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मानक

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IS 14961 (2001): Guidelines for Rain Water Harvesting in Hilly Areas by Roof Water Collection System [CED 56: Hill Area Development Engineering]



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“ज्ञान एक ऐसा खजाना है जो कभी चुराया नहीं जा सकता है”

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भारतीय मानक

पहाड़ी क्षेत्रों में छत पर जल संग्रहण विधि द्वारा वर्षा के  
जल को एकत्रित करना — मार्गदर्शी सिद्धांत

*Indian Standard*

**GUIDELINES FOR RAIN WATER HARVESTING IN  
HILLY AREAS BY ROOF WATER  
COLLECTION SYSTEM**

ICS 13.060.10; 13.060.20

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**BUREAU OF INDIAN STANDARDS**  
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NEW DELHI 110002

## FOREWORD

This Indian Standard was adopted by the Bureau of Indian Standards, after the draft finalized by the Hill Area Development Engineering Sectional Committee had been approved by the Civil Engineering Division Council.

In the absence of sustained drinking water sources, rain water collection and storage is one of the effective means to provide drinking water. The term 'Water Harvesting' connotes collection and storage of rain water and also other activities aimed at harvesting surface water, prevention of losses through evaporation and seepage, and all other hydrological studies and engineering interventions aimed at conservation and efficient utilization of limited water endowment of a physiographic unit such as a watershed or a geomorphic basin.

The water harvesting is affected by:

- a) *In-situ* harvesting,
- b) Artificial recharge — methods and structures, and
- c) Treatment of catchments for augmenting surface run-off.

*In-situ* harvesting system is necessary in areas, where (a) rainfall is scanty, and/or (b) water bearing geological formations are not available.

*In-situ* harvesting is affected through natural and artificial sources. Roof water collection system is recommended as the first option for hill areas and also in arid/semi-arid and coastal areas.

The composition of the technical committee responsible for the formulation of this standard is given in Annex A.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

## *Indian Standard*

# GUIDELINES FOR RAIN WATER HARVESTING IN HILLY AREAS BY ROOF WATER COLLECTION SYSTEM

### 1 SCOPE

This standard covers guidelines for rain water harvesting in hilly areas by roof water collection system.

### 2 REFERENCES

The following Indian Standards contain provisions which through reference in this text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreement based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards given below:

<i>IS No.</i>	<i>Title</i>
277 : 1992	Galvanized steel sheet (plain and corrugated) ( <i>fifth revision</i> )
1239 (Part 1) : 1990	Mild steel tubes, tubulars and other wrought steel fittings: Part 1 Mild steel tubes ( <i>fifth revision</i> )
1254 : 1991	Corrugated aluminium sheet ( <i>third revision</i> )
1536 : 1989	Centrifugally cast (spun) iron pressure pipes for water, gas and sewage ( <i>first revision</i> )
4984 : 1995	High density polyethylene pipes for water supply ( <i>fourth revision</i> )
12701 : 1996	Rotational moulded polyethylene water storage tanks ( <i>first revision</i> )
14243 (Part 2) : 1995	Selection and development of site for buildings in hill areas — Guidelines: Part 2 Selection and development

### 3 GENERAL

Rain water may be harvested in areas, having rainfall of considerable intensity, spread over the larger part of the year, that is, in the hilly areas. Roof water collection is an ideal solution for water problem where there is inadequate ground water supply and surface sources are either lacking or insignificant. Rain water is bacteriologically pure, free from organic matter and soft in nature.

### 4 ROOF WATER COLLECTION SYSTEM

4.1 In this system roof top forms the catchment.

Typical details of roof water harvesting structures are given in Fig. 1 and 2.

#### 4.2 Materials

Although suitable locally available materials of non-corroding, non-rusting, non-absorbent nature are permissible, for longer life, materials indicated below are recommended.

