ANSI/NFPA 259 An American National Standard December 10, 1986

NFPA 259 Potential Heat of Building Materials 1987 Edition

National Fire Protection Association Batterymarch Park, Quincy, MA 02269

NOTICE

All questions or other communications relating to this document should be sent only to NFPA Headquarters, addressed to the attention of the Committee responsible for the document.

For information on the procedures for requesting Technical Committees to issue Formal Interpretations, proposing Tentative Interim Amendments, proposing amendments for Committee consideration, and appeals on matters relating to the content of the document, write to the Secretary, Standards Council, National Fire Protection Association, Batterymarch Park, Quincy, MA 02269.

A statement, written or oral, that is not processed in accordance with Section 16 of the Regulations Governing Committee Projects shall not be considered the official position of NFPA or any of its Committees and shall not be considered to be, nor be relied upon as, a Formal Interpretation.

Users of this document should consult applicable Federal, State and local laws and regulations. NFPA does not, by the publication of this document, intend to urge action which is not in compliance with applicable laws and this document may not be construed as doing so.

Policy Adopted by NFPA Board of Directors on December 3, 1982

The Board of Directors reaffirms that the National Fire Protection Association recognizes that the toxicity of the products of combustion is an important factor in the loss of life from fire. NFPA has dealt with that subject in its technical committee documents for many years.

There is a concern that the growing use of synthetic materials may produce more or additional toxic products of combustion in a fire environment. The Board has, therefore, asked all NFPA technical committees to review the documents for which they are responsible to be sure that the documents respond to this current concern. To assist the committees in meeting this request, the Board has appointed an advisory committee to provide specific guidance to the technical committees on questions relating to assessing the hazards of the products of combustion.

Statement on NFPA Procedures

This material has been developed under the published procedures of the National Fire Protection Association, which are designed to assure the appointment of technically competent Committees having balanced representation. While these procedures assure the highest degree of care, neither the National Fire Protection Association, its members, nor those participating in its activities accepts any liability resulting from compliance or noncompliance with the provisions given herein, for any restrictions imposed on materials or processes, or for the completeness of the text.

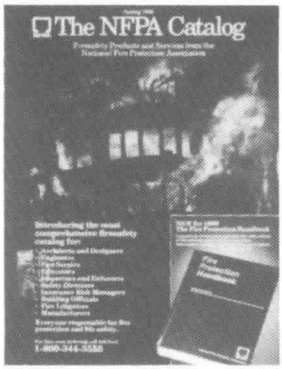
NFPA has no power or authority to police or enforce compliance with the contents of this document and any certification of products stating compliance with requirements of this document is made at the peril of the certifier.

FREE! Send today for the NFPA Catalog.

The National Fire Protection Association publishes a 100 page catalog of all its Firesafety Products and Services.

If you ever need firesafety codes and standards, Fire Service training programs and firesafety education materials this catalog is a necessity.

To receive your free copy of the NFPA Catalog, just mail in this postage paid card today! Or call toll-free 1-800-344-3555 and ask one of our Customer Service Reps to send you one. (M6)



(Please Print)

Name _____ Title _____

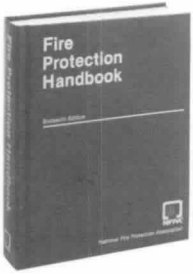
Business _____

Address _____ Phone _____

City _____ State _____ Zip _____

☐ I am also interested in NFPA membership.

NEED QUICK ANSWERS TO A WIDE RANGE OF FIRESAFETY QUESTIONS?



Save your time — put the leading **one-volume** firesafety "Library" on your bookshelf! — the new 16th edition of NFPA's **FIRE PROTECTION HANDBOOK**

You need to preplan a response to a hazardous waste emergency . . . quench an oil fire in a hurry . . . OK the design of a state-of-the-art sprinkler system . . . fireproof a robotics installation . . . inspect an aerosol charging outfit . . .

WHERE CAN YOU TURN FOR QUICK ANSWERS AND DIRECTION? THE RIGHT ANSWERS? RIGHT AWAY?

Do what thousands of fire-safety professionals do . . . keep a copy of the world's leading one-volume firesafety "library" close at hand. No other fire reference comes close to matching the colossal coverage of NFPA's FIRE PROTECTION HANDBOOK. Or to matching its ease of use, either. *And the new 16th edition is better equipped than ever to meet your fire protection and prevention needs — with over 600 pages of all new or updated information!* (M3-FPH1686) **$75.00 Members $67.50**

NEW 16TH EDITION LET US SEND YOU A COPY FOR 30 DAYS FREE EXAMINATION

Simply complete and mail this card today for free trial copy of *FIRE PROTECTION HANDBOOK*. Then either keep it and pay our bill for $75.00 plus $2.85 for handling, or return it within 30 days and owe nothing.

