

# इंटरनेट

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IS 14345 (1996): Specification for autoclave apparatus [CED  
2: Cement and Concrete]



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भारतीय मानक  
ऑटोकलेव उपकरण — विशिष्टि

*Indian Standard*  
AUTOCLAVE APPARATUS — SPECIFICATION

ICS 91.100.10

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**BUREAU OF INDIAN STANDARDS**  
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## FOREWORD

The Indian Standard was adopted by the Bureau of Indian Standards, after the draft finalized by the Cement and Concrete Sectional Committee had been approved by the Civil Engineering Division Council.

The Bureau of Indian Standards has formulated a series of standards on different types of cement and methods of test of cement. Having recognized that reliable and reproducible test results could be obtained only with use of standard testing equipments capable of giving desired level of accuracy, a series of specification covering the requirement of testing equipments have been brought out to encourage the development and manufacture of standard testing equipments for cement testing in the country.

Accordingly, this standard has been prepared to cover requirements of autoclave machine used for autoclaving of the cement specimens to be tested for soundness.

In the formulation of this standard due weightage has been given to international co-ordination among the standard and practices prevailing in different countries in addition to relating it to the practices in the field in this country.

The Composition of the Committee responsible for the formulation of this standard is given at Annex B.

For the purpose of deciding whether a particular requirement of this standard is complied, 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

## AUTOCLAVE APPARATUS – SPECIFICATION

### 1 SCOPE

This standard specifies the requirement of cement autoclave apparatus used for determination of soundness (Autoclave method) of cement.

### 2 REFERENCES

The following Indian Standards are necessary adjuncts to this standard.

IS No.	Title
1570 ( Part 5 ) : 1985	Schedules for wrought steels : Part 5 Stainless and heat resisting steels ( <i>second revision</i> )
2062:1984	Specification for weldable structural steel ( <i>third revision</i> )

### 3 MATERIALS

Materials of construction of different components of Autoclave apparatus shall be as given in Table 1.

### 4 CONSTRUCTION

4.1 Autoclave apparatus shall consist of a high pressure steam vessel with lid having thermometer well, connected on the vessel with bolts and nuts.

#### NOTES

1 Vessels fitted with the Autoclave apparatus shall be pre-certified from the competent authority.

2 The steam vessels shall be hydraulically tested every year during operation.

The high pressure steam vessel shall be enclosed in heat insulated metal housing with enamel finish. The autoclave shall be equipped with a rupture disk with a bursting pressure of  $2.4 \text{ MPa} \pm 5 \text{ percent}$  ( $24.5 \text{ kg/cm}^2 \pm 5$

percent). In locations where the use of rupture disk is not permitted, the autoclave shall be equipped with a safety valve.

In addition, the autoclave shall be equipped with a release valve to allow the escape of air during the early part of heating period and to release any steam pressure remaining at the end of the cooling period.

#### 4.2 Pressure Gauge

The pressure gauge shall have a dial with a nominal diameter of 114 mm. approximately and shall be graduated from 0 - 4.1 MPa ( 0 - 41.8 kg/cm<sup>2</sup> ) with scale division of not more than 0.04 MPa ( 0.4 kg/cm<sup>2</sup> ). The error in the gauge shall not exceed  $\pm 0.02 \text{ MPa}$  ( 0.2 kg/cm<sup>2</sup> ) at the operating pressure of 2.0 MPa ( 20.4 kg/cm<sup>2</sup> ).

#### 4.3 Capacity of Heating Unit

The capacity of the heating unit shall be such that with maximum load ( water and specimens ) the pressure of saturated steam in the autoclave may be raised to a gauge pressure of 2 MPa ( 20.4 kg/cm<sup>2</sup> ) in 75 minutes approximately from the time heat is turned on.

#### 4.4 Pressure Switch

The automatic pressure switch shall be capable of maintaining the gauge pressure at  $2 \pm 0.1 \text{ MPa}$  (  $20.4 \pm 1 \text{ kg/cm}^2$  ) for atleast 3 hours.

