32. Drainage for improved health

The objectives of drainage

The principal function of drainage is to remove unwanted water from an area as rapidly as possible. Good drainage is critical to the general well-being of a site. Lack of adequate drainage causes rapid deterioration of road and path surfaces, restricts pedestrian and vehicular movement, results in damage to buildings and their contents, and creates generally insanitary conditions including potential sites for insect breeding.

The requirements are for:

- **Drainage of sullage,** that is, household wastewater which has been used for washing, cooking or cleaning purposes, but which does not contain excreta;

- **Drainage of stormwater,** that is, water which runs off the buildings and land as a result of rainfall.

Separate sullage drainage is not required if sewerage is used as the system of sanitation; all sullage can be discharged into the sewers.

Sullage drainage

It is important to ensure adequate sullage drainage both from houses and communal water supply points such as standposts and handpumps; between 50-80 per cent of the water supplied may end up as sullage. Water from personal use and clothes washing may be contaminated with pathogens, but to nothing like the same extent as toilet wastes. There is likely to be a significant amount of organic matter in water which has been used for food preparation and cleaning cooking utensils.

The quantity of sullage produced varies with the quantity of water supplied and local bathing practices. The provision of individual household water connections significantly increases the volume of sullage to be disposed of. The use of large quantities of water for bathing at communal standposts or wells can create highly insanitary conditions if the drainage is inadequate.

The problems resulting from inadequate disposal of sullage tend to be indirect, rather than due to the actual quality of the wastewater itself. Pools of sullage become breeding grounds for flies; the decay of organic matter may result in unpleasant smells; a generally insanitary environment results, in which certain pathogens, such as worm eggs, can survive.

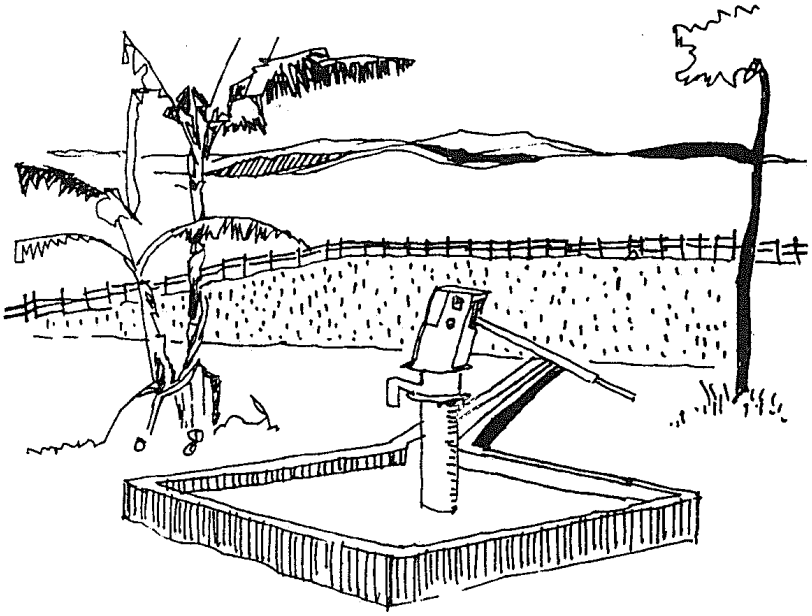

Figure 1. Water drained from water points can be used for production of fruit and vegetables. This can lead to improved nutrition and income generation.

On-plot disposal

Sullage can be disposed of within the housing plot, either by using the sullage for garden watering, (Figure 1) or by allowing it to percolate through the soil by means of a soakage pit as shown in Figure 2.The suitability of this method of disposal depends upon the quantity of sullage, the plot size, and the permeability the ground. If the ground is very sandy and highly permeable, it may be feasible to dispose of sullage into a latrine pit. Garden watering is only appropriate if plots are large; certain plants and trees, for example the banana tree, take up large quantities of water. On-plot disposal may be feasible where water is being fetched from a public water supply point. However, it is unlikely to be appropriate when the houses have individual water connections unless the ground is very sandy.

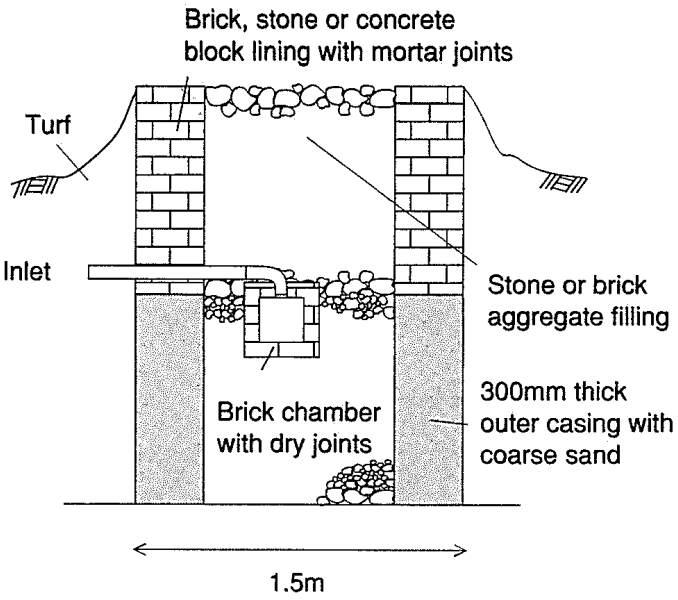

Figure 2. Soakage pit
(after Indian Standards Institution)

