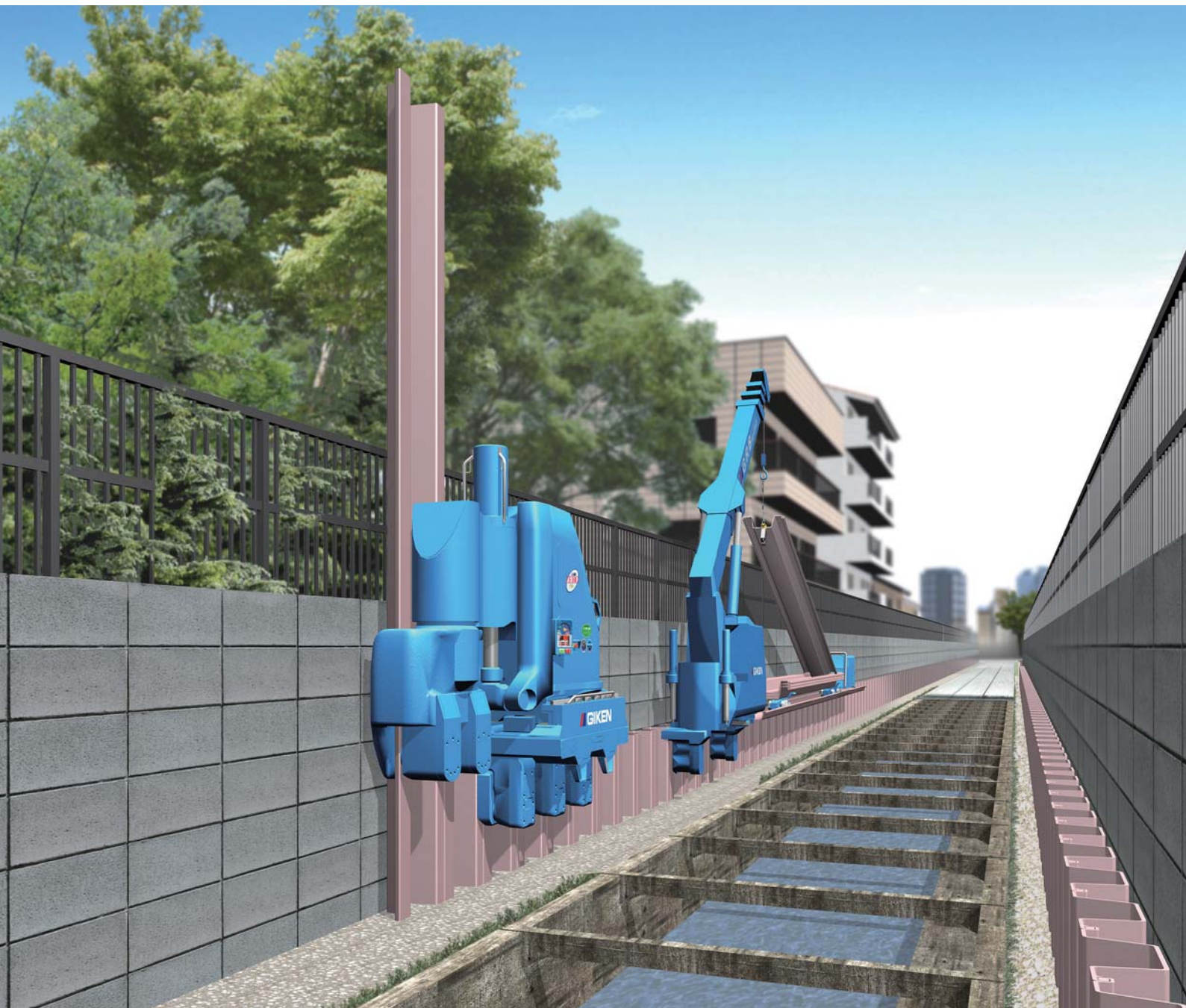


Piling work with zero clearance to adjacent structures

# Zero Clearance Method



# Introduction

The Zero Clearance Method employs an especially designed press-in machine (the Zero Piler) and Zero Sheet piles (NS-SP-J) to press-in piles with zero "dead space" between the piles and the adjacent structure. Conventional approaches often fail to provide a solution in civil engineering works on narrow water courses, etc., or building projects requiring efficient utilization of the available land. But the Zero Clearance Method enables maximum use of the space in a way that was not possible before.

Also, the machinery is compact, so it doesn't dominate the surrounding area, has no risk of overturning, and is very safe indeed. And by using the GRB system, which requires no temporary works, the construction time is shortened and costs are reduced. This path-breaking method is hugely beneficial in the development of underground spaces and antiseismic reinforcement work.



Building a Wastewater Structure in a Narrow Site with the Zero Clearance Method

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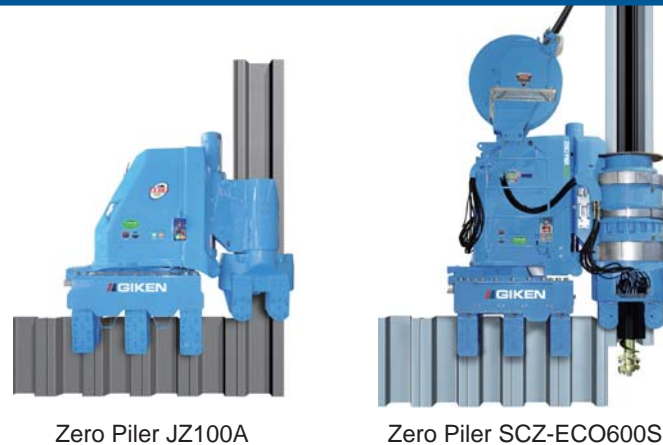
# Overview of Zero Clearance Method

**The press-in machine and piles are custom-designed to achieve zero clearance when working up against an existing structure, so efficient use can be made of limited work space**

The Zero Clearance Method uses especially designed equipment (the Zero Piler) and Zero Sheet Piles (NS-SP-J) to insert piles with zero "dead space" between the piles and the adjacent structure.

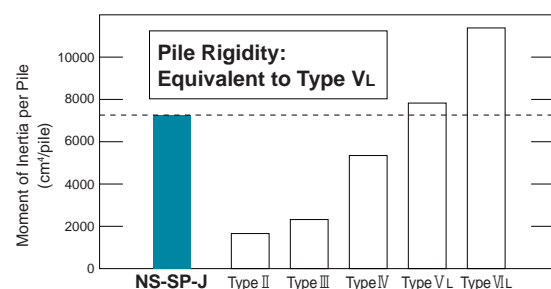
## The Superiorities of the Press-in Method

- No Vibration / No Noise
- No Overturning
- Press-in Machine Light and Compact
- Pile Bearing Capacity can be Checked as Work Progresses
- High Working Precision

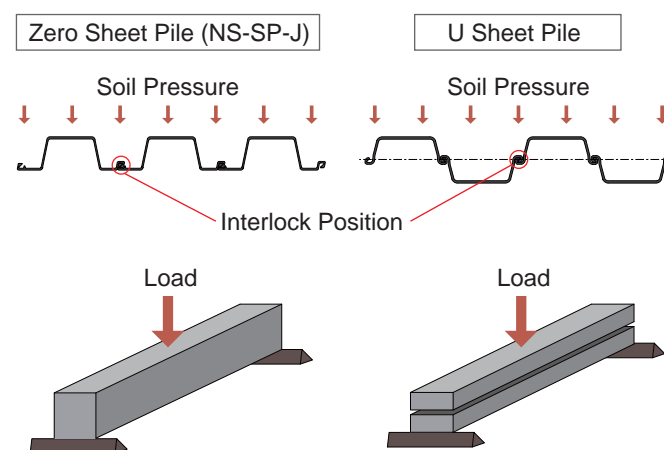


## Features of the Zero Sheet Pile (NS-SP-J)

- Interlock joint on the outside means no need to reduce cross-sectional performance because of interlock efficiency
- Individual piles are very rigid and resistant to deformation, making them excellent to work with

