IS : 11629 - 1986

(Reaffirmed 1997)

Indian Standard

CODE OF PRACTICE FOR INSTALLATION AND OPERATION OF SINGLE POINT HYDRAULIC OVER-FLOW SETTING GAUGE

UDC 681·128:681·121·873:006·76

INDIAN STANDARDS INSTITUTION
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

Gr 2

December 1986

Indian Standard

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Indian Standard

CODE OF PRACTICE FOR INSTALLATION AND OPERATION OF SINGLE POINT HYDRAULIC OVER-FLOW SETTING GAUGE

0. FOREWORD

0.1 This Indian Standard was adopted by the Indian Standards Institution on 30 January 1986, after the draft finalized by the Foundation Engineering Sectional Committee had been approved by the Civil Engineering Division Council.

0.2 Hydraulic over-flow settlement gauge is a simple device used for measuring settlements of earthfill like ground; embankments and dams. This standard is being formulated so as to cover detail guidance in regard to installation and operation of such single point type of gauge which is commonly used.

0.3 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*. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

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1. SCOPE

1.1 This standrad covers details of installation and operation of single point hydraulic over-flow settlement gauge.

2. GENERAL

2.1 Hydraulic over-flow settlement gauge is essentially a instrument which works on the principle of manometer and is thus basically a large U-tube. Its one end is in the form of a measuring stand pipe (manometer) located in a remotely built instrument house and the other end is an over-flow tube terminating in the settlement capsule.

*Rules for rounding off numerical values (*revised*).

2.2 The unit comprises (a) a cylindrical settlement capsule (cell) of glass/ Pvc (b) a rigid transparent measuring glass/Pvc stand pipe which shall a metre high and (c) a set of three Pvc/glass tubes that is drain tube, air line tube and water over-flow tube with brass leak proof connections. Each of these tubes shall be not less than 30 m long (*see* Fig. 1).

3. INSTALLATION AND OPERATION (*see* Fig. 1)

3.1 The three tubes should be connected at the appropriate junctions at the bottom of the settlement cell through leak proof connections and the cell should be installed vertically within the fill or the subgrade at the elevation where measurements are required. The cell should then be encased in concrete. The tubings from the cell should be laid in a shallow trench leading to the instrument house. In order to assist quick drainage of the water from the cell, a minimum longitudinal slope of 1 in 100 should be provided in trench bottom towards instrument house. The tubings should be coated with minimum 50 mm thick bentonite layer of working consistency and the trench backfilled with sand or soil to avoid stones damaging the tubes. A reference level is marked on the outside of each gauge in order to check the initial reading.

3.2 The height of the stand pipe should be selected so as to cover up the elevation of the cell unit and its anticipated settlement.

3.3 When the centre of the scale of the stand pipe is at the same level as the upper end of the over-flow tube in the settlement cell, the air pressure acting on both is the same. The elevation of the over-flow level in the cell is then read out on the scale attached to the stand pipe.

3.4 If it is not possible to have the buried settlement cell and the stand pipe at the same level, the air pressure in the stand pipe can be increased or reduced by a column of water. At rest (stabilization), the water level stands in the stand pipe lowered or raised by exactly the height of the additional water column.

3.5 The gauge should have an accuracy of $\pm$ 1 mm when the stand pipe is at the same height as the cell and $\pm$ 2 mm when the water column is used.

4. PROCEDURE

4.1 The system is primed by passing de-aired water from the read-out location to the cell via the water tube, and back through the drain tube. This circulation should be continued until all air has been removed from the water tube.

4.2 The water supply valve is then closed, and air pressure applied to the top of the cell through the air line. All water, except that in the cylinder and water tube should be expelled and a continuous stream of air should be noted at the read out station through the drain tube.

4.3 The water level in the cell should then be at *A* as shown in Fig. 1 and the cell should be at the atmospheric pressure through the air tube. This level is noted in the stand pipe after connecting the same to the cell and adjusting it to the stabilized point.

4.4 Any subsequent settlement of the strate should cause a corresponding settlement of the cell, thus causing a variation in the level of the water column in the stand pipe. The changed level should be recorded after making necessary adjustments. The difference between initial and final levels of stand pipe water column level indicates the settlement at the level of the cell.

5. PRECAUTIONS

5.1 Before taking measurements, the over-flow tube should be de-aired. If necessary, a slight suction may be applied through the drain tube to facilitate drainage of the over-flow water. To take care of the effect of temperature of water, it should be flushed with de-aired water before each measurement is taken.

5.2 All connections should be ensured to be leak-proof and a pair of spanners should be used to screw and unscrew the compression couplings.

