THERMAL INSULATION LABORATORY ACCREDITATION PROGRAM

J. O. Bryson

Thermal Performance of the Exterior
Envelopes of Buildings Conference

ABSTRACT

Laboratory accreditation has emerged because U.S. commerce has a strong interest in ensuring that laboratory test results are accurate, useful, and obtained in an efficient manner. Criteria for accrediting laboratories that test thermal insulation materials were published in the Federal Register on January 28, 1979. Inspection and evaluation procedures have been carried out in thirty testing laboratories which constitute the first group evaluated for accreditation under the National Voluntary Laboratory Accreditation Program (NVLAP). NVLAP is a system developed within the Department of Commerce in cooperation with the private sector to examine, upon request, the professional and technical competence of private and public testing laboratories. The program is intended to accredit laboratories that meet certain general and specific criteria germane to their technological testing service. An overview of the accreditation process and the experience gained in evaluating the laboratories is presented.

Keywords: laboratory accreditation; laboratory performance; testing laboratory examination; thermal insulation materials; thermal insulation testing laboratories.

INTRODUCTION

Laboratory accreditation on a national and international scale is an idea whose time has come. Our society today relies on accurate measurements for realizing equity in the market place, for industrial quality control, for equitable enforcement of and compliance with government regulations related to the environment, health and safety, and for scientific research. Consequently, there is an increasing demand for the accreditation of laboratories that are capable of providing reliable measurement services in all areas of the measurement field.

In May 1975, the Department of Commerce publicly announced proposed procedures for a national voluntary laboratory accreditation program and invited written comments and participation in public hearings by all interested parties. More than 150 respondents, including Federal and State agencies, technical societies and trade associations, industries, testing laboratories, and individuals provided oral testimony or written comments on the proposal during the public review period that

James O. Bryson, Chief, Office of
Testing Laboratory Evaluation Technology
National Bureau of Standards
Washington, D.C. 20234

followed. On the basis of this public review, the proposed procedures were revised and the National Voluntary Laboratory Accreditation Program (NVLAP) was established by notice in the Federal Register, February 25, 1976 [2]*.

Laboratory accreditation has emerged because U.S. Commerce has a strong interest in ensuring that laboratory test results are accurate, useful, and obtained in an efficient manner. Accordingly, NVLAP was established by the Department of Commerce to meet a broadly based need to identify and recognize technically competent testing laboratories in a consistent and uniform manner. Calibration and standardization of laboratory equipment and procedures are essential to obtain the reliable measurements necessary for modern technology and to assure that credible testing laboratories can be identified and called on to determine if the quality of the product adequately reflects specification requirements. Voluntary participation in laboratory examination and proficiency test programs significantly increases the precision and accuracy of the nation's testing laboratories. This, in turn, impacts favorably on research and development, investment products and raw materials, sound regulations, and in the procurement of goods and services which require the intermediate services of testing laboratories.

The first accreditation program established under NVLAP was for laboratories that test thermal insulation materials. Thermal insulation materials production exceeds $1 billion in value of annual shipments. Residential and industrial use of thermal insulation materials is expanding rapidly due to increasing fuel costs and the corresponding interest in energy conservation. Federal and State governments are promoting increased use of thermal insulation materials through energy conservation legislation, aid to low-income families, tax rebate plans, requirements of building codes, and through home loan guarantee programs. A number of jurisdictions are proposing to use laboratory accreditation programs to identify laboratories capable of testing insulation to meet federal and state requirements. (i.e., California, Pennsylvania, Tennessee Valley Authority)

Measurement of the physical properties of thermal insulation materials may be prone to significant error unless the appropriate test methods and recommended practices are carefully and expertly employed. Such errors may result in the production and use of inadequate thermal insulation materials. Availability of testing services from accredited laboratories will increase availability in the market place of thermal insulation materials with accurately stated properties. This will enhance energy conservation efforts, fuel cost savings, and advantages to commerce and consumer well-being, thereby constituting a major benefit to the public interest.

