

# Instruction Manual

## Open Pan-Evaporation



Image of Open-Pan Evaporation (I.S. 5973-1970)



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# **TABLE OF CONTENTS**

<b>INSTRUCTION MANUAL .....</b>	<b>1</b>
<b>EVAPORATION PAN .....</b>	<b>1</b>
<b>1. INTRODUCTION.....</b>	<b>3</b>
<b>2. SPECIFICATION .....</b>	<b>3</b>
<b>3. INSTALLATION.....</b>	<b>4</b>
<b>4. OPERATION .....</b>	<b>5</b>
A. Rainfall .....	5
B. Class Is 5973:1970 Evaporation Pan .....	5
<b>5. OBSERVATION CHART TEMPLATE .....</b>	<b>10</b>

## **1. Introduction**

The (I.S.: 5973-1970) Evaporation Pan is used for measurement of water evaporation. It is normally installed on a wooden platform set on the ground in a grassy location. The pan is filled with water and exposed to represent an open body of water. The pan is filled to the datum in the fixed-point gauge. The evaporation rate can be measured by refilling to the datum in the fixed point gauge



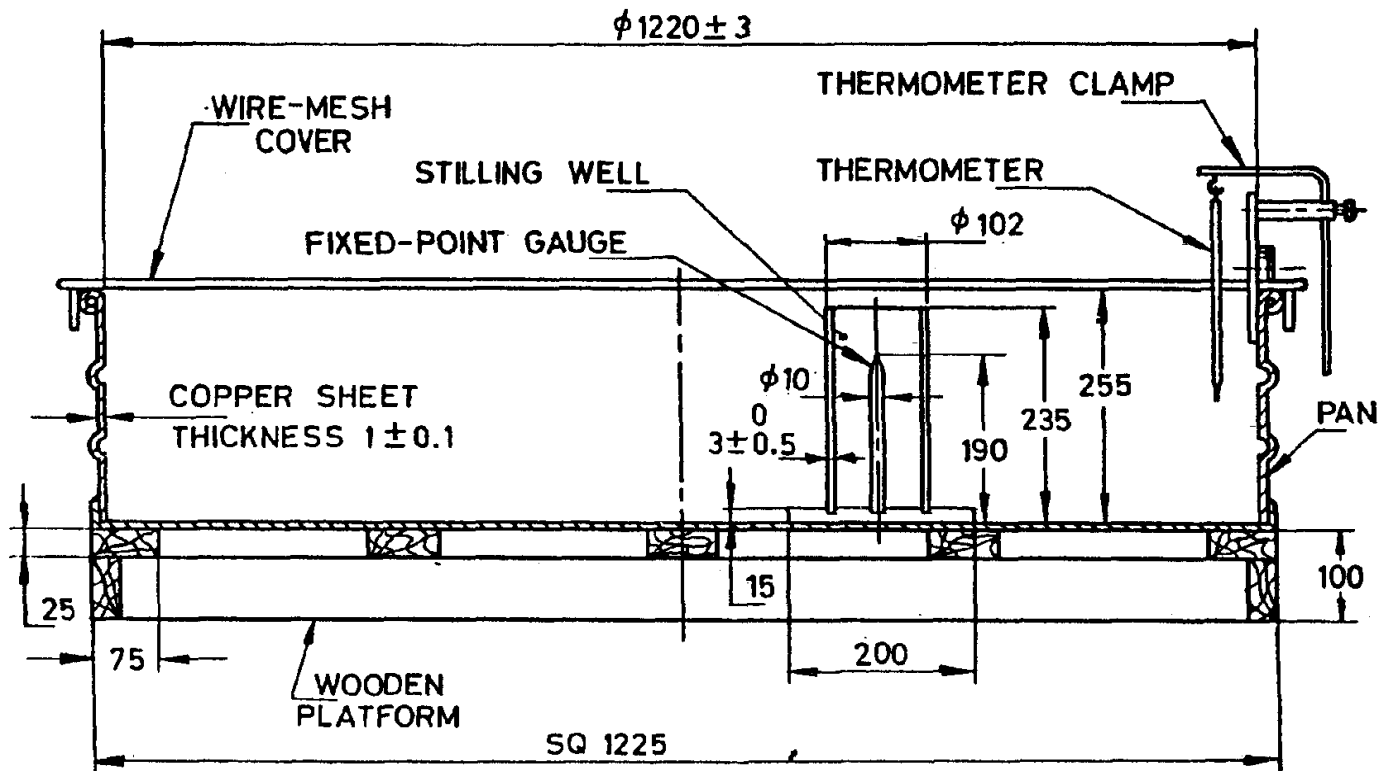
**Figure 1:** (I.S. 5973-1970) EVAPORATION PAN WITH FIXED POINT GAUGE AND MEASURING CYLINDER

