# WATER SAVING DEVICES FOR SANITATION

Ministry of Public Works & Housing

U.A.E.

UNITED NATIONS MISSION ON HOUSING, BUILDING AND PLANNING

U.N.D.P.

★ بعثـــة الأمـــم المتحـــدة للاسكان والتعمـــير والتخطيط ★
بـــدولـــة الامـــارات العـــربية المتحـــدة

UNITED NATIONS MISSION ON HOUSING, BUILDING AND PLANNING TO THE UNITED ARAB EMIRATES

---

# ✻ WATER SAVING DEVICES FOR SANITATION IN DESERTS. ✻

BY A. ORTEGA - ARCHITECT - UN ADVISER TO THE UAE AND
B. LEFEBVRE - ARCHITECT - UAE CONSULTANT.

## a) THE PROBLEM.

★ Using water as a transportation for human waste. ★

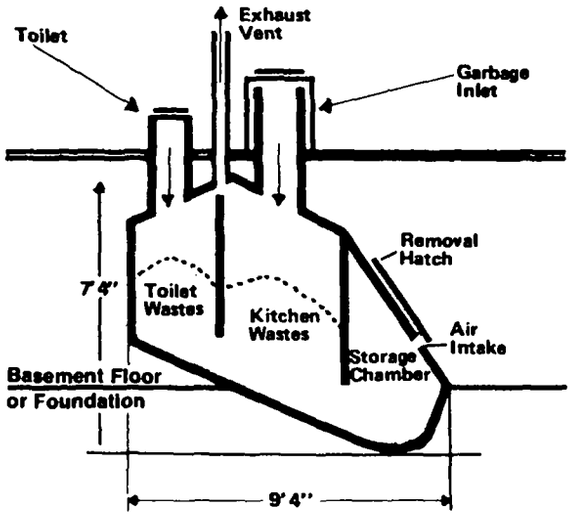
The collection of human waste from house connections via an underground network of sewers, and the disposal of the sewage in centralised locations, appeared in the European cities in the middle of the nineteenth century. First in Hamburg (1842) and later in London (1855) and Paris (1860), following disastrous cholera epidemics, underground sewers were begun. The first American example was in Brooklyn (1857). However the problem of disposing of large amounts of sewage in spot locations was not immediately appreciated, and it was estimated that in the fifties, in the United States, more than a quarter of the systems discharged their wastes without treatment.

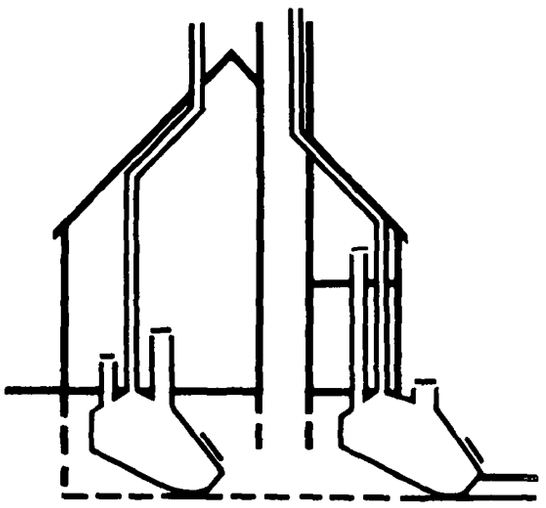
The system of collection and neutralization of human wastes calls for high densities to justify the required network of water supply and sewer pipes, large quantities of water, and facilities for waste disposal. When one or more of these factors are absent from the equation, the network system approach cannot be applied. This may be the case in rural areas where people live too far apart, in poor countries which cannot afford investment required, in regions where water is scarce.

*Two factors deserve special mention; the use of large quantities of water and the need to then purify this water, and the cost of the network approach.

The annual water consumption of the average family in a consumer society* 400 cubic metres, and 40% of this water is used for toilet flushing. The "standard" toilet requires 22-30 litres for each flushing. Obviously in arid regions, or in areas with dry seasons, or where water supply is critical, the conventional water-borne system is wasteful and costly. Moreover, even where water supply is not a problem, it can be argued that the cost of purifying the water, (and sewage is 99% water), is the cost of purifying the transporting medium, rather than the waste, and so represents a misuse of energy and resources.

The original composting system was invented by a Swedish sanitary engineer, Rikard Lindstrom, in 1938. He patented his system in 1962 (U.S. Patent 3,136,608) and it was produced commercially in 1964, under the name Clivus-Mulltrum.

