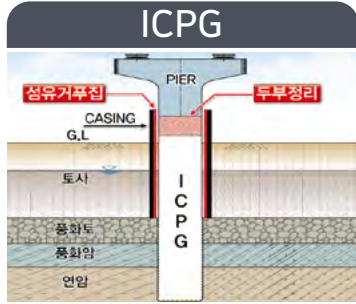


# ICPG (Land, River, Sea) Pile and SJB, SLOC Method Introduction to Construction Method



• **SLOC (Self Leveling Osterberg Cell Pile Load Test)**

A system that enhances the accuracy of testing by incorporating a horizontal leveling device into the bidirectional load testing apparatus (Osterberg Cell) for bored concrete piles.

• **SLOC Construction Process Flowchart**

<p>1. Production of the bidirectional load test device (Osterberg Cell) in the factory</p>	<p>2. Deployment and horizontal calibration of the load testing apparatus on site</p>	<p>3. Construction of Rebar Cage</p>	<p>4. Installation of a hydraulic jack for horizontal adjustments</p>
<p>5. Welding to connect the testing device to the steel mesh</p>	<p>6. Setting up a horizontal leveling device</p>	<p>7. Recording the initial horizontal measurement</p>	<p>8. Making initial horizontal corrections as needed</p>
<p>9. Embedment of the testing apparatus and steel mesh into the setup</p>	<p>10. Determining the final horizontal measurement</p>	<p>11. Making final adjustments to the horizontal positioning as required</p>	<p>12. Executing the bidirectional load test, following the pouring and curing of concrete</p>

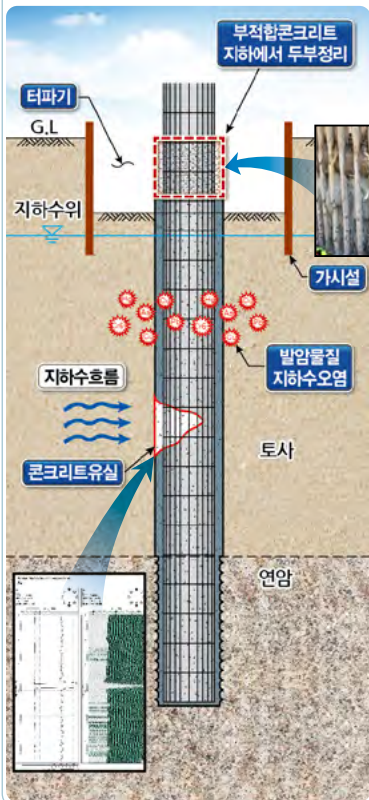
# ICPG PILE (In-site Concrete Pile Geotextile Form)

## ICPG PILE (Earth)

- Cast-in-place piles excavate the ground first and then reinforce. It is a concrete pile that is cured and manufactured by pouring concrete.
- It has various diameters from small to large (D3,000) and, as the superstructure becomes gigantic, large-diameter cast-in-place concrete piles are used to build cast-in-place piles to the original ground.
- "Large-diameter single" construction of piers on top of the head after tidying up. Cast-in-place piles are mainly used.

### Existing Cast-in-Place Piles

- The loss of concrete to aquifers compromises quality, leading to issues such as aggregate separation, compromised integrity, exposed rebar, and corrosion.
- There are worries about groundwater contamination from unset concrete.
- Pile cutting work underground presents challenges in workability and economic viability, necessitating temporary structures and significant earthworks.
- Utilizing sacrificial steel pipes in aquifers leads to higher construction costs.



### ICPG Piles

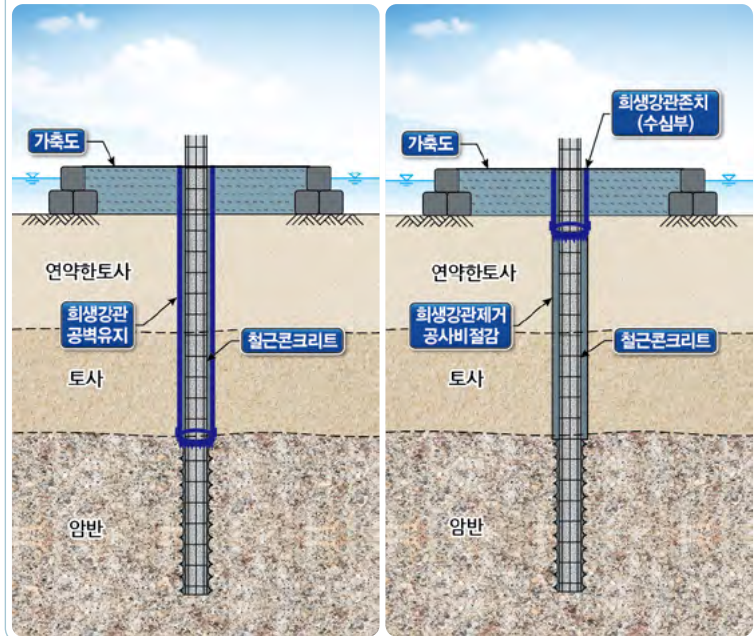
- Using Textile Form to prevent concrete loss in aquifers ensures concrete pile quality by avoiding aggregate separation, rebar exposure, and corrosion.
- Textile Form acts as a barrier against groundwater contamination from unset concrete.
- Ground-level pile cutting work enhances workability and cost-effectiveness, significantly reducing the construction timeline by eliminating the need for temporary labor and earthworks.
- Substituting sacrificial steel pipes in aquifers with Textile Form leads to:
  - ▶ Better economic viability.