## **2. SPECIFICATION**

- Specified by IS:5973 and known as the modified Class A Pan
- A pan of diameter 1220mm and depth 255mm
- The pan is made of copper sheet 0.9mm thick, tinned inside and painted white outside
- The pan is placed on a square wooden platform of width 1225 mm and height 100mm above ground level to allow free air circulation below the pan
- A fixed-point gauge indicates the level of water
- Water is added to or removed from the pan to maintain the water level at a fixed mark using a calibrated cylindrical measure
- The top of the pan is covered with a hexagonal wire net of GI to protect water in the pan from birds
- Presence of the wire mesh makes the temperature of water more uniform during the day and night
- Evaporation from this pan is about 14% lower as compared to that from an unscreened pan

### 3. INSTALLATION

The (I.S.: 5973-1970) Evaporation Pan is normally installed on a wooden platform on the ground. Please refer to figure below for details.



All dimensions in millimetres.

FIG. 1 DIMENSIONS FOR PAN EVAPORIMETER

Figure 2: (I.S.: 5973-1970) EVAPORATION PAN INSTALLED ON A WOODEN PLATFORM

## **4. OPERATION**

### **A. Rainfall**

To calculate the evaporation it is necessary to measure the rainfall and the water level in the pan at the same time.

#### **Normal Rainfall Situation:**

1. Read the rain gauge every day at 8:00 or 9:00 O' clock. If the raingauge is empty no entry need to be made against the date [i.e in column (L)]. [see figure (4) and figure (6)].
2. If the reading is 0.1 mm (i.e below the first graduation in the measure) enter the word "trace" in column (L) [see figure (4) and figure (6)] . *Note:* Days in which rainfall is less than 0.1 mm are not considered as rain days.
3. If the amount measured is due entirely to frost, fog or dew please write the word "frost", "fog" or "dew" beside the entry of the amount. *Note:* although an amount of 0.2 mm or more may be entered these particular days are not counted as rain days.
4. If there is an error in the raingauge reading due to "raingauge overflow", "raingauge leaking" or "funnel blocked by hail" enter the amount and enter the reason for suspecting the reading in the "remarks" section.

