



# ASIAN STONE COLUMN

**Geotechnic and Civil**



## ASIAN STONE COLUMN

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# ASIAN STONE COLUMN

## About Us

Asian Stone Column Company is a specialized geotechnical and civil contractor that is active in the fields of soil improvement, drilling for geotechnical studies, excavation and drainage in coastal areas and buildings. Our working method in Asian Stone Column Company is based on three principles: 1) review, planning and organizing the project 2) preparation for the transfer of equipment and experts to the project site 3) implementation of the project in accordance with the soil improvement plan.

The company has a head office in Tehran and two branches in Bushehr port and Rasht city to provide communication with employers . To get acquainted with our company.

## Geotechnical Services

- Soil Improvement
- Excavation at Coastal Areas
- Structure
- Drilling
- Soil Compacting Methods

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## Geotechnical Services

### **a- Soil Improvement Methods**

- Stone Columns
  - Vibro Sand Stone Columns
  - Impaction Sand Stone Columns
- PinPiles or Minipiles
- Permeation Grouting
- Micro Piles
- In Place and Driven Piles
- DSM- In urban areas

### **b- Excavation in Coastal Areas**

- Geosynthetics
- Composite Retaining Structures
- Soil Nailing System
- Shotcrete
- Drainage in Coastal

### **c- Structures**

### **d- Drilling**

- Geotechnical Identification of Underground Layers
- Drilling for Injection

### **e- Soil Compacting Methods**

- Excavation and Embankment
- Compaction of Waste Lands
- Impact Compaction



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# Soil Improvement



# Stone Columns



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## Vibro Sand Stone Columns

Vibro-replacement stone columns, has been one of the world's most popular methods over the past half century. The purpose of the stone column implementing is creating soil beds under the structure with new characteristics, as different structural foundations (strip, single or mat foundations, concrete slabs, embankment and etc.) show predictable and justifiable behavior consistent with the privacy and tolerance that is intended for building structures. During the process of construction of stone columns using vibro-replacement method, due to the water jet of the end of the probe, lead creation of wells with desired depth in the earth. Well get washed without casing with water jets, and then gravel materials which feed from the top or bottom of the well, by an electric or hydraulic vibrator, located at the bottom of the probe are dense in layers with 0.3-1.2 meters thick.

Vibro-replacement process is commonly used where the stability of walls is doubtful. Thus, it is useful for areas with loose to dense relative density (or soft to stiff) soil layers and high underground water level. Vibro-replacement process should be used in areas with too soft soil where the well without casing can be stable and underground water level is high. The columns can be made in regular or variable grid as row or group or even individually. Soil improvement with using stone columns contain one or a combination of the following effects :

- Increasing bearing capacity
- Reducing settlement
- Correcting uniformity of geotechnical properties
- Increasing the rate of consolidation with creation of drainage elements
- Increasing technical characteristics of the composite soil bed



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# Stone Columns



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## Impaction Sand Stone Columns

GICPs is one of the ASC's suggested options for reinforcement of sandy soil with loose relative density to moderate and clays and silty with relative consistency soft to medium in order to increase the bearing capacity and stiffness modulus, reduce settlement and retrofitting at the liquefaction. A Gravel Impact Compaction Pier considered as a reinforcing soil and not a foundation element or a deep foundation. Technology and construction of Gravel Impact Compaction Piers system which is known as GICPs in format of 3 indoor inventions over the years of 2014\_2016 by research and development unit of this high-tech company registered in patent offices of Iran. These inventions won first place in several festivals and country patents. Here of, implementation of the two national projects located in Bushehr port from Iran in order to retrofitting soil against liquefaction and conducted extensive researches in this field, lead detoxify defects. The construction method of GICPs rely on implementation of 4 main steps; (step 1) excavation and pass the dense layer or rock fill, if needed, (step 2) once or twice hammering the special shuttle into the loose soil, casing installation and pouring gravel materials into the pipe and then removing it, (step 3) hammering the ended pile with conical shape into gravel pier frequently and feeding gravel to the end of pier, (step 4) hammering the top of piers and between them with short tamper and Implementation of wide gravel berm on the ground.