A gauge pressure of  $2 \pm 0.1 \text{ MPa}$  (  $20.4 \pm 1 \text{ kg/cm}^2$  ) corresponds to a temperature of  $214 \pm 2^\circ\text{C}$

#### 4.5 Rupture Disk

The rupture disk shall be made of a material having tensile strength that is relatively insensitive to temperature in the range of 20 to 216° and that is

**Table 1 Materials of Construction of Different Components of Cement Autoclave**

( Clause 3 )

Sl No.	Part	Material	Recommended Indian Standard Specification, if any
(1)	(2)	(3)	(4)
i)	Steam vessel	S.S. 04 Cr 19 Ni : 10	IS 1570 (Part 5) : 1985
ii)	Lid	S.S. 04 Cr 19 Ni : 10	IS 1570 (Part 5) : 1985
iii)	Safety valve	S.S. 04 Cr 19 Ni : 10	IS 1570 (Part 5) : 1985
iv)	Sample stand	S.S. 04 Cr 19 Ni : 10	IS 1570 (Part 5) : 1985
v)	Cabinet	Mild steel	IS 2062 : 1984

electro chemically compatible with the pipe leading to it and to its holder.

5 Autoclave shall be designed to permit the gauge pressure drop from 2.0 MPa ( 20.4 kg/cm<sup>2</sup> ) to less than 0.06 MPa ( 0.6 kg/cm<sup>2</sup> ) in one and half hours (90 min) after the heat supply is shut off.

6 The autoclave shall be provided with a temperature control system so that incase of steam escape also the temperature control will act as a safety device.

## 7 SAFETY REQUIREMENTS

7.1 The pressure gauge should have a maximum capacity of 4.1 MPa ( 41.8 kg/cm<sup>2</sup> ). This is important because, with too small capacity there is but little length of arc in which the gauge hand may indicate pressures above the specified maximum working pressure. The operator should be sure that the gauge hand has not passed the maximum graduation on the scale.

7.2 It is recommended to have the pressure gauge tested, however a thermometer should always be used together with the pressure gauge so as to provide a means of detecting any failure of the pressure gauge to operate properly and to indicate any unusual condition such as that resulting from loss of water

from autoclave during the test.

7.3 Recommendations for safe operation of Autoclave apparatus is given in Annex A.

## 8 MARKING

8.1 The following information shall be clearly and indelibly marked on autoclave machine.

- a) Indication of the source of manufacture,
- b) Date of manufacture, and
- c) Serial number.

## 9 BIS CERTIFICATION MARKING

Each autoclave machine may also be marked with the Standard Mark.

9.1 The use of Standard Mark is governed by the provisions of the *Bureau of Indian Standards Act, 1986* and the Rules and Regulations made thereunder. The details of conditions under which the licence for the use of Standard Mark may be granted to manufacturers or producers may be obtained from the Bureau of Indian Standards.

## ANNEX A

### ( Clause 7.3 )

#### RECOMMENDATIONS FOR SAFE OPERATION OF AUTOCLAVE APPARATUS

A-1 The automatic control should be maintained in proper working order at all times.

A-1.1 The safety valve should be set to relieve the pressure at about 5 percent above the maximum of 2.1 MPa specified in this method, that is at about 2.3 MPa. Unless the manufacturer has given specific instructions as to maintenance of the safety valve, the valve should be tested twice a year. It can be tested either with a gauge testing device, or by adjusting the automatic controls to allow the autoclave to reach a pressure of about 2.3 MPa, at which pressure the safety valve should either open or should be adjusted to open. The safety valve should discharge away from the operator.

A-1.2 Unexpected combinations of conditions causing failure of machine may also occur during operation. It should be rectified on the basis of the merit of the case.

A-1.3 Heavy leather work gloves should be used to prevent burning of the hands when removing the top of the autoclave at the end of the test. The vent valve should be directed away from the operator. When removing the autoclave lid, it should be so that any steam escaping from beneath the lid may be discharged away from the operator. Care should be taken to avoid scalding by any liquid that may have been used in the autoclave wall.

A-1.4 In autoclave pressure gauges in use, the return of the gauge hand to the initial rest of starting point may not necessarily indicate zero pressure within the autoclave; there may then still remain an appreciable pressure. Due precaution should be taken in such cases.

A-1.5 A few drops of kerosene placed in the vent valve once a week will aid in keeping the needle clear and in good condition.

## ANNEX B

### ( Foreword )

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