Name _____ NFPA Member I.D.# _____

Organization _____

Address _____

City _____ State _____ Zip _____

Phone _____

FOR FASTER SERVICE CALL TOLL-FREE 1-800-344-3555

NFPA®

NO POSTAGE
NECESSARY
IF MAILED
IN THE
UNITED STATES

BUSINESS REPLY CARD

FIRST CLASS PERMIT NO. 3376 QUINCY, MA

POSTAGE WILL BE PAID BY ADDRESSEE

National Fire Protection Association
Batterymarch Park
Quincy, MA 02269-9904

NO POSTAGE
NECESSARY
IF MAILED
IN THE
UNITED STATES

BUSINESS REPLY CARD

FIRST CLASS PERMIT NO. 3376 QUINCY, MA

POSTAGE WILL BE PAID BY ADDRESSEE

National Fire Protection Association
Batterymarch Park
Quincy, MA 02269-9904

FORM FOR PROPOSALS ON NFPA TECHNICAL COMMITTEE DOCUMENTS

Mail to: Secretary, Standards Council
National Fire Protection Association, Batterymarch Park, Quincy, Massachusetts 02269

Date _____ Name _____ Tel. No. _____

Address _____

Representing (Please indicate organization, company or self) _____

1. a) Document Title: _____ NFPA No. & Year _____

   b) Section/Paragraph: _____

2. Proposal recommends: (Check one) ☐ new text
   ☐ revised text
   ☐ deleted text.

3. Proposal (include proposed new or revised wording, or identification of wording to be deleted):

4. Statement of Problem and Substantiation for Proposal:

5. ☐ This Proposal is original material.
   ☐ This Proposal is not original material; its source (if known) is as follows: _____

(Note: Original material is considered to be the submitter's own idea based on or as a result of his own experience, thought, or research and, to the best of his knowledge, is not copied from another source.)

I agree to give NFPA all and full rights, including rights of copyright, in this Proposal and I understand that I acquire no rights in any publication of NFPA in which this Proposal in this or another similar or analogous form is used.

_____
Signature

PLEASE USE SEPARATE FORM FOR EACH PROPOSAL

Cut Here

FORM FOR PROPOSALS ON NFPA TECHNICAL COMMITTEE DOCUMENTS

Mail to: Secretary, Standards Council
National Fire Protection Association, Batterymarch Park, Quincy, Massachusetts 02269

Date 5/18/85 **Name** John B. Smith **Tel. No.** 617-555-1212

Address 9 Seattle St.. Seattle, WA 02255

Representing (Please indicate organization, company or self) Fire Marshals Assn. of North America

1. a) **Document Title:** Protective Signaling Systems **NFPA No. & Year** NFPA 72D

   b) **Section/Paragraph:** 2-7.1 (Exception)

2. **Proposal recommends: (Check one)** ☐ new text
   ☐ revised text
   ☒ deleted text.

3. **Proposal (include proposed new or revised wording, or identification of wording to be deleted):**

   Delete exception.

4. **Statement of Problem and Substantiation for Proposal:**

   A properly installed and maintained system should be free of ground faults. The occurrence of one or more ground faults should be required to cause a "trouble" signal because it indicates a condition that could contribute to future malfunction of the system. Ground fault protection has been widely available on these systems for years and its cost is negligible. Requiring it on all systems will promote better installations, maintenance and reliability.

5. ☒ **This Proposal is original material.**
   ☐ **This Proposal is not original material; its source (if known) is as follows:** _____

(Note: Original material is considered to be the submitter's own idea based on or as a result of his own experience, thought, or research and, to the best of his knowledge, is not copied from another source.)

I agree to give NFPA all and full rights, including rights of copyright, in this Proposal and I understand that I acquire no rights in any publication of NFPA in which this Proposal in this or another similar or analogous form is used.

John B. Smith

Signature

PLEASE USE SEPARATE FORM FOR EACH PROPOSAL

SUBMITTING PROPOSALS ON NFPA TECHNICAL COMMITTEE DOCUMENTS

Contact NFPA Standards Administration for final date for receipt of proposals on a specific document.

INSTRUCTIONS

Please use the forms which follow for submitting proposed amendments. Use a separate form for each proposal.

1. For each document on which you are proposing amendment indicate:
   (a) The number and title of the document
   (b) The specific section or paragraph.

2. Check the box indicating whether or not this proposal recommends new text, revised text, or to delete text.

3. In the space identified as "Proposal" include the wording you propose as new or revised text, or indicate if you wish to delete text.

4. In the space titled "Statement of Problem and Substantiation for Proposal" state the problem which will be resolved by your recommendation and give the specific reason for your proposal including copies of tests, research papers, fire experience, etc. If a statement is more than 200 words in length, the technical committee is authorized to abstract it for the Technical Committee Report.

5. Check the box indicating whether or not this proposal is original material, and if it is not, indicate source.

6. If supplementary material (photographs, diagrams, reports, etc.) is included, you may be required to submit sufficient copies for all members and alternates of the technical committee.

