

# NORTH WESTERN RAILWAY

## PCE's Circular No. 127

### **Sub: - Rain Water Harvesting.**

In today's world, water conservation has become very essential, looking to depletion of water table & drying up of ground water sources like wells and bore wells. It is said that the third world war will be on account of water. Rain Water Harvesting (RWH) is an important way to conserve water. It has, therefore, been decided that provisions should compulsorily be made for rain water harvesting in drawings of all the buildings to be constructed hereafter.

In CPDE's seminar held at IRICEN, Pune on 07.07.2011, the issue of RWH was deliberated upon and it was decided that "***All Railways should have provision of Rain water harvesting while approving new drawings.***"

The main advantage of Rain water harvesting is not only to save water from conventional sources, but also to save energy on transportation and distribution of water at the doorstep.

### **Some commonly used methods of Rainwater Harvesting are mentioned below**

#### **A. Storage for Direct use**

In this method, rain water from the roofs of buildings is collected in a storage tank. The storage tank has to be designed according to the rainfall and roof area. Each drain pipe should have mesh filter at mouth and first flush device followed by desilting pit before connecting to the storage tank. The storage tank should be provided with over flow pipe.

Water from the storage tank can be used raw for secondary purposes such as washing and gardening etc and after treatment may be used for drinking purpose. This is the most cost effective way of rainwater harvesting.

#### **B. Recharging ground water aquifers**

Ground water aquifers can be recharged by various kinds of structures as illustrated below to ensure percolation of rainwater in the ground instead of draining away from the surface.

- (i) Recharging of existing bore wells / hand pumps
- (ii) Recharge pits
- (iii) Recharge Shafts
- (iv) Recharging of existing wells.
- (v) Percolation Tanks
- (vi) Borrow pits for Railway embankment.

### **(i) Recharging of existing bore wells/hand pumps**

Rainwater collected from the rooftops of buildings is diverted through drainpipes to settlement tank. After settlement, filtered water is diverted to bore wells to recharge deep aquifers. Abandoned bore wells can also be used for recharge.

Optimum capacity of settlement tank can be designed on the basis of area of catchment, intensity of rainfall and recharge rate as required in design parameters. While recharging, entry of floating matter and silt should be restricted because it may clog the recharge structure. First one or two showers should be flushed out through rain separator to avoid contamination.

***Sketch Plan no -1 illustrates the typical layout.***

### **(ii) Recharge Pits**

Recharge pits are small pits of any shape rectangular, square or circular, contracted with brick or stone masonry wall with weep hole at regular intervals. top of pit can be covered with perforated covers. Bottom of pit should be filled with filter media.

The capacity of the pit can be designed on the basis of catchment area, rainfall intensity and recharge rate of soil. Usually the dimensions of the pit may be of 1 to 2 m width and 2 to 3 m deep depending on the depth of pervious strata. These pits are suitable for recharging of shallow aquifers.

***Sketch Plan no -2 illustrates the typical layout.***

### **(iii) Recharge Shafts**

#### **(a) For less pervious strata**

Recharge shafts with bore hole are provided where upper layer of soil is alluvial or less pervious. These are bored holes of 30 cm dia. up to 10 to 15 m deep, depending on depth of pervious layer. Bore should be lined with slotted/perforated PVC/MS pipe to prevent collapse of the vertical sides. At the top of bore hole, required size of sump is constructed to retain runoff before the filters. Sump should be filled with filter media.

***Sketch Plan no.-3 illustrates the typical layout.***

#### **(b) For pervious strata**

Recharge shafts are provided where upper layer of soil is pervious. These are made with cement rings having 75 cm dia and 4 m deep. Rainwater collected from rooftops of buildings is diverted through drainpipes to settlement tank. After settlement, filtered water is diverted to recharge shaft.

***Sketch Plan no -4 illustrates the typical layout.***

### **(iv) Recharging of existing wells**

The existing well can be used as recharge structure. Rainwater from the roof top and catchment area are diverted to wells after passing it through filtration bed. Cleaning and desilting of the wells should be done regularly to enhance the recharge rate.

***Sketch Plan no -5 illustrates the typical layout.***

#### **(v) Percolation tanks**

Percolation tanks are artificially created surface water bodies, submerging a land area with adequate permeability to facilitate sufficient percolation to recharge the ground water table. These can be built in big campuses where land is available and topography is suitable.