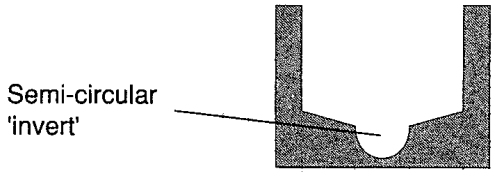

Figure 3. Compound section of a lined open drain

Use of Stormwater drains

Sullage can be discharged into the stormwater drains; problems may arise due to suspended matter settling out in the drain invert and careful hydraulic design is required to avoid this. Lined open channels having a compound section should be used wherever possible.

Stormwater drainage

Rain which falls on firm impervious surfaces such as roads and the roofs of buildings will run off that surface without being absorbed and the stormwater drainage system must have the ability to remove that water. There should normally be a drain running alongside roads and pathways which collects the rainwater from the road surface and surrounding buildings (Figure 4).

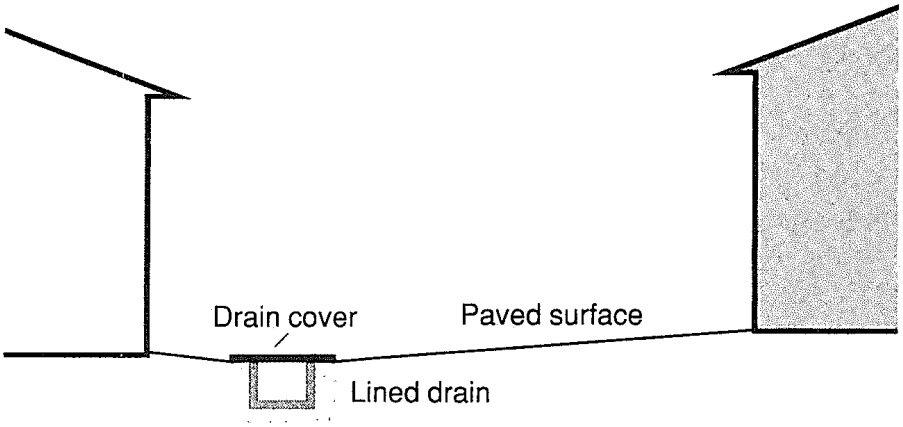

Figure 4. A roadside drain

Water in the drains should flow by gravity; it is therefore important that drains slope downhill in the direction of flow. The drain will normally slope at a similar gradient to the ground; if the ground is very flat, the recommended minimum gradients are 1:300 if the drain carries only stormwater and 1:150 if the drain carries sullage.

The drainage of large built-up areas in towns and cities is complex and needs to be designed by a qualified engineer.

Open channel drainage networks

These are relatively simple to construct and maintain, but take up space and pose a hazard to road users, especially if the drain is very wide or deep, or passes along a busy thoroughfare. In such cases the drains can be covered with removable slabs. The simplest open channel drain is a hand dug, unlined ditch (Figure 5). Although there are limitations on its use, they are usually much cheaper than open channels lined with masonry or concrete. However lined drains (Figure 6) require less maintenance as they do not suffer from erosion; regular cleaning to remove blockages and debris is vitally important.

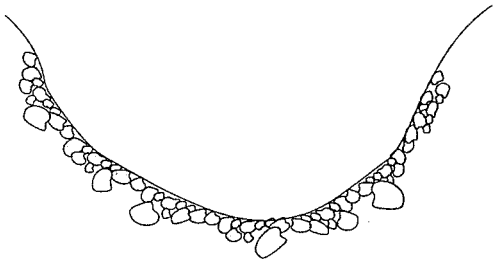

Figure 5. An unlined drain

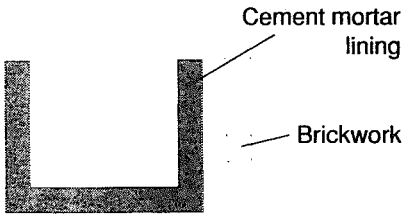

Figure 6. A lined drain

If streams or ditches which carry the drainage water from other areas pass through the site, improvement of the channel section may be necessary to prevent the bed and banks from eroding during high flows (Figures 7 and 8).