NATIONAL VOLUNTARY LABORATORY ACCREDITATION PROGRAM

The goal of NVLAP is to serve the needs of industry, consumers and the Government by accrediting this nation's testing laboratories [1]*. This goal will be sought by fostering and promoting a uniformly acceptable base of professional and technical competence in testing laboratories. The NVLAP also will seek, through coordination and consultation, to maximize benefits derived from other laboratory accreditation activities and to avoid duplication of other such programs conducted by public and private sectors [2].

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*Numbers in brackets refer to references at the end of the paper.

Organization

NVLAP is a Department of Commerce (DOC) program. The administration and management has been delegated to the Deputy Assistant Secretary of Commerce for Product Standards who also serves as the Director of the Office of Product Standards. The National Bureau of Standards (NBS), an agency of DOC, provides the technical support required by NVLAP.

The NBS Office of Testing Laboratory Evaluation Technology (OTLET) secures the assistance of various technical divisions of NBS and other agencies, organizations and individuals to provide technical support for NVLAP. This office provides for the examination of applicant laboratories, including the qualification of inspectors, provision of proficiency test samples, scheduling of examinations, review of examination results for adequacy, and the maintenance of a storage and retrieval system for technical information regarding participating laboratories.

NBS technical support of NVLAP will, in turn, increase it's support of the standards system in general. The evaluation of standard specifications and test methods, the development of procedures and criteria for evaluations and the inspector's feedback on laboratory examinations will furnish useful means by which the adequacy of existing standards can be assessed. NVLAP also has an important role in feeding back this information to the standards-writing bodies such as American Society for Testing and Materials Committee C16.

Program Development Process

There are four phases in the establishment and implementation of a laboratory accreditation program (LAP) for a product [2]. These are:

1. Finding of Need
2. Establishing Criteria Committee
3. Developing Criteria
4. Evaluation and Accreditation of Laboratories

Finding of Need - The first phase in establishing a laboratory accreditation program for a product is to identify the need for such a LAP. Any individual, partnership, firm, company, corporation, association, educational institution, society or agency of government can request a LAP. The request will be evaluated to determine whether the proposed program will:

- Benefit the public interest
- Serve national needs beyond that served by existing programs
- Reference product standards important to commerce, consumer well-being or the public health and safety
- Reference test methods capable of meeting requirements of the product standards
- Be practical and feasible

Public comment will be considered by DOC in arriving at a decision on the need for the program.

Establishing Criteria Committee - The second phase consists of establishing a National Laboratory Accreditation Criteria Committee for the product area involved. The membership of the Criteria Committee will be composed of employees of the Department of Commerce, other Federal agencies, and qualified representatives chosen from among producers, distributors, users, consumers, testing laboratories, academia, and general interest groups, including State and local governmental bodies and agencies affected by the Secretary's finding of need. The membership of each Criteria Committee shall be selected so as to provide an equitable balance that represents the interest affected by the Secretary's finding of need. The Committee functions solely as an advisory body

and must comply with the provisions of the Federal Advisory Committee Act.

Developing Criteria - The development of criteria for the accreditation of laboratories represents the third phase of the establishment of a laboratory accreditation program for a product area. The Committee develops both general and specific criteria with technical and administrative assistance from NBS/DOC.

General criteria relate to characteristics of a testing laboratory commonly found in, and generally expected of, such a laboratory testing the product under consideration; e.g. criteria pertaining to organization, staff, operation processes, control procedures, quality assurance, and professional and ethical business practices, as appropriate.

Specific criteria are those detailed requirements necessary to assure an acceptable examination and evaluation of the laboratory function in performing the specific tests; e.g. laboratory personnel and equipment qualifications, proficiency testing requirements, examination procedures and examiner qualifications.

The following are the criteria statements from which the examination of a laboratory is derived.