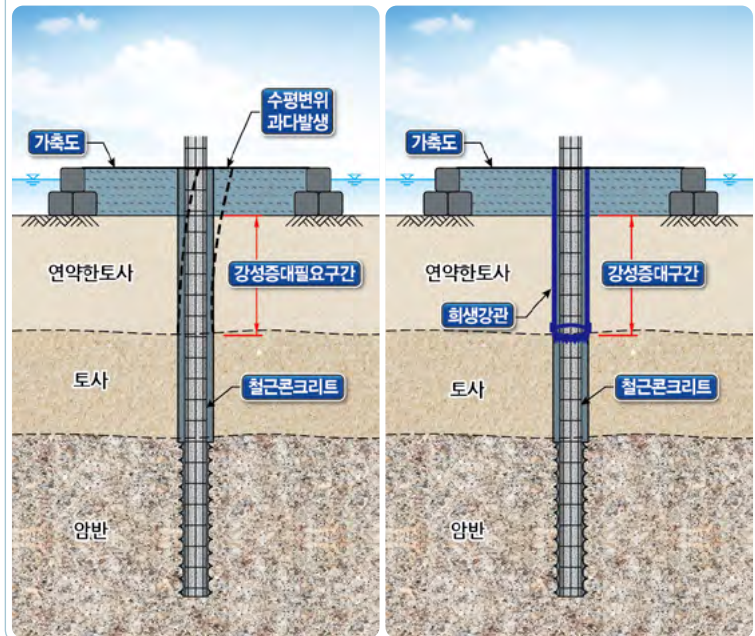
## ICPG PILE (River)

- To minimize the use of sacrificial steel pipes in cast-in-place piles while enhancing their upper rigidity,
- Construction costs can be lowered by removing non-functional sacrificial steel pipes after concrete has set among those used for stabilizing double-wall,
- Installing sacrificial steel pipes solely at the upper section of cast-in-place piles, especially in soft soils like clay, improves resistance to horizontal forces, thus reducing lateral movement.

### Reduction of Sacrificial Steel Pipe



### Enhancing the rigidity against horizontal forces at the pile's upper section



# ICPG PILE (Land) construction flow chart

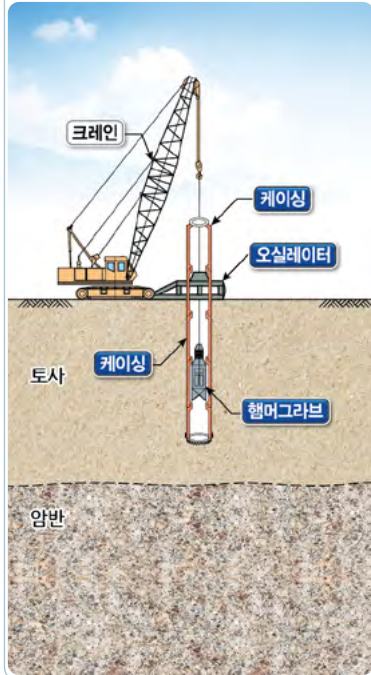
## 1: Initial Survey

- Determine the exact location for the pile and align the oscillator accordingly.



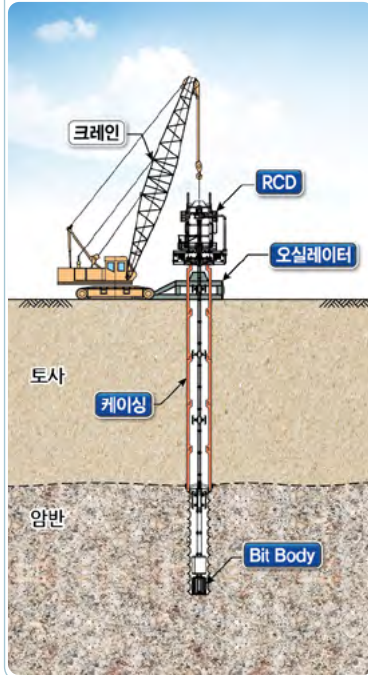
## 2: Soil and Sand Excavation

- Securely position the casing within the oscillator, connect and press the casing into place, and remove the soil inside the casing using a hammer grab.



## 3: Excavating Rock

- Once soil excavation is finished, use RCD or BG to reach the required depth for installing the cast-in-place pile.



