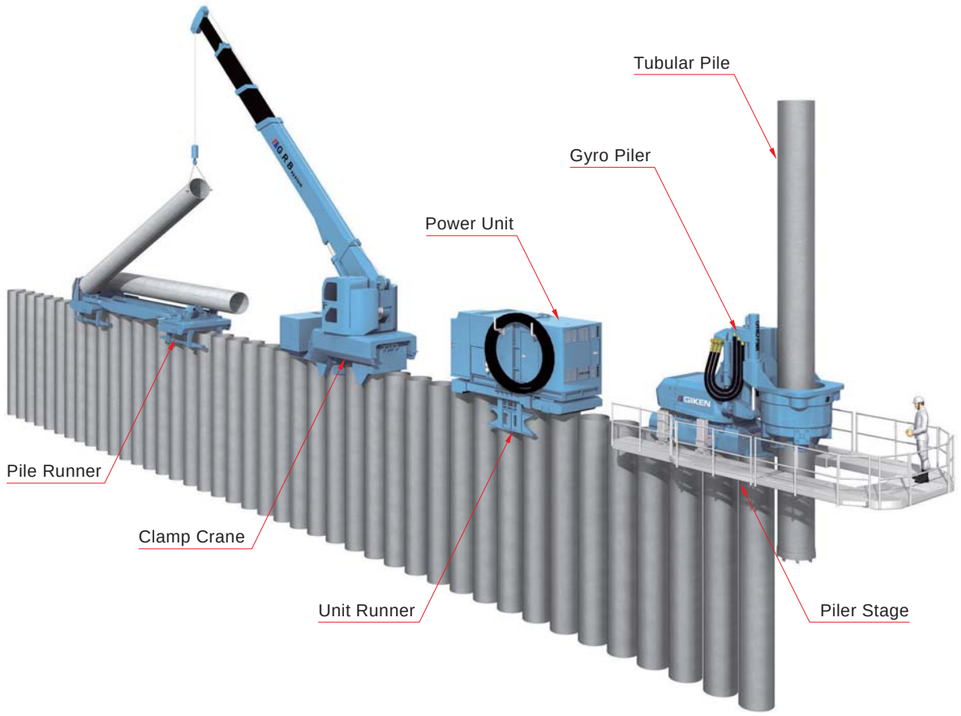
The followings present cutting off performance through reinforced concrete (t = 80 cm, σ_{ck} = 24 N/mm^2, D16@250 x 3 layers).

Overcoming various ground conditions by selecting bit arrangements.



GRB System for "Temporary Work Less" Construction

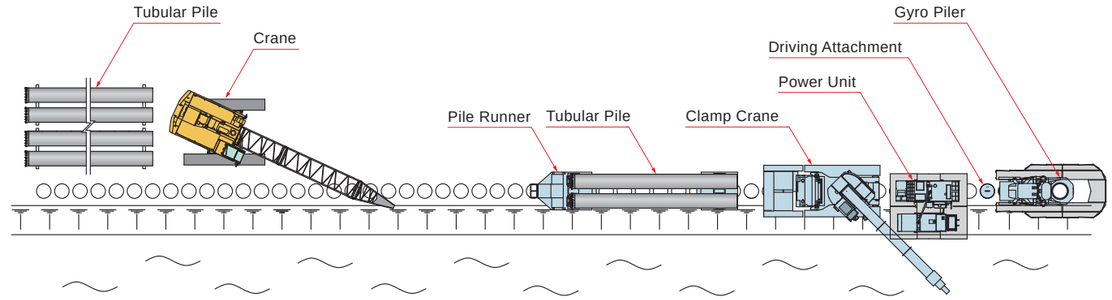
GRB system is the construction technology which performs all of piling works such as pile conveying, pile pitching and press-in work on top of completed piles. With the press-in machine (Gyro Piler) in the front, Power Unit as a power source, Clamp Crane to pitch piles and Pile Runner to convey piles from work base perform on top of pile head as working orbit. All machines are self-supported by holding existing piles with less risk of overturning. Temporary working platform or detour road is not required even at waterfront, narrow land, slope and low overhead clearance condition since influence range of work is minimised to just the width of those machinery. GRB System enables to construct just wall structure which is its original purpose of construction without any temporary works.



