Designation: C 1558 – 03 (Reapproved 2007)

Standard Guide for Development of Standard Data Records for Computerization of Thermal Transmission Test Data for Thermal Insulation[1]

This standard is issued under the fixed designation C 1558; 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 guide provides recommended formats for the recording of thermal transmission test data for thermal insulation and similar materials for inclusion in computerized material property databases. From this information, the database designer should be able to construct the database dictionary preparatory for development of a database schema.

1.2 This guide is applicable to thermal transmission test data obtained from standard test methods that cover planar and radial specimen geometries.

1.3 This guide is not intended for thermal transmission data obtained for thermal insulation assemblies or systems (that is, heat transmission coefficients for walls, roofs, ceilings, and floors).

1.4 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory requirements prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:* [2]

C 168 Terminology Relating to Thermal Insulation

C 177 Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus

C 195 Specification for Mineral Fiber Thermal Insulating Cement

C 196 Specification for Expanded or Exfoliated Vermiculite Thermal Insulating Cement

C 208 Specification for Cellulosic Fiber Insulating Board

C 335 Test Method for Steady-State Heat Transfer Properties of Pipe Insulation

C 449/C 449M Specification for Mineral Fiber Hydraulic-Setting Thermal Insulating and Finishing Cement

C 516 Specification for Vermiculite Loose Fill Thermal Insulation

C 518 Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus

C 533 Specification for Calcium Silicate Block and Pipe Thermal Insulation

C 534 Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form

C 547 Specification for Mineral Fiber Pipe Insulation

C 549 Specification for Perlite Loose Fill Insulation

C 552 Specification for Cellular Glass Thermal Insulation

C 553 Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications

C 578 Specification for Rigid, Cellular Polystyrene Thermal Insulation

C 592 Specification for Mineral Fiber Blanket Insulation and Blanket-Type Pipe Insulation (Metal-Mesh Covered) (Industrial Type)

C 610 Specification for Molded Expanded Perlite Block and Pipe Thermal Insulation

C 612 Specification for Mineral Fiber Block and Board Thermal Insulation

C 656 Specification for Structural Insulating Board, Calcium Silicate

C 665 Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing

[1] This guide is under the jurisdiction of ASTM Committee C16 on Thermal Insulation and is the direct responsibility of Subcommittee C16.30 on Thermal Measurement.

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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.

C 726 Specification for Mineral Fiber Roof Insulation Board
C 728 Specification for Perlite Thermal Insulation Board
C 739 Specification for Cellulosic Fiber Loose-Fill Thermal Insulation
C 745 Test Method for Heat Flux Through Evacuated Insulations Using a Guarded Flat Plate Boiloff Calorimeter
C 764 Specification for Mineral Fiber Loose-Fill Thermal Insulation
C 991 Specification for Flexible Fibrous Glass Insulation for Metal Buildings
C 1014 Specification for Spray-Applied Mineral Fiber Thermal and Sound Absorbing Insulation
C 1029 Specification for Spray-Applied Rigid Cellular Polyurethane Thermal Insulation
C 1033 Test Method for Steady-State Heat Transfer Properties of Pipe Insulation Installed Vertically[3]
C 1044 Practice for Using a Guarded-Hot-Plate Apparatus or Thin-Heater Apparatus in the Single-Sided Mode
C 1045 Practice for Calculating Thermal Transmission Properties Under Steady-State Conditions
C 1071 Specification for Fibrous Glass Duct Lining Insulation (Thermal and Sound Absorbing Material)
C 1086 Specification for Glass Fiber Felt Thermal Insulation
C 1114 Test Method for Steady-State Thermal Transmission Properties by Means of the Thin-Heater Apparatus
C 1126 Specification for Faced or Unfaced Rigid Cellular Phenolic Thermal Insulation
C 1149 Specification for Self-Supported Spray Applied Cellulosic Thermal Insulation
C 1289 Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board
C 1290 Specification for Flexible Fibrous Glass Blanket Insulation Used to Externally Insulate HVAC Ducts
C 1363 Test Method for Thermal Performance of Building Materials and Envelope Assemblies by Means of a Hot Box Apparatus
C 1410 Specification for Cellular Melamine Thermal and Sound-Absorbing Insulation
C 1427 Specification for Extruded Preformed Flexible Cellular Polyolefin Thermal Insulation in Sheet and Tubular Form

2.2 *ISO Standards:*

ISO 8301 Thermal Insulation, Determination of Steady-State Thermal Resistance and Related Properties—Heat Flow Meter Apparatus[4]
ISO 8302 Thermal Insulation—Determination of Steady-State Thermal Resistance and Related Properties—Guarded Hot Plate Apparatus[4]
ISO 8497 Thermal Insulation—Determination of Steady-State Thermal Transmission Properties of Thermal Insulation for Circular Pipes[4]
ISO 8990 Thermal Insulation—Determination of Steady-State Thermal Transmission Properties—Calibrated and Guarded Hot Box[4]

3. Terminology

3.1 *Definitions*—For definitions of some terms applicable to this guide, see Terminology C 168

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *class*, *n*—a major material class, for example, ceramic, insulation, polymer, etc.