Criterion G1. The laboratory has a legally identifiable organizational structure that enables it to develop and maintain a testing capability to perform satisfactorily the functions for which accreditation is sought.

Criterion G2. The laboratory is operated in accordance with generally accepted professional and ethical business practices.

Criterion G3. The laboratory maintains a quality control system to help assure the technical integrity of its work.

Criterion S1. The laboratory is staffed by personnel who are competent to perform the tests for which accreditation is sought.

Criterion S2. The laboratory's facilities, equipment, and procedures are appropriate for accreditation.

Criterion S3. The laboratory maintains records of its operations.

Evaluation of Laboratories - In the forth phase of the procedures, the laboratory accreditation program becomes operational. The National Bureau of Standards will receive and review applications and upon acceptance thereof will notify the laboratories of the specific applicable examination and fee requirements. NBS will conduct or arrange by contract the conduct of examinations in accordance with the requirements of the program. In general, the examination will consist of an appropriate questionnaire, an on-site inspection and the performance of proficiency tests on test samples. In all cases, NBS will assure that the personnel conducting the examination possess the qualifications needed for the work.

Upon completion of the examination, NBS assembles and reviews the results to assure that all examination requirements have been fulfilled. After review of the findings submitted by NBS, the Secretary of Commerce issues or denies accreditation to the testing laboratory.

THERMAL INSULATION MATERIALS
LABORATORY ACCREDITATION PROGRAM

On December 1, 1976, the Secretary of Commerce received a joint request from a group of organizations asking that a LAP be established to accredit testing laboratories which render services in the field of thermal insulation testing. The organizations which made the request were the Thermal Insulation Manufacturers Association, Inc.; the National Mineral Wool Insulation Association, Inc.; and the National Cellulose Insulation Manufacturers Association, Inc.

The request identified the product as measurement services associated with thermal insulation and classified the services as measurement of the following properties of thermal insulation:

1. Thermal properties;
2. Dimensions, stability, and density properties;
3. Strength properties;
4. Fire properties;
5. Vapor permeance properties

For each classification of measurement service specified above, the request identified a number of standard test methods, practices, or definitions of terms promulgated by the American Society for Testing and Materials (ASTM). A total of 51 related ASTM standards were submitted with the request with the contention that these standards could serve as a point of reference for ascertaining the technical competence and proficiency of testing laboratories which provide measurement services as classified in the request [3]. In addition, the requestors addressed all of the issues as outlined under the "Finding of Need" given above.

A careful analysis of the request was conducted for compliance with the requirements of the NVLAP procedures [2]. The analysis disclosed that in reality the specific product for which testing would be provided is "thermal insulation materials." It was concluded that the establishment of criteria and other conditions for accrediting such testing laboratories would benefit the public interest, and thus the need was established.

Subsequent to the finding of need, a criteria committee was established in accordance with the NVLAP procedures. As a result of the recommendations of the criteria committee along with consideration of public comments on proposed criteria, general and specific criteria for Thermal Insulation Material Laboratory Accreditation Program (TIMLAP) were published in the Federal Register Vol. 44, No. 13 (44 FR 3886-3906) January 18, 1979. A total of 62 test methods were identified for which accreditation could be sought. A list of these test methods is presented in Table 1.

Thirty laboratories submitted applications for accreditation by NVLAP for specific tests on thermal insulation materials. The individual requests ranged from as few as one test to as many as all 62 tests. The accreditation procedure starts with an evaluation methodology with a three part approach: 1) an appropriate questionnaire; 2) an on-site inspection; 3) and proficiency testing. The examination procedure is as follows:

Upon receiving an application for accreditation from a laboratory, a detailed questionnaire, based on the final published criteria for the LAP, is sent to the laboratory for written completion. An initial evaluation is then made of the information submitted by the laboratory in answering the questionnaire. If this evaluation indicates that the material in the questionnaire is complete and satisfactory, an on-site

inspection is scheduled in which the information submitted will be verified and a comparison made between the capabilities of the laboratories and the requirements of the test methods and the criteria. Finally, the laboratory may be required to participate in proficiency sample programs with the test data submitted to NBS for evaluation.