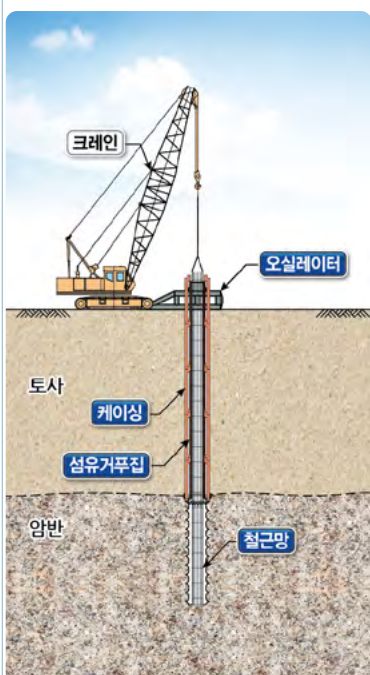
## 4: Assembly of Reinforcing Mesh + Fiber Formwork

- Construct the reinforcement mesh at its designated assembly area and place the prefabricated fiber mold outside the mesh at the fiber mold installation section, doing this simultaneously with the excavation process.



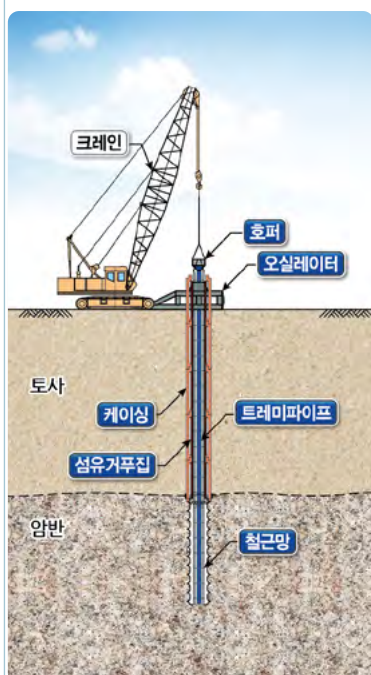
## 5: Insertion of Reinforcing Mesh + Fiber Form

- Insert the pre-assembled rebar mesh and fiber formwork into the casing.



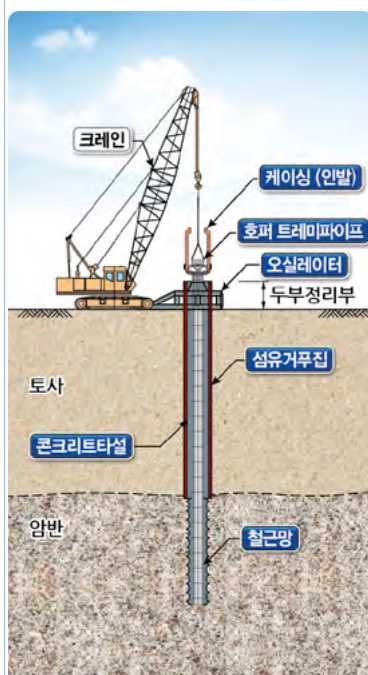
## 6: Setting up Hopper + Tremie Pipe

- Set up hoppers and tremie pipes for the application of underwater concrete.



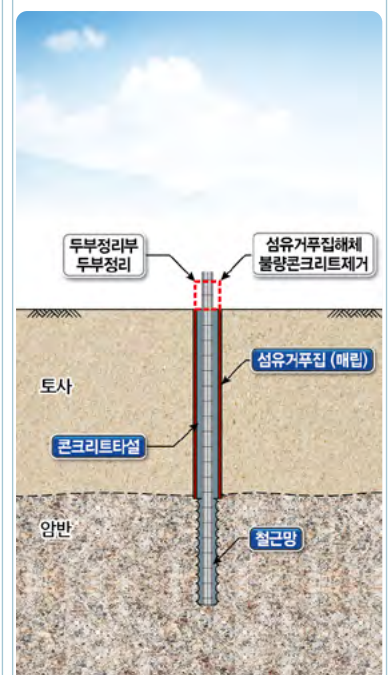
## 7: Pouring Concrete

- Fill the pile from bottom to top with concrete, utilizing a tremie pipe while simultaneously retracting the casing, up to the surface pile cutting area.



## 8: Pile Cutting Work

- After the concrete has set, dismantle the fiber formwork at the pile cutting site, extract any flawed concrete, and conclude the cast-in-place pile construction following the pile cutting process.

