



Ground Improvement and Piling

Main Contractor



Client



Location

**Goscote,
Walsall**

Project Brief

Foundations for a new housing development in Walsall comprising 412 housing plots. The site was a former residential estate which had been demolished to make way for the new homes.

Roger Bullivant Limited (RB) developed a programme utilising two foundation techniques - ground improvement vibro stone columns and displacement piling; a top feed vibro stone column rig, and the quiet hammer rig system were used.

Key issues/ requirements

- The ground conditions were determined by exploratory boreholes. This revealed the site to be underlain by a variable thickness of made ground over glacial till. The made ground was at variable depths up to 4.1m bgl. While the underlining glacial till, which was present in all exploratory holes, ranged from depths 2.5m - 4.8m bgl. The material typically comprised of medium dense sand or very gravelly clayey medium sub rounded sand.
- As the majority of the site was overlaid by made ground of unknown consistency this is generally not a competent material for foundation construction. Vibro stone columns were utilised to help densify the ground above the natural ground of the glacial till.
- An isolated northern area of the site was deemed unsuitable for ground improvement. This was due to the presence of a black clayey gravel fill with an organic content. A piled solution was deemed appropriate for this area.



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Solution

- A total of 5122 stone columns were installed equating to 412 housing plots to depths ranging from 1.2m - 2.1m. The scheme was designed to provide a total bearing capacity of 125kN/m² below the foundations.
- Stone columns were installed to refusal, each with a diameter of approximately 480mm.
- Vibro stone columns help densify and stabilise the majority of the site while the pre-cast displacement piling technique created supports within the ashy black clays and gravelly fill regions of the site.
- The pre-cast displacement piles amounted to a total of 466. These were installed to a depth of 10m and achieved a designed maximum safe working load of 350kN. Two pile sizes were used 200mm² and 250mm².

The first step to any robust foundation system is a good Site Investigation (SI). From this, the soil consistency, strength and characteristics can be determined. Hence a practical and cost effective foundation system can be designed, which includes the working platform.

The ground is initially cut down to the appropriate ground level and compacted. A Geomembrane layer is placed on top of the compacted and levelled ground along the route of the desired stone columns. The membrane mitigates the amount of gases or fluids emitting from the ground, it also helps keep the integrity of the working platform acting as tensile barrier between the soil and stoned platform. The stoned platform, which utilised site-won material, was placed on top of the membrane and compacted. This membrane also reduces the platform thickness required.

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.