NOTE: The NFPA Regulations Governing Committee Projects in Paragraph 10-10 state: Each proposal shall be submitted to the Council Secretary and shall include:

(a) identification of the submitter and his affiliation (Committee, organization, company) where appropriate, and

(b) identification of the document, paragraph of the document to which the proposal is directed, and

(c) a statement of the problem and substantiation for the proposal, and

(d) proposed text of proposal, including the wording to be added, revised (and how revised), or deleted.

Appendix B Referenced Publications

B-1 The following documents or portions thereof are referenced within this document for informational purposes only and thus are not considered part of the requirements of this document. The edition indicated for each reference should be the current edition as of the date of the NFPA issuance of this document. These references should be listed separately to facilitate updating to the latest edition by the user.

B-1-1 NFPA Publication. National Fire Protection Association, Batterymarch Park, Quincy, MA 02269.

NFPA 255-1984, *Standard Method of Test of Surface Burning Characteristics of Building Materials.*

B-1.2 ASTM Publications. American Society of Testing and Materials, 1916 Race St., Philadelphia, PA 19103.

ASTM, E 162-83-1984, *Standard Method of Test for Surface Flammability of Materials Using a Radiant Heat Energy Source.*

ASTM E 906-83-1984, *Standard Test Method for Heat and Visible Smoke Release Rates for Materials and Products.*

ASTM STP 464-1970, *Interlaboratory Comparison of the Potential Heat Test Method*, Gross, D. and Natrella, M. G., pp. 127-152.

ASTM STP 502-1972, *Ignition, Heat Release and Noncombustibility of Materials*, Parker W. J. and Long, M. E., "Development of a Heat Release Rate Calorimeter at NBS." pp. 135-151.

Proc. ASTM, Vol. 61, 1961, Loftus, J. J., Gross, D., and Robertson, A. F., "Potential Heat, A Method for Measuring the Heat Release of Materials in Building Fires," pp. 1336-1348.

ASTM Standardization News, Nov. 1975, A. F. Robertson, "Test Method Categorization and Fire Hazard Standards," pp. 18-20.

B-1.3 NBS Publication. National Bureau of Standards, Gaithersburg, MD 20899.

Gross, D. and Robertson, A. F., "Self-Ignition Temperatures of Materials from Kinetic Reaction Data," *J. Res. NBS* V 61, n5, pp. 413-417, Nov. 1958.

Index

Res. NBS, Vol. 61, ASTM STP 502, ASTM E 906, ASTM E 162, and NFPA 255.) Only the flame spread and heat release rate tests have received recognition by national standards organizations. The smoldering and adiabatic furnace test have not yet received recognition as standards, although numerous ad hoc tests of this type have been conducted as the need for them became obvious.

A-4 Precision of the Potential Heat Test.

The original paper on this test method (*see ASTM Proceedings, Vol. 61*) discussed the precision level possible within a single laboratory. It was concluded that with technicians skilled in the procedure involved, the standard deviation of differences between duplicate determinations of potential heat would be equal to about 94 Btu/lb (219 kJ/kg). This prediction, based on early work at NBS, was later confirmed for three of the five materials tested in the interlaboratory study. (*See ASTM STP 464.*) In this reference a figure of 92 Btu/lb (214 kJ/kg) was reported. These values correspond to expected repeatability between duplicates of 200 Btu/lb (465 kJ/kg) with a 95 percent confidence level.

In the original paper it was stated that this order of repeatability was independent of the potential heat measured. Figure A-4 provides a graphical indication of the basis of this claim. This figure presents a plot of the difference between duplicate determinations of potential heat as a function of the average. Because of the precision, most of the recent measurements of potential heat have involved a single determination and thus are not useful for this plot. The materials represented by the data comprise a widely varied group. They include materials of laminated, homogeneous, and heterogeneous characteristics. Both very low and high values of potential heat are shown. Different symbols are used as a means for identification of slightly different procedures used for deriving the data. Thus, all the data above 8000 Btu/lb (18,600 kJ/kg) represent a single calorimetric determination as permitted by the test procedure when negligible ash remains following specimen exposure in the muffle furnace. The data reproduced as dots are based on two direct bomb calorimetric determinations and one measurement of the heat of combustion of the ash from a muffle exposed specimen. All remaining data are based on duplicate determinations of both the direct specimen and muffle exposed specimen. It should be noted that all the NBS data derived in connection with the interlaboratory study (*see ASTM STP 464*) are included in this figure. Thus the figure tends to confirm the predictions made with regard to reproducibility in that study.

Actually the test procedure has been slightly modified from that used in the last interlaboratory test, with the objective of improving the precision on those materials that proved most difficult in the study. These changes have included more detailed instructions on the preparation of specimens from laminated materials or those of heterogeneous character. Because of this and the fact that four of the eleven laboratories participating in the interlaboratory study were successful in producing data for all materials that were within the 200 Btu/lb (465 kJ/kg), repeatability and reproducibility values reported, based on three of the materials, would also be applicable to the full range of materials likely to be tested in the future. These precision levels involve a repeatability within a laboratory of 200 Btu/lb (465 kJ/kg) and a reproducibility between laboratories of 500 Btu/lb (1160 kJ/kg) based on duplicate tests. Thus, the procedure appears to provide adequate precision when skilled laboratory technical work is available.

