Our Three Promises for the Future
“Sustain the Land” “Protect from Natural Disaster” “Mediate with the Next Generation”

Reliable Technology and Force of Continuity
We, Sanshin Corporation, will keep the mission of transferring safe and comfortable land to the next generation in our minds and strive to create safe society in the future.

Sustain the Land
Reliable Technological Capability That Produces Ease and Safety
We will sustain the social infrastructure.

Protect from Natural Disaster
Executive Power to Realize the Society Harmonizing with Nature
We will protect the land from natural disaster.

Mediate with the Next Generation
Creativity to Ensure the Future of the Country
We will aim to create the sustainable land.

Technology

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CPG method
(Compaction Grouting method)
» Seismic Reinforcement of Operating Airport Runways
NETIS Registration Number | KT-140005-A

WILL method
» Widely Applied to Recover from Earthquake Disaster
NETIS Registration Number | GS-090004-V

Backfill Grouting for Tunnels
» Long-Term Conservation of Existing Tunnels

V-JET method
» Rapid Performance of Large Diameter Ground Improvement
NETIS Registration Number | KT-120047-A

Soil Nailing method
» Efficient Excavation Support and Ground Stabilization
Ground Improvement - Soil Mixing

- DJM method
- WILL method
- CDM method
- MIITS method
- MIDDLE Pressure Injection Total System

These are the ground improvement methods that rotating mixing blades will mix in-situ soft soils with binders such as cement and create hard soil mass. Depending on our huge experiences, we, the leading company of DJM method, can satisfy our clients' various requirements from shallow to deep soils.

DJM method

Deep Mixing method by Using Powdery Binders

Mixing blades are rotated and penetrated into ground, then powdery binders are pneumatically ejected from tip of mixing blades and mixed with in-situ soils. Chemical reaction between the binders and the in-situ soils stabilizes the mixed mass and increases its strength. By positioning the improved elements properly, we can create the purpose-fitting improved ground. DJM is the representative deep soil mixing method that doesn’t need mixing water. In comparison with European methods with similar concepts, it has higher quality and reliability. The following related methods are also available: EX-DJM that has larger diameter of improvement body, HL-DJM that has higher strength and applicability of lower improvement ratio, and RD-DJM that has lower displacement of surrounding ground during operation.

WILL method

Innovative Mid-Depth Mixing

Special shaped mixing blades that move mixing soils from inside to outside than from outside to inside during their rotation are attached to the arm of an excavator. Binder slurry is ejected from the blades and mixed with in-situ soils. Binders and in-situ soils are mixed together in both up-and-down and left-and-right directions thus homogenized rectangular improved body is created.

CDM method

The De Facto Standard of Slurry-Phase Deep Mixing

Binder slurry that is prepared in the slurry mixing plant is mixed with in-situ soils. The following related methods are also available: CDM-LENI method, CDM-LODIC method, CDM-Lemni2/3 method and CDM-FLOAT method.

MIITS method

Applicable to Slopes

Mixing and penetration with a withdrawal attachment is installed to an excavator. The equipment is compact and has high mobility. Binder slurry is ejected with higher pressure than that by conventional Deep Mixing method, more homogenous mixing is achievable.

Gi Column method

High Quality Deep Mixing by Using Compact and Lightweight Equipment

This is the method to improve soft soils by injecting cementitious slurry. A compact machine can construct a large-diameter (Ø 1.6m) and long (20m) improvement body that is usually constructed by using a large machine.

ALiCC method

Reasonable Design of Deep Mixing with Lower Improvement Ratio

By considering the arch effect to the load on the improved body, lower improvement ratio is applicable, and cost reduction and schedule shortening are achievable.

Ground Improvement - Jet Grouting

- V-JET (Vortex Jet) method
- JST (Urine) method
- JST (Parallel) method
- Column Jet Grouting method
- CSCP (Chemical Churning Pile) method
- K-EX (Cross-Jet) method
- K-Recycle Jet method
- K-Para (Parallel) method
- K-Step (Step) method

Jet Grouting is the ground improvement method that cut and break the ground by the energy of high pressure jet fluid (water and/or binder slurry) and mix the broken soils with binder slurry. We are the leader of Jet Grouting through huge experience of JSG method, and keep licenses of various Jet Grouting methods. Based on these experiences, we are developing more advanced methods from viewpoints of environment friendliness and sustainability.

