

Technical Guide: Heavy Duty Helical (Screw) Piles for Residential House Foundations



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Introduction to Heavy Duty Helical Piles

Heavy duty helical piles consist of high-strength steel shafts (typically circular hollow sections) with one or more helical bearing plates (helices) welded to the shaft. The system is rotated into the ground using hydraulic torque equipment, transferring structural loads (compression, tension/uplift, and lateral) to competent deeper soil strata via end-bearing on the helices and shaft friction.

Key Advantages Over Traditional Concrete Foundations:

- Immediate load-bearing capability (no curing time).
- Minimal excavation and site disturbance.
- Verifiable capacity via installation torque correlation.
- Adaptable to variable UK soils (clay, sand, silt, weak fill).
- Removable/reusable where required.
- Reduced carbon footprint (less material waste, lower transport emissions).

Typical applications: New-build houses, extensions, garage bases, modular homes, and underpinning in subsidence-prone areas.



Technical Specifications



Shaft Types (Common for Heavy Duty Residential):

- Circular hollow sections (CHS): Diameters 76–114 mm (3–4.5"), wall thickness 6–10 mm or greater for higher torque/loads.
- Square shafts available for specific high-torque needs.
- Material: High-strength structural steel (e.g., S355 or equivalent), compliant with BS EN 10025.

Helical Plates:

- Diameters: 200–400 mm (8–16") typical; multiple plates (2–4) spaced at $\geq 3 \times$ largest helix diameter to avoid overlapping stress zones.
- Thickness: 10–20 mm, pitch consistent for efficient penetration.
- Welded per ISO 9606/BS EN 1090 standards.

Corrosion Protection:

- Not always required to be hot-dip galvanized (BS EN ISO 1461). Options include:
 - Bare steel with sacrificial allowance (thicker walls for 50+ year design life in low-aggressivity soils).
 - Epoxy coatings, polyurethane, or galvanizing where soil resistivity is low or for extended life.
 - Site-specific assessment per BS EN 1997 and geotechnical report.

Load Capacities (Indicative – Site-Specific Required):

- Axial compression: 100–500 kN+ per pile (working loads; higher with groups).
- Tension/uplift: 50–300 kN.
- Lateral: 20–50 kN (enhanced with concrete collars if needed).
- Determined by torque correlation: Ultimate capacity $Q_u \approx K_t \times T$ (K_t empirical factor $\sim 10 \text{ m}^{-1}$ for typical shafts; T = final installation torque in kNm).

Standards & Compliance:

- Design: Eurocode 7 (BS EN 1997-1), BS 8004:2015.
- Manufacturing: BS EN 1090 Execution Class 2/3.
- Installation verification: Torque monitoring, proof load testing where specified.

Installation Process – Technical Overview

Installation uses tracked/wheeled excavators or dedicated rigs with hydraulic drive heads (torque capacity 10–30 kNm+ for heavy duty).

1. Positioning & Installation:

- Piles located per engineered layout (spacing typically 2–3 m).
- Rotated clockwise under constant torque/advance monitoring.
- Depth: Until refusal or target torque achieved (last 1–3 m torque averaged).
- Extensions coupled (welded or bolted) for required depth.

2. Verification:

- Torque logs recorded (e.g., final torque correlates to capacity via Kt method).
- Optional: Pull-out or compression proof tests (e.g., 150–200% design load).
- Plumb and alignment checked (<1–2° deviation).

3. Termination:

- Cut to level, weld/load-transfer brackets (e.g., pile caps, beam seats).
- Immediate loading possible.

Typical residential project: 10–30 piles installed in 1–3 days.



Real-World Case Studies: Successful UK Residential Applications



The following examples illustrate practical implementations of heavy duty helical piles in residential settings across the UK. These demonstrate proven performance in challenging conditions, rapid installation, and long-term stability.

Case Study 1: Eco-Friendly 1.5-Storey House – Dundee, Scotland

An eco-conscious residential project required sustainable foundations for a 1.5-storey dwelling. RADIX EXT 89mm screw piles with bespoke helical fittings and structural brackets were installed to ~5.0m depths to support the main ring beam. The system provided immediate load transfer in variable soils, minimized site disruption, and aligned with the project's low-carbon ethos. Installation completed efficiently despite access constraints, with full compliance to local regs.

Case Study 2: House Extension with Protected Trees – Chingford, UK

A rear house extension near mature protected trees faced risks of ground movement from tree roots. 10 heavy duty screw piles were installed to bypass shallow unstable layers, achieving stable support without excavation or tree damage. The solution preserved landscaping, reduced spoil, and allowed construction to proceed quickly—ideal for urban residential extensions.

Case Study 3: New Detached House on Challenging Ground – Newbury, UK

A new-build detached house encountered rubble-filled surface soils and access difficulties. 38 helical piles were torque-installed in just 6 days, overcoming bad weather and poor ground conditions. The piles provided verified high-capacity foundations for the structure, demonstrating reliability in constrained residential sites.

Case Study 4: Passive House Concrete Slab Raft – Great Bardfield, Essex, UK

For a sustainable passive house, helical piles supported a concrete slab raft foundation. The system ensured precise leveling and load distribution in variable soils, with minimal environmental impact and fast handover—highlighting suitability for energy-efficient modern homes. These cases showcase how JAS Welding Services' custom heavy duty helical piles deliver engineered solutions tailored to UK residential challenges, from subsidence-prone clays to restricted-access sites.

Why Partner with JAS Welding Services?

As UK-based fabricators, we produce custom heavy duty helical piles to your engineer's specifications—using premium steel, precise welding, and site-matched protection. Our expertise ensures torque-monitored installations deliver compliant, durable foundations. Next Steps:

- Request site assessment and free preliminary quote.
- Supply your structural drawings/soil report for tailored design support.

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