3.2.2 *data element*, *n*—an individual piece of information used to describe a material or to record test results; for example, a variable name or a test parameter.

3.2.2.1 *Discussion*—The term is synonymous with *data item*.

3.2.3 *essential field*, *n*—a field in a record that must be completed in order to make the record meaningful in accordance with the pertinent guidelines or standard.

3.2.3.1 *Discussion*—Fields are considered essential if required to make a comparison of property data from different sources meaningful. A comparison of data from different sources may still be possible if essential information is omitted, but the value of the comparison may be greatly reduced.

3.2.4 *field*, *n*—an elementary unit of a record that may contain a data item, a data aggregate, a pointer, or a link.

3.2.5 *field name*, *n*—a name or code associated with a field and used for identification.

3.2.6 *form*, *n*—the material form, for example, blanket, board, or roll.

3.2.7 *value set*, *n*—an open listing of representative acceptable text which could be included in a particular field of a record.

4. Significance and Use

4.1 This guide defines the principal elements of information, which are considered important and worth recording and storing permanently in computerized databases. Sufficient information is provided in this guide to enable the user to construct a database structure suitable for the intended application involving thermal insulation.

4.2 Because of increased activity in building computerized materials databases and the desire to encourage uniformity and ease of data comparison and interchange, these recommended formats provide for the inclusion of specific elements of thermal transmission test data in databases.

4.3 This guide has no implication on data required for materials production or purchase. Reporting of actual test results shall be as described in the actual materials specification or as agreed upon between the vendor and purchaser.

4.4 The suggested set of units for the recommended standard format given in this guide is SI. This guide, however, does not preclude other sets of units, such as inch-pound (IP).

5. Recording of Test Data

5.1 Table 1 is a recommended standard format for the computerization of thermal transmission data for thermal insulation materials. The headings for each field are:

5.1.1 *Field Number*—A reference number assigned to an individual data field that has no permanent value and does not become part of the database.

[3] Withdrawn.
[4] Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036, http://www.ansi.org.

TABLE 1 Data Format for Computerization of Test Data for Thermal Insulation

Field No.	Field Name and Description	Data Type	Value Sets or Units
Material Identification			
1*	Material reference number	text	
2*	Material class	text	
3*	Material name	text	
4*	Material description	text	
5	Material specification	text	
6	Material designation	text	
7	Material manufacturer	text	
8	Material source	text	
9	Material lot code	text	
10	Date of manufacture	text	
11	Material form	text	
12	Material classification	text	
Microstructure			
13*	Microstructure type	text	
14	Cell size	real	μm
15	Fiber size	real	μm
16	Particle size	real	μm
17	Blowing agent	text	
18	Closed-cell content	real	%
19	Binder content	real	%
20	Shot content	real	%
Test Method			
21*	ASTM, ISO, or other designation	text	
22*	Test facility—laboratory	text	
23*	Test facility—city	text	
24*	Test facility—state	text	
25	Test facility—country	text	
26	Test facility—Site elevation	real	m
27	Test operator	text	
28*	Apparatus type	text	
29*	Apparatus arrangement	text	
30*	Apparatus size—outer dimension	real	m
31*	Apparatus size—outer dimension	real	m
32*	Apparatus meter area—dimension	real	m
33*	Apparatus meter area—dimension	real	m
34*	Apparatus identification	text	
35*	Mode of operation	integer	
36*	Direction of heat flow	text	
37	Emittance	real	(dimensionless)
38	Plate flatness	real	mm
39	Method of plate separation	text	
40	Data collection method	text	
41	Sampling interval	real	s
42	Computer software	text	
Specimen Description			
43	Specimen layout reference	text	
44*	Conditioning temperature	real	K
45*	Conditioning humidity	real	% RH
46*	Conditioning time	real	hours
47	Conditioning environment	text	
48*	Number of test specimens	integer	
49*	Specimen identification	integer	
50*	Specimen geometry	text	
51	Specimen width	real	mm
52	Specimen length	real	mm
53	Specimen diameter	real	mm
54	Specimen circumference	real	mm
55*	Specimen thickness	real	mm
56*	Specimen mass	real	kg
57*	Bulk density	real	kg/m^3
58	Porosity	real	(dimensionless)
59	Sub-components	text	
Test Results and Analysis			
60*	Date of test	date	(year, month, day)
61*	Moisture content before testing	real	%
62*	Moisture content after testing	real	%
63*	Hot temperature—average	real	K
64	Hot temperature—standard deviation	real	K
65*	Cold temperature—average	real	K
66	Cold temperature—standard deviation	real	K
67*	Heat flow—average	real	W
68	Heat flow—standard deviation	real	W
69*	Meter area	real	m^2