V-JET method

Rapid Construction of Large Diameter Improvement

By the ejection of ultrahigh pressure cementitious slurry with the surrounding compressed air, the ground is cut and broken, and column shaped improved body from 2.0m to 5.5m in diameter is rapidly created. A special monitor consists of two nozzle with difference in level and opposite direction each other achieves very high efficiency of cutting. This monitor realizes faster construction and larger diameter of improved body than the conventional methods.

JSG method

Historic Double Tube method

By ejecting ultrahigh pressure cementitious slurry with the surrounding compressed air from tip of double tube and rotating and withdrawing of the tube, the column shaped improved body from 1.0m to 2.0m in diameter is constructed.

Historic Triple Tube method

By ejecting ultrahigh pressure cementitious slurry with the surrounding compressed air from tip of triple tube to cut and break the surrounding soils and simultaneously filling the cut space with binder slurry from lower portion of the tube, the column shaped improved body from 1.5m to 2.0m in diameter is constructed.
Ground Improvement - Permeation Grouting

The grouting method that stabilizes ground by reducing permeability or increasing strength is the indispensable auxiliary method for tunnel and underground excavations. In recent years, it is used as countermeasure against liquefaction of ground beneath existing structures. We are proposing the suitable method to the particular soil and environmental conditions, performing reliable construction, and developing new technologies, depending on our vast experiences.

Multi-Strainer method

- Multi-Strainer method
- Various Double Packer methods
- Various Double Tube Strainer methods
- Dynamic Grouting method

The employment of multi-delivery injection pump (8 units per machine) and 3D (dimensional) total control system has realized perfectly controlled injection of maximum 8 stages at the same time thereby accelerating the productivity.

Grouting Effect Depends on the Size of Injection Core

Advantages

1. Larger spacing between adjacent injection location and higher injection speed make fewer number of injection locations and reduce total injection time.
2. Smaller upheaval of surrounding ground makes the work adjacent to existing structures possible.
3. By the combination with 3D injection system, more precise construction is achievable.

Double Packer method

Safe and Secure Chemical Grouting method

After installing an injection pipe, grouting is done by using the grouting device equipped with special packers. The Double Packer methods have plenty of case histories and sophisticated permeation system.

Dynamic Grouting method

Aggressive Change of Injection Elements

Application of a simple device which dynamically fluctuates injection velocity and pressure prevents run off of chemicals and creates homogeneous grouted mass within the designated area.

3D injection system

Inject 8 Stages at the Same Time

The employment of multi-delivery injection pump (8 units per machine) and 3D (dimensional) total control system has realized perfectly controlled injection of maximum 8 stages at the same time thereby accelerating the productivity.

Grand Flex Mole method

Dynamic Grouting method

- Grand Flex Mole method
- Ex-Packer method
- Super Multi Point Injection method
- 3D (Dimensional) Injection system

Pinpoint Treatment by Using Steerable Directional Boring

This is a new grouting technique that combines directional boring and double packer injection. Location and direction of the drilling bit are measured and controlled by a special device. Percussion device is available to drill harder soils. This method is suitable for liquefaction prevention yet applicable to soil remediation and filling of voids.

Advantages

1. We can treat the soils beneath the existing structures without interrupting the operation of the structure.
2. Since there is no process of withdrawal of tools, one-way operation is possible.
3. Construction of shaft is unnecessary, so schedule shortening and cost reduction are achievable.

Ground Improvement - Compaction

The liquefaction of ground that has occurred during large earthquake has seriously damaged our social economy and social infrastructure including life lines. We have promptly worked on and accomplished the development of liquefaction countermeasures that is applicable to existing structures without terminating their operation.

Compaction Grouting (CPG) method

The Definitive Method to Prevent Liquefaction for Existing Structures

This is the method to compact ground by statically injecting the mortar with very low fluidity. Since this method has compact equipment with no vibration, low noise, and less negative impact on surrounding ground, it is suitable for the work adjacent to existing structures and operating facilities, and narrow area. This method, as much performance records under the conditions of height restrictions, inside building and narrow work space. This is the representative method to prevent liquefaction of soils beneath existing structures.

