IS : 2645 - 1975
(Reaffirmed 1987)

Indian Standard

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SPECIFICATION FOR INTEGRAL CEMENT WATERPROOFING COMPOUNDS

(First Revision)

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

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Indian Standard

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(First Revision)

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Indian Standard

SPECIFICATION FOR INTEGRAL CEMENT WATERPROOFING COMPOUNDS

(First Revision)

0. FOREWORD

0.1 This Indian Standard (First Revision) was adopted by the Indian Standards Institution on 25 February 1975, after the draft finalized by the Cement and Concrete Sectional Committee had been approved by the Civil Engineering Division Council.

0.2 A number of proprietary integral cement waterproofing compounds exist in the market which, according to the manufacturers' recommendations, may be added to cement to render the mortar or concrete waterproof. However, recommendations are normally not available to test these products for their efficacy as waterproofers or their effects on other properties of cement. It was, therefore, considered necessary to publish this specification for such compounds.

0.2.1 This standard was first published in 1964. The provisions of the standard have been under the review of the Cement and Concrete Sectional Committee from time to time and the first revision has been taken up with a view to modifying the earlier requirements in the light of experience gained in working to this standard by both manufacturers and users.

0.3 The usefulness of the integral waterproofing compounds is sought to be determined by measuring the permeability of standard mortar specimens prepared with and without the addition of such compounds. The grading of the sand to be used in preparing these specimens is different from that of the standard sand (*see* IS : 650-1966*) used ordinarily in the testing of Portland cement. While in cement testing, the requirement of the sand in regard to size is that the sand obtained in three separate fractions, that is, 2 mm to 1 mm, 1 mm to 0·5 mm and below 0·5 mm be blended together, the sand specified for permeability test has a much closer control of particle size and is the same as that used in RILEM CEMBUREAU tests. This is a graded sand with five point control and ensures increased uniformity in

*Specification for standard sand for testing of cement (*first revision*).

testing of waterproofing compound as compared to the standard sand conforming to IS : 650-1966* which is of three point control.

0.3.1 A second variation from the normal practice in cement testing is in regard to the cement-sand ratio in the mortar. Instead of the usual 1 : 3 ratio, this standard specifies a ratio of 1 : 5 of cement and sand for the permeability test. The object in this is to have a mortar less dense than that used for cement testing (as in compressive strength tests) and having some capillary voids so that the effect of the addition of the waterproofing compounds may become more apparent.

0.3.2 Water-cement ratio for the test specimens for permeability tests is also different from the water-cement ratio normally employed for cement testing. While in the first specification (IS : 2645-1964), the water-cement ratio was maintained constant at 0·54, in this revision a constant workability has been specified in terms of flow of mortar. Instead of specifying a fixed water-cement ratio, it is considered more rational to mould specimens at a fixed workability. This change takes into consideration fineness of cement and improved workability, if any, brought about by the admixtures. A flow of 75 ± 5 percent has therefore been specified with the aim of producing mortar having sufficient plasticity to permit easy moulding without need for compaction by vibration or other means.

0.4 It is necessary that all constituent materials in concrete including integral cement waterproofing compounds should, as far as possible, be free from chlorides and sulphates. Sometimes, waterproofing compounds are likely to contain water soluble chlorides and sulphates which may cause corrosion of steel reinforcement in reinforced cement concrete and also produce other harmful effects in concrete. IS : 456-1964† prohibits the use of chlorides containing admixtures, and the possibility of specifying a maximum permissible limit of chlorides and sulphates in terms of total weight of concrete is under consideration in the revision of IS : 456-1964†. Since chlorides and sulphates can enter concrete from various sources, it is desirable that the chloride and sulphate content should be as low as possible in concrete admixtures, such as integral cement waterproofing compounds. Pending a decision for the maximum limit of chlorides and sulphates in the integral cement waterproofing compounds, provisions have been made in **2.4** requiring the manufacturer to declare chloride and sulphate contents in the integral cement waterproofing compounds so that different samples of waterproofing compounds can be compared and engineer-in-charge is in knowledge of the amount of chlorides and sulphates entering into concrete through waterproofing compound. To ensure unification in the method of determination of chlorides, IS : 6925-1973‡ has been formulated.

