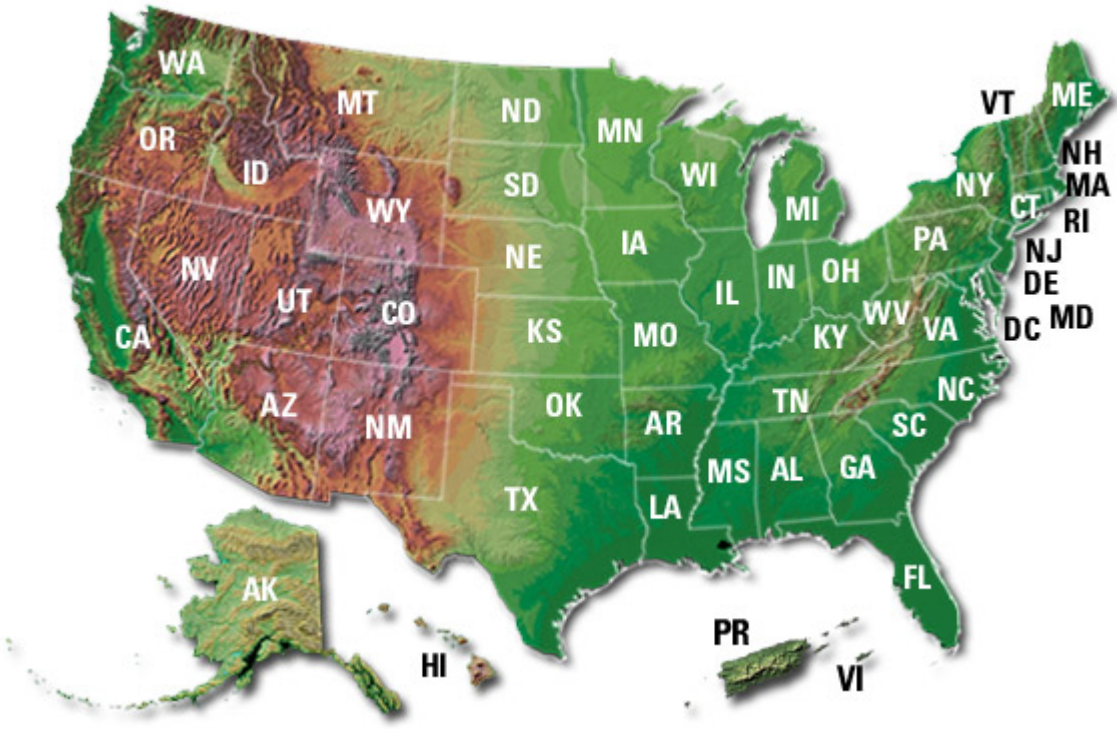
2012

State Laboratory Program Workload Survey



Published by the NCSL International Legal Metrology Committee

Contents

Objectives and History 7
Presentation and Analysis of Data 8
Participants 23
Mass 38
- Mass Echelon I 40
- Mass Echelon II 42
- Mass Echelon III 44
- Weight Carts 46

Length 48
- Steel Tape Measures 50
- Rigid Rules 52

Volume 54
- Glassware 56
- Test Measures (≤5 gallon) 60
- Provers (> 5 gallon and ≤ 100 gallon) 64
- Provers (> 100 gallon) 68
- Liquefied Petroleum Gas (LPG) Prover 72
- Dynamic Small Volume Prover (SVP) 74

Frequency 78
Timing Devices 80
Wheel Load Weighers 82
Lottery Balls 84
Summary Other Tests 86
Laboratory Fees (2012) 87
- Mass Echelon I 88
- Mass Echelon II 89
- Mass Echelon III 90
- 5,000 lb Weight Cart 91
- Scale Truck Calibration Class F 92
- Length 100 ft Steel Tape 93
- 5 gallon test measures – Volume Transfer 94
- 5 gallon test measure - Gravimetric 95
- 100 gallon field standard prover – Volume Transfer 96
- 100 gallon field standard prover- Gravimetric 97
- 100 gallon field standard prover LPG – Volume Transfer 98
- 20 gallon Dynamic Small Volume Prover (SVP) - Volume Transfer 99
- 20 gallon Dynamic Small Volume Prover (SVP) – Volume Gravimetric 99

Metrology Positions/Title and Salaries 100

2012 State Laboratory Program Metrologists....103
State Laboratory Program/Metrology Experience....107
Acknowledgment of Calibration Certificates Matrix....110
2012....112
Workload Survey Instructions....112
Instructions....113
Frequently Asked Questions & General Guidance....113
Laboratory Data – Sections 1-6:....113
Staff Data - Section 7:....114
Workload Sections 8-29:....114
ASSISTANCE/QUESTIONS??....115
2012....116
Workload....116
Survey....116
Form....116

Tables

Table 1: Historical survey titles and the year represented by each. 7
Table 2: Laboratory Scoring Model Trends....16
Table 3: Program Area References. 22
Table 4: Laboratory Facilities....35
Table 5: Laboratory Participation....37
Table 6: Summary of echelon I tests reported on previous surveys....40
Table 7: Echelon II tests reported on previous surveys. 42
Table 8: Echelon III tests reported on previous surveys. 44
Table 9: Weight Cart tests reported on previous surveys. 46
Table 10: Tape measure tests reported on previous surveys. 50
Table 11: Rigid rule tests reported in previous surveys. 52
Table 12: Glassware calibrations from previous surveys. 56
Table 13: Test Measure (≤ 5 gallon) volume tests from previous surveys. 60
Table 14: Provers (> 5 gallon and ≤ 100 gallon) volume tests from previous surveys. 64
Table 15: Provers (> 100 gallon) tests from previous surveys. 68
Table 16: LPG Prover volume tests from previous surveys. 72
Table 17: SVP tests from previous surveys. 74
Table 18: Temperature standard tests from previous surveys. 76
Table 19 Frequency standard tests from previous surveys. 78
Table 20: Timing devices tests from previous surveys 80
Table 21: Wheel load weigher tests from previous surveys 82
Table 22: Lottery balls tests from previous surveys 84
Table 23: Other tests reported by the participating laboratories 86
Table 24: Average fee charged for Echelon I mass testing from 2004 through 2012. 88
Table 25: Average fee charged for Echelon II mass testing from 2000 through 2012 89
Table 26: Average fee charged for Echelon III mass testing from 2000 through 2012. 90
Table 27: Average fee charged for a 5,000 lb weight cart testing from 2004 through 2012. 91
Table 28: Average fee charged for typical scale truck testing from 2004 through 2012. 92
Table 29: Average fee charged for typical 19 point testing of a 100 ft steel tape from 2000 through 2012. 93
Table 30: Average fee charged for testing of a 5 gallon field test measure via volume transfer from 2000 through 2012. 94
Table 31: Average fee charged for testing of a 5 gallon field test measure via gravimetric method from 2000 through 2012. 95
Table 32: Average fee charged for testing of a 100 gallon field standard prover via volume transfer from 2000 through 2012. 96
Table 33: Average fee charged for testing of a 100 gallon field test standard prover via gravimetric method from 2006 through 2012. 97
Table 34: Average fees charged for the testing of a 100 gallon LPG prover via volume transfer from 2006 through 2012. 98
Table 35: Fees charged for testing a SVP via volume transfer. 99
Table 36: Average fee charged for testing a SVP via volume transfer from 2006 through 2012. 99
Table 37: Fees charged for testing a SVP gravimetrically. 99
Table 38: Average fee charged for testing a SVP gravimetrically from 2006 through 2012 99
Table 39: Metrologist position titles and salary range. 102
Table 40: listing of SLP metrologists as of 2012 105
Table 41: Comparison matrix summarizing metrology experience reported by metrologists from 2000 to 2012. ..107
Table 42: Calibration Certificate acceptance matrix. 111

Figures

Figure 1: Number of NIST calibrations per year 10
Figure 2: Laboratory Metrology Program Areas. 12
Figure 3. Laboratory Recognition by OWM (NIST Handbook 143, 2014 Sept.) 14
Figure 4. Laboratory Scoring Model (2014 Sept). 15
Figure 5. Laboratory Scoring Model Trends. 16
Figure 6. NVLAP Accreditation of State W&M Laboratories (2014 Sept.) 17
Figure 7. Regional Measurement Assurance Program (RMAP) Groups. 18
Figure 8. Metrology Training Redesign (2009 to 2015). *Advanced Mass to be offered in June 2015. 19
Figure 9. Proficiency Testing Success Rates (2006 to 2013). 20
Figure 10: Mass Echelon I tests. 41
Figure 11: Mass Echelon II tests. 43
Figure 12: Mass Echelon III tests. 45
Figure 13: Weight Cart tests. 47
Figure 14: Tape Measure tests. 51
Figure 15: Rigid rule tests 53
Figure 16: Glassware calibrations, volume transfer method 57
Figure 17: Glassware calibrations, gravimetric method. 58
Figure 18: Test Measure tests (≤ 5 gallon), volume transfer. 61
Figure 19: Test Measure tests (≤ 5 gallon), gravimetric. 62
Figure 20: Prover (> 5 gallon and ≤ 100 gallon) tests, volume transfer. 65
Figure 21: Prover (> 5 gallon and ≤ 100 gallon) tests, gravimetric 66
Figure 22: Prover (> 100 gallon) tests, volume transfer 69
Figure 23: Prover (> 100 gallon) tests, gravimetric 70
Figure 24: LPG Prover tests, volume transfer 73
Figure 25: SVP gravimetric 75
Figure 26: Temperature standard tests. 77
Figure 27: Frequency standard tests 79
Figure 28: Timing device tests 81
Figure 29: Wheel load weigher tests 83
Figure 30: Lottery Ball tests 85
Figure 31: Fees charged for calibration of a precision weight kit containing 21 individual weights ranging from 100 g to 1 mg to ASTM Class 0 tolerances using Echelon I testing techniques. 88
Figure 32: Fees charge for calibrating a precision weight kit containing 21 individual weights ranging from 100 g to 1 mg to ASTM Class 2 tolerances using Echelon II testing techniques. 89
Figure 33: Fees charged for testing a 31 lb weight kit containing 22 pieces to NIST HB 105-1 Class F tolerances (10) using mass Echelon III procedures. 90
Figure 34: Fees charged for testing a 5,000 lb weight cart according to NIST HB 105-8 (9) tolerances using mass Echelon III procedures 91
Figure 35: Fees charged for testing a typical scale truck according mass Echelon III procedures. 92
Figure 36: Fees charged for testing a steel 100 ft tape 93
Figure 37: Fees charged for testing a 5 gallon field standard steel prover via volume transfer technique. 94
Figure 38: Fees charged for gravimetrically testing a 5 gallon field test measure 95
Figure 39: Fees charged for testing a 100 gallon field standard prover via volume transfer technique 96
Figure 40: Fees charged for gravimetrically testing a 100 gallon field standard steel prover. 97
Figure 41: Fees charged for testing a 100 gallon LPG prover. 98
Figure 42: Retirement Eligibility Histogram, 100 metrologists reporting. Metrologists were asked to provide the year which they are eligible for “full” retirement. This may not reflect when any one person actually plans to leave the SLP. 106
Figure 43: 121 Metrologists reporting. Metrologists were asked to indicate which type of calibrations they are authorized to perform on behalf of their laboratories. 106
Figure 44: SLP metrologists ranked by years of experience. Red indicates experience in the SLP, green indicates other metrology experience. 108

Acknowledgements

This report was prepared with the help of the members of the NCSL International Committee 156 - Legal Metrology Committee. Special thanks must be given to the metrology professionals working in the State Laboratory Program who generously gave their time to complete the 2012 State Program Workload Survey thus providing the data essential to make this report possible. Thanks also go to the staff of the National Institute of Standards and Technology Office of Weights and Measures who have provided considerable support in collecting data and preparing and publishing this report.