TABLE 1 *Continued*

Field No.	Field Name and Description	Data Type	Value Sets or Units
70*	Specimen test thickness	real	mm
71	Clamping pressure	real	kPa
72	Mean temperature	real	K
73	Temperature difference	real	K
74*	Ambient temperature—average	real	K
75	Ambient temperature—standard deviation	real	K
76	Ambient humidity—average	real	%
77	Ambient humidity—standard deviation	real	%
78	Ambient barometric pressure—average	real	kPa
79	Ambient barometric pressure—standard deviation	real	kPa
80*	Thermal conductance—average	real	$W/(m^2 \cdot K)$
81	Thermal conductance—standard deviation	real	$W/(m^2 \cdot K)$
82*	Thermal resistance—average	real	$m^2 \cdot K/W$
83	Thermal resistance—standard deviation	real	$m^2 \cdot K/W$
84	Thermal conductivity—average	real	W/(m·K)
85	Thermal conductivity—standard deviation	real	W/(m·K)
86	Thermal resistivity—average	real	m·K/W
87	Thermal resistivity—standard deviation	real	m·K/W
88*	Is the test valid?	logical	
89*	Standard uncertainty of test result	real	%
90*	Footnotes	text	

* Essential field

5.1.2 *Field Name and Description*—The complete name of the field, descriptive of the data element of information of interest.

5.1.3 *Data Type*—Type of data to be included in the field, such as the type of number, character text, logical values (yes/no), and date.

5.1.4 *Value Sets or Units*—A listing of the types of information which would be included in the field or, in the case of properties or the numeric fields, the SI units in which the numbers are expressed.

5.2 The presentation of the recommended standard format does not require that every element of information be included in every database. There is, however, a minimum number of fields considered essential to any database and these fields are marked with an asterisk (*).

NOTE 1—Many databases are prepared for specific applications and, therefore, some database builders may omit certain elements considered to be of no value for that specific application. Conversely, in some individual cases, additional data elements are needed and the database builder is encouraged to include these elements along with the elements in the recommended standard format. It is important to note that not all of the elements considered essential will be available for every test. Further, not all of the fields included in the recommended standard format are appropriate for all tests.

5.3 The recommended standard format is divided into five sections as illustrated in Fig. 1: material identification; microstructure; test method; specimen description; and test results and analysis.

5.4 Fields that indicate the accuracy of each measurement are beyond the scope of this guide. However, the entries in all fields should be given to the appropriate number of significant figures.

6. Material Identification

6.1 The fields in this section identify the material tested.

NOTE 2—The numbers given in parentheses after the field name refer to the field number in Table 1 and accompanying tables. Essential fields are identified by an asterisk (*).

6.1.1 *Material Reference Number (1*)*—Unique database identifier containing material and process information for the specimens. A typical value set may contain information from the material lot code (see Field 9).

6.1.2 *Material Class (2*)*—A major material class, for example ceramic, insulation, metal, polymer, rubber, etc.

6.1.3 *Material Name (3*)*—A (generic) name for the particular material. A value set of typical responses is given in Table 2.

6.1.4 *Material Description (4*)*—Descriptive name of material tested, for example, E-type fibrous glass with phenolic binder.

6.1.5 *Material Specification (5)*—Specification and year of issue for material name in field (3). A value set of typical responses is given in Table 2.

6.1.6 *Material Designation (6)*—Trade name, trademark, brand name, etc., of material.

6.1.7 *Material Manufacturer (7)*—Manufacturer of material.

6.1.8 *Material Source (8)*—Source of material, if different from manufacturer.

6.1.9 *Material Lot Code (9)*—Manufacturer identification (date, plant, etc.).

6.1.10 *Date of Manufacture (10)*—Date of manufacture.

6.1.11 *Material Form (11)*—Functional form of material. A value set of typical responses is given in Table 2.

