

# Soil Mixing

**SMX**



## Geologic Hazard Application

- Soft/Loose Soil
- Liquefaction
- Contaminated Soil
- Lateral Spread
- Slope Stability

## Key Advantages

- Versatile
- Liquefaction mitigation
- Downdrag mitigation
- Environmental remediation
- Reuse of onsite materials
- Increase compression strength
- Low/no vibration

## Diameter/Depth

- 2 – 8 ft dia
- Mass mixing up to 20 ft deep
- Deep mixing up to 80 ft deep

## Key Considerations

- Spoil removal
- Load transfer platform construction
- Final site grading

## Compatible Soils

- Poorly Graded Sand (SP)
- Sand (SP, SM, SC)
- Clayey Sand (SC)
- Clay (CL, CH)
- Silt (ML, MH)
- Contaminated Soil
- Undocumented Fill

## Comparable To

- Aggregate Piers
- Rigid Inclusions
- Compaction Grouting
- Jet Grouting

## Overview

**Soil Mixing (SMX)** is the process of mixing binder, such as cement, with the soil in situ using specially-designed mixing tools. Common types of SMX include deep soil mixing, cutter soil mixing, and shallow mass mixing.

Soil mixing is a versatile geotechnical construction technique and is used for a wide variety of applications including ground improvement, environmental remediation, support of excavation, and hydraulic cutoff. The binder that is selected for mixing can improve both settlement and strength characteristics of the soil, decrease permeability, and/or act as a reagent, depending on the application.

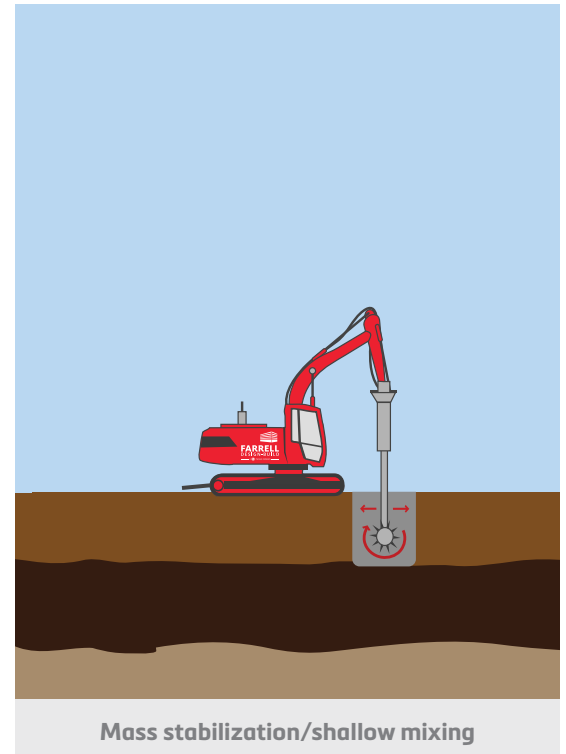
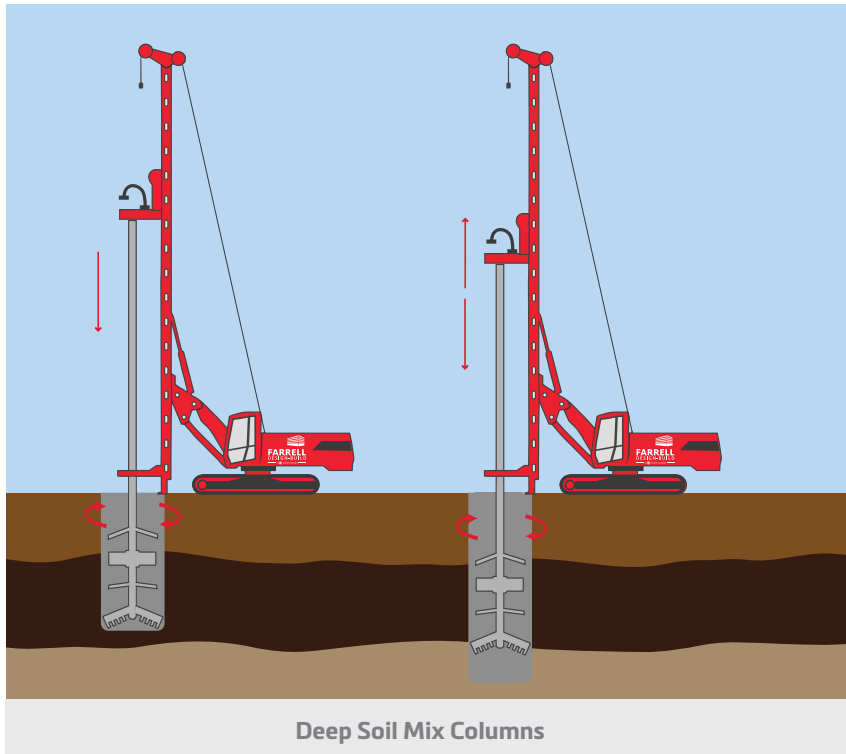
For ground improvement, SMX reduces settlement, increases bearing capacity and shear resistance, and mitigates liquefaction. Soil mixing is also used to support tunneling and excavation operations, for hydraulic cutoff, and can also be incorporated into earth retention structures. For environmental remediation applications, soil mixing is commonly used to treat, neutralize, demobilize or confine contaminants that are present in the soil.

## SMX Applications

Reduce compressibility of weak soil, enhance shear resistance & bearing capacity, mitigate liquefaction and downdrag. Ideal applications for SMX:

- 1) Liquefaction mitigation with shear panel grids to contain liquefiable soil and increase composite soil shear wave velocity.
- 2) Direct foundation support like aggregate piers and rigid inclusions.
- 3) Support tunneling and excavation operations Earthen structures such as embankments, MSE walls, dams/ levees.
- 4) Environmental remediation.

## SMX Construction Process



## Technical Details

**Soil Mixing (SMX)** entails blending the soil structure, adding cement and additive binders in wet or dry form, and thoroughly mixing within the treated zone.

Soil mixing may be performed using augers or paddles that form soil mix columns. Columns can be installed to depths of up to 80 feet and typical diameters are in the range of 2 to 8 feet. Columns may be installed using single or multiple-axis tooling allowing for the installation of discrete or overlapping/tangent columns. Depending on the application, columns can be installed individually or to form continuous rows, panels, grids, or block/mass treatment.

Shallow mixing, also referred to as mass stabilization is most typically performed with a bladed rotary mixing tool that is attached to an excavator. Rather than columns, the mixing is performed in linear panels that are overlapped to result in mass or full treatment of the improved zone. Shallow mixing is typically limited to a depth of approximately 20 feet.

SMX is a versatile densification ground improvement system that supports your project to *Go Vertical with Confidence.*