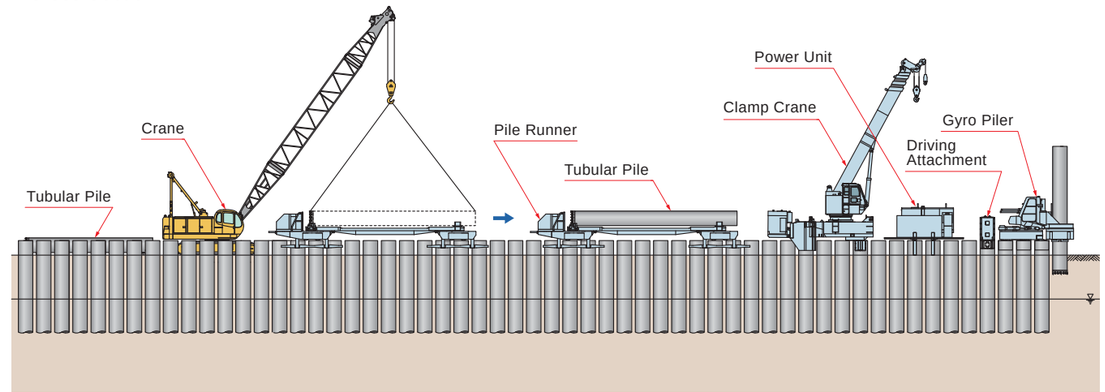
Standard Machine Layout

GRB System

▼ Plan View

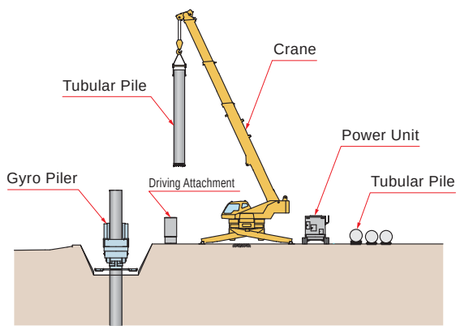


▼ Cross Section

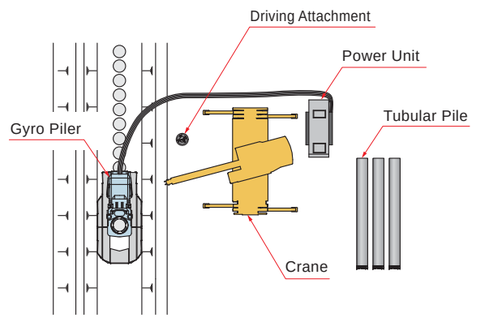


Standard Construction (SMP)

