

**The following guidance outlines recognised good practice in relation to vibro stone columns. The design and construction of vibro stone columns and foundations should be in accordance with the Premier Guarantee Technical Manual and recognised publications from British Standards, Eurocodes, CIRIA, BRE and ICE.**

## **KEY REQUIREMENTS:**

The scheme design needs 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 should be designed in accordance with BS8004:2015 and need to 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:**

We require the following documentation to carry out the assessment. Items 1-3d should be submitted prior to commencement of vibro treatment on site. Developers are reminded that these audits are a requirement and that without approval of the documents, any proceeding works are at their 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. Note that the deepening of foundations in respect of trees/clay soils needs to be taken into account.
  - (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., see notes below).
  - (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.

## **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.

## **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 (e.g. 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 considered an increase in complexity. Sites designated for partial treatment, will be considered on a case-by-case basis.

## **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 won't be required if dummy footing tests are carried out at the above rate

## **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.

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.

## **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

**If there are queries with regards to anything not covered within this document and/or it is intended to deviate from the above guidance, then please contact Premier Guarantee for agreement before starting the project. Following acceptance of the proposals, please contact us if anything is subsequently discovered on site, which affects the design and/or construction.**