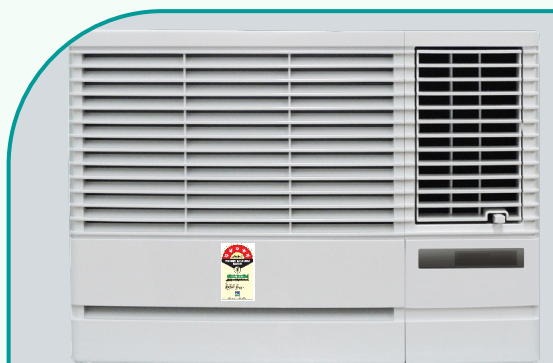


Inspection And Testing Manual For Room Air Conditioners



About EESL



ENERGY EFFICIENCY SERVICES LIMITED
A JV of PSUs under the Ministry of Power

Efficiency Services Limited (EESL), a Joint Venture of Company of Public Sector Undertaking (PSU) of Ministry of Power to facilitate implementation of energy efficiency projects. It is registered under the companies Act, 1956 on 10 December 2009 and the commencement of business certificate was obtained on 11 February 2010. EESL functions as an Energy Service Company (ESCO), as Consultancy Organization and as a Resource Centre.

About CLASP



CLASP is an international 501© 3 non-profit organization headquartered in Washington DC, USA, with the mission to improve the energy and environmental performance of the appliances & equipment we use every day, accelerating our transition to a more sustainable world. CLASP has been supporting the development and implementation of appliance standards and labeling programs in India since its inception in 1999.

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**Inspection And Testing
Manual For
Room Air Conditioners**



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(भारत सरकार, विद्युत मंत्रालय के सार्वजनिक क्षेत्र के उपक्रमों का संयुक्त उद्यम)
ENERGY EFFICIENCY SERVICES LIMITED
(A Joint Venture of PSUs of Ministry of Power, Govt. of India)



Foreword

Energy Efficiency Services Limited (EESL) is a publicly owned energy services company with the mission of delivering energy efficiency across India. Established in 2009, EESL is promoted by Ministry of Power, Government of India as a Joint Venture company of four Central Power Sector undertakings viz NTPC Ltd. PFC, REC and Power Grid.

EESL is set up to create and sustain markets for energy efficiency in the country. EESL works closely with Bureau of Energy Efficiency (BEE) and is leading the market related activities of the National Mission for Enhanced Energy Efficiency (NMEEE), one of the eight national missions under the Prime Minister's National Action Plan on Climate Change

Based on the success of *Unnat Jyoti by Affordable LEDs for All (UJALA)*, the world's largest LED programme for domestic consumers, EESL has established itself as a super Energy Service Company (ESCO). EESL and UJALA have paved the way for large-scale energy efficiency implementation in India. It has shown government stakeholders that energy efficiency can deliver multiple benefits within a short time period to all sectors, and importantly, with limited or no costs to the government. Recognising the potential for replication with other high efficient appliances and equipment to trigger investment, innovation and best-in class manufacturing, EESL is expanding its programs to scale up deployment of energy efficient appliances such as energy efficient fans, air conditioners, induction motors and agricultural pumps for which demand is projected to grow significantly.

The success of bulk procurement & distribution program is based on a robust quality assurance framework and build credibility of the program amongst consumers such that it provides a level playing field for the participants, and deliver the projected energy savings.

Quality assurance is a key element to all aspects of energy efficiency programs: program design, implementation and evaluation. It provides a framework to ensure program standards are met and closes the feedback loop in order to assess and improve program processes. To ensure that the products procured through EESL's program meet the quality standards, EESL, in partnership with CLASP, has developed 'Inspection and Quality Assurance Manuals' for its bulk procurement programs. This manual provides stepwise guidelines, and defines the quality assurance criteria and inspection process that include the relevant test methods, sampling criteria, schedule of tests and levels of control at the manufacturers' end. This is to ensure compliance of the procured products with the requirements prescribed by EESL, thereby building credibility of the program and ensuring the quality of the product.

EESL is making every effort toward this, and the inspection and testing manual is a key milestone in that direction. It reflects our commitment and sincerity in ensuring that only quality products are procured and delivered to the consumers.

I would like to commend & congratulate CLASP and EESL teams for their efforts in the development of this manual. I am convinced that this manual will be integral to EESL's quality assurance program and demonstrate our commitment and sincerity in ensuring the procurement of quality products.

(Saurabh Kumar)

Date: 23.07.19

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MANUAL FOR TESTING AND INSPECTION OF ROOM AIR CONDITIONERS

1. SCOPE

1.1 This manual highlights the key elements essential for the field inspection officers to ensure the quality for room air conditioners procured by EESL in compliance with the requirements laid out in the tender/bid document, thereby building credibility of the program and ensuring the quality of the product.

This manual specifies guidelines for the bid evaluation, pre-delivery, and post-delivery/verification inspection including the sampling methodology in carrying out the type, acceptance and routine tests for single split non-ducted having single indoor and single outdoor unit, of floor, ceiling and wall mounted type both fixed and variable capacity/speed for cooling only, of rating up to and including 11 kW, single phase, rated voltage up to and including 250 V, 50 Hz, AC covered under the scope of IS 1391 (Part 2).

Stepwise guidelines for the inspection of room air-conditioners are given in Annex A of this manual.

2. REFERRED STANDARD

2.1 The following standard shall be referred while using this manual:

| IS No/IEC/ISO | Title |
|----------------------|--|
| IS 996 | Single-phase small AC and universal electric motors |
| IS 1391: Part 2 | Room Air Conditioners – Part 2 : Split Air conditioners |
| IS 2500 : (Part 1) | Sampling procedure for inspection by attributes, Part 1 Sampling plan indexed by acceptance quality limit (AQL) for lot by lot inspection |
| IS 10617 (Part1) | Hermetic compressors: Part 1 High temperature application group |
| IS 11329 | Specification for Finned type Heat Exchanger for Room Air Conditioner |
| IS 11338 | Thermostats for Use in Refrigerators, Air Conditioners, Water Coolers and beverage coolers |
| IEC 60335-2-40 | Household and similar electrical appliances - Safety - Part 2-40: Particular requirements for electrical heat pumps, air-conditioners and dehumidifiers |
| IS/ISO 9001 | Quality management system - Requirements |
| ISO 16358-1 | Air cooled air conditioners and air to air heat pumps – testing and calculating methods for seasonal performance factors – Part 1 Cooling seasonal performance factor |

3. DEFINITIONS

All definitions given in IS 1391 (Part 2) and ISO 16358-1 shall apply. Some of the important definitions relevant to this manual are given below:

3.1 Non-ducted Air Conditioner

Encased assembly or assemblies, designed primarily to provide free delivery of conditioned air to an enclosed space, room or zone.

3.2 Split Air Conditioners

It comprises of indoor unit and outdoor unit. The indoor unit may be mounted on floor or wall or ceiling. The major components of the indoor and outdoor units comprise of hermetically sealed compressor, heat exchanger, fan motors and air handling system in two separate cabinets.