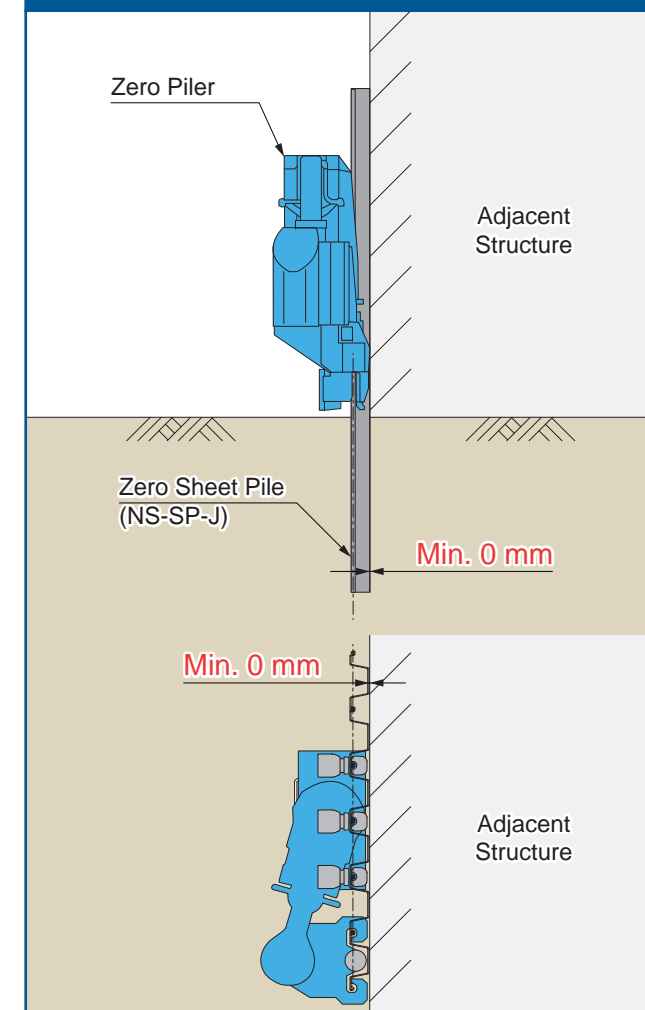


### Schematic View of Interlock Efficiency

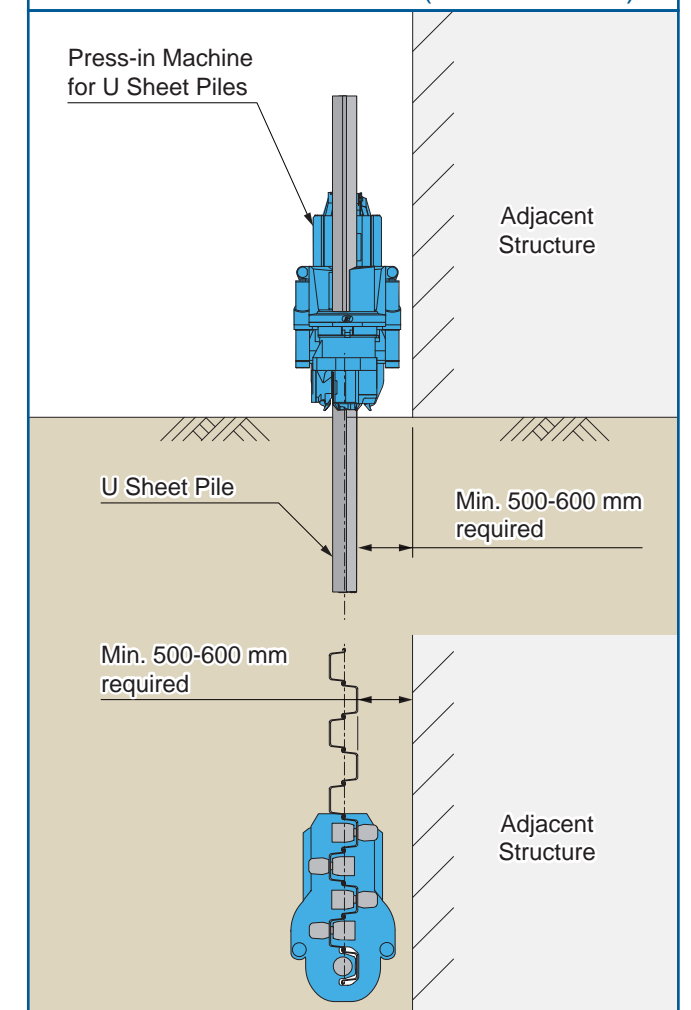


**Zero Clearance Method**

## Zero Clearance Method



## Normal Press-in Method (U Sheet Piles)



## Features of the Zero Clearance Method

### Respectful of the surrounding area

Because the Press-in Method uses static load, and the Zero Sheet Piles (NS-SP-J) all face the same way, then it is possible to minimize the effects on the ground behind the piles when using driving assistance.

### Excellent Safety with No Risk of Overturning

Because the press-in machine grips securely onto the completed piles, there is no risk of overturning.

### Outstandingly Economical

The Zero Sheet Piles (NS-SP-J) have their interlock situated on the outside, which enables economical design with no need to lower cross-sectional performance on the grounds of interlock efficiency.

### Faster Completion

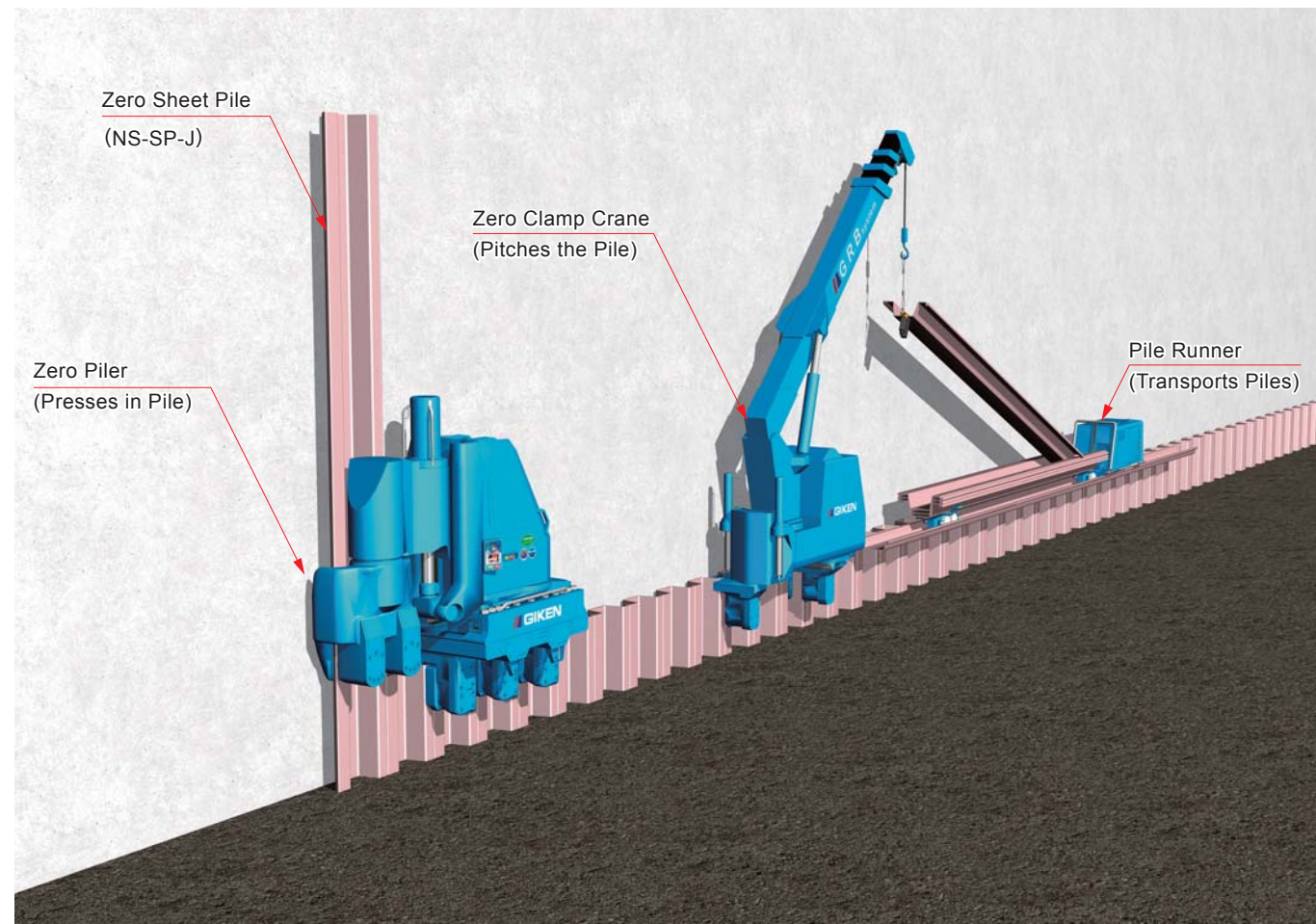
The Zero Sheet Piles (NS-SP-J) have an effective width of 600 mm, and when compared with 400 mm-width sheet piles, this means fewer piles to install and shorter construction time.