##### 4.2.1 Roofing

Galvanized iron sheet (*see IS 277*), aluminium sheet (*see IS 1254*), deleterious glass fibre sheet, concrete clay tiles, slates and other roofing materials. Thatched roof may be used provided it is covered by water proof sheeting like food grade low density polyethylene films.

If the roof is painted, only non-toxic paints be used for painting the roof. Water collected from roofs painted with toxic paints should not be used for drinking purposes.

##### 4.2.2 Drain (Gutter)

Galvanized iron sheet (*see IS 277*), wood, bamboo or reinforced cement concrete gutters.

##### 4.2.3 Down Pipe

Galvanized mild steel pipe [*see IS 1239 (Part 1)*] cast iron pipe (*see IS 1536*), high density polyethylene pipe (*see IS 4984*).

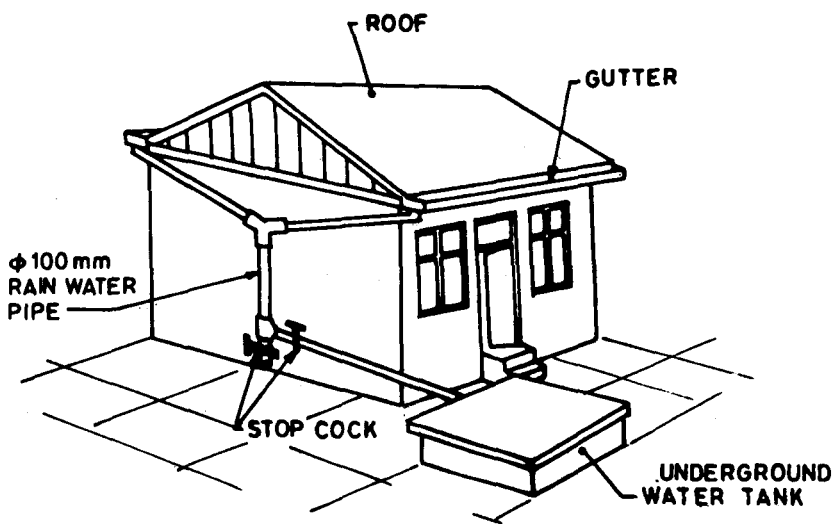
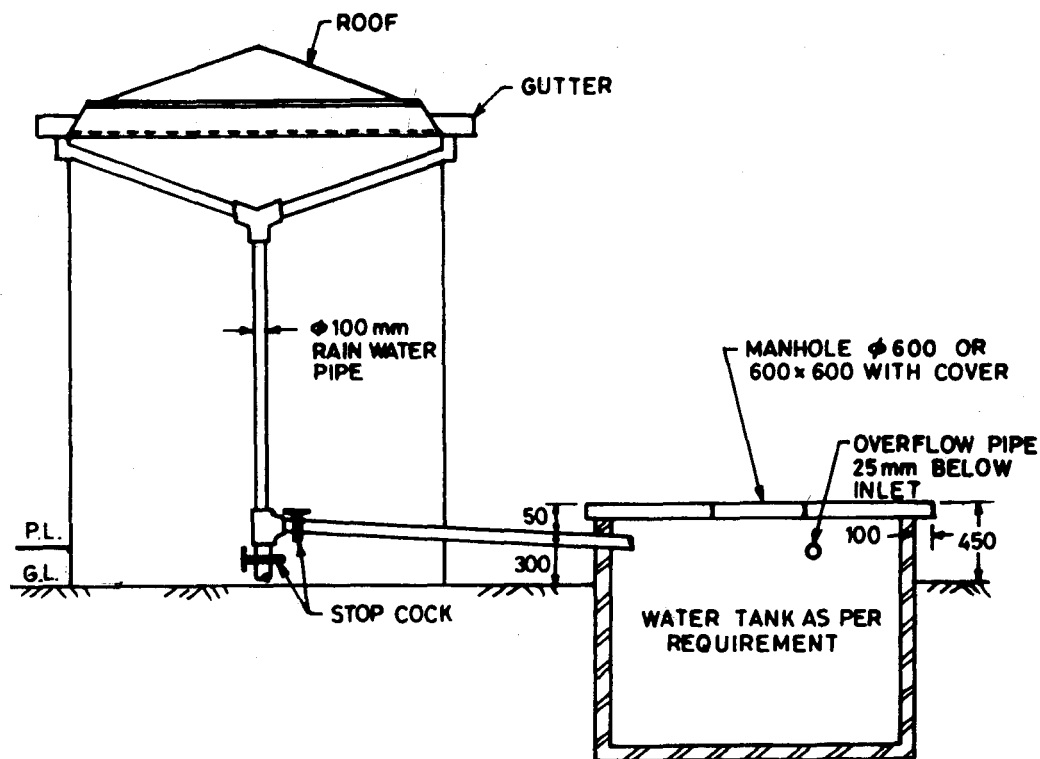
##### 4.2.4 Storage Tank

