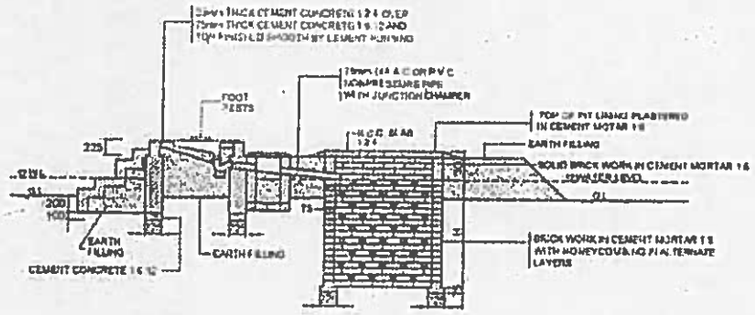
5885

Figure 3: Pour-flush latrine in water-logged areas

(Source: Manual on Sewerage and Sewage Treatment Systems, 2013, Part A: Engineering)



SECTION A B C

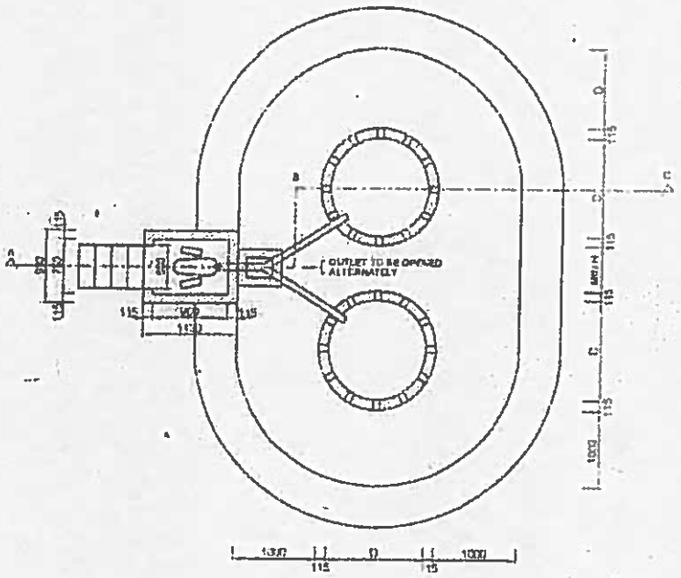


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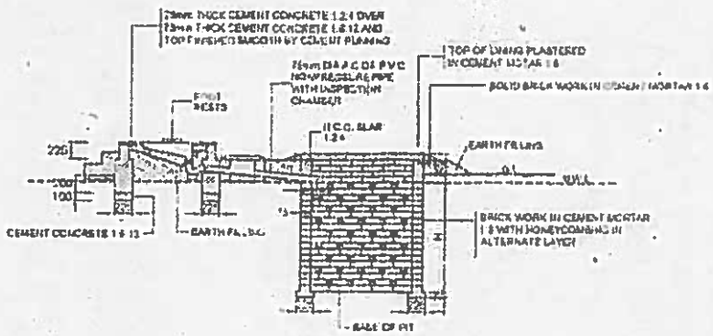
Figure 4: Leach pits in high subsoil water level

(Source: Manual on Sewerage and Sewage Treatment Systems, 2013, Part A: Engineering)



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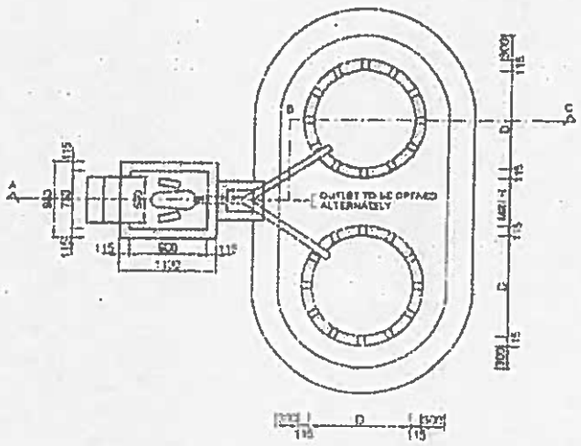