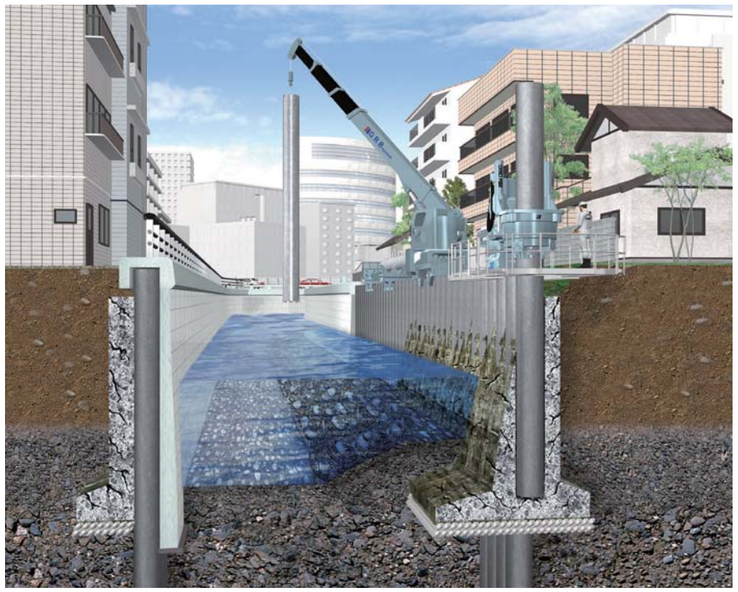
▼ Cross Section



▼ Plan View



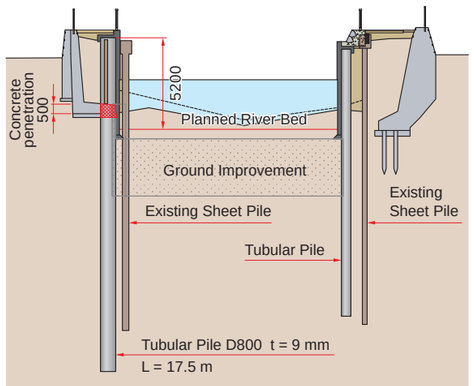
Riverbank Reinforcement



Gyropress Method can be applied for tough work conditions such as flood countermeasure works and seismic countermeasure works at residential areas. Because Gyro Piler can install piles through existing underground structure, the piling work can be carried out without disturbing cross-section area of river and active vessel traffics.

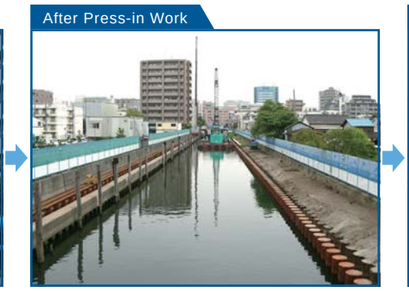
Reference Riverbank Construction Work at South Feeder Stream, OYOKOGAWA-River Tokyo, Japan

A riverbank protection work was carried out with GRB System. Piles were installed through existing structure at a narrow canal where there is no access for a large barge crane.



Before Construction

After Press-in Work



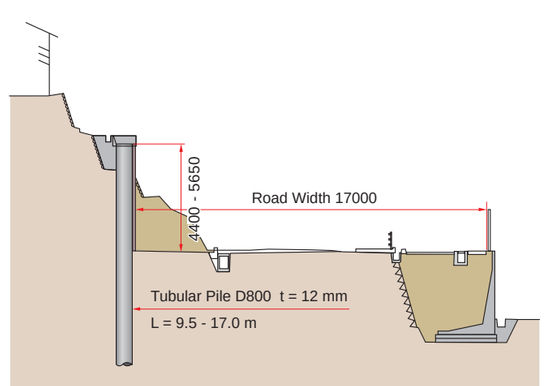
After Completion

Road Retaining Wall

Retaining wall can be easily constructed by continuos tubular pile wall with interlock pieces. Urban function is able to be evolved without disturbing active traffic and surrounding environment even at urban congested area by GRB System that various construction machines such as Clamp Crane, and other associated machines work on the top of tubular piles.

Reference Retaining Wall Construction Work for KASEDA Road Widening Kagoshima, Japan

Press-in into shaley sandstone layer (Extrapolated SPT N Value: 750)
A compact construction work with consideration for surrounding environment at the narrow land between a hospital and a prefectural road.



Before Construction

After Press-in Work

After Completion

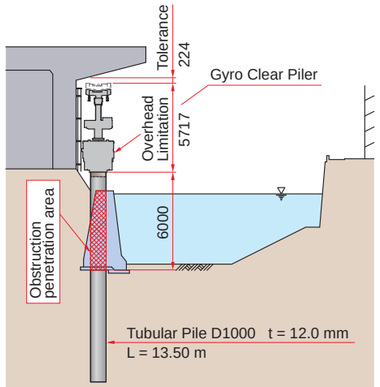
Applications & Reference

Construction under Overhead Clearance Restriction

Construction work can be carried out at beneath overhead obstruction, because Gyro Piler is compact and gripping position of pile being pressed-in is close to the pile top of competed piles. Especially in case of severe height restriction, Gyro Clear Piler, a specially designed Gyro Piler with short height, should be selected.

Reference Furukawa River Renovation Work — Tokyo, Japan

Construction Work at Low Overhead Clearance (6.0m) with Gyro Clear Piler.
A new bank protection work with penetrating existing protection bank without giving any impact on current surrounding functions.