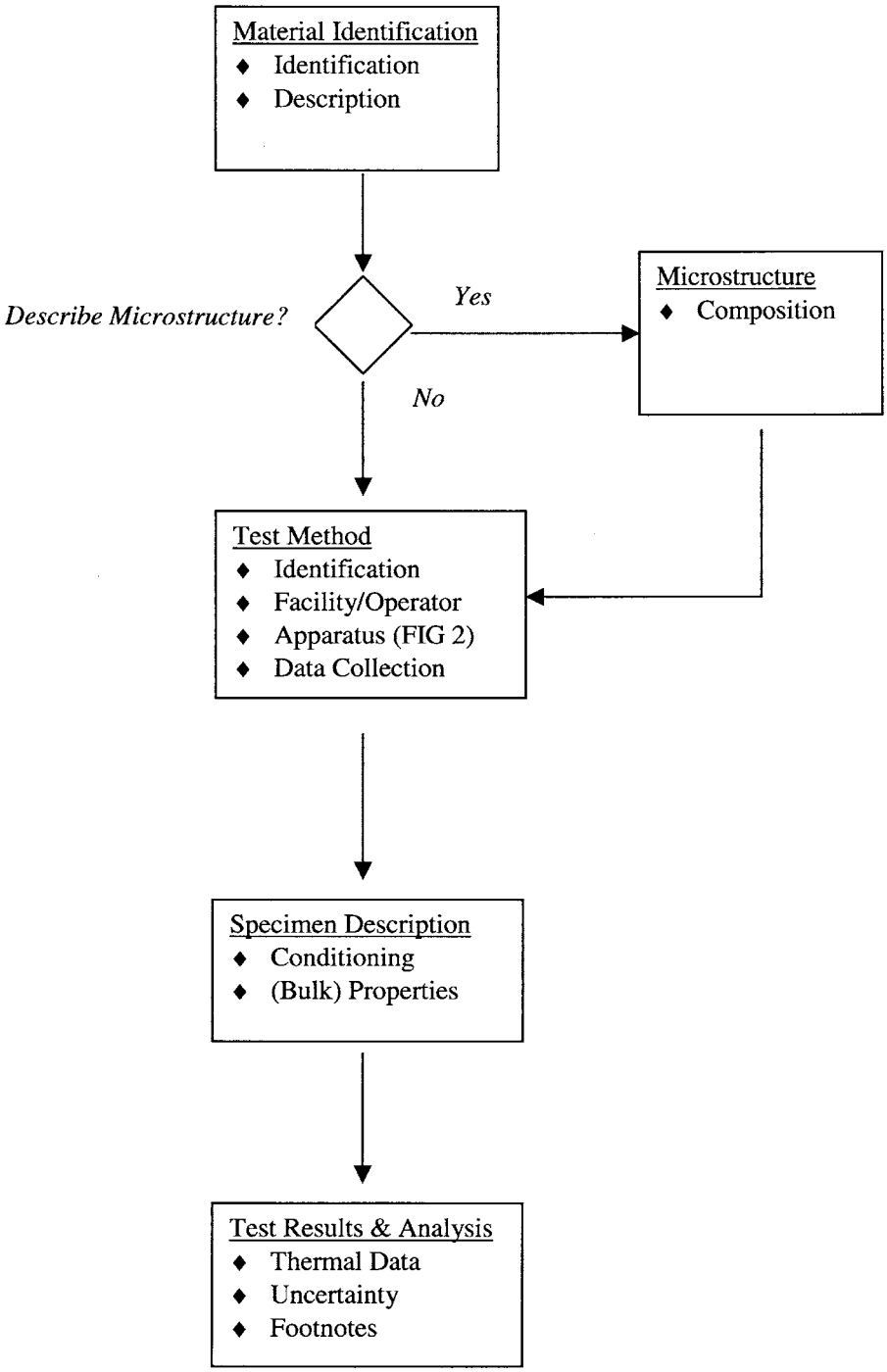

FIG. 1 Sequence of Steps for Entering Data

6.1.12 *Material Classification (12)*—ASTM Classification for material, see particular material specification (include year of issue).

7. Microstructure

7.1 The fields in this section pertain to the microstructure of the material and provide information complementary to the test results and analysis given in 10. The information requested is basic to the characterization of the insulation and is not intended, in this condensed form, for prediction of thermal performance.

7.1.1 *Microstructure Type (13*)*—Composition (cellular, fibrous, particle, etc.).

7.1.2 *Cell Size (14)*—Diameter of cells, if applicable.