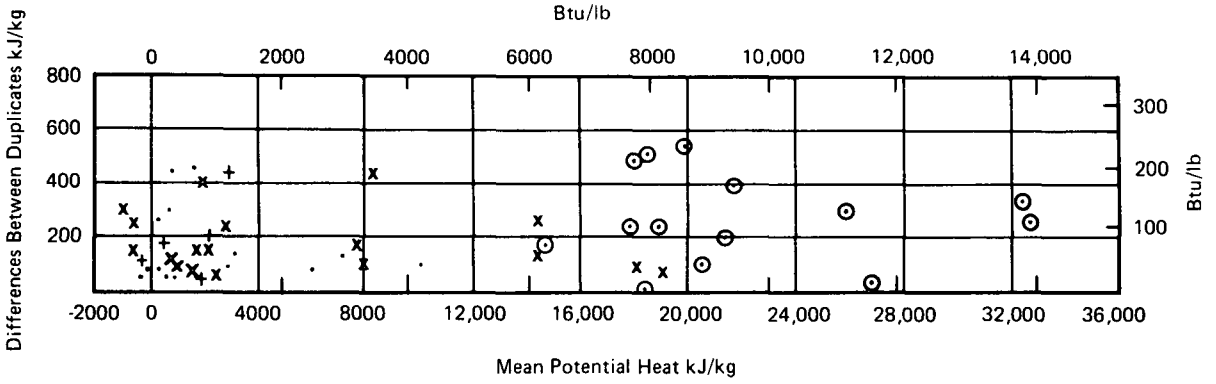


Chart represents deviation between duplicates as a function of average potential heat for a wide range of materials. Data points represent: x - specified procedure, two determinations on both material and muffled specimen, + - specified procedure NBS data from round robin study (see ASTM STP 464), • - specified procedure but only one test of muffled specimen, and ⊙-specified procedure for materials of low ash content, no test on muffled specimen.

Figure A-4 NBS Data Difference Between Duplicate Potential Heat Measurements, as a Function of the Average.

6-2.1 The heat of combustion of the residue shall be subtracted from the heat of combustion determined via the direct bomb test. The potential heat shall thus be a measure of the heat released by a material in the muffle furnace firing.

6-2.2 Potential heat shall be reported as quantity of heat per unit weight.

Exception: Where appropriate, potential heat shall be reported as quantity of heat per unit volume or surface area. For material such as metals where the combustion process is relatively slow, and is a function of surface area, potential heat shall be reported appropriately on a surface area basis only.

6-2.3 One determination of the potential heat of a material is normally adequate, provided there is not significant variability to the material and the testing laboratory has established good confidence in its procedures.

Chapter 7 Referenced Publications

7-1 The following documents or portions thereof are referenced within this document and shall be considered part of the requirements of this document. The edition indicated for each reference shall be the current edition as of the date of the NFPA issuance of this document. These references shall be listed separately to facilitate updating to the latest edition by the user.

7-1.1 ASTM Publications. American Society for Testing and Materials, 1916 Race St., Philadelphia, PA 19103.

ASTM D2015-78, *Test Method for Gross Calorific Value of Solid Fuel by the Adiabatic Bomb Calorimeter*

ASTM D3286-82, *Test Method for Gross Calorific Value of Solid Fuel by the Isothermal-Jacket Bomb Calorimeter*

Appendix A Application of Potential Heat Data

This Appendix is not a part of the requirements of this NFPA document, but is included for information purposes only.

A-1 Application of Potential Heat Data.

The potential heat test provides an assessment of one property of a material — the total heat release possible with muffle exposure of the specimen, under oxidizing conditions, at 750°C (1382°F). The appropriate use of this procedure must recognize its nature as a property type-test. (*See A. F. Robertson in ASTM Standardization News.*) In many applications, additional supporting test data by other fire test methods may be required for qualifying materials for various fire safe applications. As an example, it should be recognized that under actual fire conditions some materials release all or most of their heat very rapidly. Other materials release heat very slowly and depending upon thickness and fire conditions may never release all the heat possible. The use of the material and additional supporting data are usually required for classifying the materials.

A-2 The Test Method.

The potential heat test method (*see ASTM Proceedings*) makes use of oxygen bomb calorimetric measurement methods. It measures the difference between the heat of combustion of a product sample and that of the residue remaining after exposure of another specimen to a standardized intense thermal exposure. Results of the test are usually reported in terms of heat release per unit mass of the specimen involved.

The test procedure is based on as complete combustion of the specimen as is possible within a two-hour exposure period in a muffle furnace at 750°C (1382°F).

The bomb calorimetry techniques used involve very small specimens of about 1-g mass. Because of this, the sampling and specimen preparation procedures used become of considerable importance, especially with heterogeneous or composite materials. Two procedures are available to the investigator: One involves pulverizing a representative section of the complete composite and then testing the resultant mixture in the form of a small pellet. Another involves measuring the potential heat of the individual components of the material and then, on the basis of computations, deriving an overall value for the composite. The selection of a specimen for thermal exposure in the muffle furnace will, of course, depend on which of the preparation procedures is to be used.