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

# GRB System

## GRB System for "Temporary Work Less" Construction

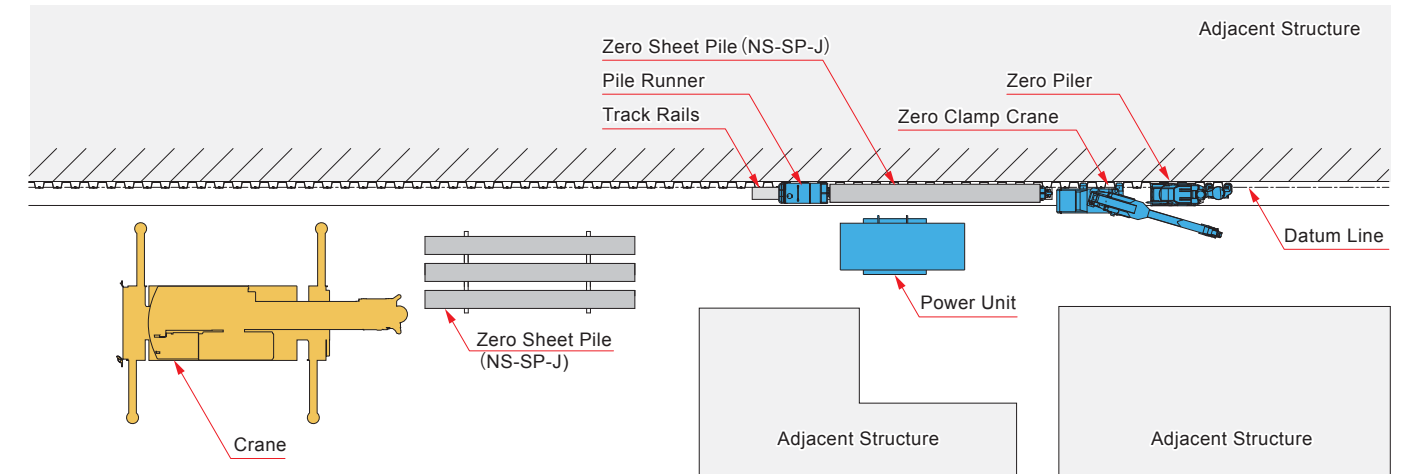
The GRB system applies the Press-in Principle which states that a reaction force is obtained from completed piles. In this way, all of the steps of the process, from transporting and pitching the pile, to pressing it in, can be carried out from a position on top of the existing piles. And since all of the equipment is self-supporting and grips onto the completed piles, then there is no risk of overturning, and the area affected by the works is restricted to the width of the machinery on the piles. Even over water, on sloping or uneven ground, in narrow spaces, or locations with restricted headroom, the GRB system has no need for any temporary structures, like platforms or roadways, and can focus efficiently on the purpose of the project - building the main structure.



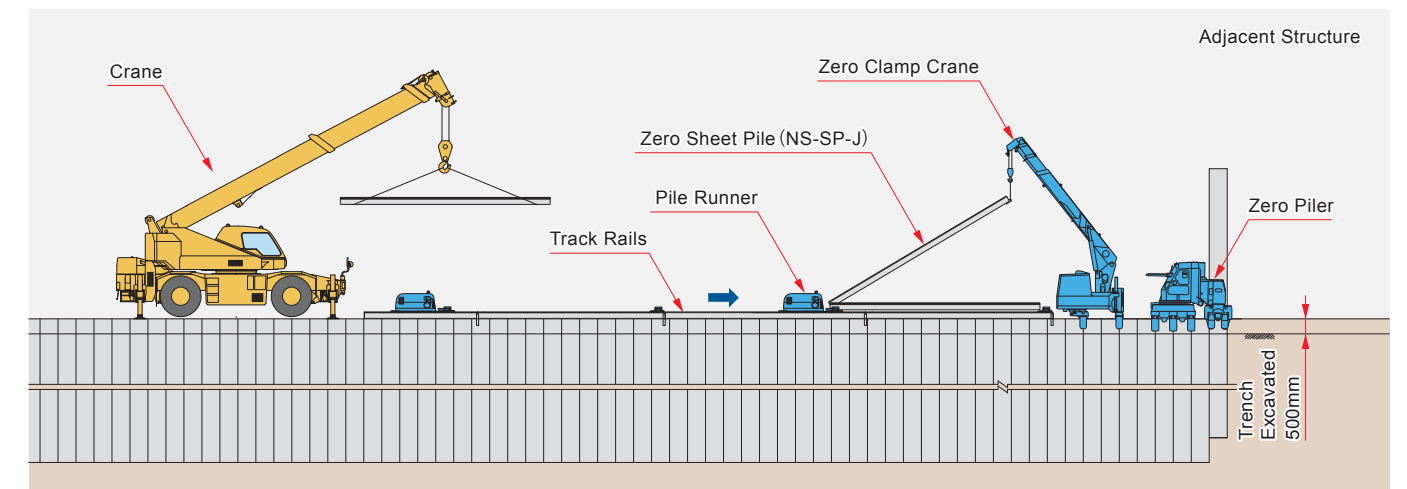
## Standard Machine Layout

### GRB System Working Layout

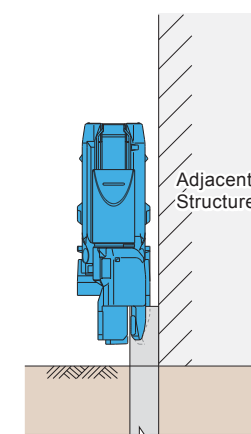
#### ▼ Plan View



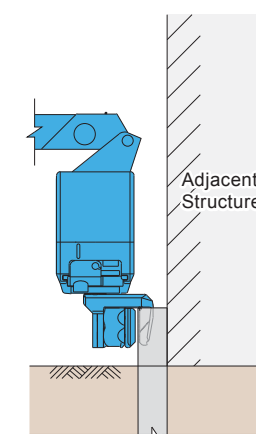
#### ▼ Side View



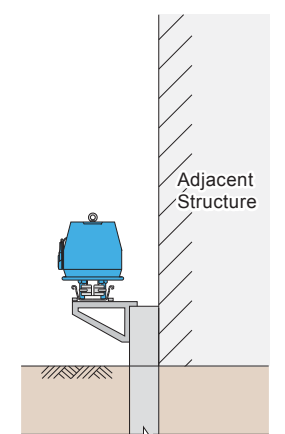
#### Zero Piler



#### Zero Clamp Crane



#### Pile Runner

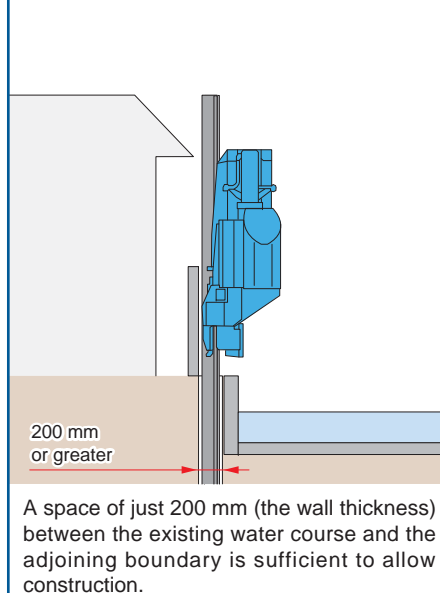




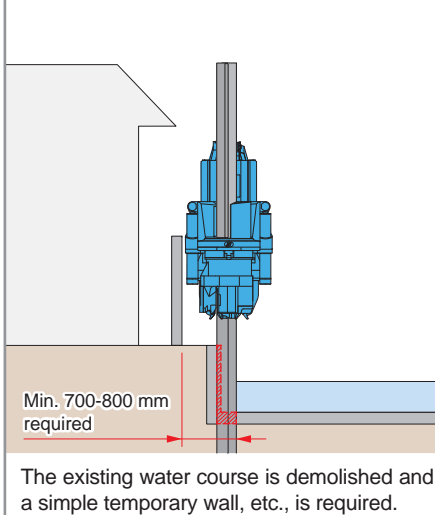
## Applications & Reference

### Water Course Repair Work

#### Zero Clearance Method



#### Conventional Method (Press-in Machine for U Sheet Piles)



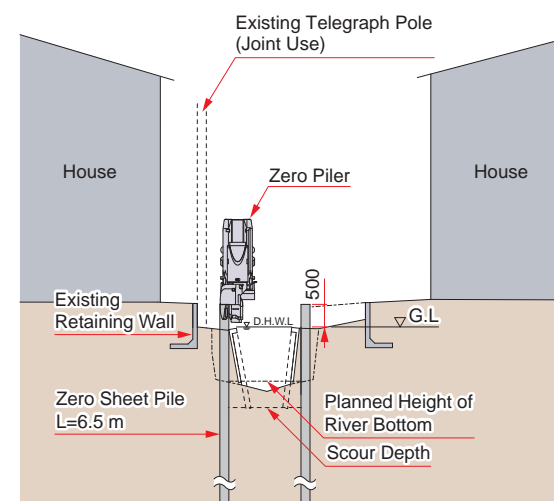
The Zero Piler can install piles with zero dead space to adjacent structures, and provided that there is at least a space corresponding the pile wall thickness (200 mm) between the existing water course and the adjoining boundary, the equipment is capable of working safely without interrupting ongoing activities and functions, even in narrow sites where conventional methods are not applicable.

#### Reference

River Restoration Project to Repair Earthquake Damage, Soeyamafurukawa

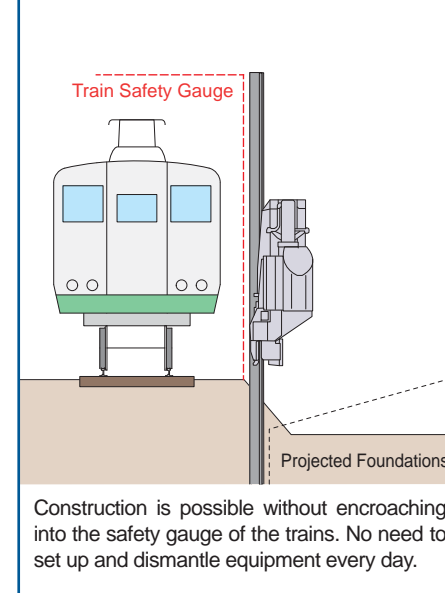
Hokkaido

An extremely safe construction process, minimizing the gap to the houses and making efficient use of the available ground.