TABLE 2 Typical Information for Material Name, Specification, and Form

Material Name	Material Specification[A]	Material Form
Calcium Silicate	C 533, C 656	Block/Pipe, Board
Cellular Glass	C 552	Block/Board/Pipe/Special
Cellular Elastomeric	C 534	Pipe/Sheet
Cellular Melamine	C 1410	Slab/Pipe/Special
Cellular Phenolic	C 1126	Board/Pipe
Cellular Polyisocyanurate	C 1289	Board
Cellular Polyolefin	C 1427	Pipe/Sheet
Cellular Polystyrene	C 578	Board
Cellular Polyurethane, Spray	C 1029	Spray
Cellulosic Fiber	C 739	Loose
Cellulosic Fiberboard	C 208	Board
Cellulosic, Spray	C 1149	Spray
Fibrous Glass	C 991, C 1071, C 1290	Blanket, Blanket/Board, Blanket
Glass Fiber Felt	C 1086	Mat
Mineral Fiber	C 553, C 592, C 665, C 612, C 764, C 726, C 547	Blanket, Block, Board, Loose, Pipe
Mineral Fiber Insulating Cement	C 195	Paste (dry after application), Flat/Special
Mineral Fiber Hydraulic Cement	C 449/C 449M	Paste (dry after application), Flat/Special
Mineral Fiber, Spray	C 1014	Spray
Perlite	C 549, C 610, C 728	Loose, Block/Pipe, Board
Vermiculite	C 516	Loose
Vermiculite Insulating Cement	C 196	Paste

[A] Include year of issue.

7.1.3 *Fiber Size (15)*—Diameter of fibers, if applicable.

7.1.4 *Particle Size (16)*—Diameter of particles, if applicable.

7.1.5 *Blowing Agent (17)*—Name of blowing agent, if applicable.

7.1.6 *Closed-cell Content (18)*—Percentage of closed cells, if applicable.

7.1.7 *Binder Content (19)*—Binder content, if applicable.

7.1.8 *Shot Content (20)*—Shot content, if applicable.

8. Test Method

8.1 The fields in this section describe the test procedure, apparatus, and data collection for a particular test method.

8.1.1 *Test Method (21*)*—ASTM, ISO, or other designation, for example, Test Method C 177 or ISO 8302 (include year of issue, if applicable). A value set of typical responses is included in Table 3.

8.1.2 *Test Facility (22*, 23*, 24*, 25, 26)*—Laboratory, city, state, country, and site elevation where the tests were performed.

8.1.3 *Test Operator (27)*—Include as a minimum the operator responsible for the test report.

8.1.4 *Apparatus Type (28*)*—Differentiate between planar or radial geometry. A value set of typical responses is included in Table 3 and Fig. 2.

8.1.5 *Apparatus Arrangement (29*)*—Provide apparatus arrangement. A value set of typical responses is included in Table 3 and Fig. 2.

8.1.6 *Apparatus Size (30*, 31*)*—Outer dimensions of apparatus. A value set of typical responses is included in Table 3 and Fig. 2.

8.1.7 *Apparatus Meter Size (32*, 33*)*—Dimensions of meter area. A value set of typical responses is included in Table 3 and Fig. 2.

8.1.8 *Apparatus Identification (34*)*—Documentation of apparatus including serial number, for example, line-heat-source guarded-hot-plate apparatus (SN NIST LHS/GHP02).

8.1.9 *Mode of Operation (35*)*—Differentiate between double-sided (*2*) test or single-sided (*1*) test (for example, Practice C 1044). A value set of typical responses is included in Table 4.

8.1.10 *Direction of Heat Flow (36*)*—Direction of heat flow through specimens. A value set of typical responses is included in Table 4.

8.1.11 *Emittance (37)*—Total hemispherical or normal emittance value of heat transfer surfaces of apparatus.

8.1.12 *Plate Flatness (38)*—Flatness of plates, if applicable.

8.1.13 *Method of Plate Separation (39)*—Technique used to maintain plate separation between the hot surfaces and cold surfaces, for example spacers.

TABLE 3 Typical Information for Test Apparatus (see also Fig. 2)

Method[A]	Figure	Type	Arrangement	Outer/Inner Dimensions		Meter Dimensions	
C 177	(2a)	Planar	Square	A_1	A_1	B_1	B_1
	(2b)		Round	D_1	. . .	D_2	. . .
C 335	(2d)	Radial	Cylindrical, guarded end	A_1	D_1/D_2	B1	D_1
			Cylindrical, insulated end	A_1	D_1/D_2	B_1	D_1
C 518	(2a)	Planar	Square	A_1	A_1	B_1	B_1
C 745	(2a)	Planar	Square	A_1	A_1	B_1	B_1
	(2b)		Round	D_1	. . .	D_2	. . .
C 1033	(2e)	Radial	Cylindrical, guarded end	A_1	D_1/D_2	B_1	D_1
C 1114	(2c)	Planar	Rectangular	A_1	A_2	B_1	B_2
C 1363	(2c)	Planar	Rectangular	A_1	A_2	B_1	B_2

[A] Include year of issue.