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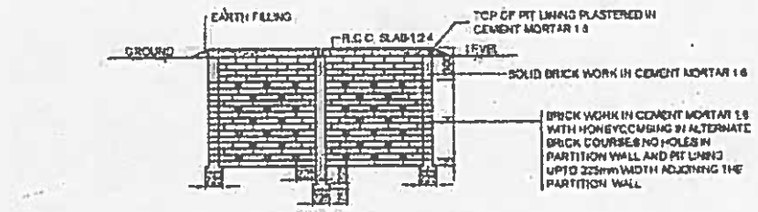
Figure 5: Pour-flush latrine with combined pits

(Source: Manual on Sewerage and Sewage Treatment Systems, 2013, Part A: Engineering)



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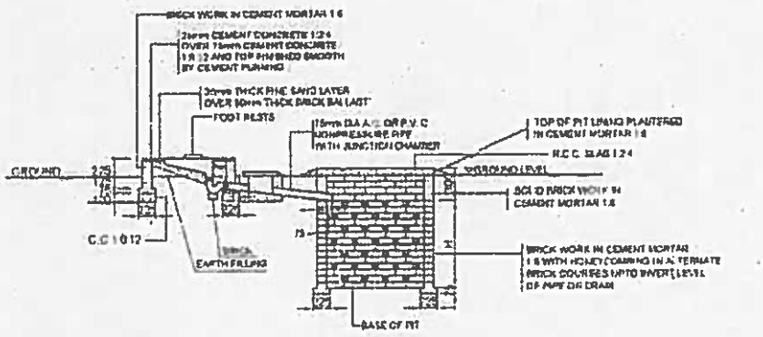

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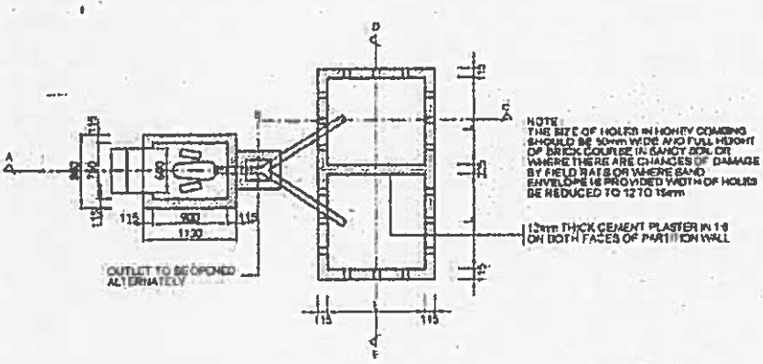

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Figure 6: Typical sketch of Two-compartment Septic Tank for 5 users (Source: Manual on Sewerage and Sewage Treatment Systems, 2013, Part A: Engineering)

(Dimensions in mm)

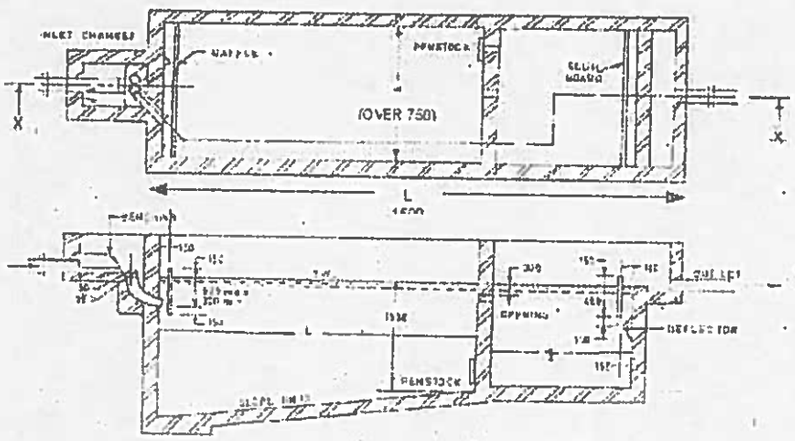

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Figure 7: Details of bio-digester with reed bed (Source: DRDO)

