

When piling is not boring

Could steel become the foundation material of choice?

Revolutions in piling are few and far between, but a number of market trends and technical innovations are coming together which could hold out the prospect of a major switch from concrete to steel as the preferred piling design choice for many locations.

A major obstacle to using steel in the past has been the perception that steel piles mean driven piles, which equals noise and vibration nuisance.

That perception is out of date, according to Milton Keynes based Dawson Construction Plant, which has pioneered the development of a new generation of hydraulically powered equipment that can install high capacity steel piles without noise or vibration.

Advantages such as being able to install retaining walls hard up against party walls or in other tight locations will be of interest to many private developers and infrastructure operators.

Dawson forecasts a strong boost for steel from the recently highlighted problem of removing redundant concrete piles which are effectively seen as a form of solid pollution getting in the way of new works in our cities. Removal of steel piles when a site is redeveloped – which is increasingly going to be every 30 years or so for buildings – is also much easier than for concrete.

"Steel piles can now be put in very quickly without noise or vibration, and when the structure is being replaced the steel can simply be pulled out again even faster," says Dawson's managing director Robin Dawson.

"We can extract piles in all soil conditions with quiet and vibration free plant. We can take out most shapes of pile. Stand-alone piles can be extracted as the rig uses the ground as reaction rather than adjacent piles. Extraction is quick, at up to 3m/minute, and it is safer than using the traditional vibrator and pulling with a crane." Two versions are now available, a 400t and a massive 1,000t extractor.

The new Dawson machinery significantly extends what has gone before to produce a piling rig that can install up to eight sheet piles at a time, with a pressing force of 200 tonnes per sheet.

As the hydraulic system pushes in one pile, it reacts against other piles in the panel, making use of the friction between the pile and the ground. The Dawson system rig is not restricted to piling in straight lines – sheet piles can be driven in a box and the system is modular so the set up can be

unbolted and rearranged easily.

"The revolution is that there is no longer any compulsion to use bored piles," says Dawson. "We can install large capacity piles into the ground quietly and without vibration."

The first use of the system on a civil engineering job was the Westcroft Bridge, recently completed in Milton Keynes. Here the 16 steel foundation box piles – installed to up to 13m through stiff to very stiff glacial boulder clay with lenses of silty sand – were continued to form the piers which were then cast directly into the deck soffit to form a moment connection with no need for bearings.

There were houses nearby and noise and vibration meant impact driven piles could not be used. The client was also keen on the sustainability benefits of not having to dispose of excavated material and of being able to extract the piles at some time in the future and re-use the steel.

A 30% saving on overall contract cost was achieved because of the innovative design and method of installation. A six-week saving in construction time has been acknowledged by the project team.

Dawson reckons that once the environmental benefits of not having to dig concrete piles out of the ground (which may also be contaminated) are more widely appreciated, then many

clients will insist on steel piles. "Engineers will like the system not least because of the accuracy of placement. When needed, very tight tolerances on position and verticality can be achieved."

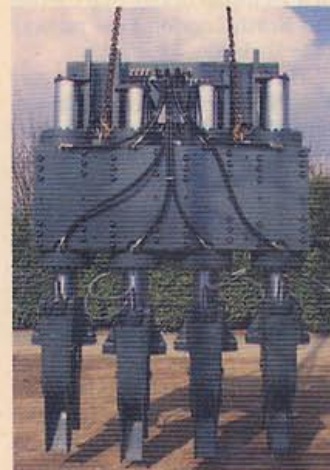
The computerised controls also mean that an instant read-out of load capacity is produced, so there is less need for time consuming testing of piles – there is even an argument for dispensing with testing altogether. "There is a readily measured load capacity and the piles can be loaded immediately," says Dawson.

The pile extraction system has already been used on Heathrow Terminal 5 to remove temporary sheet piles installed for construction of the rail box. It has also been used in Singapore on a mass rapid transit rail project by the WH-STEC-NCC joint venture on MRT 825, Marina Square. The extractor had to operate in very restricted space with limited headroom in hard clay soils to remove 360mm by 360mm by 16mm H piles which had been installed 12-15 years earlier and were obstructing progress of a tunnel boring machine.

Interest is being shown in the UK by, among others, the Highways Agency and the rail industry, attracted by the prospect of being able to load the piles as soon as they are in place with no need to wait for concrete to set. This is good news for motorways and railways or wherever possessions are short or expensive.

"A lot of people still think that concrete is the only alternative, but we have demonstrated that is far from the case," Dawson argues.

"There is still a place for concrete. But where you don't want noise or vibration, you want quick installation of piles and the ability to build off them straight away with no delays, or you want to be sure that you will not have to leave your concrete piles behind in the ground for another generation to deal with, then steel can now be reliably considered."



Dawson's new 1000t rig opens up new possibilities for steel piling.