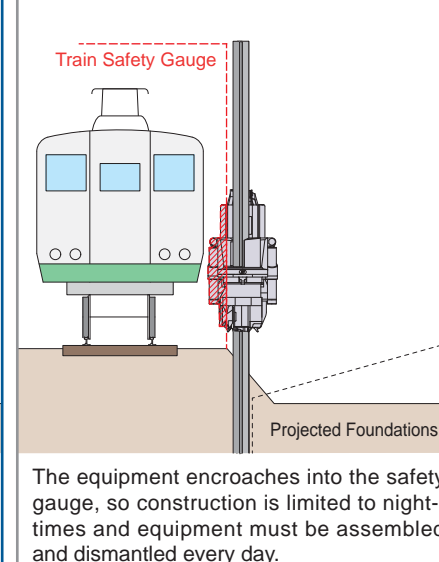


### Trackside Projects

#### Zero Clearance Method



#### Conventional Method (Press-in Machine for U Sheet Piles)

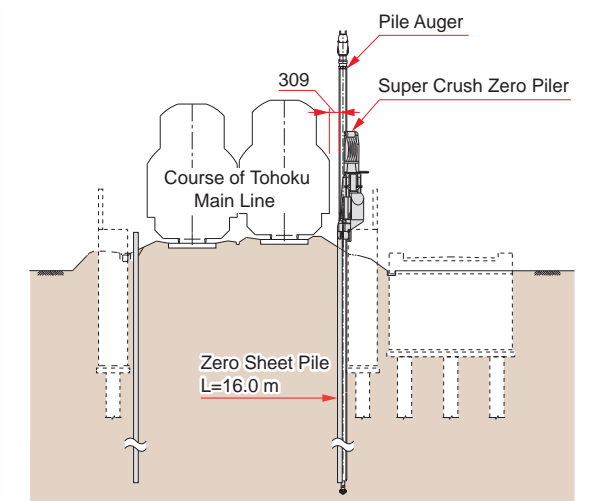
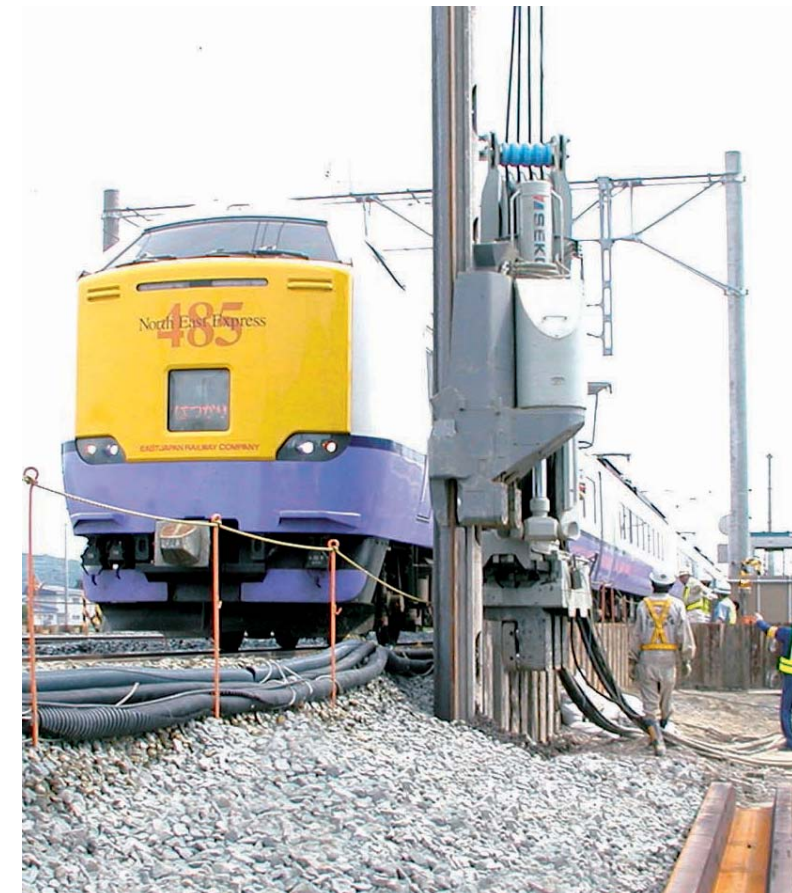


The Zero Piler is capable of working safely in strict observance of building restrictions, and respects the train safety gauge at all times. The machinery does not have to be assembled and removed every day, there is no impact on railway operations, and the construction time can be made much shorter.

#### Reference

No. 1 Shimounabara B Reconstruction Project between Nonai and Yadamae on the Tohoku Main Line Aomori Prefecture

Piles could be built close alongside the tracks during train operating hours, without any effect on traffic, resulting in much faster completion.

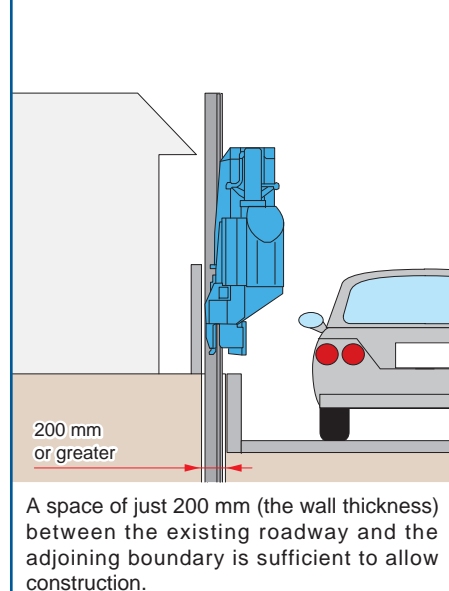




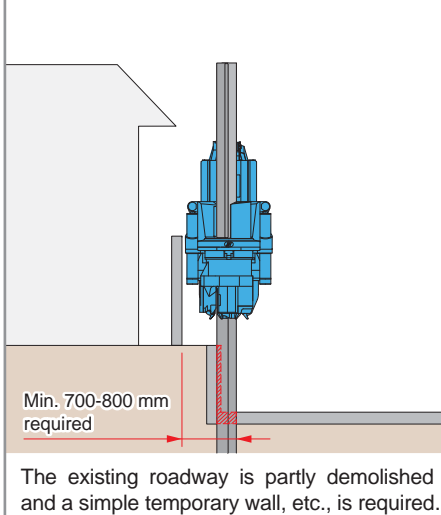
## Applications & Reference

### Retaining Walls for Highways

#### Zero Clearance Method



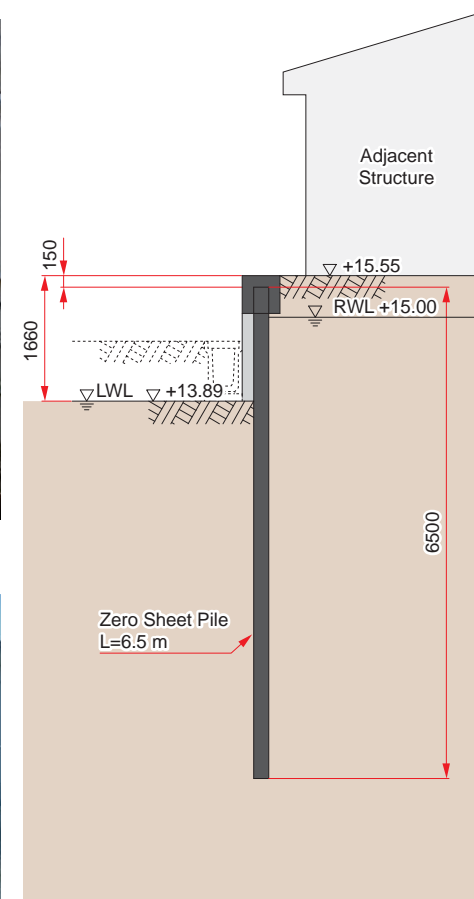
#### Conventional Method (Press-in Machine for U Sheet Piles)



The compact Zero Piler and the special piles used minimize the effects on the surrounding area and make it possible to construct retaining walls for roads alongside residential dwellings.

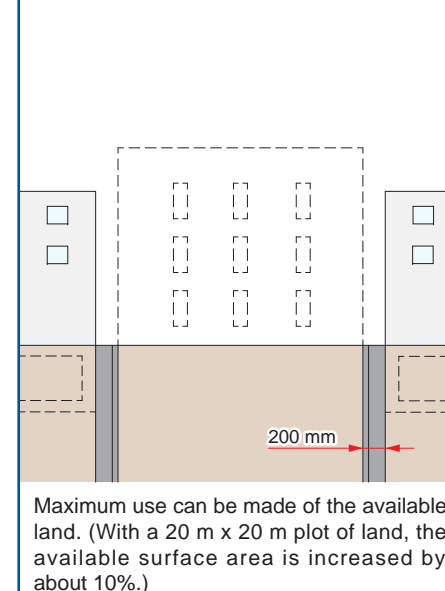
Reference Specific Country Road Repair Works, Road Improvements on Urban Stretch between Shimbashi and Mure Yamaguchi Prefecture

Retaining wall built with minimum clearance between sheet piles and adjacent structure. Safe and compact machinery means that work is completed without having to demolish nearby structures.