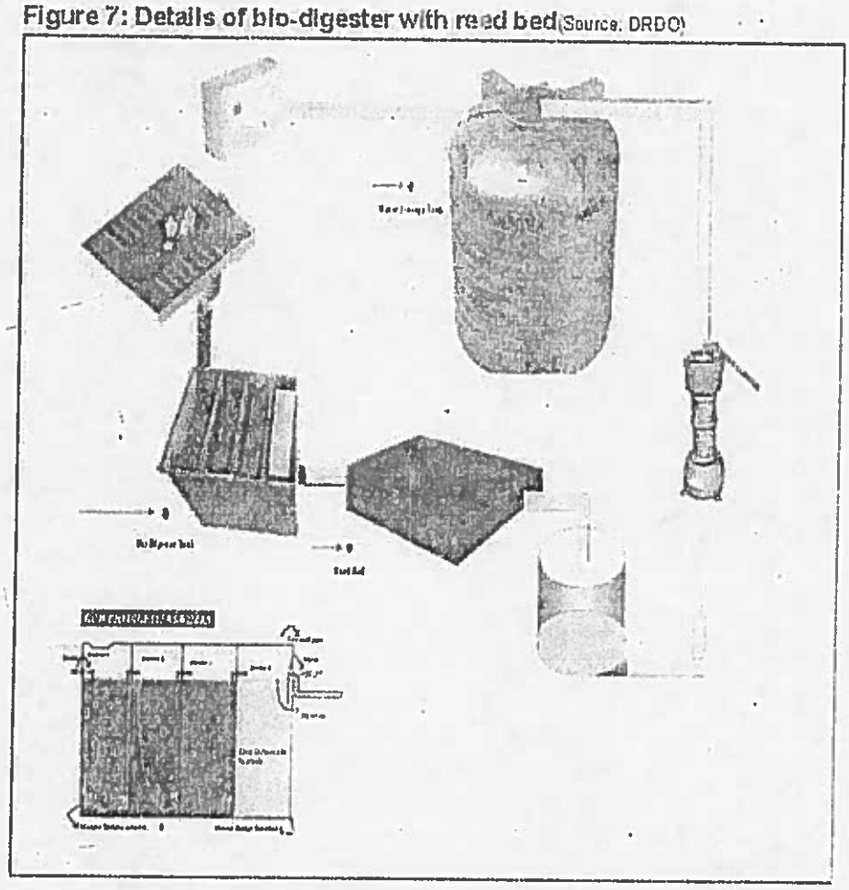

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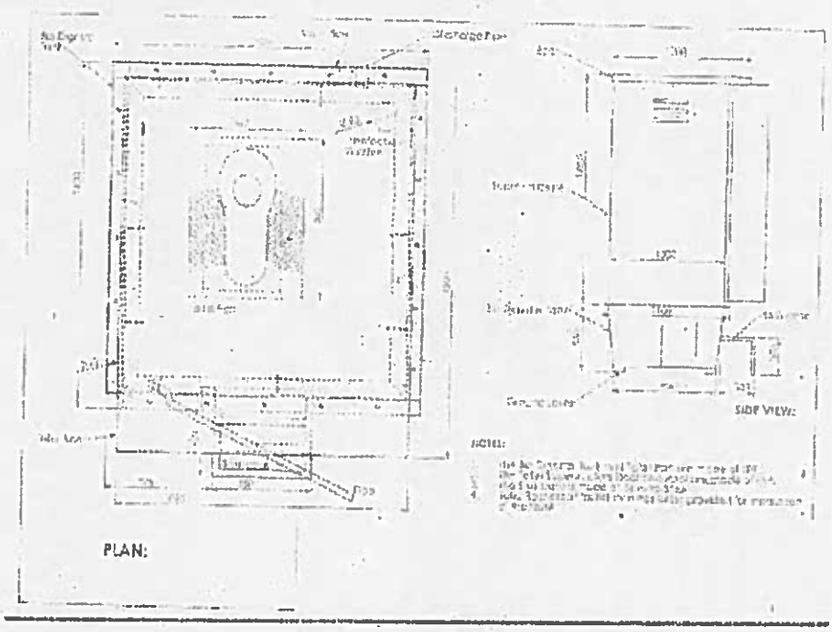
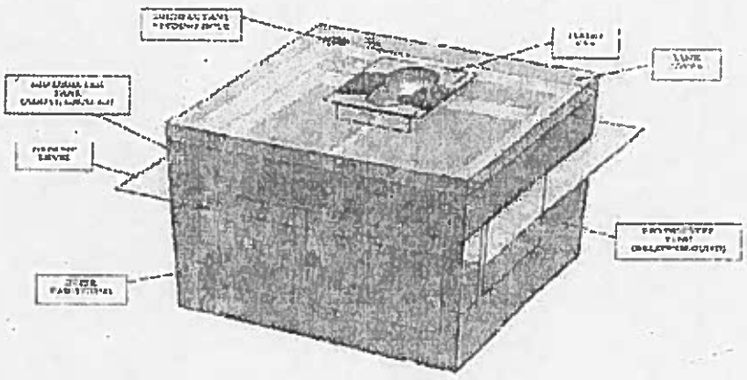
Figure 8: Details of Bio-Toilet(Source: Private Agency)





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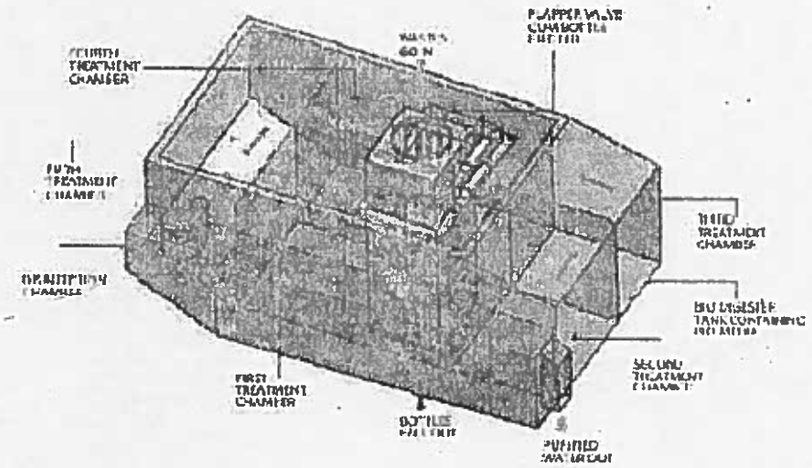

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Figure 9: Self-cleaning electronic toilet (E-toilet)

Self-cleaning electronic toilet (E-toilet)

E-toilet is addressing public sanitation by developing toilets that are portable, hygienically maintained, and eco-friendly. The insertion of a coin opens the door of the e-toilet for the user, switches on a light and provides audio commands to guide users. E-toilets are programmed to flush 1.5 litres of water after 3 minutes of usage or 4.5 litres if usage is longer. It can also be programmed to clean the platform with a complete wash down after every 5 or 10 persons use the toilet.