It is designed primarily to provide conditioned air to an enclosed space, room or zone (conditioned space). It includes a prime source of refrigeration for cooling and dehumidification and means for the circulation and filtering of air.

3.3 Total Cooling Capacity

Amount of sensible and latent heat that the equipment can remove from the conditioned space in a defined interval of time.

NOTE: Total cooling capacity is expressed in units of watts.

3.4 Rated Voltage

Voltage shown on the nameplate of the equipment.

3.5 Rated Frequency

Frequency shown on the nameplate of the equipment.

3.6 Energy Efficiency Ratio (EER)

Ratio of the total cooling capacity to the effective power input to the device at any given set of rating conditions.

NOTE: Where the EER is stated without an indication of units, it is understood that it is derived from watts/watt.

3.7 Coefficient of Performance (COP)

Ratio of the heating capacity to the effective power input to the device at any given set of rating conditions.

NOTE: Where the COP is stated without an indication of units, it is understood that it is derived from watts/watt.

3.8 Total Power Input (P_t)

Average electrical power input to the equipment as measured during the test.

NOTE: Total power input is expressed in units of watts.

3.9 Effective Power Input (PE)

Average electrical power input to the equipment obtained from:

- a) the power input from the compressor(s);
- b) the power input to electric heating devices used only for defrosting;
- c) the power input to all control and safety devices of the equipment; and
- d) the power input for operation of all fans.

NOTE: This is expressed in units of watts.

3.10 Full-load Operation

Operation with the equipment and controls configured for the maximum continuous duty refrigeration capacity specified by the manufacturer and allowed by the unit controls.

NOTE: Unless otherwise regulated by the automatic controls of the equipment, all indoor units and compressors operate during full-load operations.

3.11 Lot

The number of air-conditioners of the same capacity and type offered for inspection at one time shall constitute a lot.

3.12 Sampling

The selection of a portion of a lot with a view to taking a decision about the quality of the lot on the basis of results obtained by inspecting the selected portion.

3.13 Sample Size

The number of air-conditioners selected for inspection and/or testing from a lot.

3.14 Type test

Tests that are necessary to check the performance and characteristics of the units and components and shall be carried out by a recognized testing authority who may be the manufacturer if approved by the purchaser.

3.15 Acceptance test

Tests carried out on samples taken from a lot for the purpose of acceptance of the lot.

3.16 Routine test

Routine tests are intended to check the quality of the individual test unit. These tests are done to ensure the reliability of test objects and consistency of the material used in their manufacture that are likely to vary during production. These tests are conducted on each unit after completion at the manufacturer's work.

3.17 Verification test

Verification tests are the evaluation of whether or not a product, service, or system complies with a regulation, requirement, or imposed conditions.

3.18 Room Calorimeter

It is a test facility consisting of two contiguous calorimeters with a common partition. One is designated as the room side compartment, and the other as the outdoor compartment. Each side is equipped with instrumented reconditioning equipment whose output may be measured and controlled to counterbalance the room side humidifying and cooling effect and the outdoor side humidifying and heating effect of the split air conditioner under test.

3.19 Indian Seasonal Energy Efficiency Ratio (ISEER)

Ratio of the total annual amount of heat that the equipment can remove from the indoor air when operated for cooling in active mode to the total annual amount of energy consumed by the equipment during the same period.

4 UNITS AND SYMBOL

| S. No. | Quantity | International System (SI) | | Metric Units | |
|--------|---|---------------------------|-------------------|---|----------------------|
| | | Units | | | |
| 1 | Air mass flow rate | kilogram per second | Kg/s | kilogram per hour | Kg/h |
| 2 | Air volume flow rate | cubic meter per second | m ³ /S | cubic metre per hour | m ³ /h |
| 3 | Air Specific humidity | kilogram per kilogram | kg/kg | kilogram per kilogram | kg/kg |
| 4 | Air Specific volume | cubic metre per kilogram | m ³ /h | cubic metre per kilogram | m ³ /kg |
| 5 | Air static pressure or dynamic pressure | newton per square metre | N/m ² | millimetre of water | mm |
| 6 | Air velocity | metre per second | m/s | metre per second | m/s |
| 7 | Air volume | cubic metre | m ³ | cubic metre | m ³ |
| 8 | Area | square metre | m ² | square metre | m ² |
| 9 | Barometric pressure | newton per square metre | N/m ² | bar millibar millimetre of mercury(torr) | bar mbar mm Hg |
| 10 | Cooling effect | watt | W | *kilocalorie per hour | kcal/h |
| 11 | Dehumidifying effect | watt | W | *kilocalorie per hour | kcal/h |
| 12 | Electric current input | ampere | A | ampere | A |
| 13 | Electric frequency | hertz | Hz | hertz | Hz |
| 14 | Electric power input | watt | W | watt | W |
| 15 | Specific enthalpy | joule per kilogram | J/kg | kilocalorie per kilogram | kcal/kg |
| 16 | Rotating speed | radian per second | rad/s | turn per second turn per minute | tr/s tr/min |

| S. No. | Quantity | International System (SI) Units | | Metric Units | |
|--------|-------------------------|---------------------------------|------------------|-------------------------|----------------|
| | | | | | |
| 17 | Heat flow rate | watt | W | *kilocalorie per hour | kcal/h |
| 18 | Heat leakage rate | watt | W | *Kilocalorie per hour | kcal/h |
| 19 | Linear measurement | Meter/ millimeter | m/ mm | Meter/ millimeter | m /mm |
| 20 | Temperature | Kelvin | K | degree Celsius | °C |
| 21 | Interval of temperature | Kelvin | K | degree Celsius | °C |
| 22 | Water mass flow | kilogram per second | kg/s | kilogram per hour | kg/h |
| 23 | Acceleration | meter per square second | m/s ² | meter per square second | m ² |

*Kilocalorie 15⁰C = 4.183 5 kJ.

5 QUALITY CONTROL MEASURES BY THE MANUFACTURER

The manufacturer shall exercise suitable quality control measures as described in 5.1 to 5.6 below:

5.1 In House Test Laboratory

The manufacturer shall have the requisite test facilities in house, which shall be suitably equipped and staffed where different tests, specified in the relevant standard, shall be carried out in accordance with the test methods prescribed in the standard.

5.2 Maintenance of Test Records

The manufacturer shall maintain all records of tests, inspection and calibration. All testing equipment and measuring instruments shall be periodically checked and calibrated and records of such checks/calibration shall be maintained. Copies of any records and other connected papers that may be required by the EESL representatives shall be made available during the visit at the manufacturing premises.

5.3 Quality System in the Organization

The manufacturer should implement proper Quality Management System in their organization in accordance with IS/ISO 9001 as applicable to various day-to-day activities of the organization.

5.4 Marking on the Product

The marking on the room air-conditioners shall be furnished in a permanent and legible manner on either the product where it is accessible and visible where it is accessible and visible and/or packaging or product data sheet/leaf-let. The information on the room air-conditioners shall be in accordance with clause 17 of IS 1391 (Part 2).