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*Specification for standard sand for testing of cement (*first revision*).
†Code of practice for plain and reinforced concrete (*second revision*).
‡Methods of test for determination of water soluble chlorides in concrete admixtures.

0.5 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 he 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.

1. SCOPE

1.1 This standard covers the requirements for integral cement waterproofing compounds which shall be assessed by:

a) the permeability to water of standard cylindrical specimens made from cement-sand mortars with and without the addition of the waterproofing compound under test, by measuring the percolation of water through standard cylindrical specimens, and

b) the physical tests of setting time and compressive strengths of cement mixed with the recommended proportions of the waterproofing compounds by comparing with similar tests on the same cement without the addition of the compounds.

NOTE 1 — Integral cement waterproofing compounds shall be used in such proportions as recommended by manufacturers but not exceeding 3 percent by weight of cement.

NOTE 2 — For purposes of **1.1** and other requirements in this specification, cement shall mean ordinary Portland cement conforming to IS : 269-1967†. By agreement between the purchaser and the supplier, testing of waterproofing compound may be done with Portland blastfurnace slag cement or Portland pozzolana cement conforming to IS : 455-1967‡ and IS : 1489-1967§ respectively.

2. REQUIREMENTS

2.1 Permeability to Water — The permeability to water of the standard cylindrical specimens prepared with the recommended proportion of the waterproofing compound shall be less than half the permeability of similar specimens prepared without the addition of the compound, when tested in the manner described in Appendix A.

2.2 Setting Time — The setting time of the cement mixed with the recommended proportion of the waterproofing compound, when tested

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

†Specification for ordinary, rapid-hardening and low heat Portland cement (*second revision*). (Since revised).

‡Specification for Portland blastfurnace slag cement (*second revision*).

§Specification for Portland-pozzolana cement (*first revision*).

according to IS : 4031-1968* (except that the time of gauging is not less than 5 min nor more than 6 min), shall conform to the following requirements:

Initial setting time, not less than	30 min
Final setting time, not more than	600 min

2.3 Compressive Strength — The average compressive strength of 3 mortar cubes, prepared, stored and tested in accordance with method of test for compressive strength of hydraulic cement (other than masonry cement) described in IS : 4031-1968*, using the recommended proportion of integral waterproofing compounds (*see* **1.1**, Notes 1 and 2) as admixture to the cement, shall be as follows:

Compressive strength at 3 days (72 h)	Not less than 160 kg/cm^2, nor less than 80 percent of the 3 days (72 h) compressive strength of mortar cubes prepared with cement and sand only, according to IS : 4031-1968*
Compressive strength at 7 days (168 h)	Not less than 220 kg/cm^2, nor less than 80 percent of the 7 days (168 h) compressive strength of mortar cubes prepared with cement and sand only, according to IS : 4031-1968*

NOTE — The requirement concerning 3 days compressive strength shall not apply in case of Portland pozzolana cement conforming to IS : 1489-1967† (*see* **1.1**, Note 2).

2.4 Chloride Content — The chloride content determined in accordance with IS : 6925-1973‡ and the sulphate content in the product shall be declared by the manufacturer.

APPENDIX A

(*Clause* 2.1)

TEST FOR DETERMINATION OF PERMEABILITY TO WATER OF CEMENT MORTARS WITH AND WITHOUT ADDITION OF INTEGRAL WATERPROOFING COMPOUND

A-1. GENERAL

A-1.1 This method of test covers the procedure for determining the permeability to water of the cement-sand mortar specimens, prepared with

*Methods of physical tests for hydraulic cement.
†Specification for Portland-pozzolana cement (*first revision*).
‡Methods of test for determination of water soluble chlorides in concrete admixtures.

and without the additions of the waterproofing compound and cured under specified conditions, by measuring the percolation of water through standard cylindrical specimens.

A-2. TESTING EQUIPMENT

A-2.1 Permeability Unit — The permeability unit shall consist of a specimen container ring of 100 mm diameter and 50 mm height held between a bottom plate and a water cell. The hydraulic head for testing shall be obtained by connecting the unit to a compressor through a water pressure vessel. A pressure regulator and a pressure gauge shall be included between the compressor and water pressure vessel to indicate the test pressure. Water percolating through the specimen shall be collected in a container. Figures 1 and 2 give details of an individual unit.