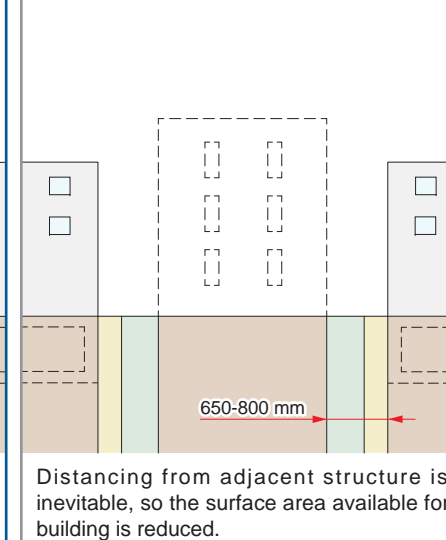


### Architectural Bracing Projects

#### Zero Clearance Method



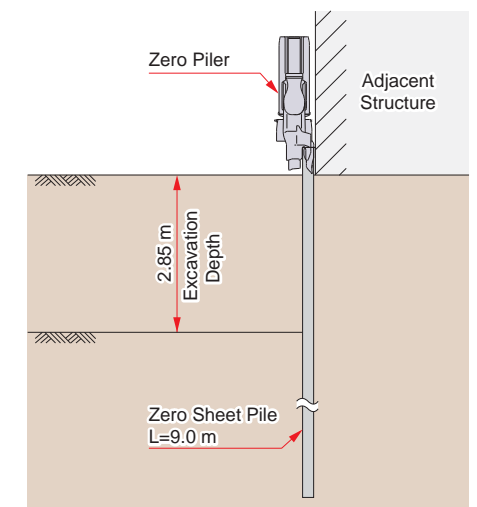
#### Conventional Method (Three-Point Pile Driver)



The Zero Clearance Method is compact and safe, and permits highly efficient work in sites with very restricted lateral space. Using the Zero Sheet Piles helps to minimize the thickness of the retaining wall, so that the available building land can be used to the maximum.

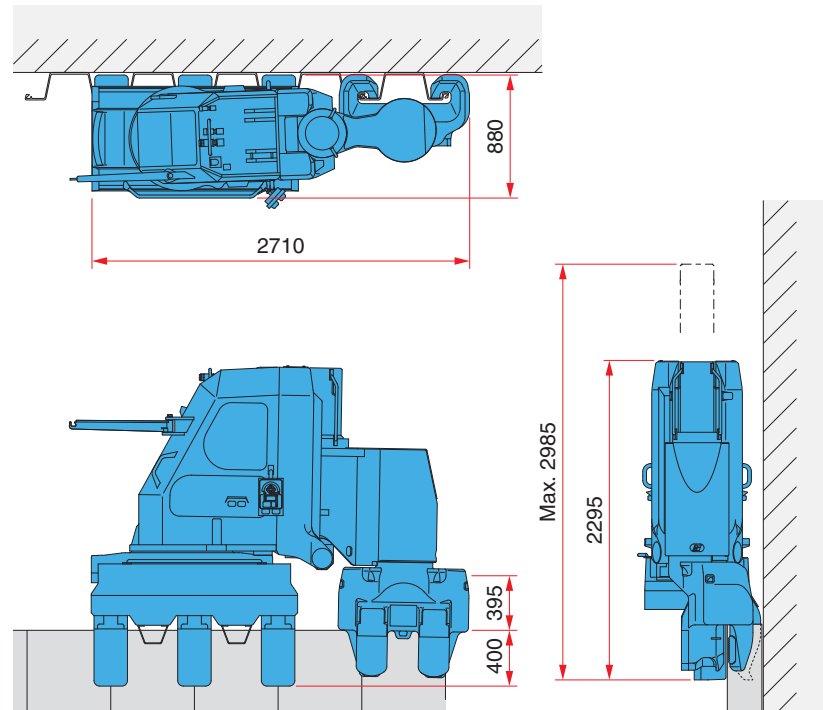
Reference New Construction, Mitsui Life Matsue Building Shimane Prefecture

Achieving zero clearance to the adjacent structure makes more land available for building Project completed with no effects on the surrounding area.



# Zero Piler

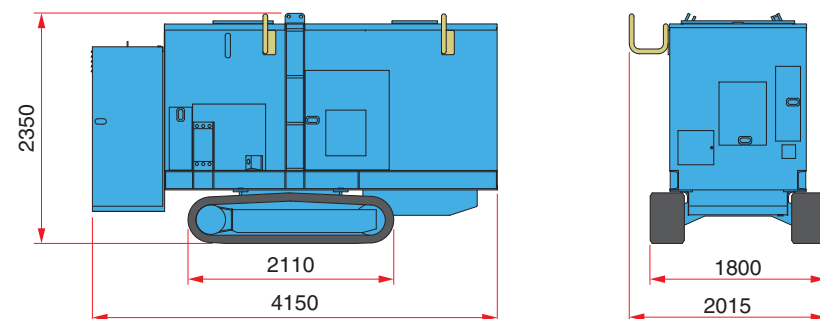
## Zero Piler JZ100A (Standard / Water Jetting Mode Compatible)



Press-in Machine Main Body	
Press-in Force	980 kN
Stroke	700 mm
Power Unit	EU200I3
Mass	7900 kg
Compatible Piles	Zero Sheet Pile (NS-SP-J) 600 mm Width

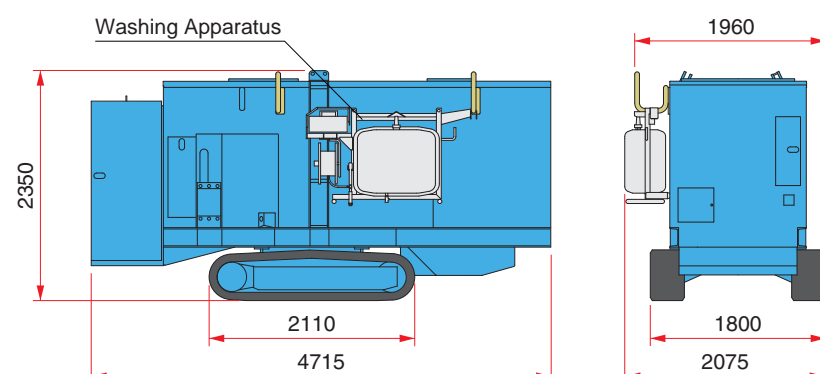
## Power Unit

### EU200I3



Model	EU200I3	
Power Source	Diesel engine	
Rated Output	Power Mode	195 kW / 1800min <sup>-1</sup>
	Eco Mode	173 kW / 1600min <sup>-1</sup>
Fuel Tank Capacity	400 L	
Hydraulic Oil Tank Capacity	490 L	
Travel Speed	1.4 km/h	
Mass	6800 kg	

### EU300G3

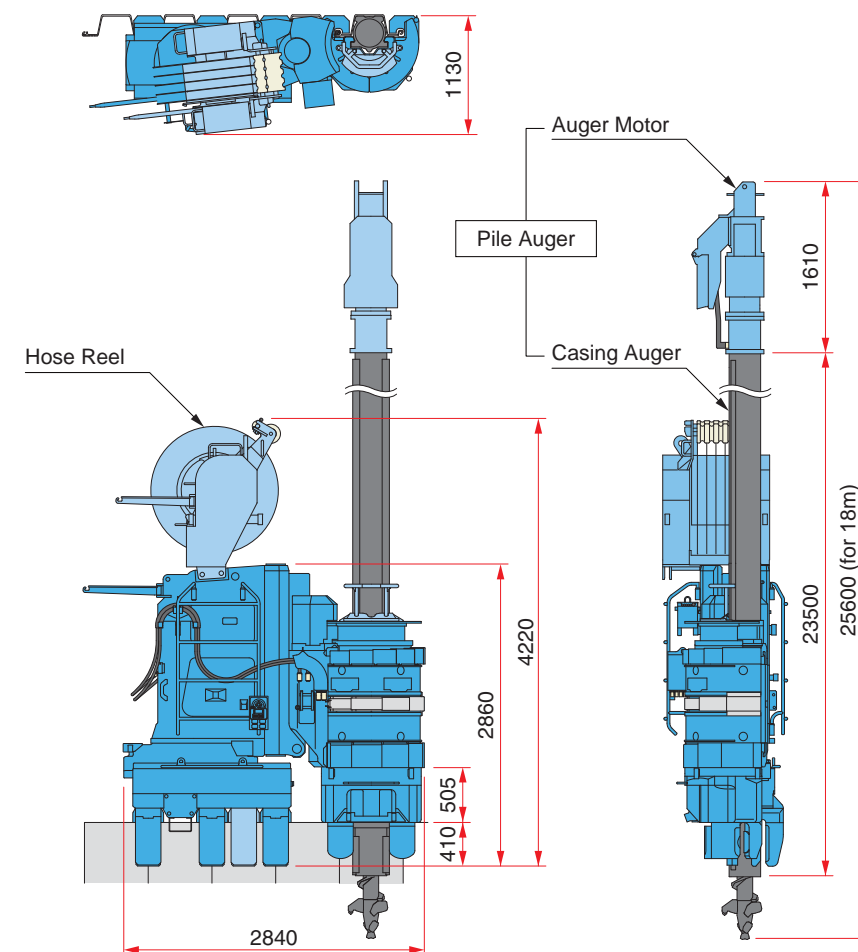


Model	EU300G3	
Power Source	Diesel engine	
Rated Output	Power Mode	230 kW / 1800min <sup>-1</sup>
	Eco Mode	204 kW / 1600min <sup>-1</sup>
Fuel Tank Capacity	500 L	
Hydraulic Oil Tank Capacity	630 L	
Travel Speed	1.4 km/h	
Mass	8250 kg	

\* Product specifications may be changed without prior notice.