Before Construction

After Press-in Work

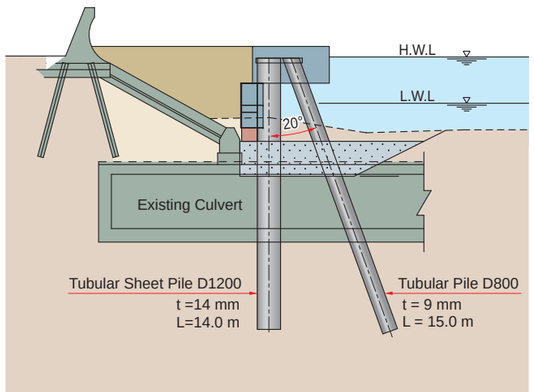
After Completion

Batter Pile Press-in

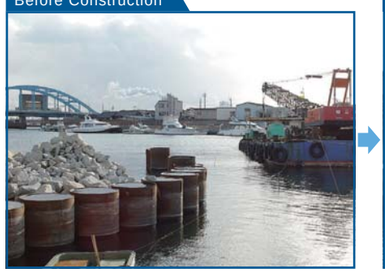
Gyro Piler has a lateral tilting function. It enables to install batter piles and anchor piles. Gyro Piler can construct high modulus retaining walls.

Reference Reinforcement Construction Work at TOMISUHARA Harbor — Mie, Japan

Batter piles were installed by Gyro Piler for reinforcement of a tubular sheet pile wall.