A-2.1.1 The water-cell shall be a 100 mm diameter brass cylinder and the top and bottom plates shall be either of brass or any other non-corroding metal. The connecting pipe line from the water-cell to the water pressure vessel shall also be of non-corroding metal or of hard polythene. This requirement is necessary since the tests last over a number of days in which mild steel or allied materials will corrode and the rust formed will coat the top of the specimen and affect the permeability. The connection of the units to the compressor shall be done by means of armoured heavy-duty rubber hose.

A-2.1.2 The water pressure vessel shall be made of galvanized steel and capable of withstanding the applied pressure with an adequate margin of safety.

A-2.2 Rammer — A standard rammer of the type shown in Fig. 3 shall be used to compact the mortar. The rammer shall consist of a plunger weighing 500 ± 5 g which shall fall freely through a height of 150 ± 1 mm in a tubular guide. The base of the plunger shall have a diameter of 50 ± 1 mm.

A-3. SAND

A-3.1 The sand to be used in the preparation of the mortar shall be natural, rounded siliceous sand with a maximum amount of quartz grains. The sand should preferably be the same as standard sand conforming to IS : 650-1966* but clean, separated and recombined to yield the following gradation:

IS Sieve Designation	*Cumulative Retained, Percent*
2·00 mm	0
1·70 mm	5 ± 5
1·00 mm	33 ± 5
500 micron	67 ± 5
150 micron	88 ± 5
75 micron	98 ± 2

*Specification for standard sand for testing of cement (*first revision*).

