

A sinking feeling

BY TONIA JURBIN

Just how many guys does it take to lift a house that was built on a bunch of giant sized rocks thrown into a pit of spongy soil? Well, the owner of a million-dollar ocean view home in West Vancouver, one of BC's most affluent neighborhoods, is quickly finding out! The 21 year old house is rumored to have been built when the municipal inspectors were holding a job action. While it is for others of a more legal inclination to decide what really happened all those years ago, the problems created must be dealt with today.

Most of the house is founded on glacial till (hardpan) and rock; however, it appears that a large section under the house is made up of compressible organic soils (including peat). In recognition that the material was not suitable to support a structure, very large boulders were end dumped into the spongy excavation in the hope of supporting the structure. Today, a good portion of the back of the house has experienced about 127 mm of differential settlement due to the lack of support under the concrete slab in the family room, the back foyer and patio area, and the load bearing spread footing foundations around the affected perimeter of the structure. The huge voids were present at the time the site was originally being filled, but only became obvious when the aggregate bedding for the foundations migrated downwards over time leaving the large boulders precariously positioned.

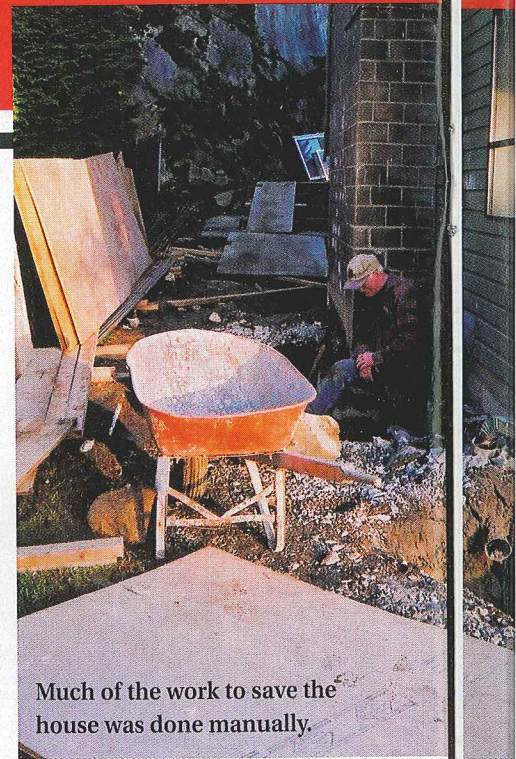
The original repair plan was to unpin the house with nine, 457 mm columns around the perimeter foundation. Without a geotechnical investigation, the designers estimated the columns would be 1.2 to 2.5 m-long. When the crew started excavating under the foundation to install the columns, it became obvious that the original plan was not going to work because the assumptions about the subsurface were incorrect. Large boulders were encountered, so large in fact some of the

rocks were the size of a small vehicle. In some areas the voids between boulders were so large that a crewman could crawl around inside the voids. The competent material was more than 3 m down.

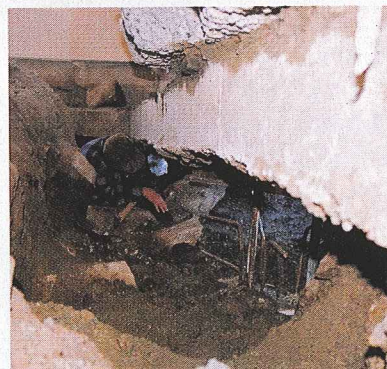
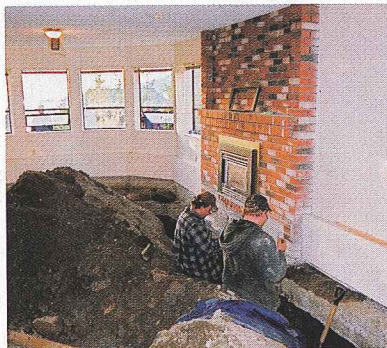
The concrete slab in the family room had to be broken out to facilitate removing the huge rocks, even so, the rocks were so large that they had to be broken several times with a portable hydraulic splitter before they could be lifted and removed with a tripod. The work was extremely dangerous explains Bob Vickars, the owner and president of Vickars Developments Co. Ltd. out of Burnaby BC. "The owner was anxious but understanding about the extra costs involved in underpinning his

house once we started excavating and he could see for himself the risks that my crew was facing. Any one of those large rocks could have shifted and caused serious injury. All of my men really have to know what they're doing." The estimate to lift and repair the involved section of the house based on the first design was \$30,000 to \$40,000, by the time the dust settles it will have cost about three times that amount.

Once the slab was removed, more cracks in the foundations were discovered and the structural engineer had to be called out yet again to redesign the repair. The number of columns was reduced because of the difficulties and risk of hand-excavating 3 to 4.5 m as opposed to the original estimate of 1.2 to 2.5 m. The reduction in the total number of columns to nine from six increased the spacing between the columns and therefore the structural re-design of the repair now required the installation of a grade beam to



Much of the work to save the house was done manually.



Two views show tight working conditions.



support the house, and five concrete jacking pads also had to be poured. Eventually the bottom of the foundation of the house would sit on a concrete grade beam that was 508 mm thick and 406 mm, with about 4 to 5 m between columns. (No grade beam was required in the initial design because there were more supporting columns).

The first step of the repair was to break out the perimeter sidewalks using mostly sledgehammers, and start digging under the foundation of the house. The high strength concrete floor in the family room was broken up with a jackhammer but all of the excavation material was removed by hand. About eight 12 yard bins of hand excavated material had to be removed from the site.

The repairs had to be broken down into several phases to ensure that the house would always have adequate support during the repair. During the first phase, three columns were installed. To install the columns the excavation under the house was hand dug down to firm ground and shored using a

combination of methods and materials; plywood was used in some areas, in other areas mini retaining structures were built using epoxy, rebar and formwork. About 12 yards of concrete was used in shoring these excavations. All excavations and shoring was inspected by a geotechnical engineer before the rebar and forms for the concrete jacking pads and columns were placed. A combination of railway ties and jacks had to be used as temporary support while the other columns were being excavated, formed and poured. In phase II, two more columns were built, in phase III the interior slab was removed and in the final phase, the last column was built and the jacking pits excavated and formed.

With all the columns installed and confirmed by a geotechnical engineer to have at least 10,000 lbs/sq. foot bearing capacity, twenty 30 ton bottle jacks were placed on the columns and pads. With the house supported the crews then had to complete the excavation around the house so that the grade beam could be formed and poured.

The work at this site was extremely labour intensive and potentially dangerous due to the voids between the boulders. "My biggest challenge was ensuring the safety of the crew, said foreman Cam Meakin." ♦

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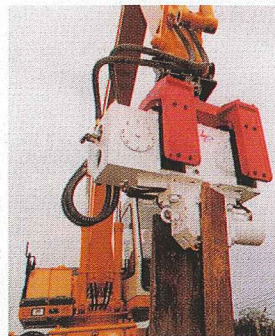


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