- a) *Underground* — Masonry or reinforced cement concrete structure suitably lined with water proofing materials, high density polyethylene tanks (*see IS 12701*).
- b) *Over Ground/Surface* — Galvanized iron sheet (*see IS 277*), reinforced cement concrete, plastic/high density polyethylene (*see IS 12701*) or ferro-cement sheet.

#### 4.3 General Requirements

The following requirements should be considered for designing/installing/operating the system, although the choice of the tank depends on locally available materials and space available:

- a) The tank should be located on slope which is structurally stable. In case the slope is in the



All dimensions in millimetres and tentative.  
 Dimensions may be modified depending upon the site requirements.

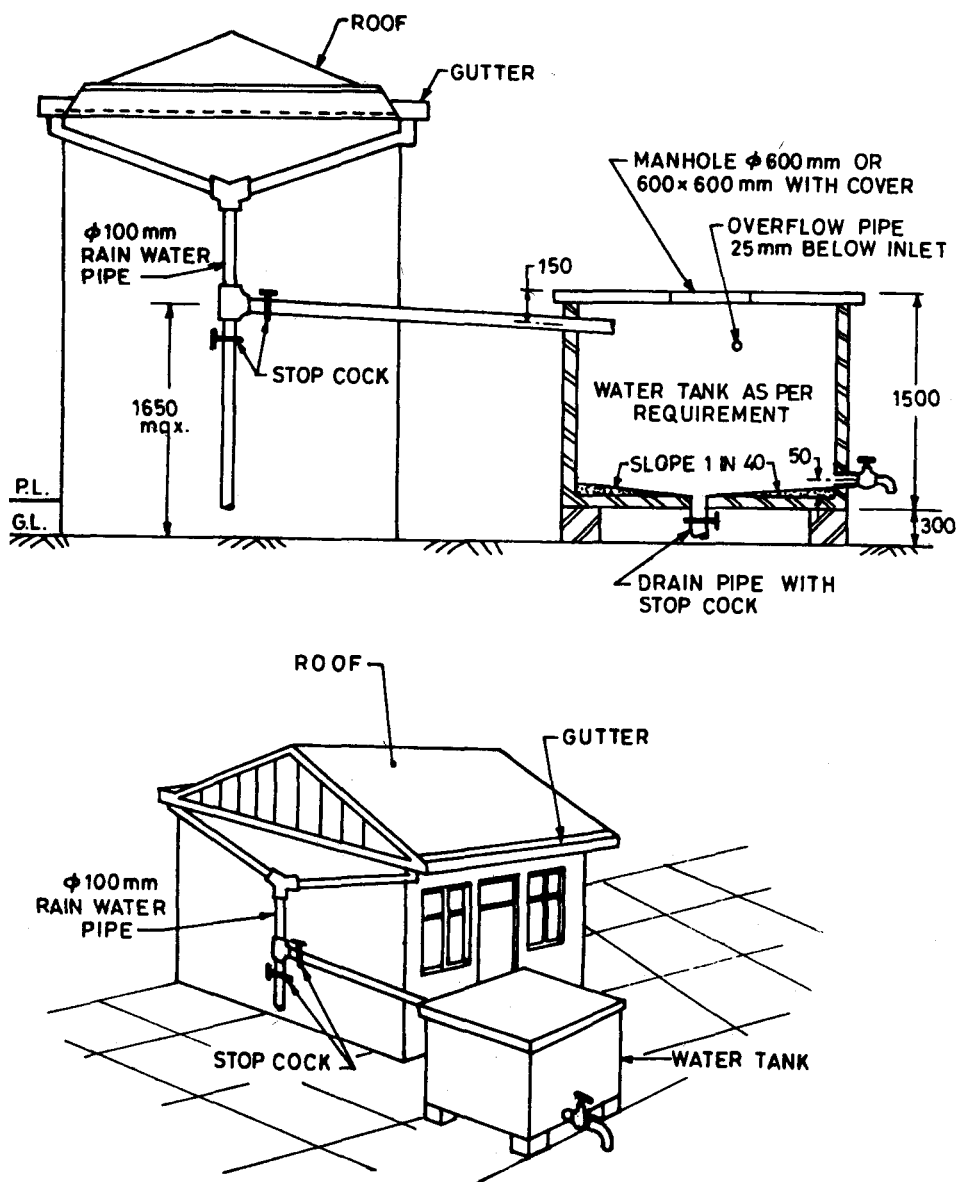
FIG. 1 TYPICAL ROOF WATER COLLECTION STRUCTURES — UNDERGROUND

distress, adequate safety measures be taken before installation of tank [see IS 14243 (Part 2)].

- b) The size of the tank depends upon factors like daily demand, duration of dry spell, catchment area and rainfall.
- c) The down pipe should be of at least 100 mm

diameter with 20 mesh (850 microns) nylon wire screen at the inlet to prevent dry leaves and debris from entering in it.

- d) Dust, bird droppings, etc, accumulated on the roof during the period of no rain and washed off with the first rains shall not be allowed to enter the storage tank to contaminate the



All dimensions in millimetres and tentative.  
Dimensions may be modified depending upon the site requirements.

FIG. 2 TYPICAL ROOF WATER COLLECTION STRUCTURES — OVERGROUND

water. This can be prevented by two methods:

- 1) Simple diversion of foul water, and
- 2) Installation of foul flush system.