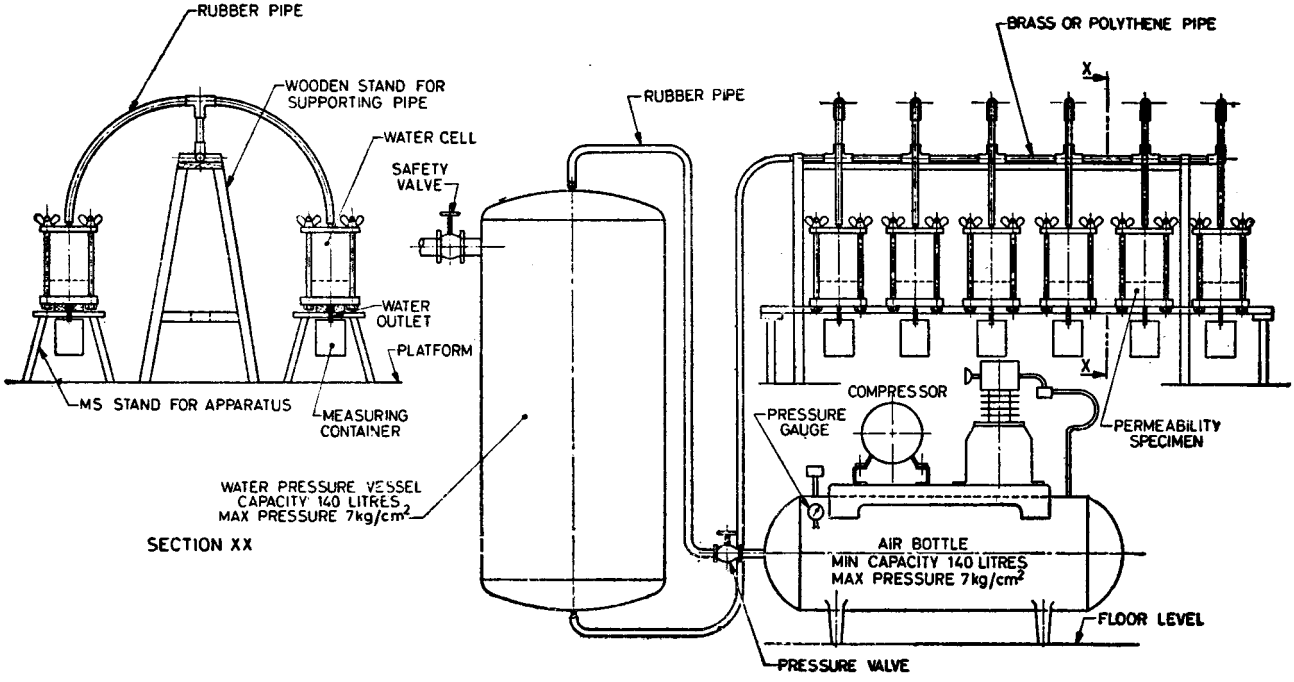
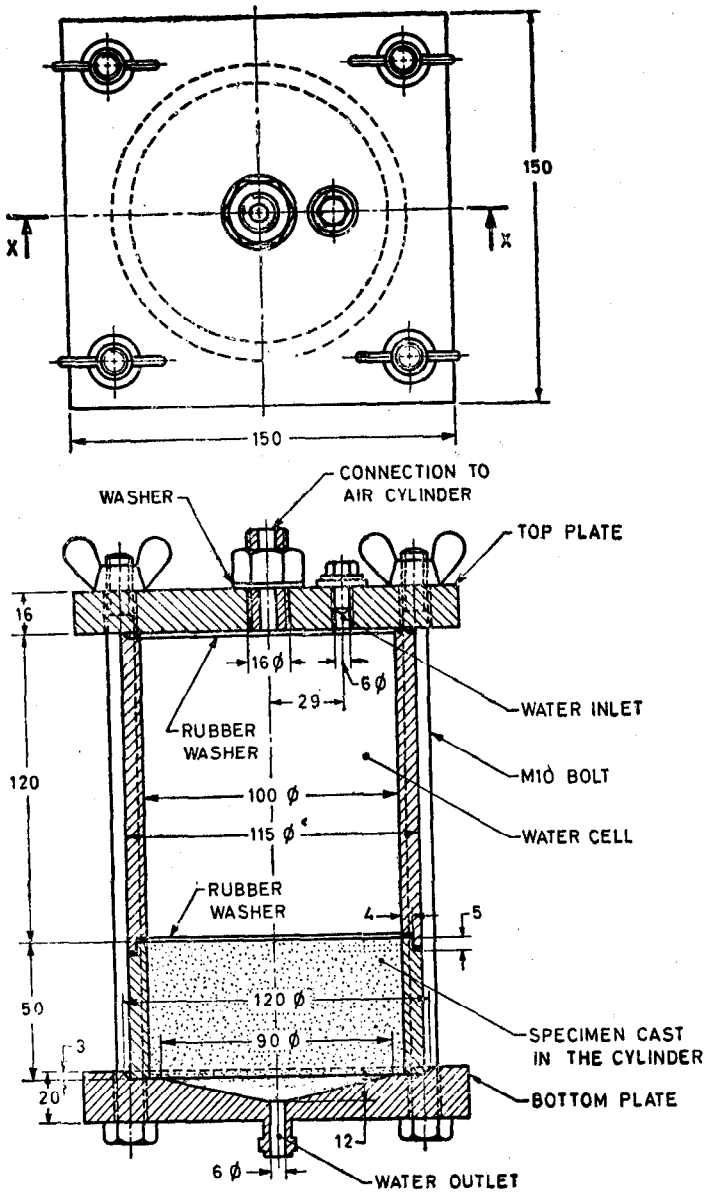