Before Construction

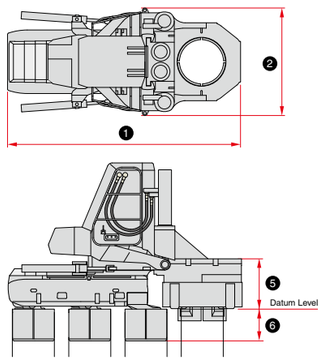


After Completion

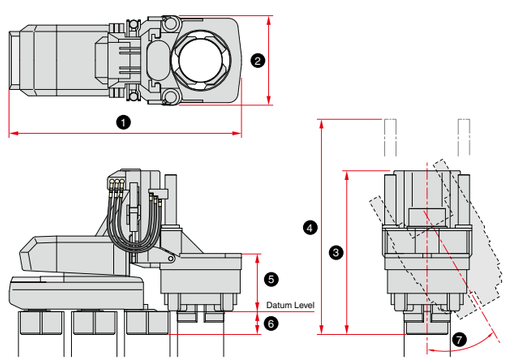
Gyro Piler

Gyro Piler : Dedicated Models for Vertical Gyropress, Batter Pile Installation

For Vertical Gyropress

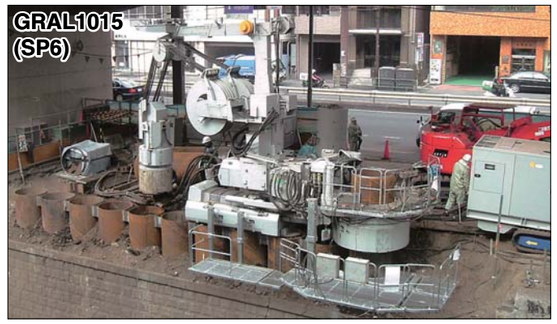


For Batter Pile Installation

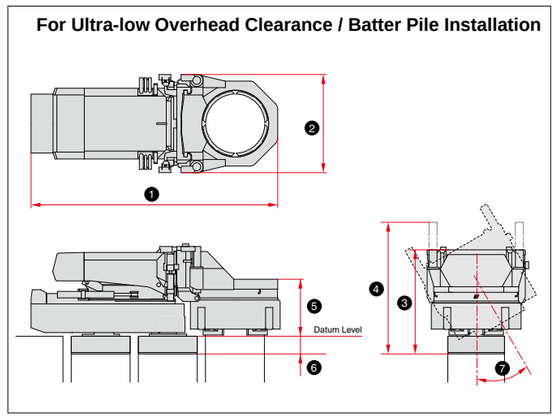


Models	GRV0615(SP3)	GRV0926(SP4)	GRV1026(SP7)	GRV1226(SP5)	GRV1230(SP12)	GRV2540(SP11)	GRA1030(SP1)
Press-in Force	1500 kN	2600 kN	2600 kN	2600 kN	3000 kN	4000 kN	3000 kN
Stroke	1200 mm	1250 mm	1300 mm	1300 mm	1300 mm	1500 mm	1300 mm
❶ Length	3530 mm - 3610 mm	4700 mm - 5060 mm	4900 mm - 5410 mm	5060 mm - 6110 mm	5620 mm - 7360 mm	8900 mm - 11910 mm	5200 mm - 5450 mm
❷ Width	1640 mm	2200 mm	2055 mm	2200 mm	2130 mm	3330 mm	2140 mm
❸ Height	3000 mm	3640 mm	3660 mm	3640 mm	4370 mm	5535 mm	3880 mm
❹ Max. Height	4020 mm	4800 mm	4800 mm	4800 mm	5120 mm	6440 mm	5050 mm
❺ Chuck Height	1180 mm	1030 mm	1180 mm	1080 mm	1940 mm	2375 mm	1360 mm
❻ Clamp Depth	400 mm	650 mm	600 mm	650 mm	800 mm	1250 mm	540 mm
❼ Mast Inc. Angle							30 Degrees, Either Side
Power Unit	EU300C2	EU300F3	EU500A3			EU500C3	EU500₂
Mass	15930 kg(D600)	29650 kg(D800)	33300 kg(D1000)	32000 kg(D1200)	47400 kg(D1200)	105000 kg(D2500)	37700 kg(D900)
Applicable Pile (without Interlock)	D500, 600	D800, 900	D800 - 1000	D1000, 1200	D1000, 1200	D2000, 2500	D800 - 1000
Applicable Pile (with Interlock)	D500	D700 - 900	D800, 900	D800 - 1000		D2000	

Gyro Clear Piler : For Ultra-low Overhead Clearance / Batter Pile Installation



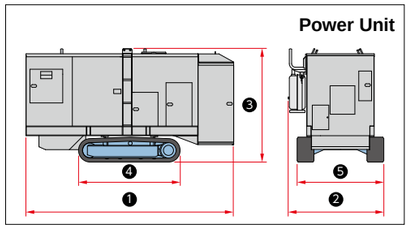
For Ultra-low Overhead Clearance / Batter Pile Installation



Models	GRAL1015(SP6)	GRAL1520(SP8)
Press-in Force	1500 kN	2000 kN
Stroke	700 mm	800 mm
❶ Length	4810 mm	6110 mm
❷ Width	2085 mm	2320 mm
❸ Height	2360 mm	3180 mm
❹ Max. Height	2990 mm	3620 mm
❺ Chuck Height	1160 mm	1560 mm
❻ Clamp Depth	300 mm	470 mm
❼ Mast Inc. Angle	30 Degrees, Either Side	
Power Unit	EU300C2	EU500A3
Mass	22100 kg (D1000)	41650 kg (D1500)
Applicable Pile (without Interlock)	D800 - 1000	D1200 - 1500
Applicable Pile (with Interlock)	D800	D1100 - 1300

