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NVLAP Partnerships with NIST Technical Units

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Foreword

NIST management needs to have the best information, at the right time, to make fact-based programmatic, technical, business, and policy decisions with respect to NIST policies and activities in measurement services, standards services, information services, external partnerships, and legal metrology. Because Technology Services (TS) is a repository of much useful information that could aid these decisions, TS has created the *TS Report* series. These reports present data and information for decision-makers in a condensed, focused format supported by careful analysis. The *TS Report* series can be found at the *TS Reports* button at http://www-i.nist.gov/ts/tsintranet/. Selected TS Reports are also published as NIST Internal Reports (IRs), when appropriate, for wider hard copy distribution.

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1. Introduction

This report provides NIST managers with an overview of the range and types of technical partnerships between Technology Services' National Voluntary Laboratory Accreditation Program (NVLAP) and NIST Technical Units. It provides a description of NVLAP programs, and analyzes growth trends in specific programs. The report also provides information on NVLAP partnerships with other government agencies and with the private sector, and reports on partnerships, both by field of accreditation, and by NIST Laboratory Division. Finally, the report identifies implications of these trends for the NIST Laboratories, as well as for NVLAP. The data and analyses presented are intended to inform managers in NIST technical units about trends in the NVLAP program and to provide information that can assist them in their own technical, business and policy planning activities. As demands for laboratory accreditation services change in response to market and legislative needs, it is hoped that new and stronger partnerships can be achieved for the mutual benefit of NIST laboratory staffs and NVLAP.

2. Background

2.1 What is NVLAP?

NVLAP is a voluntary, fee-supported program to accredit testing and calibration laboratories that are found competent to perform specific tests or calibrations, or types of tests or calibrations. The program is intended to serve the needs of industry, consumers, government, and others by fostering and promoting a uniformly acceptable base of professional and technical competence. NVLAP develops its accreditation programs for testing and calibration laboratories in response to legislative or administrative actions, requests from government agencies or, in special circumstances, from private sector entities. The program provides an unbiased third-party evaluation and recognition of performance, as well as expert technical guidance to upgrade laboratory performance.

NVLAP is committed to maintaining its reputation for quality by fostering continued process improvement and problem prevention within NVLAP; understanding and using the NVLAP quality system to do a good job consistently; striving to fulfill and exceed the needs and expectations of NVLAP customers; forming relationships with both laboratories and contractors that will improve quality in all aspects of services; and maintaining close associations with comparable national and international accreditation and standards development organizations. NVLAP's association with NIST technical units promotes and sustains its reputation as a world-class accreditation body.

Appendix A contains additional information about NVLAP and its history.

2.2 Overview of NVLAP Activities

NVLAP currently offers accreditation in 16 fields of testing; eight fields of calibration, covering 90 parameters; and two fields of chemical calibration. Appendix B contains a current list of calibration parameters organized by field of calibration. NVLAP's annual budget for FY02 was $4.57 million. A staff of 16 technical and administrative personnel manages programs that accredit a total of almost 750 testing and calibration laboratories. During FY02, NVLAP transferred more than $164 thousand to NIST laboratories in support of program development, proficiency testing, and technical assessor services.

Table 2.2.1 shows the number of NVLAP accreditations by program group and field of accreditation as of October 10, 2002. Because many laboratories, particularly calibration laboratories, are accredited in more than one field of accreditation, the number of accreditations listed exceeds the number of NVLAP-

accredited laboratories. As of October 10, 2002, NVLAP had 749 accredited laboratories, of which 685 were testing laboratories and 64 were calibration laboratories (51 calibration, 11 providers of proficiency testing (PPT) and two NIST traceable reference materials (NTRMs)).

NVLAP directly supports the U.S. measurement infrastructure by accrediting calibration laboratories that disseminate secondary standards and provide measurement results that are traceable to appropriate national and international standards. These NVLAP-accredited calibration laboratories rely on NIST calibration services for the calibration of their own equipment. They include laboratories operated by federal agencies, such as the Department of Defense, the Department of Energy, and the Food and Drug Administration; eight state metrology laboratories that provide legal metrology support in their respective states; major manufacturers of standards and test equipment; and a mixture of calibration service laboratories, some general and some sector-specific.

Table 2.2.1. ***Testing and calibration laboratories by field of accreditation***

Program Group/Field of Accreditation	*Number of Accreditations*
Calibration Laboratories Group	
Dimensional	21
Electromagnetics – DC/Low Frequency	13
Electromagnetics – RF/Microwave	5
Ionizing Radiation	7
Mechanical	29
Optical Radiation	3
Thermodynamic	15
Time and Frequency	14
Chemical Calibration Laboratories Group	
NIST Traceable Reference Materials (NTRMs)	2
Providers of Proficiency Testing (PPT)	11
Ionizing Radiation Dosimetry	34
Electromagnetic Compatibility and Telecommunications Group	187
Environmental Group	
Bulk Asbestos Analysis (PLM-polarized light microscopy)	235
Airborne Asbestos Analysis (TEM-transmission electron microscopy)	74
Fasteners and Metals Group	35
Information Technology Security Testing Group	
Common Criteria Testing	6
Cryptographic Module Testing	7
Product Testing Group	
Acoustical Testing Services	25
Carpet and Carpet Cushion	8
Commercial Products Testing	
(Paints, Paper, Plastics, Plumbing, Roofing, Seals/Sealants)	9
Construction Materials Testing	17
Efficiency of Electric Motors	15
Energy Efficient Lighting Products	16
Thermal Insulation Materials	13
Wood Based Products	4
Total Accreditations	**805**

Table 2.2.2 provides a detailed listing of the number of laboratories participating in the NVLAP Calibration Laboratories Accreditation Program as of October 10, 2002.

Table 2.2.2. ***Accredited and applicant calibration laboratories by field of accreditation***

Field of Accreditation	Number of Accredited Labs	Number of Applicant Labs
Dimensional	21(5)	8(4)
DC/Low Frequency	13	4
RF/Microwave	5	1
Ionizing Radiation	7	1
Mechanical	29(8)	17(7)
Optical Radiation	3	0
Thermodynamics	15(2)	9(3)
Time and Frequency	14(3)	4(1)

Note: The number in parentheses indicates the number of state metrology laboratories included in the count.

A detailed list of the number of calibration laboratories accredited by parameter is provided in Appendix C. Ten parameters in five fields account for the vast majority of calibration laboratory accreditations. In the mechanical field, mass, force, and volume and density account for the largest number of accreditations; most accreditations in the dimensional field are for gage blocks and for length and diameter (step gages). In the thermodynamic field, resistance thermometry is the most common parameter in accreditations, and in the time and frequency field, nearly all laboratories are accredited for frequency dissemination.

Legal metrology accounts for a large part of the activity in the area of mechanical testing since such testing often relates to commerce, public health and safety, and environmental monitoring. In addition, state laboratories have growing interest in providing measurement services traceable to NIST in support of commerce within their states. High activity in the DC/low frequency areas may reflect activity in general purpose measurement and test equipment support.

Under the terms of an agreement between the Analytical Chemistry Division (ACD) and EPA, NVLAP has accredited 11 laboratories for their competence to characterize samples and to conduct proficiency test programs to support EPA requirements for environmental laboratories. Technical oversight of the program and the evaluation process is provided by the ACD.