The fact that the muffle exposure is a severe one, involving combustion of most of the oxidizable fuel at 750°C (1382°F), is essential for its consideration as a property type-test method. This must be carefully considered when applying potential heat data as a basis of code or regulatory procedures for building or other fire safety purposes. This is especially true when life safety is of prime concern. Thus the potential heat of two wall components may be identical, and yet in one wall the combustible component may be placed on the exposed wall surface while in the other it may be deeply buried, for example, beneath an exposed masonry construction. Obviously, these walls represent two possible extremes in the hazard presented by the wall to building occupants in the event of a fire. Thus, simple consideration of the potential heat of the wall materials yields little information on the relative fire participation hazard of the two walls. This problem is characteristic of property-type fire tests. It emphasizes the need for discretion in the use of the test methods and in the application of resulting test data.

A-3 Auxiliary Tests.

As indicated above, property-type fire tests are seldom comprehensive enough to form the sole basis of acceptance of materials or products. Additional tests are usually required. Examples of other types of tests that might be of value in evaluating materials as to their fire hazard include the adiabatic furnace, a smoldering test, heat release rate calorimeter, and flame spread tests. (*See J.*

4-2 Test Procedure.

4-2.1 The pellet shall be placed in the crucible and tested in accordance with ASTM D3286, *Test Method for Gross Calorific Value of Solid Fuel by the Isothermal-Jacket Bomb Calorimeter*, or ASTM D2015, *Test Method for Gross Calorific Value of Solid Fuel by the Adiabatic Bomb Calorimeter*.

Caution: For tests on specimens that are predominantly metallic, the use of a silica or quartz crucible is recommended. The water equivalent of the calorimeter using the appropriate crucible should be measured and used.

4-2.2 If, after being fired in the oxygen bomb, the pellet is found to have burned completely, or to have left residue or ash that weighs less than 1 percent of the original pellet weight, the heat of combustion shall be computed on an air-dry basis. In this case, procedures set forth in 4-2.3 shall be ignored.

4-2.3 If the pellet does not burn, or a residue or ash that weighs 1 percent or more of the original pellet weight remains after the firing, another 1-g pellet shall be prepared using approximately ½-g portions of the powdered specimen and a standard specimen of benzoic acid combustion promoter. (*See Section 4-1.*)

4-2.3.1 Each portion shall be weighed accurately to 0.1 mg prior to pelletizing.

4-2.3.2 The pellet shall be weighed accurately to 0.1 mg.

4-2.3.3 Any loss in weight after mixing and pelletizing shall be subtracted from the specimen and the combustion promoter in proportion to their original weight fractions, and the corrected weights shall be used in the heat of combustion calculations.

4-2.3.4 The pellet prepared with the benzoic acid shall be tested in accordance with 4-2.1.

4-2.4 In calculating the heat of combustion, as determined in 4-2.3, a correction for the heat of combustion of the benzoic acid present in the pellet shall be applied to the measured heat released by the specimen. The gross heat of combustion of the specimen material, on an air-dry basis, shall then be computed.

Chapter 5 Muffle Furnace and Bomb Test

5-1 Specimen Preparation. An air-dry specimen of the test material selected in accordance with Chapter 3 shall be cut in the form of a rectangular prism ½ ± ⅛ in. by ¾ ± ⅛ in. by 2 ½ ± ½ in. (12.7 ± 3.2 mm by 190 ± 3.2 mm by 63.5 ± 12.7 mm). Sheet materials shall be layered to these dimensions.

5-2 Muffle Furnace Procedure.

5-2.1 The muffle furnace shall be preheated to 750 ± 10°C (1382 ± 18°F).

5-2.2 The specimen shall be weighed and placed on the wire support in the specimen container. The container shall be closed with its cap, and placed in the fire-brick base.

5-2.3 When the furnace has been preheated, the fire-brick base, with the specimen and its container, shall be placed in the muffle furnace so as to align the muffle furnace port and the opening in the specimen container cap. The external air supply tube shall be passed through the port into the container in proximity to the specimen.

5-2.4 The test specimen shall be fired for two hours with a regulated airflow supplied to the specimen of 0.1 cfm (47.2 cm^3/sec), referenced to 60°F (15.6°C) and 30 in. Hg (101,000 N/m^2).

5-2.4.1 If ignition should occur immediately upon placing the specimen in the furnace, application of air shall be delayed until the initial flaming has stopped.

5-2.5 Upon completion of the two-hour firing cycle, the container with the specimen shall be cooled in a desiccator, and the weight of the residue shall be determined.

5-2.6 If the residue from the muffle firing procedure is less than 5 percent of the initial weight of the specimen, the provisions of 5-2.7 and 5-2.8 shall be omitted, and the heat of combustion previously determined under the direct bomb test, described in Chapter 4, shall be reported as the potential heat of the material.