In addition, the room air-conditioners shall carry BIS certification mark and/or BEE star label.

- a. Manufacturer's name and address;
- b. Type of model;
- c. Serial number of the unit;
- d. Name and quantity of refrigerant charge;
- e. Rated Voltage, number of phases and rated frequency;
- f. Nominal cooling capacity at rated condition;
- g. Power consumption at rated conditions;
- h. Nominal current at rated conditions;
- i. BIS standard mark and BIS License number, if any; and
- j. BEE star label (mandatory).

Any other additional information may be provided on the rating plate subject to agreement between the manufacturer and EESL.

5.5 Raw Materials and Components

As far as possible, each consignment of the raw material and components should be accompanied by a test certificate certifying its conformity to the relevant Indian Standard wherever exists or else each lot of raw material shall be checked for its conformity as per the relevant standard, if any.

5.6 Sampling and Frequency of Testing

The manufacturer shall carryout all the tests specified in IS 1391 (Part 2). The number of samples to be subjected to various tests and the frequency of testing including the action that are required to be taken by the manufacturer in case of failure of sample in any of the test or tests are given in Table 1.

Table 1
Sampling and Frequency of Testing

| S. No. | Test Requirement | Test Methods | | Number of Samples | Frequency of Testing |
|--------|---------------------------------|------------------|-----------------------|-------------------|----------------------|
| | | Clause Reference | Indian Standards | | |
| 1 | General Construction | 5.1 | 1391 (Part 2) | Each RAC | - |
| 2 | Material | 5.2 | -do- | -do- | - |
| 3 | Electrically charged parts | 5.3 | -do- | -do- | - |
| 4 | Refrigerant Circuit | 5.4 & 10.4.3 | 1391 (Part 2) & 10773 | One | weekly |
| 5 | Electrical Heater (if provided) | 5.5 | 1391 (Part 2) | -do- | -do- |

| S. No. | Test Requirement | Test Methods | | Number of Samples | Frequency of Testing |
|--------|-----------------------------------|------------------|---|-------------------|---|
| | | Clause Reference | Indian Standards | | |
| 6 | Grounding (Earthing) terminal | 5.6 & 27 | 1391 (Part 2) & IEC 60335-2-40 | -do- | -do- |
| 7 | Air Filter | 5.7 | 1391 (Part 2) | Three | Every lot received from the supplier or manufactured in house |
| 8 | Thermostat | 5.8 & All tests | 1391 (Part 2) & 11338 | -do- | -do- |
| 9 | Heat Exchanger | 6 to 10 | 11329 | -do- | -do- |
| 10 | Hermetically sealed Compressors | 5.9 & All tests | 1391 (Part 2) & 10617-1 | -do- | -do- |
| 11 | Motors | 5.10 & All tests | 1391 (Part 2) & 996 | -do- | -do- |
| 12 | Cooling capacity test | 8.1 & 9.9 | 1391 (Part 2) | One | Once a week for each type and rating |
| 13 | Power consumption | 9.7 | -do- | Each motor | - |
| 14 | Maximum operating conditions test | 8.2 & 9.4 | -do- | One | Once a week for each type and rating |
| 15 | Freeze up test | 8.3 & 9.5 | -do- | -do- | -do- |
| 16 | Enclosure sweat test | 8.4 & 9.6 | -do- | -do- | -do- |
| 17 | Power factor test | 9.3 | -do- | -do- | Daily |
| 18 | Test for safety | 9.2 & All tests | 1391 (Part 2) & IEC 60335-2-40 (where applicable for A2/A2L/A3 refrigerant) | -do- | Once a month for all types and ratings |

| S. No. | Test Requirement | Test Methods | | Number of Samples | Frequency of Testing |
|--------|-------------------------------------|-------------------|--------------------------------------|-------------------|---------------------------------------|
| | | Clause Reference | Indian Standards | | |
| 19 | Noise level test | 9.10 | 1391 (Part 2) | -do- | -do- |
| 20 | Energy efficiency test (ISEER/CSPF) | 6.4 and 6.7 | ISO 16358-1 | -do- | -do- |
| 21 | General running test | 15.3.1 | 1391 (Part 2) | Each AC | - |
| 22 | Pressure/leakage test | 15.3.2 | IS 1391 (Part 2) | Each AC | - |
| 23 | Insulation resistance tests | 15.3.3 | -do- | -do | - |
| 24 | High voltage test (as routine test) | 15.3.4 & 13 | 1391 (Part 2) & IEC 60335-2-40 | -do- | - |
| 25 | Performance test | 15.3.5 | 1391 (Part 2) | One | Once a week for all types and ratings |
| 26 | Leakage Current test | 15.3.6 & 13 | 1391 (Part 2) & IEC 60335-2-40 | Each AC | - |
| 27 | Earthing resistance test | 15.3.7 & 27 | -do- | -do- | - |
| 28 | Marking | 17 | 1391 (Part 2) | -do- | - |

In case the manufacture does not have requisite test facilities for any of the tests shown in Table 1 above, the same may be tested from any independent NABL accredited test labs except for the tests, which are to be carried out on each air-conditioners. However, it is necessary for the manufacturer to have in house test facilities for all the performance and safety related tests.

In case of failure of any air-conditioners in respect of tests carried out on each air-conditioners, cause of failure shall be identified and corrective action shall be taken to remove the non-conformity.

In the case of failure of any sample, in respect of the tests conducted on each lot manufactured, double the number of samples shall be taken for testing and no failure in those samples shall be permitted. Otherwise, the lot shall be rejected. After corrective actions two consecutive lots shall be tested as per the sample size and frequency indicated in the Table 1 and then original frequency shall be restored if both the samples pass.

6. INFORMATION TO BE FURNISHED BY THE PURCHASER/BUYER

6.1 When enquiring or ordering air conditioners to the prescribed standard as specified in the contract, the following information may be furnished by EESL to the suppliers/manufacturers in addition to those given in clause 7 and 17 of IS 1391 (Part 2):

General information:

- a) Name of the purchaser;
- b) Address of the purchaser;
- c) Name of the contact person and the contact details;
- d) BEE Star label (mandatory);
- e) BIS certification Mark on the product and the copy of licence document;
- f) In case of BEE star labelled product, relevant documents relating to approval of model registration;
- g) Total number of room air-conditioners required; and
- h) Location where the meters required to be supplied.

Technical Information

- a) Type/rating;
- b) Rated voltage, frequency and number of phase;
- c) Rated cooling capacity;
- d) Rated power consumption;
- e) Seasonal Energy Efficiency ratio (SEER);
- f) Variable/fixed speed compressor;
- g) Material of heat exchanger;
- h) Name and quantity of the refrigerant;
- i) Nominal current at rated condition;
- j) Energy Efficiency ratio (SEER) for cooling/heating;
- k) Variable/fixed speed compressor;
- l) Maintenance and installation instructions;
- m) Name of the service agencies; and
- n) Length of connecting pipe between IDU and ODU.

