

## Indian Standard

**METHODS OF SAMPLING AND TEST ( PHYSICAL AND  
CHEMICAL ) FOR WATER AND WASTE WATER  
PART 20 DISPERSION CHARACTERISTICS ( FLOW PATTERNS )  
( First Revision )**

**1. Scope** — Prescribes dye dispersion method for determination of dispersion characteristics of a water body.

**2. Principle** — Dispersion characteristics of a water body are determined using the organic pigment rhodamine-B.

**3. Apparatus** — Fluorometer.

**4. Reagents**

**4.1 Sodium Chloride** — saturated solution.

**4.2 Dye** — Rhodamine-B dissolved in methanol in the proportion 1 : 5 resulting in a solution of density 0.8 g/ml approximately.

**5. Procedure**

**5.1** Increase the density of rhodamine-B solution, by adding saturated sodium chloride solution, to the value of the density of the water body. Inject this solution into the water body.

**5.2** At regular intervals, draw a sample from the centre of the patch ( $r = 0$ ) and determine the concentration of rhodamine-B using a fluorometer, which measures the fluorescence of the dye present in the sample. Hence obtain the concentration of the dye.

**5.3 Precautions** — The following should be noted before the results are interpreted:

- a) Fluorescence of rhodamine-B decreases by about 2 percent per °C increase in temperature;
- b) Effect of the chlorinity of water is insignificant;
- c) The dye is heavily adsorbed by organic suspended matter and this adsorption decreases with increasing chlorinity;
- d) In bright sunlight the fluorescence decreases by about 2 percent per hour and by about 0.5 percent per hour in cloudy conditions;
- e) It may be noted that the position of the centre of the patch of the dye is an indicator of the movement of the water body; and
- f) The dispersion can also be measured directly by using an *in-situ* fluorometer, which is commercially available.

**6. Calculation** — Calculate the diffusion parameter using the following equation :

$$C(r, t) = \frac{M e^{-r/t}}{2\pi (pt)^2}$$

where

$M$  = mass of rhodamine-B injected into a layer of unit thickness in g/cm,

$r$  = distance from the centre of the patch (point of maximum concentration) in cm,

$t$  = time in s,

$p$  = diffusion parameter in cm/s, and

$C$  = concentration of rhodamine-B dye in g/cm.

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