Key features of E-Toilets include

- Mild steel and stainless steel body for low maintenance
- User-friendly access, sensitive to the needs of the elderly and the differently abled
- Hygienic and easy to maintain components and accessories
- Durable and vandal-resistant enclosure
- Easy to erect and relocate if required.
- User guides, display boards and audio instructions
- Sensor based resource conservation and automated access control
- Waste processing through STP
- Online mapping, GPRS enabled units for real-time updation

There are provisions to customize the designs as per the usage and needs by adding optional items such as stainless steel wash basin, Napkin vending machine, mirror and STP.

Figure 10: Namma Toilets

Namma Toilets

Namma toilets are modular toilets made with fibre reinforced polymer. These are the latest state of the art toilets which are modern replacements for the conventional Pay and use toilets. The aim of Namma toilets is to make people use the toilet to control open defecation. The initiative started by Chennai Municipal Corporation

Key features of the Namma toilets are:

- Namma toilets are designed to suit the needs of men, women , children, elderly and the differently abled in an eco-friendly manner
- Sensor based automated LED lights (3W) with solar power
- Adequate ventilation
- Durable and Vandal-Resistant model
- Privacy for ladies and provision of hygienic disposal of Sanitary napkins
- Human waste will be converted to useful materials like bio gas and fertilizers
- No User Charges

Functionalities:

- Universal design – privacy & safety.
- Easy maintenance - easy to clean due to composite material .
- Modules to fit varying site size, user requirement and shapes.
- Signage for easy entry – Common logo
- Easy to install - Accessible 24 x 7 .
- Concealed plumbing.
- Provision for overhead tank (200 L capacity).
- Provision for Flush Cistern (9 L capacity).

Figure 11: Waterless Urinals

Waterless Urinals

Waterless urinals do not require water for flushing and can be promoted at homes, institutions and public places to save water, energy and to harvest urine as a resource. Reduction in infrastructure required for water supply and waste water treatment is also spinoff arising from installing waterless urinals.

Waterless urinals do not need water and expensive plumbing accessories usually required for flushing. Also, the dry operation of waterless urinals and touch free operations reduce spreading of communicable diseases.

Advantages of Waterless Urinals and Reuse of Urine

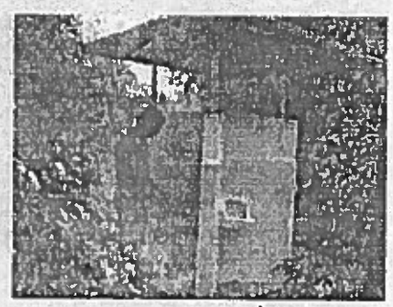
- Save enormous quantities of freshwater
- Enhance efficiencies of sewer lines and wastewater treatment plants
- Optimize cost of plumbing accessories at supply & consumption ends
- Conserve electricity used for pumping water & treating wastewater
- Replace chemical fertilizers with urine to grow crops
- Produce fertiliser & other chemicals from urine (industrial feedstock)
- Recover hydrogen for producing energy and fuel
- Reduce emission of green house gases and pollution of water bodies

Waterless urinals are good options to be considered while promoting public urinals because they overcome the need for water as well as infrastructure required for conventional urinals.

Figure 12: Waterless Public Urinal Kiosk

Waterless Public Urinal Kiosk

Waterless public urinal kiosk is a stand-alone concrete reinforced pre-fabricated urinal kiosk which can be installed in public places and institutions. Although pre-fabricated urinal kiosks made of steel and FRP have existed in the past, the kiosks made of concrete can be cheaper and robust. Urine collected can be diverted to a storage tank of the urinal kiosk covered with a planted hedge to offer privacy to the users. In place of the planted hedge, billboards can be erected at public places to generate revenue for maintenance of the urinals.



Waterless Public Urinal Kiosk

Green Waterless Urinal

A green waterless urinal is low cost onsite urine application model suitable for sites where adequate space is available and the number of users is limited. Urine collected is diverted to a plant bed of Canna Indica and Ficus planted around the urinal. For enabling uniform distribution of urine to the plant bed, a perforated pipe connected to the urinal is laid along the plant bed. As urine contains essential plant nutrients such as nitrogen, phosphate and potassium, these are utilized by the plants for their growth. The plantation also doubles as a hedge around the urinal offering privacy to the users.

