



Ground Improvement Engineering Course: Vibro and Dynamic Compaction, Grouting and Soil Mixing



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Introduction:

Ground improvement engineering, covering vibro and dynamic compaction, grouting and soil mixing, is a 5-day course for geotechnical design, site supervision and specialist contractor engineering staff, ending with a Ground Improvement Design and Verification Plan for a case reclaimed platform. Loose hydraulic fill, soft clay and sabkha left untreated or treated without proof cause differential settlement, liquefaction damage and costly retreatment after buildings and tanks are placed. Nominees already supervise or review earthworks and foundations, and teaching is by case study on CPT profiles, trial records and monitoring data. CoreConcept Training Center delivers this ground improvement engineering course.

Course Objectives:

- Select a ground improvement technique for loose fill, soft clay, sabkha or collapsible soil from grading, groundwater and CPTu baseline data
- Design vibro compaction and vibro replacement stone column grids, dynamic compaction energy patterns and vertical drain spacing with surcharge preloading
- Specify jet grouting, permeation grouting and deep soil mixing works with trial mixes, field trial panels and parameter records
- Verify treated ground with pre and post treatment CPT comparison, zone load tests and settlement and pore pressure monitoring
- Diagnose non-conforming treatment zones and sabkha dissolution or corrosion risks and decide on retreatment or design change
- Produce a Ground Improvement Design and Verification Plan for a case reclaimed platform

Target Audience:

- Geotechnical design staff responsible for choosing and sizing treatment of weak or loose ground
 - Site supervision staff responsible for recording vibro, tamping, drain and grouting works
 - Specialist contractor engineering staff responsible for treatment method statements and trial programmes
 - Consultant and owner engineering staff responsible for reviewing treatment submittals and acceptance results
 - Testing and monitoring staff responsible for CPT campaigns, load tests and settlement instrumentation
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Course Outline:

Day 1: Weak Ground Problems and Treatment Selection Logic

- Ground Improvement Method Selection Chart by Soil Grading
- Loose Hydraulic Fill and Liquefaction Triggering Screening
- Soft Clay Consolidation Behaviour and Settlement Time Drivers
- Sabkha and Collapsible Soil Hazards for Treatment Planning
- Baseline CPTu Profiles Defining Treatment Depth and Targets

Day 2: Densification and Drainage Methods Under EN 14731

- EN 14731 Vibro Compaction Probe Spacing and Sequence
- Vibro Replacement Stone Column Grid and Settlement Reduction
- Dynamic Compaction Tamper Energy, Drop Pattern and Ironing Pass
- Rapid Impact Compaction for Shallow Fill Densification Works
- Prefabricated Vertical Drain Spacing With Surcharge Preloading Design

Day 3: Grouting and Deep Soil Mixing Application

- EN 12715 Permeation and Compaction Grouting Mix Selection
- EN 12716 Jet Grouting Single, Double and Triple Fluid Systems
- EN 14679 Wet and Dry Deep Soil Mixing Binders
- Laboratory Trial Mixes and Core Strength Acceptance for Columns
- Field Trial Panels and Parameter Records for Grouted Ground

Day 4: Verification Testing, Monitoring and Problem Zones

- ASTM D5778 Pre and Post Treatment CPT Comparison
- Zone Load Tests and Plate Tests on Treated Ground
- Settlement Plate and Piezometer Monitoring During Preloading
- Sabkha Dissolution, Salt Crust and Corrosive Groundwater Controls
- Non-Conforming Treatment Zones and Remedial Retreatment Decisions

Day 5: Case Study Practice and the Ground Improvement Design and Verification Plan

- Case Reclaimed Platform Brief and CPTu Data Review
 - Case Technique Selection Matrix Across Platform Zones
 - Case Treatment Layout, Energy and Drain Spacing Calculations
 - Case Verification Testing Schedule With Acceptance Criteria
 - Ground Improvement Design and Verification Plan Completion
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Skills You Will Gain:

- Treatment Technique Selection
- Stone Column Grid Design
- Tamping Energy Planning
- Vertical Drain Consolidation Analysis
- Jet Grout Parameter Control
- Soil Mixing Quality Assurance
- CPT Verification Interpretation
- Retreatment Decision Making

Why Attend This Course:

- Deliver a Ground Improvement Design and Verification Plan for a case reclaimed platform to the project geotechnical lead and the construction manager
- Decide whether vibro, tamping, drains, grouting or soil mixing suits each zone of a site before the treatment tender is issued
- Avoid differential settlement, liquefaction damage and late retreatment that delay foundations and raise claims on reclaimed and coastal sites
- Share treatment selection charts, CPT comparison templates and acceptance schedules with design and site colleagues

Conclusion:

Back at work, the participant gives the project geotechnical lead and the construction manager a Ground Improvement Design and Verification Plan that records treatment zones, chosen techniques, layouts, energy and drain spacing, trial requirements and the verification schedule with acceptance criteria. Designers use it to fix the treatment basis before foundations are sized, and site teams use it to accept or retreat each zone. After the first post-treatment CPT campaign, the unit should compare measured improvement with design targets and adjust spacing or energy where results fall short.

Frequently Asked Questions FAQ:

What should participants know before a ground improvement engineering course?

Participants should already supervise, design or review earthworks or foundations and be able to read CPT logs, borehole records and drawings. Basic soil mechanics and spreadsheet skills help, because treatment layouts and verification checks are worked through on case data.

How does a ground improvement engineering course differ from a site investigation or pile foundation course?

It concentrates on changing the ground itself: densifying, draining, grouting or mixing weak soils and proving the result. Site investigation courses stop at describing the ground, and pile courses carry loads through weak soil rather than improving it.

When is vibro compaction preferred over dynamic compaction in ground improvement engineering?

Vibro compaction suits deep, clean sands and hydraulic fill where treatment must reach well below the surface near structures. Dynamic compaction suits open sites with shallower loose fill or sabkha, where vibration and noise are acceptable and lower cost matters.

What do participants take back from the ground improvement engineering course?

Participants take back a Ground Improvement Design and Verification Plan for a case reclaimed platform, with a technique selection matrix, treatment layouts and calculations, trial requirements and a verification schedule with CPT and load test acceptance criteria.
