



Ground Improvement

Main Contractor



Client



Location

Newport,
Shropshire

Project Brief

Foundations for a new Agricultural Young Stock building in Newport, Shropshire amounting to 2312m² floor area. The site is located within the grounds of Harper Adams University. The area was an unoccupied grassed agricultural field sounded by various other adjoining farming infrastructure.

Foundations specialist and geotechnical contractors Roger Bullivant Limited (RB) set out a programme utilising vibro stone columns to improve the ground. This was chosen as the most cost effective technique to support the designed structure in the prevailing ground conditions.

Key issues/ requirements

- The ground conditions were determined by exploratory trial pits. These revealed the site to be underlain by the Bridgnorth Sandstone Strata, which was formed during the Permian Period. The sandstone is soft and red in nature, this was because it had a weathered consistency in the uppermost horizon of the layer. The strata was at depth of 3 - 3.15m. However, in some locations, superficial deposits of bolder clay masked the Bridgnorth Sandstone.
- The initial layer comprised of made ground over variable depths up to 1.1m below ground level. Below the made ground were the superficial deposits which were present in all exploratory pits. These extended to depths between 2.2m and 3.6m below ground level. The material typically comprised medium dense gravely sand. The gravel content included pebbles of quartz with some sandstone.



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Solution

- A total of 632 stone columns were installed over the floor slab surface area to depths ranging from 3m - 4m. The scheme was designed to provide a total bearing capacity of 125kN/m² below the foundations and below the floor slab to 20kN/m².
- The vibro stone column process densifies the ground which increases the bearing capacity and reduces the settlement potential of variable superficial deposits; this in turn makes it more uniform in structure.
- Settlement was predicted to be excessive on this site. However, the densification of the ground utilising vibro stone columns controls the amount of settlement to the necessary tolerances.

- The stone columns were placed to support the following aspects of the structure; the footings, floor slab and the concrete apron positioned around the perimeter of the building. Once the vibro stone columns were installed, the ground around the foundations was reduced, which allowed for the construction of the footings.

The Vibro Stone Column Construction Process



1. The steel vibrating probe is inserted into the soil to the required depth. The vibrations from the probe densify the soil which creates a void.
2. The probe is removed and stone is placed in to the newly formed void. The probe continually penetrates and compacts the placed stone, which displaces the 40mm stone into the surrounding soil at depth.
3. The process is repeated several times which compacts the soils creating densified ground.
4. The objective is to increase the bearing capacity and reduce settlement of the ground.