7. INFORMATION TO BE FURNISHED BY THE MANUFACTURER OR THE SUPPLIER

7.1 EESL may ask the manufacturer/supplier to furnish the following information while supplying the air conditioner complying with the relevant standard specified in the contract:

- a) Name and address of the manufacturer;
- b) Type/model number and serial number of the unit;
- c) Organization structure;
- d) Location of different manufacturing units, if manufacturing is done at more than one locations;

- e) Name and contact details of the responsible person in each units;
- f) Details of the testing personnel;
- g) Availability of complete test facilities at the manufacturing premises;
- h) List of test equipment, measuring instruments and their accuracy class;
- i) Details of calibration of each equipment/measuring instruments including their validity period;
- j) Whether any arrangements made with any outside test labs where test facilities for any particular test (s) are not available with the manufacturer;
- k) Whether the manufacturers lab is accredited by NABL and if yes what is the scope of accreditation and its validity;
- l) Accreditation of outsourced lab and the validity period;
- m) Declaration in uncertainty in measurement; and
- n) Whether the product (s) covered are BIS certified. If BIS certified what is the validity of the licence and the varieties/types covered in the licence.

7.2 In addition to the above, the following information may be furnished by the manufacturer as and when desired:

- a) Net total cooling effect;
- b) Net dehumidifying effect;
- c) Net sensible cooling effect;
- d) Total air capacity;
- e) Name of refrigerant;
- f) Weight of the refrigerant charged into the unit;
- g) Power input of each motor separately;
- h) Total power input;
- i) Name plate ratings of each motor; and
- j) Manufacturer's instructions and requirements, which may affect performance.

8. STAGES OF INSPECTION AND CONTROL

The inspection activities shall be undertaken in three different stages as follows:

Stage 1 – Bid Evaluation through document verification and Type Testing

Stage 2 – Production/Pre-Delivery

Stage 3 – Post-Delivery/Verification Testing

The detail procedure for inspection and control is described in 8.1 to 8.3 below:

8.1 Bid Evaluation

Bid evaluation shall comprise of type test certificate and the verification of relevant documents. Manufacturers or bidders shall submit a declaration about the product details supported by type test certificate from an independent third party NABL accredited laboratory against the specified test standard. During the bidding phase, the pre-qualification of any manufacturer or bidder shall be based on verification of the documents and test certificates submitted. In case of any change in any design parameter, the complete type test shall be repeated. The

manufacturer shall submit the type test report along with other necessary supporting documents while submitting their bid, which are subject to evaluation and scrutiny by EESL.

All the necessary information submitted by the bidder, as confirmation and declaration of quality should comply with the prescribed guidelines of EESL and the stipulation of the prescribed test standard. In case of non-compliance in any of the parameter, the bid shall be rejected.

8.1.1 Type Test

Manufacturer and/or the bidder shall get their product tested on two samples in an independent accredited laboratory or in the manufacturers own lab which shall be duly accredited by NABL.

Before commencement of the tests, the air-conditioners shall be visually examined including the components, parts and their assembly, constructions, mechanical hazards, marking provision of suitable terminals for supply connections, earthing and the effectiveness of screws and connection. The external surface finish shall be even and free from finishing defects. The air-conditioners shall be subjected to the following type test as given in Table 2.

Table 2

List of Type Tests for Bid Evaluation

| S. No. | Test Requirement | Clause Reference as per IS 1391 (Part 2) | Test Methods | |
|--------|---------------------------------|--|------------------|--------------------------------|
| | | | Clause Reference | Reference Standards |
| 1 | General Construction | 5.1 | 5.1 | 1391 (Part 2) |
| 2 | Material | 5.2 | 5.2 | -do- |
| 3 | Electrically charged parts | 5.3 | 5.3 | -do- |
| 4 | Refrigerant Circuit | 5.4 | 5.4 & 10.4.3 | 1391 (Part 2) & 10773 |
| 5 | Electrical Heater (if provided) | 5.5 | 5.5 | 1391 (Part 2) |
| 6 | Grounding (Earthing) terminal | 5.6 | 5.6 & 27 | 1391 (Part 2) & IEC 60335-2-40 |
| 7 | Air Filter | 5.7 | 5.7 | 1391 (Part 2) |
| 8 | Thermostat | 5.8 | 5.8 & All tests | 1391 (Part 2) & 11338 |
| 9 | Heat Exchanger | - | 6 to 10 | 11329 |

| S. No. | Test Requirement | Clause Reference as per IS 1391 (Part 2) | Test Methods | |
|--------|-------------------------------------|--|------------------|---|
| | | | Clause Reference | Reference Standards |
| 10 | Hermetically sealed Compressors | 5.9 | 5.9 & All tests | 1391 (Part 2) & 10617-1 |
| 11 | Motors | 5.10 | 5.10 & All tests | 1391 (Part 2) & 996 |
| 12 | Cooling capacity test | 9.9 | 8.1 & 9.9 | 1391 (Part 2) |
| 13 | Power consumption | 9.7 | 9.7 | -do- |
| 14 | Maximum operating conditions test | 9.4 | 8.2 & 9.4 | -do- |
| 15 | Freeze up test | 9.5 | 8.3 & 9.5 | -do- |
| 16 | Enclosure sweat test | 9.6 | 8.4 & 9.6 | -do- |
| 17 | Power factor test | 9.3 | 9.3 | -do- |
| 18 | Test for safety | 9.2 | 9.2 & 7 to 32 | 1391 (Part 2) & IEC 60335-2-40 (where applicable for A2/A2L/A3 refrigerant) |
| 19 | Noise level test | 9.10 | 9.10 | 1391 (Part 2) |
| 20 | Energy efficiency test (ISEER/CSPF) | - | 6.4 and 6.7 | ISO 16358-1 |
| 21 | General running test | 15.3.1 | 15.3.1 | 1391 (Part 2) |
| 22 | Pressure/leakage test | 15.3.2 | 15.3.2 | IS 1391 (Part 2) |
| 23 | Insulation resistance tests | 15.3.3 | 15.3.3 | -do- |
| 24 | High voltage test (as routine test) | 15.3.4 | 15.3.4 & 16 | 1391 (Part 2) & IEC 60335-2-40 (where applicable for A2/A2L/A3 refrigerant) |
| 26 | Performance test | 15.3.5 | 15.3.5 | 1391 (Part 2) |
| 27 | Leakage Current test | 15.3.6 | 15.3.6 & 13 | 1391 (Part 2) & IEC 60335-2-40 |

| S. No. | Test Requirement | Clause Reference as per IS 1391 (Part 2) | Test Methods | |
|--------|--------------------------|--|-------------------|---------------------|
| | | | Clause Reference | Reference Standards |
| 28 | Earthing resistance test | 15.3.7 | 15.3.7 & 27 | -do- |
| 29 | Marking | 17 | 17 | 1391 (Part 2) |

8.1.2 Document Verification

The following documents shall be submitted by the manufacturers/bidders for verification and scrutiny by EESL. A detail scrutiny of the documents listed below is essential to verify the authenticity and validity of each documents submitted.

