PENCOL™ offers a highly economical and sustainable alternative to piling. It is an effective ground improvement technique developed to provide enhanced bearing capacity and settlement control in very weak or organic soils.

The system can be used in a variety of applications from embankments and slopes to structures such as industrial units, housing and tanks. It offers a number of benefits that include:

- Embankments can be built quickly and safely without the need for staged construction
- Limited or no spoil produced (ideal for brownfield/contaminated sites)
- Very economical and fast, up to 2,500m/week

What's more, it can be used in virtually all ground conditions

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**PENCOL™ APPLICATIONS**

- Road and Railway embankments
- Retail/industrial units
- Housing
- Tanks
- Retaining Walls
- Slopes

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**BASIC TECHNIQUE**

The PENCOL™ system is installed using either a rotary displacement hollow auger or a vibrated driven steel tube which can tighten the surrounding soil. At the bottom of the tool, a lost or recoverable shoe prevents any ingress of materials during penetration.

Once the required design depth and/or torque are achieved the high slump mortar (or concrete) is bottom fed by pumping continuously at positive pressure through the hollow stem or tube during extraction so forming the Rigid Inclusion.

The combined effect of densification and reinforcement improve the engineering performance of the soft ground resulting in a composite mass with enhanced settlement and load bearing characteristics.

**APPLICATIONS**

- **ROAD/RAILWAY EMBANKMENTS**
- **SLOPES**
- **RETAINING WALLS**
The PENCOL™ system is a form of ground improvement whereby closely spaced grouted columns or rigid inclusions (0.3 - 0.6m diameter) are designed and installed to reinforce the soil to provide a stiffened, composite soil mass. Unlike piling, the soil between the PENCOL™ Inclusions carries a proportion of the load. The system requires a nominal granular load transfer mattress (min 0.5m thick) to help transfer the load and provide uniform conditions.
**Benefits**

Ground Improvement used with granular mattress allowing ground bearing slabs and conventional foundations (strip/pad/raft) to be used

Suitable in very soft clay and peat where vibro stone columns cannot be used

Displacement system - limited or no spoil produced (ideal for brownfield/contaminated sites)

Excellent settlement control, even for heavy loading conditions (up to 250kN/m²)

Embankments can be built quickly, without delay or the need for staged construction

Global stability of embankment is improved

**Technical Capabilities**

<table>
<thead>
<tr>
<th>Dimension</th>
<th>From</th>
<th>To</th>
</tr>
</thead>
<tbody>
<tr>
<td>Depth</td>
<td>2.5m</td>
<td>25m</td>
</tr>
<tr>
<td>Diameter</td>
<td>0.30m</td>
<td>0.60m</td>
</tr>
<tr>
<td>Load Capacity</td>
<td>10kN/m²</td>
<td>250kN/m² (subject to soil conditions)</td>
</tr>
</tbody>
</table>

**Ground Conditions**

**Soil Type**

- Peat
- Silt
- Clay
- Sand
- Gravel
- Inert Made Ground
- Domestic Refuse

**Method**

- Band Drains
- Vibro Compaction
- Vibro Stone Columns
- Dry Soil Mixing
- Dynamic Compaction

**PENCOL™**

Suitable for all soil types

Note: This table is indicative only, some exceptions apply

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