SRI LANKA STANDARD 980: 1992

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GUIDE FOR CONDITIONING OF SOLID ELECTRICAL INSULATING MATERIALS PRIOR TO AND DURING TESTING

SRI LANKA STANDARDS INSTITUTION

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SLS 980 : 1992

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SRI LANKA STANDARDS INSTITUTION
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Sri Lanka.

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This standard does not purport to include all the necessary provisions of a contract.

C O N T E N T S

SRI LANKA STANDARD

GUIDE FOR CONDITIONING OF SOLID ELECTRICAL INSULATING MATERIALS PRIOR TO AND DURING TESTING

FOREWORD

This standard was approved by the Sectoral Committee on Electrical Accessories and Appliances and was authorized for adoption and publication as a Sri Lanka Standard by the Council of the SLSI on 1992-12-17 .

All values given in this specification are in SI units.

This standard provides "Standard conditions" for pre-conditioning, conditioning and testing of electrical insulating materials.

In the preparation of this standard, the assistance derived from the following publications is gratefully acknowledged.

IEC 212 : 1986 : Standard conditions for use prior to and during the testing of solid electrical insulating materials.

BS 2844: 1972 : Memorandum on conditioning of solid Electrical Insulating Material prior to and during testing.

1 SCOPE

This guide gives standard conditions of exposure time, temperature, atmospheric humidity and liquid immersion for use in testing electrical insulating materials.

2 REFERENCES

ISO 62 Plastics - Determination of water absorption at 23 ^{o}C.

ISO 483 Plastics - Small enclosures for conditioning and testing using aqueous solutions to maintain relative humidity at constant value.

3 OBJECTIVES OF CONDITIONING

3.1 To obtain greater reproducibility of test results by

a) reducing the variations of the properties of the material due to the past history of the test specimens (often known as 'normalizing', here called 'pre-conditioning'), and

b) ensuring uniformity of conditions during the testing.

3.2 To determine the influence of exposure to certain temperatures and humidities, or immersions in liquids, on the properties of a material by subjecting specimens to specified conditions before or during the test or both.

4 DEFINITIONS

For the purpose of this standard the following definitions shall apply:

4.1 **conditioning (of a specimen):** The subjection of the specimen to an atmosphere of a specified relative humidity, or complete immersion in water or other liquid at a specified temperature for a specified period of time.

NOTE

When the combination of temperature and humidity for conditioning is the same as that prescribed for preconditioning, the preconditioning and conditioning may be merged and the preconditioning may be said to take the place of conditioning as well.

4.2 **preconditioning** : The treatment of a specimen with the object of removing or reducing the effect of its previous history with respect, principally, to the temperature and humidity to which it has been exposed. This treatment (sometimes known as 'normalizing') usually precedes coditioning of a specimen.

4.3 **relative humidity** : The ratio of the actual vapour pressure to the saturation vapour pressure at the same (dry bulb) temperature, expressed as a percentage.

4.4 **standard reference atmosphere:** The atmosphere to which values measured under any other atmospheric conditions are corrected by calculation.

4.5 **test Conditions:** The temperature and humidity of the atmosphere surrounding the specimen, or temperature and kind of liquid (for liquid immersion), at the time tests are carried out.

5 TEMPERATURE AND HUMIDITY (OR LIQUID IMMERSION) RECOMMENDED FOR PRECONDITIONING, CONDITIONING AND TESTING

When preconditioning is required, one of the standard atmospheres or one of the dry-hot conditions given in Table 1 may be used for a time specified in the material specification (for example 24 $\pm$ 1/2 h). It is usual to specify 50 $\pm$ 2 ^{o}C with a relative humidity less than 20 per cent.

The recommended standard conditions of temperature and humidity (or liquid immersion) for conditioning and testing are given in Table 1 and Table 2.

6 PERIOD OF PRECONDITIONING AND CONDITIONING

The period of preconditioning or conditioning, or both, should be specified in the relevant material specification or test method. The period of conditioning will usually depend upon the type of material being tested.

In general, it is not intended that the period shall be sufficient to enable the specimens to reach equilibrium with the surrounding atmosphere. The rate at which equilibrium is reached depends largely upon the nature and dimensions of the test specimens. Consequently, the period of exposure necessary to obtain equilibrium may in some cases (e.g. thin paper) be only a matter of a few minutes, but in others (such as hard rubber) it may be many months.

It is recommended that periods be selected from the list given in Table 3.

7 PROCEDURES FOR ATMOSPHERIC PRECONDITIONING, CONDITIONING AND TESTING

It is strongly recommended that, whenever possible, measurements should be made on specimens in a room or in a suitable chamber in which the required conditions are maintained throughout the measurement.