NVLAP's Certifiers of Spectrophotometric NIST Traceable Reference Materials (NTRMs) program has accredited two laboratories that design, prepare, characterize, certify, and distribute spectrophotometric filter reference materials traceable to NIST. The commercially produced reference materials under this program are recognized by NIST as NTRMs.

3. Trends in NVLAP Programs

There is growing recognition among governments and industries worldwide that laboratory accreditation is a vital tool to enhance confidence that data generated in accredited laboratories are accurate, traceable, and reproducible. Today, more than ever, governments and specifiers rely on laboratory accreditation to reduce uncertainties associated with decisions that affect the protection of human health and the environment, eliminate redundant audits, reduce costs, and improve acceptance of products in world markets.

Laboratory accreditation is now referenced in global trade agreements, such as the Asia Pacific Economic Cooperation (APEC) Telecommunications Arrangement, as a mechanism to ensure uniformity of products across borders. U.S. automobile manufacturers rely on laboratory accreditation to ensure the accuracy and consistency of the measurements made by their suppliers and to have confidence in the quality of the components that they purchase.

Table 3.1 provides data on trends in the number of laboratories accredited by NVLAP, by laboratory accreditation program. As shown in this table, several NVLAP programs have experienced growth in the past five years. For example, the number of laboratories enrolled in the Electromagnetic Compatibility and Telecommunications (ECT) Program has more than quadrupled since 1996 due to the rising number of information technology products placed on the market and the growing number of regulations that cover these products. Trade agreements signed in 1998 and 1999 provide for mutual recognition of testing and certification carried out in support of electromagnetic compatibility (EMC) and telecommunications equipment regulations between the United States and the European Union, APEC and CITEL (Inter-American Telecommunications Commission) countries. This has also created impetus for laboratories in these fields in the United States to seek accreditation, or to expand their scopes of accreditation. The level of laboratory enrollment remains steady, but there is a great deal of activity among laboratories to expand their capabilities and to increase their scopes of accreditation in order to meet new requirements.

Although there are only 15 laboratories in the Information Technology Security Testing Program, this highly specialized area of testing continues to experience growth. The testing conducted in these accredited laboratories is used to validate products that have been evaluated in accordance with the provisions of the National Information Assurance Partnership (NIAP) Common Criteria Evaluation and Validation Scheme, and the Common Criteria Recognition Arrangement (CCRA). Laboratories in this program also test encryption/decryption products that ensure information security, which is critical in financial industries and other sectors dependent on secure communications. While few new laboratories are expected to join this program in the future, this small program is likely to have an enormous impact on the public and the economy by contributing to the security of financial and medical records.

The Acoustics Program has seen a recent increase in applications because accreditation is viewed as a marketing advantage in the small community of acoustical testing laboratories. Moreover, many federal agencies are now upgrading their laboratories and seeking accreditation so that they can confidently conduct tests for hearing protection products to ensure the safety of their personnel.

The Calibration Laboratories Program continues slow, steady growth. Increased demands by the automobile industry and other clients have caused many calibration laboratories to seek accreditation. Enrollment has doubled in the past five years and continued growth is anticipated because of growing industry reliance upon results from accredited calibration laboratories.

Since 1996, the Electric Motors Program has experienced a twofold increase in the number of laboratories seeking accreditation for testing the efficiency of electric motors. The program was developed in response to the Energy Policy Act of 1992 (EPAct). The Department of Energy (DOE) expects that a significant reduction in energy consumption in the U.S. will be achieved with the increased efficiency of electric motors.

Also developed in response to the EPAct of 1992 is NVLAP's Energy Efficient Lighting Program. The number of laboratories seeking accreditation has doubled since 1996. Efficient lamps and luminaires will significantly reduce energy consumption of businesses and households in the United States.

Table 3.1. ***Trends in the number of accreditations in each testing and calibration program***

Accreditation Program	*FY96*	*FY97*	*FY98*	*FY99*	*FY00*	*FY01*	*FY02*	*Change FY01/FY02*
Calibration Laboratories Group	13	15	23	27	31	45	51	6
Chemical Calibration Laboratories Group								
NTRMs	0	0	0	0	0	3	2	(1)
Providers of Proficiency Testing	0	0	0	0	12	12	11	(1)
Electromagnetics Compatibility and Telecommunications Group	41	122	142	150	179	181	187	6
Environmental Group								
PLM (bulk asbestos analysis)	331	311	291	280	254	244	235	(9)
TEM (airborne asbestos analysis)	73	73	75	76	74	73	74	1
Fasteners and Metals Group	0	78	92	83	49	43	35	(8)
Information Technology								
Cryptographic Module Testing	3	2	3	8	4	4	7	3
Common Criteria Testing	0	0	0	0	4	5	6	1
Ionizing Radiation Dosimetry Group	51	49	45	42	40	37	34	(3)
Product Testing Group								
Acoustical Testing Services	14	18	20	21	24	23	25	2
Carpet and Carpet Cushion	16	14	13	12	11	8	8	0
Commercial Products Testing	6	8	8	6	6	7	9	2
Construction Materials Testing	17	17	18	16	14	15	17	2
Efficiency of Electric Motors	6	6	7	9	8	14	16	2
Energy Efficient Lighting Products	8	10	10	9	8	10	15	5
Thermal Insulation Materials	17	19	18	18	16	13	13	0
Wood Based Products	5	5	5	5	4	4	4	0
Total Accreditations	595	747	770	762	738	741	749	8

Some NVLAP programs have seen a decrease in laboratory enrollment. For example, NVLAP's Asbestos Program, which was established in 1988, had an enrollment of more than 700 laboratories in the early nineties. Although most of the regulated work that prompted Congress to pass legislation has been completed, the Asbestos Program, with 237 laboratories (163 PLM only, 72 PLM/TEM, and two TEM only), remains NVLAP's largest program.

Similarly, the Fasteners and Metals Program was developed in response to the Fastener Quality Act of 1990. In 1998, NVLAP enrolled more than 90 laboratories in the program, but an amendment to the law significantly reduced the requirement for laboratory accreditation: enrollment plunged to the current level of 35 laboratories. It is expected that this program will remain at this level for the near future.

NVLAP's Dosimetry Program had more than 75 laboratories enrolled in 1994. Today only 34 laboratories are accredited because dosimetry-processing laboratories have been closing their facilities and contracting out their work to a few large laboratories to save operating costs. The number of accredited laboratories is expected to continue its downward trend although this program provides critical support for ongoing homeland security efforts.

NVLAP will potentially be involved with new programs, including accreditation of laboratories that test various types of voting machines, as required by the Help America Vote Act of 2002, signed into law by President Bush on October 29, 2002. NVLAP will work with ITL to develop criteria to evaluate the laboratories. In addition, there are ongoing discussions between NVLAP and NIAP about the accreditation of laboratories to test and evaluate information systems for computer security. This is a very complex issue that will require much coordination and cooperation between NVLAP, ITL, other government agencies, and industry in order to harmonize systems evaluation government-wide. Future initiatives in homeland security may also call for government-operated laboratory accreditation to test and evaluate equipment and systems (e.g., biometric devices, metal detectors, radiation detectors, chemical sensors, etc.) that are used to enhance security.