It is our sincere hope that this biannual report continues to be a valuable resource to the State Laboratory Program laboratories and to those who utilize the service those laboratories provide.

Objectives and History

The Workload Survey Committee, after examining the data from past surveys, determined that there has been inconsistency in the titles as they relate to the year from which data was extracted. To allow proper comparison of the survey data to other available measurement data the comparisons in the charts and tables of the 2008 Survey report reflect the year from which data was extracted rather than the year in the survey title (1).

Survey Title	Year represented
1996 State Laboratory Program Workload Survey	1996
1999 State Laboratory Program Workload Survey	1998
2000 State Laboratory Program Workload Survey	1999
2001 State Laboratory Program Workload Survey	2000
2003 State Laboratory Program Workload Survey	2002
2005 State Laboratory Program Workload Survey	2004
2005 & 2006 State Laboratory Program Workload Survey	2005&2006
2008 State Laboratory Program Workload Survey	2008
2010 State Laboratory Program Workload Survey	2010
2012 State Laboratory Program Workload Survey	2012

Table 1: Historical survey titles and the year represented by each.

In 1996, the National Conference on Weights and Measures (2) (NCWM) Metrology Subcommittee surveyed the State Laboratory participants to quantify the workload of the State Laboratory Program (SLP) and document its impact on the United States economy. From the survey analysis, it was clear that the workload statistics were dynamic and only provided a snapshot of the workload at the time. Therefore, the Metrology Subcommittee circulated a revised survey April 16, 1999 to update program statistics and to investigate trends in the National workload. The subcommittee has since recommended that the survey be conducted on a regular basis and that the core survey be kept standardized in order for state labs to develop databases that could automatically generate the information for the survey.

Survey data will be used not only to quantify the impact of the SLP on the United States economy, but also to plan and maximize its effectiveness. Training and inter-laboratory comparisons will be designed to meet real needs of the workload. Ultimately, the survey information will increase the efficiency of the entire SLP and maximize the benefits to the National Economy. The results of previous surveys have been used extensively at NIST to gain support and attention for the State Laboratories and have been helpful in putting together budget proposals. The information from the survey is also useful in identifying the diversities of the workload on a national level.

Presentation and Analysis of Data

SLP laboratories submitted their data using a Microsoft Excel spreadsheet, or a Microsoft Word document, or an Acrobat PDF file. This was done to accommodate as many of the participants as possible. The 2012 survey is published in this report beginning on page 112.

The data was copied from each individual completed survey form into a master data spreadsheet for analysis. Those surveys completed using the excel form provided the most accurate means of data transcription. A file was designed to reformat the information so that it could be copied to the master file with minimal manual transcription. Both word and handwritten surveys required manual transcription of the data.

The NIST Office of Weights and Measures provides an initial report of workload data from the NIST Measurement Services Division from 2000 through 2012 covering a range measurements including mass, volume, temperature, pressure, etc. It describes the value of each measurement performed and the value of the SLP laboratories in assisting in providing metrologically traceable measurements in support of commerce. The SLP removes a burden from the NIST Measurement Services, as is evidenced by the sheer number of devices tested, and provides a relatively convenient source of traceable measurements for the local industry. This report also outlines training and laboratory accreditation goals and quantifies their progress towards meeting these goals. The NIST report begins with “Impact and Leveraging of NIST Calibrations” on page 10.

The participating SLP laboratories in the survey are identified by name location, age, size, and number of customers served in the opening section of this report. Current contact information for the individual SLP laboratories and their NIST OWM Certificate of Traceability can be found on the NIST Office of Weights and Measures website(3). Each laboratory’s participation in previous surveys is reported from 1996 through 2012.

The SLP workload is generally broken down into four categories; mass, length, volume, and other. Each particular procedure was further subdivided into three categories; laboratory, weights and measures enforcement, and external. The laboratory category includes work done internally by the metrology laboratory staff in order to maintain measurement standards, to maintain internal quality control systems, and for participation in inter-laboratory crosscheck programs. The weights and measures enforcement category includes work done in direct support of a government operated weights and measures enforcement program which includes the calibration of a field inspector’s measurement and test equipment. The external category covers essentially all other work done by the laboratory. The data is presented in the form of choropleth maps, color coded to illustrate the distribution of work across the entire SLP, and bar charts, ordered from high to low displaying the number of tests performed by each SLP laboratory. Summary pie graphs are included to analyze totals across the entire SLP. Summary data from previous workload surveys are included for each measurement category covered in this survey for comparison purposes. Mass testing data begins on page 38, Length on page 48, Volume on page 54, and all other tests from pages 75 through 86.

All of the SLP laboratories responding to the 2012 SLP workload survey report perform measurement services for hire in addition to the regulatory functions they support. Fee data for 2012 covering a range of routine measurement services is presented in a series of bar graphs along with historical averages. The results may be found in the section title “Laboratory Fees (2012)” beginning on page 87.

Each SLP laboratory provided salary ranges and position titles for each member of the laboratory staff. The SLP survey is attempting to document the need for effective succession planning within its ranks. Data is presented for each metrologist working in the SLP for the 2012 calendar year including years of experience and the year at which each person is eligible for full retirement. The results are presented in a series of charts and tables beginning with the section title "Metrology Position/Title and Salaries" beginning on page 100.

The remaining sections summarize the acceptance of calibration certificates by each of the SLP laboratories. Each state and local weights and measures jurisdiction operates under slightly different rules and regulations. This means each laboratory has different guidelines for accepting calibration certificates from other metrology laboratories both inside and out of the SLP. A table is provided on page 110 detailing each laboratory's calibration certificate acceptance policy.

> *Note: Caution should be used when comparing one state's data with data for another. It was determined in the 1996 survey that laboratory workload is influenced by industrial and population densities that vary by geographical location. Thus low numbers for a lab may simply reflect low local demand for a laboratory's service. Thus variance in the number of devices tested, staffing, and facilities between individual laboratories are normal and cannot legitimately be used to rate the quality of any laboratory program.*

No attempt was made to compare increases or decreases in the workload of individual laboratories due to the fact that laboratories may use different calibration intervals for different standards and their annual workload will fluctuate accordingly. For example, a state may have their volumetric glassware on a two-year calibration interval with the majority of these standards calibrated in one twelve month period with very few that are tested in the following twelve-month period. This does not indicate that the workload is decreasing in that state; it is just a reflection of the calibration interval assigned to those standards.

The individual SLP metrology laboratories charge fees for the measurement services they provide. Individual laboratory fees are presented in bar graphs ranked from highest to lowest. Average fees of the responding labs are provided for each measurement service covered in the survey. It can be difficult to compare fees between labs as they tend to bill an hourly rate for services. Each individual laboratory has a unique facility with its own particular measurement equipment meaning there is significant variation between the labs as to their ability to complete a particular job in a timely fashion.

Staffing is a concern with all metrology laboratories. Each metrologist working in the SLP is asked to provide his/her years of metrology experience, both inside the SLP and out, and the year he/she is eligible for retirement. This data is included in a table ordered by laboratory code. Retirement and experience are plotted on bar charts to provide an overview of potential future staff needs within the program. We asked each metrology laboratory to provide position names and salary ranges for their metrologists and have presented this information in table form sorted by laboratory code on page 100.

Impact and Leveraging of NIST Calibrations

(Information provided by NIST/OWM)

Calibration data for State laboratories was obtained from the NIST Measurement Services Division from 2000 to 2013. One of the measures of impact of NIST calibrations is to quantify the number and impact of downstream calibrations. How many additional calibrations are made by other laboratories using these calibrations? The answer to this question is a measure of the national impact of NIST calibration services and training. This leveraging of NIST calibrations to industry by the State weights and measures laboratories contributes greatly to the economy of the United States.