Power Unit

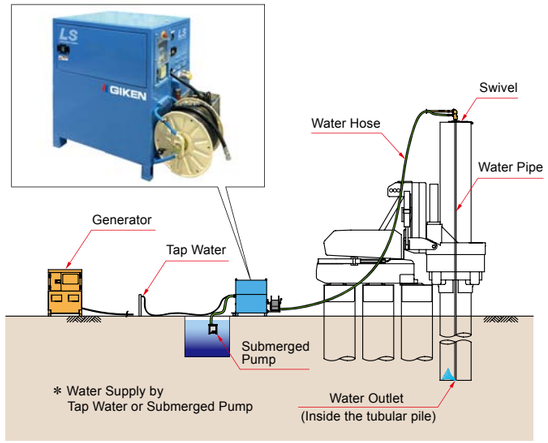
Power Unit



Models		EU300C2	EU300F3	EU500₂	EU500A3	EU500C3
❶ Length		4315 mm	4715 mm	4750 mm	4900 mm	4900 mm
❷ Width		2075 mm	2145 mm	2200 mm	2350 mm	2350 mm
❸ Height		2350 mm	2550 mm	2350 mm	2630 mm	2700 mm
❹ Crawler Length		2110 mm	2110 mm	2710 mm	2855 mm	2855 mm
❺ Crawler Width		1800 mm	1800 mm	2200 mm	2300 mm	2300 mm
Power Source		Diesel Engine				
Rated Output	Power Mode	221 kW/ 1800min^{-1}	230 kW/ 1800min^{-1}	368 kW/ 1800min^{-1}	377 kW/ 1800min^{-1}	377 kW/ 1800min^{-1}
	Eco Mode	177 kW/ 1600min^{-1}	204 kW/ 1600min^{-1}	327 kW/ 1600min^{-1}	335 kW/ 1600min^{-1}	335 kW/ 1600min^{-1}
Fuel Tank Capacity		500 L	500 L	800 L	850 L	850 L
Oil Tank Capacity		630 L	630 L	720 L	700 L	660 L
Moving Speed		1.4 km / h				
Mass		8050 kg	8650 kg	12400 kg	11500 kg	10950 kg

Auxiliary Equipment

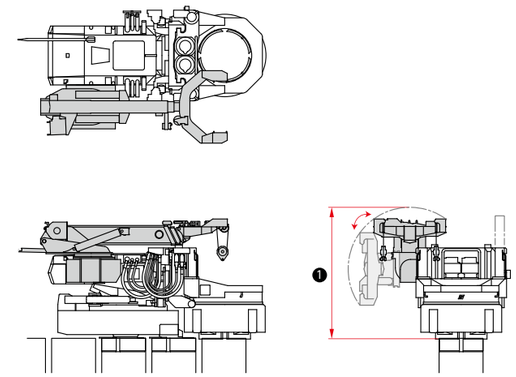
Lubrication System



* Example for using water as lubricant.

Input Voltage (3 phases)	AC200V, 50/60Hz, 24KVA or more
Water Pump Discharge Rate	Max. 60 ℓ/min
Water Pump Discharge Pressure	Max. 6 MPa
Outer Dimensions (W x D x H)	1505 × 755 × 1230 mm
Water Tank Capacity	300 L
Mass (without water)	410 kg

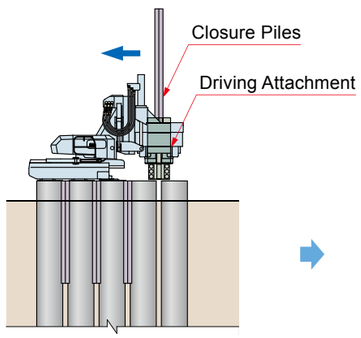
Crane Attachment



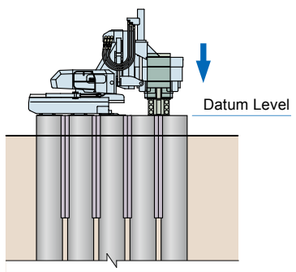
Models	For GRAL1015 (SP6)	For GRAL1520 (SP8)
❶ Min. Height	2890 mm	3540 mm
Hoisting Capacity	2.9 ton	2.9 ton
Mass	1870 kg	2000 kg

Driving Attachment

The attachment is used to install closure piles follolwing the tubular pile installation.



Attach the Driving Attachment into the Chuck and set out the closure pile at installation position.



Install the closure pile to the required depth.

