Good Practice 11

Settled Sewerage

Settled sewerage (also called solids-free sewerage and small-bore sewerage) is a sanitation system in which discharges all the wastewater from a household, or from a group of adjacent households, into a 'solids interceptor tank' (essentially a single-compartment septic tank) which discharges its liquid effluent into a 'settled sewer' (Figure 1). As all the settleable solids are removed in the interceptor tank, the sewer is designed to convey only settled (i.e., solids-free) wastewater, and this means it can be designed in a completely different way from the design of either conventional or simplified sewerage which convey unsettled wastewater and therefore have to be designed to be 'self-cleansing' - i.e., to prevent solids settlement in the sewer and consequent blockage of it. Thus the achievement of a 'self-cleansing velocity' or a 'minimum tractive tension' is not required for settled sewerage. Instead a settled sewerage network is designed using the 'inflective gradient' design approach, as follows:

(1) there must be an overall fall between the upstream and downstream ends of the sewer;
(2) the sewer is laid to closely follow the ground contours;
(3) as a result of (2), the flow in the sewer may vary between open channel flow (i.e., where there is a free wastewater surface in the sewer) and full-bore pressure flow (where the sewer flows full and under pressure);
(4) along sections of the sewer where the flow is pressure flow the design has to ensure that the hydraulic gradient of the wastewater does not rise above the level of the invert of the outlet from any interceptor tank discharging into this section of sewer (if it did, then wastewater would flow from the sewer to the interceptor tank) - this is easily achieved either by locally increasing the sewer diameter or by locally laying the sewer at a greater depth;
(5) using simple inspection points in place of manholes (but not at every junction or change of direction); and
(6) using a minimum sewer diameter of 75 mm.

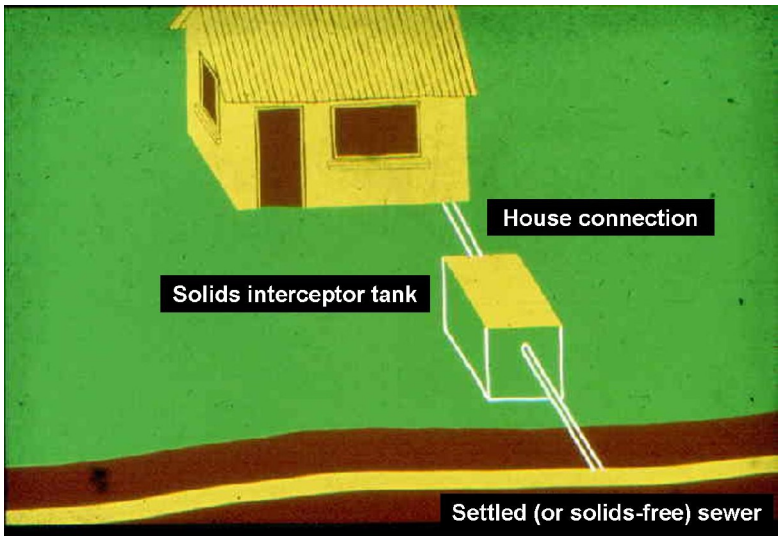

Figure 1. Schematic diagram of settled (or solids-free) sewerage.

Figure 2 shows a settled sewerage scheme in a village in the Nile Delta region of Egypt.

Operation and maintenance is straightforward: the local sewerage agency has to (1) assume the responsibility for regular desludging of the interceptor tanks (as individual householders cannot be relied on to do this on time) - this ensures that no settleable solids from full tanks enter the settled sewer; these desludging costs can be recovered from the householders via their monthly water and sewerage bills; and (2) ensure that no illegal connections are made to the settled sewer (as these would typically be of unsettled wastewater and would therefore block the sewer.)

Figure 2. A village house in the Nile Delta, Egypt with its solids interceptor tank.

Settled sewerage is commonly more expensive than simplified sewerage in areas without existing septic tanks. However, in areas with existing septic tanks (and these are generally non-poor areas), settled sewerage is often a financially competitive solution (as the cost of the existing septic tank is a 'sunk' cost and it is economically and financially prudent to take maximal advantage of existing infrastructure components, rather than simply abandon them).

Further information

University of Leeds, *Settled Sewerage*, webpage (with links to several publications, including design manuals, on settled sewerage) at: http://www.personal.leeds.ac.uk/~cen6ddm/settsew.html.

Prepared by Duncan Mara, University of Leeds, UK, December 2007.