4. NVLAP Partnerships with NIST Technical Units–Testing and Calibration

NVLAP partners with the NIST Laboratories in at least three different ways. (1) When a new laboratory accreditation program (LAP) is being considered, the appropriate NIST Laboratory participates in determining the need for the program through public meetings with affected or interested industry, government, and laboratory representatives. (2) Once the decision has been made to proceed with a LAP, knowledgeable NIST laboratory staff work with NVLAP staff to develop the technical criteria that will be used to assess laboratory expertise. These criteria are published in program-specific handbooks (see <www.nist.gov/nvlap> for a complete list of handbooks). If a LAP is developed in response to a request from a federal agency, its personnel will also review the technical criteria. (3) After a LAP has been established, NIST laboratory staff often contribute technical expertise by serving as Technical Assessors at laboratory assessments and by providing technical support for laboratory proficiency testing. Eleven NIST laboratory divisions currently provide support for NVLAP's testing laboratory programs; more than ten divisions have provided support to NVLAP's Calibration Laboratories Program; and two laboratory divisions partner with NVLAP for its Chemical Calibration Laboratories Program.

The following sections describe specific NVLAP partnerships with NIST laboratories, listed in order of their division numerical designation.

4.1 *Technology Services (TS (200))*

4.1.1 Calibration Laboratories Program

The Weights and Measures Division (260) provided the technical criteria for inclusion in NIST Handbook 150-2 (draft), *Calibration Laboratories Technical Guide*, and other technical support and guidance, as needed. The field supported is Mechanical Metrology. Division 260 has also participated in on-site assessments of laboratories and proficiency testing activities.

4.2 *Electronics and Electrical Engineering Laboratory (EEEL (810))*

4.2.1 Calibration Laboratories Program

EEEL Divisions, Electricity (811), Semiconductor Electronics (812), Radio-Frequency Technology (813) and Optoelectronics (815), provided technical criteria for inclusion in NIST Handbook 150-2 (draft), *Calibration Laboratories Technical Guide*, and other technical support and guidance, as needed. Fields supported are DC/Low Frequency and RF/Microwave Electromagnetics, Thin Film, and Optical Radiation Metrology. Divisions 811, 812 and 815 have also participated in on-site assessments of laboratories and/or proficiency testing activities.

4.3 *Manufacturing Engineering Laboratory (MEL (820))*

4.3.1 Acoustical Testing Services Program

The NVLAP Acoustical Testing Services Program accredits laboratories for selected test methods in the areas of sound absorption, impedance, attenuation, vibration, power levels, emitted sound, and hearing protection, among others. The program was designed to satisfy the requirements of contracts, state and local governments, and federal agencies that specify accreditation for laboratories that perform testing for compliance to acoustical design specifications and performance testing of acoustical materials and noise protection devices. Manufacturing Metrology Division (822) technical staff provide consultation services to the NVLAP Program Manager.

4.3.2 Calibration Laboratories Program

MEL Divisions, Precision Engineering (821), Manufacturing Metrology (822), and Manufacturing Systems Integration (826), provided technical criteria for inclusion in NIST Handbook 150-2 (draft), *Calibration Laboratories Technical Guide*, and other technical support and guidance, as needed. Fields supported are Dimensional and Mechanical Metrology. Divisions 821 and 822 have also participated in on-site assessments of laboratories and/or proficiency testing activities.

4.4 *Chemical Science and Technology Laboratory (CSTL (830))*

4.4.1 Asbestos Fiber Analysis Program

NVLAP's Asbestos Fiber Analysis Program was developed in response to the passage of Public Law 99-519, *Asbestos Hazard Emergency Response Act of 1986*, referred to as AHERA. This law required that

NIST (then NBS) develop an accreditation program for laboratories that analyze either bulk samples of asbestos-containing materials or air samples of asbestos using test methods specified by the Environmental Protection Agency (EPA). Beginning in mid-1986, a new partnership between NVLAP and CSTL's Surface and Microanalysis Science Division (837) resulted in a long-term collaboration. The partnership led to the development of four Standard Reference Materials (SRMs) (1866a, 1867, 1868, 1876b) for use by asbestos-testing laboratories, and one Research Material (RM 8411). Since 1989, data compiled from proficiency tests (PT) on overall laboratory performance have been analyzed and used to evaluate the test method and technical requirements of the program. As the program matured, laboratory personnel were required to have more analytical skills to perform successfully in proficiency testing and to meet on-site requirements. Laboratories that have not met the accreditation requirements, including proficiency testing, have been dropped from the program, ensuring program credibility and more accurate test results for the general public.

Technical staff in Division 837 co-authored NVLAP Handbooks 150-3 and 150-13, the program handbooks for Bulk Asbestos Analysis (PLM) and Airborne Asbestos Analysis (TEM), respectively. Staff continue to provide technical support for proficiency testing activities as well as addressing extraordinary technical microscopy issues.

4.4.2 Calibration Laboratories Program

CSTL's Process Measurements Division (836) and Physical and Chemical Properties Division (838) provided technical criteria for inclusion in NIST Handbook 150-2 (draft), *Calibration Laboratories Technical Guide*, and other technical support and guidance, as needed. The field supported is Thermodynamics Metrology. Division 836 staff have also participated in on-site assessments of NVLAP calibration laboratories and proficiency testing activities, and provide extensive support to NVLAP in the design and implementation of proficiency testing schemes for the laboratories.

4.4.3 Chemical Calibrations Laboratories Program

The Chemical Calibrations Laboratories Program consists of two fields of accreditation: (a) NIST Traceable Reference Materials (NTRMs) for spectrophotometric filters, and (b) Providers of Proficiency Testing (PPT).

The *NIST Traceable Reference Materials (NTRMs) Program* provides NVLAP accreditation to those laboratories that demonstrate capabilities and competence as certifiers of spectrophotometric filter reference materials that meet certain technical specifications and requirements. Laboratories accredited under this program are permitted to distribute filter reference materials with the designation *NTRM*. This designation means that an accredited laboratory has designed, prepared, characterized, and certified an NTRM that meets all of the technical specifications and other requirements set forth in the NIST program. NVLAP assesses the laboratories and accredits those meeting the technical requirements, while the Analytical Chemistry Division (839) provides technical oversight and is the sole authority for determining which laboratories meet the technical requirements to be certifiers of NTRMs. The program illustrates how NVLAP can assist NIST laboratories in leveraging their resources to provide industry with the tools needed to be competitive in the global marketplace.

The *Providers of Proficiency Testing Program* was developed to support the privatization of the U.S. EPA Water Proficiency Evaluation Program. A partnership between CSTL's Analytical Chemistry Division (839), PL's Ionizing Radiation Division (846), and NVLAP, the program provides accreditation to laboratories demonstrating capabilities and competence to provide proficiency testing services to environmental analysis laboratories. Laboratories that provide proficiency testing services must undergo

a periodic, on-site, technical assessment of competence and demonstrate their proficiency in accurately characterizing the samples that they distribute and the methods they employ in conducting proficiency tests. Accredited laboratories are required to participate in proficiency testing programs conducted by the Analytical Chemistry Division on a fee-for-service basis. Currently, 11 accredited laboratories service approximately 8000 water analysis laboratories across the United States.

