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## When to use MDM™ In comparison to wet & dry mixing

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### Summary

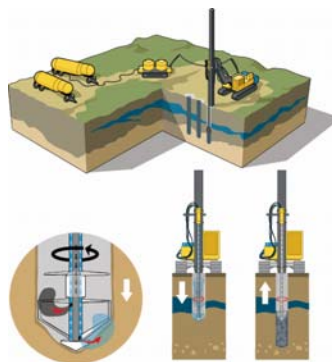
MDM is a stand-alone deep foundation system with the following advantages:

- Seamless switching between dry and wet mixing
- Suitable for soil improvement and piling
- Suitable for retaining structures as well as cut-off walls
- Complete system for design, execution and control
- Improves soils with high relative density & low liquidity index
- Effective load-transfer of concentrated as well as spread loads
- Penetrate and create columns in stiff & dry soils

### This is MDM™

MDM is a deep foundation system introducing great flexibility since high strength columns as well as low strength columns can be tailor-made with the same equipment. The patented process comprises a complete system for design, execution and control.

- Water is added when necessary with purposes of improving homogeneity, increasing penetrability as well as speed up the binder hydration.
- Dry binder and water are injected during penetration, withdrawal or a combination thereof
- The quantity of binder and actual water-cement ratio can be adjusted according to the expected quality and application.
- The patented system is fully computer controlled.
- The quantity of spoil is negligible.



## Suitability according to geotechnical properties

### Above ground water level & at low water contents

The process adds the required quantity of water to achieve proper hydration of the binder.

### Grain size distribution

The addition of water facilitates the mixing due to fluidization of the coarser material.

### Relative density

For high relative densities in frictional soils, the water liquefies the soil structure and prepares for introduction and mixing of binder.

*Example: Silty sand with  $q_c$ -values in the order of 20 MPa.*

### Strength properties

For high strength cohesive soils, the process disaggregates the soil and mixes it with binder.

*Example: Dry crust & upper Lias clay*

### Consistency

Mixing of cohesive soil and binder in-situ is best performed with the liquidity index in the order 1.0 or above due to the free water available for the hydration process as well as the increased sensitivity facilitating the mixing efficiency. The MDM-process modifies the liquidity index accordingly.

## Suitability according to load intensity

The combination of columns is nuanced which supports the flexibility of the MDM. Foundation support can be achieved from single columns as well as groups of columns in different pattern. The large diameter of the formation also stresses the efficiency to withstand horizontal loads.



## Purpose of application

### Reduction of Settlement

The column pattern and load transfer system can be e.g.

- Low stiffness (low strength) columns with small spacing
- High stiffness (high strength) columns in combination with a competent load transfer platform (geogrid, shallow stabilization or coarse crushed rock)

### Increase of Stability

For traditional slope stability problems in cohesive soils, the most efficient system is normally to introduce columns in wall type patterns (see EN 14679, appendix A). Low strength columns with small spacing are more efficient than high strength columns.

### Bearing capacity (combination of settlement reduction and increase of stability)

MDM columns can be designed and installed either as typical soil improvement members with full interaction between soil and column according to the equal strain concept or as piles. Columns can be installed as single ones or in interacting blocks.

### Cut-off barrier

Requirements on permeability and homogeneity are high when the purpose is to cut-off water

## Project examples

- Deep foundation of buildings
- Soil improvement & piling for embankments
- Stabilization & solidification of contaminated soils
- Retaining structures

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