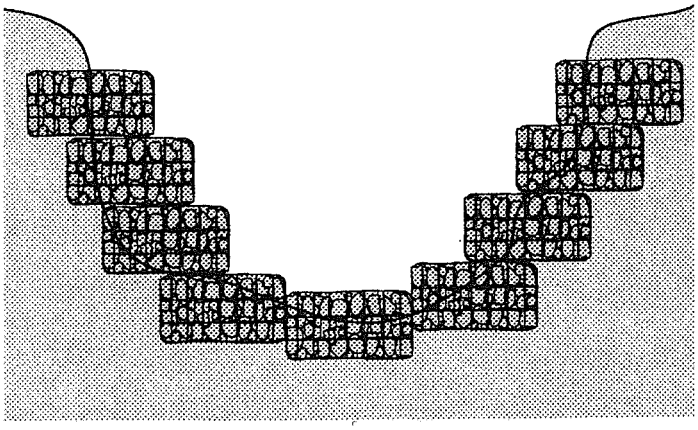

Figure 7. Improvement of a channel using gabions

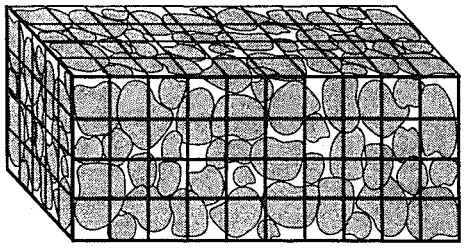

Figure 8. A gabion is a pack of stones or rocks held together by a wire mesh

Road-as-drain

In some densely populated settlements, paved roadways and alleys are used to carry stormwater short distances to drainage channels; that is, water is deliberately allowed to flow along the paved surface and there are no channels alongside. This works where the surfaces are fully paved and well maintained; it is only applicable if adequate sullage disposal facilities exist and in general is not recommended other than for small, fully paved areas (Figure 9).

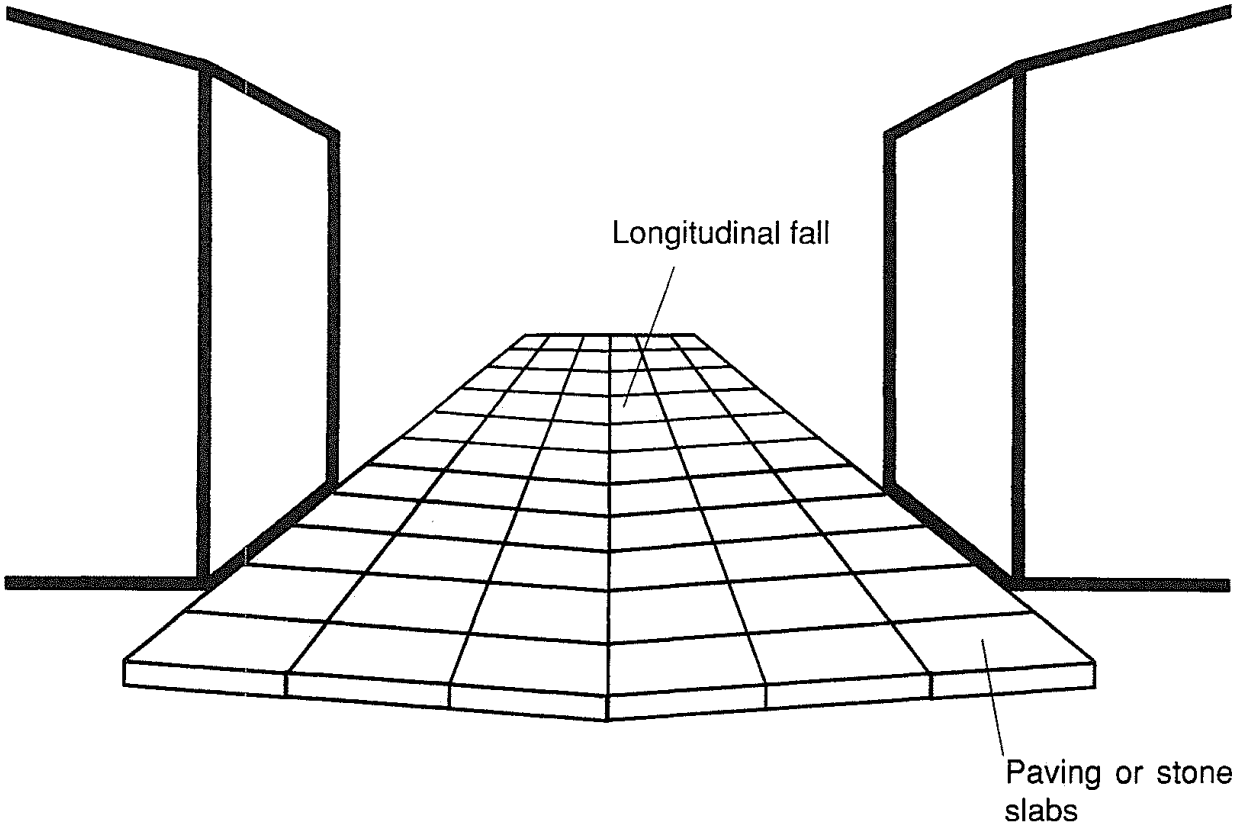

Figure 9. In some areas paved roads are used for drainage.

For further reading:

UNCHS, *Community participation and low-cost drainage.* Training Module, 1986, Nairobi, Kenya.

WEDC, *Services for urban low-income housing.* Fifth edition, 1988, Loughborough, UK.

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Text: Andrew Cotton Illustrations and design: Rod Shaw

WEDC, Loughborough University of Technology, Loughborough, Leicestershire LE11 3TU, UK.