4.5 *Physics Laboratory (PL (840))*

4.5.1 Calibration Laboratories Program

Physics Laboratory Divisions, Electron and Optical Physics (841), Atomic Physics (842), Optical Technology (844), Ionizing Radiation (846), and Time and Frequency (847), provided technical criteria for inclusion in NIST Handbook 150-2 (draft), *Calibration Laboratories Technical Guide*, and have contributed additional technical support and guidance, as needed. Fields supported are Optical Physics, Ionizing Radiation, and Time and Frequency Metrology. Divisions 844, 846, and 847 have also participated in on-site assessments of laboratories and/or proficiency testing activities.

4.5.2 Chemical Calibrations Laboratories Program

See description of PL's partnership with CSTL and NVLAP in 4.4.3.

4.5.3 Energy Efficient Lighting Products Program

NVLAP's Energy Efficient Lighting (EEL) Products Program was established in anticipation of the passage of the Energy Policy Act of 1992 (Public Law 102-486) at the request of the Lighting Equipment Division of the National Electrical Manufacturers Association (NEMA). The Act requires that the Department of Energy (DOE) specify energy efficiency standards for certain types of fluorescent and incandescent reflector lamps. It also stipulates that DOE determine whether efficiency standards would be appropriate for other incandescent and general service fluorescent lamps. The test procedures for determining energy efficiency are to be prescribed by DOE, and are to be conducted by accredited laboratories using Illuminating Engineering Society-North America (IESNA) and American National Standards Institute (ANSI) test methods. The test methods for lamps and luminaires covered by the NVLAP program are consistent with the requirements of the Energy Policy Act of 1992. NVLAP program requirements also support Energy Star, the government/industry energy efficiency program, which requires the use of accredited laboratories.

Proficiency testing for lamps and luminaires is ongoing. The Optical Technology Division (844) participated in round 4 of proficiency testing for this laboratory accreditation program (LAP) in 1996, providing direct comparison between performance of participating laboratories and NIST, and has helped to reduce the spread in the data among laboratories. The proficiency testing program has highlighted the need for appropriate, traceable calibration in this group of laboratories. As a result of the collaboration, a meeting with government and industry was held to evaluate the results and provide guidance to the standards community. Staff in Division 844 continues to provide technical support for the lighting proficiency testing, while staff in BFRL's Building Environment Division (863) provide review and consultation for the lighting proficiency testing.

4.5.4 Ionizing Radiation Dosimetry Program

This program was developed by and for the Nuclear Regulatory Commission (NRC); it offers NVLAP accreditation to any laboratory that processes personnel dosimeters used to monitor individual

occupational exposure to ionizing radiation. The NRC specifies that all personnel dosimeters that require processing be processed and evaluated by a NVLAP-accredited laboratory. Processor accreditation is related to the type of monitoring service provided, including radiation type monitored and the type and model of dosimeter utilized for each radiation category. NVLAP currently accredits laboratories for several different types of whole body and extremity dosimeters, such as Thermoluminescence Dosimeter (TLD), Film Badge, Track Etch, and Electronic Personnel Dosimeters.

Since 1982, the Physics Laboratory's Ionizing Radiation Division (846) has collaborated on the design of proficiency testing and calibrations for the Ionizing Radiation Dosimetry Program. Division 846 staff audit the proficiency testing contractor, Battelle, Pacific Northwest National Laboratory, Richland, Washington, and provide technical support to NVLAP for the Ionizing Radiation Dosimetry Program. NVLAP has conducted an ANSI N13.11-compliant proficiency testing program continuously since 1984.

4.6 *Materials Science and Engineering Laboratory (MSEL (850))*

4.6.1 Calibration Laboratories Program

MSEL's Metallurgy Division (855) provided technical criteria for inclusion in NIST Handbook 150-2 (draft), *Calibration Laboratories Technical Guide,* and other technical support and guidance, as needed. The field supported is Mechanical Metrology. Division 855 has also participated in on-site assessments of laboratories and proficiency testing activities.

4.6.2 Fasteners and Metals Program

The Fastener Quality Act, Public Law 101-592, was enacted in 1990 to protect the public by requiring that certain fasteners sold in commerce conform to the specifications for which they are represented to be manufactured. The 1990 Act required the Secretary of Commerce, acting through the Director of NIST, to establish a laboratory accreditation program to accredit laboratories engaged in fastener testing. The Act also required NIST evaluation and approval of any other laboratory accreditation bodies seeking recognition under the law. The Act has been amended several times, most recently in 1999, to focus requirements and reduce the burden on fastener manufacturers. The Fastener Quality Act, as amended, still provides for accreditation, in limited circumstances, of testing laboratories engaged in fastener testing.

NVLAP currently offers accreditation in the areas of mechanical and physical testing and inspection, metallography, nondestructive inspection, dimensional inspection, and chemical analysis. NVLAP worked with current and former NIST experts to develop the technical requirements for the Fasteners and Metals Program. Staff in the Metallurgy Division (855) partnered with NVLAP in the development of the technical requirements for mechanical and metallographic testing for the program. Fastener testing laboratories that are currently accredited by NVLAP must participate in proficiency testing for test methods for Rockwell hardness, axial tensile strength of full-size threaded fasteners, wedge tensile strength of full-size threaded fasteners, and chemical analysis.

4.7 *Building and Fire Research Laboratory (BFRL (860))*

4.7.1 Construction Materials Testing

The Building and Fire Research Laboratory's (BFRL) Materials and Construction Research Division (861) has provided technical assistance to the NVLAP Construction Materials Testing Program since the 1980s through its Construction Materials Reference Laboratories program. This program consists of both

the Cement and Concrete Reference Laboratory (CCRL), which is sponsored by ASTM International, and the AASHTO Materials Reference Laboratory (AMRL), a research associate program sponsored by the American Association of State Highway and Transportation Officials (AASHTO).

NVLAP-accredited construction laboratories are required to participate in CCRL/AMRL proficiency testing, and their results are sent to NVLAP on a quarterly basis. Five staff members in Division 861 provide NVLAP with program technical support. In addition, NVLAP worked with CCRL to achieve its goal of implementing the requirements of ISO/IEC Guide 25 and, subsequently, ISO/IEC 17025. NVLAP also assisted AMRL staff with the recognition process for laboratory accreditation bodies; two AMRL staff members attended NVLAP assessor training.

4.7.2 Carpet and Carpet Cushion Program

NVLAP's Carpet and Carpet Cushion Program provides for laboratory accreditation to ensure that standard test procedures for performance properties, including physical, mechanical, and surface flammability characteristics, are followed in testing carpets and carpet cushions. The program includes test methods developed by ASTM International, the American Association of Textile Chemists and Colorists (AATCC), and Federal Specifications. Established in 1981, the program was developed in response to a request from the U.S. Department of Housing and Urban Development (HUD). Its purpose is to assist HUD in assessing the suitability of carpet and attached carpet cushion products for use in federal housing programs, including single, multifamily, elderly, and care-type dwellings. HUD Use of Materials Bulletin No. 44 (UM 44), *Building Products Standards and Certification Program for Carpet*, includes the minimum requirements and standard test methods to be used for determining the acceptability of carpet and attached carpet cushion products for HUD housing. One of the provisions of UM 44 is that a sample of the carpet or attached carpet cushion product, if intended for use in HUD housing, be tested in a NVLAP-accredited laboratory to determine that its properties comply with the minimum requirements of UM 44. In 1993, HUD issued UM 72, *Building Products Standards and Certification Program for Carpet Cushion*, which includes minimum requirements and test methods for separate (not attached) carpet cushion products.