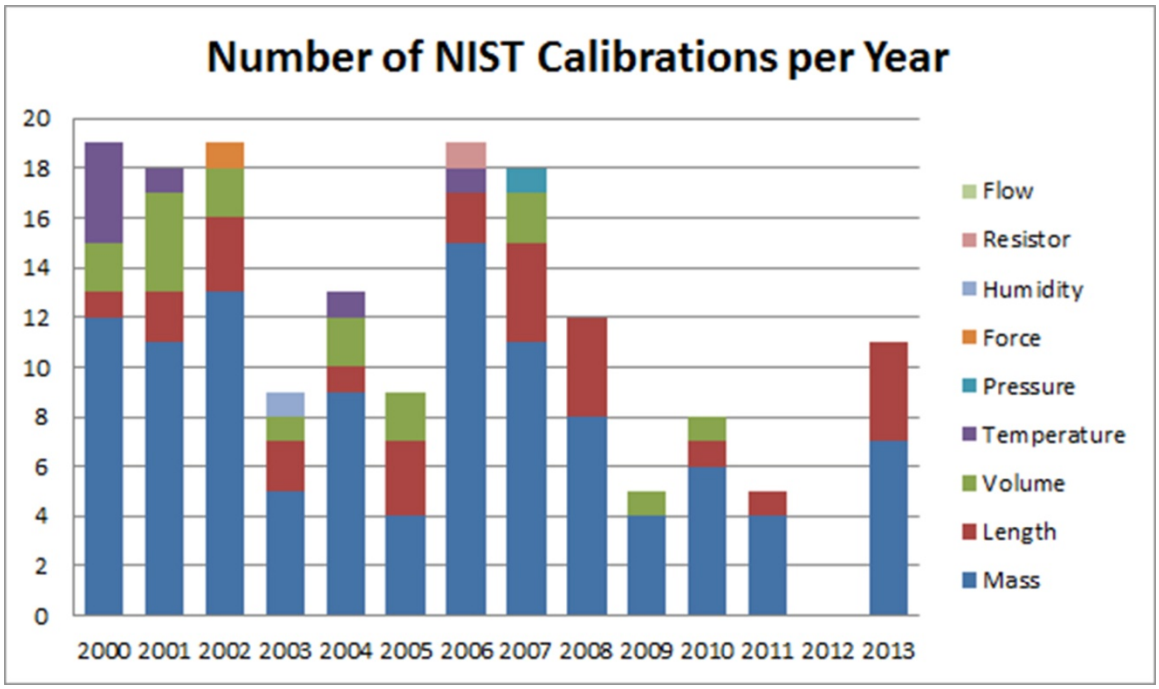


Figure 1: Number of NIST calibrations per year

Data in the current survey has been expanded to include measurements and calibrations performed at NIST in non-traditional measurement areas (e.g., those outside of mass, length, and volume) as were reported in past surveys.

State weights and measures laboratories account for a small portion of NIST's annual calibrations. The average leveraging impact is approximately 28,000:1. Given data obtained in the early SLP surveys, about half of the customer workload in the state laboratories is for industry and other government agencies (i.e., not weights and measures enforcement efforts). Many of these customers are the same customers who, in other countries, must obtain calibrations from the national laboratory.

Economic statistics indicate that weights and measures enforcement, supported by these leveraged State weights and measures laboratory calibrations, affects more than half of the U.S.

GDP. Since nearly half of the State weights and measures laboratory workload does not affect weights and measures enforcement, the economic impact of these calibrations influences virtually all of the U.S. GDP. Accurate measurements ensure product quality for practically every product manufactured, are required for other legal and regulatory functions (EPA, FDA, DOD, DOE, DOT), and are requisite for health, safety, environmental control, and international trade.

One question that might be asked in looking at this kind of leveraging data is "are enough calibrations being obtained from NIST by the States?" One responsibility of the NIST Office of Weights and Measures is to coordinate the State weights and measures laboratories. Each state laboratory that is recognized by OWM or accredited by NVLAP is required to have calibrations from acceptable sources, which are most often from NIST or other accredited laboratories. OWM Recognition or NVLAP Accreditation ensures that enough calibrations are obtained from NIST by the State weights and measures laboratories and that the State metrologists are trained adequately. Furthermore, metrologists must prove their proficiency and have specified calibration intervals for laboratory standards to ensure the ongoing ability to provide calibration results that are traceable to SI units or international and national standards. The number one corrective action following failed PTs/ILCs is that of obtaining updated calibrations for laboratory reference standards. It is estimated better than 96 % of the laboratory standards are calibrated in a timely manner according to established and documented calibration intervals.

A special assessment effort to catalog and document calibration standards and intervals was completed during the 2011 Recognition assessment cycle as a part of a "traceability evaluation" effort. Corrective actions were provided to many states at that time and one can see the up-tick in calibrations obtained in 2013 (there is often a lag in the approval process to manage calibration fees).

We can also look at comparisons by industry sector. For example, the CENAM in Mexico must calibrate all volumetric standards used by the petroleum industry. In the 2006 report, 8,800 volumetric standards were calibrated by the States to support petroleum meter calibration. Very small fractions of that number are calibrated annually by NIST. The same kind of leveraging comparison can be made for other measurement areas. It would require a very significant expansion of NIST facilities, equipment, and staffing just to handle the number of standards calibrated by the State weights and measures laboratories. Also, the economic impact of cost and downtime to ship standards from all over the United States to NIST for calibration would be crippling to U.S. industry. The recognition of this evolving reality was the primary driving force behind the legislation enabling the "new State standards program" in the 1950's. The State weights and measures laboratories established by that legislation have matured to the efficiently leveraged program documented in this and previous surveys. From this analysis, it is clear that the State weights and measures laboratories are an essential element of the U.S. National Measurement System.

Office of Weights and Measures (OWM) – Laboratory Metrology Program Overview
(This section was submitted by NIST OWM. Portions of this section were published as an article in the OWM W&M Newsletter.)

There are often questions about what each program in the NIST Office of Weights and Measures and does and what the program responsibilities are. One of NIST's primary responsibilities is to ensure that uniform standards are available to support the nation's measurement infrastructure. State laboratories provide the foundation for over 350,000 calibrations as a critical part of the U.S. measurement infrastructure. Approximately half of these calibrations support commercial weights and measures with the remaining supporting measurements needed by industry and other government agencies. NIST will be successful if measurement results from State laboratories are accurate, traceable, defensible in support of enforcement actions, and widely accepted (both nationally and internationally.)

Four Interrelated Program Areas

There are four key areas of responsibility in the OWM Laboratory Metrology Program: Laboratory Recognition, Proficiency Testing, Training, and Field Standards for Weights and Measures (Figure 2). Each functional area has a set of guiding documents as well as international documentary standards used for benchmarking to enhance program recognition and credibility.

All areas are interrelated with the other areas. For example, laboratories that are recognized often support the weights and measures program requirements to ensure that measurement results have demonstrated metrological traceability while the Handbook 105-series documentary standards are often required by the weights and measures program for enforcement applications. The Laboratory Recognition area is very narrow in scope and only supports weights and measures laboratories in the United States. To be recognized, the laboratory must successfully complete both training and proficiency testing requirements, in addition to all other published requirements that follow the ISO/IEC 17025 standard for calibration laboratories. Training on both proficiency testing and laboratory Recognition requirements is available. Then, proficiency testing is used not only to assess laboratory competency for Recognition and Accreditation, but assesses the level of impact and application of training concepts.

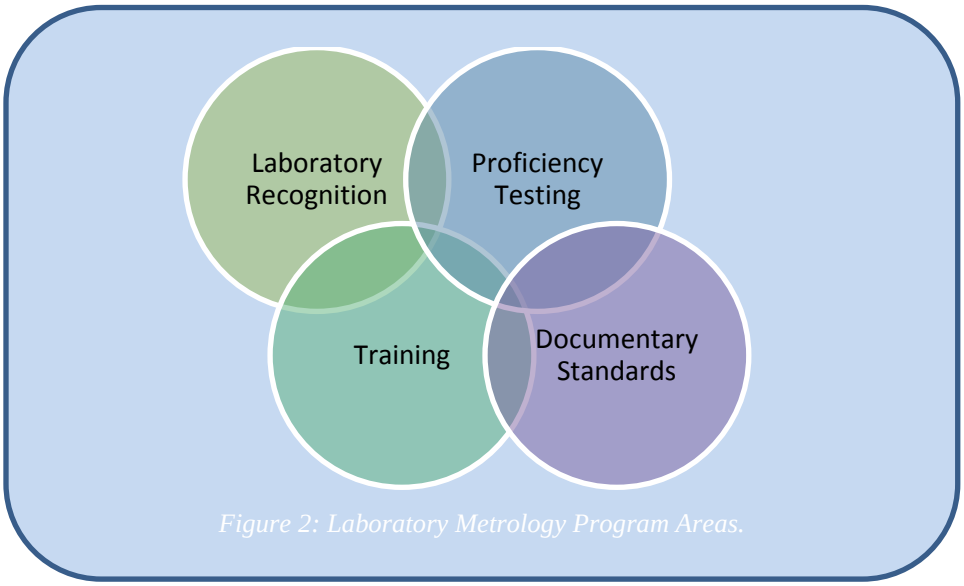


Figure 2: Laboratory Metrology Program Areas.

Program Measures:

Program measures for the four areas include the following items to assess ongoing program improvements (or declines and areas for needed focus). Graphic examples are included in each section to present the association measures.

1. Number of laboratories Recognized by the Office of Weights and Measures according to NIST Handbook 143, Program Handbook.
2. Laboratory Scoring Model measures changes in the national system over time with a key INDEX value according to elements of the Program Handbook.
3. Number of laboratories Accredited by NVLAP (third-party independent assessment of compliance to ISO/IEC 17025 criteria) to NIST Handbook 150, NVLAP Program Handbook.
4. Number of staff completing training requirements as noted in NIST Handbook 143, Program Handbook.
5. Percentage of acceptable/passing proficiency test results and increasing percentage of effective follow up action (improvement, preventive, and corrective).
6. Updated publications.

Program Area Descriptions

Laboratory Recognition

Laboratory Recognition is provided for the weights and measures laboratories to help demonstrate evidence of metrological traceability that is required in the States and local jurisdictions. Handbook 130, model weights and measures laws, as adopted in the jurisdictions, often state that weights and measures programs are required to ensure metrological traceability to NIST or the International System of Units (SI). The latest model laws indicate that laboratory Recognition or Accreditation provides the demonstrated evidence of metrological traceability. One value-added impact of the OWM Laboratory Recognition over Accreditation alone is that we can target specific technical areas each year when and where problems have been identified as well as conduct national-level analysis to consider system-wide needs assessments. Annual assessments are conducted for all laboratories and periodic resources are posted on the NIST website related to annual assessments. Example technical assessments that have provided national level assessments in the past few years include: facility assessments, software verification and validation, succession planning, measurement assurance, uncertainties, and metrological traceability. Identified problems provide input into the Training area.