### Applications

- Increase the bearing capacity and reduce settlement on soft and compressible soil beds under the foundation of residential, office, commercial, industrial, military, sports and etc. buildings
- Increase the bearing capacity and reduce settlement on soft and compressible soil beds under the foundation of tanks, chemical and petroleum products
- Settlement control of embankment road and access ramp of bridges
- Natural slope stabilization



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# Micropile



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The diameter of micro pile is less than 300 mm. Generally, they are implementing in two modes; with or without light steel reinforcement and cement grout injection. While, hammering the steel pipes and cement grout injection are implementing without steel reinforcement, in addition to improving physical and mechanical properties of the surrounding soil, retrofitting soil against liquefaction can be solved. Also, if hammering the steel pipes and cement grout injection are implementing with steel reinforcement, in addition to improving physical and mechanical properties of the surrounding soil because of cement grout injection, the bearing capacity and settlement of foundation increases and decreases, respectively.

## Benefit

- Ability of implementing in lands with limited city areas
- Fast implementing speed
- Using smaller equipment in contrast with other methods
- Not creating destructive vibrations for neighboring buildings
- Ease of implementation tensile, compressive and lateral load tests on micro pile elements
- The flexibility of this method in case of increasing the number of floors and structural change

## Applications

- Retrofitting soil against liquefaction
- Foundation settlement control
- Seismic retrofit foundation
- Foundation piping control
- Increasing the compressive, tensile and lateral bearing capacity of foundation
- Implementation of supporting structures



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# Pinpile or Minipile

Pinpile or minipile with two compressive and tensile performances refers to casted-in-place piles with diameter of 250 mm and with the maximum length of 30 meters. These elements have been widely used in many construction projects during the past half century. The main purpose of the pin pile application is controlling settlement. Pin piles are applicable in most soils and they have acceptable bearing capacity. This method is particularly valuable when the soil layers are variable and surrounding buildings are sensitive to vibrations. The standard method of making pin piles consist of 4 steps; (1) excavation and if necessary casing installation, (2) installation of reinforcement elements, (3) cement grout injection with casing removal.



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# Permeation Grouting



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Permeation Grouting can be used for filling the cracks and holes in the rock, filling the empty space between the earth and structures located on it and loose soil improvement in order to increase the strength, density and homogeneity and reduce permeability of them.

Permeation Grouting as an injection method is used for improving soil structure. This method after digging the soil to the required depth in a triangular or square grid and installation of perforated PE pipes at regular intervals and implementing primary sealing, injecting grout of cement and required additives step by step. Based on the gained experience, in the case of existence of gravel soil and high level of underground water, the performance of this method consider as desired.



## Benefits

- Ability of implementing in lands with limited city areas
- Not creating destructive vibrations for neighbor's buildings
- Using smaller equipment in contrast with other methods
- Increasing cargo capacity pressure of the foundation
- Fast implementing speed

## Applications

- Soil retrofitting against liquefaction
- Foundation settlement control
- Seismic retrofitting of foundation
- Foundation piping control
- Increasing the compressive bearing capacity of foundation
- The flexibility of this method in case of increasing the number of floors and structural change



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# In Place and Driven Piles



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A pile is like a column that runs through the soil to transfer surface load from the foundation to the deep layers. The usual depth of piles is between 10 to 40 meters and their diameter is between 40 to 150 cm.

Piles are practically divided into two main categories: 1) driven piles and 2) drilled piles. Driven piles can be made of metal, concrete or wood, and the use of metal and concrete in this type of pile is more common. Drilled or in-situ piles also consist of drilling wells and concreting inside. The maximum possible length for the pile depends on the type of pile and the method of its execution.

The length of prefabricated concrete piles cannot be too long. In-situ concrete piles are not as limited in length compared to prefabricated concrete piles. Of course, the maximum depth of drilling and concreting in situ is limited due to the equipment used.