The NVLAP Carpet and Carpet Cushion Program has maintained an extended partnership (1980 to the present) with BFRL's Fire Research Division (866). In 1986-87, NVLAP and BFRL were able to determine through the use of NVLAP proficiency testing data and confirm with NBS Standard Reference Material 1012 that ASTM Test Method E648 (*Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source*) was defective. BFRL received an industry-funded project grant to work with the Carpet and Rug Institute and ASTM Sub-Committee E05.22 to improve the method, which was subsequently issued as a parallel standard by ASTM and the National Fire Protection Association (NFPA). The results of the NIST work on the improvement of the E648 test method were reported in NISTIR 4799, August 1992. Division 866 and NVLAP staff continue to consult on proficiency testing for critical radiant flux and flammability.

4.7.3 Thermal Insulation Materials Program

BFRL's Building Environment Division (863) also provides technical support to NVLAP for the Thermal Insulation Materials program. This partnership with BFRL has existed since the 1970s. NVLAP recently provided BFRL with data from an early round of proficiency testing so that it could complete a long-term study for a smoke test.

The Thermal Insulation Materials Program was the first NVLAP laboratory accreditation program, established in 1979 at the request of three private sector thermal insulation trade associations. The

purpose of the program is to accredit laboratories that produce reliable thermal insulation test data. The program provides for laboratory accreditation to ensure that standard test procedures to measure corrosiveness, thermal resistance, strength, flammability, mass, density and dimensional stability, and water vapor retarder characteristics are followed. The program uses standard test methods from ASTM, the Code of Federal Regulations (CFR), TAPPI (Technical Association for the Pulp, Paper and Converting Industry), and the Canadian General Standards Board (CGSB). Test methods include ASTM C177 (Guarded Hot Plate), C236 (Guarded Hot Box), and C518 (Heat Flow Meter). Division 863 continues to provide support for proficiency testing.

4.7.4 Energy Efficient Lighting Program

The Building Environment Division (863) also provided review/consultation for the Energy Efficient Lighting Program's lighting proficiency test (see Physics Laboratory entry in 4.5.3).

4.8 *Information Technology Laboratory (ITL (890))*

The Information Technology Laboratory's (ITL) Computer Security Division (893) collaborates with NVLAP in two accreditation programs: the Common Criteria Testing Program and the Cryptographic Module Testing Program.

The Common Criteria Testing Program, known as the National Information Assurance Partnership (NIAP), was established in support of ITL's partnership with the National Security Agency (NSA). The establishment of NIAP fulfilled requirements of the Computer Security Act of 1987. Since 1997, the partnership has combined the extensive security experience of both NIST and NSA to promote the development of technically sound security requirements for Information Technology (IT) products and systems and appropriate metrics for evaluating those products and systems. The Cryptographic Module Testing Program was established in support of a joint effort between NIST and the Communications Security Establishment (CSE) of the Government of Canada.

4.8.1 Common Criteria Testing Program

NVLAP's Common Criteria Testing program accredits laboratories that perform IT security evaluations using the *Common Criteria* and *Common Methodology*, ensuring that such laboratories are capable and competent to meet the needs of the Common Criteria Scheme. IT security evaluations assess the conformance of a Protection Profile, Security Target, or IT product with a specific set of *Common Criteria* requirements. NVLAP accreditation is the primary requirement for achieving status as a Common Criteria Testing Laboratory (CCTL). Laboratories must go through a series of steps that involve both the NIAP Validation Body and NVLAP.

The *Common Criteria* (ISO/IEC 15408) is a set of functional and assurance IT security requirements that were developed to provide a common baseline against which IT products and systems could be evaluated. The *Common Methodology* describes a common approach for performing IT security evaluations using the *Common Criteria*. The *Common Criteria* and *Common Methodology* were developed and sponsored by the governments of the United States (represented by NIST and NSA), Canada, France, Germany, the Netherlands, and the United Kingdom.

NIAP initiated the development of the program to accredit laboratories that perform IT security evaluations under the Common Criteria Scheme. The Common Criteria Scheme is the NIAP program to manage the validation of IT security products using the *Common Criteria* and *Common Methodology*. IT

security products validated by this program will receive a Common Criteria Certificate and be listed on the NIAP Validated Products List.

Three staff members from the Computer Security Division (893) provide technical support to NVLAP in the operation of this program by serving as technical assessors and technical experts and as the liaison between NVLAP and NIAP.

4.8.2 Cryptographic Module Testing

NVLAP's Cryptographic Module Testing Program accredits laboratories for conformance testing of cryptographic modules conducted in accordance with FIPS PUB 140-2, *Security Requirements for Cryptographic Modules*, and conformance testing of associated cryptographic algorithms. (Cryptographic modules are the set of hardware, software, firmware, or a combination thereof, that implements cryptographic logic or processes, including cryptographic algorithms and key generation that is contained within the cryptographic boundary of the module.) The Program accredits laboratories that perform conformance testing for acceptance by the Cryptographic Module Validation Program (CMVP), a product certification program administered jointly by ITL and the Communications Security Establishment of the Government of Canada. Under this program, third-party cryptographic module testing (CMT) laboratories accredited by NVLAP conduct all of the tests. Vendors interested in validation testing of their cryptographic modules and algorithms must use NVLAP-accredited CMT laboratories.

ITL staff in the Computer Security Division (893) and the Software Diagnostics and Conformance Testing Division (897) provide technical support for the operation of this program and serve as NVLAP technical assessors and technical experts.

4.9 *Cooperation with Other NIST Divisions*

4.9.1 NIST Counsel

A cooperative effort between NVLAP and the Counsel for NIST (100) on topics such as Mutual Recognition Arrangements (MRAs) for APLAC and ILAC has provided benefits regarding other NIST MRAs, use of the NVLAP term and logo, Freedom of Information Act (FOIA) requests, fraud, and other legal issues.

4.9.2 Office of International and Academic Affairs

NVLAP staff cooperates with the Office of International and Academic Affairs (109) by meeting with foreign visitors and giving talks to various groups.

4.10 *NVLAP Partnerships with Other Government Agencies*

Seven of NVLAP's current testing and calibration programs directly respond to and support specific Federal agency programs. These programs assist the Environmental Protection Agency (EPA) (asbestos); the Department of the Navy and the Federal Communications Commission (electromagnetic compatibility (EMC) and telecommunications requirements); the Nuclear Regulatory Commission (dosimetry); Department of Housing and Urban Development (carpet and carpet cushion, and wood based products); and the Department of Energy (energy efficient lighting and motors, calibration). Appendix D contains detailed information on each of these programs. In addition, the Chemical Calibrations Program (Providers of Proficiency Testing) supports the privatization of the EPA's Performance Evaluation

Studies relating to administration of the Clean Water Act and the Safe Drinking Water Act. NVLAP's Information Technology and Security Testing Program supports the National Security Agency and the Common Criteria Mutual Recognition Agreement, which includes 14 governments as signatories, the United States among them.

5. Conclusions

NVLAP accredits testing and calibration laboratories that comply with the requirements of the International Organization for Standardization (ISO) and the International Electrotechnical Commission (IEC) 17025, *General Requirements for the Competence of Testing and Calibration Laboratories*. Most national laboratories of world economies provide accreditation through a government-sponsored body. NVLAP, because of its close working relationship with the NIST laboratories, is widely recognized and respected as a technically sound and rigorous accreditation program, and has met international accreditation requirements of the Asia Pacific Laboratory Accreditation Cooperation (APLAC), and the European co-operation for Accreditation (EA) through the International Laboratory Accreditation Cooperation (ILAC).

