

SANSHIN CORPORATION



三信建設五業株式会社

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.

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CPG method

(Compaction Grouting method)

» Seismic Reinforcement of Operating Airport Runways

NETIS Registration Number | KTK-140005-A



WILL method

» Widely Applied to Recover from Earthquake Disaster

NETIS Registration Number | QS-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 (Publication Period is end)



Soil Nailing method

» Efficient Excavation Support and Ground Stabilization

Ground Improvement - Soil Mixing

- DJM method
- WILL method
- CDM method
- KS-S · MIX method
- GI Column method
- MITS method
- ALiCC method
- TOFT method
- Float-Type Deep Mixing Wall method
- Columlink method
- Shallow Mixing method

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

NETIS® Registration Number | HR-030032-V (Publication Period is end)



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.

Mixing water?
This deep mixing method doesn't need it.

WILL method

NETIS® Registration Number | QS-090004-V



Innovative Mid-Depth Mixing

Special shaped mixing blades that move mixing soils from inside to outside then 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.

Advantages

1. We can choose the blades from two types of ribbon screws depending on the treated soil type.
2. The boomerang plate that is attachable to bottom of the blades can scrape hard soils thereby applying to gravel layer.
3. Since the blades can be installed to general excavators, very high mobility is obtained even at narrow and/or slopes.

This technology is very innovative.

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 - Mega method, CDM - LODIC method, CDM-Lemni2/3 method and CDM-FLOAT method.

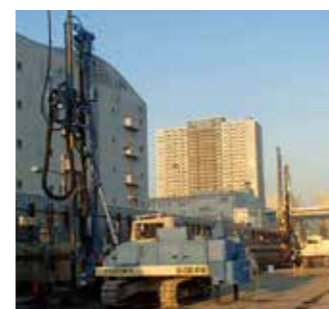
KS-S · MIX method



Applicable to the hard soil layer

This method can effectively improve the lost motion in the ground, and the unique blade can achieve the improved area of more than twice the traditional slurry mixing method (double blade to reach 1 m diameter).

GI Column method



High Quality Deep Mixing by Using Compact and Lightweight Equipment

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

MITS method



Applicable to Slopes

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

Ground Improvement - Jet Grouting

- V-JET method
- MultiFan Method
- JSG method
- Column Jet Grout method
- CCP method
- X-JET(Cross Jet) method
- Recycle Jet method
- Parajet method
- Step Grout method
- Jet Grouting (Overseas)

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

NETIS® Registration Number | KT-120047-A (Publication Period is end)



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 nozzles 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.

Advantages

1. We can select the most suitable monitor from three types to design wide range of improved diameter combined with the specifications of ejection.
2. Since mixing efficiency is overwhelming, we can reduce the quantity of required binder and spoils that are produced due to ejection.

This Jet Grouting is much different from the conventional methods.

MultiFan method



New technology to achieve the fan shape jet grouted

The concept of MultiFan was used of jet grout to formed the fan shape improvement. The MultiFan can reduce the ineffective arrangement of jet grouted improved and practice the improvement configuration and layout with high economic efficiency.

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.

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

Ground Improvement - Permeation Grouting

- Multi-Strainer method
- Ultrasonic Vibration Grouting Method (UVG method)
- Ground Flex Mole method
- Various Double Packer method
- Various Double Tube Strainer method
- Dynamic Grouting method (Ex-Packer method)
- Super Multi Point Injection method
- 3D (Dimensional) Injetction system

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

NETIS® Registration Number | KT-140123-A



Rapid Construction by Means of Large-Flow Column-Shaped Permeation
Specially developed outer injection pipe (multi-strainer pipe) maintains the injection core. By using this system, we obtain reliable permeation grouting at higher injection speed. Moreover, the availability of "first injection" and subsequent "second injection" realizes more precise grouting.

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.

Ultrasonic Vibration Grouting method (UVG method)

NETIS® Registration Number | CB-180008-A



Ultrasonic wave to enhance the grouting permeation
The UVG is a newly generated grouting method that combined with the Tube-A-Manchette (TAM) grouting features and the propagation characteristic of ultrasonic wave. It can use the ultrasonic wave to drive the tube vibrated and enhance the permeation of grout during grouting. Meanwhile, it can form high quality and uniform grouted.

Advantages

1. Ultrasonic wave driving the vibration of grouting tube and reducing the blockage of soil particles. It can increase the permeability of the grout and form a wide range of grout with high quality.
2. The ground heavy and deformation can reduce after the grout permeability was improving. The grouting workaround or under the structures would be more workability.
3. It is improving the grout permeability that can reduce the amount of waste slurry and lowered the grout overflow to the ground surface.

Ground Flex Mole method



Pinpoint Treatment by Using Horizontal Directional Drilling
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.

Directional Boring Expands the Possibility of Business Continuity Plan (BCP).

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.

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

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.

Double Tube Strainer method



Typical Chemical Grouting method

This is the typical chemical grouting method that utilizes double tube. At this method, 1st injection with instant gel time chemical and subsequent 2nd injection with longer gel time chemical are performed at each injection stage thus homogeneous grouted mass is created.