Where the conditions in the testing room do not differ materially from the conditioning atmosphere or the property of the material is not likely to be affected appreciably by transfer from the required conditioning atmosphere to the testing atmosphere, test specimens may be conditioned (e.g. in a suitable chamber) and rapidly transferred to the testing room atmosphere, the measurements being made within a few minutes of such a transfer. This is admissible only when so indicated in the specification concerned which should, where necessary, specify the maximum period allowed between the transfer and the test.

Any technique may be used for obtaining the required conditions, e.g. controlling temperature and humidity in the room or chamber in which the test specimens are maintained prior to test and in which the tests are made, or enclosing the test specimens in a chamber, oven or other enclosure in which the required conditions are maintained throughout the preconditioning, conditioning and testing operations.

Care should be taken to allow free access of the conditioning atmosphere to all the specimens, and to ensure uniform conditions throughout the conditioning atmosphere in the neighbourhood of the specimens.

When dry-hot conditions are used, the oven should be ventilated.

When some materials are being conditioned, harmful products may develop and it is important to prevent these from contaminating specimens of other materials.

When measuring leads are passed through the wall of a chamber, care should be taken to prevent significant leakage paths in parallel with the electrodes or measuring instrument, for example over the surfaces of the insulation of the leads.

8 LIQUID IMMERSION CONDITIONING AND TESTING

The recommended temperatures for liquid immersion conditioning and testing are given in Table 2. Specimens should be preconditioned, if specified, and immersed in the liquid at the specified temperature for the required time given in the material specification.

Care should be taken to allow free access of the liquid to all the specimens and to ensure uniform conditions throughout the liquid in the neighbourhood of the specimens.

When some materials are being conditioned, harmful products may develop and it is important to prevent contamination of specimens of other materials.

If the specimen cannot be tested in the liquid, it should be taken from the liquid and the surface liquid removed by pressing with clean dry filter or blotting paper or by wiping with a clean absorbent cloth before testing. The test should be commenced immediately after the surplus liquid has been removed, and completed as soon as possible. The maximum time between the removal of the specimen from the liquid and the measurement should be specified in the material specification.

9 STANDARD REFERENCE ATMOSPHERE

When it is desired to correlate results of tests which have been obtained at different temperatures or humidities, and conversion factors are established for a particular material and test on the basis of adequate available information, the standard reference atmosphere shall be 27 ^{o}C, 65 per cent relative humidity and 101.3 kPa.

TABLE 1 - Standard atmospheric conditions for testing and conditioning

Condition designation (See Note 1)	Title (See Notes 4 & 5)	Temperature (See Note 2) °C	Relative humidity (see Notes 2 and 3) percentage
R	As received	-	-
(Hours) h/15-35C/45-75 percent	Standard ambient (see Note 5)	15 to 35	45 to 75
(Hours) h/20C/65 percent	Standard atmosphere A	20	65
(Hours) h/23C/50 percent	Standard atmosphere B (see Note 4)	23	50 ± 5
(Hours) h/27C/65 percent	Standard atmosphere C	27 ± 2	65
(Hours) h/23C/93 percent	Damp	23	93
(Hours) h/40C/93 percent	Damp-warm	40	93 ± 2
(Hours) h/55C/93 percent	Damp-warm	55	93
(Hours) h/15-35C/<1.5 percent	Dry (see Note 5)	15 to 35	Less than 1.5
(Hours) h/55C/<20 percent	Dry hot	55	Low (less than 20)
(Hours) h/70C/<20 percent	Dry hot	70	Low (less than 20)
(Hours) h/90C/<20 percent	Dry hot	90	Low (less than 20)
(Hours) h/105C/<20 percent	Dry hot	105 ± 2	Low (less than 20)
(Hours) h/120C/<20 percent	Dry hot	120	Low (less than 20)
(Hours) h/130C/<20 percent	Dry hot	130	Low (less than 20)
(Hours) h/155C/<20 percent	Dry hot	155	Low (less than 20)
(Hours) h/180C/<20 percebt	Dry hot	180	Low (less than 20)
(Hours) h/200C/<20 percent	Dry hot	200	Low (less than 20)
(Hours) h/220C/<20 percent	Dry hot	220 ± 3	Low (less than 20)
(Hours) h/250C/<20 percent	Dry hot	250	Low (less than 20)
(Hours) h/275C/<20 percent	Dry hot	275	Low (less than 20)
(Hours) h/320C/<20 percent	Dry hot	320 ± 5	Low (less than 20)
(Hours) h/400C/<20 percent	Dry hot	400	Low (less than 20)
(Hours) h/500C/<20 percent	Dry hot	500 ± 10	Low (less than 20)
(Hours) h/630C/<20 percent	Dry hot	630	Low (less than 20)
(Hours) h/800C/<20 percent	Dry hot	800 ± 20	Low (less than 20)
(Hours) h/1000C/<20 percent	Dry hot	1000	Low (less than 20)
(Hours) h/-10C/-	Cold	-10	-
(Hours) h/-25C/-	Cold	-25	-
(Hours) h/-40C/-	Cold	-40 ± 3	-
(Hours) h/-55C/-	Cold	-55	-
(Hours) h/-65C/-	Cold	-65	-