Surface run-off and roof top water can be diverted to this tank. Water accumulating in the tank percolates in the soil to augment the ground water. The stored water can also be used directly for gardening and raw use. Percolation tanks should be built in gardens, open spaces and roadside green belts of urban area.

Anti-larval treatment should be done at regular interval to avoid breeding of mosquitoes.

#### **(vi) Borrow pits alongside track**

For repair to cess, earth should be taken along the embankment by digging borrow pits of suitable size by keeping the undisturbed ground for a stretch not less than 3.0 metres between two consecutive borrow pits. Rain water collected in these pits may be used for watering tree plantation and it shall also recharge ground water.

#### **Precautionary measures to collect rain water free from pollutants are suggested below:-**

- Roof or terraces used for rain water harvesting should be clean, free from dust, algal plants etc.
- Roof should not be painted since most paints contain toxic substances and may peel off.
- Do not store chemicals, rusting iron, manure or detergent on the roof.
- Nesting of birds on the roof should be prevented.
- Terraces should not be used for toilets either by human beings or by pets.
- Provide gratings at mouth of each drainpipe on terraces to trap leaves, debris and floating materials.
- Provision of first rain separator should be made to flush off first rains.
- Do not use polluted water to recharge ground water.
- Ground water should only be recharged by rainwater.
- Before recharging, suitable arrangements for filtering should be provided.
- Filter media should be cleaned before every monsoon season.
- During rainy season, the whole system (roof catchment, pipes, screens, first flush, filters, tanks) should be checked before and after each rain and preferably cleaned after every dry period exceeding a month.
- At the end of the dry season and just before the first shower of rain is anticipated, the storage tank should be scrubbed and flushed off all sediments and debris.

DA: Typical layout sketch plan No.1 to 5.

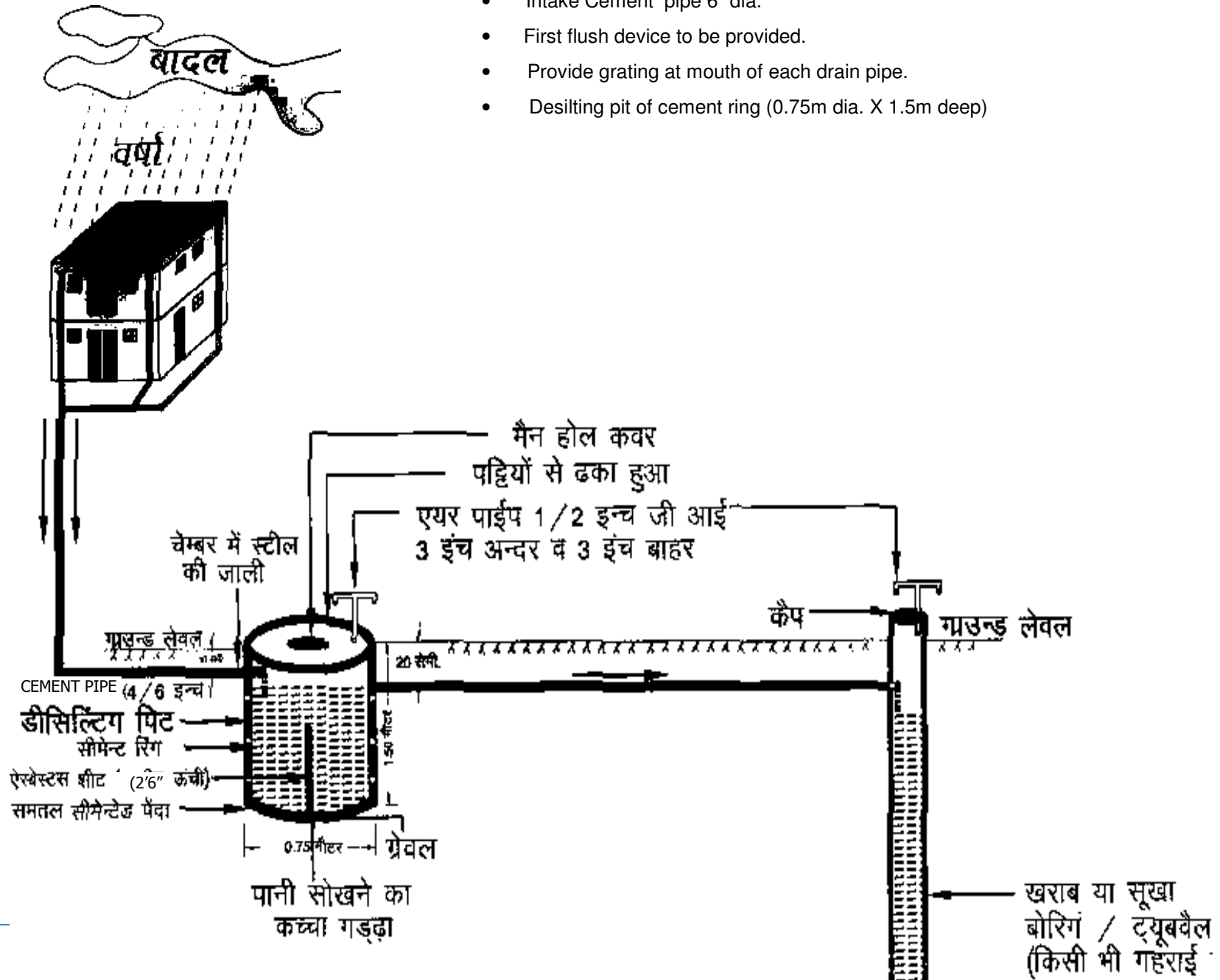
(No. W/432/0/CE dated 03.01.2013)