#### **Unusual Heavy Rainfall**

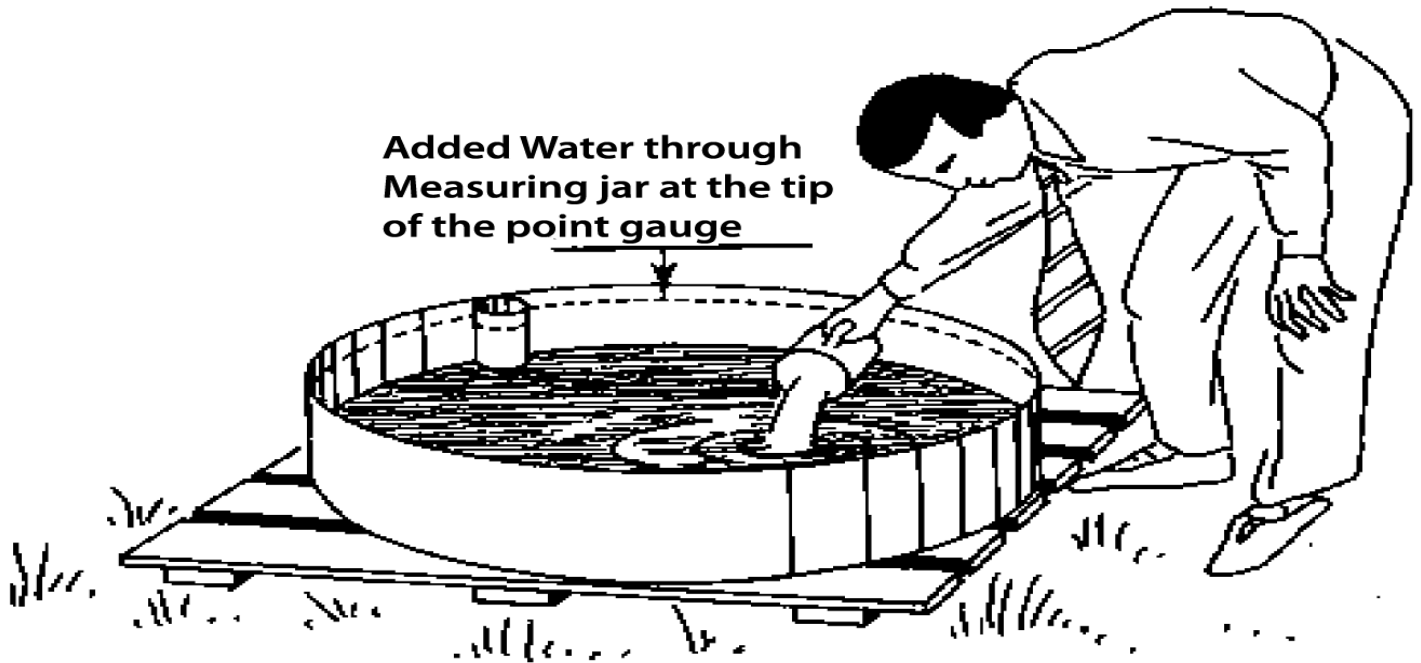
1. In addition to the routine check of rainfall at 8:00 or 9:00 O'clock, it is valuable to provide information of the actual time when heavy rainfall occurs.
2. If heavy rainfall has been falling for some hours a reading of the raingauge at the time is considered valuable information.
3. A reading of the raingauge at the end of a thunderstorm also provides valuable information.

### **B. Evaporation Pan**

1. Measure the evaporation daily at 8:00 or 9:00 O'clock.
2. If an observation is missed leave the columns for that day blank and enter the time interval since the previous observation in the remarks section (e.g. "72 hours period" entered on Monday when Saturday and Sunday are missed).

**Case1: Water level in the pan is below the fixed point proceed as follow:**

- (a.) Let “A” be the amount of water added to the pan, enter the “A” value in column (D) of the observation chart.
- (b) Water should only be added using the supplied **measuring cylinder**. **Always full measures** should be used.



*Figure 3: Refilling water to the fixed point gauge (datum).*

- (c). Let “E” be the **number** of full measures (i.e filled to the zero mark in the measuring cylinder).
- (d). Add the “E” value to column (E) in the observation chart and times the “E” value by 2.
- (e). Let “F” be the value of full measure **amount** added to the pan. Therefore the F value is obtained as shown in equation (1) below.

$$E \times 2 = F \text{ (Equation 1)}$$

$$\text{Let say } E= 4 \Rightarrow F = 4 \times 2 = 08 \text{ mm (Equation 2)}$$

- (f). Add the “F” value to the observation chart as shown in figure (4) below.
- (g). When the water level just reaches the fixed point **read**, to the nearest at tip of the fixed point gauge, the level of the water remaining in the measure.

## 5. Observation Chart Template

Please refer to the recording template below.

Rainfall, Evaporation		Station : NHPC Chamoli (Uttarakhand)						Time: 9: 00 AM		Date: 26/10/2017	
Day	Water Temperature (°C)		Amount of water Added or Removed (mm)					Rainfall (mm)	For office use only	Evaporation (mm)	Remarks
	Before touching Still Well Pointer	After touching Still Well Pointer	A or R	No. of full measures	full measures amount	Part measures amount	Total	24hours to 0900		If A in col F L+H=M	
	B	C	D	E x 2 =	F	G	(F+G)=H	L		If R in col F L-H=M	
									M		
1	27	26	A	4 x 2 =	08	0.5	8.5	1.5		10 mm	4 Full Measuring Jar
2				x 2 =							
3				x 2 =							
4				x 2 =							
5				x 2 =							