Advantages

1. Smaller drilling diameter makes penetration through hard layer and reach to the specified depth easily.
2. By the availability of changeable flow rate, we can choose the suitable injection ratio at each layer.

CPG Guide Arch method

This is the CPG method for the treatment of soils beneath the existing structures by using curved boring. We can install the injection pipe from outside the perimeter of a structure and inject without interrupting the operation of the structure.

CPG Compact System

Efficient Prevention of Liquefaction for a Detached House

A small plant is used to perform CPG method at narrow area such as a detached house. By the combination with a portable jack that implements inclined CPG injection, more efficient liquefaction prevention becomes available.

SANSHIN CORPORATION

1. New Technology Information System by Ministry of Land, Infrastructure, Transport and Tourism

2. Developed boring expands the possibility of business continuity plan (BCP).
Earth Reinforcement and Slope Protection

In our country, having narrow land and many mountains, huge volume of land cutting is performed to construct social infrastructures thus the slope stabilization are required. We have an organization to satisfy the requirements of design, performance and maintenance of the slope stabilization methods including Soil Nailing method that is original with us.

Soil Nailing method

Having Original Theory and Largest Performance Records in Japan

This is the method to construct composite earth reinforcing mass by placing reinforcing nails into ground at a certain spacing then spraying shotcrete for the protection of excavation surface. Earth retaining wall is constructed in parallel with excavation thus soldier pile is not necessary.

Moreover, the mass has flexibility against deformation and high earthquake resistance. Accordingly, together with corrosion-proof, this method is applicable to repair and reinforcement of deformed retaining wall or stone masonry.

For the slope stabilization methods including Soil Nailing method, we apply the advantages and scopes of this method, we can handle it by changing the specifications of reinforcement material.

Advantages

1. Since small equipment is available, this method is applicable to narrow area or steep slopes.
2. If soil condition has changed during excavation, we can handle it by changing the specifications of reinforcement material.

High Spec Nailing method

The Packer-Equipped Reinforcement Material Grabs Firmly

This is the earth reinforcement method by inserting many short reinforcements equipped with bag-shaped packers into ground. Large pulling power is produced by injecting grout into the packers. And secure anchorage even at ground where grout easily runs off, such as gravel or talus cone, is performable. This method has higher reinforcing effect comparing with the conventional methods and needs fewer reinforcing materials for stabilizing excavation surface or slope.

By evaluating the advantages and scopes of this method, we can use this method to more important slopes or structures.

Advantages

1. Since small equipment is available, this method is applicable to narrow area or steep slopes.
2. The reinforcement material can be placed in the ground that is not possible with other methods.
3. The reinforcement material can be placed more deeply than with other methods.
4. The reinforcement material can be placed where it is difficult to use other methods.

Anchor

Anchor method has more than 50 years of history in our country and has been used for various fields including slope stabilization and earth-retaining support.

We have worked on the anchor method from its early phase as the leading company. Therefore, based on our vast experiences, we perform reliable work even under very strict conditions.

Permanent Anchor method

Representative Slope Stabilization Method with Rich Performance Records

This method is to prevent collapse of slope by the pulling resistance of tensile material that is fixed to the solid soils. It is also used for stabilization of slope and structures, and landslides prevention. The anchoring material has enough corrosion-proofing and rust-proofing thereby obtaining long-lasting function. Since its maintenance methods are established, the maintenance and renovation of its durability is easily planned.

We have the performance license of many permanent anchor methods such as VSL, KTB, Super Finach, EHD and SEEE, together with many of their performance records.

Do you know it?

Surprisingly, there are many applications of the permanent anchor to slopes.

Temporary Anchor methods (removal type and left-in-place type)

There is a Case that the Bracing is Not Preferable

Anchor is used instead of bracing for excavation support at urban area. Its pulling resistance will undertake the reaction by the bracing. Anchor is advantageous if alignment of retaining walls is complicated or ground surface is inclined.

There are two types of temporary anchors, removal type that removes tensile materials after excavation and construction of structure, and left-in-place type that leaves the tensile material as is.

At removal type anchor, a loop-shaped bent un-bonded PC stranded wire combined with anchor body is mostly used. After completion of the utilization, the PC strand wire is easily removed.