A team of three inspectors and two technical experts was used to carry out the on-site inspections and to assist in evaluating the examination information. The three inspectors were obtained under contractual arrangement with the Cement and Concrete Reference Laboratory which is a Research Associate Program at NBS sponsored by ASTM. The inspectors were experienced in the inspection of laboratories that test cement and concrete but were not completely familiar with the testing of thermal insulation materials. So, in preparation for their new activities, they received intensive training conducted by NBS and other personnel.

The two technical experts had considerable experience in the field of thermal insulation materials testing and research. Both had worked for major producers of insulation materials and had retired after 30 or more years of work with their companies. They were used to assist in the training of the inspection team, and in the review of the questionnaires submitted by the laboratories. In addition, they assisted the inspectors during the on-site inspections, especially in the area of thermal measurement, and assisted in the final evaluation of each laboratory.

The first and second on-site inspections were carried out in early May, 1979. The following week was used to critique these inspections and to make changes that were needed. The remaining inspections began in the middle of May and were continued until completion at the end of August, 1979. The length of time for an inspection varied from one to five days at the laboratory.

After each on-site inspection the laboratory was notified by letter from NBS of the recorded results of the inspection with respect to mechanical deficiencies in apparatus or departures from requirements of the related methods. Twenty of the 30 laboratories inspected had one or more deficiencies in apparatus or departures from requirements of the related methods.

The following are examples of the type of deficiencies found in the laboratories on inspection.

- environmental conditions not controlled within required limits.
- required equipment not available.
- equipment not conforming to specifications.

Proficiency testing is the third major part of the examination methodology. Proficiency testing was envisaged as a means of determining a laboratory's ability to correctly conduct the tests in question. The National Criteria Committee for Thermal Insulation Materials designated 25 methods for proficiency testing and suggested a twice-annual test frequency. Due to minimum participant requirements imposed for statistical reasons proficiency samples were supplied for only six thermal tests and three flammability tests.

Thermal conductivity measurements were conducted on batt, board, and loose-fill materials in accordance with ASTM test method C177-76, the guarded hot plate or with ASTM test method C518-76, the heat flow meter. The flammability tests were conducted on a loose-fill material in accordance with ASTM E84-77a, the Steiner tunnel, and the radiant panel and smoldering combustion tests from Federal Specification, HHI-515D.

The batt material used in the thermal tests was specially prepared for NVLAP. It was designed for maximum uniformity and was extensively characterized by both the supplier and by NBS. In a similar fashion, the board material was chosen for its uniformity and thermal conductivity.

The loose-fill material was chosen to be usable for both the thermal and flammability tests. This material was similar to cellulosic thermal insulation products and was specifically selected to produce uniform test results.

Data sheets and sample preparation instructions were prepared at NBS and included in each sample package. These instructions and data sheets were designed to assure uniformity of testing among the laboratories.

Upon completion of testing, the laboratories filled out the data sheets and returned them to NBS for evaluation and statistical analysis to determine compliance with the accuracy requirements detailed in the Federal Register Notice of January 18, 1979. In addition, the thermal data was analysed to determine among-laboratory agreement.

As a result of an evaluation of all of the examination information, (the questionnaires, the on-site inspection, and the proficiency testing program) obtained on the laboratories in the TIMLAP, a total of thirty laboratories have been accredited by the Department of Commerce to perform one or more of the test methods available in the NVLAP program [4]. This accreditation is for a one year period. An alphabetical listing of the accredited laboratories showing the NVLAP Code for the test methods for which each laboratory is accredited is shown in Table 2.

REFERENCES

1. National Voluntary Laboratory Accreditation Program, First Annual Report (for the period February 25, 1976, to December 31, 1977).