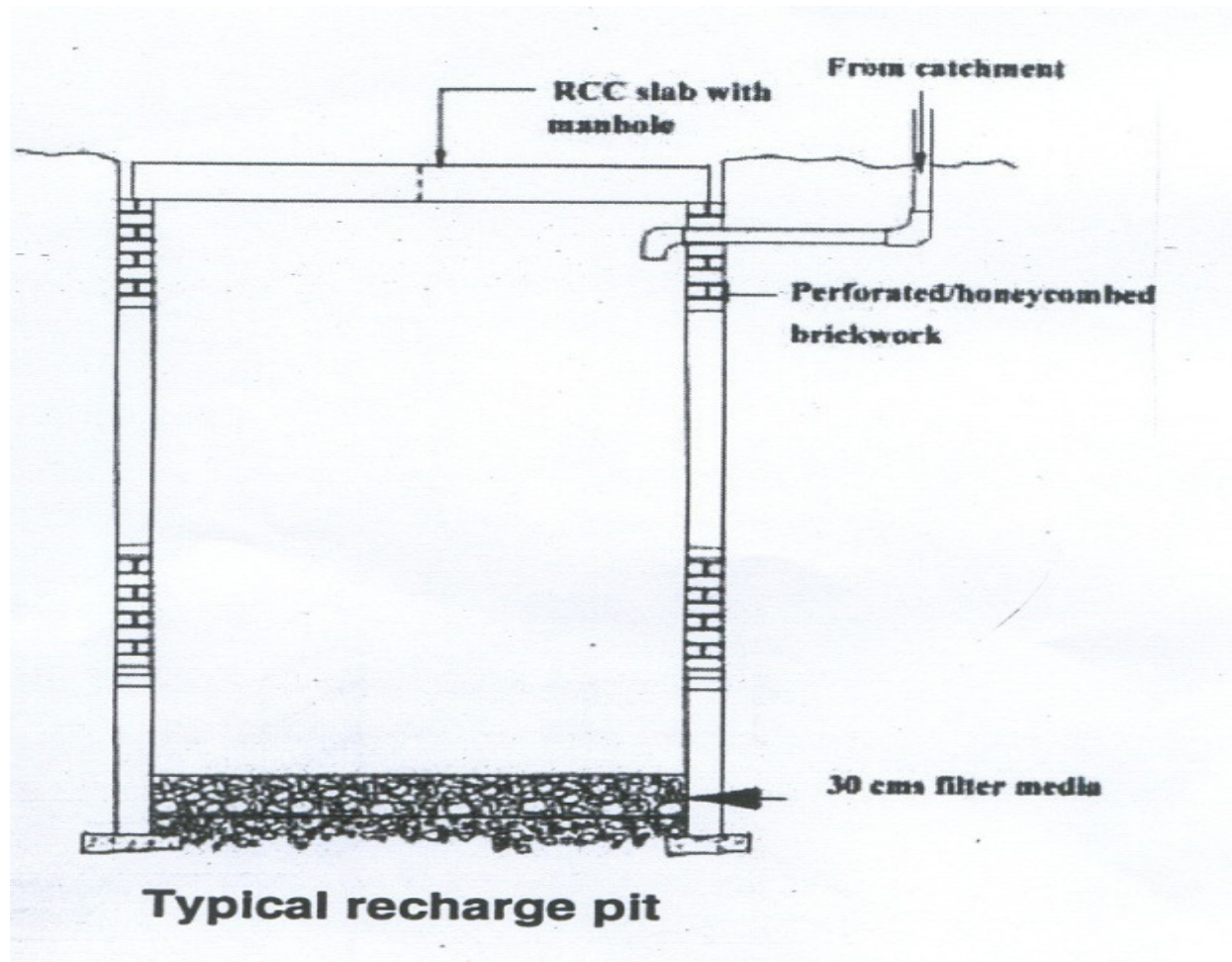
**( Y.P.Singh)**  
**Principal Chief Engineer**