## Application

- The soil under the foundation should not have a suitable load
- The foundation settlement should be problematic
- It is not possible to implement a surface foundation

## Advantages

- Possibility to run below the water level and off the coast
- High execution speed
- Density of granular soils and improvement of their resistance parameters during compaction
- Ability to control the quality of materials



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# DSM-In Urban Areas



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Deep soil mixing or DSM is one of the practical methods of soil improvement in the world, which produces cemented columns and modified soil characteristics by injecting stabilizing materials such as cement or lime using a mechanically hollow shaft drill in the soil. In this method, by successively executing the DSM columns and creating an overlap between them, sealing walls can be created or any arrangement can be performed under the foundation of the building, and after obtaining sufficient resistance, the foundation of the structure can be built on the executed DSM columns.

## **Additives for Deep Soil Mixing (DSM)**

Cement slurry or dry cement is the most common additive in the deep soil mixing method

## **Applications of Deep Soil Mixing (DSM) Method**

Deep soil mixing method is one of the most economical methods for improving soft soils. Economic, temporal, or environmental constraints sometimes make other improvement methods, such as preloading, or dynamic methods, uneconomical. On the other hand, these two methods are not very useful in urban areas due to vibrations and noise. The deep mixing method has proven its capabilities as a suitable alternative to these two methods as well as the deep foundation method (pile execution)

## **Some applications of deep soil mixing method in bed improvement**

- Strengthen the foundations of various structures
- Decreased liquefaction potential
- Strengthen the foundation
- Strengthen foundations in road construction
- Oil tank foundations
- Sealing wall
- Execution of vertical retaining wall
- Excavation slope protection
- Port development
- Tunnel stabilization







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# **Excavation in Coastal Areas**

# Geosynthetics

Geosynthetics are produced in different shapes and materials, each of which is used for almost the same use. The word geosynthetics is used for a group of products that are commonly used to solve geotechnical problems.

## Geotextiles

For reinforcement, separation, proper drainage, increasing the bearing capacity of asphalt and soil, increasing the useful life of asphalt, protection of structures from shores and ports, homogeneous subsidence in marine structures such as breakwaters, protection of eroding ground, protection of ballast layer in railways, it is used to increase the bearing capacity of the railway track, protect the geomembrane layers and many other things.

## Geogrid

They are used for soil reinforcement and construction of retaining walls, and etc.

## Geomembrane

Geomembrane is a sheet made of polyethylene, PVC, etc.

## Geonts

They are suitable for preventing erosion of slopes and drainage.

## GCL

GCL are used to prevent water leakage and sealing.

## Geocomposites

They are a combination of different geosynthetic sheets such as geotextile-geont, geotextile-geogrid, geotextile-geocell, etc.

## Geocell

Are used to prevent erosion and control the erosion of slopes.

## Geomat

Is used to prevent soil erosion, soil leaching by water and sloping soils.



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# Composite Retainig Structures



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In most urban constructions, especially in coastal areas, excavation in loose and soft lands in conditions below groundwater level is inevitable due to the existence of basements and design requirements and high regional land prices, and most civil engineers face major concerns and challenges in this area

In this regard, the existence of buildings the excavations, unsuitable land, high groundwater level, inefficiency and inadequacy of most excavations stabilization methods for lands with limited area and high cost of conventional guard structures from the perspective of implementers, are among the main challenges.

## Applications

The process of constructing a composite retaining walls in excavating loose and soft lands can be widely used in excavating construction projects and urban constructions, specially in limited areas, the presence of loose and soft lands and high groundwater

Specially, in situations where other methods are not feasible. Therefore, the use of this method in the construction of urban structures with basements, in the implementation of drainage pumps and pumping water and sewage, and shallow underground reservoirs and many construction projects is possible.