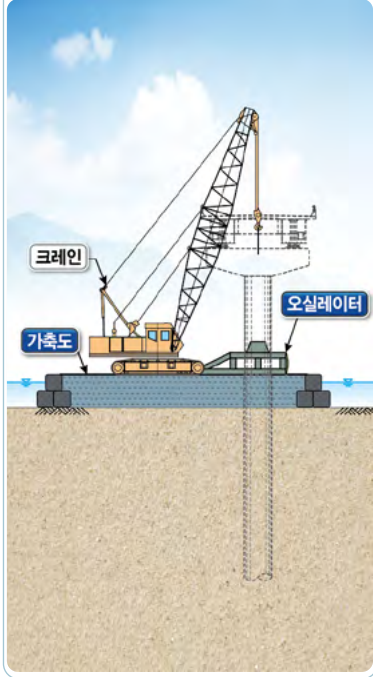


# ICPG PILE (In-site Concrete Pile Geotextile Form)

## ICPG PILE (River) construction flow chart

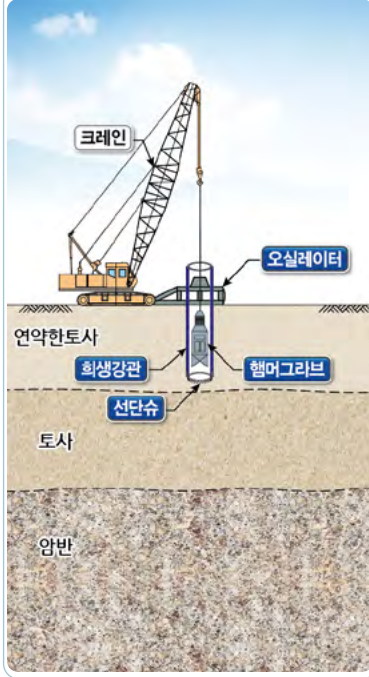
### Stage 1. Installation of sand island

- For oscillator excavation work, a sand island is established, with the manufacturing of casing and sacrificial steel pipe happening simultaneously.



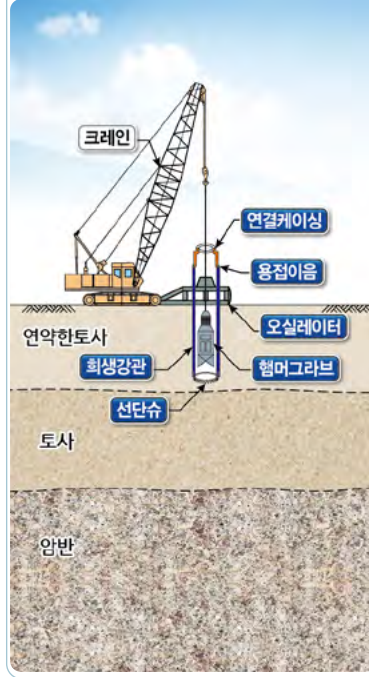
### Stage 2. Excavation of Soil and Placement of Sacrificial Steel Pipe

- Initially, position the sacrificial steel pipe within the oscillator, remove soil inside it using a hammer grab, and then press the sacrificial steel pipe deeper with the oscillator.



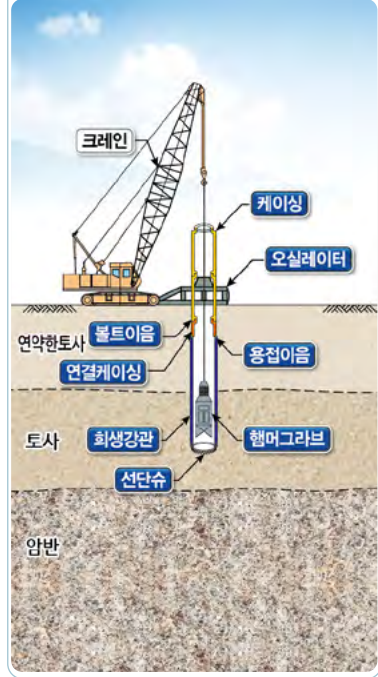
### Stage 3. Connecting the Casing

- Following the soil excavation equal to the length of the sacrificial steel pipe and its insertion, the connecting casing is installed.



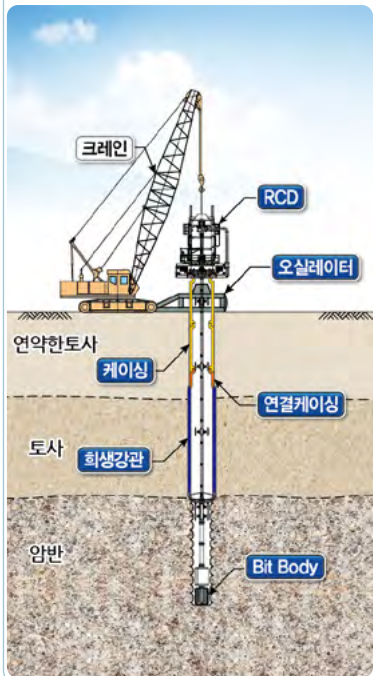
### Stage 4. Casing and Excavation of Soil

- The casing is then attached to the top of this connecting casing as per the depth required, pressed in using the oscillator, and the soil within is excavated with a hammer grab.



