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Standard Specification for Cell-Type Oven with Controlled Rates of Ventilation[1]

This standard is issued under the fixed designation E95; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This specification covers the general requirements of a cell-type oven with controlled rates of ventilation for determining loss in weight or changes in properties of materials on heating at elevated temperatures. These specifications take into account the fact that chamber geometry, rate of ventilation, and temperature each affect the rate of loss of volatile constituents from a material, or the rate of change in other properties. This oven is recommended whenever the results are dependent on the time and temperature of heating, the amount of ventilation, or both. It is assumed that specific requirements such as specimen shape and dimensions, rate of ventilation, time, and temperature will be included in the applicable material specifications or test methods.

NOTE 1—Ovens meeting these specifications have been found useful for determination of plasticizer loss in plastics, and for controlled aging of elastomers and plastics.

1.2 The values stated in inch-pound units are to be regarded as the standard.

2. Referenced Documents

2.1 *ASTM Standards:*[2]

D1870 Practice for Elevated Temperature Aging Using a Tubular Oven (Withdrawn 1998)[3]

3. Types

3.1 Ovens are classified according to ventilation rate within the cells, provision being made for low (LV) and high (HV) ventilation rates. Thus, for materials showing low rates of weight loss a means is provided for their evaluation without the necessity of providing the excessive heat input required by the higher ventilation rate. It should, however, be established by experiment when using the LV-type oven that the rate of ventilation is adequate to avoid stagnation at the surface of the specimens, as would be caused, for example, by high rates of diffusion of volatile constituents through the body of the specimen.

3.2 Oven types are classified as follows:

Type	Ventilation Rate, m/min
LV	0.25 to 25
HV	100 to 250

4. Requirements

4.1 The oven shall consist of one or more cylindrical cells, each having a minimum diameter of 35 mm (1.4 in.) and a minimum length of 300 mm (12 in.). The cells shall be mounted in a thermostatically controlled, heat-transfer medium: for example, an aluminum block, a liquid bath, or a circulating-air oven. The cells shall not be constructed of copper or a copper alloy.

4.2 The design of the oven shall be such that heated air enters one end of the cell and is exhausted from the other end of it without being recirculated. In order to prevent cross-migration of volatile constituents contained in the specimens being tested, air passing over a specimen in one cell shall not come in contact with specimens in other cells.

4.3 Air entering the cells shall have been filtered and preheated to within 1°C of the specified temperature for the space occupied by the specimen. The design shall also permit the cells to be cleaned easily after each test.

4.4 Provision shall be made for metering the airflow through each cell within ±10 % of any desired rate within the range of the particular type of oven. The air may be metered to each tube, or a single pressure-control device leading to a plenum chamber may be used. If a plenum chamber is used, cells should be connected to it by passageways or orifices having restrictions to assure the same rate of airflow to each cell. The rate of flow may be measured on the entering air at room temperature, if the proper factor is applied for the increase in rate of flow caused by the thermal expansion of the air when it is raised to the temperature of the cell.

4.5 Provision shall be made for supporting and positioning specimens within the cell, separated from each other and without touching the walls of the cell.

[1] This specification is under the jurisdiction of ASTM Committee E41 on Laboratory Apparatus and is the direct responsibility of Subcommittee E41.06 on Laboratory Instruments and Equipment.

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[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

[3] The last approved version of this historical standard is referenced on www.astm.org.

NOTE 2—Only one specimen should be mounted in each cell unless it is known that the inclusion of additional specimens would not affect the result. The specimens and specimen supports should not occupy more than 25% of thecross-sectional area of the cell.

4.6 The temperature in the space occupied by the specimen shall be controllable within 1°C of any specified temperature within the range of 50 to 150°C. The assumption should not be made that the temperature of individual cells is the same as the temperature of the heating medium, or that the temperature of all cells is alike simply because they are immersed in the same heating medium. Differences in cell temperatures may result from differences in the rate of airflow, in the temperature of air entering the cells, or in the temperature at various locations in the oven. It is recommended that the temperature in the space occupied by the specimen be verified by means of

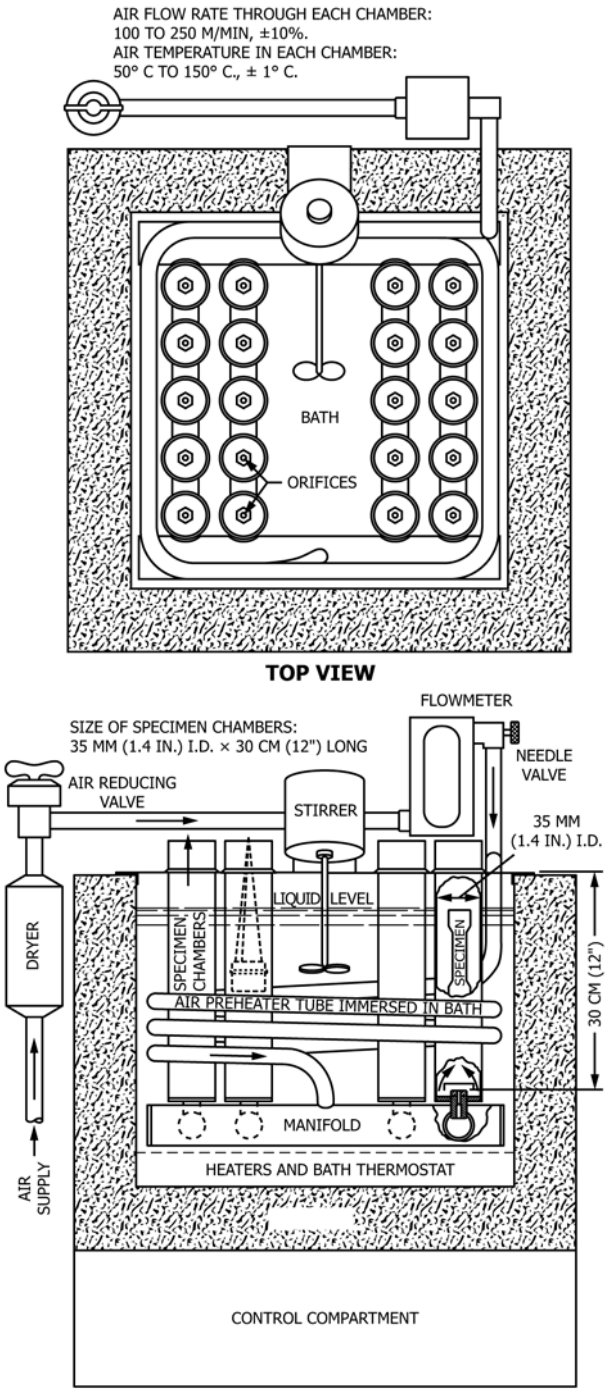

FIG. 1 Type HV Cell-Type Oven

thermocouples, care being taken to avoid heat loss along thermocouple lead wires.

5. Design

5.1 The design of the oven is optional provided it complies with the requirements of 4.1 – 4.6, inclusive. One design that conforms to these requirements is shown in Fig. 1. Another design is shown in the appendix of Practice D1870.

6. Keywords

6.1 cell-type; controlled rates of ventilation; ovens

REFERENCES

(1) Marks, M. E., "Method for Weight Loss of Plastic Films and Sheets on Heating," *ASTM Bulletin*, No. 159, July, 1949, p. 53.
(2) *Journal*, Society Chemical Industry, January, 1947.
(3) *Industrial and Engineering Chemistry*, Vol 35, 1943, p. 896.
(4) *Journal Scientific Instruments*, Vol 11, 1934, p. 10.