

# VIBRO STONE COLUMNS

**LABC Warranty's Surveyors and Engineers are required to assess the design and installation of vibro stone columns as part of the audit process on behalf of the Underwriter. The following guidance outlines recognised good practice in relation to vibro stone columns which is acceptable to LABC Warranty. The design and construction of vibro stone columns and foundations should be in accordance with the LABC Warranty Technical Manual and recognised publications from British Standards, Eurocodes, CIRIA, BRE and ICE.**

## KEY REQUIREMENTS

The scheme shall be designed to clearly demonstrate that the foundations and treatment of the ground with vibro stone columns are capable of supporting and transferring the foundation design loads safely to known natural soil strata that are, in turn, capable of supporting the foundation loads using the appropriate soil properties obtained from geotechnical testing and contained in the appropriate site investigation report. The foundations and vibro stone columns shall be designed in accordance with BS8004:2015 and shall ensure that long term settlement does not exceed 25mm or 1:500 (differential) at working load, unless more stringent criteria are required by the Project Structural Engineer.

## TECHNICAL DOCUMENTATION REQUIRED

The following documentation shall be submitted to LABC Warranty for assessment. Items 1-3d should be submitted prior to commencement of vibro treatment on site. In the absence of approval, works are proceeding at the Developer's own risk. Items 3e-3g shall be submitted as soon as they become available, prior to construction continuing over the piles.

1. Geotechnical site investigation report with appropriate geotechnical testing.
2. Foundation drawings and design calculations. Strip footings should be designed for the specified bearing pressures and be designed to span between vibro stone columns.

3. Vibro stone columns:
  - a) Written confirmation from the vibro designer that the ground conditions are suitable for vibro treatment and that the site investigation report is adequate for the purposes of the design and installation of stone columns
  - b) Vibro stone column layout drawings
  - c) Vibro design calculations confirming full-depth of made ground and soft/loose natural strata
  - d) Confirmation of proposed testing regime (i.e. plate and dummy footing tests etc)
  - e) Vibro installation logs (with vibro column numbers referenced to the vibro layout drawing). Logs should include date, column number, depth, diameter, weight of stone and surface level. Confirmation of the platform level in relation to the finished floor levels and site investigations and details demonstrating that all made ground and soft/loose natural strata.
  - f) Copies of all testing carried out (with the locations referenced to the drawings) and interpretation of test results
  - g) Written confirmation from the vibro designer that the as-built installation has achieved the required bearing capacity and settlement characteristics

If there are queries with regard to anything not covered within this document and/or it is intended to deviate from the above guidance, then please contact LABC Warranty for agreement prior to commencement. Following acceptance of the proposals, please contact us if anything is subsequently discovered on site, which affects the design and/or construction.

## REFERENCE DOCUMENTS

- BS EN 1997-1:2004 + A1:2013 - Eurocode 7: Geotechnical Design (EC7)
- BS 8004:2015 - Code of Practice for Foundations
- BS EN 1997-2:2007 – Ground Investigation and testing
- BS 5930: 2015 - Code of Practice for Ground Investigations

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## GEOTECHNICAL SITE INVESTIGATION REPORT

A site specific geotechnical site investigation should take place and be in accordance with BS5930/EC7 and extend into adequate strata beneath the filled or poor-strength strata above. The investigation should include enough geotechnical testing to enable accurate geotechnical design of the vibro stone columns in accordance with proven design methods.

## STRIP FOUNDATIONS

Foundation drawings and calculations should be prepared by the Structural Engineer indicating the required bearing capacity and settlement characteristics for the purposes of design of vibro stone columns. In general foundations should be designed for maximum settlements of 25mm or differential settlement of 1 in 500 unless more stringent measures are required by the Structural Engineer. Strip foundations should be designed to span between vibro stone columns and must incorporate top and bottom reinforcement. Irrespective of vibro foundations, the Technical Manual needs to be fully complied with, with respect to trees/cohesive soils, whilst ensuring that the vibro treatment is not affected by deepening of the foundations.

## VIBRO DESIGN

The ground must be suitable for vibro treatment (refer to the above mentioned references for details). Vibro stone columns should be designed in accordance with recognised methods (eg. Priebe) and must extend through the full extent of filled or poor ground and reach natural competent ground. Partial-depth treatment of made ground or poor strength (loose/soft) natural soils is not acceptable.

## VIBRO TESTING

Testing should be carried out across the full site and cover all of the various ground conditions.

Plate Tests should be carried out:

- With 600mm diameter plates loaded to 3 times working load or 11 tonnes, whichever is greater
- At a minimum rate of 1 test per rig per day
- Note that plate tests do not provide a direct indication of the anticipated settlement of the completed structure and therefore can't be considered as the sole means of load testing
- Dummy Footing Tests should be carried out:
  - With 1500 x 600mm plates, loaded to at least 1.5 times working load (kN/m<sup>2</sup>) for a minimum period of 13 hours
  - At a minimum rate of 1 per week
- Penetration Tests should be carried out:
  - At a rate of 1 per 20-50 stone columns or 1 test for not more than 500m<sup>2</sup>, with a minimum of 1 test for each structural unit
  - Penetration tests will not be required if dummy footing tests are carried out at the above rate.

**If there are queries with regard to anything not covered within this document and / or it is intended to deviate from the above guidance, then please contact LABC Warranty for agreement prior to commencement.**