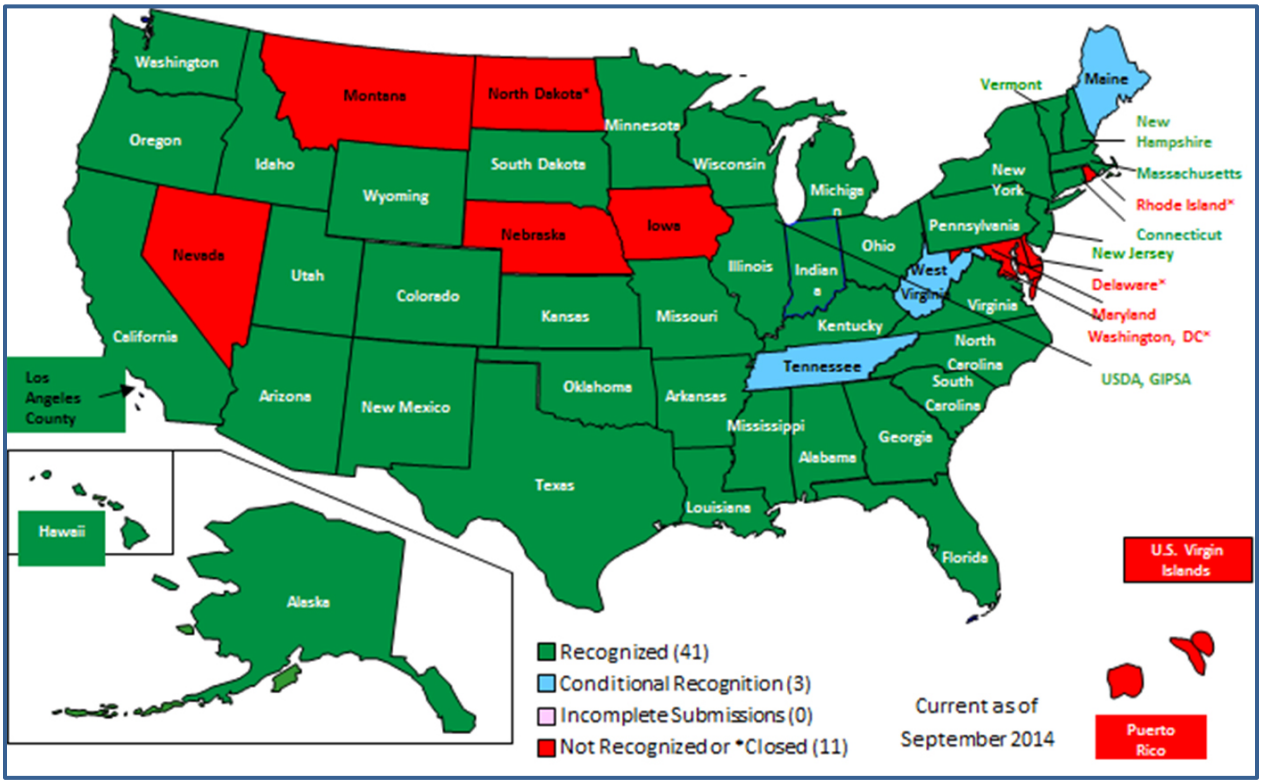


Figure 3. Laboratory Recognition by OWM (NIST Handbook 143, 2014 Sept.).

Laboratory Scoring Model

A laboratory scoring model was developed in 2006 and is based on assigning numerical values to each laboratory in a number of categories that correspond to NIST Handbook143. Points are awarded in the following categories to each laboratory:

- Quality Management System
- Administrative Procedures
- Facility
- Equipment
- Standards
- Staff
- Management Support
- Proficiency Tests (PTs)
- Extra Credit – Timely Submissions
- Multipliers (NVLAP accreditation with 2 year OWM Recognition, 2.5; NVLAP Accreditation with 1 year OWM Recognition, 2.25; OWM, 2 year recognition, 2; OWM, 1 year recognition, 1.5; OWM, 1 year conditional recognition, 1; No recognition, 0.5; Lab Closed, 0)

The model is intended to provide a quality index to the overall laboratory program. The scoring model was updated in 2008 based on laboratory feedback and the first two years of use. The scoring model is used internally at NIST to identify where resources and efforts will be allocated. The current "top score" possible (success goal) is 275. Laboratories that are fully successful with OWM 2-year Recognition generally score between 140 and 220.

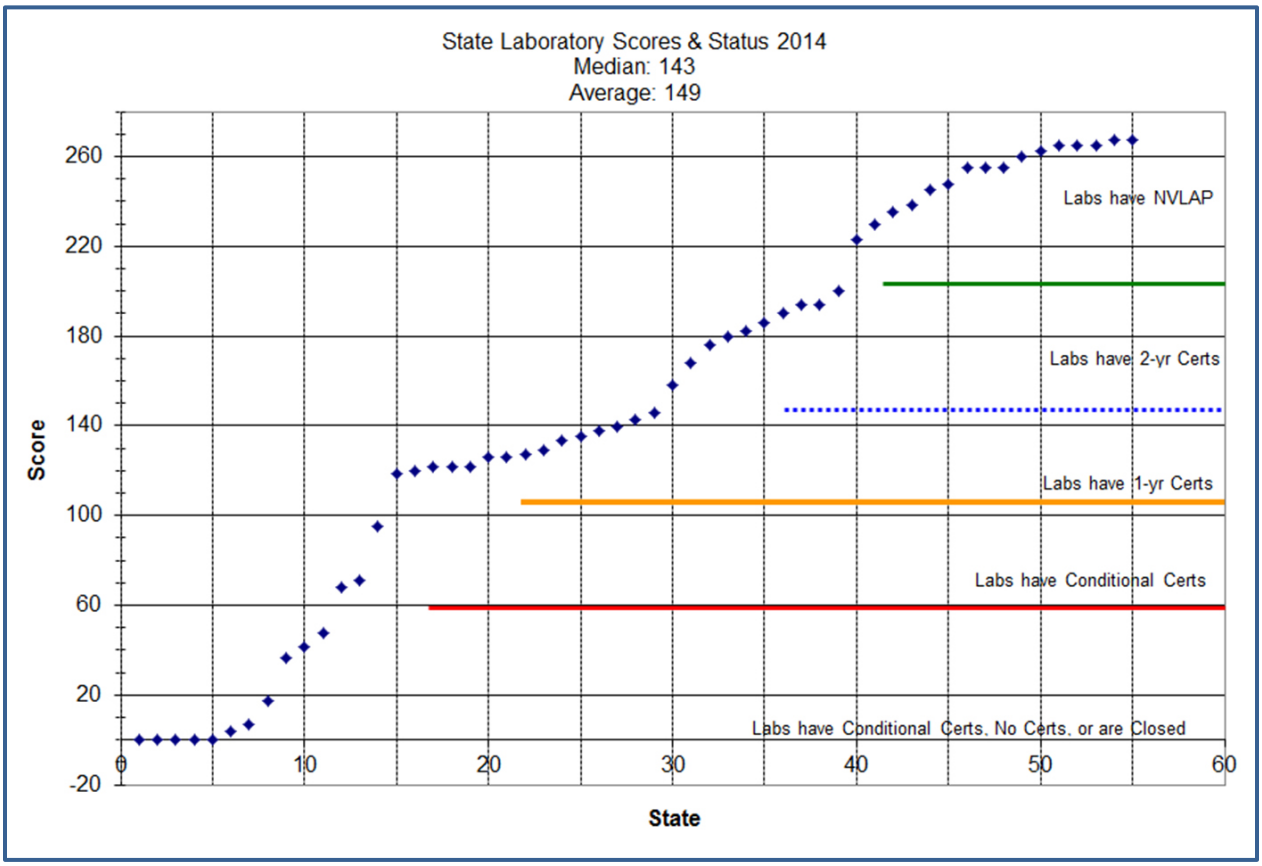


Figure 4. Laboratory Scoring Model (2014 Sept).

Scoring Model Trends

The OWM goal is to see the laboratory scores increase (or at least remain stable). Note: At this time, specific coding is not provided for identifying laboratories. In the latest assessment, we noted that several laboratories that were previously Recognized and Accredited have lost staff and not had adequate succession planning in place to keep laboratory Recognition and/or Accreditation in place or in place at the levels prior to staffing changes.

Year	Median	Mean
Successful Goals	140 to 220	140 to 220
Accreditation Goals	220+	220+
2006	97.5	130
2007	140	140
2008	172	156
2009	172	156
2010	168	154
2012	168	156
2014 (end)	143	149

Table 2: Laboratory Scoring Model Trends.

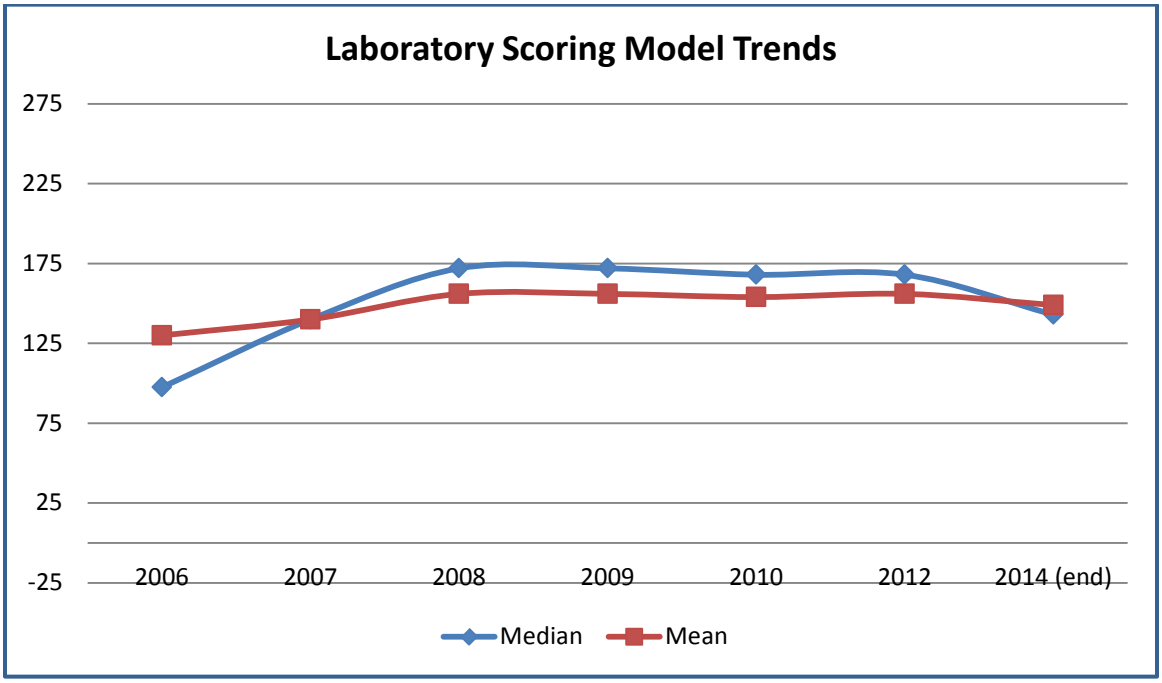


Figure 5. Laboratory Scoring Model Trends.