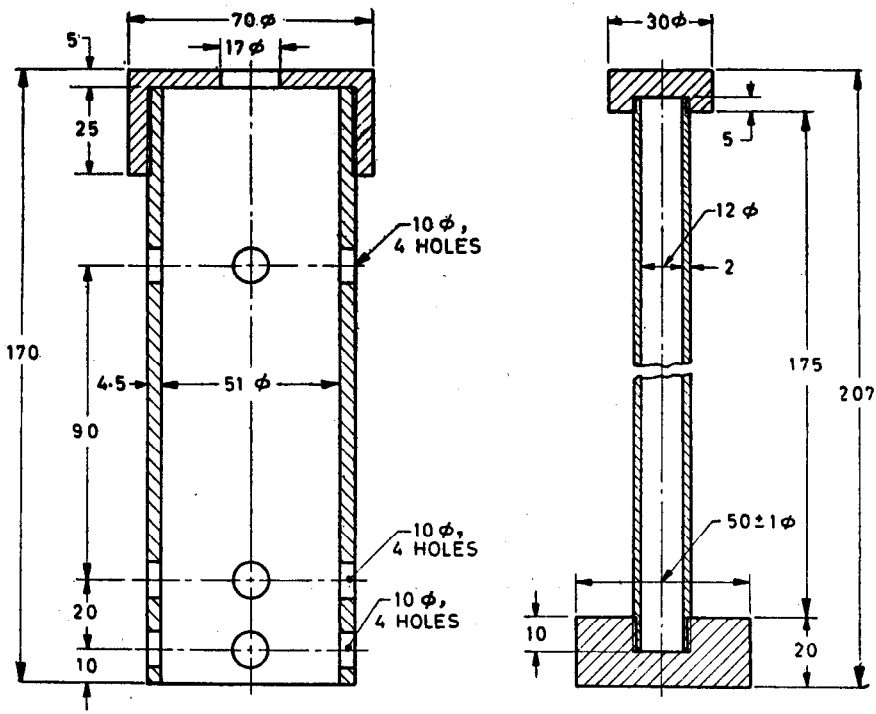
FIG. 1 GENERAL ARRANGEMENT OF PERMEABILITY TEST UNIT



SECTION XX

All dimensions in millimetres.

FIG. 2 DETAILS OF PERMEABILITY UNIT



All dimensions in millimetres.

FIG. 3 SPECIMEN COMPACTING APPARATUS (GUIDE AND RAMMER)

A-4. PREPARATION OF MORTAR

A-4.1 Clean appliances shall be used for mixing and the temperature of the water and that of the test room at the time when the above operations are being performed shall be 27 ± 2°C.

A-4.2 The quantities of cement and standard sand required for each specimen shall be as follows:

Cement	140 g
Waterproofing compound	As recommended by manufacturer
Standard sand	700 g

A-4.2.1 The amount of water used for gauging shall be that required to produce a flow of 75±5 percent with 25 drops given in 15 seconds as determined in accordance with the procedure given in **9.5.3** of IS : 1727-1967*.

A-4.3 The mortar shall be mixed in the manner described in **8.4.3.2** of IS : 4031-1968† for determination of the compressive strength of cement.

NOTE — Wherever possible, mixing with Hobart type mortar mixer is recommended. In such cases, it is desirable to take a batch of 300 g cement and 1 500 g regraded sand since in the Hobart mixer efficiency is better with a 1 800 g-2 000 g batch. The material used for the flow test can be collected back into the bowl, mixed again for 15 seconds at medium speed and used for casting. In case where flow test is omitted after completion of mixing, allow the mortar to stand for 90 seconds, remix for 15 seconds at medium speed and later mould two test specimens.

A-5. PREPARATION OF SPECIMEN

A-5.1 The container ring shall be given a thin coating of neat cement slurry and the mortar shall be placed in it in two layers. Each layer shall be compacted with 10 blows of the standard rammer. During compaction the guide of the rammer shall remain in contact with the wall of the container ring. It shall be moved through a uniform distance after each blow so as to cover the entire periphery of the container ring after 10 blows. After compaction the top of the specimen shall be levelled off with a 12 mm diameter rod slowly and firmly moved over the surface. No trowelling or other type of surface finish shall be allowed.

A-6. CURING AND STORAGE OF SPECIMEN

A-6.1 Keep the container ring with the specimen at a temperature of 27 ± 2°C in an atmosphere of at least 90 percent relative humidity for 24 hours. At the end of that period submerge the specimen in clean fresh water and keep there for 20 days, and take it out just prior to testing. The water in which the specimens are submerged shall be changed every 7 days and shall be maintained at a temperature of 27 ± 2°C.

A-7. PROCEDURE OF TEST

A-7.1 The specimen shall be lightly wire-brushed on either faces to remove laitance, surface fines, etc, and washed. Later each of the specimen shall be fitted into the permeability cell as shown in Fig. 2. An initial pressure of about 0·5 kgf/cm² shall be applied to the water and from time to time the collecting container shall be taken out and weighed to determine the rate of percolation. The rate of percolation will be comparatively high in the initial stages and will then become stabilized. At this stage the pressure shall be increased again by 0·5 kgf/cm² and this procedure repeated until a final pressure of 2 kgf/cm² is reached. When a stable flow has been

*Methods of test for pozzolanic materials (*first revision*).
†Methods of physical tests for hydraulic cement.

reached at this pressure, readings of the percolation shall be taken at fixed intervals of time for 8 hours.