High Water Pressure Resistant Anchor method

Secure Bracing Anchors under High Water Pressure Environment

This is the technique to securely install the anchors under high water pressure environment by preventing effluence of groundwater and soils, and backflow of grout. This method is equipped with special devices such as water-cut-off entrance device and water-cut-off packers.

Close Adhesion to the Ground

This is the cast-in-place concrete frame consists of a special frame and reinforcing bars, and works as a pressure reception plate from an anchor. During the placement of concrete, a fitting sheet will expand and adhere closely to the ground, thus this frame exhibits uniform reactions.
Pile and Foundation

We are developing the pile and foundation methods by utilizing small equipment. CPG Lift method that is for adjustment of building settlement and applicable to narrow space or low height, and permanent ground anchor method that sustain the building by its tensile strength are representative.

CPG Lift method

Settlement Adjustment and Ground Reinforcement to Prepare for Next Earthquake
This is the adjustment of existing building’s settlement. We utilize the CPG’s nature that cause upheaval during its operation near ground surface. The grout with low fluidity creates a consolidated lump near the injection point thus limited lift-up of superstructure is controllable. Since compaction of ground is intense, the ground is reinforced during the adjustment of its settlement. Introduction of pre-mixed exclusive binders and small equipment makes application of this method to single family homes easier.

Advantages:
1. Excavation beneath the foundation is not needed and execution at narrow space such as perimeter of existing structure or interior of a room is possible.
2. We can expect the ground improvement effect by compressing the ground.

BHP method

Foundation Pile that Conquers Height Restriction and Narrow Space
Drilling is done by forward circulation of slurry. After drilled debris are treated, reinforcement cage or H-shaped beam is inserted, then concrete is placed to construct a cast-in-place pile. This method is also called Borehole Pile method, using lightweight boring machine.

TBH method

Large Diameter Cast-In-Place Pile Can Be Constructed by Using Small Equipment
This is the Borehole Pile method by using a top-drive type boring machine. By adopting reverse circulation drilling system, drilled face is further stabilized and faster construction of larger diameter drilling is achievable.

High Load-Bearing Micropile method

High Load-Bearing Pile Endorsed by Anchoring Technique
This is the small diameter cast-in-place pile by utilizing anchor drilling and pressure grouting techniques. By the combination of high-stress steel pipe as the pile body and thick deformed steel bar as the reinforcement, a high load-bearing pile is constructed.

VSL-J1 Permanent Anchor method

Representative Permanent Anchor method
This method utilizes the anchoring technique to stabilize a structure and its foundation. It has received the technical evaluation by the Building Center of Japan as the permanent anchor by utilizing VSL method. This anchor has high reliability as a permanent structure.

Consolidation and Drainage

Consolidation and drainage methods that increase strength of ground by draining pour water have long histories as the ground improvement methods. Plentiful Experiences and Achievements Satisfy Various Requirements

Well Point method

The Basic Dewatering Method
Many well points that consist of a riser pipe and a cylinder-shaped filter at end of the pipe are installed throughout the excavation area. Each well point is connected to the header pipe on the ground surface. Vacuum pump sucks water through well points thus the ground-water level is lowered easily.

Deep Well method

Deep Well Method Suits Dewatering for Deep Excavation
A deep well which diameter is between 50 and 100 centimeters is drilled and the casing pipe with strainer pipe is installed. A high lift pump that is inserted into the strainer pipe pumps the water and lowers the ground-water level.

Well-In-Wall (WIW) method

Groundwater Control Unit within Earth Retaining Walls
At this method, a pre-fabricated special well unit is placed inside the earth retaining walls. This method can control the groundwater during excavation more efficiently than Deep Well or Recharge Well being installed inside or outside the excavation area.

Abrasive Wall Cut (AWC) method

Permeable Silt Recovering Groundwater Flow
High pressure slurry containing abrasives is jetted toward the earth retaining wall that mainly consists of soil cement thereby permeable silt is bored. By preparing the permeable slits within the existing retaining wall, the groundwater flow that is interrupted by the wall is normalized.