Laboratory Accreditation

The last measure of assessment in the Recognition area that is presented here is the laboratory Accreditation status through the NIST National Voluntary Laboratory Accreditation Program (NVLAP). The OWM Laboratory Metrology Program interfaces with the NIST National Voluntary Laboratory Accreditation Program (NVLAP) for those state laboratories that are accredited.

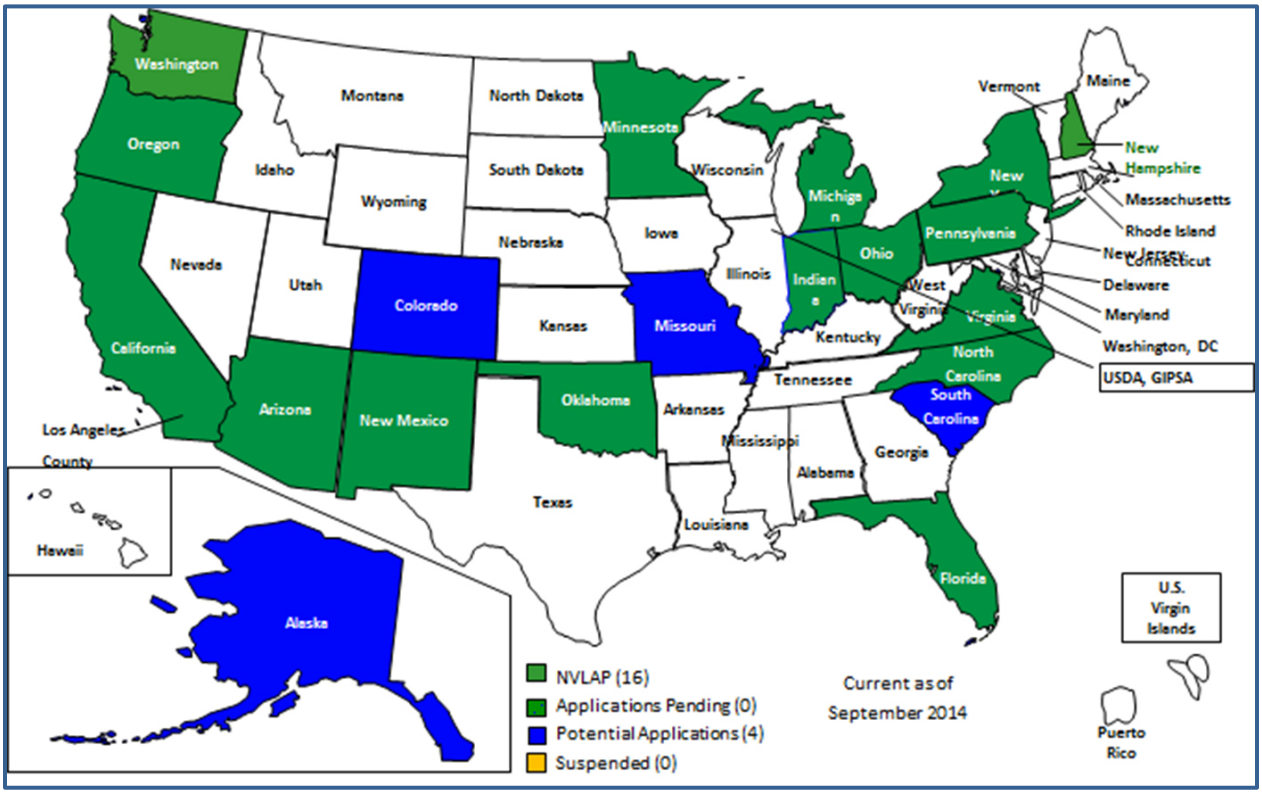


Figure 6. NVLAP Accreditation of State W&M Laboratories (2014 Sept.)

Within NVLAP, the current primary contact for state laboratories is Barbara Belzer. The primary contacts in OWM for this area are Georgia Harris and Elizabeth Gentry.

Training

Training includes both courses that are taught at NIST in the OWM Demonstration and Training Laboratory as well as regionally at the Regional Measurement Assurance Program (RMAP) annual training sessions (Figure 7).

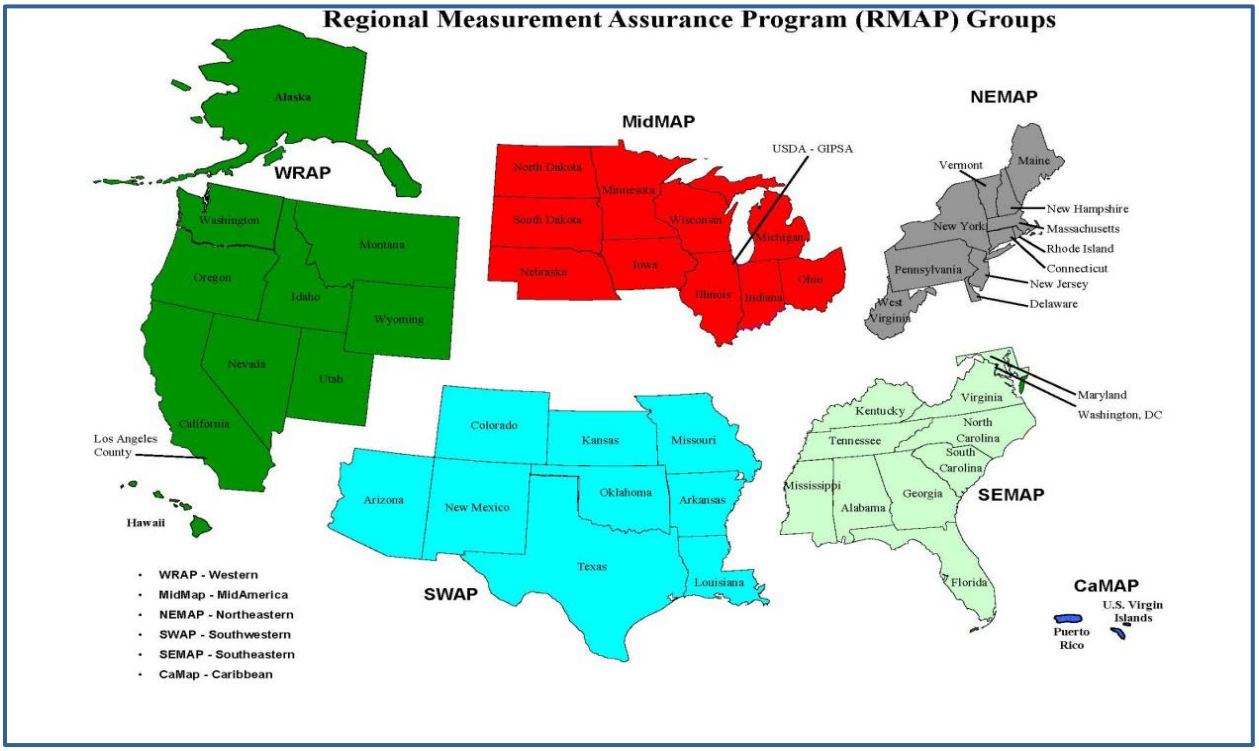


Figure 7. Regional Measurement Assurance Program (RMAP) Groups.

The current core laboratory metrology courses that are offered include: Fundamentals of Metrology, Mass Metrology, Volume Metrology, and Advanced Mass Metrology. These courses were developed and updated over the past three years as a part of a training redesign project to ensure that all training requirements needed by the laboratories are covered as well as to integrate more activities and adult learning concepts into the courses as a part of our goal in having an accredited training program. Previous courses (Basic Metrology for States, Intermediate Metrology) are no longer available. In addition to the traditional hands-on training courses, the OWM Laboratory Metrology Program has developed a series of 2 hour webinars on a variety of high interest topics. Webinar tuition is funded by the OWM and provided free to U.S. weights and measures officials and metrologists to enhance legal metrology uniformity. Figure 8 compares the old training course structure and the new.

Specific training and personnel competency requirements to support laboratory Recognition are published in Handbook 143 with interim updates published on the NIST website. Training at the RMAP sessions is selected each year based on training needs assessments with input gathered through laboratory requests and inquiries, assessments of annual submissions from the laboratories, and through assessment of reasons for proficiency testing failures.

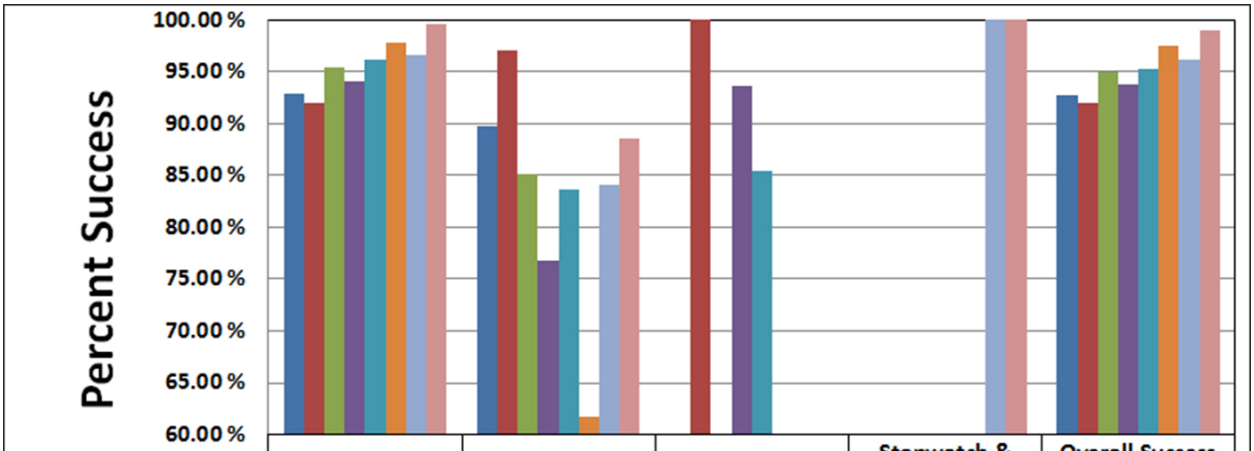
Weeks	1	2	3	4	5
***Old* Course Structure**					
		Basic Mass		**Intm. Mass and Volume**	**Adv. Mass**
		Basic Metrology for States (Mass, Volume, Length)			
***New* Course Structure**					
Math Pre-Test	**Fundamentals of Metrology**				
		Mass (Basic and Intm.)			**Adv. Mass***
				Volume (Basic and Intm.)	