## Zero Piler SCZ-ECO600S (Standard / Water Jetting / Hard Ground Mode Compatible)

### Super Crush Mode



\* Three clamps used for adjacent piling and four clamps used for normal work.

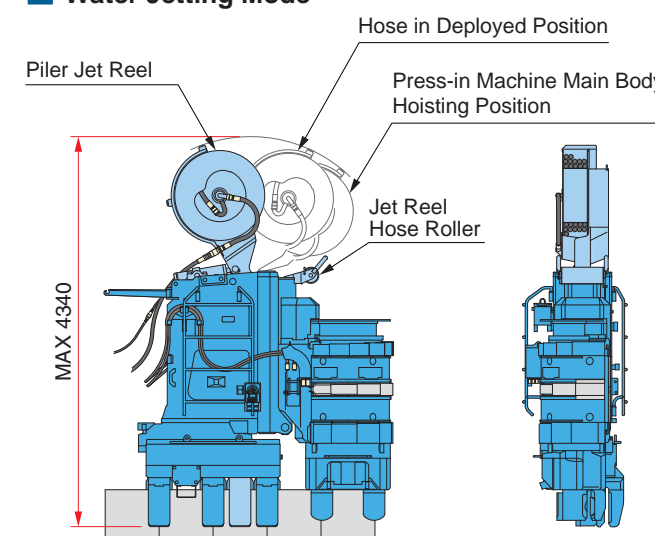
Press-in Machine Main Body		
Press-in Force		770 kN
Stroke		1000 mm
Power Unit		EU300G3
Mass	3-Clamp	12440 kg
	4-Clamp	12840 kg
Compatible Piles		Zero Sheet Pile (NS-SP-J) 600 mm Width

Pile Auger PA17		
Compatible Pile Length		Max. Length 18 m
Mass	Auger Motor	760 kg
	Casing Auger	5980 kg (for 18 m)
Total Mass		6740 kg

Hose Reel HR12	
Mass	1500 kg

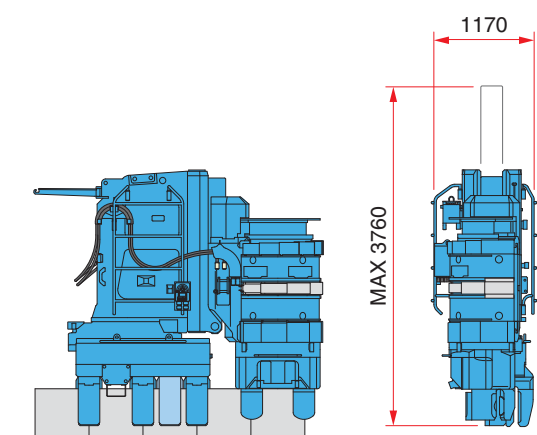
Piler Jet Reel JR27	
Compatible Pile Length	Standard 17 m (Max. Length 27 m)
Mass	780 kg

### Water Jetting Mode



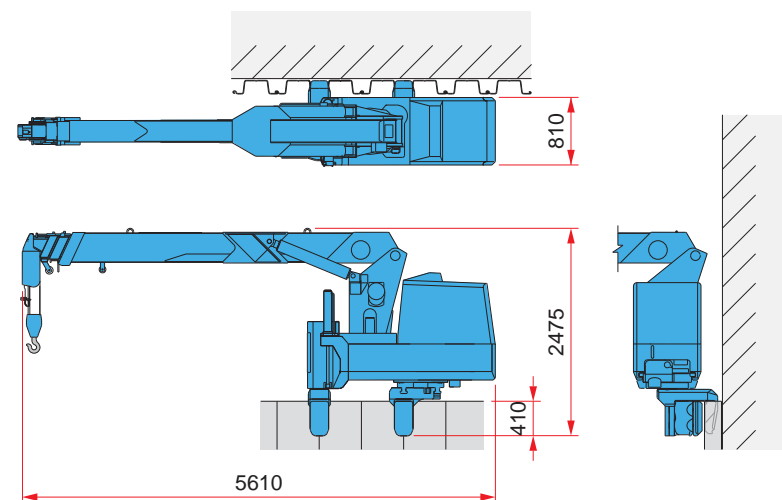
\* Piler Jet Reel optional.

### Standard Press-in



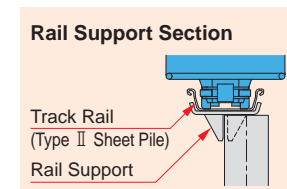
\* Product specifications may be changed without prior notice.

## Zero Clamp Crane CB1-7



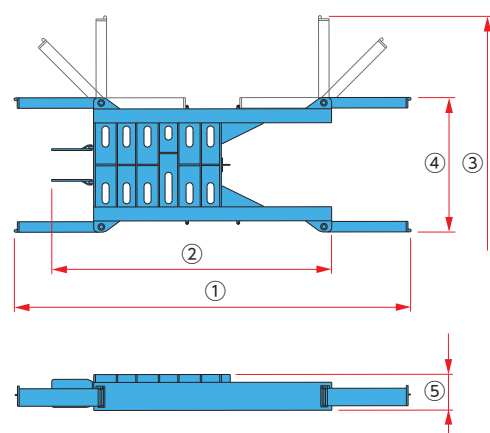
Model	CB1-7
Crane Power	2.93 ton x 4.5 m
Max. Working Radius	12.0 m
Compatible Piles	Zero Sheet Pile (NS-SP-J) U Sheet Pile 400-600 Pitch Hat Sheet Pile 900 Pitch Concrete Sheet Pile KF100-150H
Mass	4500 kg

## Pile Runner PR1



Model	PR1
Carrying Capacity	5.0 t
Mass	Towing Rig: 645 kg Carriage: 140 kg
Total Mass	785 kg
Compatible Piles	Zero Sheet Pile (NS-SP-J) U Sheet Pile 400-600 Pitch Hat Sheet Pile 900 Pitch Concrete Sheet Pile KF100-150H

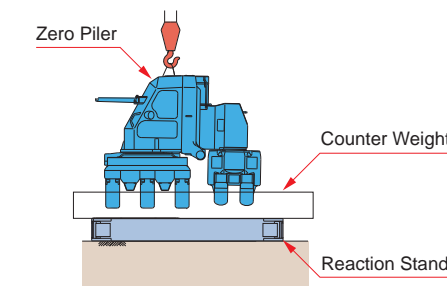
## Reaction Stand



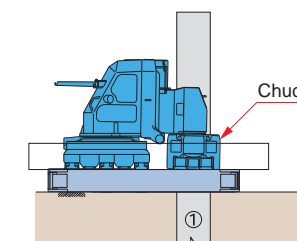
Model	For JZ100A	For SCZ-ECO600S
① Total Length	5720 mm	5670 mm
② Total Length (Arm Folded)	3450 mm	4000 mm
③ Total Width	4310 mm	4260 mm
④ Total Width (Arm Folded)	1970 mm	1920 mm
⑤ Total Height	414 mm	512 mm
Mass	1600 kg	2100 kg

# Standard Press-in Procedure

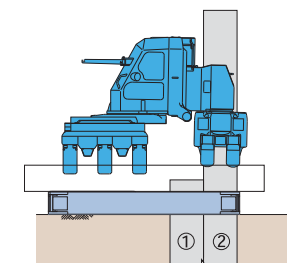
## Initial Press-in



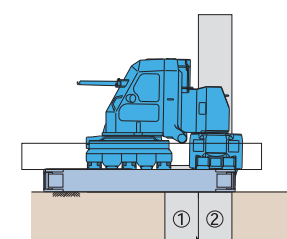
- 1 Set the Reaction Stand horizontally on the press-in line, and install the Zero Piler and then the Counter Weight.



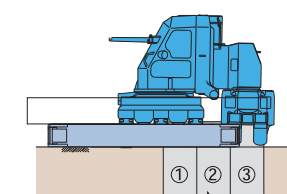
- 2 Pitch a Zero Sheet Pile ① in the Chuck, check the verticality and alignment, and start press-in.



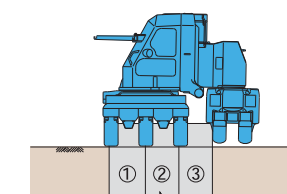
- 3 Press-in Zero Sheet Pile ① to prescribed height and press-in Zero Sheet Pile ② to a position which allows safe self-moving. The Zero Piler then self-moves.



- 4 Press-in Zero Sheet Pile ② until the prescribed height.

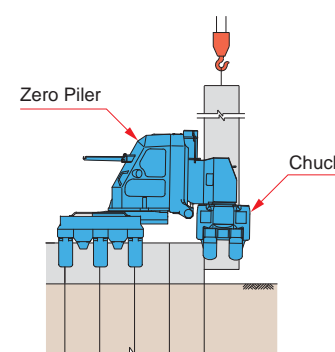


- 5 Press-in three piles by this same procedure.