Most of NVLAP's programs are developed in response to legislative mandates or other agency requests related to critical health, safety and environmental issues, as well as to support international trade activities. The combination of testing and calibration laboratory accreditations by NVLAP provides an infrastructure of competent measurement laboratories supporting domestic and international trade and conformity assessment activities.

NIST laboratory personnel benefit from involvement in accreditation activities by having access to the commercial laboratories that use the measurement standards and SRMs that they develop. This first-hand experience provides them with valuable feedback that can be utilized to better serve NIST's customers, including recognition of industry needs that can trigger useful research. NIST technical units may also use NVLAP accreditation to leverage their limited resources. One example of this is the development of the accreditation program for Certifiers of Spectrophotometric NTRMs. The NIST Analytical Chemistry Division (ACD) provides technical oversight for the accreditation of laboratories to be Certifiers of NTRMs. By recognizing NVLAP-accredited laboratories to certify the NTRMs, ACD frees up time to pursue other activities while still ensuring the accuracy of measurements.

NVLAP has made its resources available to NIST groups that seek to implement quality systems in their laboratories. NVLAP staff experience with laboratory quality systems, particularly ISO/IEC 17025, is a valuable reservoir of knowledge that can be tapped by NIST laboratories. A NVLAP staff member participated in the development of the NIST Traceability Policy and is serving on the NIST Task Group investigating NIST-wide approaches for implementing as many of the requirements in ISO/IEC 17025 as practicable.

Many NVLAP programs have stabilized, but there is continuing and anticipated growth with respect to homeland security, computer security, electromagnetic compatibility and telecommunications, voting machines, and calibration activities. These portend increased reliance on NIST laboratory expertise and partnership.

Appendix A. *National Voluntary Laboratory Accreditation Program*

A1. Background of NVLAP

NVLAP was established as a result of a 1970 conference held by the National Bureau of Standards (NBS), now NIST, to consider a proposal for a voluntary national testing laboratory accreditation program that would issue accreditations to provide national recognition to those laboratories found to be competent to make certain tests. NVLAP was officially established by the U.S. Department of Commerce by the publication of program procedures in the *Federal Register* on February 25, 1976, for inclusion under Title 15, Part 7, of the U. S. Code of Federal Regulations.

NVLAP accreditation signifies that a laboratory has demonstrated that it operates in accordance with NVLAP's management and technical requirements for accreditation. These include requirements in the areas of quality systems, personnel, accommodation and environmental conditions, test and calibration methods and method validation, equipment, measurement traceability, sampling, handling of test and calibration items, assuring the quality of test and calibration results, and reporting results. NVLAP accredits laboratories that serve the testing needs of product certification programs, but does not accredit certification programs since they generally include activities outside NVLAP's scope, e.g., marketplace surveillance and product recalls. Through coordination and consultation, NVLAP also seeks to maximize benefits achievable from other laboratory accreditation activities, avoiding duplication of programs conducted by the public and private sectors. NVLAP accreditation does not imply any guarantee (certification) of laboratory performance or of the validity of test/calibration data; it is solely a finding of laboratory competence.

NIST Handbook 150, *NVLAP Procedures and General Requirements*, July 2001, sets forth the basic procedures under which NVLAP operates and the general accreditation requirements for testing and calibration laboratories. NVLAP operates an accreditation system that is compliant with ISO/IEC Guide 58, *Calibration and testing laboratory accreditation systems: General requirements for operation and recognition,* 1993. ISO/IEC Guide 58 requires that the competence of applicant laboratories be assessed by the accreditation body against all of the requirements of ISO/IEC Guide 25, *General Requirements for the Competence of Calibration and Testing Laboratories.* In 1999, ISO/IEC Guide 25 was replaced by ISO/IEC 17025, *General Requirements for the Competence of Testing and Calibration Laboratories*, which NVLAP now uses as the basis for its accreditation of testing and calibration laboratories.

International standards-based accreditation programs, such as NVLAP, rely on a uniform approach to determining laboratory competence, promote mutual recognition among accrediting bodies, and support increased acceptance of exported goods in overseas markets. NVLAP is recognized internationally as a high quality accreditation body whose accreditations can be used to reduce trade barriers and facilitate trade. NVLAP has entered into mutual recognition arrangements (MRAs) with other laboratory accreditation bodies through the Asia Pacific Laboratory Accreditation Cooperation (APLAC), the International Laboratory Accreditation Cooperation (ILAC), and the National Cooperation for Laboratory Accreditation (NACLA). These arrangements provide NVLAP customers with readier acceptance of their calibration and test data, both domestically and in those foreign economies where laboratory accreditors are also signatories.

Laboratory accreditation is further supported through the MRA among national metrology institutes (NMIs) under the Comité International des Poids et Mesures (CIPM), in which NIST is an active participant. As stated in the CIPM MRA: *This arrangement provides for the mutual recognition of national measurement standards and of calibration and measurement certificates issued by national*

metrology institutes, and is founded on the efforts of each national metrology institute to base its measurements and measurement uncertainties on SI units.

Laboratory accreditation MRAs and the CIPM MRA are complementary functions that are intended to contribute to reducing barriers to trade. The CIPM arrangement ensures that signatory NMIs disseminate measurement results that are traceable to the SI (International System of Units) while laboratory accreditation assures that accredited laboratories are capable and competent to provide measurement results traceable to standards maintained by those NMIs. Hence, the concept, *One test, one calibration, sell anywhere,* can be realized.

A2. Development of the NVLAP Testing and Calibration Programs

Since 1929, NBS/NIST has participated with Federal and State agencies and private interests in developing evaluation criteria for testing laboratories and in providing on-site examinations, proficiency test samples, calibrated standards, and reference materials. In 1969, the American Society for Testing and Materials (now known as ASTM International) requested that NIST participate with ASTM and other interests in establishing a testing laboratory examination service to cover a broad range of product areas when and as needed. Also that year, the National Conference of States on Building Codes and Standards (NCSBCS) asked NBS to develop evaluation criteria and examination methodology for determining the capability of agencies that test and certify mobile homes. The ASTM proposal for a Technical Inspection Service led to an NBS study and development of a program for publicly recognizing qualified testing laboratories. As noted above, the *NVLAP Procedures and General Requirements* were subsequently published in the Code of Federal Regulations in 1976.

In June 1991, the National Conference of Standards Laboratories (NCSL), now known as NCSL International, filed a request that NIST, under the NVLAP procedures, develop and administer a laboratory accreditation program for calibration laboratories. As a result of that request and subsequent public notice process, on May 18, 1992, the Director of NIST published in the *Federal Register* a notice of intent to develop the Calibration Laboratories Accreditation Program under the procedures of NVLAP.

On May 18, 1993, a public workshop was held at NIST Boulder to provide interested parties an opportunity to participate in the development of a NVLAP Program Handbook for Calibration Laboratories. This workshop was attended by more than sixty industry and government representatives. As a result of the workshop, and responses to a survey/checklist mailing, a draft handbook was finalized. A decision was made to include the handbook in NIST Handbook 150: *Procedures and General Requirements* (using ISO/IEC Guide 25 as a basis). NIST Handbook 150 was published in March 1994.