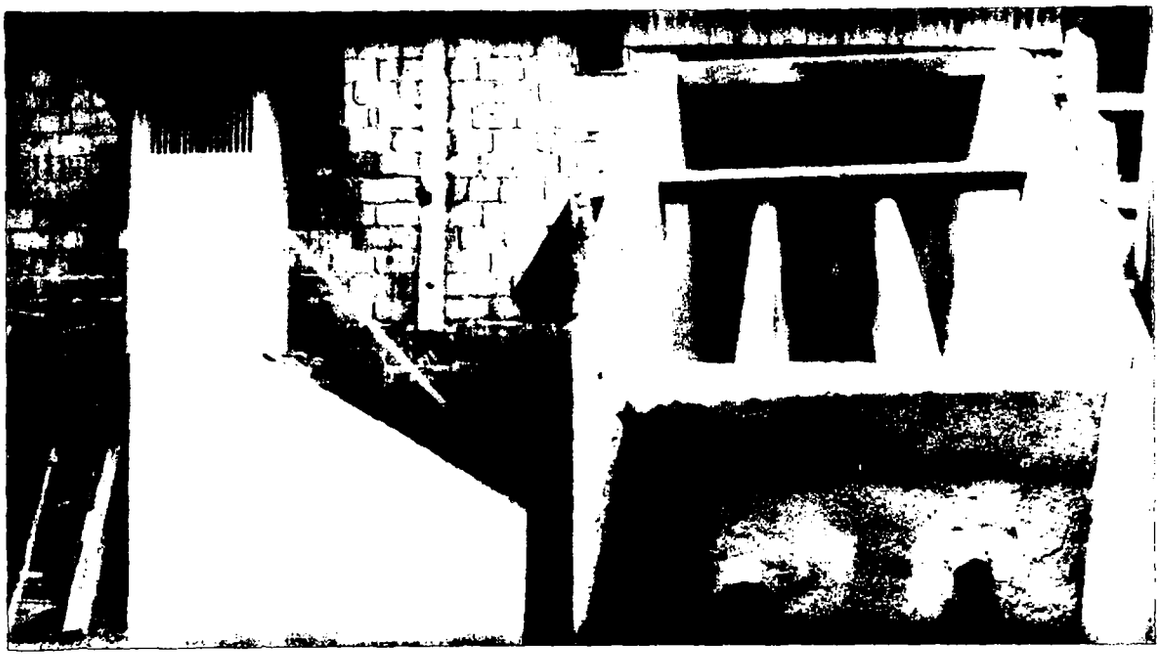


## C.) LOCALLY BUILT COMPOSTING TOILET

★The objective is to build a composting toilet roughtly of the same geometry and dimensions of the swedish Clivus Mulltrum but at a much lower cost using local materials.
The Swedish fiberglass unit has a cost F.O.B US $ 1800.

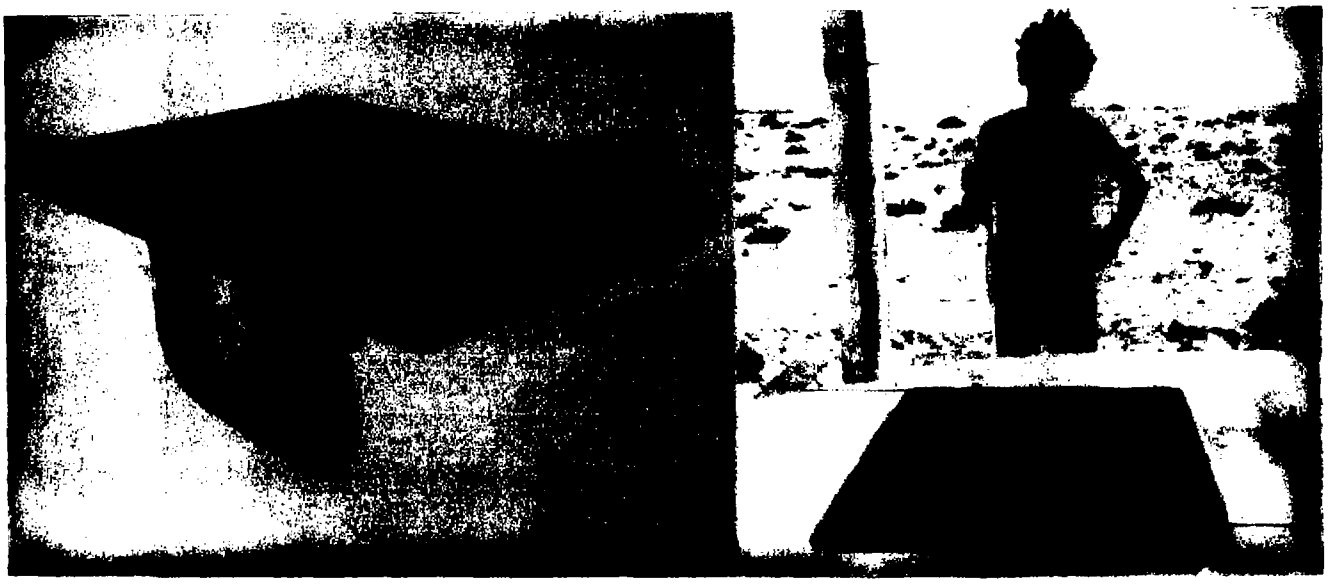
Four prototypes were built in Canada and performed well. The next step was to see if they would function properly in hot-humid climates. So another three were built in the Philippines; one above ground because of high water table conditions and two other underground.