**Figure 4:** Example (1)- When adding water to the pan

- (h) Let “G” be the level of the water remaining in the measure. Add this value to the observation chart (see figure 4)

Let Say:  $G = 0.5 \text{ mm}$  (equation 3)

- (i). Let “H” be the entries added in column “F” and “G”

Therefore:  $H = F + G$  (equation 4)

Substitute equations (2) and (3) in equation (4)

Therefore  $H = 08 + 0.5 = 8.5 \text{ mm}$  (equation 5)

- (j). Add the rainfall value in column “L” to the “H” value and enter the result in column “M” of the observation chart

Therefore the evaporation to the nearest top of the point gauge is calculated as follows:

$M = L + H$  (equation 6)

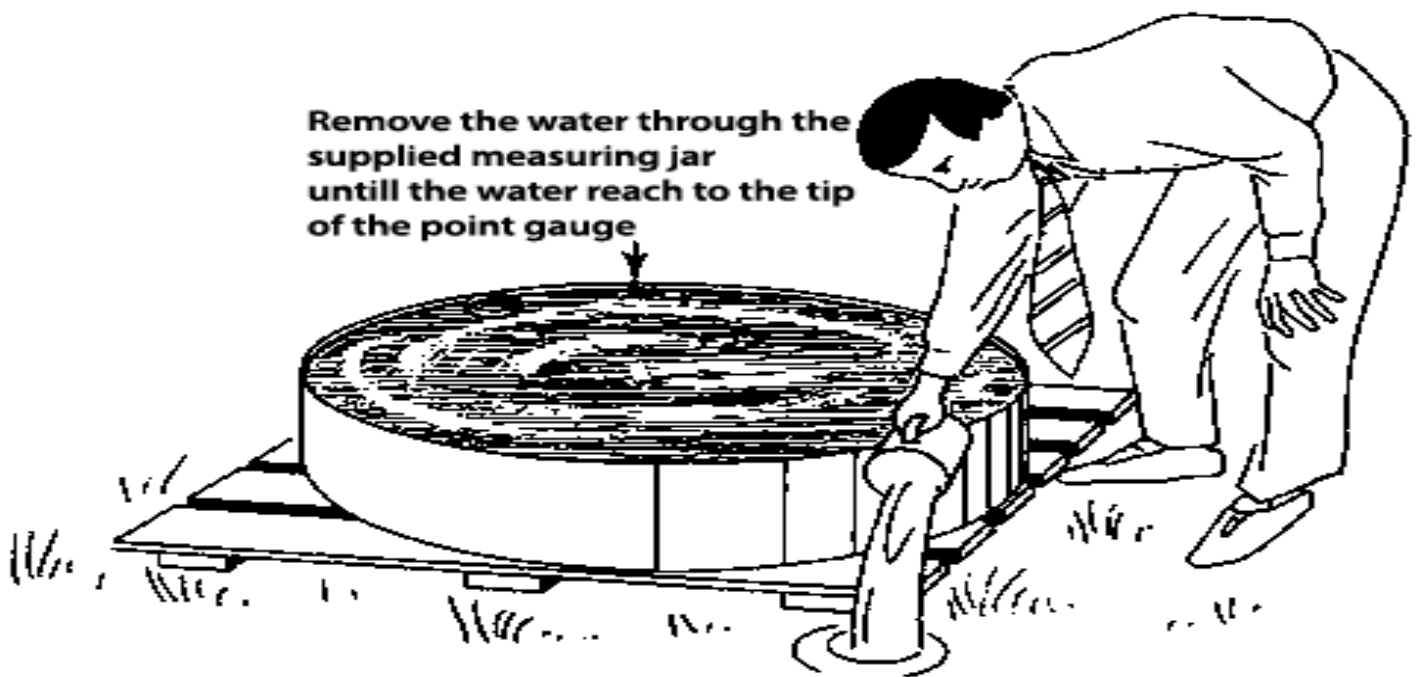
By looking at the example in figure (4) the value of “M” will be:

**$M = 1.5 + 8.5 = 10.0 \text{ mm}$**

**Note:** Please note equation (6) is only used when water is added to the evaporation pan by the observer

## Case2: Water level in the pan is above the fixed point proceeds as follow:

- (a) Let “R” be the amount of **water removed** from the pan, enter the “R” value in column (D) of the observation chart.
- (b) Water should only be removed using a vessel and the supplied **measuring cylinder**. Remove water with a vessel and pour into measuring cylinder till you reach the **zero mark**. Continue with the operation until the level of water required in the pan is reached. If the last measure is **partly filled** read value to the nearest at the top of the Fixed Point Gauge.
- (C) Let “E” be the **number** of full measures removed (i.e filled to the zero mark in the measuring cylinder).
- (d) Add the “E” value to column (E) in the observation chart and times the “E” value by 2.



*Figure 5:* Emptying water to the fixed point gauge (datum).

- (e). Let “F” be the value of full measure **amount** removed from the pan.  
Therefore the F value is obtained as shown in equation (7) below.  
 $E \times 2 = F$  (equation 7).  
Let say  $E = 4 \Rightarrow F = 4 \times 2 = 8$  mm (equation 8)
- (f). Add the “F” value to the observation chart as shown in figure (6) below

## 5. Observation Chart Template

Please refer to the recording template below.

Rainfall, Evaporation			Station : NTPC Joshimath (U.K)					Time: 9:00 AM		Date: 26/03/2016	
Day	Water Temperature (°C)		Amount of water Added or Removed (mm)					Rainfall (mm)	For office use only	Evaporation (mm)	Remarks
	Before touching Still Well Pointer	After touching Still Well Pointer	A or R	No. of full measures	full measures amount	Part measures amount	Total	24hours to 0900		If A in col F L+H=M	
	B	C	D	E x 2 =	F	G	(F+G)=H	L		M	
1	22	22.5	R	4 x 2 =	08	1.0	9.0	18.5		9.5	4 Full Measuring Jar Removed
2				x 2 =							
3				x 2 =							
4				x 2 =							
5				x 2 =							
6				x 2 =							

**Figure 6:** Example (2)- When removing water from the pan.

- (g) Let “G” be the level of the water remaining in the partly filled measure.  
Add this value to the observation chart (see figure 6)

Let Say:  $G = 1.0 \text{ mm}$  (equation 9)

Let “H” be the entries added in column “F” and “G”

Therefore:  $H = F + G$  (equation 10)

Substitute equations (8) and (9) in equation (10)

Therefore  $H = 8 + 1.0 = 9.0 \text{ mm}$  (equation 11)

- (i) Subtract the rainfall value in column “L” from the “H” value and enter the result in column “M” of the observation chart

Therefore the evaporation to the nearest to the tip of the Point Gauge is calculated as follows

$M = L - H$  (equation 12)

By looking at the example in figure (6) the value of “M” will be:

$M = 18.5 - 9.0 = 9.5 \text{ mm}$

**Note:** Please note equation (12) is only used when water is removed from the evaporation pan by the observer. If there is a Bird Guard in use with the evaporation pan. Please use the gate on the top when adding or removing water from the pan and close when operation is finished.

### Case 3 . Heavy Rain Fall

If, due to heavy rain, the level of water in the pan has risen to a height that it is less than 12 mm from its rim, no evaporation reading will be recorded.

## 5. Observation Chart Template

Please refer to the recording template below.

Rainfall, Evaporation			Station :					Time:		Date:	
Day	Water Temperature (°C)		Amount of water Added or Removed (mm)					Rainfall (mm)	For office use only	Evaporation (mm)	Remarks
	Before touching Still Well Pointer	After touching Still Well Pointer	A or R	No. of full measures	full measures amount	Part measures amount	Total	24hours to 0900		If A in col F L+H=M	
	B	C	D	E x 2 =	F	G	(F+G)=H	L		If R in col F L-H=M	
1				x 2 =							
2				x 2 =							
3				x 2 =							
4				x 2 =							
5				x 2 =							
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28				x 2 =							
29				x 2 =							
30				x 2 =							
31				x 2 =							
Total							Total Rainfall		Total Evap.		Name of observer:
Mean											Signature