A-7.1.1 The test shall be carried out at a temperature of 27 ± 2°C. For each test three specimens shall be tested without the use of waterproofer, and three with the use of the waterproofer in the recommended proportions. If the average percolation (measured in millilitres of water) for the specimens incorporating the waterproofing compound is less than 50 percent of the average percolation in the case of the specimens without the waterproofer, the integral waterproofer under test shall be considered satisfactory.

A-8. FAULTY SPECIMENS AND RETESTS

A-8.1 Specimens that are manifestly faulty or that give percolations (measured in millilitres of water) differing by more than 20 percent from the average shall not be considered. In such cases, the average of the remaining two specimens can be considered provided the two values agree within 10 percent of their average otherwise a retest shall be made.

(*Continued from page* 2)

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R14 Yudhister Marg, C Scheme, JAIPUR 302005	6 34 71
117/418 B Sarvodaya Nagar, KANPUR 208005	21 68 76
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AMENDMENT NO. 1 JULY 1984

TO

IS : 2645 - 1975 SPECIFICATION FOR INTEGRAL CEMENT WATERPROOFING COMPOUNDS

(First Revision)

(*Page* 4, *clause* **0.4**) — Substitute the following for the existing clause:

'**0.4** It is necessary that all constituent materials in concrete including integral cement waterproofing compounds should, as far as possible, be free from chlorides and sulphates. Sometimes, waterproofing compounds are likely to contain water soluble chlorides and sulphates which may cause corrosion of steel reinforcement in reinforced concrete and also produce other harmful effects in concrete. IS : 456-1978† specifies the permissible limit of chlorides and sulphates in the concrete in terms of percent by mass of cement. The Cement and Concrete Sectional Committee, while reviewing the standard felt that the dosage of sulphates in waterproofing compounds was so small that contribution of these compounds to the total soluble sulphates in concrete would be insignificant when compared to the limit of sulphates specified in IS : 456-1978† and that the adverse effects of chlorides in concrete and its control through limiting the chlorides from the concrete materials and admixtures were more significant. The committee, therefore, felt that the chloride content in the waterproofing compound shall be declared by the manufacturer so that different samples of waterproofing compounds can be compared and engineer-in-charge is in knowledge of the amount of chlorides entering into concrete through waterproofing compound. The method of determination of chlorides in waterproofing compounds is covered in IS : 6925-1973‡. '

(*Page* 4, *footnote with* '†' *mark*) — Substitute the following for the existing matter:

' Code of practice for plain and reinforced concrete (*third revision*)'.

(*Page* 6, *clause* **2.4**) — Substitute the following for the existing clause:

'**2.4 Chloride Content** — The chloride content determined in accordance with IS : 6925-1973‡ in the product shall be declared by the manufacturer. '

(*Page* 6, *clause* **2.4**) — Add the following new clause after clause **2.4**:

'3. DELIVERY

3.1 The integral cement waterproofing compound shall be packed in suitable containers and the following information shall be indelibly marked on each container:

a) Name of the manufacturer and/or his registered trade mark; if any;

b) Net mass of the material;

c) Date, month and year of manufacture; and

d) Maximum chloride content (*see* **2.4**).

3.1.1 The containers may also be marked with the ISI Certification Mark.

NOTE — The use of the ISI Certification Mark is governed by the provisions of the Indian Standards Institution (Certification Marks) Act and the Rules and Regulations made thereunder. The ISI Mark on products covered by an Indian Standard conveys the assurance that they have been produced to comply with the requirements of that standard under a well-defined system of inspection, testing and quality control which is devised and supervised by ISI and operated by the producer. ISI marked products are also continuously checked by ISI for conformity to that standard as a further safeguard. Details of conditions under which a licence for the use of the ISI Certification Mark may be granted to manufacturers or processors, may be obtained from the Indian Standards Institution.