

MDM™ – Modified Dry Mixing

MDM – Modified Dry Mixing is a patented deep foundation system that combines the injection of water and dry binder. MDM can be applied in a wide variety of soils, from saturated clay to dry sandy soils.

MDM is competitive and suitable for:

- Piling and soil improvement.
- Stabilization and solidification.
- Shallow cut-off walls.
- Retaining structures.
- Up-lift applications (with reinforcement).

MDM, in conjunction with shallow stabilization, has great potential as foundation systems for industrial buildings, road and railroad embankments.

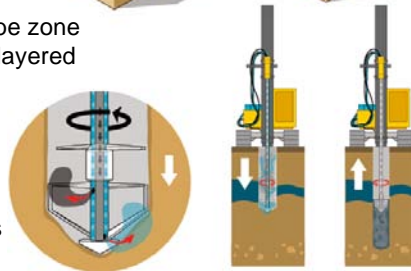
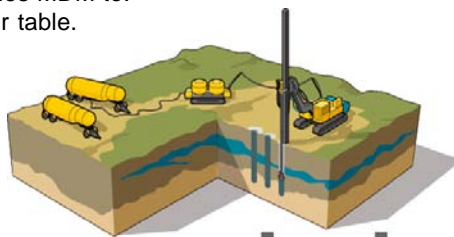
This is MDM

Water is added as needed. This enables MDM to:

- Stabilize soils above the ground water table.
- Penetrate hard/dry soils.
- Create columns with increased homogeneity.
- Create high strength columns by effective hydration of large quantities of binder.

The amount of binder introduced can be zone customized. This is advantageous in layered soils.

In some applications different strengths may be desired at different depths. For example, low strength columns near the surface facilitate excavation, and high strength columns at depth as load transfer system.



Applications

- Road and railroad embankments, in particular higher embankments, e.g. bridge approaches.
- Foundations for industrial and apartment buildings.
- Cut-off walls.
- Stabilization and solidification of contaminated soils.
- Basins and levees (foundation/cut-off).
- Soil structure interaction (e.g. piled rafts).

Test methods

- MDM columns with improved homogeneity and increased strength facilitates testing by internationally accepted methods.
- Core sampling.
 - Wet grab sampling with MOSTAP sampler.
 - Pressure meter testing.
 - Extraction of complete columns.

Introduction of water and binder is performed during penetration or retraction or both.

Advantages of MDM

Load capabilities

High road and railroad embankments

- High strength MDM columns in combination with a load transfer platform (surface stabilization or geo-grid system).
- MDM columns can be shorter as compared to driven piles for a given load.
- MDM columns can be tailor-made (low strength/high strength) with same equipment.

Deep foundation, concentrated loads,

- e.g. industrial, warehouse buildings
- Loads of 150–400 kN (15–40 tons) per MDM column.
 - Columns can be installed as a block supporting up to 5,000 kN (500 tons).
 - Can replace precast concrete piles or micro piles.

Deep foundation, spread loads,

- piled slabs, with or without load transfer platform (surface stabilization or geo-grid).

- Loads of 150–400 kN (15–40 tons) per column.

- Economical alternative to micro piles on large projects.

Up-lift loads

- Re-bars/anchors can easily be inserted into a MDM-column during early hydration phase.
- Transfers great up-lift loads due to large surface for shaft resistance.

Geo-technical aspects

Deep ground water table

- MDM can produce competent (designed) columns above the ground water table.

Silty/sandy soils

- MDM can create high strength columns with improved homogeneity.

Hard, dry soils

- The added water facilitates the mechanical disaggregation which improves the mixing of binder and soil for e.g. stiff clays.

Construction-economical aspects

- In many cases MDM can provide a more economical solution by cutting installation time and reducing spoil compared to other methods.
- Consolidation time and settlement is reduced due to the high Young's modulus, thus reducing costly and time-consuming preloading.