*Figure 8. Metrology Training Redesign (2009 to 2015). *Advanced Mass to be offered in June 2015.*

Numerous supplementary courses are taught throughout the year as webinars covering many topics related to implementing content from Handbook 143 or to address training needs between other seminars that are scheduled. Registration for all courses is done through the NIST OWM contact database with transcripts readily available to students. The primary contacts for this area are Val Miller and Georgia Harris from a program perspective, Yvonne Branden from an administrative perspective, and Isabel Chavez for the OWM database. Val Miller, Georgia Harris, and Elizabeth Gentry, plus contract instructors from working laboratories who have completed training requirements provide course instruction at NIST and at the RMAP training sessions.

Proficiency Testing

The Proficiency Testing area is primarily coordinated through the annual RMAP training sessions. A 4-year plan is developed within each RMAP group to support the need for laboratories to have a 4-year plan and comply with Recognition and Accreditation policies. The planning, analysis, and reporting takes place at each meeting, where laboratories are given opportunities to help create the plan to meet the needs of their measurement Scopes as well as providing an opportunity to minimize overall program costs through volunteering to coordinate and analyze data.



	Mass	Volume	Length	Stopwatch & Frequency	Overall Success rate
2006: 4964 points	92.90 %	89.80 %			92.67 %
2007: 3628 points	92.00 %	97.00 %	100.00 %		92.00 %
2008: 4464 points	95.47 %	85.14 %			94.96 %
2009: 4658 points	94.11 %	76.83 %	93.69 %		93.75 %
2010: 9675 points	96.20 %	83.65 %	85.38 %		95.22 %
2011: 6570 points	97.82 %	61.67 %			97.49 %
2012: 7586 points	96.67 %	84.07 %		100.00 %	96.23 %
2013: 3684 points	99.62 %	88.53 %		100.00 %	98.97 %

Figure 9. Proficiency Testing Success Rates (2006 to 2013).

Proficiency testing and interlaboratory comparisons (PTs/ILCs) have been conducted in the Regional Measurement Assurance Program (RMAP) regions since the early 1980's. NIST has captured the number and types of PTs/ILCs since that time. However, measures for evaluating proficiency testing results have been modified since 2006. NIST began capturing pass/fail statistics for all PT/ILC results and compiling them by measurement parameter. This allows NIST to evaluate the effectiveness of training efforts and use of uniform calibration procedures among laboratories and to see improvements (or declines) over time. It also provides information on where to dedicate effort and resources in additional training and follow-up efforts.

Further assessments can be observed based on the data. For example, in the area of volume, special training efforts were conducted on gravimetric volume calibrations in 2005 and 2006 at the 5 gal level, reflecting overall improvements in the proficiency testing results. However, glass flasks were included for gravimetric calibrations in 2008, demonstrating the need for additional follow up for all gravimetric calibrations.

A four-year assessment of follow-up and corrective actions was conducted by NIST in 2007 and again in 2009 with a summary report circulated to all laboratories. The top 5 lab actions that were identified from periodic reviews in 2007 and 2009 included the need for:

1. Obtaining or calibrating standards
2. Obtaining updated equipment or service for existing equipment
3. Revising uncertainty analyses
4. Training on problem areas and review of procedures
5. Implementing better measurement assurance methods

Overall, based on the four-year assessment in 2007, laboratories completed a total of 245 follow-up actions from 85 PTs/ILCs. The success goals are 100 % passing rates and 100 % completed follow-up when needed. Examples of ongoing corrective action were incorporated into the training plan. Additional assessments are planned for this area in 2015.

Program planning, analysis and reporting tools used in this area are used by many other laboratories outside the program and outside the United States. As of 2014, the software analysis tools used in this program will begin to transition from an Excel based assessment to a standardized software package with training on its use being provided at the 2014 and 2015 RMAP training sessions. Val Miller is the primary contact in this area.

Documentary Standards

Ideally, documentary standards would be reviewed at least every five years and updated as appropriate. This area of the program receives the least overall attention but standards are selected for updates when issues arise indicating a need. At this time, an update to NIST Handbook 105-1 field standard weights and Handbook 105-7 for small volume provers are in the development process. A new standard is being considered for master meters. The program also participates with ASTM, USP, and OIML standards development. Val Miller is currently the primary contact for Handbook 105-1, ASTM, and USP updates and Georgia Harris with the volumetric standards.

Program References

An intentional effort that has been made by the OWM Laboratory Metrology Program over the years (at least since the 1980's) is to adopt and use international standards and references to gain program credibility. For example, when NIST Handbook 143 was first published in 1986, it referenced ISO Guide 25 and Handbook 145 procedures referenced Mil-Std-45662A. Both ISO Guide 25 and Mil-Std-45662A were the internationally and nationally accepted standards at that time. Yet, full implementation of these and their current standard counterparts has taken time. The first documented guidance in the Proficiency Testing area followed ISO Guide 43, which has since become a formal standard rather than a guide.

Program Area	Reference Documents
Laboratory Recognition	NIST Handbook 143, Program Handbook (based on ISO/IEC 17025:2005)
Training	ANSI/IACET Standard for Continuing Education and Training Laboratory Procedures: NBS Handbook 145 (length), NISTIR 5672 (mass dissemination), NISTIR 6969 (mass), NISTIR 7383 (volume)
Proficiency Testing	ISO/IEC 17043, ISO 13528 (applicable portions) NISTIR 7082, Proficiency Testing Policy NISTIR 7214, Proficiency Testing Quality Manual
Documentary Standards	NIST Handbooks 105-1 through 105-8 for field standards used in weights and measures

Table 3: Program Area References.

Internal Processes and Strategic Assessments

Each OWM Laboratory Metrology Program area has documented internal processes that are followed to ensure consistency on an ongoing basis. At a high level, the Office of Weights and Measures conducts annual strategic planning and selects specific strategic and operational objectives. The Laboratory Metrology Program conducts an annual SWOT analysis (identifying strengths, weaknesses, threats, and opportunities) within each program area. This method has also been used to gather input from metrologists at the annual RMAP training sessions to ensure customer input is considered and that program efforts are responsive to current and emerging national needs.

Measuring Results

As noted throughout this section, specific concepts are used to measure results in each Laboratory Metrology Program area. At one time, the majority of the measures were output measures. These included a count of how many laboratories were recognized, how many students attended training and how many courses were held, how many proficiency tests were conducted and in what measurement areas, along with the status of how many 105-series handbooks were published or in the process of being updated. Gradually, these measures have moved to include outcome measures where improvements are tracked, especially quality and impact. For example, the maps show how many laboratories are Recognized by OWM and Accredited by NVLAP. In addition, the scoring model shows the big picture assessment of all of the laboratories against standardized criteria to track whether or not improvements (or declines) are seen from year to year in the overall national quality of the laboratories. In the Training area, OWM obtained IACET Accreditation in 2013 and a formal Kirkpatrick-type course evaluation system is used to assess measure satisfaction with a training experience, learning, application, and impact. In the Proficiency Testing area, pass-fail statistics are tracked as well as a periodic evaluation of the resulting follow-up corrective actions made by the laboratories. In the Documentary Standards area, the level of application and adoption within the weights and measures programs is considered.

If you have questions or comments about any of these program areas or the OWM Laboratory Metrology Program, please feel free to contact Georgia Harris at gharris@nist.gov.

Participants

The SLP is comprised of 55 metrology laboratories. There are 50 state laboratories and 5 other government laboratories (Puerto Rico, Washington DC, Los Angeles County, USDA-GIPSA (identified as 'DA' in the survey), and U.S.-Virgin Islands). Of these 55 laboratories, 4 are not operational. The Washington DC, Delaware, U.S.-Virgin Islands, Rhode Island, and North Dakota metrology laboratories were not operational during the 2012 reporting period of the survey. The Montana, Indiana, and Puerto Rico laboratories did not participate this year.

Notes and Comments

47 metrology laboratories provided data for the 2012 State Program Workload Survey.

Table 4: This table provides information regarding the participating laboratories including location, age[1], size, and total number of customers served as of the 2012 calendar year.

Table 5: This table indicates laboratory participation in workload surveys conducted from 1996 through 2012.

Table 3: This table indicates from which labs your State W&M will acknowledge calibration certificates.

Findings

Size of Laboratory Facility:

- Average 3703 ft^2
- Maximum 14200 ft^2
- Minimum 585 ft^2

Age of Laboratory Facility

- Average 24 years
- Maximum 80 years
- Minimum <1 year

These laboratories reported serving 8,679 customers in 2012.

[1] Laboratory age is not indicative of laboratory condition. Many facilities have been significantly renovated in recent years.

State of Alaska Metrology Laboratory
12050 Industry Way Bldg. O #6
Anchorage, AK 99515
907-365-1233 (phone)
907-365-1275 (fax)
http//www.dot.state.ak.us/mscve/main.cfm?go=metro

Survey Completed by Garret Brown

Age of Lab: 42 Years
Office Space: 270 Square Feet
Lab Space: 900 Square Feet

Number of Customers: 60

Alabama Dept. of Agriculture
1445 Federal Dr.
Montgomery, AL 36107
334-240-3729 (phone)
334-240-7175 (fax)
www.alabama.gov.