Plastic Board Drain method

Economical Acceleration of Consolidation Shortens Construction Period
A band-shaped drainage material which is made of either resin or natural material is pressed into ground by a mandrel. It shortens the drainage passage of pour water and accelerate the consolidation of clay thereby increasing the strength.

Vacuum Deep method

Provides More Efficient Deep Well
This is the special Deep Well. The strainer pipe consists of solid inner pipe and strainer pipe. The water that flowed from bottom of the strainer pipe doesn’t mix with air by means of the negative pressure inside the inner pipe.
To maintain our safe and comfortable social-and-economic activities, long-term utilization of the accumulated social infrastructures is important. In recent years, the extension of structures’ life by their maintenance and repair is required to reduce life cycle costs. We have abundant experience in repair of cracks on concrete structures and are aggressively working on repair and reinforcement of structures to respond to the needs of society.

**Space Pack method**

- Simply Mixed Backfilling Material for Tunnel
  - This is the filling method for voids at back of tunnel lining or voids with spring water by using plastic filler. This filler fluidizes only under pressure thus injection of it to the definite area is achievable without running off.

**Aqua Grout method**

- High Capability of Non-Segregation and Pumping
  - This is the filling method for voids at back of existing tunnel lining by using plastic filler that contains polymer. Since this filler has very high non-segregation in the water, it is suitable for the area with much spring water or injection to the definite area.

**Aqua-Mate Plus method**

- Superior Long-Distance Pumping
  - This is the filling method for voids at back of tunnel lining by using plastic filler. Separately blended two liquid materials are mixed by a blander near the injection point, then becomes plastic. Therefore, long-distance pumping is achievable.

**JOT’S-Crete method**

- Highly Efficient Section Repair
  - This is the method to repair and reinforce concrete structures by spraying slurried fiber-reinforced polymer cement mortar. A wide range of section repair with thickness of up to 100 millimeters is achievable. In addition, the mixed fiber prevents peeling off.

**Carbon Fiber Sheet Adhesion method**

- Rehabilitation by Just Pasting
  - This is the method to reinforce and raise anti-earthquake capability and durability of structures by adhering high-strength carbon fiber sheets with impregnating epoxy resin. Carbon fiber has 10 times larger tensile strength than steel, with less increase of weight and transformation after the reinforcement.

**Hyper CF method**

- Carbon Fiber Sheet Adhesion method with Cushioning Material
  - Existing concrete is repaired and reinforced by adhering high-strength carbon fiber sheets. At this method, soft and transformable cushioning material is inserted between the structure and the carbon fiber sheet thereby reducing quantity of carbon fiber sheets.

In recent years, the necessity is increasing to preserve living environment by remediating soils and groundwater that have been contaminated through past economic development. We are realizing secure and reliable in-situ (non-excavation) remediation of contamination depending on our huge experiences and accumulated technical know-how on ground treatment.

**Replacement**

- Remediation of Contamination by the Force of Heat and Air
  - The additives mainly contain quick lime and mixes with contaminated soils. The contaminants such as VOC’s are volatilized in-situ by the heat of hydration and collected on ground surface. The optimum specifications are determined by adjusting frequency of mixing and aeration.

**Thermal Treatment**

- Remediation of Contamination by Decomposition to Harmless State
  - This is the injection of chemicals into contaminated soils by employing mechanical mixing or grouting techniques. Iron powders and oxidizing agents are injected and mixed with in-situ soils to decompose the contaminants by either oxidation or deoxidization.

**Bioremediation**

- Remediation of Contamination by the Natural Recovery of In-Situ Soils
  - Some contaminants become harmless by their decomposition caused by microbes. Usually, the decomposition takes long time; therefore, the acceleration by activating the in-situ microbes by injecting nutrients into contaminated soils is performed.

**Chemical Decomposition**

- Remediation of Contamination by Decomposition
  - This is the injection of chemicals into contaminated soils by employing mechanical mixing or grouting techniques. Iron powders and oxidizing agents are injected and mixed with in-situ soils to decompose the contaminants by either oxidation or deoxidization.

**Insolubilization**

- Remediation of Contamination by Changing to Insoluble State
  - This is the method to change the contaminants within in-situ soils to insoluble state. Contaminated soils will be mechanically mixed with binders like cement or chemicals like sulfates and stabilized against dissolution.