## Advantage

- In the presence of granular soil and high groundwater level that it is not possible to drill a well, the installation of vertical piles is done by high frequency hammering without the need to drill a well
- Possibility of using this method in lands with large or limited area
- In granular and loamy soils, in addition to providing the necessary inhibitory force, it causes modification (creating cementation in the granular texture) of a significant volume of wall soil
- This system is not cumbersome and will not prevent construction operations



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# Soil Nailing



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The soil nailing method is one of the common methods in temporary and permanent stabilization and protection of earthen walls, soft stones and crushed stones. The implementation of this method is step by step and from top to bottom

Each stage of the operation, including (a) excavation of the pit to a stable depth (1-2 meters), (b) plowing with specified length, diameter, slope and distance, (c) installation of reinforcement and injection of cement slurry, (d) installation Special composite drainage strips on the working chest, (e) installation of welded mesh, shotcrete execution and installation of restraining plate in place of reinforcements. Unsuitable and problematic conditions for nailing can be dry and cohesionless soils, high groundwater, rubble soils, fine to very soft fine soils, organic soils, corrosive soils, rocks Weather, long cold, loose and very loose granular soils.

## Application

- Restraining the walls caused by mountaineering during road construction
- Restraint of walls caused by temporary or permanent excavations in urban areas
- Widening of roads located under the base of bridges
- Stabilization of natural slopes
- Stabilization of engineering embankment slopes

## Advantages

- Do not occupy space in the building and the floor
- Ability to run according to different geometric patterns
- Ability to maintain the wall from top to bottom and at the same time with excavation
- High safety due to the large number of soil nails and the possibility of increasing them in the required areas
- Adjust and reposition the soil nails when dealing with obstacles
- No need for structural elements supporting the earth wall



# Shotcrete



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Shotcrete is a mortar or concrete that is sprayed on the surface with high pressure and speed. In the construction industry today, shotcrete has several applications that, depending on the intended purpose, can play the role of protecting the work surface or creating a concrete cover. One of the advantages of shotcrete is that it covers the uneven surfaces of underground excavations and forms a relatively smooth surface. In stone and earthen walls created after excavation, a temporary layer of shotcrete is used as soon as the substrate is prepared. The purpose of applying the temporary shotcrete layer is to protect the soil against weathering, the initial connection between the soil nails and to protect against erosion and soil scaling in the excavated soil.

## Application

- Temporary and permanent maintenance of earth and stone walls in excavation
- Covering the base and roof of bridges
- Repair of worn concrete components
- Coating light construction walls
- Tunnel Lining
- Increasing the thickness of concrete pipes in corrosive and fire-hazardous environments
- Stabilizing mountains and rocks by covering them with a welded mesh and spraying concrete on them

## Advantages

- The possibility of executing concrete structures with curved, circular and irregular shapes
- Creating complete adhesion between the slurry and the round bar or welded mesh
- Achieving strength of concrete in the range of kg / cm<sup>2</sup> in normal conditions 250-480
- High execution speed
- It is economical
- Prevent the advancement of corrosive agents in steel and concrete components



# Drainage in Coastal Areas



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Drainage means the removal of excess groundwater, surface water and runoff from a structure or area by gravity or pumping in order to prevent disturbance of this excess water or to prevent damage to it. In geotechnical engineering, drainage is installed to drain excess groundwater to prevent liquefaction and the dangers of high pore water pressure. At present, Asian Stone Column Company is announcing its readiness to carry out projects related to this operation by implementing drainage projects on the coasts and sites with high groundwater levels.



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# Structure

# Structure

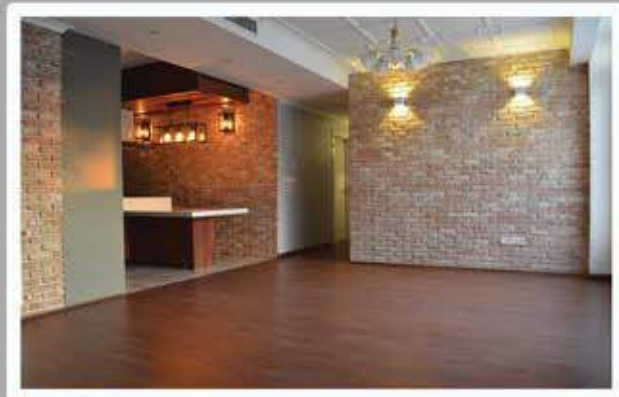
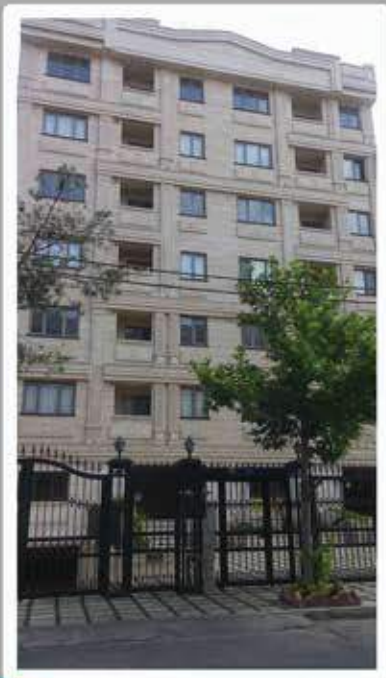