5-2.7 If the residue after muffle firing is in excess of 5 percent of the original specimen weight, the residue shall be pulverized into a homogeneous powder. A ½-g sample of residue shall be mixed with an equal weight of benzoic acid and formed into a 1-g pellet. The pellet is then treated as specified in the procedure for direct bomb test to determine the heat of combustion of the residue.

5-2.8 The heat of combustion of the residue per unit weight of original specimen shall be computed by multiplying the heat of combustion determined in 5-2.7, by the ratio of residue weight in 5-2.5, to the original specimen weight.

Chapter 6 Calculating Potential Heat

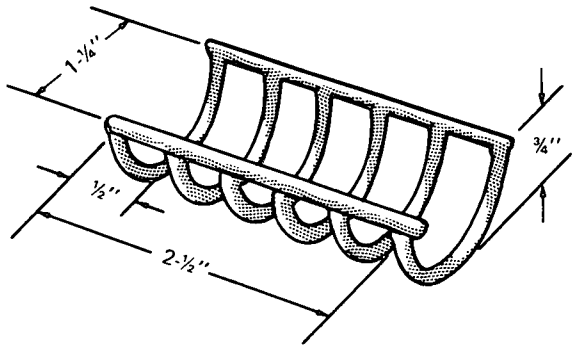
6-1 Calculations with Less than 5% Residue. The potential heat for test specimens yielding a residue from the muffle test procedure of less than 5 percent of the specimen's initial weight shall be equivalent to the specimen's heat of combustion, as determined by the direct bomb test, described in Chapter 4.

6-2 Calculations with More than 5% Residue. For test specimens that yield a residue from the muffle test procedure of 5 percent or more of initial specimen weight and, therefore, require direct bomb calorimetry of the residue, the potential heat shall be determined as follows:

cient to extend beyond the opening in the container cap (b).

(d) *Wire Specimen Holder [see Figure 2-2 (d)]*. This shall be formed to hold the test specimen away from the walls of the specimen container (a), thus allowing free airflow around the specimen. Corrosion-resistant wire shall be used.

(e) *Specimen Container Support*. This shall be of fire brick or similar material, shaped to hold the specimen container (a) and cap (b) in alignment with the port of the muffle furnace, thus allowing the air supply tube (c) to be inserted through the port and into the specimen container (a).



For SI Units: 1 in. = 25.5 mm.

Figure 2-2(d) Wire Specimen Holder for Muffle Furnace Firing.

2-3 Mill. This shall be either the hand mill or the ball mill type. It shall be used to pulverize test specimens.

2-4 Pelleting Press. This press shall be used for compressing the pulverized test specimen into a pellet shape suitable for the bomb calorimetry procedure. The press shall be a type normally used for bomb calorimetry.

2-5 Microbalance. This balance shall be a type normally used for chemical analysis, weighting to 0.1 mg.

2-6 Oxygen Cylinder and Accessory Equipment. This cylinder and its accessories shall be suitable for use with the bomb calorimeter.

2-7 Compressed Air Supply. This shall be a suitable laboratory air supply for use with the muffle furnace.

2-8 Standard Alkali Solution. This shall be the standard alkali titrating solution, as specified in ASTM D3286, *Test Method for Gross Calorific Value of Solid Fuel by the Isothermal-Jacket Bomb Calorimeter*, or ASTM D2015, *Test Method for Gross Calorific Value of Solid Fuel by the Adiabatic Bomb Calorimeter*.

2-9 Combustion Promoter. This shall be the National Bureau of Standards standard material for calorimetric determinations, benzoic acid (SRM 39i).

Chapter 3 Test Specimens

3-1 Specimens. Two air-dry representative specimens shall be required for each determination, one for each test procedure.

3-1.1 A specimen shall be considered air dry when it has reached constant weight in an environment maintained at 73 ± 2°F (23 ± 1°C) and 50 ± 5 percent relative humidity.

3-1.2 If the test subject is a composite or heterogeneous material, the various elements of the subject shall be contained in the test specimen in the same proportions as in the material.

Chapter 4 Direct Bomb Test

4-1 Specimen Preparation.

4-1.1 One test specimen shall be pulverized in the hand or ball mill so as to pass through a 60-mesh screen.[1] Enough of the specimen shall be pulverized so as to provide no less than 10 g of powder.

4-1.1.1 The specimen that is pulverized shall not be smaller than ½ in. × 3 in. (12.7 mm × 76.2 mm) in the thickness supplied.

4-1.1.2 Particular care shall be taken to avoid segregation or separation of components. For grossly heterogeneous materials, a representative specimen shall be obtained by combining samples of material from different units (or sheets) and from different locations on each unit.

4-1.2 A pellet, weighing approximately 1 g, shall be prepared from an intimate mixture of the powder.

4-1.2.1 All weight measurements shall be to the nearest 0.1 mg.