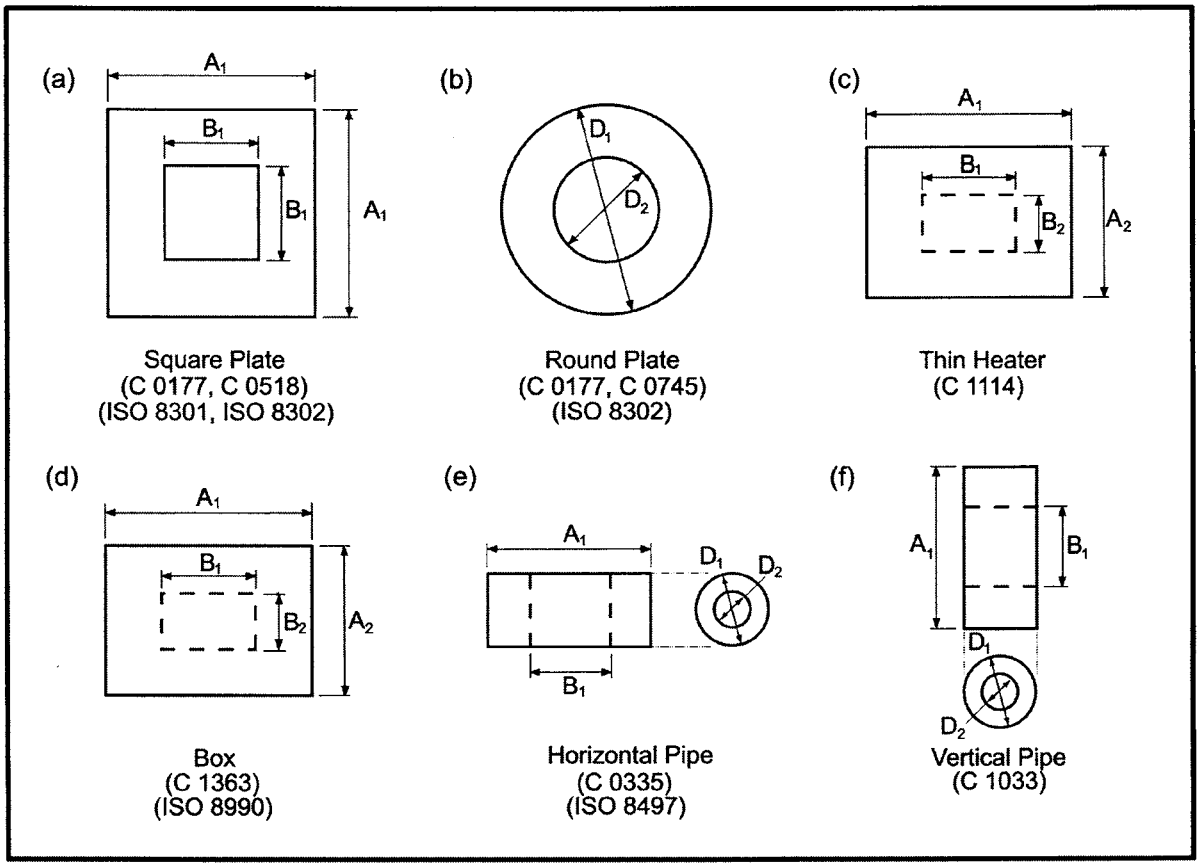

FIG. 2 Schematic of Test Apparatus (see also Table 3)

TABLE 4 Typical Information for Direction of Heat Flow

Single-Sided (1) Mode of Operation	Double-Sided (2) Mode of Operation
Up	Vertical
Down	Horizontal
Horizontal	
Radial inward	
Radial outward	

8.1.14 *Data Collection Method (40)*—Method of data collection, for example manual or computer.

8.1.15 *Sampling Interval (41)*—Sampling interval for data collection.

8.1.16 *Computer Software (42)*—Software and version used for data collection, if applicable.

9. Specimen Description

9.1 The fields in this section describe the preparation, conditioning, and technical information for the test specimens. The fields in this section should be repeated for each test (including multiple temperature tests).

9.1.1 *Specimen Layout Reference (43)*—Reference to cutting plan and location for each specimen when cut from a production run.

9.1.2 *Specimen Conditioning Data (44*, 45*, 46*, 47)*—Provide the conditioning temperature, humidity, elapsed time, and environment prior to test.

9.1.3 *Number of Specimens (48*)*—Number of test specimen(s).

9.1.4 *Specimen Identification (49*)*—Identification number(s) for specimens.

9.1.5 *Specimen Geometry (50*)*—Indicate whether rectangular, pipe, round, or square, specimens.

9.1.6 *Specimen Width, Length (51, 52)*—If rectangular or square specimens, provide length and width.

9.1.7 *Specimen Diameter (53)*—If round specimens, provide diameter.

9.1.8 *Specimen Circumference (54)*—If pipe specimens, provide circumference.

9.1.9 *Specimen Thickness (55*)*—Thickness of specimen.

