



Standard Test Method for the Thermal Performance of Building Assemblies by Means of a Hot Box Apparatus¹

This standard is issued under the fixed designation C 1363; 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 test method covers the laboratory measurement of heat transfer through a specimen under controlled air temperature, air velocity, and thermal radiation conditions established in a metering chamber on one side and in a climatic chamber on the other side.

1.2 This test method generally is used for large homogeneous or nonhomogeneous specimens. This test method may be applied to any building structure or composite assemblies of building elements for which it is possible to build a representative specimen of a size that is appropriate for the apparatus.

NOTE 1—This test method was prepared for the purpose of replacing Test Methods C 236 and C 976. The test method was developed by combining the technical information contained in the two existing hot box methods with some additional information added to improve the test accuracy and reproducibility. Test apparatus, designed and operated under Test Methods C 236 and C 976, should, in most cases, meet the requirements of this test method with only slight modifications to calibration and operational procedures.

1.3 This test method is intended for use at conditions typical of normal building applications. The usual consideration is to duplicate naturally occurring outside conditions that in temperate zones may range from approximately -48 to 85°C and normal inside residential temperatures of approximately 21°C . Building materials used to construct the specimens are generally pre-conditioned to typical laboratory conditions of 23°C and 50 % relative humidity prior to assembly. Practice C 870 may be used as a guide for sample conditioning. Further conditioning prior to testing may be performed to provide moisture conditioned samples, if necessary.

1.4 This test method permits operation under natural or forced convective conditions at the specimen surface. The direction of air flow motion may be either perpendicular or parallel to the surface.

1.5 The hot box apparatus also can be used for measurements of individual building elements that are smaller than the metering area. Special calibration specimens and procedures are required for these tests. The general testing procedures for these cases are described in Annex A4.

1.6 Specific procedures for the thermal testing of window and door systems are described in Test Method C 1199 and Practice E 1423. The hot box also may be used to investigate the effect of non-homogeneous building assemblies such as structural members, piping, electrical outlets, or construction defects such as insulation voids.

1.7 This test method governs steady-state tests and does not establish procedures or criteria for conducting dynamic tests or for analysis of dynamic test data. However, several hot box apparatuses have been operated under dynamic (non-steady-state) conditions (1). Dynamic control strategies have included both periodic or non-periodic temperature cycles, for example, to follow a diurnal cycle.

1.8 This test method does not permit intentional mass transfer of air or moisture through the specimen during measurements of energy transfer. Air infiltration or moisture migration can significantly alter net heat transfer. Complicated interactions and dependence upon many variables, coupled with only a limited experience in testing under such conditions, have made it inadvisable to include this type of testing in this test method. ASTM Subcommittee C16.30 has several task groups that are researching this testing need, and will be preparing a separate standard. Further considerations for such testing are given in Appendix X1.

1.9 This test method sets forth the general design requirements necessary to construct and operate a satisfactory hot box apparatus, and covers a wide variety of apparatus constructions, test conditions, and operating conditions. Detailed designs conforming to this test method are not given, but must be developed within the constraints of the general requirements. Examples of analysis tools, concepts, and procedures used in the design, construction, calibration, and operation of a hot box apparatus are provided in Refs (1-26).

1.10 This test method does not specify all details necessary for the operation of the apparatus. Decisions on sampling, specimen selection, preconditioning, specimen mounting and positioning, the choice of test conditions, and the evaluation of test data shall follow applicable ASTM test methods, guides, practices, or product specifications or government regulations. If no applicable standard exists, sound engineering judgment that reflects accepted heat transfer principles shall be used and documented.

1.11 In order to ensure the level of precision and accuracy

¹ This test method is under the jurisdiction of ASTM Committee C-16 on Thermal Insulation and is the direct responsibility of Subcommittee C16.30 on Thermal Measurements.

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