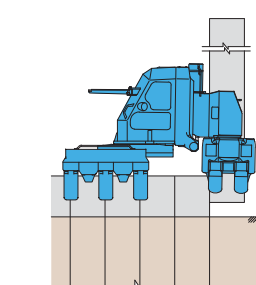


- 6 Remove the counter weight and the Reaction Stand. Installation of initial reaction sheet piles completed.

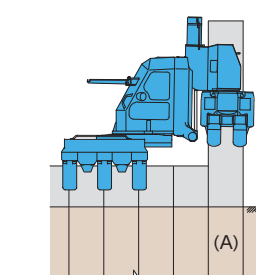
## Standard Installation



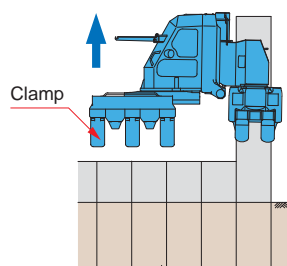
- 1 Pitch the Zero Sheet Pile and grip with the chuck.



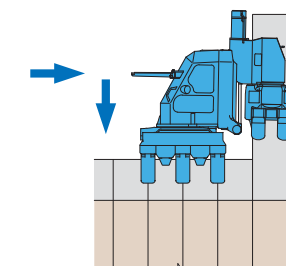
- 2 Check verticality and alignment, and then start press-in work.



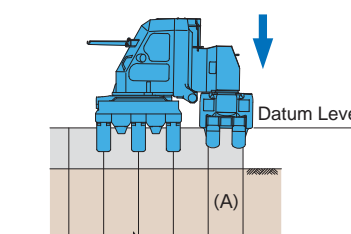
- 3 Press in Zero Sheet Pile (A) until bearing capacity is achieved.



- 4 Open clamp and start self-moving.



- 5 Close clamp and end self-moving.

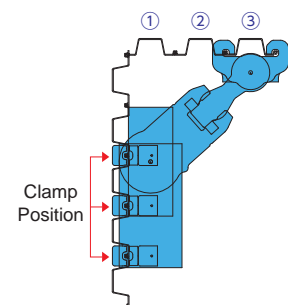


- 6 Press in Zero Sheet Pile (A) to datum level. Pile complete.

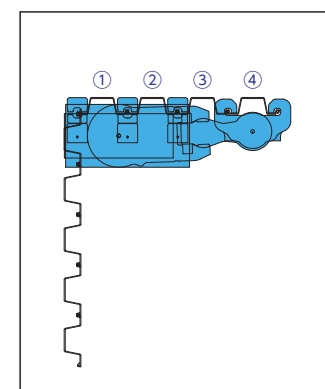


## Corner Installation

**Site Condition A:**  
Hoisting possible

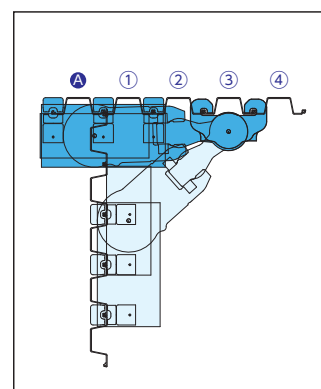


The press-in machine main body can press in up to three piles in the positions shown above. A fourth pile requires various approaches, depending on the site conditions A-C.



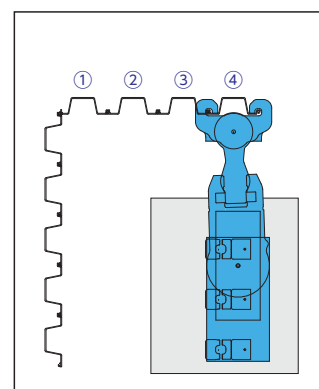
The press-in machine is hoisted and moved to the indicated position by crane, and then presses in the fourth pile.

**Site Condition B:**  
Installation of sacrificial pile possible



One sacrificial pile A is pressed in on the opposite side to the piling direction, so that Clamp No. 3 can grip this pile A when self-moving. After moving, the fourth pile is pressed in.

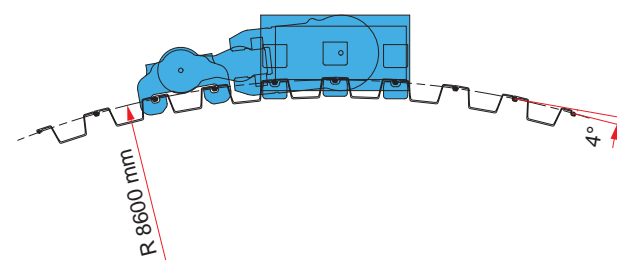
**Site Condition C:**  
Hoisting and sacrificial pile both impossible



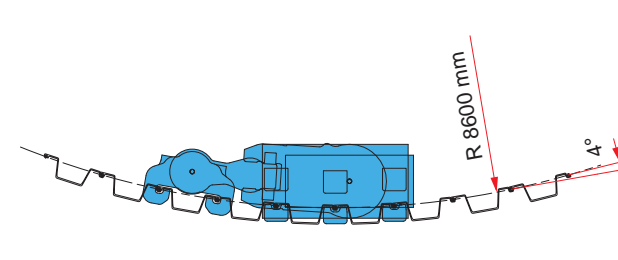
The press-in machine is installed on the Reaction Stand, and the fourth pile is pressed in.

## Curve Installation

Outward Curve

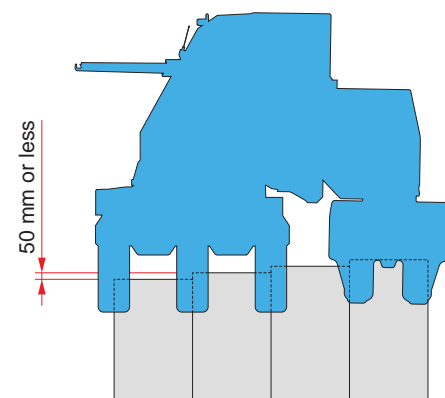


Inward Curve

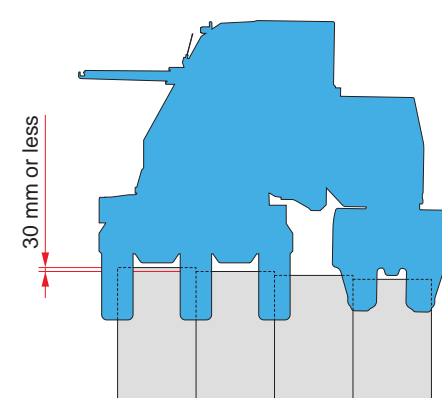


## Slope Installation

Upward Gradient



Downward Gradient



Specifications vary with the site conditions, so check with the manufacturer, Nippon Steel and Sumitomo Metal Corp., for details about models and thread conditions.

## Standard Shapes and Cross-Sectional Performance of Zero Sheet Piles (NS-SP-J)

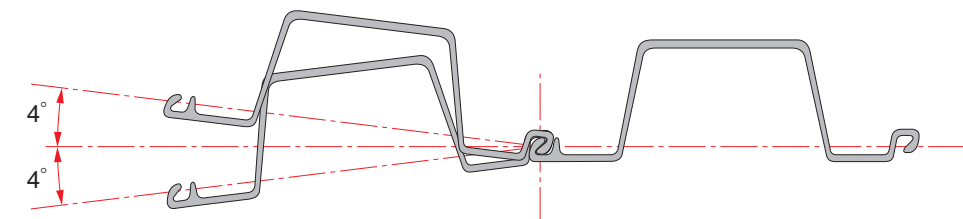
\* "NS-SP-J" is a Sheet Pile made by Nippon Steel and Sumitomo Metal.

Approved by Ministry of Land Infrastructure, Transport and Tourism (MSTL-0148).

		Dimensions			Per Pile				Per Metre of Wall			
		Effective Width	Height *	Thickness	Cross-sectional Area	Moment of Inertia	Section Modulus	Unit Mass	Cross-sectional Area	Moment of Inertia	Section Modulus	Unit Mass
Reference	NS-SP-J	600	200	13.0	111.2	7250	705	87.3	185.3	12090	1175	145
	SP-III	400	125	13.0	76.42	2220	223	60.0	191.0	16800	1340	150
	SP-IV	400	170	15.5	96.99	4670	362	76.1	242.5	38600	2270	190

\* Indicates effective height in the case of U Sheet Piles (Wall Thickness = Effective Height x 2)

## Interlock Thread Angle



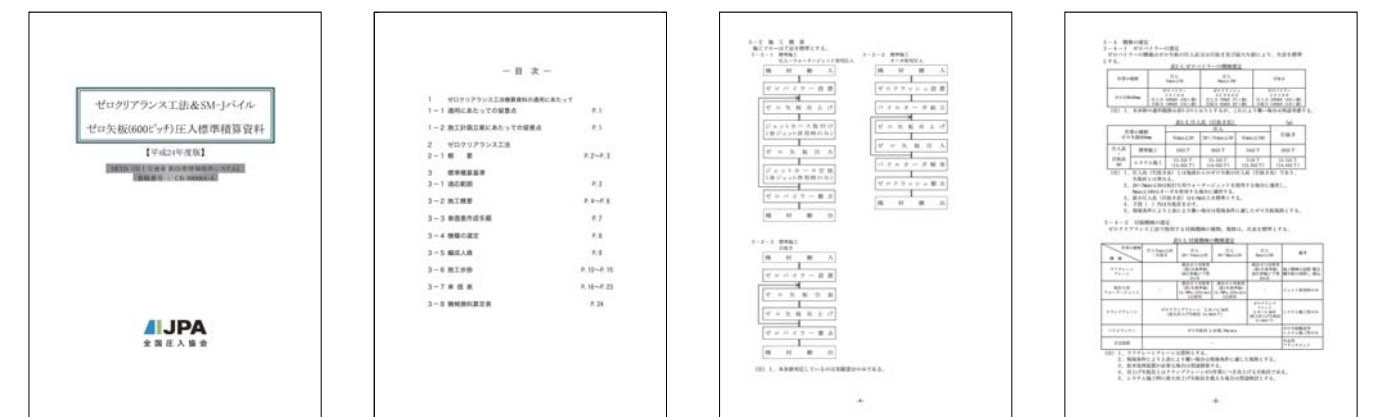
\* NS-SP-J piles can be threaded with U Sheet Piles.