9.1.10 *Specimen Mass (56*)*—Mass of specimen.

9.1.11 *Bulk Density (57*)*—Determination of bulk density for specimen.

9.1.12 *Porosity (58)*—Determination of porosity for specimen.

9.1.13 *Sub-Components (59)*—Provide generic name(s) for sub-component materials, if present. For example, an all service (pipe) jacket.

10. Test Results and Analysis

10.1 The fields in this section describe the test results and analysis.

TABLE 5 Example Report of Data Format for Computerization of Steady-State Thermal Transmission Test Data for Thermal Insulation

Field No.	Field Name and Description	Value
Material Identification		
1*	Material reference number	to be assigned
2*	Material class	thermal insulation
3*	Material name	fibrous glass board
4*	Material description	E-type glass fiber, phenolic binder
5	Material specification	
6	Material designation	
7	Material manufacturer	
8	Material source	
9	Material lot code	
10	Date of manufacture	
11	Material form	board
12	Material classification	
Microstructure		
13	Microstructure type	fibrous
14	Cell size	
15	Fiber size	
16	Particle size	
17	Blowing agent	
18	Closed-cell content	
19	Binder content	
20	Shot content	
Test Method		
21*	ASTM, ISO, or other designation	ASTM C 177-85 (1993), C 1043-96
22*	Test facility—laboratory	NIST
23*	Test facility—city	Gaithersburg
24*	Test facility—state	Maryland
25	Test facility—country	USA
26	Test facility—Site elevation	
27	Test operator	
28*	Apparatus type	planar
29*	Apparatus arrangement	round
30*	Apparatus size—outer dimension	1016 mm
31*	Apparatus size—outer dimension	n.a.
32*	Apparatus meter area—dimension	406 mm
33*	Apparatus meter area—dimension	n.a.
34*	Apparatus identification	SN NIST LHS/GHP02
35*	Mode of operation	2
36*	Direction of heat flow	vertical
37	Emittance	0.89
38	Plate flatness	
39	Method of plate separation	specimen rigidity
40	Data collection method	computer data acquisition
41	Sampling interval	30 s
42	Computer software	Basic (1996-007A)
Specimen Description		
43	Specimen layout reference	unavailable
44*	Conditioning temperature	363 K
45*	Conditioning humidity	≈0
46*	Conditioning time	16 h
47	Conditioning environment	air
48*	Number of specimens	2
49*	Specimen identification	063, 077
50*	Specimen geometry	round
51	Specimen width	n.a.
52	Specimen length	n.a.
53	Specimen diameter	1016 mm
54	Specimen circumference	n.a.
55*	Specimen thickness	25.46 mm
56*	Specimen mass	3242.6 g
57*	Bulk density	159.91 kg/m^3
58	Porosity	
59	Sub-components	none
Test Results and Analysis		
60*	Date of test	1996 July 19
61*	Moisture content before testing	≈0 %
62*	Moisture content after testing	0.2 %
63*	Hot temperature—average	335.15 K
64	Hot temperature—standard deviation	0.002 K
65*	Cold temperature—average	315.15 K
66	Cold temperature—standard deviation	0.002 K
67*	Heat flow—average	3.712 W
68	Heat flow—standard deviation	0.006 W
69*	Meter area	0.1297 m^2

TABLE 5 *Continued*

Field No.	Field Name and Description	Value
70*	Specimen test thickness	25.46 mm
71	Clamping pressure	
72	Mean temperature	325.15 K
73	Temperature difference	20.00 K
74*	Ambient temperature—average	325 K
75	Ambient temperature—standard deviation	0.02 K
76	Ambient humidity—average	< 5 %
77	Ambient humidity—standard deviation	
78	Ambient barometric pressure—average	99.58 kPa
79	Ambient barometric pressure—standard deviation	0.10 kPa
80*	Thermal conductance—average	1.43 W/(m^2·K)
81	Thermal conductance—standard deviation	
82*	Thermal resistance—average	0.699 m^2·K/W
83	Thermal resistance—standard deviation	
84	Thermal conductivity—average	0.0364 W/(m·K)
85	Thermal conductivity—standard deviation	
86	Thermal resistivity—average	27.5 m·K/W
87	Thermal resistivity—standard deviation	
88*	Is the test valid?	yes
89*	Standard uncertainty of test result	1.1 %
90*	Footnotes	Expanded Uncertainty Coverage (k = 2)

* Essential field

10.1.1 *Date of Test (60*)*—Date specimen was tested using the format: year/month/day (YYYYMMDD).

10.1.2 *Moisture Content (61*, 62*)*—Moisture content of specimen before and after testing.

10.1.3 *Hot Temperature—Average (63*)*—Time-averaged temperature of the hot surface in contact with the specimen.

