WITHERS
STRENGTH IN DEPTH

CASE STUDY 2

RAFT RESCUE

The biggest domestic underpinning contract ever?

Dave Parker reports.
Photographs by David Jones.

There is a 600 year old oak tree in Sunningdale, Berkshire that is said to be the finest specimen of an English oak in the south of England. Planted at around the same time as the more famous Weybridge Golf Club oak, it forms the centrepiece of a garden of which any homeowner would be proud. Over the centuries, however, it has extended a network of roots over a vast area, with expensive consequences.

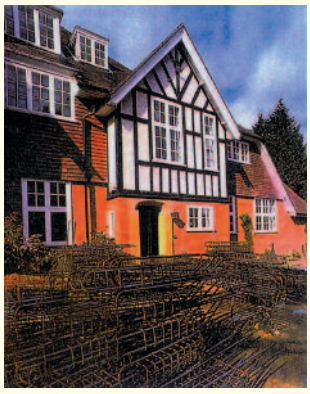
The garden was laid out late last century to complement a typical six bedroom example of "Stockbroker Tudor" domestic architecture. And to complete the rural illusion, the original victorian owners of the house planted broad-leafed and coniferous trees.

Unfortunately, the brick-built property's shallow corbelled brick foundations rested on 3m of silty, shrinkable clay, the Bracklesham beds. As the trees matured the clay became increasingly dessicated and cracks appeared in the brickwork and plaster above.

Lopping back and pollarding the less spectacular trees helped for a time, but the ancient oak remained sacrosanct. Then came the droughts of the late 1980s. Subsidence accelerated, the need for drastic action became urgent. In 1990 conventional underpinning was carried out under 75% of the house.

"Unfortunately it only went down 1.5m," says structural engineer John Wyatt Associates director Stuart Jebb. "By 1993 it was obvious that movement was continuing, and we were all called in."

Preliminary trial pits established the extent of the previous underpinning. Root samples were taken, and an arboriculturist consulted. "The problem was obvious - there were too many trees too close to the house," says Jebb. "But in these unusual circumstances the option of removing or drastically cutting back the trees was not on. The main culprits were the big oak tree 25m from the rear of the house and a Lombardy poplar 17m away to the front. Both had preservation orders on them."



Three boreholes were drilled so that a Building Research Establishment suction test could be carried out to determine the degree of dessication of the soil. This showed it to be severe, making the option of creating a root barrier between the house and the guilty trees unattractive; foundation heave as the clay re-absorbed water could cause more problems than the original subsidence.

The engineer recommended a deep piled raft solution, an expensive option but one which it believed would solve the problem. As similar houses in the area sell for seven figure sums, the insurer's decision to go with Wyatt's recommendation was not unexpected. Two more boreholes were driven, one 15m deep, the other 20m. These established that the clay was underlaid with variable firm sands, the Bagshot beds, which extended below the deepest borehole. Tree roots were found down to 5m.

The 18 week design and build contract went to Croydon-based minipile specialist Withers. "It involves everything from removing the kitchen units and timber floors to repairing the superstructure and making ready for redecoration," says Withers. "The difficult part was the sheer scale of the job."

Withers' detail design used 84 continuous flight augered piles, 250mm diameter and 8m long, designed to take loads up to 250kN. Concrete is C45 grade. On top of the piles sits a reinforced C35 grade concrete raft 400mm deep around the perimeter, 250mm deep in the less heavily loaded centre, extending to the external face of the perimeter brickwork. reinforcement is beefed up under such concentrated loads as chimney breasts, and the raft is cast in three phases on top of a compressible anti heave board.

"The clay under the house is so hard and dessicated it can support the stools that take the needles under the walls with no problems," Berry says. "We had to manouvre a powerful tracked piling rig through the front door; a UK-made Twintec with a 8000Nm capacity. And as the water table is at 7m we had to use a fully pressurised system to place the concrete."

Construction of the raft went to programme and the contractor is now replacing the timber floors and staircases. Total cost, including rent of an equivalent house for the owner for 18 weeks and redecoration and reinstatement, is around £250,000", Jebb says. This is thought to be the most expensive ant-subsidence operation ever undertaken on a private house, but it may be seen as a small price to ensure the trees continue to flourish.

NEW BUILDER

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