## Range of Application of the Zero Clearance Method

Type of Work	Press-in	Water Jetting Mode (Using 1 Unit)	Water Jetting Mode (Using 2 Units)	Press-in with the Pile Auger
Max. SPT-N Value	$N_{max} \leq 20$	$20 < N_{max} \leq 40$	$40 < N_{max} \leq 50$	$50 < N_{max} \leq 180$
Compatible Model	JZ100A / SCZ-ECO600S			SCZ-ECO600S

## Sekisan

The technical data published by the Japan Press-in Association can be applied to the Zero Clearance Method.



Standard technical data can be downloaded from the Association's website.

<http://www.atsunyu.gr.jp>

## Eco-Friendly Design

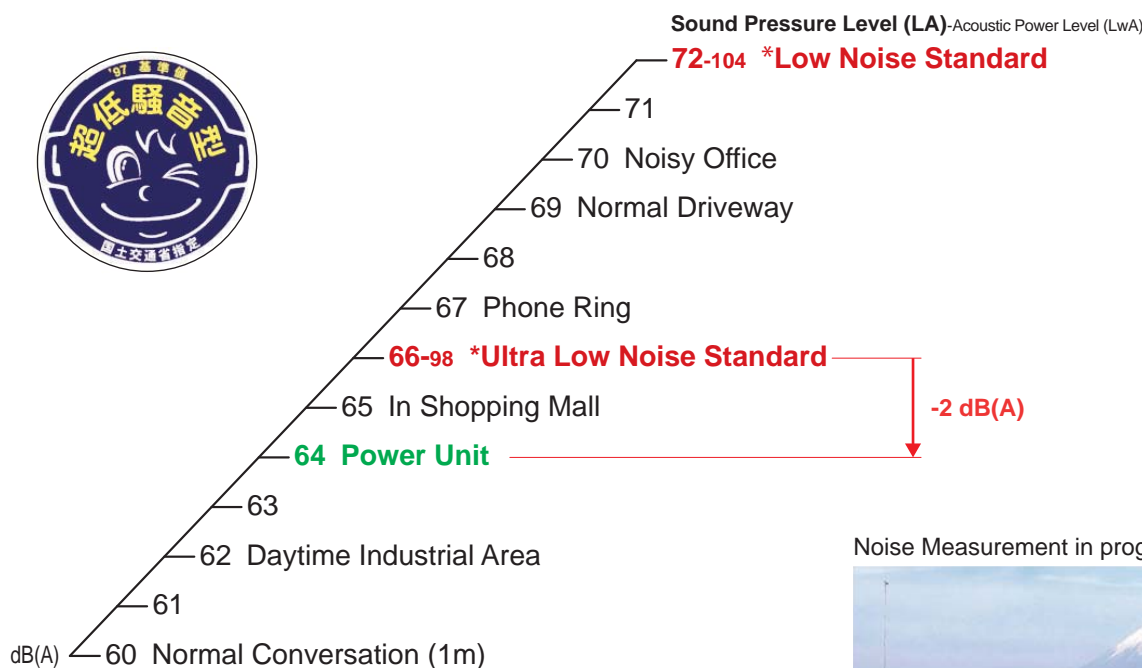
### Exhaust Gas Cleaning Compliant with "Offroad" Law

The SCZ-ECO600S Power Unit is equipped with a new-generation environmentally friendly engine. The high combustion efficiency, allied with Giken's independent hydraulic control technology, means that exhaust gases are cleaned thoroughly and effectively, and the equipment complies with the "Off-Road" Law regulating work vehicle emissions and Level 3 of the Ministry of Land, Infrastructure, Transport and Tourism's exhaust gas measures for construction machinery.



### Meeting Ultra-Low-Noise Standards

The Power Unit also meets the "ultra-low-noise standards" set by the MLIT.



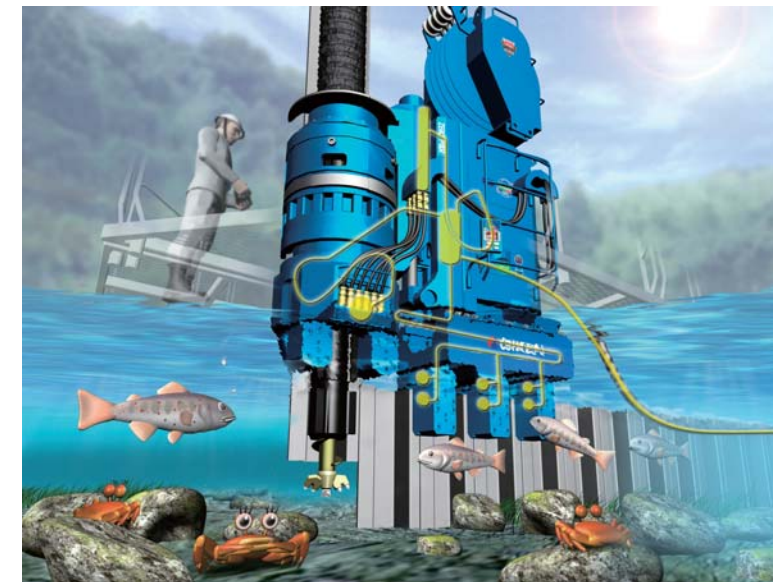
Noise Measurement in progress



\* The MLIT low-noise standard applicable to the Silent Piler is 104 dB(A) in terms of the acoustic power level of the sound source (LwA), and the ultra-low-noise standard is 98 dB(A). Converted to a noise (sound pressure) level (LA) at 16-m distance, for the purpose of comparison, the low-noise standard is equivalent to 72 dB(A) and the ultra-low-noise standard, 66 dB(A).

### Biodegradable Oils for Standard Specification

The press-in machinery uses special biodegradable hydraulic oil (Piler Eco Oil) and grease (Piler Eco Grease) developed by Giken in collaboration with oil manufacturers. In the event of any escape into the water or soil, the oil and grease is decomposed by natural bacteria and has no effect on the ecosystem.



No need to worry about contamination when working at river, canal and ocean.

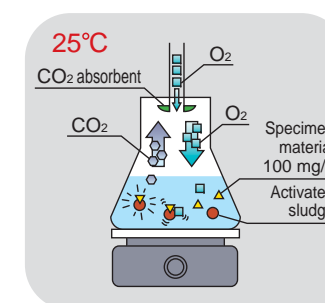


Biodegradable Oil Usage Indicator Sticker



The Piler Eco Oil and Piler Eco Grease have been approved with the Eco Mark by the Japan Environment Association.

Their biodegradability has been certified by biodegradability test.



Biodegradability test: OECD\*1 301C

Activated sludge was used as microorganism source. Biochemical oxygen consumption (BOD) of specimen material (Piler Eco Oil & Piler Eco Grease 100mg/L) was continuously assayed by automatic assay system to evaluate biodegradability (percentage of volume of degrade into carbon dioxide and water) after 28 days.

After 28 days (Required more than 60% degraded.)

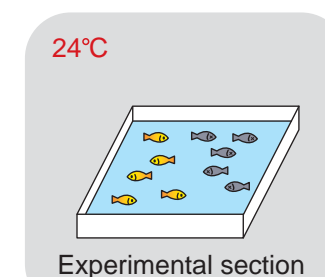
Eventually 100% will degraded. Time differs from conditions for 100% degraded.

#### Result

**Piler Eco Oil**  
Degraded 77.2%  
→ Meet the standard

**Piler Eco Grease**  
Degraded 66.2%  
→ Meet the standard

Avirulence is certified by Fish Toxicity Test.



Acute Toxicity Test: JIS\*2 K 0102

This test is carried out to investigate the survival rate of 10 killifishes within 4 days in the water contains specimen material 100mg/L.

After 4 days (Survival rate needs to be more than 50%)

#### Result

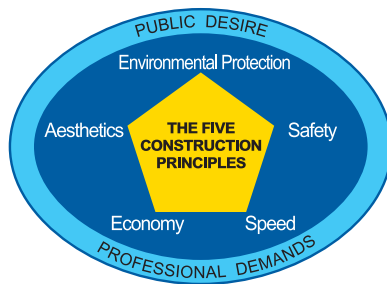
**Piler Eco Oil**  
100% alive  
→ Meet the standard

**Piler Eco Grease**  
100% alive  
→ Meet the standard

\*1: The Organization for Economic Co-operation and Development Standards. \*2: Japan Industrial Standards.



## 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.