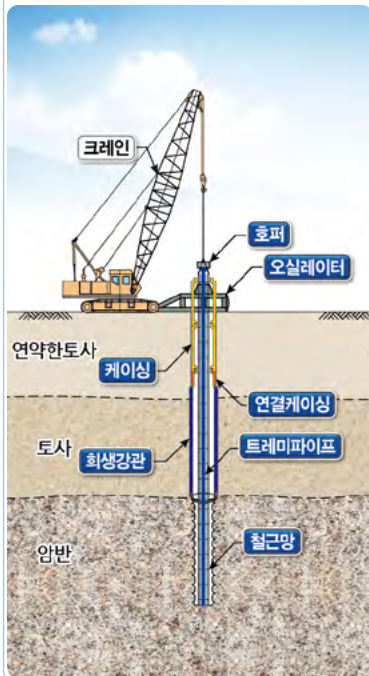
### Stage 5. Rock Excavation

- Upon finishing the soil excavation, rock layers are drilled through using RCD or BG to reach the predetermined depth for the installation of the cast-in-place piles.



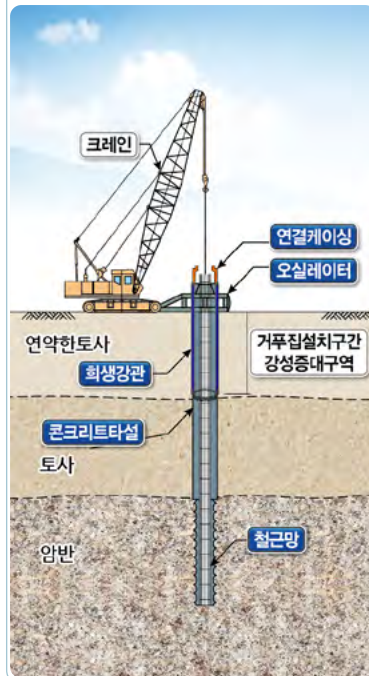
### Stage 6. Insertion of Reinforcement Mesh

- Assembled reinforcement mesh is placed inside the casing, followed by the setup of hoppers and tremie pipes for concrete pouring.



### Stage 7. Pouring of Concrete

- Concrete is poured up to the lower end of the connecting casing as the bottom of the sacrificial steel pipe arrives at the formwork installation zone or area where stiffness is to be increased.