Under method (1), the down pipe is moved away from the inlet of the storage tank initially during the rains, until clean water flows. Under method (2), storage provision for initial rain should be kept in a pipe. These are cleaned after each heavy rain. These are provided between down pipe and the storage tank.

- e) Filter materials such as gravel, sand, or coconut, palm or betalnut fibre, etc, should be used as filter media.
- f) Underground storage tanks should be suitably lined with water proofing material and preferably have a hand pump installed for withdrawal of water. Their top shall remain at least 300 mm above the ground.
- g) The bottom of surface tank should be placed little higher than the ground level on a raised



platform. An outlet pipe should be fixed at the bottom of the tank to facilitate cleaning of the tank. A tap should be provided for withdrawing water.

- h) The following provisions shall be made:
- 1) a manhole of 600 mm × 600 mm square or 600 mm dia with cover,
  - 2) Vent pipe/overflow pipe (with screen) of 100 mm dia, and
  - 3) Drain pipe at bottom.
- j) Before the tank is put into use it should be thoroughly cleaned and disinfected with a

suitable disinfectant such as chlorine, bleaching powder, potassium permanganate. Since the water shall remain stored for quite a long time, periodical disinfection of stored water is essential to prevent growth of pathogenic bacteria.

- k) In order to avoid any instability to slopes, excess and after use water should be drained to the nearest nullah or any natural drains or disposed through a properly designed outlet system.

## ANNEX A

### (Foreword)

#### COMMITTEE COMPOSITION

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### Amendments Issued Since Publication

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