2. Procedures for a National Voluntary Laboratory Accreditation Program, Federal Register, Volume 41, Number 38 (41 FR 8163-8168), February 25, 1976.

3. Preliminary Finding of Need to Accredit Testing Laboratories That Test Thermal Insulation Materials, Federal Register, Volume 42, Number 47 (42 FR 13326-13336), March 10, 1977.

4. National Voluntary Laboratory Accreditation Program; Report of Accreditation Actions, Federal Register, Volume 44, Number 202 (44 FR 60052-60054), October 17, 1979.

TABLE 1

LIST OF TEST METHODS FOR WHICH
ACCREDITATION MAY BE SOUGHT-1

NVLAP Code	TEST METHOD DESIGNATION	SHORT TITLE (PROPERTY) SUBTITLE (IF APPLICABLE)
01/C01	ASTM C739 (para. 7.7 in 77 version)	Corrosiveness; Cellulosic fiber (loose-fill)
01/C02	HH-I-515 (para. 4.8.5 in D version)	Corrosiveness; Cellulosic fiber (loose-fill)
01/D01	ASTM C136	Sieve or screen analysis
01/D02	ASTM C167	Thickness and density; Blanket and batt
01/D03	ASTM C209 (para. 6 in 72 version)	Thickness Board (cellulosic fiber)
01/D04	ASTM C209 (para. 13 in 72 version)	Water absorption, 2 hour; Board (cellulosic fiber)
01/D05	ASTM C209 (para. 13 in 72 version) by D1037 (para. 100-106 in 72 version)	Water absorption, 24 hour; Board (cellulosic Fiber)
01/D06	ASTM C209 (para. 13 in 72 version) by D1037 (para. 107-110 in 72 version)	Linear expansion; Board (cellulosic fiber)
01/D07	ASTM C272	Water absorption; Core materials
01/D08	ASTM C302	Density; Preformed pipe insulation
01/D09	ASTM C303	Density; Preformed block insulation
01/D10	ASTM C355	Water vapor transmission; Thick materials; Desiccant method
01/D11	ASTM C356	Linear shrinkage; Soaking heat; Preformed high temperature insulation
01/D12	ASTM C411	Hot-surface performance; High temperature insulation
01/D13	ASTM C519	Density; Loose-fill (fibrous)
01/D14	ASTM C520	Density; Granular loose-fill
01/D15	ASTM D756	Weight and shape changes; Accelerated service (proc. A); Plastics
01/D16	ASTM D756	Weight and shape changes; Accelerated service (proc. B); Plastics
01/D17	ASTM D756	Weight and shape changes; Accelerated service (proc. E); Plastics
01/D18	ASTM D1622	Apparent density; Rigid Cellular Plastics
01/D19	ASTM D2126	Response to thermal and humid Aging (proc. B); Rigid Cellular Plastics
01/D20	ASTM D2126	Response to thermal and humid Aging (proc. D); Rigid Cellular Plastics
01/D21	ASTM D2126	Response to thermal and humid Aging (proc. E); Rigid Cellular Plastics
01/D22	ASTM D2126	Response to thermal and humid Aging (proc. F); Rigid Cellular Plastics