# GROUND WATER RECHARGE BY EXISTING TUBE WELL/HAND PUMPS

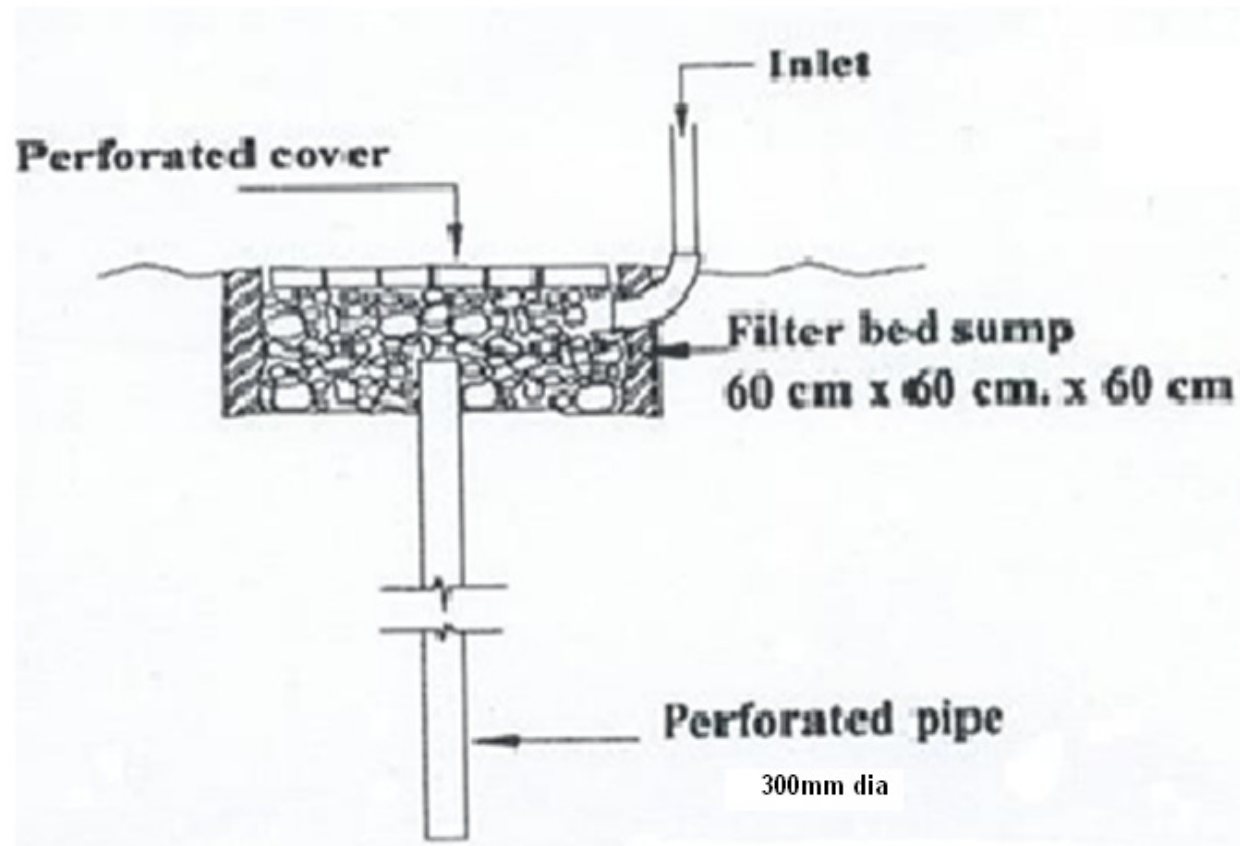
## SKETCH PLAN NO.1

- PVC Pipe 4"/6" dia.
- Intake Cement pipe 6" dia.
- First flush device to be provided.
- Provide grating at mouth of each drain pipe.
- Desilting pit of cement ring (0.75m dia. X 1.5m deep)