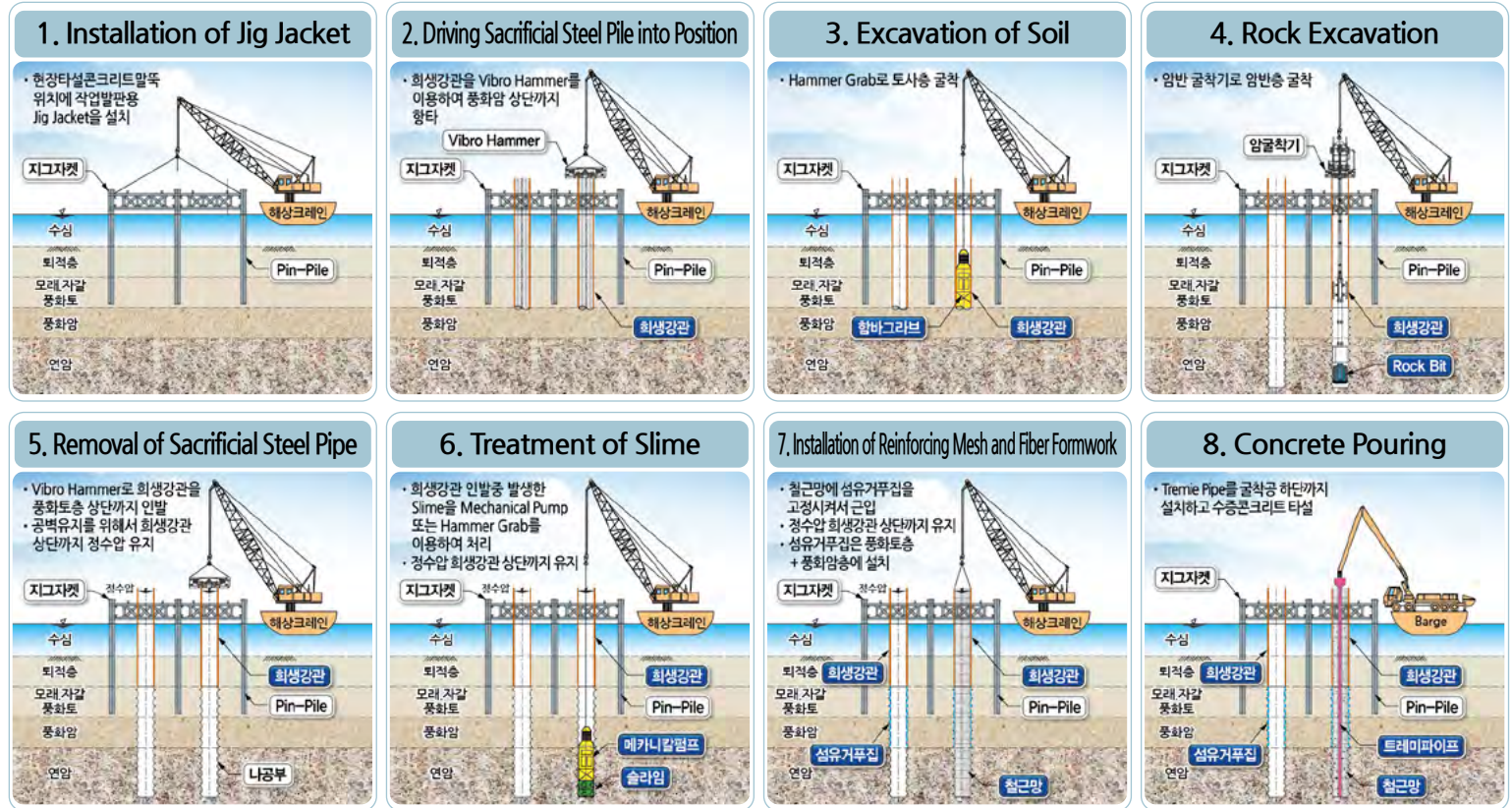


### Stage 8. Pile cutting work

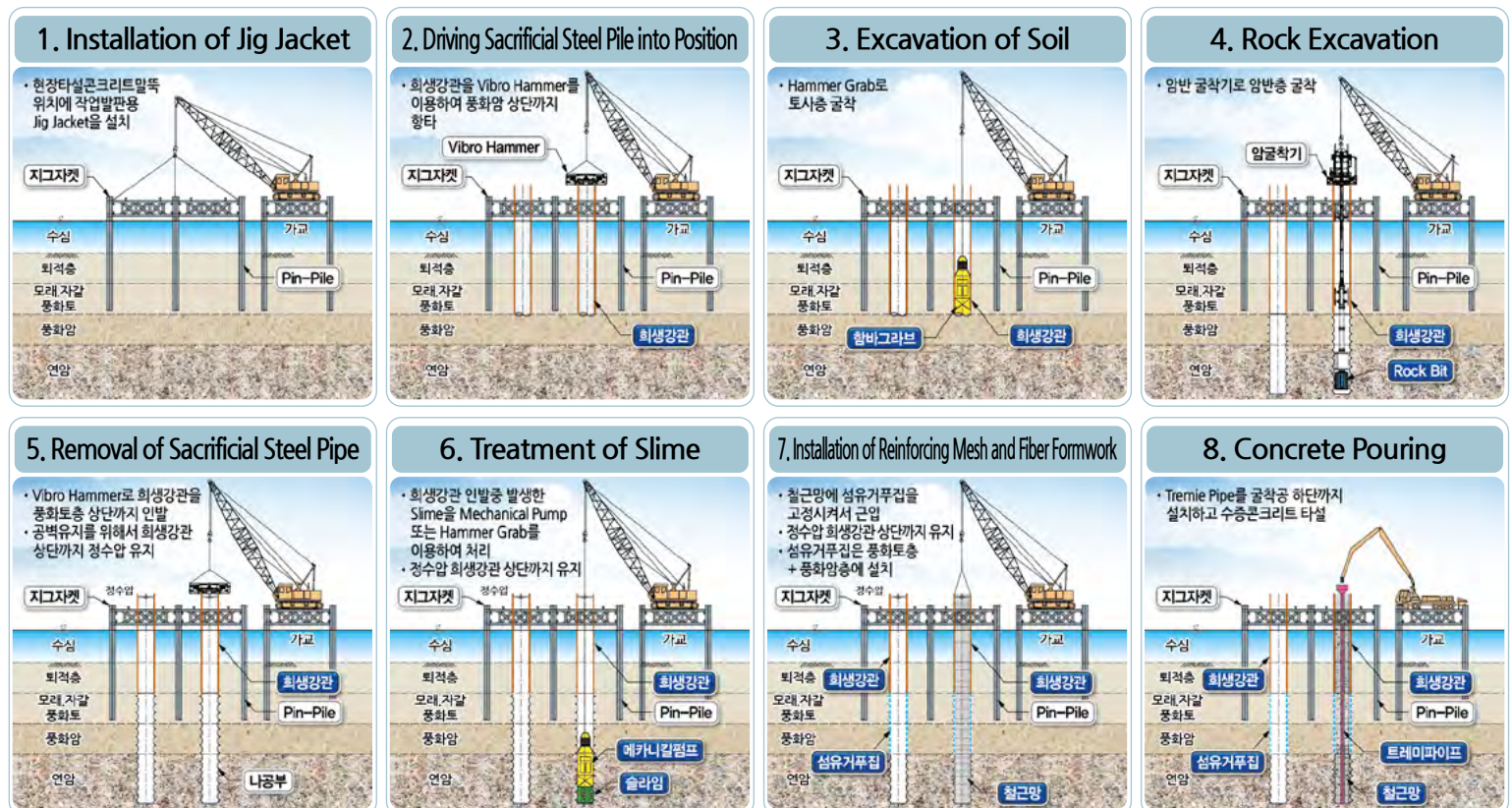
- After the concrete sets, the connecting casing is removed, the sacrificial steel pipe is dismantled at the pile cutting area, and any substandard concrete is eliminated to finalize the cast-in-place pile work following the pile cutting process.