Concurrently, another public workshop was held to review a Calibration Laboratories Technical Guide, which was under development. The Guide, covering eight fields of calibration, was intended to be a companion document to NIST Handbook 150. Public comments to the Guide were reviewed and revisions made, resulting in a NIST Handbook 150-2 (draft): *Calibration Laboratories Technical Guide*, containing detailed technical information for each of the eight fields. This Guide is not considered a requirements document, but rather a book of good laboratory practices and is a living document, to be updated and revised as needed. Plans are to break it up into eight handbooks, two of which have been published.

On May 11, 1994, as a result of the efforts of NVLAP and many other NIST participants, a *Federal Register* notice announced the commencement of the Calibration Laboratories Accreditation Program in accordance with the intent of the original request.

Appendix B. *Calibration Parameters (FIELD/Parameter)*

DIMENSIONAL
D01 - Angular
D02 - API Ring Gages
D03 - Gage Blocks
D04 - Laser Frequency/Wavelength
D05 - Length & Diameter; Step Gages
D06 - Line Standards
D07 - Measuring Wires
D08 - Optical Reference Planes
D09 - Roundness
D10 - Sieves
D11 - Spherical Diameter; Plug/Ring Gages
D12 - Surface Texture
D13 - Surveying Rods & Tapes
D14 - Threaded Plug & Ring Gages
D15 - Two Dimensional Gages
D16 - Coordinate Measuring Machines
D17 - Film Thickness Standards
D18 - Gears

DC/LOW FREQUENCY
E01 - Voltage/Current Converter (to 1 MHz)
E02 - AC Resistors
E03 - Capacitance Dividers
E04 - Current Transformers
E05 - DC Resistance
E06 - DC Voltage
E07 - High Voltage Resistors
E08 - Inductive Dividers
E09 - LF AC Voltage
E10 - LF Capacitance
E11 - LF Inductance
E12 - LF Power/Energy
E13 - Magnetics
E14 - Mixed Dividers
E15 - Phase Meters
E16 - Power-Frequency Capacitors
E17 - Pulse Waveform
E18 - Resistance Dividers
E19 - Voltage Transformers

RF/MICROWAVE
R01 - Coaxial Air Line Standards
R02 - Coaxial/Waveguide Terminations
R03 - Dielectric Materials
R04 - Electromagnetic Field Strength
R05 - HF Capacitance
R06 - HF Inductance
R07 - High Frequency Resistors
R08 - Microwave Antenna Parameters
R09 - Noise Temperature
R10 - Q-Standards
R11 - RF-DC Voltage/Current Converter
R12 - RF/Microwave Bolometer Units
R13 - RF/Microwave Attenuators
R14 - RF/Microwave Phase Shifters
R15 - VHF Omnidirectional Range
R16 - Group Delay
R17 - RF/Microwave Power Meters

IONIZING RADIATION
I01 - Dosimetry of X Rays, Gamma Rays & Electrons
I02 - High-Dose Dosimetry
I03 - Neutron Sources and Dosimeters
I04 - Radioactive Sources

MECHANICAL
M01 - Acoustic
M02 - Acoustic Emission Transducers
M03 - Airspeed
M04 - Cryogenic Flow
M05 - Flow Rate
M06 - Force
M07 - Hydrometers
M08 - Mass
M09 - Ultrasonic Reference Block
M10 - Ultrasonic Transducer
M11 - Vibration
M12 - Volume and Density
M13 - Hardness

OPTICAL RADIATION
O01 - Laser Power Energy
O02 - Photometric
O03 - Radiometric
O04 - Spectrophotometric
O05 - UV Radiometric - Standard Detectors
O06 - UV Radiometric - Standard Sources

THERMODYNAMIC
T01 - Heat Flux Gages
T02 - Humidity
T03 - Laboratory Thermometers
T04 - Leak Artifacts
T05 - Pressure
T06 - Radiation Thermometry
T07 - Resistance Thermometry
T08 - Thermocouples & Pyrometer Indicators
T09 - Vacuum & Low Pressure Gages
T10 - Vacuum & Low Pressure Transducers

TIME & FREQUENCY
F01 - Frequency Dissemination
F02 - Time Dissemination
F03 - Oscillator Characterization

Appendix C. *Calibration Parameters (FIELD/Parameter) #accredited/# applicants*

DIMENSIONAL	**21/8**
D01 - Angular	3
D02 - API Ring Gages	
D03 - Gage Blocks	11/2
D04 - Laser Frequency/Wavelength	1
D05 - Length & Diameter; Step Gages	9/3
D06 - Line Standards	1
D07 - Measuring Wires	3
D08 - Optical Reference Planes	1
D09 - Roundness	2/1
D10 - Sieves	
D11 - Spherical Dia.; Plug/Ring Gages	5/2
D12 - Surface Texture	4/1
D13 - Surveying Rods & Tapes	5/4
D14 - Threaded Plug & Ring Gages	5
D15 - Two Dimensional Gages	3
D16 - Coordinate Measuring Machines	1
D17 - Film Thickness Standards	1
D18 - Gears	1
DC/LOW FREQUENCY	**13/4**
E01 - Voltage/Current Conv. (to 1 MHz)	2/1
E02 - AC Resistors	4/2
E03 - Capacitance Dividers	1/1
E04 - Current Transformers	0/2
E05 - DC Resistance	11/3
E06 - DC Voltage	11/4
E07 - High Voltage Resistors	0/1
E08 - Inductive Dividers	1/1
E09 - LF AC Voltage	4/3
E10 - LF Capacitance	4/2
E11 - LF Inductance	1/1
E12 - LF Power/Energy	1/1
E13 - MagneticsE14 - Mixed Dividers	
E15 - Phase Meters	3/2
E16 - Power-Frequency Capacitors	0/1
E17 - Pulse Waveform	1/1
E18 - Resistance Dividers	1/1
E19 - Voltage Transformers	0/2
RF/MICROWAVE	**5/1**
R01 - Coaxial Air Line Standards	1
R02 - Coaxial/Waveguide Terminations	1
R03 - Dielectric Materials	
R04 - Electromagnetic Field Strength	
R05 - HF Capacitance	1
R06 - HF Inductance	1
R07 - High Frequency Resistors	
R08 - Microwave Antenna Parameters	2/1
R09 - Noise Temperature	
R10 - Q-Standards	1
R11 - RF-DC Voltage/Current Converter	1
R12 - RF/Microwave Bolometer Units	2
R13 - RF/Microwave Attenuators	3
R14 - RF/Microwave Phase Shifters	
R15 - VHF Omnidirectional Range	
R16 - Group Delay	1
R17 - RF/Microwave Power Meters	3