Survey Completed by Michael Bridges

Age of Lab: 42 Years
Office Space: 314 Square Feet
Lab Space: 588 Square Feet

Number of Customers: 163

Arkansas Bureau of Standards
4608 W 61st
Little Rock, AR 72209
501-570-1191 (phone)
501-562-7605 (fax)
www.plantboard.org

Survey Completed by Nikhil G Soman

Age of Lab: 45 Years
Office Space: 1900 Square Feet
Lab Space: 1700 Square Feet

Number of Customers: 65

Arizona Department Weights and Measures Metrology Laboratory
4425 W Olive Ave Ste 134
Glendale, AZ 85302
602.771.4938 (phone)
623.463.0440 (fax)
www.azdwm.gov

Survey Completed by Brian Sellers

Age of Lab: 13 Years
Office Space: 500 Square Feet
Lab Space: 5500 Square Feet

Number of Customers: 170

State of California
6790 Florin Perkins Rd, Ste 100
Sacramento, CA 95828
916-229-3022 (phone)
916-229-3064 (fax)
WWW.cdfa.ca.gov/dms

Age of Lab: 8 Years
Office Space: 296 Square Feet
Lab Space: 3747 Square Feet

Number of Customers: 138

Survey Completed by Greg Boers

Colorado Metrology Laboratory
3125 Wyandot St
Denver, CO 80211
303-867-9244 (phone)
303-477-4248 (fax)
www.colorado.gov

Age of Lab: 41 Years
Office Space: 1979 Square Feet
Lab Space: 1927 Square Feet

Number of Customers: 217

Survey Completed by Kate Smetana

State of Connecticut, Metrology Laboratory
9 Windsor Avenue
Windsor, CT 06095
860-246-9620 (phone)
860-706-1236 (fax)
www.ct.gov/dcp

Age of Lab: <1 Years
Office Space: 130 Square Feet
Lab Space: 1862 Square Feet

Number of Customers: 44

Survey Completed by Ana Maria Feliciano

Florida Department of Agriculture and Consumer Services
3125 Conner Blvd., Lab 2
Tallahassee, FL 32399
850-921-1580 (phone)
850-921-1593 (fax)
www.800helpfla.com

Age of Lab: 39 Years
Office Space: 260 Square Feet
Lab Space: 3240 Square Feet

Number of Customers: 379

Survey Completed by Davis Terry

Georgia Weights and Measures Laboratory
P.O. Box 1227
Tifton, GA 31793
229-386-3601 (phone)
229-386-3365 (fax)
agr.georgia.gov/weights-measures.aspx

Age of Lab: 1.5 Years
Office Space: (not reported)
Lab Space: (not reported)

Number of Customers: 32

Survey Completed by Kontz Bennett

Hawaii Measurement Standards Lab
1851 Auiki St.
Honolulu, HI 96819
(808) 832-0682 (phone)
(808) 832-0683 (fax)
http://hawaii.gov/hdoa/qad/ms

Age of Lab: 12 Years
Office Space: 443 Square Feet
Lab Space: 2602 Square Feet

Number of Customers: 27

Survey Completed by Michael Tang

Iowa Metrology Ellsworth Community College
1100 College Ave.
Iowa Falls, IA 50126
641.648.8737 (phone)
641.648.6216 (fax)

Age of Lab: 3 Years
Office Space: 175.5 Square Feet
Lab Space: 2764 Square Feet

Number of Customers: 335

Survey Completed by Andrew Blackburn

ISDA Metrology Laboratory
2216 Kellogg Lane
Boise, ID 83701
208-332-8692 (phone)
208-334-2378 (fax)
www.agri.idaho.gov

Age of Lab: 43 Years
Office Space: 720 Square Feet
Lab Space: 1900 Square Feet

Number of Customers: 68

Survey Completed by Kevin Merritt

IL Dept. of Agriculture Metrology Laboratory
801 Sangamon Avenue East
Springfield, IL 62702
217-785-8480 (phone)
217-785-3136 (fax)

Age of Lab: 35/18 Years
Office Space: 1200 Square Feet
Lab Space: 3320 Square Feet

Number of Customers: 328

Survey Completed by Mike Rockford

Kansas Metrology Laboratory
PO Box 19282
Topeka, KS 66619
785-862-2415 (phone)
785-862-2460 (fax)
www.ksda.gov/weights_measures/

Age of Lab: 14 Years
Office Space: 217 Square Feet
Lab Space: 3404 Square Feet

Number of Customers: 245

Survey Completed by Kevin Uphoff

Kentucky Department of Agriculture
107 Corporate Dr
Frankfort, KY 40601
502-573-0282 (phone)
502-573-0303 (fax)
www.kyagr.com

Age of Lab: 12 Years
Office Space: 400 Square Feet
Lab Space: 2395 Square Feet

Number of Customers: 53

Survey Completed by Jason Glass

Louisiana Metrology Laboratory
PO Box 3098
Baton Rouge, LA 70821
225-922-1380 (phone)
225-237-5580 (fax)
www.ldaf.state.la.us

Age of Lab: 23 Years
Office Space: 192 Square Feet
Lab Space: 1568 Square Feet

Number of Customers: 116

Survey Completed by Richert Williams

Massachusetts Division of Standards Laboratory	Age of Lab: 1.5 Years
661 (rear) Highland Avenue	Office Space: 160 Square Feet
Needham, MA 02494	Lab Space: 2192 Square Feet
781-444-0219 (phone)	
781-444-0891 (fax)	Number of Customers: 107
www.mass.gov/standards/	
Survey Completed by Raymond Costa	

MD Dept of Agriculture, Weights and Measures Laboratory	Age of Lab: 22 Years
50 Harry S. Truman Parkway	Office Space: 2639 Square Feet
Annapolis, MD 21401	Lab Space: 6138 Square Feet
410-841-5790 (phone)	
410-841-2765 (fax)	Number of Customers: 28
http://mda.maryland.gov/weights_measures	
Survey Completed by Zenon Waclawiw	

Maine Metrology Laboratory	Age of Lab: 36 Years
333 Cony Road	Office Space: 1068 Square Feet
Augusta, ME 04330	Lab Space: 2100 Square Feet
207-287-7587 (phone)	
207-287-6171 (fax)	Number of Customers: 180
www.maine.gov/agriculture/qar/metrology.html	
Survey Completed by Danny Newcombe	

State of Michigan	Age of Lab: 14 Years
940 Venture Lane	Office Space: 2000 Square Feet
Williamston, MI 48895	Lab Space: 12200 Square Feet
517-655-8202 (phone)	
517-655-8303 (fax)	Number of Customers: 350
http://www.michigan.gov/wminfo	
Survey Completed by Craig VanBuren	

Minnesota Metrology Laboratory
14305 Southcross Drive W #150
Burnsville, MN 55306
651-539-1555 (phone)
952-435-4040 (fax)
mn.gov/commerce/weights-and-measures/industry/metrology/

Age of Lab: 6 Years
Office Space: 1120 Square Feet
Lab Space: 4706 Square Feet

Number of Customers: 292

Survey Completed by Steven Harrington

Missouri Metrology Lab
1616 Missouri Blvd
Jefferson City, MO 65109
573-751-9487 (phone)
573-751-0281 (fax)
mda.mo.gov

Age of Lab: 23 Years
Office Space: 385 Square Feet
Lab Space: 2433 Square Feet

Number of Customers: 335

Survey Completed by Tom Hughes

Mississippi
1000 ASU Dr.
Lorman, MS 39096
(601)877-3802 (phone)

Age of Lab: 12 Years
Office Space: 320 Square Feet
Lab Space: 3752 Square Feet

Number of Customers: 112

Survey Completed by Mel Iasigi

NCDA&CS Standards Laboratory
1051 Mail Service Center
Raleigh, NC 27699
(919) 733-4411 (phone)
(919) 733-8804 (fax)
www.ncstandards.org

Age of Lab: 28 Years
Office Space: 2700 Square Feet
Lab Space: 4800 Square Feet

Number of Customers: 441

Survey Completed by Sharon Woodard

Nebraska Standards Laboratory
3721 West Cuming Street
Lincoln, NE 68524
402-471-2087 (phone)
402-471-6685 (fax)
www.agr.ne.gov

Age of Lab: 0 Years
Office Space: 437 Square Feet
Lab Space: 1672 Square Feet
Number of Customers: 91

Survey Completed by Craig Olsen

New Hampshire Metrology Laboratory
25 Capitol St.
Concord, NH 03301
603-271-0894 (phone)
603-271-1109 (fax)
http://agriculture.nh.gov/divisions/weights_measures/metrology.htm

Age of Lab: 40 Years
Office Space: 0 Square Feet
Lab Space: 700 Square Feet
Number of Customers: 53

Survey Completed by Tim Osmer

State of New Jersey
1261 Rts 1 & 9 South
Avenel, NJ 07001
908-403-5798 (phone)
732-382-5298 (fax)

Age of Lab: 23 Years
Office Space: 400 Square Feet
Lab Space: 2700 Square Feet
Number of Customers: 537

Survey Completed by Ray Szpond

New Mexico Department of Agriculture
MSC 3170, P.O. Box 30005
Las Cruces, NM 88003
575-646-1616 (phone)
575-646-2361 (fax)
www.nmda.nmsu.edu

Age of Lab: 38 Years
Office Space: 171 Square Feet
Lab Space: 947 Square Feet
Number of Customers: 280

Survey Completed by Steve Sumner

Nevada Metrology Laboratory	Age of Lab: 41 Years
2150 Frazier Avenue	Office Space: 170 Square Feet
Sparks, NV 89431	Lab Space: 1044 Square Feet
775-353-3794 (phone)	
775-353-3798 (fax)	Number of Customers: 90
http://agri.nv.gov/Protection/Weights_and_Measures/Metrology_Lab/	

Survey Completed by Steve Schultz

New York State	Age of Lab: 42 Years
Harriman Campus	Office Space: 1100 Square Feet
Albany, NY 12206	Lab Space: 2400 Square Feet
518-457-3452 (phone)	
518-457-2552 (fax)	Number of Customers: 117
www.agriculture.ny.gov	

Survey Completed by Mike Sikula

Ohio Department of Agriculture, Division of Weights and Measures	Age of Lab: 54 Years
8995 E Main St, Building 5	Office Space: 2500 Square Feet
Reynoldsburg, OH 43068	Lab Space: 3047 Square Feet
614-728-6290 (phone)	
614-728-6424 (fax)	Number of Customers: 190
http://www.agri.ohio.gov	

Survey Completed by Dan Walker

Oklahoma Bureau of Standards	Age of Lab: 4 Years
2800 N. Lincoln Blvd.	Office Space: 400 Square Feet
Oklahoma City, OK 73105	Lab Space: 5807 Square Feet
405-522-5459 (phone)	
405-522-5457 (fax)	Number of Customers: 187
http://www.oda.state.ok.us/	

Survey Completed by Richard Gonzales

Oregon Department of Agriculture, Weights and Measures Program	Age of Lab: 14 Years
635 Capitol St NE	Office Space: 367 Square Feet
Salem, OR 97301	Lab Space: 2038 Square Feet
503-986-4669 (phone)	
503-986-4784 (fax)	Number of Customers: 67
http://www.oregon.gov/ODA/MSD/pages/metrology_intro.aspx	
Survey Completed by Aaron Aydelotte	

Pennsylvania Standards Laboratory	Age of Lab: 15 Years
2221 Forster Street, Room G-44A	Office Space: 1568 Square Feet
Harrisburg, PA 17125	Lab Space: 3780 Square Feet
717-787-4707 (phone)	
717-705-0882 (fax)	Number of Customers: 600
www.dgs.state.pa.us	
Survey Completed by James P. Gownley	

South Carolina	Age of Lab: 26 Years
237 Catawba Street	Office Space: 208 Square Feet
Columbia, SC 29201	Lab Space: 3500 Square Feet
803-253-4052 (phone)	
803-253-4052 (fax)	Number of Customers: 590
agriculture.sc.gov	
Survey Completed by Robert L. McGee	