- a) Copy of valid BIS certification marks Licence, if the product carries BIS certification mark;
- b) Document relating to BEE approval for star rating label;
- c) Type test report in original from a NABL accredited testing laboratory for air-conditioners as per IS 1391 (Part 2);
- d) Copy of test certificates of important raw materials and components for air conditioners;
- e) Copy of valid NABL certificate of accreditation; and
- f) Warranty certificate for guarantee of performance of minimum as prescribed by EESL.

8.2 Production/ Pre-Delivery Inspection

The production/pre-delivery inspection shall be carried out by EESL or their authorized representatives. The sample shall be supplied free of cost by the manufacturer. The testing charges for all the type tests shall be borne by EESL. The schedule of test for pre-delivery inspection prior to shipment from the manufacturer's premises or their warehouse shall comprise of the following:

- a) Type test
- b) Acceptance test
- c) Routine test

The production/pre-delivery inspection shall be carried out at the manufacturer's premises on samples selected at random from their finished stock or their warehouse.

To ensure the production of quality products in a continuous manner, verify the proper levels of control in the manufacturing process by the manufacturer. These include presence of an in house accredited test facility, trained and competent testing personnel, maintenance of test records, inspection and calibration, proper Quality Management System measures in accordance with IS/ISO 9001.

8.2.1 Type Test

For the purpose of type tests, two samples of room air-conditioners of each type and design shall be selected from the lot offered. Sample drawn for type tests shall be tested at a NABL approved manufactures or third party test lab.

The tests given in the Table 2 as given below shall constitute the type tests and shall be carried out on the selected samples for type tests. The sample shall be representative of a manufacturer's production selected from the finished stock at the manufacturers end or in their warehouse.

Before commencement of the type tests, the samples shall be visually examined including the components, parts and their assembly, constructions, mechanical hazards, marking provision of suitable terminals for supply connections including the provisions for earthing. The external surface finish shall be even and free from surface defects.

The samples shall successfully pass all the type tests for proving conformity with the requirements of the standard. If the sample fails in any of the type tests, EESL at its discretion, may call for fresh samples not exceeding twice the original number and subject them again to all tests or to the test (s) in which failure (s) had occurred. No failure is permitted in the repeat test.

The type test report shall also contain the nameplate or rating plate particulars of the room air-conditioners for purposes of identification.

Type test may be waived off in case tender document originally lays out the requirement of BIS certification mark, if any.

The type test report shall also contain the nameplate particulars of the split air conditioners for purposes of identification.

8.2.2 Acceptance Test

To ensure the quality of products supplied by the manufacturer, acceptance test shall be carried out by EESL on each lot offered for inspection.

Samples shall be selected at random to ensure proper representation of a lot from the factory or their warehouse/stockyard for necessary testing in the manufacturers own lab duly accredited by NABL in the presence of EESL representatives. The method employed for random selection should be in accordance with IS 4905 to ensure proper representation of a lot. The sample size and acceptance quality level (AQL) shall be as laid down in IS 2500 (Part 1).

The samples selected from the lot shall be checked for any visual defects including the components, parts and their assembly, constructions, mechanical hazards, marking provision of suitable terminals for supply connections including the provisions for earthing as well as the external surface finish for any surface defects.

In case of failure of sample in any of the tests specified in the standard/inspection manual, reject the lot and send a written communication to the manufacturer. The manufacturer may after rectifying the necessary corrective measures can reoffer the lot for inspection.

Three inspection levels, I, II and III, are given in Table 1 of IS 2500 (Part 1) for general use. Unless otherwise specified, level II shall be used. Level I may be used when less discrimination is needed level III when greater discrimination is required.

Table 1 of IS 2500 (Part 1) provides the information about the lot size and corresponding inspection level. For the purpose of lot inspection by EESL, single sampling plan with normal or tightened or reduced inspection as given in Table 2A, 2 B and 2 C of IS 2500 (Part 1) may be followed. The different level of AQL specifying the acceptance and rejection number of the lot as given in Tables 2 A to 2 C shall be at the discretion of EESL.

Special levels, S-1, S-2, S-3 and S-4 given in Table 1 of IS 2500 (Part 1) may also be used where relatively small sample sizes are necessary and larger sampling risks can be tolerated.

NOTE: A third party inspecting agency can be employed for inspection of the lot offered by the manufacturers and submit test reports in the prescribed format as given in Annex B and duly approved by EESL for scrutiny and approval.

The nature of tests and the relevant test standard for the acceptance tests for direct connected and transformer operated meters are given in the Table 3.

Table 3
List of Acceptance Tests for Pre-Delivery Inspection

| S. No. | Test Requirement | Clause Reference as per IS 1391 (Part 2) | Test Methods | |
|--------|---------------------------------|--|------------------|--------------------------------|
| | | | Clause Reference | Indian Standards |
| 1 | General Construction | 5.1 | 5.1 | 1391 (Part 2) |
| 2 | Material | 5.2 | 5.2 | -do- |
| 3 | Electrically charged parts | 5.3 | 5.3 | -do- |
| 4 | Refrigerant Circuit | 5.4 | 5.4 & 10.4.3 | 1391 (Part 2) & 10773 |
| 5 | Electrical Heater (if provided) | 5.5 | 5.5 | 1391 (Part 2) |
| 6 | Grounding (Earthing) terminal | 5.6 | 5.6 & 27 | 1391 (Part 2) & IEC 60335-2-40 |
| 7 | Cooling capacity test | 9.9 | 8.1 & 9.9 | 1391 (Part 2) |
| 8 | Power consumption | 9.7 | 9.7 | -do- |

| S. No. | Test Requirement | Clause Reference as per IS 1391 (Part 2) | Test Methods | |
|--------|-------------------------------------|--|------------------|---|
| | | | Clause Reference | Indian Standards |
| 9 | Maximum operating conditions test | 9.4 | 8.2 & 9.4 | -do- |
| 10 | Freeze up test | 9.5 | 8.3 & 9.5 | -do- |
| 11 | Enclosure sweat test | 9.6 | 8.4 & 9.6 | -do- |
| 12 | Power factor test | 9.3 | 9.3 | -do- |
| 13 | Test for safety | 9.2 | 9.2 & 7 to 32 | 1391 (Part 2) & IEC 60335-2-40 (where applicable for A2/A2L/A3 refrigerant) |
| 14 | Noise level test | 9.10 | 9.10 | 1391 (Part 2) |
| 15 | Energy efficiency test (ISEER/CSPF) | - | 6.4 and 6.7 | ISO 16358-1 |
| 16 | General running test | 15.3.1 | 15.3.1 | 1391 (Part 2) |
| 17 | Pressure/leakage test | 15.3.2 | 15.3.2 | IS 1391 (Part 2) |
| 18 | Insulation resistance tests | 15.3.3 | 15.3.3 | -do- |
| 19 | High voltage test (as routine test) | 15.3.4 | 15.3.4 & 16 | 1391 (Part 2) & IEC 60335-2-40 (where applicable for A2/A2L/A3 refrigerant) |
| 20 | Performance test | 15.3.5 | 15.3.5 | 1391 (Part 2) |
| 21 | Leakage Current test | 15.3.6 | 15.3.6 & 13 | 1391 (Part 2) & IEC 60335-2-40 |
| 22 | Earthing resistance test | 15.3.7 | 15.3.7 & 27 | -do- |
| 23 | Marking | 17 | 17 | 1391 (Part 2) |

8.2.3 Routine Test

In case production routine tests are to be repeated at the time of procurement, then where agreed between EESL and the manufacturer, the tests may be carried out at the manufacturer's

works; alternatively, the tests may be repeated at the place specified by EESL provided that all the arrangements for tests are made by EESL at the specified place.