During The bed must be surrounded by the earthen bunds to prevent flow of the urine to nearby areas during rainy seasons. At periodic intervals, watering and emptying of the phosphate deposits is carried out to maintain the system. Treatment for reducing salinity of the soil must be taken up at regular intervals. This model of onsite utilization of the urine through GWUs can be adopted in public places, gardens and institutions where there is open space. The initial and maintenance cost of GWUs is also very low compared to the normal urinals. GWUs can be established at a cost of INR 500/- to INR 10,000 based on the design adopted.

Figure 13: Urine diverting toilets

Urine Diverting Toilets

Like waterless urinals, urine diverting toilets can also be employed to harvest urine for reuse in agriculture. Urine diverting toilets facilitate separation of urine from faeces and wash-water. A variant in which urine, faeces and wash-water are separated are called Urine Diverting Dry Toilets. In many parts of the world, including India, such toilets are being promoted to recover resources present in urine and faeces for productive purposes, mainly agriculture.

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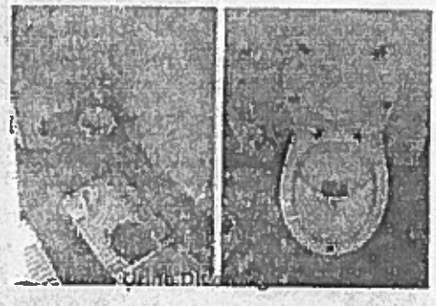
Urine diverting toilets facilitate

- Harvesting of nutrients present in urine and faeces.
- saving of water used for flushing
- Saving of energy required for water and wastewater treatment
- To minimise ground water pollution. (Chariar & Sakthivel, nd)



Source: http://web.iitd.ac.in/~chariarv/WLUResourceBookFinal.pdf

Figure 14: Decentralised Wastewater Treatment Systems (DEWATS)

DEWATS treatment methodology will provide a treatment efficiency that allows for reuse of the treated wastewater for gardening or irrigation as well as for safe disposal in to a water body or natural drain.

The decentralised wastewater treatment system is a simple design, non-dependent on energy, reliable, long-lasting, tolerant towards inflow fluctuation and low in costs. It can treat organic wastewater from domestic and industrial sources.

DEWATS is based on different natural water treatment techniques which are combined according to requirements such as the characteristics of wastewater, desired effluent quality and technical specifications.

Advantages of DEWATS

- Treat organic wastewater from domestic sources
- Deep sewer line construction not required
- Comply to statutory discharge standards
- Wastewater can be treated on site
- Tolerant to inflow fluctuation (unknown peak flow)
- No external energy is required to run the system
- Reliable, durable and requires minimal maintenance
- Treat wastewater flows from 1–1000m3 per day

