

# Soil mixing

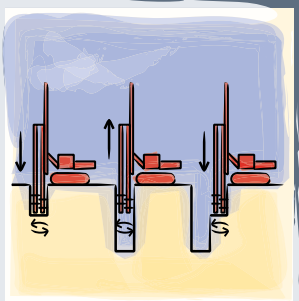


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Soil mixing consists in the mechanical blending of the in-situ soils with a cementitious material using an auger or specially designed mixing tools. The system involves simultaneously the displacement of the soil without extraction, the low-pressure injection of a binding agent and the blending with the soil using the mixing tool.

The process can be used for a wide variety of applications: reduction of the compressibility of the soil mass under sensitive structures, increase of the bearing capacity of weak soils, mechanical stabilization (including liquefaction mitigation), reduction of the active earth pressure behind vertical retaining structures, cut-off walls and impervious plugs, shear strength increase around piles,...





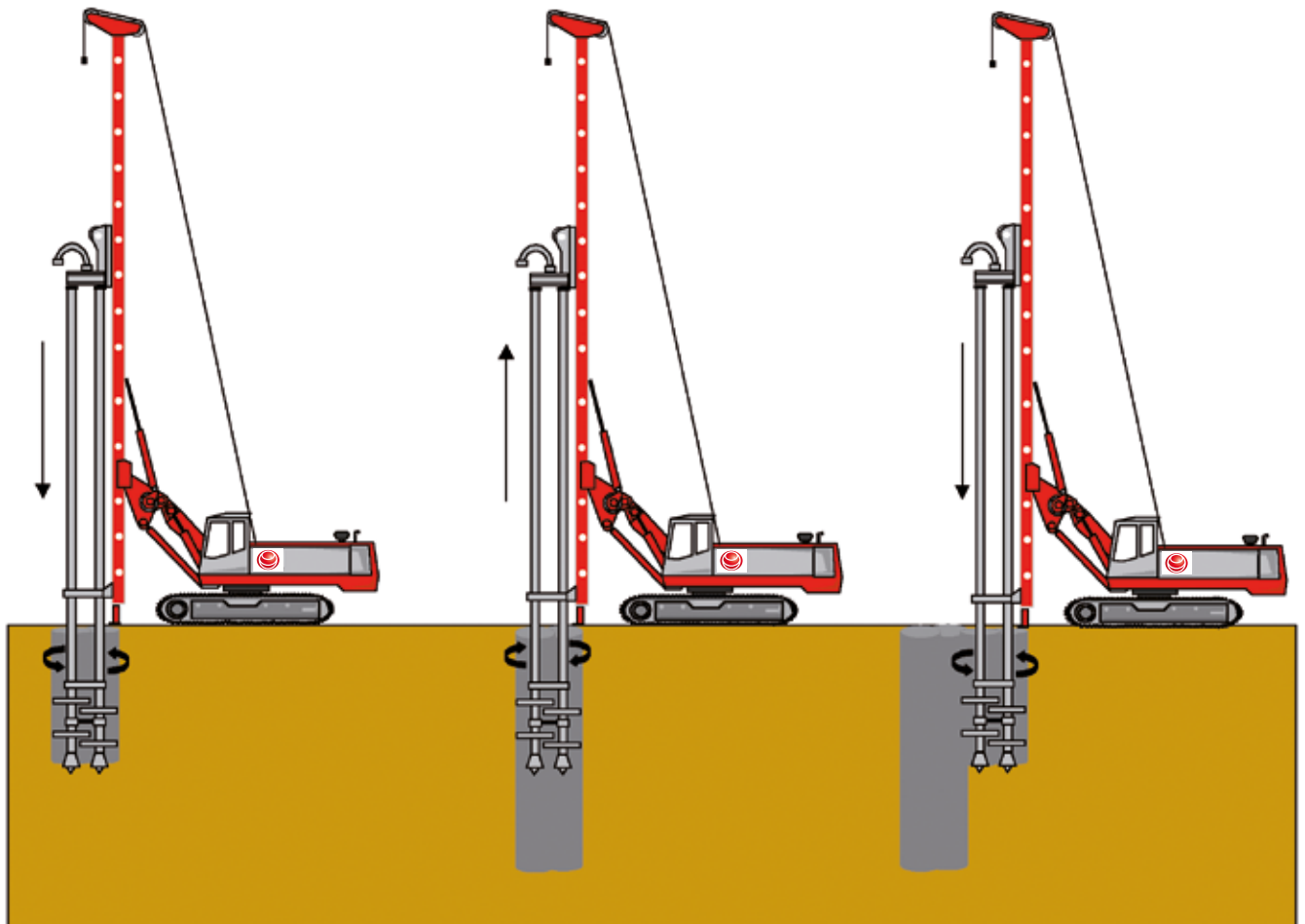
# Soil mixing



*Dry method soil mixing tool*

## Implementation and methods

The process consists of a mixing tool or auger (single or multiple axis mixing) attached to a drilling rig. Up to four tools can be mounted on a rig at the same time. A binding agent is injected into the compressible soil and blended/mixed with the soil by the paddles attached to the tool. The reagent can be delivered in a slurry form (wet method) or as a dry, powder form cementitious material (dry method).