Routine tests are the tests that would be conducted on each unit after completion at the manufacturer's work.

The following shall constitute the routine tests:

| S. No. | <i>Nature of Test</i> | <i>Referred Indian Standard</i> | <i>Clause Number</i> |
|---------------|-------------------------------------|--|-----------------------------|
| 1 | General running test | 1391 (Part 2) | 15.3.1 |
| 2 | Pressure/leakage test | -do- | 15.3.2 |
| 3 | Insulation resistance tests | -do- | 15.3.3 |
| 4 | High voltage test (as routine test) | 1391 (Part 2) & 302-1 | 15.3.4 & 13 |
| 5 | Performance test | 1391 (Part 2) | 15.3.5 |
| 6 | Leakage Current test | 1391 (Part 2) & 302-1 | 15.3.6 & 13 |
| 7 | Earthing resistance test | -do- | 15.3.7 & 27 |
| 8 | Marking | 1391 (Part 2) | 17 |

8.3 Post Delivery Inspection/Verification Testing

For verification testing, the sample shall be drawn from open market or manufacturer's warehouse/stockyard. EESL shall bear the cost of the sample as well as the cost of testing.

Verification tests shall cover all the type tests for room air-conditioners as mentioned in Table 3. The type testing shall be carried out in an independent test laboratory.

9 COMPLAINT REDRESSAL

Whenever a complaint is received after the air conditioners have been delivered/used and the complaint is proved to be genuine and the warranty period (where applicable) has not expired, the defective goods or their components shall be replaced or repaired free of cost by the manufacturer. The final authority to judge the conformity of the product to the relevant standard specified in the contract shall be with EESL. In the event of any damages caused by the air conditioner or claim being filed by the user against the supply made by the manufacturer as per the contract, and also not conforming to the relevant standard specified in the contract, entire liability arising out of such non-compliance product shall be with the manufacturer and EESL shall not in any way be responsible in such cases.

The manufacturer shall give a guarantee for the soundness of construction and performance of the air-conditioner, and shall be responsible for putting right any manufacturing defects free of charge for a period of 12 months right from the date of sale or date of installation whichever is

later. Such repairs or replacements of defective parts shall be carried out at manufacturer's works, or his authorized agent at site or at service shop.

10 PRODUCTION PLAN

The manufacturer shall provide advance information about their production plan and readiness of the lot to be offered for inspection to EESL.

11 TEST METHOD AND ITS REQUIREMENTS

11.1 The method of tests and its requirements shall be in accordance with IS 1391 (Part 2) and ISO 16358-1.

11.2 For the purpose of this manual, the term Indian Seasonal Energy Efficiency Ratio (ISEER) is used in place of the Cooling Seasonal Performance Factor (CSPF). The test conditions and the method of calculation to determine the EER/ISEER shall be as given in Clause 6.1 of ISO 16358-1.

All the tests specified in this schedule shall be carried out as per IS 1391 (Part 2) using the balanced ambient calorimeter method. The methodology/test protocol for calculating ISEER, CSEC and CSTL shall be in accordance with ISO-16358-1 with following deviations considered especially for Indian conditions.

Method of evaluation of CSTL, CSEC and ISEER is based on bin hours as specified in the Table 1 below as per national climatic zone.

Method of evaluation of CSTL, CSEC and ISEER is based on bin temperature range of 24 to 43°C and 1600 operating hours for cooling per annum.

The bin hours against each bin temperature is given in the following Table:

| Temperature in °C | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 41 | 42 | 43 | Total |
|----------------------|-----|------|------|------|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-------|
| Average Annual Hours | 527 | 590 | 639 | 660 | 603 | 543 | 451 | 377 | 309 | 240 | 196 | 165 | 130 | 101 | 79 | 59 | 44 | 31 | 20 | 10 | 5774 |
| Fraction | 9.1 | 10.2 | 11.1 | 11.4 | 10.4 | 9.4 | 7.8 | 6.5 | 5.4 | 4.2 | 3.4 | 2.9 | 2.3 | 1.7 | 1.4 | 1.0 | 0.8 | 0.5 | 0.3 | 0.2 | 100 |
| Bin Hours | 146 | 163 | 177 | 183 | 167 | 150 | 125 | 104 | 86 | 67 | 54 | 46 | 36 | 28 | 22 | 16 | 12 | 9 | 6 | 3 | 1600 |

The ISEER and cooling capacity shall be not less than the value prescribed by BEE in their schedule or better subject to agreement between EESL and the manufacturer/supplier.

12 TEST REPORT PROFORMA FOR AIR CONDITIONERS

The test report format give in Annex B1 may be used by the testing laboratory or EESL while submitting their test reports. The test report format for EER/ISEER and annual energy consumption as given in Annex B 2 to B 4 may be used by the testing laboratory or EESL while submitting their test reports.

Annexures

ANNEX A

STEPWISE GUIDELINES FOR THE INSPECTION OF ROOM AIR-CONDITIONERS

1. Introduction

This inspection manual elaborates the quality assurance process for room air conditioners procured by EESL. This will ensure compliance of the procured products with the requirements laid out in the tender document, thereby building credibility of the program and ensuring the quality of the product.

To ensure procurement of quality products, proper inspection should be carried out by EESL. The inspection activities are divided in three different stages:

Step 1 – Bid Evaluation before finalization of the bid

Step 2 – Production/Pre-Delivery

Step 3 – Post-Delivery/Verification Testing

2. Bid Evaluation

For bid evaluation, manufacturer shall submit the test report from an NABL accredited lab against the relevant standard along with other necessary supporting documents (show the list in red below) while submitting their bid. The test report should include type tests on safety and performance.

All the necessary information submitted by the bidder should comply with the prescribed guidelines of EESL and relevant test standard. In case of non-compliance in any of the parameter, the bid shall be rejected.