Source: http://www.cddindia.org/dewats.html

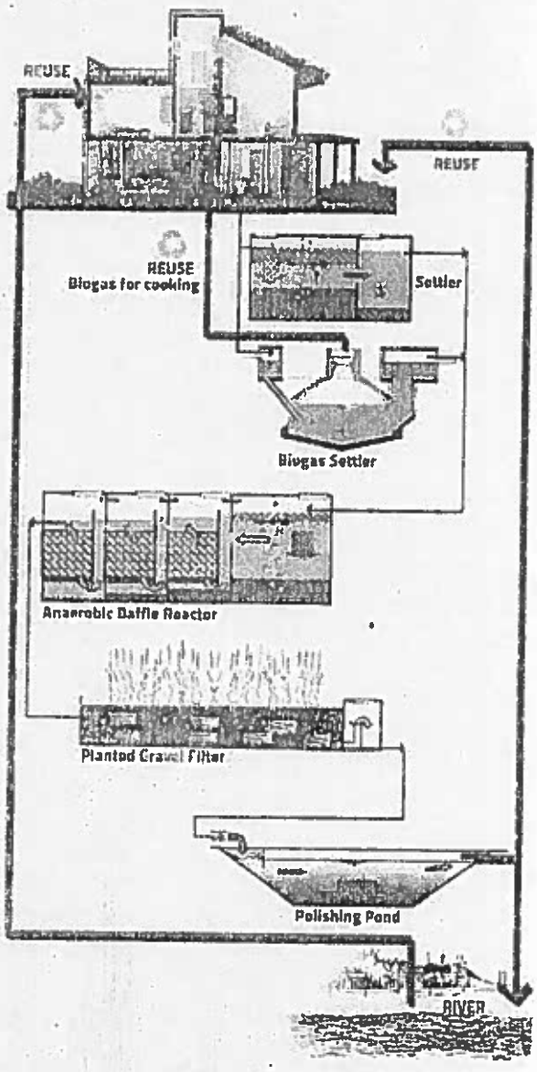


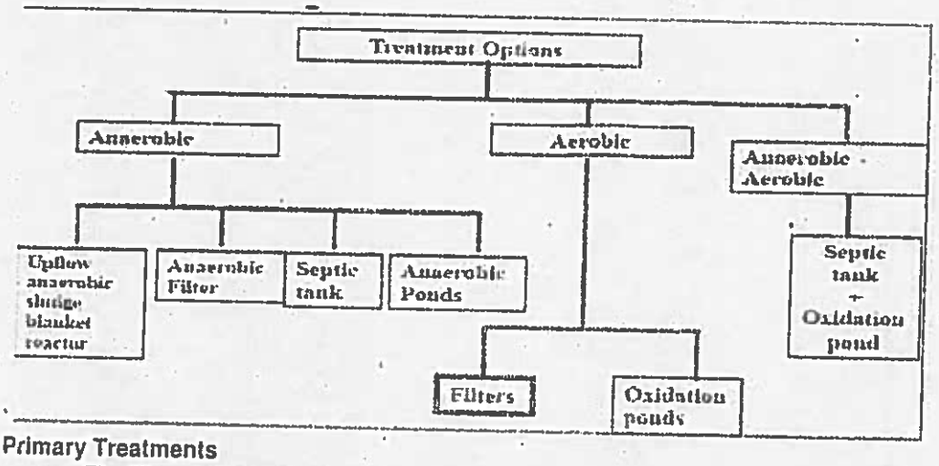
Figure 15: Low Cost Treatment Technologies for Reuse/Recycle by NEERI

The amount spent on pollution control should be optimum. The general approaches available for pollution control are waste minimization (low-waste technology), wastewater conservation and development of low cost treatment options. Grey water and black water from a building which is connected to a municipal sewerage system are disposed of into municipal sewers directly and treatment is given in a centralized facility.

In the areas where sewerage system is non-existent the black water is treated primarily in a septic tank and effluent from septic tank and grey water are disposed of into ground though soak pit. In some cases untreated grey water is used for gardening. There is a need to develop appropriate technology for green building constructed in sewered and non-sewered areas especially from the operation and maintenance viewpoint. There should be more inclination towards the development of sustainable treatment plants. The natural systems of waste treatment are the obvious choice for sustainability. This is will extract the desirable features such as benefit from warmer temperatures, use of little mechanization, utilization of minimum electric power and reuse for non-domestic purposes. Further the systems to be adopted for sustainable treatment should need less land, are easier to construct and can generate some income. All these aspects ensure sustainability of the treatment plants and will keep them acceptable, affordable, and manageable for a long time.

Methodology

The reuse and recycle of grey water as well as black water requires series of treatments similar to the conventional treatment plants which comprises of Primary, Secondary & sometimes tertiary treatments. The simulation can be carried out on economical basis with low cost treatment technologies available in the wastewater field.