# ICPG PILE (Sea) construction flow chart



# ICPG PILE (Temporary bridge) construction flow chart



# ICPG PILE (In-site Concrete Pile Geotextile Form)

## Cost Comparison: Sacrificial Steel Pipe vs. ICPG Piles

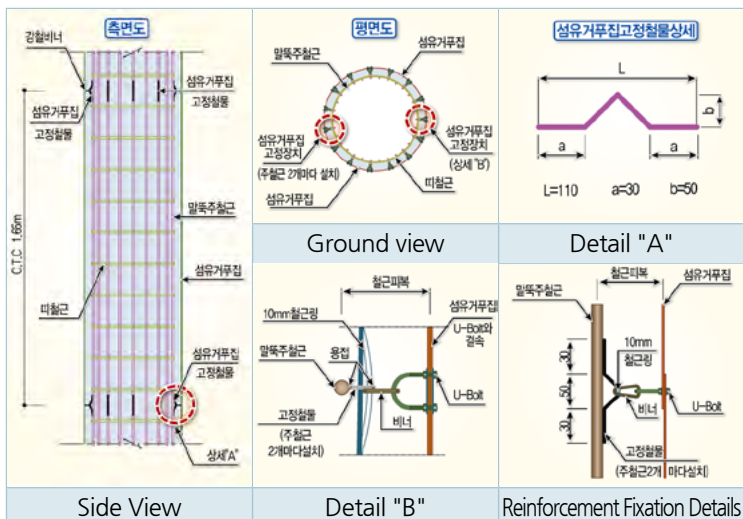
Constr. Type	D1500		D2000		D2500		D3000	
	Steel Pipe	ICPG Pipe	Steel Pipe	ICPG Pipe	Steel Pipe	ICPG Pipe	Steel Pipe	ICPG Pipe
Material Cost of Steel Pipe	660		900		1103		1275	
Casing Cost		82		97		120		150
Fiber Formwork		87		117		147		176
Driving Steel Pipe	33		39		45		52	
Casing Press-in		13		18		26		40
Casing Pulling Out		13		18		26		40
<b>Total</b>	<b>693</b>	<b>195</b>	<b>939</b>	<b>250</b>	<b>1148</b>	<b>319</b>	<b>1327</b>	<b>406</b>
Gap	498		689		829		921	

## Construction Process and Equipment

## Construction Costs for Single Cast-in-Place Piles

Classification	Single Pile(L=28m)			Steel Pipe (PHC) Pile (L=20m)
	ICPG	R.C.D.+Sacrificial Steel Pipe	R.C.D.+Temporary structure	
Type				
Construction Method	ICPG Pile	Steel Pile	Cast-In-Place Single Pile	Steel Pipe (PHC) Pile
Specifications	D2500 D3000	D2500 D3000	D2500 D3000	D450 ~ D1000
Support Layer	Weathered Rock Soft Rock	Weathered Rock Soft Rock	Weathered Rock Soft Rock	Weathered Rock Soft Rock
Materials Used	Rebar+Concret	Rebar+Concret	Rebar+Concret	Steel Pipe (PHC) Pile
Auxiliary Method	Geotextile form	Steel Pile	Waterstop Wall	Waterstop Wall
Cost Efficiency	968 dollar	1283 dollar	1110 dollar	2108 dollar (1365 dollar)

## Details of Fiber Formwork Fixation



### 1. Steel Mesh Fabrication



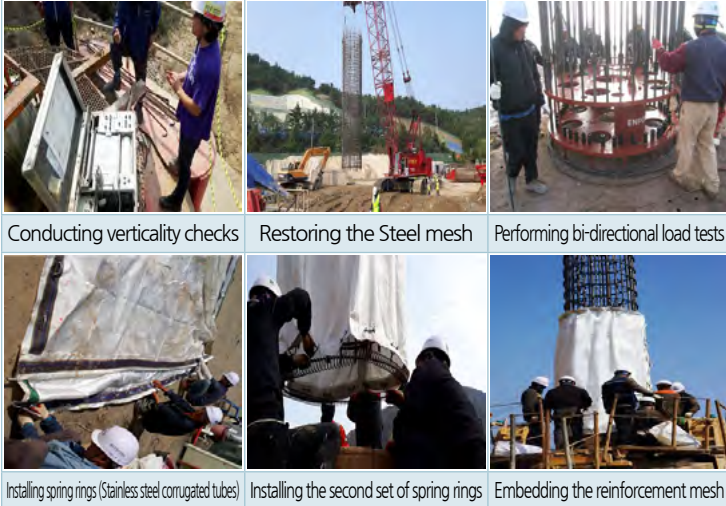
### 2. Positioning Oscillator, Establishing Casing, and Driving Sacrificial Steel Pipes