Ground Improvement - Compaction

- Compaction Grouting (CPG) method
- CPG Guide Arc method
- CPG Compact System

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

NETIS® Registration Number | KTK-140005-A



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 has 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

The Budding Method to Prevent Liquefaction for Existing Structures

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

CPG Guide Arc method



CPG Method by Using Horizontal Directional Drilling

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.

Anchor

- Permanent Anchor methods
- Temporary Anchor methods (removal type and left-in-place type)
- Fit Frame method
- High Water Pressure Resistant Anchor method
- Balloon Body Anchor method

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.

Earth Reinforcement and Slope Protection

- Soil Nailing method
- High Spec Nailing method
- Free Frame method
- PAN WALL method
- Inducible Plant Spray method

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.

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 landslide 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 Flotech, 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.

We proudly have the most experience and performance records in Japan.

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-cutoff entrance device and water-cut-off packers.

Fit Frame method



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.

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.

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.

Applicable to Residential Area

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 resistance 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.

Widely Applied to Reinforcement of Railroad Embankment

Free Frame method



Representative Grating Crib method by Shotcrete Spray

This is the grating crib method by placing flexible wire net form that fits uneven ground surface and subsequent shotcrete spray. Stabilization or protection of extensive slopes is achievable by either placing the frame only or combining with reinforcement materials or anchors.

PAN WALL method



A practical method for preserve the working face of Top-down slope

The PAN WALL method used precast concrete slab to stabilization the excavation slope. This method is covered at slope surface and suitable for high degree excavated slope. Meanwhile, it can preserve the working face of the Top-down excavated and maintain the slope stabilization.

Ground Improvement

Anchor

Earth Reinforcement and Slope Protection

Pile and Foundation

Consolidation and Drainage

Repair and Reinforcement of Structures

Remediation of Contaminated Soil and Water

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Pile and Foundation

- CPG Lift method
- BHP method
- TBH method
- High Spec Micro Pile method
- High Load-Bearing Micropile method
- VSL-J1 Permanent Anchor method

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.

Ground reinforcement together with settlement adjustment, like killing two birds with one stone.

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 Spec Micro Pile method



Seismic rehabilitation method in the limit working space

The High Spec Micro Pile method used a small and flexible machine and small-diameter steel pipe pile to reinforce the foundation of existing structures. It can be constructed in a limited height and narrow working space. Moreover, this method compared to the traditional method has cost-effectively and material saving benefit.

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

- Well Point method
- Deep Well method
- Plastic Board Drain method
- Vacuum Deep method

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 groundwater level is lowered easily.

Deep Well method



Deep Well Method Suits Dewatering for Deep Excavation

A deep well which diameter is between 20 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 lower the groundwater level.

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.

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 Slit Recovers Groundwater Flow

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

Ground Improvement
Anchor
Earth Reinforcement and Slope Protection
Pile and Foundation
Consolidation and Drainage
Repair and Reinforcement of Structures
Remediation of Contaminated Soil and Water

Repair and Reinforcement of Structures

- Space Pack method
- Aqua Grout method
- Aqua Mate Plus method
- Pinup method
- JOT'S-Crete method
- Carbon Fiber Sheet Adhesion method
- TACSS method
- Hyper CF method
- ADOX method
- Bond Cylinder method
- Visible Net method
- Jet Powder Grout method

To maintain our safe and comfortable social-and-economical 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 in 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 blender near the injection point, then becomes plastic. Therefore, long-distance pumping is achievable.

Pinup method



Seismic rehabilitation of stone wall

The Pinup method can locally solidify the backfill gravel material in the back of the stone wall. Meanwhile, the shorter anchor is used to fix the ground and increasing the seismic resistance of the stone wall.

JOT'S-Crete method



Highly Efficient Section Repair

This is the method to repair and reinforce concrete structures by spraying slurry-phased 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.

Remediation of Contaminated Soil and Water

- Replacement
- Volatile Extraction
- Biodegradation
- Chemical Decomposition
- Insolubilization
- Groundwater Pumping
- Rotary Crushing and Mixing method

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 Removing the Diseased Part

The clayey soils contaminated by VOC's are cut and discharged toward ground surface by high-pressure jetting and replaced with sandy materials. The treated soil is highly permeable thus subsequent pumping aeration and bioremediation are achievable.

Volatile extraction



Remediation of Contamination by the Force of Heat and Air

The additives mainly contain quick lime are mixed 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.

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 the contaminated soils is performed.

Chemical Decomposition



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/or oxidizing agents are injected and mixed with in-situ soils to decompose the contaminants by either oxidization or deoxidization.

Groundwater Pumping



Many A Little Makes A Mickle

The groundwater within the contaminated soils is pumped up and transported to treatment plant to separate and collect the contaminants. Long-term operation of the plant is necessary, but we can certainly collect the contaminants. The water after removal of contaminants can be recharged into the original ground.

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 sulfate and stabilized against dissolution.

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