LIST OF THE METHODS FOR WHICH
ACCREDITATION MAY BE SOUGHT-2

NVLAP Code	TEST METHOD DESIGNATION	SHORT TITLE (PROPERTY) SUBTITLE (IF APPLICABLE)
01/D23	ASTM D2842	Water absorption; Rigid Cellular Plastics
01/D24	ASTM C739 (para. 7.5 in 77 version)	Moisture absorption, Cellulosic Fiber (loose-fill)
01/D25	HH-I-515 (para. 4.8.3 in D version)	Moisture absorption; Cellulosic fiber (loose-fill)
01/D26	HH-I-515 (para. 4.8.1 in D version)	Settled density; Cellulosic fiber (loose-fill)
01/F01	ASTM D777 as modified by HH-B-100B	Flammability; Paper and paperboard
01/F02	ASTM E84	Surface burning characteristics; Building materials (loose-fill)
01/F03	ASTM E84	Surface burning characteristics; Building materials (blanket and batt)
01/F04	ASTM E84	Surface burning characteristics; Building materials (board and block)
01/F05	ASTM E136	Noncombustibiltiy; Elementary materials
01/F06	ASTM C739 (para. 10.4 in 77 version)	Flame resistance permanency; Cellulosic fiber (loose-fill)
01/F07	HH-I-515 (para. 4.8.7 in D version)	Critical radiant flux; Radiant Panel (cellulosic fiber, loose-fill)
01/F08	HH-I-515 (para. 4.8.8 in D version)	Smoldering combustion; Cellulosic fiber (loose-fill)
01/S01	ASTM C165	Compressive properties; Thermal insulation (proc. A)
01/S02	ASTM C203	Breaking load/flexural strength; Preformed block insulation
01/S03	ASTM C209 (para. 9 in 72 version)	Transverse strength; Board (cellulosic fiber)
01/S04	ASTM C209 (para. 10 in 72 version)	Deflection at specified load; Board (cellulosic fiber)
01/S05	ASTM C209 (para. 11 in 72 version)	Tensile strength; Parallel to surface; Board (cellulosic fiber)
01/S06	ASTM C209 (para. 12 in 72 version)	Tensile strength; Perpendicular to surface
01/S07	ASTM C273	Shear test; Sandwich construction
01/S08	ASTM C446	Breaking load/modulus of rupture; Preformed pipe insulation
01/S09	ASTM D781	Punction test; Paperboard and fiberboard
01/S10	ASTM D828	Tensile breaking strength; Paper and paperboard
01/S11	ASTM D1621	Compressive properties; Rigid cellular plastics (proc. A-Crosshead)
01/T01	ASTM C177	Thermal transmission properties; Low-temperature guarded hot plate (loose-fill)
01/T02	ASTM C177	Thermal transmission properties; Low-temperature guarded hot plate (blanket and batt)

LIST OF THE METHODS FOR WHICH
ACCREDITATION MAY BE SOUGHT-3

NVLAP Code	TEST METHOD DESIGNATION	SHORT TITLE (PROPERTY) SUBTITLE (IF APPLICABLE)
01/T03	ASTM C177	Thermal transmission properties; Low-temperature guarded hot plate (board and block)
01/T04	ASTM C236	Thermal conductance; Guarded hot box
01/T05	ASTM C335	Thermal conductivity; Pipe insulation
01/T06	ASTM C518	Thermal transmission properties; Heat flow meter (blanket and batt)
01/T07	ASTM C518	Thermal transmission properties; Heat flow meter (board)
01/T08	ASTM C518	Thermal transmission properties; Heat flow meter (loose-fill)
01/T09	ASTM C653	Thermal resistance (Rec. Practice); Blanket (mineral fiber)
01/T10	ASTM C687	Thermal resistance (Rec. Practice); Loose-fill (fibrous)
01/V02	ASTM D591	Starch in paper; Qualitative test
01/V03	ASTM D2020	Mildew (fugus) resistance; Paper and paperboard
01/V04	ASTM E96	Water vapor transmission; Thin sheets (proc. A)
01/V05	HH-I-515 (para. 4.8.6 in D version)	Fungus; Cellulosic fiber (loose-fill)
01/V06	HH-I-515 (para. 4.8.9 in D version)	Starch; Cellulosic fiber (loose-fill)