5.3 The measuring unit should be installed outside the zone affected by settlement.

5.4 As the air tube has to maintain the over-flow and the stand pipe water surfaces at the same pressure it should be kept free from all kinds of obstructions such as water droplets and other such obstructions.

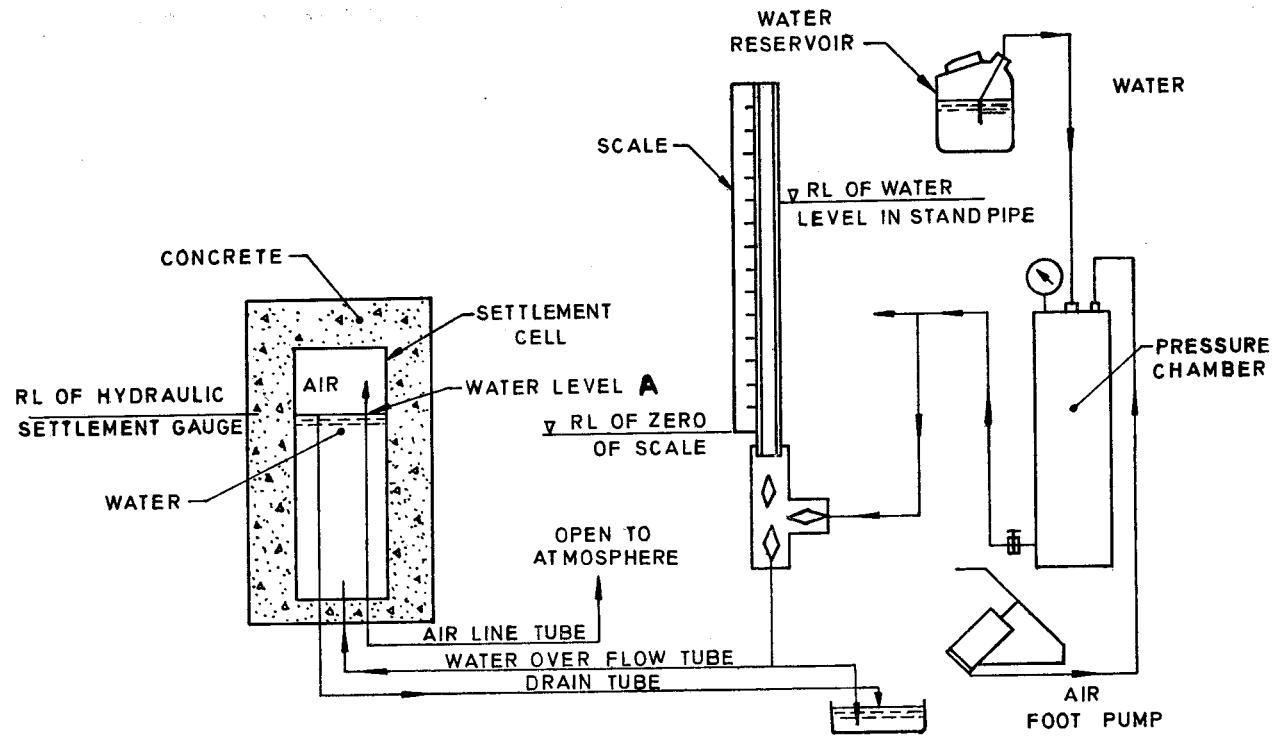

FIG. 1 DETAILS OF INSTALLATION OF SINGLE POINT HYDRAULIC SETTLEMENT GAUGE

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INTERNATIONAL SYSTEM OF UNITS (SI UNITS)

Base Units

Quantity	*Unit*	*Symbol*
Length	metre	m
Mass	kilogram	kg
Time	second	s
Electric current	ampere	A
Thermodynamic temperature	kelvin	K
Luminous intensity	candela	cd
Amount of substance	mole	mol

Supplementary Units

Quantity	*Unit*	*Symbol*
Plane angle	radian	rad
Solid angle	steradian	sr

Derived Units

Quantity	*Unit*	*Symbol*	*Definition*
Force	newton	N	1 N = 1 kg. m/s^2
Energy	joule	J	1 J = 1 N.m
Power	watt	W	1 W = 1 J/s
Flux	weber	Wb	1 Wb = 1 V.s
Flux density	tesla	T	1 T = 1 Wb/m^2
Frequency	hertz	Hz	1 Hz = 1 c/s (s^{-1})
Electric conductance	siemens	S	1 S = 1 A/V
Electromotive force	volt	V	1 V = 1 W/A
Pressure, stress	pascal	Pa	1 Pa = 1 N/m^2