## RECHARGE PIT



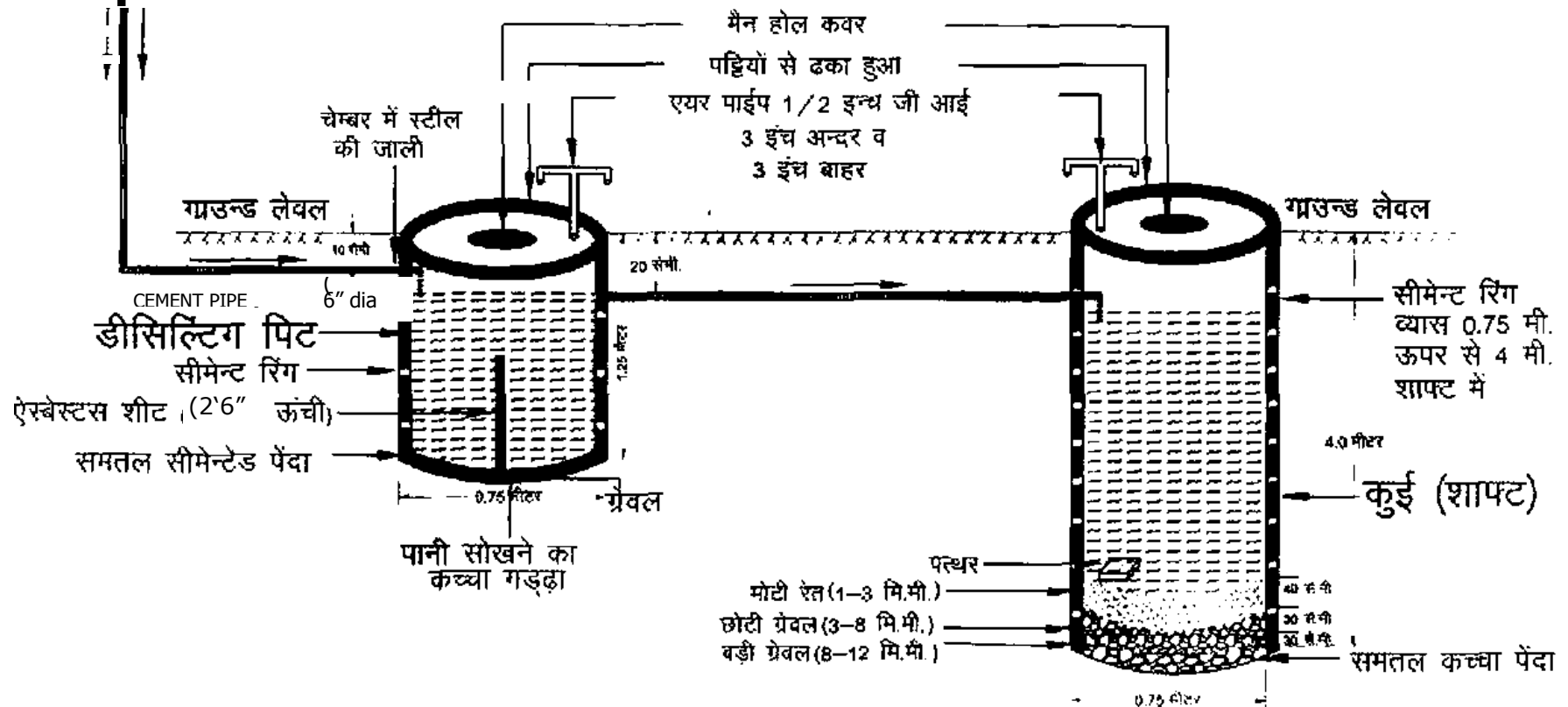
**RECHARGE SHAFT**

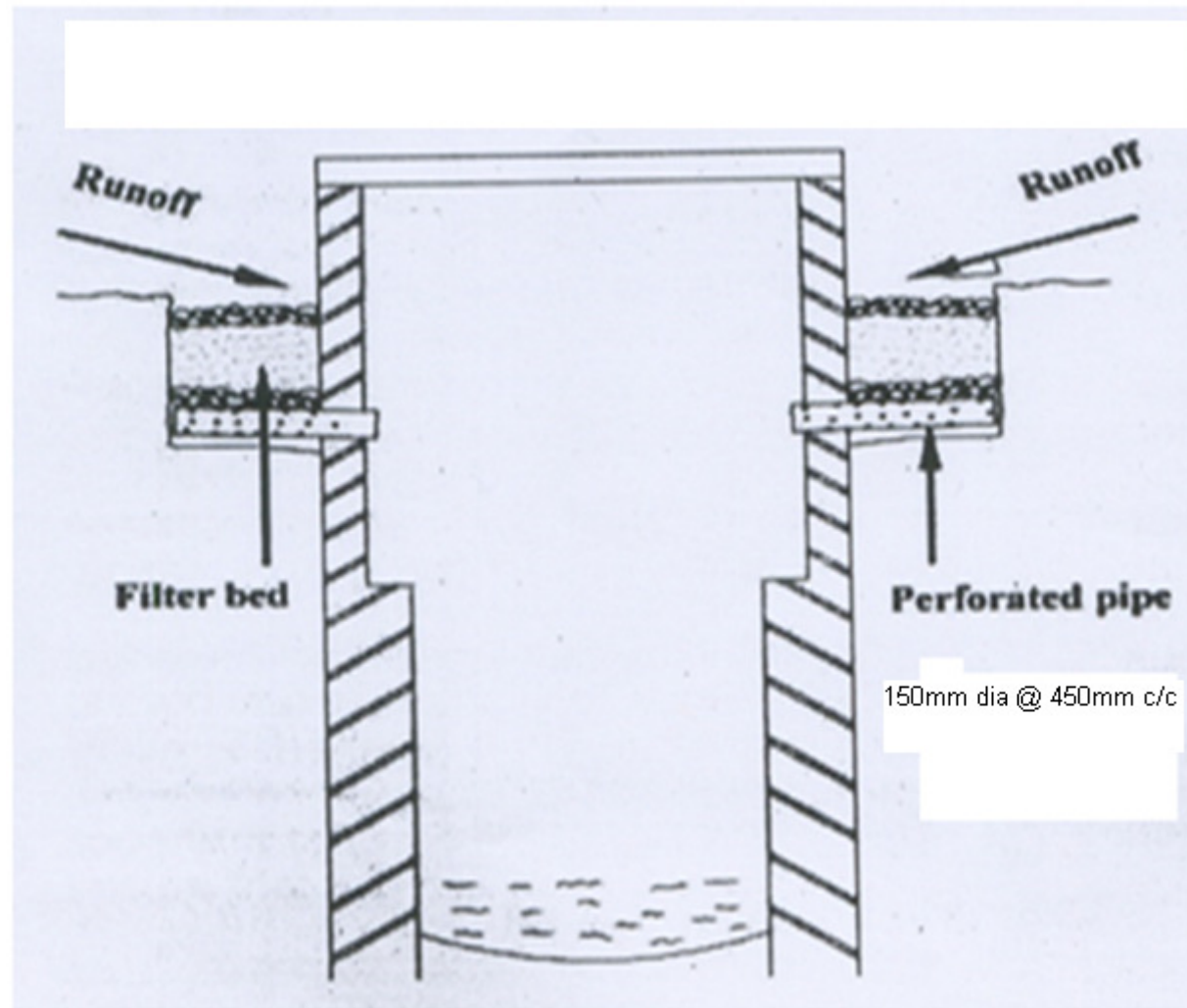


## BUILDING ROOF TOP

## Sketch Plan No.4

- PVC down pipe 4" dia.
- Intake Cement pipe 6" dia.
- First flush device to be provided.
- Provide grating at mouth of each drain pipe.
- Desilting pit of cement ring (0.75m dia. X 1.25m deep)
- Shaft of cement ring (0.75m dia. X 4m deep)
- Manhole to be provided for intake pipe at suitable interval and on change of direction.





RECHARGE OF WELLS