NOTES

1. The periods for preconditioning and conditioning (represented by 'Hours' in Column 1) should be specified in the material specification and should be selected from Table 3.

2. In special cases, closer tolerances may be used such as ± 1 °C and ± 2 per cent r.h. Where a tolerance of ± 5 per cent on 50 per cent r.h. is too wide and ± 2 per cent is required, it should be noted that saturated salt solutions will only give 52 ± 2 per cent r.h. See ISO 483 : 1988.

3. When the testing specification requires a period of preconditioning or conditioning, it is important to distinguish between the over-all limits of the temperatures with which it may be carried out and the limits within which the temperature must be maintained in order to maintain the specified relative humidity limits, e.g. the temperature tolerances in Column 3 will not in themselves ensure the close relative humidity control required by Column 4.

4. The standard atmosphere B(23C/50 per cent) is the preferred atmosphere.

5. When the range of 15 °C to 35 °C is considered too wide, the range may be reduced to 18 °C to 28 °C.

TABLE 2 - Standard liquid immersion conditions for testing and conditioning

Condition designation (see Note 1)	Title	Liquid	Temperature (see Note 2) °C
(1)	(2)	(3)	(4)
(Hours h/23+0.5C/ water	Standard water immersion *	Distilled water or water of equivalent purity (de ionized water)	23 ± 0.5
(Hours h/20C/liquid	Liquid immersion	As designated	20
(Hours h/23C/liquid	Liquid immersion	As designated	23
(Hours h/27C/liquid	Liquid immersion	As designated	27
(Hours h/50C/liquid	Liquid immersion	As designated	50
(Hours h/70C/liquid	Liquid immersion	As designated	70 ± 2
(Hours h/90C/liquid	Liquid immersion	As designated	90
(Hours h/105C/liquid	Liquid immersion	As designated	105
(Hours h/120C/liquid	Liquid immersion	As designated	120
(Hours h/130C/liquid	Liquid immersion	As designated	130

** This is the immersion condition recommended in ISO 62 : 1980 : Plastics-Determination of water absorption.*

NOTES

1. The period of immersion (represented by 'Hours' in Column 1) should be specified in the material specification and should be selected from Table 3.

2. For special tests, closer tolerances may be required as, for instance ± 0.5 °C in place of ± 2 °C.

TABLE 3 - List of preferred periods for preconditioning and conditioning

Hours	1	2	4	8	16	24		48		96
Weeks	1	2	4	8	16		26		52	

10 CODE FOR SPECIFYING PRECONDITIONING, CONDITIONING AND TESTING

Where it is desired to use a code for describing conditions for preconditioning, conditioning and testing, the code given in Table 4 may be used .

TABLE 4 - Code for conditioning

Conditioning	Code
As received	R
Atmospheric preconditioning and atmospheric conditioning	(Hours)h/(temperature)C/(r.h.) per cent
Immersion conditioning	(Hours)h/(temperature)C/ liquid
Measurement (M)	M/(temp)C/(r.h.) per cent

When the conditioning time is weeks, the time portion of the code may be expressed as weeks (w).

When preconditioning is used before conditioning, the two codes should be connected with a plus sign (+). A semicolon should separate the conditioning code from the testing code. Thus, if a specimen is to be preconditioned for 48 h at 50 °C and less than 20 per cent r.h., conditioned 96 h at 23 °C and 50 per cent r.h. and tested in the same atmosphere, the code would read:

48 h/50C/<20 per cent + 96 h/23 C/50 per cent;
M/23 C/50 per cent.

If preconditioning is not to be used the first part of the code is omitted. If closer tolerances are required than those designated in Tables 1 and Table 2, the tolerance should be included in the code as, for instance, 96 h/27 ° ± 0.5 C/93 ± 1 per cent.

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SRI LANKA STANDARDS INSTITUTION

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