Primary Treatments

- Fine/Coarse Screening,
- Oil & Grease Traps,
- Settling Tanks.

Secondary Treatments

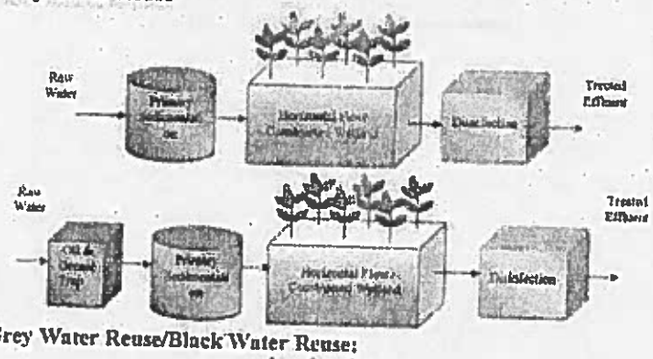
- Chemical Methods,
- Biological Treatments-Aerobic & Anaerobic,
- Secondary Settling & Sludge Treatment.

Tertiary Treatments

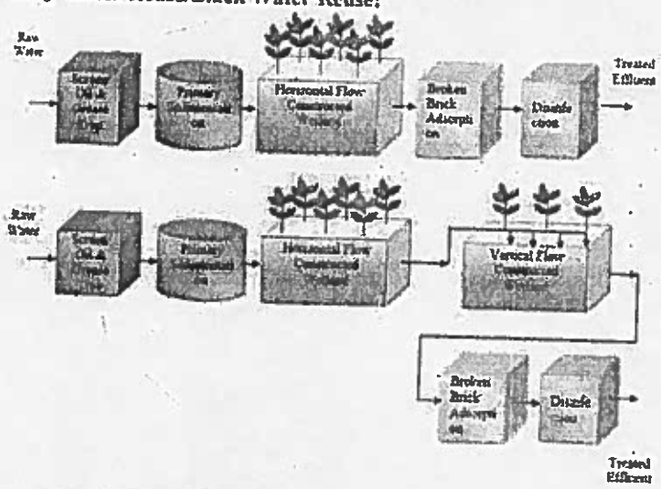
- Charcoal Filtration
- Broken Bricks Adsorption for polishing the treated water.

Treatment options available:

Grey Water Reuse



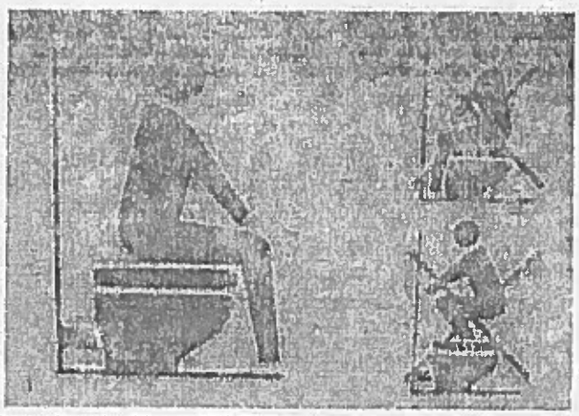
Grey Water Reuse/Black Water Reuse:



Source: http://urpjournals.com/tocjnls/34_14v4i4_2.pdf

Annexure 4: Draft IEC messages for toilet usage

ટોઇલેટ-પાશ્ચાત્ય શૈલી (મહિલા)



(Source of image)

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બહાર નીકળતાં પહેલાં ફ્લશનો ઉપયોગ અચૂક કરો.
બહાર નીકળતાં પહેલાં પ્લાસ્ટિકના સીટ ઉપર કરો, અથવા બરાબર સાફ કરો.
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કચરો ફક્ત કચરાપેટીમાં જ નાંખો.
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સેનીટરી નેપકીન કાગળમાં લપેટી કચરાપેટીમાં નાખો.
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