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Asia Stone Column Company, with the competence of buildings and specialized personnel, participates in construction in the provinces of Tehran, Gilan and Bushehr, including design and construction.

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# Drilling



# Drilling for injection

Permeation grouting is used as one of the injection methods to improve soil structure. In this method, after digging the ground to the required depth, in a triangular or square grid and installing perforated polyethylene pipes punctured at regular intervals and performing initial sealing, cement grout and necessary additives are injected in stages. Based on the obtained experiences, in the presence of granular soil and high groundwater level, the performance of this method is evaluated as optimal. Asian Stone Column Company, with its equipment, specialized personnel and valuable experiences in this field, has a good performance in drilling for injection



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# Geotechnical identification of underground layers



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In the first step, for the construction of a building, pier, beach construction, etc., geotechnical studies are required. After drilling and sampling operations, various tests such as soil classification and hydrometry, moisture percentage and density, unconfined compression test, consolidation, direct shear test and etc. are performed on the samples to determine the soil type and characteristics. This company is able to perform drilling and sampling operations, laboratory tests, etc.



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# **Soil Compacting Method**



# Excavation and Embankment



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This company provides the possibility of excavation and embankment operations by using the necessary equipment .



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# Compaction of Waste Lands



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In organic soils that do not have the desired geotechnical characteristics, in order to prepare the bed for the construction of various structures such as residential / commercial / office buildings, railways and road construction, etc., the method of soil compaction can be used by the innovative method of this company. Asian Stone Column Company, by using the necessary equipment, provides the possibility of drilling operations in waste areas.



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# Impact Compaction



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Rammed Impact Compaction is one of the ways to increase the density of the surface soils. In this method, the energy transfers as frequency shootout by a hammer connected to a hydraulic hammer on a mechanical shovel, in a network with square or triangular format transfers to soil bed. The number of beats from the hammer to the ground is about 400\_650 beats per minute. Rammed points and other soil improvement parameters including the energy, rammed staging and periods of stopping, get chosen based on data obtained from the test site .

## Benefits

- Increase the bearing capacity of soil
- Reduce settlement
- Demolition holes and increase the density of soil
- Fast implementing speed
- Economically efficient
- Reduce the volume of embankment
- The possibility of bed compaction in excavation area



## Applications

- Compaction of the construction debris
- Compaction of collapsible soils
- Compaction of loose and soft soils







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Some completed projects

**Project:** Central building of Persian Gulf Science and Technology Complex

**Contract Subject:** Implementation of the soil improvement plan with an area of 2.8 hectares

**Location:** Bushehr province



**Project:** Construction of Parias villa complex in the Laleh Vejeh Sar village

**Contract Subject:** Soil improvement by Stone column, cement injection by manchette and sand pad methods

**Location:** Guilan province



**Project:** Delvar Cultural and Artistic Complex  
**Contract Subject:** Soil improvement by manchette and cement injection methods  
**Location:** Bushehr province



**Project:** Bushehr Fisheries Jihad Agricultural Staff 86-unit complex  
**Contract Subject:** Excavation and soil improvement by Gravel Impact Compaction Piers and cement injection  
**Location:** Bushehr province