TABLE 2

ALPHABETICAL LIST OF LABORATORIES SHOWING
TEST METHODS FOR WHICH EACH IS ACCREDITED-1

Butler Manufacturing Company Research Center 135th Street and Botts Road Grandview, MO 64030	01/T04, 01/T06, 01/T07
CertainTeed Corporation Research & Development Laboratory 1400 Union Meeting Road Blue Bell, PA 19422	01/C02 01/D01, 01/D02, 01/D08, 01/D09, 01/D13, 01/D25, 01/D26 01/F01, 01/F05, 01/F07, 01/F08 01/S01, 01/S08, 01/S09, 01/S10 01/T01, 01/T02, 01/T03, 01/T04, 01/T05, 01/T06, 01/T07, 01/T08, 01/T09, 01/T10 01/V04
Certified Testing Laboratories, Inc. 1105 Riverbend Road Dalton, GA 30720	01/C02 01/D25 01/F07, 01/F08 01/V06
Commercial Testing Company, Inc. P. O. Box 94 Dalton, GA 30720	01/C02 01/D25 01/F07, 01/F08 01/T08 01/V06
Dynatech R/D Company 99 Erie Street Cambridge, MA 02139	01/C01, 01/C02 01/D24, 01/D25, 01/D26 01/S01, 01/S02, 01/S11 01/T01, 01/T02, 01/T03, 01/T04, 01/T05, 01/T06, 01/T07, 01/T08 01/V06
Dynatherm Engineering 595 Marshan Lane Lino Lakes, MN 55014	01/T04
DOW Chemical U.S.A. Granville R & D Center P. O. Box 515 Granville, OH 43023	01/D07, 01/D10, 01/D18, 01/D23 01/S02, 01/S11 01/T07
Factory Mutual Research 1151 Boston-Providence Turnpike Norwood, MA 02062	01/F02, 01/F03, 01/F04, 01/F06, 01/F07, 01/F08
Hauser Laboratories P. O. Box G Boulder, CO 80306	01/C02 01/D25, 01/D26 01/F07, 01/F08 01/T08 01/V05, 01/V06
International Acoustical Testing Laboratory 2820 Anthony Lane South Minneapolis, MN 55418	01/C02 01/D25, 01/D26 01/F07, 01/F08 01/V06

ALPHABETICAL LIST OF LABORATORIES SHOWING
TEST METHODS FOR WHICH EACH IS ACCREDITED-2

Jim Walter Research Corporation 10301 Ninth Street, North St. Petersburg, FL 33702	01/D03, 01/D04, 01/D05, 01/D06, 01/D09, 01/D18, 01/D19, 01/D20, 01/D21, 01/D22, 01/D23 01/S01, 01/S02, 01/S03, 01/S04 01/S05, 01/S06, 01/S07, 01/S11 01/T03, 01/T04, 01/T05, 01/T07
Johns-Manville R & D Center P. O. Box 5108 Denver, CO 80217	01/D02, 01/D03, 01/D04, 01/D08, 01/D09, 01/D11, 01/D12, 01/D13 01/F02, 01/F03, 01/F04, 01/F05 01/S01, 01/S02, 01/S03, 01/S06, 01/S08 01/T04, 01/T05, 01/T06, 01/T07, 01/T08, 01/T09, 01/T10 01/V04
NAHB Research Foundation, Inc. P. O. Box 1627 Rockville, MD 20850	01/D02 01/T06, 01/T07, 01/T09
Owens-Corning Fiberglas Corp. Technical Center Laboratory P. O. Box 415 Granville, OH 43023	01/C01, 01/C02 01/D02, 01/D03, 01/D04, 01/D05, 01/D06, 01/D07, 01/D08, 01/D09, 01/D10, 01/D11, 01/D12, 01/D13, 01/D15, 01/D16, 01/D17, 01/D18, 01/D19, 01/D20, 01/D21, 01/D22, 01/D23, 01/D24, 01/D25, 01/D26, 01/F01, 01/F02, 01/F03, 01/F04, 01/F05, 01/F07, 01/F08 01/S01, 01/S02, 01/S03, 01/S04, 01/S05, 01/S06, 01/S07, 01/S08, 01/S09, 01/S10, 01/S11 01/T01, 01/T02, 01/T03, 01/T04, 01/T05, 01/T06, 01/T07, 01/T08, 01/T09, 01/T10 01/V02, 01/V03, 01/V04, 01/V05, 01/V06
Owens-Corning Fiberglas Corp. Plant Laboratory P. O. Box 8 Barrington, NJ 08007	01/D02, 01/D09 01/T06, 01/T07
Owens-Corning Fiberglas Corp. Plant Laboratory P. O. Box 89 Delmar, NY 12054	01/D02 01/T06
Owens-Corning Fiberglas Corp. Plant Laboratory P. O. Box 578 Fairburn, GA 30213	01/D02 01/T06
Owens-Corning Fiberglas Corp. Plant Laboratory P. O. Box 15139 Fairfax Station Kansas City, KS 66115	01/D02, 01/D09 01/T06, 01/T07