The binding agent is injected through the hollow stem to the base of the tool in either one phase during drilling or in two phases (during drilling and withdrawal of the tool). This second option, because of the re-compaction effect during the lifting phase, presents several advantages:

- Significant increase of the in-situ density and compaction of the soil;
- Improvement of the homogeneity and overall quality of the blending soil/reagent.



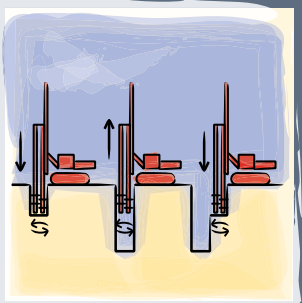


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*Wet method triple-axis soil mixing tool*

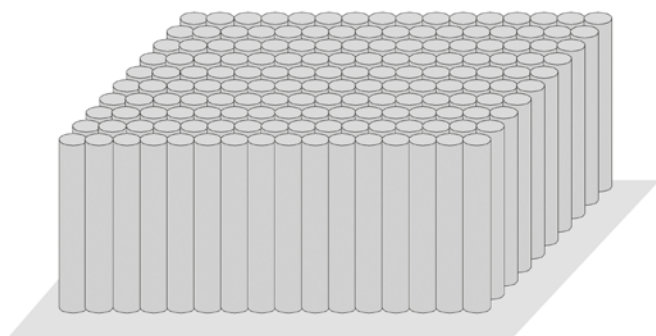




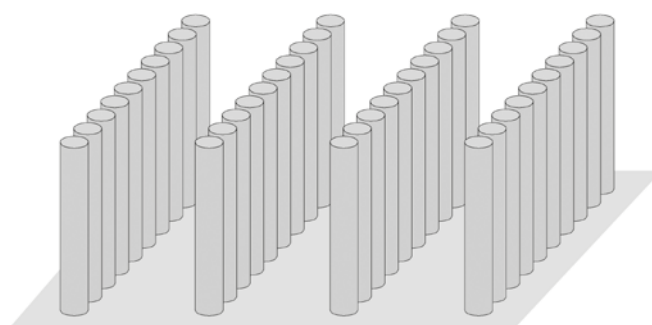
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This technique is usually used for the stabilization and mass improvement of soft clays and organic soils. Depth of treatment of up to 40 m can be achieved. Depending on the overall design and soil conditions, several methods of treatment have been developed:

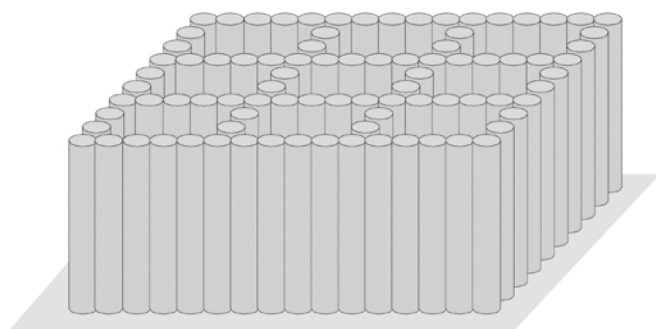
**Block-type in-situ treatment**



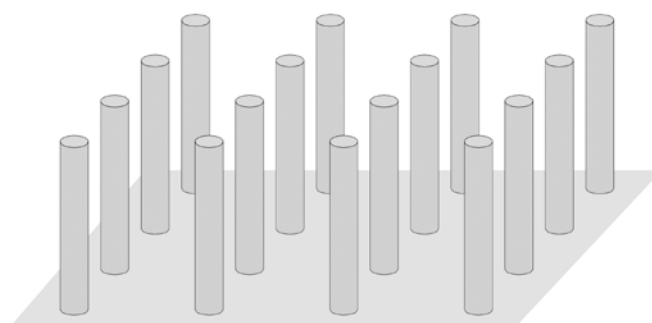
**Wall-type in-situ treatment**



**Cellular-type in-situ Treatment**



**Treatment using a grid of soil mixing columns**



## Advantages

- Mass treatment of the in-situ soils;
- It is not necessary to inject grout on the whole length of drilling and selective treatment of target compressible layers can be achieved;
- Treatment depths of up to 40 m;
- Various pre-designed shapes of treatment can be formed within the soil (blocks, walls, columns..).

## Applications

- Stabilization and consolidation of cut or fill retaining structures and embankment by increasing the shear strength and reducing compressibility of the soils;
- Ground improvement under structures with uniform loading conditions (embankments, slabs-on-grade, roadways and railways...);
- Liquefaction mitigation through the combined improvement of the shear strength and the confinement effect of the mixing columns within the liquefiable soils.