- a) Copy of valid BIS certification marks License, if the product carries BIS certification mark;
- b) Type test report in original from a NABL accredited testing laboratory as per the relevant standard;
- c) Copy of test certificates of important raw materials and components;
- d) Copy of valid NABL certificate of accreditation of the test lab issuing the test certificate/report; and
- e) Warranty certificate for guarantee of performance of minimum number of years prescribed by EESL.

2. Prerequisite for Inspection at the manufacturers premises

Before undertaking the inspection, the EESL inspecting officers should ensure the following:

- a) Opening meeting with the concerned officials and the testing and quality control personal to discuss and planning to undertake the required task;
- b) Visit to the test laboratory to check the following:
 - Availability of requisite test facilities as per the prescribed standard and its workability;
 - Calibration detail and the validity of each instruments and test equipment ;

- Verification of test records and other relevant records related to in process quality control including the manual and procedure for ISO 9001 certification;
- Verification of testing facilities at the production line if applicable;

After ensuring the compliance of all the requirements mentioned above, the inspecting officers shall draw samples for acceptance and type tests from the lot offered for inspection by the manufacturers. For acceptance tests the sampling plan and AQL shall be as per IS 2500 (Part 1). Routine tests shall be carried out on the entire lot.

After the completion of all the tests as per the specified standard, the test report shall be prepared on the prescribed format as given in Annex B of this manual. The test reports shall be signed by the inspecting officer from EESL and the authorized person from the manufacture.

3. Production/ Pre-Delivery Inspection

The field-inspecting officer shall draw samples at random from the finished stock of the lot offers. The number of samples for acceptance tests shall be as laid down in IS 2500 (Part 1) using a suitable AQL.

The production/pre-delivery inspection shall be carried out by field inspecting personnel from EESL or their authorized representatives at the manufacturer's premises on samples selected at random from their finished stock or their warehouse for testing. The sample shall be supplied free of cost by the manufacturer. The manufacturer shall provide advance information about their production plan and readiness of the lot to be offered for inspection to EESL. Pre dispatch inspection tests include type, acceptance and routine tests.

Before commencement of the type tests, the samples shall be visually examined including the components, parts and their assembly, constructions, mechanical hazards, marking provision of suitable terminals for supply connections including the provisions for earthing. The external surface finish shall be even and free from surface defects.

3.1 Type Tests

The sample selection for type testing shall be based on random sampling. The number of samples for type testing shall be two drawn from the finished stock of the lot offered by the manufacturer/supplier. Sample drawn for type tests shall be sent to an NABL approved test labs. The testing charges for all the type tests shall be borne by EESL.

The samples shall successfully pass all the type tests for proving conformity with the requirements of the standard. If the sample fails in any of the type tests, EESL at its discretion may call for fresh samples not exceeding twice the original number and subject them again to all tests or to the test in which failure had occurred. No failures are permitted in the repeat test.

EESL may waive off the type test on the lot offered by the supplier/manufacturers in case the AC carries BIS certification mark and/or BEE energy efficiency level.

The list of type tests shall be as given in Table 2 of this manual.

3.2 Acceptance Tests

To ensure the quality of products supplied by the manufacturer, acceptance test shall be carried out by EESL on each lot offered for inspection. The manufacturer shall supply, free of charge, the samples from the factory or their warehouse/stockyard for necessary testing in the manufacturers' accredited lab in presence of EESL representatives.

Samples shall be selected at random from the lot offered by the manufacturers/supplier from the finished stock using IS 4905 to ensure proper representation of a lot. The sample size and acceptance quality level (AQL) shall be as per IS 2500 (Part 1).

In the absence of test facilities for any particular test, the testing personnel deputed by EESL shall draw the samples from the manufacturing premises or from manufacturers warehouse/stockyard and send the same to an NABL approved test labs for the required tests.

In case of failure of sample in any of the tests specified in the standard/inspection manual, the lot shall be rejected and a written communication to this effect shall be made to the manufacturer. The manufacturer may after rectifying the necessary corrective measures can reoffer the lot for inspection.

A third party inspecting agency can be employed by EESL for inspection of the lot offered by the manufacturers and submit test reports in the prescribed format given in the inspection manual. The list of acceptance tests shall be as given in Table 4 of this manual.

3.3 Routine Test

In case production routine tests are to be repeated at the time of procurement, then where agreed to between EESL and the manufacturer, the tests may be carried out at the manufacturer's works; alternatively, the tests may be repeated at the place specified by EESL provided that all the arrangements for tests are made by EESL. The routine tests shall be carried out on each air-conditioners from the lot offered for inspection. In case of failure in any of the tests, the sample under tests shall be either rejected or reworked/rectified and retested. The list of routine tests is given in section 8.2.3 of this manual.

4. Post Delivery Inspection/Verification Testing

Verification testing is a vital crosscheck mechanism to ensure quality products reach the end users/consumers post-delivery. For verification testing, the sample shall be drawn from open market or manufacturer's warehouse/stockyard. EESL shall bear the cost of the sample as well as the cost of testing in an independent NABL accredited lab. The verification testing shall include all the type tests specified in IS 1391 (Part 2) and ISO 16358-1 and the inspection manual and shall be sent to independent test lab approved by NABL.

The samples shall successfully pass all the type tests for proving conformity with the requirements of the standard. If the sample fails in any of the type tests, EESL at its discretion, shall draw the sample may call for fresh samples not exceeding twice the original number and subject them again to all tests or to the test in which failure had occurred. No failures are permitted in the repeat test. In case of failure of samples in repeat testing, EESL shall take appropriate action against the manufacturers.

ANNEX B 1

TEST REPORT FORMAT FOR MANUFACTURERS LAB AND INDEPENDENT LAB FOR ISEER AND CSTL/CSEC

1. General Information

| | | | |
|---|--|-----------------|--|
| Manufacturer/ Laboratory Name | | | |
| Address | | | |
| Date of Receipt (for Independent Labs) | | | |
| Test Report No. | | Date of testing | |
| Tested by | | Reviewed By | |

2. Details of the Sample Tested

| | | | |
|---|--|--|--|
| Brand Name | | | |
| Model Name | | Year of Manufacturer | |
| Model Number (Indoor Unit) | | Model Number (Outdoor Unit) | |
| Serial No. (Indoor Unit) | | Serial No. (Outdoor Unit) | |
| Standard Cooling at Full Capacity (W) | | Standard Cooling at 50% of Full Capacity (W) | |
| Rated Power Consumption (in W) at Standard Cooling at Full Capacity | | Rated Power Consumption (in W) at Standard Cooling at 50% of Full Capacity | |
| Rated Frequency (in Hz) at Standard Cooling at Full Capacity | | Frequency setting (in Hz) at Standard Cooling at 50% of Full Capacity | |
| Rated Voltage (V) or Voltage range | | Nominal current (A) at rated conditions | |
| Rated CSEC (kWh) | | Rated CSTL (kWh) | |
| Rated ISEER | | Star Rating | |

3. Measuring Equipment/Instruments Details

| Sr. No. | Instrument/Equipment Name | Make | Accuracy Class | Range and least count | Cal. Valid Date |
|----------------|----------------------------------|-------------|-----------------------|------------------------------|------------------------|
| | | | | | |
| | | | | | |