4-1.2.2 Pellets shall be made in accordance with the method for the particular pelleting press in use and of a size convenient for the specimen cup. The pellets shall be no harder than is necessary to prevent their disintegration during preparation for firing. Excessively hard pellets may fracture and result in incomplete combustion when fired.

[1]While many materials may be suitably reduced using a clean carbide double bastard file or mortar and pestle or both, it may sometimes be useful to (dry-ice) freeze materials containing asphaltic, mastic, or plastic components prior to filing, or to use mechanical blenders, ball or hammer mills, grinders, milling or lathe cutters, etc. For laminated materials, it may be preferable to separate into component layers and to grind, file, or pulverize each component separately. The powdered components then may be mixed intimately in proportion to their original weight fractions and the mixture tested, or, alternately, each component may be tested separately and the contributions of heat combined in proportion to their original weight fraction.

NFPA 259

Standard Test Method for

Potential Heat of Building Materials

1987 Edition

NOTICE: Information on referenced publications can be found in Chapter 7 and Appendix B.

Chapter 1 General

1-1 Scope. This method of test provides a means of determining, under controlled laboratory conditions, the total potential release of heat of materials under defined fire exposure conditions. Determinations may be made on individual homogeneous or individual composite materials, from which a representative sample can be taken. It is essential that the information on application of potential heat data in Appendix A be consulted prior to applying test results.

1-2 Significance. The potential heat test method yields a property-type measurement of the total heat release possible from building materials when exposed to oxidizing conditions at 750°C (1382°F).

Except for very low heat materials such as steel, results are reported in terms of heat release per unit mass (Btu/lb).

1-3 Definition. Potential heat of a material as determined by this method is the difference between the heat of combustion of a representative specimen of the material and the heat of combustion of any residue remaining after exposure to a defined fire condition, using combustion calorimetric techniques.

1-4 General. One of two specimens removed from the material to be tested is pulverized, pelleted, and burned in a high-pressure oxygen atmosphere. This determines the gross heat of combustion of the material. The second specimen is heated in air for two hours at a temperature of 750°C (1382°F). A portion of the resulting residue of this specimen, if any, corresponding to a predetermined weight of original material, is ground or pulverized, mixed with a combustion promoter, and pelleted for burning as was the first specimen. After correcting for the heat produced by the combustion promoter, the difference in heating values of the two specimens is the potential heat as defined in Section 1-3. The test procedure is illustrated schematically in Figure 1-4.

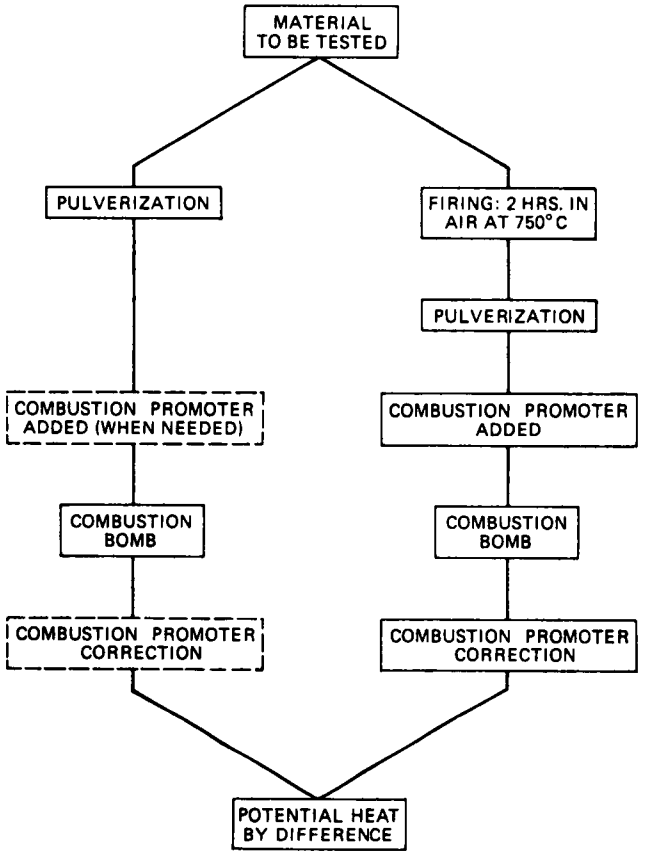


Figure 1-4 Schematic Diagram of Test Procedure for Potential Heat Measurements.

Chapter 2 Test Apparatus and Materials

2-1 Oxygen Bomb Calorimeter.[1] This device shall be used to determine the gross heat of combustion of the test specimen. The apparatus shall include the firing circuit and fuse wire.

2-2 Electric Muffle Furnace. This apparatus shall be used to fire the test specimen. A small opening or port shall be provided for passage of an air-supply tube. Auxiliary apparatus includes:

(a) *Specimen Container.* This shall be a fused silica or ceramic container, 1¼ in. (31.8 mm) inside diameter by 4 in. (101.6 mm) long.

(b) *Container Cap.* This shall be of material similar to the specimen container (a) and shall be snug fitting. An opening shall be provided for insertion of the air tube (c), sized to allow a loose fit.