10.1.4 *Hot Temperature—Standard Deviation (64)*—Standard deviation of time-averaged data of the hot surface temperature.

10.1.5 *Cold Temperature—Average (65*)*—Time-averaged temperature of the cold surface in contact with the specimen.

10.1.6 *Cold Temperature—Standard Deviation (66)*—Standard deviation of time-averaged data of the cold surface temperature.

10.1.7 *Heat Flow—Average (67*)*—Time-averaged heat flow through the meter area.

10.1.8 *Heat Flow—Standard Deviation (68)*—Standard deviation of the time-averaged data for the heat flow.

10.1.9 *Meter Area (69*)*—Mathematical area corresponding to the one-dimensional heat flow through the specimen.

10.1.10 *Specimen Test Thickness (70*)*—Dimensional separation between hot surface and cold surfaces.

10.1.11 *Clamping Pressure (71)*—Static load applied to clamp specimens between the plates divided by area of the plates.

10.1.12 *Mean Temperature (72)*—Average of hot and cold surfaces' temperatures.

10.1.13 *Temperature Difference (73)*—Difference of hot and cold surfaces temperatures.

10.1.14 *Ambient Temperature—Average (74*)*—Time-averaged ambient temperature during test.

10.1.15 *Ambient Temperature—Standard Deviation (75)*—Standard deviation of the time-averaged data for the ambient temperature.

10.1.16 *Ambient Humidity—Average (76)*—Time-averaged ambient relative humidity during test.

10.1.17 *Ambient Humidity—Standard Deviation (77)*—Standard deviation of the time-averaged data for the ambient humidity.

10.1.18 *Ambient Barometric Pressure—Average (78)*—Time-averaged ambient barometric pressure during test.

10.1.19 *Ambient Barometric Pressure—Standard Deviation (79)*—Standard deviation of the time-averaged data for the ambient barometric pressure.

10.1.20 *Thermal Conductance—Average (80*)*—Time-averaged determination of thermal conductance (power input to the meter area divided by the meter area and temperature difference).

10.1.21 *Thermal Conductance—Standard Deviation (81)*—Standard deviation of the time-averaged data for the thermal conductance).

10.1.22 *Thermal Resistance—Average (82*)*—Time-averaged determination of thermal resistance (meter area times temperature difference divided by the power input to the meter area).

NOTE 3—For box method, this quantity is determined for the temperature difference from surface to surface.

10.1.23 *Thermal Resistance—Standard Deviation (83)*—Standard deviation of the time-averaged data for the thermal resistance.

10.1.24 *Thermal Conductivity—Average (84)*—Time-averaged determination of thermal conductivity (power input to the meter area divided by the meter area, temperature difference, and specimen thickness).

10.1.25 *Thermal Conductivity—Standard Deviation (85)*—Standard deviation of the time-averaged data for the thermal conductivity.

10.1.26 *Thermal Resistivity—Average (86)*—Time-averaged determination of thermal resistivity (meter area, temperature difference, and specimen thickness divided by the power input to the meter area).

10.1.27 *Thermal Resistivity—Standard Deviation (87)*—Standard deviation of the time-averaged data for the thermal resistivity.

10.1.28 *Is the Test Valid? (88*)*—Are all the criteria for the test method met? (yes/no) If no, explain in footnote (90).

10.1.29 *Standard Uncertainty of Test Result (89*)*—Combined standard uncertainty for the estimate given for thermal conductance, thermal conductivity, thermal resistance, or thermal resistivity.

10.1.30 *Footnotes (90*)*—A brief statement of any significant deviations from a standard test. The method for including this information in a database should be determined by the database builder.

11. Examples

11.1 Table 5 provides examples of this guide for results reported for an individual pair of specimens.

12. Keywords

12.1 building materials; computer; data; database; format; thermal conductance; thermal conductivity; thermal insulation; thermal resistance; thermal resistivity; thermal transmission

APPENDIX

(Nonmandatory Information)

X1. COMMENTARY

X1.1 History

X1.1.1 In the 1990s, the National Institute of Standards and Technology (NIST) developed an Internet database of thermal conductivity measurements of insulating and building materials compiled from the NIST 200-mm guarded-hot-plate apparatus.[5,6] Recognizing that continued development in this area required a standard recording format for steady-state thermal transmission test data, Sub-committee C16.30 formed a task group to examine the feasibility of developing a standard recording format. This guide is a direct result of the activities of the task group.

[5] Zarr, R. R., Dalton, G. R., and Fioravante, S. M., "Development of a NIST Standard Reference Database for Thermal Conductivity of Building Materials," *Thermal Conductivity 25—Thermal Expansion 13*, June 13-16, 1999.

[6] http://srdata.nist.gov/insulation/