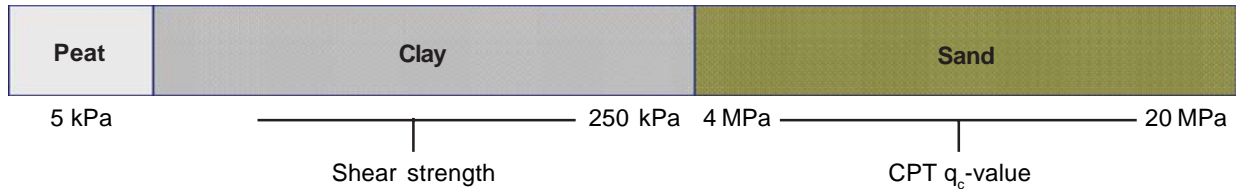
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Quick guide to applications and parameters for MDM™

Soil parameters

Soil requirements

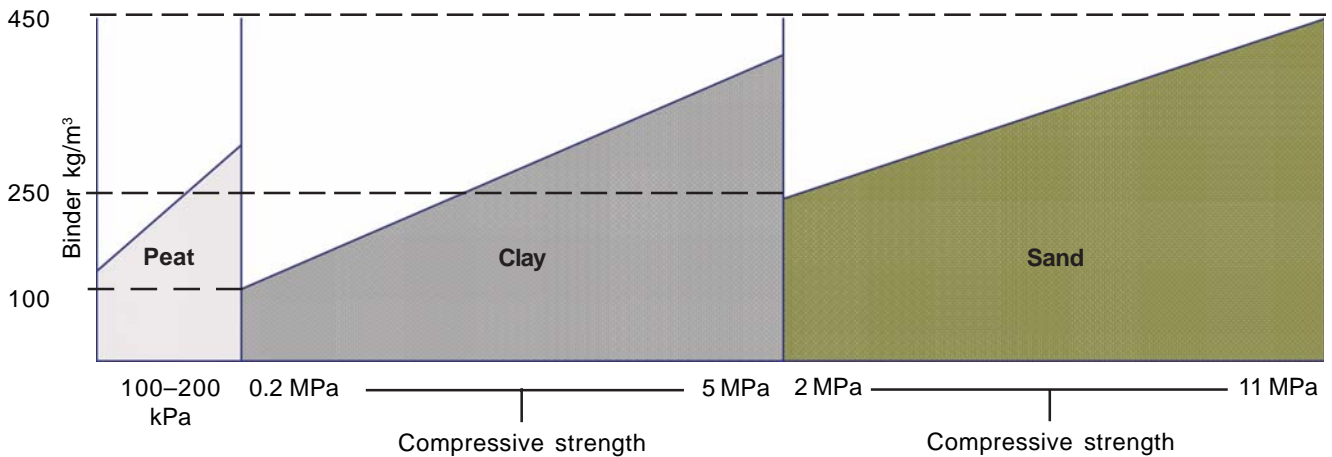
- No minimum water content required
- No minimum limits on Plasticity Index, Plasticity Limit or Liquidity Index
- Works in organic soils, silts, clay and sand
- Soil should be generally free of large boulders and debris



Strength parameters by soil type and binder quantity

Description of products

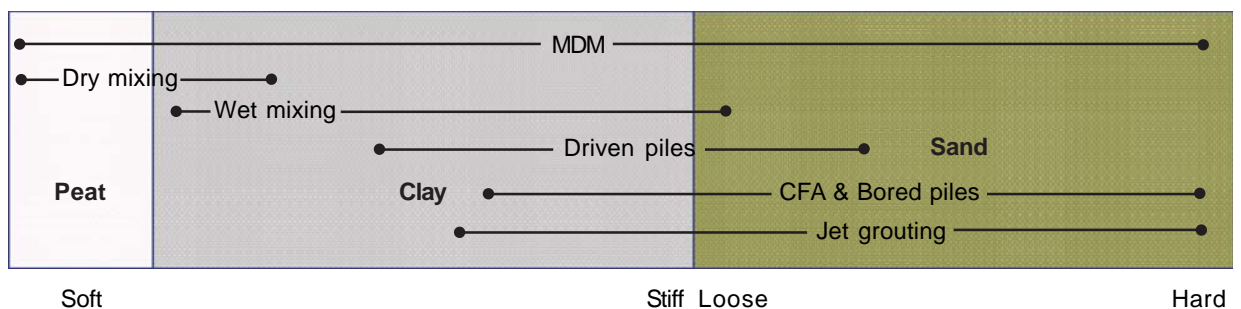
- **Soil interactive columns** at low binder quantity and strength
- **Bored concrete pilings** at high binder volumes in sand, sandy clay soils. Can be reinforced with rebar cages or rods for uplift applications



Competing methods by soil type

Typical uses

- Soil improvement
- Piling
- Cut-off walls
- Remediation of contaminated soil
- Uplift applications (when reinforced)



NOTE: All values are approximations for guidance only. Results will vary depending on actual soil conditions at time of installation.