1979/38. House drainage problems on Pilchers Hill, Lindisfarne.

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Abstract

Groundwater seepage problems occur under a house on Pilchers Hill, Lindisfarne. Effective and appropriately placed drains should resolve the problems.

INTRODUCTION

Seepage problems on a property in Marion Court, Lindisfarne [EN297563] have been examined on three occasions; August 1978 during building, mid-1979 and August 1979 after substantial rainfall. On the first visit, the site had been disturbed by building operations and several large seepages were noted on the block. On the second visit before some drainwork had been installed seepages were noted in several places under the house. On the third visit the situation was found to be slightly improved following the installation of some drains.

GEOLOGY

The property is situated on the steepest part of Pilchers Hill above the inflexion point of the slope. The slope is irregular and somewhat stepped. The bedrock is quartz sandstone with minor mudstone and the substantial beds of sandstone dominate the slope and often crop out. The weathering profile is extremely variable in thickness and content but may generally be considered to consist of a firm sandy clay. The cover of grey sandy soil is likewise variable.

When moist, the weathered materials are notoriously unstable and very plastic. Failures in fill of this type were apparent on the natural slope and the disturbed ground at the time of the first visit. In addition saggy, damp or weeping areas were observed at the toes of such deposits.

In all exposures on Pilchers Hill where sections of soil, weathering and bedrock may be seen in interaction with the water flow regime, water is observed to pass downslope at either the soil base or the base of weathering. The bedrock is virtually impermeable in contrast, although some small seepages are joint related. Most of the flow, if ephemeral, is at the base of the soil. The base of weathering, however, controls lesser but more consistent spring-type flows and supports the saggy areas. It should be noted that in some cases where thick soil deposits lie on rock benches a similar result will be observed. The thin beds of mudstone may also play an important part in forcing water out to the surface.

In summary, nearly all water flow occurs within or above the upper 50 mm of unweathered bedrock. Unweathered bedrock is here defined as material which must be worked by pick, wedge or hammer and is quite hard. The contrast between weathered and fresh rock is quite distinct.

DRAINAGE

Any successful drainage scheme must intercept and transfer this shallow water flow. With this in mind a substantial agricultural drain was suggested near the upper boundary of the property on a previous inspection. It was advised that some rock excavation might be necessary in order to produce a groove in which to set the pipe and surrounding

crushed metal. No pockets of weathered material should be allowed below the level of the groove. The drain was to be led to a sump and the water transferred from the property. The bank behind this drain weeps water from further upslope, but unfortunately the drain appears to be a failure, largely because the link from its end to the sump is porous pipe with no fall. This situation must be remedied.

In August 1979 several drainage problems could be clearly defined and the situation had evolved since the time of the second visit three months earlier. Rearrangement and removal of some soil and weathered material under the house had confirmed that virtually all water flow is above bedrock and the more the bedrock is exposed the further the problem is pushed upslope. Bedrock irregularities merely serve to collect the seepages.

On the latest visit several features were observed:

a) a major seepage along the entire north-west wall of the house upslope of the garage door.

b) pools of water along the north-east side footing of the house west of the front door.

c) two minor seepages along the soil base or tree root paths centrally under the house.

d) a major seepage under piers along an alignment directly downslope from the end of the drain along the driveway and previously described as faulty, especially in its connection to the driveway sump.

e) a possible minor seepage along the south-east wall of the house.

f) a generally dry soil but damp weathered rock and subsoil.

g) seepages continue to be active in the saggy areas outside the house downslope to the south.

Seepage (a) results from sheet run off across the sealed driveway and newly filled garden strip in the north-west corner of the house. The water is then passed along the bedrock or footing top downslope. Some water is absorbed and transferred by the lower mortar courses to the inside but most internal transfer results from the gaps between bricks and footing in the footing steps.

Some of the water (b) may be related to (a) but some may be derived from flow under the driveway drain, which could not wholly be set into bedrock, and then under the basal courses on the footing.

Seepages (c) are probably the most convenient transfer routes for water missing the driveway drain and reaching the house footing.

The major seepage (d) is readily explained and either replacement of the driveway drain (which would also assist b, c) or replacement of the sump link would probably solve this problem. The sump link must be solid tube and drain from a concrete sump at the end of the active drain to the principal exit sump.

Seepage (e) may simply result from the overall dampness of the

weathered material and continued ingress of water overall. Clearing of the material to bedrock along this side of the house will clarify this situation.

RECOMMENDATIONS

Several recommendations follow immediately from the above observations and one has been stated already.

(1) Preferably reconstruct, to continuous bedrock where possible, the driveway drain and set the drain in a rock groove. Failing this, construct a sump at the eastern end and link this to the main driveway sump by a solid 50 mm PVC pipe. Seal both ends into the concrete of the sumps.

(2) Extend the driveway drain the entire length of the property. At present this terminates several metres short of the house length. An alternative would be construction of a subsidiary drain along the unprotected section of the house. The drain should be set on bedrock.

(3) Construct a concrete barrier at the north-west corner of the house, on bedrock and with a substantial drain fill on the upper side to collect sheet runoff. Clear the footings on the north-west side of the house, fill holes, seal basal brickwork with tar or concrete and continue the drain down to the garage doors on the lower driveway. Ensure at least that metal fill rests on cleaned rock surfaces for the entire path. Protect the drain with plastic sheet and cover with soil as required, at least in the upper sections, ensuring that any such protection is the minimum required and below the upper limit of sealing compound applied to the brickwork.

Since it is desired to develop the under part of the house two courses are open. If the development is limited, simply clean up the rock faces visible, cover all with metal, provide outlets to the south-west wall and cover with concrete; walling and terracing upslope. In each wall step back-fill with metal. This approach would ignore the problem and pass it under any flooring established. If it is desired to utilise as much of the area as possible a better course may be followed.

(4) Clean up the bedrock in the region of the existing low points Where water collects, establish at least one outlet and place a 50 mm PVC pipe with a fall of 1:100 back to the lowest collection point. Concrete the area, set in the pipe and effectively force water to it. Ensure that water is encouraged to run onto and not under the concrete. Connect other low points in the bedrock by chipping narrow canals. Fill the whole with crushed metal and, if desired, agricultural pipe to assist flow and cover in concrete.

(5) Clear soil and weathered rock from under north-east corner and eastern side of house. Some may be used as fill in the south-east corner and the rest externally. This will expose water sources south of the existing drain end and dry out the rock.

(6) Proceed systematically to remove all soil and weathered rock and clean bedrock. When complete a very irregular but largely dry surface should result. Especially if items 1, 2, 3 are observed. Any persisting leakages will then be apparent at the

footing/rock interface at the side of the house and a groove or grooves chipped in the rock near the footing, and led to the main drain (4) should resolve the problem. Clearance of the cover will expose all seeps and the number will be found to be few indeed.

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