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Some completed projects

**Project:** Islamic Azad University Educational Building,  
Dayer Branch

**Contract Subject:** Soil improvement by Gravel Impact  
Compaction Piers (GICPs) method

**Location:** Bushehr province



**Project:** Bushehr Brothers Seminary Building  
**Contract Subject:** Soil improvement by Gravel  
Impact Compaction Piers (GICPs) method

**Location:** Bushehr province



**Project:** Residential project  
**Contract Subject:** Soil improvement by manchette  
method

**Location:** Mazandaran province



**Project:** 10000 cubic meter water tank  
**Contract Subject:** Soil improvement by cast in  
place piles and cemented gravel piers methods

**Location:** Bushehr province





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Some completed projects

**Project:** The residential complex

**Contract Subject:** Execution of additional operations for the construction of the excavation and retaining structure

**Location:** Bushehr province



**Project:** Khark Island Pool Building

**Contract Subject:** Soil improvement by Dynamic Compaction (DC) method

**Location:** Bushehr province



**Project:** Deylam Port Pool

**Contract Subject:** Soil improvement by Gravel Impact Compaction Piers (GICPs) and pinpile methods

**Location:** Bushehr province



**Project:** MDF Factory Site

**Contract Subject:** Soil improvement by pinpile method

**Location:** Bushehr province



**Project:** Nuclear Martyrs Educational Complex

**Contract Subject:** Excavation and soil improvement of the site

**Location:** Bushehr province







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Some completed projects

**Project:** Excavation and retaining structure implementation of residential commercial complex

**Location:** Bushehr province



**Project:** 36-units residential complex

**Contract Subject:** Execution of the whole structure of the complex

**Location:** Tehran province



**Project:** Residential complex in Guilan province

**Contract Subject:** Soil improvement by pinpile method

**Location:** Guilan province



**Project:** Execution of drilling and geotechnical study

**Location:** Mazandaran province



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# ASIAN STONE COLUMN

Some completed projects

**Project:** Residential complex in Mazandaran province  
**Contract Subject:** Soil improvement by DSM method  
**Location:** Mazandaran province



**Project:** Excavation and retaining structure implementation of residential-commercial complex  
**Location:** Bushehr province



**Project:** 9-units residential complex  
**Contract Subject:** Execution of the whole structure of the complex  
**Location:** Guilan province



**Project:** Execution of drilling and geotechnical study  
**Location:** Guilan province



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# ASIAN STONE COLUMN

Some completed projects

**Project:** Residential complex in Guilan province  
**Contract Subject:** Soil improvement by cement injection method  
**Location:** Guilan province



**Project:** Execution of drilling and geotechnical study  
**Location:** Guilan province

**Project:** Industrial buildings in Bushehr province  
**Contract Subject:** Execution of the whole structure of the complex  
**Location:** Bushehr province



**Project:** 20-units residential complex  
**Contract Subject:** Execution of the whole structure of the complex  
**Location:** Tehran province



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Some completed projects

**Project:** 10-units residential complex  
**Contract Subject:** Execution of the whole structure of the complex  
**Location:** Tehran province



**Project:** Educational complex in Bushehr province  
**Contract Subject:** Soil improvement by Cemented-Gravel Impact Compaction Piers (CGICPs) and Concrete submerged  
**Location:** Guilan province



**Project:** Execution of drilling and geotechnical study  
**Location:** Guilan province



**Project:** Excavation and retaining structure implementation of residential-commercial complex  
**Location:** Bushehr province





# ASIAN STONE COLUMN

Some completed projects

**Project:** Residential commercial complex in Bushehr province

**Contract Subject:** Soil improvement by Gravel Impact Compaction Piers (GICPs)

**Location:** Bushehr province



**Project:** 5-units residential complex  
**Contract Subject:** Execution of the whole structure of the complex  
**Location:** Tehran province



**Project:** Execution of drilling and geotechnical study

**Location:** Guilan province



**Project:** Residential commercial complex in Bushehr province

**Contract Subject:** Soil improvement by Gravel Impact Compaction Piers (GICPs)

**Location:** Bushehr province







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