Owens-Corning Fiberglas Corp. Plant Laboratory Case Avenue Newark, OH 43055	01/D02, 01/D09 01/T06, 01/T07
Owens-Corning Fiberglas Corp. Plant Laboratory P. O. Box 89 Santa Clara, CA 95052	01/D02, 01/D09 01/T06, 01/T07
Owens-Corning Fiberglas Corp. Plant Laboratory P. O. Box 839 Waxahachie, TX 75165	01/D02, 01/D09 01/T06, 01/T07
Louisiana-Pacific Corporation Pabco Insulation Division 1110 Sixteen Road Fruita, CO 81521	01/T03, 01/T05
Southwest Research Institute P. O. Drawer 28510 San Antonio, TX 78284	01/C01, 01/C02 01/D24, 01/D25, 01/D26 01/F02, 01/F03, 01/F04, 01/F05, 01/F06, 01/F07 01/T04 01/V05, 01/V06
Sparrell Engineering Research Corporation P. O. Box 8 Salem, MA 01970	01/T01, 01/T02, 01/T03, 01/T08
Technical Micronics Controls, Inc. P. O. Box 1330 Huntsville, AL 35807	01/C02 01/D26 01/F07, 01/F08 01/T01 01/V05
Underwriters Laboratories, Inc. 333 Pfingsten Road Northbrook, IL 60062	01/C01, 01/C02 01/D01, 01/D02, 01/D03, 01/D04, 01/D05, 01/D06, 01/D08, 01/D09, 01/D13, 01/D14, 01/D18, 01/D24, 01/D25, 01/D26 01/F02, 01/F03, 01/F04, 01/F06, 01/F07, 01/F08 01/S02, 01/S03, 01/S04, 01/S05, 01/S06, 01/S08, 01/S11 01/T06, 01/T07, 01/T08, 01/T09, 01/T10 01/V02, 01/V03, 01/V05, 01/V06
Underwriters Laboratories, Inc. 1655 Scott Blvd. Santa Clara, CA 95050	01/D13 01/F02, 01/F03, 01/F04, 01/F06, 01/F07
United States Testing Company, Inc. 1415 Park Avenue Hoboken, NJ 07030	01/C01, 01/C02 01/D10, 01/D24, 01/D25, 01/D26 01/F02, 01/F03, 01/F04, 01/F05, 01/F06, 01/F07, 01/F08 01/T06, 01/T07, 01/T08 01/V04, 01/V05, 01/V06

ALPHABETICAL LIST OF LABORATORIES SHOWING
TEST METHODS FOR WHICH EACH IS ACCREDITED-4

United States Testing Company, Inc. California Branch Laboratory 5555 Telegraph Road Los Angeles, CA 90040	01/C02 01/D10, 01/D21, 01/D25, 01/D26 01/F02, 01/F04, 01/F05, 01/F07, 01/F08 01/V04, 01/V06
United States Testing Company, Inc. Tulsa Branch Laboratory 1341 North 108 East Avenue Tulsa, OK 74116	01/C02 01/D10, 01/D18, 01/D25, 01/D26 01/F08 01/V05, 01/V06