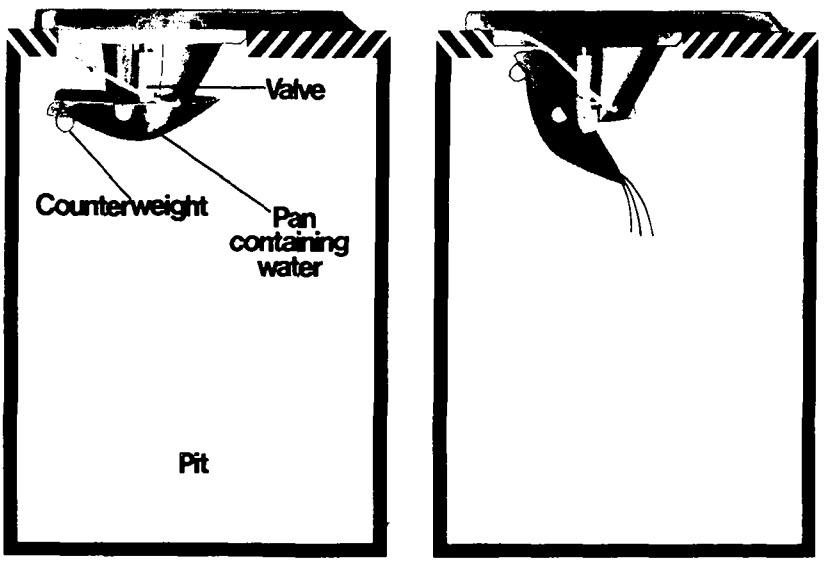
Above ground unit in the Philippines.

★ For the toilet itself a new squatting plate , called "Watergate" was installed. This unit provides a water seal with only one litre of water.
With this ingenious system of equilibrium the solids are evacuated by their own weight tilting a pan.

The amount of water added to the compost does not unbalance the decomposition process, evaporation being so rapid in desert regions.



# HOW WATERGATE WORKS




- The water in the pan (approximately 2 litres) covers the bottom end of the shute. This completely seals off the pit so that flies cannot enter and bad smells cannot escape.
- When Watergate is used, the weight of the waste matter causes the pan to tip, throwing the waste matter into the pit.
- The counterbalanced pan closes again and the valve enables it to fill with water to the correct level.

## d) OPERATING COMPOSTING TOILETS.

**Temperature.** The temperature within composting toilets varies. A toilet such as the Clivus, builds up to a temperature of about 30° C which is below body temperature, consequently pathogenic organisms are not destroyed by heat, but rather by the long pasteurization period.

**Volume.** It has been assumed that the volume output of organic waste and human excreta is in the order of 0.3 $m^3$ per person per year, of which only 20% is excreta. A long term composting toilet will require 5 $m^3$ for the three year period. The humus production is estimated to be about one or two buckets per person annually.

**Starting.** In order to start a composting toilet it is necessary to build up a layer of rich soil on the bottom of the container in order to introduce micro-organisms to facilitate composting. A layer of peat moss or dry leaves is also required to absorb the urine until the mass of the pile is adequate.

**Flies.** Most composting toilets seem to have a common problem with flies at the beginning of their operation. This may be due to the internal balance of the pile not yet having been established, a situation which seems to last only a few weeks. The addition of sawdust to the pile helps at this point.

**What goes in.** Urine, excrements, toilet paper, kleenex, tampax, kotex, paper diapers, paper towels, grease and fat, dust, vegetable and meat scraps, peelings, bones, and eggshells.

**What doesn't go in.** Cans, glass, plastic, paints, toxic liquids, chemicals, pesticides cardboard boxes, unshredded paper and especially any chemical sanitary agents.

**Capacity.** The composting toilet is designed for regular use by eight to ten peoples. Heavier use for short intervals will not affect the toilet, but if more than the recommended number of people use the toilet for any lenght of time, urine will start to accumulate in the lower chamber.

This information is based on material from the Farallones Institute, Clivus Mulltrum U.S.A. and Bernard Lefebvre experience in building composting toilets in Canada, in the Philippines and in the United Arab Emirates.