(c) *Air Supply Tube.* This tube shall be of porcelain, fused silica, or corrosion-resistant metal. Inside diameter shall be 3/16 in. (4.8 mm) minimum; length shall be suffi-

[1]Either the isothermal-jacket bomb calorimeter (ASTM D3286) or the adiabatic bomb calorimeter (ASTM D2015) may be used.

Contents

Committee on Fire Tests

Sanford Davis, *Chairman*
NBS/Ctr. for Fire Research

John A. Blair, *Secretary*
E. I. Dupont De Nemours & Co.
(Rep. Society of the Plastics Industry)

Jesse J. Beitel, Southwest Research Institute
Irwin A. Benjamin, Benjamin/Clark Assoc., Inc.
David Brackett, Gypsum Assn.
B. J. Callahan, Factory Mutual Research Corp.
William J. Christian, Underwriters Laboratories Inc.
Wells Denyes, Eastman Chemical Products Inc.
Rep. Man-Made Fiber Producers Assn.
Philip J. DiNenno, Hughes Assoc., Inc.
Gerard R. Dufresne, U.S. Testing Co., Inc.
(Vote limited to textile materials & related prod.)
Buell B. Dutton, Building and Zoning Consultants
Richard G. Gewain, American Iron & Steel Inst.
Peter Higginson, Underwriters Labs of Canada
Alfred J. Hogan, Cypress Gardens, FL
Rep. IAFC
Joan Koonce, Cone Mills Corp.
Rep. American Textile Mfrs. Inst., Inc.
(Vote limited to textile materials & related prod.)
Gerald E. Lingenfelter, American Ins. Services Group Inc.
George E. Meyer, Warnock Hersey Int'l., Inc.
James A. Milke, University of Maryland
E. E. Miller, Industrial Risk Insurers
Shirley C. Reznikoff, Arizona State University
John Ed Ryan, Nat'l. Forest Products Assn.
Herman H. Spaeth, Novato, CA
Richard P. Thornberry, The Code Consortium
Lewis W. Vaughan, Vaughan-Walter Assoc., Inc.
Rep. Canadian Steel Construction Council

Alternates

J. S. Barritt, Industrial Risk Insurers
(Alternate to E. E. Miller)
J. R. Beyreis, Underwriters Laboratories Inc.
(Alternate to W. J. Christian)
Delbert F. Boring, American Iron & Steel Inst.
(Alternate to R. G. Gewain)
J. P. Carroll, Society of the Plastics Industry
(Alternate to J. A. Blair)
Robert W. Glowinski, Nat'l. Forest Products Assn.
(Alternate to J. E. Ryan)
Norman S. Pearce, Underwriters Labs of Canada
(Alternate to P. Higginson)

Nonvoting

A. J. Bartosic, Rohm & Haas Co.

This list represents the membership at the time the Committee was balloted on the text of this edition. Since that time, changes in the membership may have occurred.

NOTE: Membership on a Committee shall not in and of itself constitute an endorsement of the Association or any document developed by the Committee on which the member serves.

NFPA 259

Standard Test Method for

Potential Heat of Building Materials

1987 Edition

This edition of NFPA 259, *Standard Test Method for Potential Heat of Building Materials*, was prepared by the Technical Committee on Fire Tests, and acted on by the National Fire Protection Association, Inc. at its Fall Meeting held November 17-20, 1986, in Denver, Colorado. It was issued by the Standards Council on December 10, 1986, with an effective date of December 30, 1986, and supersedes all previous editions.

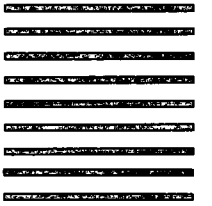
The 1987 edition of this standard has been approved by the American National Standards Institute.

Changes other than editorial are indicated by a vertical rule in the margin of the pages on which they appear. These lines are included as an aid to the user in identifying changes from the previous edition.

Origin and Development of NFPA 259

This standard is based on a test method developed at the National Bureau of Standards in 1961. Consideration of the test method by the NFPA was begun in 1973 culminating in the standard which was adopted in 1976, reconfirmed in 1981, and revised at the 1986 Fall Meeting.

NO POSTAGE
NECESSARY
IF MAILED
IN THE
UNITED STATES



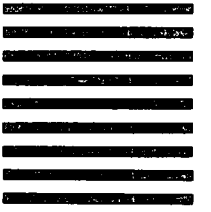
BUSINESS REPLY CARD

FIRST CLASS PERMIT NO. 3376 QUINCY, MA

POSTAGE WILL BE PAID BY ADDRESSEE

National Fire Protection Association
Batterymarch Park
Quincy, MA 02269-9904

NO POSTAGE
NECESSARY
IF MAILED
IN THE
UNITED STATES



BUSINESS REPLY CARD

FIRST CLASS PERMIT NO. 3376 QUINCY, MA

POSTAGE WILL BE PAID BY ADDRESSEE

National Fire Protection Association
Batterymarch Park
Quincy, MA 02269-9904