4. Test Conditions

a) Temperature settings

| Temperature* | | Cooling Capacity Test as per IS 1391 (Part 1 & Part 2) | Power Consumption Test as per IS 1391 (Part 1 & Part 2) |
|--------------------------|-----------------------------|---|--|
| Outdoor | Indoor | At 35°C | |
| 35°C DBT and 24°C WBT | 27°C DBT and 19°C WBT | Standard cooling at Full Capacity | Standard cooling at Full Capacity |
| | | Standard cooling at 50% of full capacity | Standard cooling at 50% of full capacity |

b) Frequency settings

| | | |
|---------------------------|---|--|
| Frequency setting (in Hz) | Standard cooling at Full Capacity (Rated) | Standard cooling at 50% of full capacity (Rated) |
| | | |

5. Test Results

a) Measured input values (at 35°C)

| | | | |
|---|--|--|--|
| Standard Cooling at Full Capacity (W) | | Standard Cooling at 50% of Full Capacity (W) | |
| Rated Power Consumption (in W) at Standard Cooling at Full Capacity | | Rated Power Consumption (in W) at Standard Cooling at 50% of Full Capacity | |

b) Calculated input values (for 29°C)

| | | | |
|---|--|--|--|
| Standard Cooling at Full Capacity (W) | | Standard Cooling at 50% of Full Capacity (W) | |
| Power Consumption (in W) at Standard Cooling at Full Capacity | | Power Consumption (in W) at Standard Cooling at 50% of Full Capacity | |

c) Calculated & Rated Value

| Parameters | Calculated | Rated |
|-------------|------------|-------|
| CSTL (kWh) | | |
| CSEC (kWh) | | |
| ISEER | | |
| Star Rating | | |

ANNEX B 2

TEST REPORT FORMAT FOR AIR CONDITIONERS AS PER IS 1391 (PART 2)

| | |
|---|--|
| Name of the test laboratory | Address and Contract details |
| Name of the Testing personal | Date of receipt of sample in the test laboratory |
| Date of start of testing | Date of completion of testing |
| Nature of test – All tests as per IS 1391 (Part 2) | |
| Rated Cooling Capacity: | Declared value of EER/SEER/CSPF |
| Declared value of CSEC: | |
| Model type Model Size.....Model Serial number:..... | Net total cooling effect kW; Net dehumidifying effect.....- |
| Total air-cooling..... Net Sensible cooling effect..... | Rated Voltage Full load current, Amps |
| Name of the Refrigerant: Mass of refrigerant | Rated frequency. |
| Test witnessed by: | |
| NABL Accreditation Certificate number: | Valid upto: |
| General requirements – Satisfactory/Unsatisfactory | Date Tested by..... Remarks, if any..... |

| S. No. | Nature of Test | Reference Test Standard (IS) | Clause Reference | Verification for test records/test certificate | Remarks (Pass/Fail or Satisfactory/Unsatisfactory/Observed Value) |
|---------------|-----------------------|-------------------------------------|-------------------------|---|--|
|---------------|-----------------------|-------------------------------------|-------------------------|---|--|

| | | | | | |
|----|--|--------------------------------|--|--|--|
| 1 | Construction | 1391-2 | 5.1 | | |
| 2 | Refrigerant Circuit | 1391 (Part 2) & IS 10773 | 5.4 of IS 1391 (Part 2) | | |
| 3 | Electrical Heater | -do- | 5.5 | | |
| 4 | Grounding terminal and grounding Lead wire | -do- | 5.6 | | |
| 5 | Air Filter | -do- | 5.7 | | |
| 6 | Thermostat | 1391 (Part 2) & IS 11338 | 5.8 | | |
| 7 | Thermostatic Expansion valve (Mechanical/electron ic) | - | - | | |
| 8 | Heat Exchanger | - | - | | |
| 9 | Hermetic Compressors | 1391 (Part 2) & IS 10617 | 5.9 of IS 1391 (Part 2) | | |
| 10 | Motors | 1391 (Part 2) & IS 996 | 5.10 | | |
| 11 | Safety requirements | IEC 60335-2- 40 | All tests | | |
| 13 | Capacity Rating Test | 1391-2 | 9.9 | | |
| 14 | Power Factor Test | -do- | 9.3 | | |
| 15 | Maximum operating conditions Test | -do- | 9.4 | | |
| 16 | Freeze-up Test | -do- | 9.5 | | |
| 17 | Enclosure sweat Test | -do- | 9.6 | | |
| 18 | Power consumption test | -do- | 9.7 (cooling) and 9.8 (heating) | | |
| 19 | Noise Test | -do- | 9.10 | | |
| 20 | Heat Pump heating capacity Test | -do- | 9.11 | | |
| 21 | General Running Test | -do- | 15.3.1 | | |

| | | | | | |
|----|----------------------------|------|--------|--|--|
| 22 | Pressure Test/Leakage Test | -do- | 15.3.2 | | |
| 23 | Insulation Resistance Test | -do- | 15.3.3 | | |
| 24 | High Voltage Test | -do- | 15.3.4 | | |
| 25 | Performance Test | -do- | 15.3.5 | | |
| 26 | Leakage current Test | -do- | 15.3.6 | | |
| 27 | Earthing Resistance Test | -do- | 15.3.7 | | |

ANNEX B 3

TEST REPORT FORMAT FOR COOLING CAPACITY TEST FOR ROOM AIR CONDITIONERS AS PER IS 1391 (PART 2)

(Data to be Recorded for Cooling Capacity Tests)

The following data shall be recorded for cooling capacity tests:

1. Date of Testing;
2. Observers;
3. Barometric pressure;
4. Applied voltage for each test unit motor;
5. Frequency of applied voltage for each test unit motor;
6. Total power input to unit, except if more than one external power connection is provided on unit, record input to each connection separately;
7. Total current input to unit;
8. Control dry bulb and wet bulb temperatures of air (room side calorimeter compartment) {see clause 12.2.7 of IS 1391 (Part 2)};
9. Control dry bulb and wet bulb temperatures of air (outdoor side calorimeter compartment) {see 12.2.7 of IS 1391 (Part 2)};
10. Average air temperature outside the calorimeter (calibrated room type) {see Fig. 2A of IS 1391 (Part 2)};
11. Total power input to room side and outdoor side compartment;
12. Water quantity evaporated in humidifier;
13. Temperature of Humidifier water entering room side compartment or in humidifier tank;
14. Cooling water-flow rate through outside compartment heat rejection coil;
15. Temperature of cooling water entering outdoor side compartment for heat rejection coil;
16. Temperature of cooling water leaving outdoor side compartment from heat rejection coil;
17. Water condensed in outdoor side compartment;
18. Temperature of condensed water leaving outdoor side compartment;
19. Volume of airflow through measuring nozzle of separating partition flow meter; and
20. Static air pressure difference across separating partition calorimeter compartments.



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