### 3. Excavation with Hammer Grab and RCD



#### 4. Steel Mesh Installation



Conducting verticality checks    Restoring the Steel mesh    Performing bi-directional load tests

Installing spring rings (Stainless steel corrugated tubes)    Installing the second set of spring rings    Embedding the reinforcement mesh

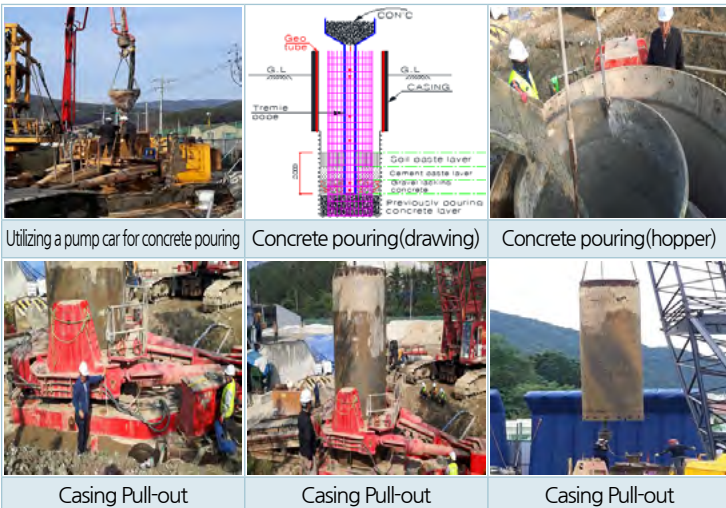
#### 5. Fiber Formwork Installation



Placing the fiber formwork    Making vertical connections of fiber formwork    Establishing horizontal connections of fiber formwork

Ensuring fiber formwork penetration    Finalizing the installation of the steel mesh    Testing the seal strength of the fiber formwork

#### 6. Concrete Pouring and Casing Drawing



Utilizing a pump car for concrete pouring    Concrete pouring (drawing)    Concrete pouring (hopper)

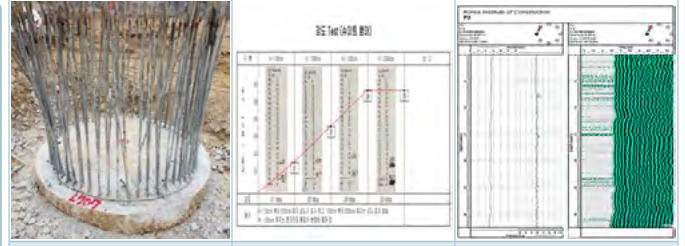
Casing Pull-out    Casing Pull-out    Casing Pull-out

#### 7. Maritime Operations



Erecting Jigiaket    Driving sacrificial steel pipes    Conducting offshore RCD excavation

#### 8. Pile Cutting Work and Testing



Executing pile cutting work onshore    Evaluating strength test outcomes    Confirming good sonic test results

#### 9. Key Equipment Utilization



Stabilizer    Bit Body    Chisel

Hammer Grab    Joint Casing    Casing

#### 10. Deployment of Major Machinery



R.C.D    Vibro Hammer    Oscillator

Power Pack    Generator    Mechanical Pump

# SJB 공법 (Super Jumbo Bag Block Method)

- SJB method: The Super Jumbo Bag Block Method (SJB) employs extra-large hemp bags to reduce construction time and ensure cost-effectiveness by streamlining the process. This method facilitates the supply and demand of materials through the use of temporary earth walls, gravity retaining walls, slope protection, and cofferdams for bank protection.



## Condition:

1. The seal strength must be at least equal to the yarn tensile strength.
2. A sun protection coating is required for prolonged sun exposure.

## Construction Performance and Construction Order

### Road Bridge, Project: Manin-ro Slope Restoration, Client: Namwon City Hall, Jeollabuk-do



#### 1. Arrangement of gunny sacks



#### 2. Assembly of reinforcement



#### 3. Installation of secure clips for gunny sack



#### 4. Pouring of concrete



#### 5. Creating a shaft for gunny sacks



#### 6. Execution of anchor reinforcement



#### 7. Conducting bench cut operations



#### 8. Utilizing refilling and compaction equipment



#### 9. Completing refilling and compaction tasks



Contact : CEO Park Eul Jae (010-2112-3840)

- ◆ Technology Development and Patented Construction Methods:
  - ICPG piles applicable in land, river, and sea settings.
  - SJB method for bracing/coffering with super jumbo bags.
  - PBW construction method employing a top-down shaft for onsite installation.
- ◆ Advisory and consulting services for civil engineering construction.