◇ Closure Piles

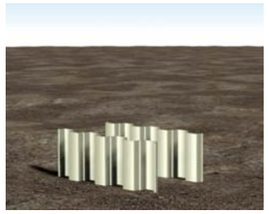
▼ Equal Angle

▼ Small diameter pipe

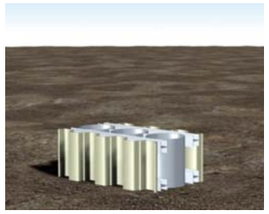
Standard Press-in Procedures

Initial Press-in

1 Press-in sheet piles for Reaction Force

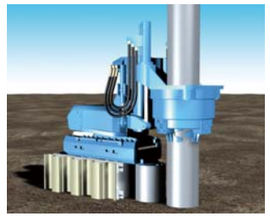


2 Erect the Reaction Stand

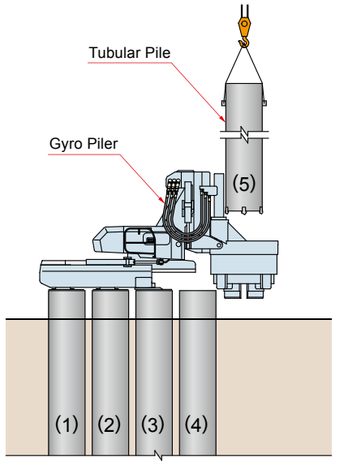


3 Assemble Main Body of Gyro Piler

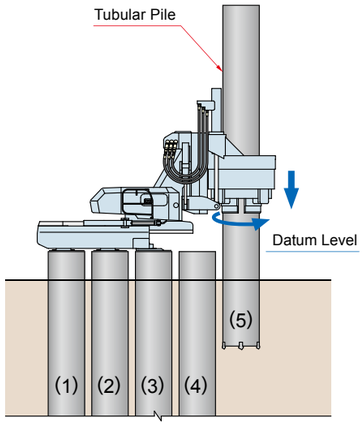
4 Press-in from the Reaction Stand



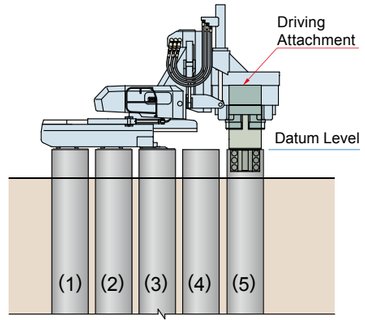
Standard Installation



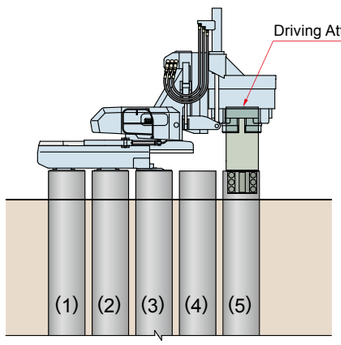
1 Pitch the tubular pile (5).



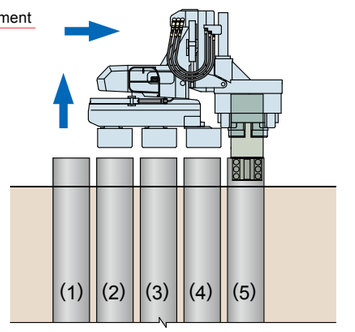
2 Confirm verticality of tubular pile and piling alignment and then gyropress-in on the datum line.



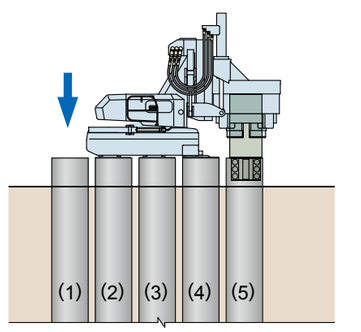
3 Set the Driving Attachment and then press-in up to the datum level.



4 Hold the upper part of the Driving Attachment.

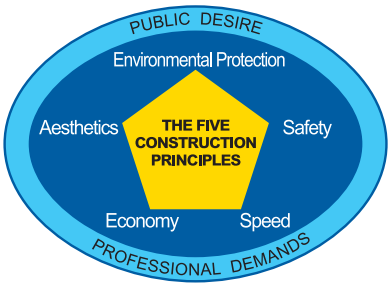


5 Confirm bearing resistance of tubular pile (5), move up main body and then make self-walking.



6 Lower the main body and complete self-walking. Remove the Driving Attachment. Then, repeat steps 1 though 6.

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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