IONIZING RADIATION	**7/1**
I01 - Dosimetry of X Rays, Gamma Rays & Electrons	4/1
I02 - High-Dose Dosimetry	2
I03 - Neutron Sources and Dosimeters	
I04 - Radioactive Sources	1
MECHANICAL	**29/17**
M01 - Acoustic	
M02 - Acoustic Emission Transducers	
M03 - Airspeed	
M04 - Cryogenic Flow	
M05 - Flow Rate	2/2
M06 - Force	13/4
M07 - Hydrometers	
M08 – Mass	20/10
M09 - Ultrasonic Reference Block	
M10 - Ultrasonic Transducer	
M11 - Vibration	1
M12 - Volume and Density	9/8
M13 - Hardness	5/2
OPTICAL RADIATION	**3**
O01 - Laser Power Energy	
O02 - Photometric	3
O03 - Radiometric	
O04 - Spectrophotometric	
O05 - UV Radiometric - Standard Detectors	
O06 - UV Radiometric - Standard Sources	
THERMODYNAMIC	**15/9**
T01 - Heat Flux Gages	
T02 - Humidity	0/2
T03 - Laboratory Thermometers	4/6
T04 - Leak Artifacts	1/1
T05 - Pressure	5/4
T06 - Radiation Thermometry	
T07 - Resistance Thermometry	8/6
T08 - TCs & Pyrometer Indicators	6/3
T09 - Vacuum & Low Pressure Gages	0/3
T10 - Vacuum & Low Pressure Trans.	1/1
TIME & FREQUENCY	**14/4**
F01 - Frequency Dissemination	12/3
F02 - Time Dissemination	4/3
F03 – Oscillator Characterization	4/1

Appendix D. *NVLAP Partnerships with Other Government Agencies and the Private Sector*

The following information regarding NVLAP programs supported by other agency partnerships is presented to complete the listing of available NVLAP accreditations and to provide NIST laboratories with information that may assist them in developing new partnerships with NVLAP.

D.1 Department of Energy

NVLAP programs support implementation of the Energy Policy Act of 1992, as well as the Energy Star Program, operated jointly by the Department of Energy (DOE) and the Environmental Protection Agency (EPA). Like NVLAP's Energy Efficient Lighting Products Program, NVLAP's Efficiency of Electric Motors (EEM) Program was developed at the request of the National Electrical Manufacturer's Association (NEMA). NEMA requested the establishment of this program to assist the electric motor industry to comply with Public Law 102-486, the Energy Policy Act of 1992 (EPAct) provisions for electric motors. NVLAP coordinated the development of the EEM program with NEMA and DOE.

EPAct required that DOE specify energy efficient standards for certain types of electric motors rated from 1 to 200 horsepower. The law stipulates that the testing of motor efficiency be conducted according to the procedures in Method B of IEEE Standard 112, as in effect on the date of the enactment of EPAct. DOE set forth these requirements in their motor efficiency rule, which was codified under Title 10, Code of Federal Regulations, Part 431. There are currently 16 accredited laboratories participating in the NVLAP EEM program.

The purpose of the EEM program is to accredit testing laboratories to ensure that standard test procedures for efficiency are followed in testing electric motors. Specifically, the EEM program addresses testing the efficiency of electric motors according to the scope and procedures given in Method B of the Institute of Electrical and Electronics Engineers (IEEE) Standard 112, *Test Procedure for Polyphase Induction Motors and Generators,* and Method 1 of the Canadian Standards Association (CSA) Standard C390 *Energy Efficient Test Methods of Three-Phase Induction Motors*. Standard 112 indicates that polyphase motors larger than 250 horsepower may be tested by Method B. Consequently, laboratories that test motors greater than 250 horsepower can also request accreditation in this program. The two standards, IEEE 112 and CSA C390, are considered equivalent because the subtest procedures producing the data on which efficiency is calculated are, for all intents and purposes, the same. However, because of DOE requirements, some of the EEM program requirements, particularly those associated with the accuracy of instrumentation, are somewhat more stringent than those given in IEEE 112 (CSA C390).

As noted earlier, NVLAP's Energy Efficient Lighting Products Program (EEL) was also developed in response to EPAct. The Act directed DOE to prescribe test procedures that must be carried out by accredited test laboratories conducting energy efficiency tests on fluorescent and incandescent lamps. DOE defines an accredited laboratory as one that meets the standards and requirements of NVLAP.

In addition, the Energy Star Program, a voluntary program sponsored by DOE and EPA, requires that each compact fluorescent lamp (CFL) model be tested by a NVLAP-accredited laboratory to determine that the lamp meets the Energy Star energy efficiency criteria. After successful testing, a CFL manufacturer may submit the necessary documentation for verification that the product meets the Energy Star specification. There are currently 15 accredited laboratories participating in the NVLAP EEL program.

DOE's Nuclear Weapons Program accepts calibration and test results from laboratories accredited by recognized accreditation bodies, including NVLAP. Laboratories that meet the accreditation requirements provide evidence to DOE that they are capable of providing the necessary services as well as traceability to national standards. This policy has eliminated the need for users of those laboratories to audit their suppliers, which has greatly reduced the audit activity within the DOE community.

D.2 Federal Communications Commission

The Federal Communications Commission (FCC) recognizes laboratories accredited under NVLAP's Electromagnetic Compatibility and Telecommunications Program (ECT) for FCC Part 15 - digital devices and FCC Part 68 – analog and digital, terminal equipment test methods. The ECT Program was originally established in response to a request from private sector testing laboratories. Accreditation is now required by the FCC. The test methods covered by the ECT Program are divided into categories of: emissions, immunity, radio, safety, MIL-STD-462, and telecommunications testing. There are currently 187 laboratories accredited in the NVLAP ECT program.

NVLAP accreditation to the FCC Part 15 test methods meets the FCC requirements under their Declaration of Conformity (DoC) rules for testing laboratories. This ruling allows manufacturers who have their products tested by NVLAP-accredited laboratories to claim FCC compliance for their products without having to apply for FCC approval. The FCC Part 68 test method has merged with the Canadian CS-03 test method, which allows NVLAP to provide accreditation that satisfies both U.S. and Canadian requirements.

NVLAP worked with the American Council of Independent Laboratories (ACIL), the American Association for Laboratory Accreditation (A2LA), private sector testing laboratories, and the FCC to develop a more flexible electromagnetic compatibility (EMC) accreditation checklist used to accommodate an expanding scope of accreditation. This allows NVLAP to respond more quickly to customers' needs to add test methods to their scopes of accreditation, particularly to meet foreign government requirements. The use of the checklist by both NVLAP and A2LA also helps ensure uniformity within the accreditation community in the United States.

D.3 Department of Housing and Urban Development

NVLAP's Wood Based Products Program was developed in response to a request made in 1992 by the American Plywood Association, and subsequently supported by the National Particleboard Association and the U.S. Department of Housing and Urban Development. The letters requesting the development of the program indicated the importance of international acceptance and reciprocity in laboratory accreditation to promote international trade. The program provides for laboratory accreditation to assure that standard test procedures for chemical, physical, mechanical, fire performance, formaldehyde, and treated-wood characteristics are followed when testing wood based products. The standard test methods used for the program are from the American Institute of Timber Construction, American National Standards Institute, American Plywood Association, ASTM International, American Wood Preservers' Association, Canadian Standards Association, European Committee for Standardization, Hardwood Plywood and Veneer Association, NIST, and the National Particleboard Association. There are currently four accredited laboratories in the NVLAP Wood Based Products program.

D.4 Department of the Navy

NVLAP also worked with the Department of the Navy and its contractors to develop a program for MIL-STD-462 electromagnetic compatibility (EMC) accreditation. NVLAP has continued to partner with the Navy to expand this accreditation to include MIL-STD-461E. The Navy, in contracts with their testing laboratories, requires NVLAP accreditation.

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