South Dakota Metrology Lab	Age of Lab: >25 Years
1500 N Garfield	Office Space: 0 Square Feet
Pierre, SD 57501	Lab Space: 585 Square Feet
605-773-3170 (phone)	
605-773-6631 (fax)	Number of Customers: 41
http://dps.sd.gov/licensing/weights_measures/default.aspx	
Survey Completed by Brad Stover	

Tennessee Department of Agriculture W&M Lab
Ellington Agricultural Center, Jennings Building
Nashville, TN 37204
(615)837-5159 (phone)
(615)837-5015 (fax)

Age of Lab: 45 Years
Office Space: 256 Square Feet
Lab Space: 837 Square Feet

Number of Customers: 85

Survey Completed by Kenneth R. Wilmoth

Giddings Metrology Laboratory
P.O. Box 1518
Giddings, TX 78942
979-542-3231 (phone)
979-542-2961 (fax)
www.texasagriculture.gov

Age of Lab: 10 Years
Office Space: 1200 Square Feet
Lab Space: 11077 Square Feet

Number of Customers: 243

Survey Completed by Philip Wright & Lisa Corn

Utah Metrology Laboratory
PO Box 146500, 350 North Redwood Road
Salt Lake City, UT 84114
801-538-7153 (phone)
801-538-4949 (fax)
http://ag.utah.gov

Age of Lab: 27 Years
Office Space: 150 Square Feet
Lab Space: 1350 Square Feet

Number of Customers: 55

Survey Completed by Bill Rigby

Commonwealth of VA, Office of W & M
600 N. 5th Street
Richmond, VA 23219
804-786-6799 (phone)
804-371-0206 (fax)
www.vdacs.virginia.gov/standards/service

Age of Lab: 11 Years
Office Space: 0 Square Feet
Lab Space: 3637 Square Feet

Number of Customers: 179

Survey Completed by Linda B. Jones

VT Weights and Measures Metrology Laboratory
322 Industrial Lane
Berlin, VT 05641
802-793-6744 (phone)
802-828-5983 (fax)
www.vermontagriculture.com

Survey Completed by Marc H. Paquette

Age of Lab: 1 Years
Office Space: 100 Square Feet
Lab Space: 1700 Square Feet

Number of Customers: 51

WA St. Dept. of Agriculture Metrology Laboratory
PO Box 42560
Olympia, WA 98512
360-753-5042 (phone)
360-586-4728 (fax)

Survey Completed by Dan Wright

Age of Lab: 34 Years
Office Space: 230 Square Feet
Lab Space: 2434 Square Feet

Number of Customers: 206

Wisconsin Weights & Measures Laboratory
3601 Galleon Run
Madison, WI 53704
608 224-4911 (phone)
608 224-4912 (fax)
www.state.datcp.wi.us

Survey Completed by Jeffrey T Houser

Age of Lab: 6 Years
Office Space: 600 Square Feet
Lab Space: 3100 Square Feet

Number of Customers: 225

WV Weights and Measures Laboratory
570 MacCorkle Ave
St. Albans, WV 25177
304-722-0602 (phone)
304-722-0605 (fax)

Survey Completed by Anthony O' Brien

Age of Lab: 42 Years
Office Space: 231 Square Feet
Lab Space: 1769 Square Feet

Number of Customers: 266

Wyoming Department of Agriculture 6607 Campstool Rd Cheyenne, WY 82002 307-777-7556 (phone) 307-777-1943 (fax) agriculture.wy.gov Survey Completed by Robert Weidler	Age of Lab: 1 Years Office Space: 650 Square Feet Lab Space: 1660 Square Feet Number of Customers: 4
USDA, GIPSA, FGIS Master Scale Depot 5800 W 69th St. Chicago, IL 60638 708-458-0655 (phone) 708-458-0749 (fax) Survey Completed by Marcus Harwitz	Age of Lab: 80 Years Office Space: 700 Square Feet Lab Space: 5000 Square Feet Number of Customers: 16
Los Angeles County 11012 Garfield Ave South Gate, CA 90280 562-622-0419 (phone) 562-861-0278 (fax) http://acwm.lacounty.gov Survey Completed by Lina Ng	Age of Lab: 38 Years Office Space: 168 Square Feet Lab Space: 2922 Square Feet Number of Customers: 42

Table 4: Laboratory Facilities

Lab Code/Year	1996	1998	1999	2000	2002	2004	2005	2006	2008	2010	2012
AK	Yes		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
AL	Yes				Yes	Yes	Yes	Yes	Yes	Yes	Yes
AR	Yes	Yes	Yes	Yes	Yes	Yes		Yes	Yes	Yes	Yes
AZ	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
CA	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
CO	Yes		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
CT	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
DE	(inactive)	(inactive)	(inactive)	(inactive)	(inactive)	(inactive)	(inactive)	(inactive)	(inactive)	(inactive)	(inactive)
FL	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
GA	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
HI	Yes	Yes	Yes	(inactive)	Yes	Yes	Yes	Yes	Yes	Yes	Yes
IA	Yes	Yes	Yes		(inactive)	Yes	Yes	Yes	Yes	Yes	Yes
ID	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
IL	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
IN	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
KS	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
KY	Yes	Yes	Yes	Yes	Yes	(inactive)	(inactive)	Yes	Yes	Yes	Yes
LA	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
MA	Yes		Yes	Yes	Yes	Yes	Yes	Yes	Yes		Yes
MD	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
ME	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
MI	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
MN	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
MO	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
MS	Yes	Yes		(inactive)	Yes	Yes	Yes	Yes	Yes	Yes	Yes
MT	Yes	Yes	Yes	Yes	Yes	Yes			Yes	Yes	
NC	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
ND	(inactive)	(inactive)	(inactive)	(inactive)	(inactive)	(inactive)	(inactive)	(inactive)	(inactive)	(inactive)	(inactive)

Lab Code/Year	1996	1998	1999	2000	2002	2004	2005	2006	2008	2010	2012
NE	Yes	Yes			Yes	Yes	Yes	Yes			Yes
NH	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
NJ	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
NM	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
NV	Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
NY	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
OH	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
OK	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
OR	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
PA	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
RI	(inactive)	(inactive)	(inactive)	(inactive)	(inactive)	(inactive)	(inactive)	(inactive)	(inactive)	(inactive)	Yes
SC	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
SD	Yes	Yes			(inactive)	Yes	Yes	Yes	Yes	Yes	Yes
TN	Yes	Yes	Yes	Yes	Yes	(inactive)	Yes	Yes	Yes		Yes
TX	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
UT	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
VA	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
VT	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
WA	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
WI	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
WV	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
WY	Yes	Yes	Yes	Yes	Yes	Yes		Yes	Yes	Yes	Yes
USDA-GIPSA	Yes					Yes	Yes	Yes	Yes	Yes	Yes
Wash. DC	(inactive)	(inactive)	(inactive)	(inactive)	(inactive)	(inactive)	(inactive)	(inactive)	(inactive)	(inactive)	(inactive)
Virgin Islands	(inactive)	(inactive)	(inactive)	(inactive)	(inactive)	(inactive)	(inactive)	(inactive)	(inactive)	(inactive)	(inactive)
Puerto Rico	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
LA County	Yes	Yes	Yes	Yes	Yes	(inactive)	(inactive)	(inactive)	Yes	Yes	Yes
TOTAL	51	46	45	45	48	47	46	49	50	47	47

Table 5: Laboratory Participation

Mass

Mass weighing procedures are broken into several categories for the purpose of this report. They are *echelon I*, *echelon II*, *echelon III*, and *Weight Carts*.

Echelon I weighing procedures are those mass calibrations which use calibration designs, such as those detailed in the NIST SEMATECH Engineering Statistics Handbook (4) and NIST Technical Note 952 (5), that are solved using numerical least squares approximations, and employ air buoyancy corrections (6). These calibrations are typically associated with, but not limited to high tolerance class weights such as those specified in ASTM E617 Class 0 or OIML E1. Masscode (7) is the industry standard software used to analyze data collected for an echelon I calibration. Any calibration for which a laboratory used masscode to analyze the primary data is considered to be an echelon I calibration for this survey.

Echelon II weighing procedures are typically used when high tolerance class calibrations are requested. They typically involve redundant measurements in order to reduce the overall measurement uncertainty to an acceptable level. Unlike Echelon I, conventional mass corrections (6) of the laboratory standards are typically used in lieu of performing air buoyancy corrections. Examples of echelon II mass calibration procedures may be found in NIST Internal Report 6969 (8), SOP 4 and SOP 7 (8).

Echelon III weighing procedures are essentially everything else with the exception of tests done on weight carts. A typical echelon III procedure is SOP 8 found in NIST Internal Report 6969 (8). Most mass standards tested in SLP metrology lab fall into this category (91 %)[2]

Weight Carts are motorized carts used to transport a load of field test weights to facilitate the field testing of larger capacity scales. Weight carts are often subject to the specifications and tolerances found in NIST Handbook 105-8 (9) and are typically tested using echelon III procedures; they are, however, treated separately herein as they are distinct from field test weights.

[2] by count of mass standards tested only. The time required to complete a test is outside the scope of this survey.

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Mass Echelon I

Description

The graphs on the following page represent the total number of Mass Echelon I standards tested by the 47 reporting laboratories. The map graph gives a geographical distribution of these standards. There are pie graphs located on the map for each individual lab and a larger pie graph that reflects the totals. The pie graphs provide a breakdown into the customer categories of Lab, W&M, and External. The bar graph at the bottom of the page shows the same breakdown along with the total number of devices tested by each laboratory.

- Lab – work done for the internal use of the metrology laboratory.
- W&M – work done for the weights and measures enforcement program.
- External – work done for customers who do not fall into any of the above categories.

Findings

Of the 47 reporting laboratories, 12 labs tested a total of 2,493 mass standards

Comparison of previous surveys

Year	# Labs	Total Devices
1998	10	2667
1999	15	5985
2000	16	5227
2002	15	5288
2004	14	3707
2005	14	3103
2006	14	3025
2008	17	2216
2010	19	2309
2012	12	2493

Table 6: Summary of echelon I tests reported on previous surveys.

Results for Mass I cannot be compared to the 1996 survey as it did not use Mass Echelon I as a category. ‘Precision Mass’ was used as the category and it included both Mass Echelon I and Mass Echelon II calibrations.

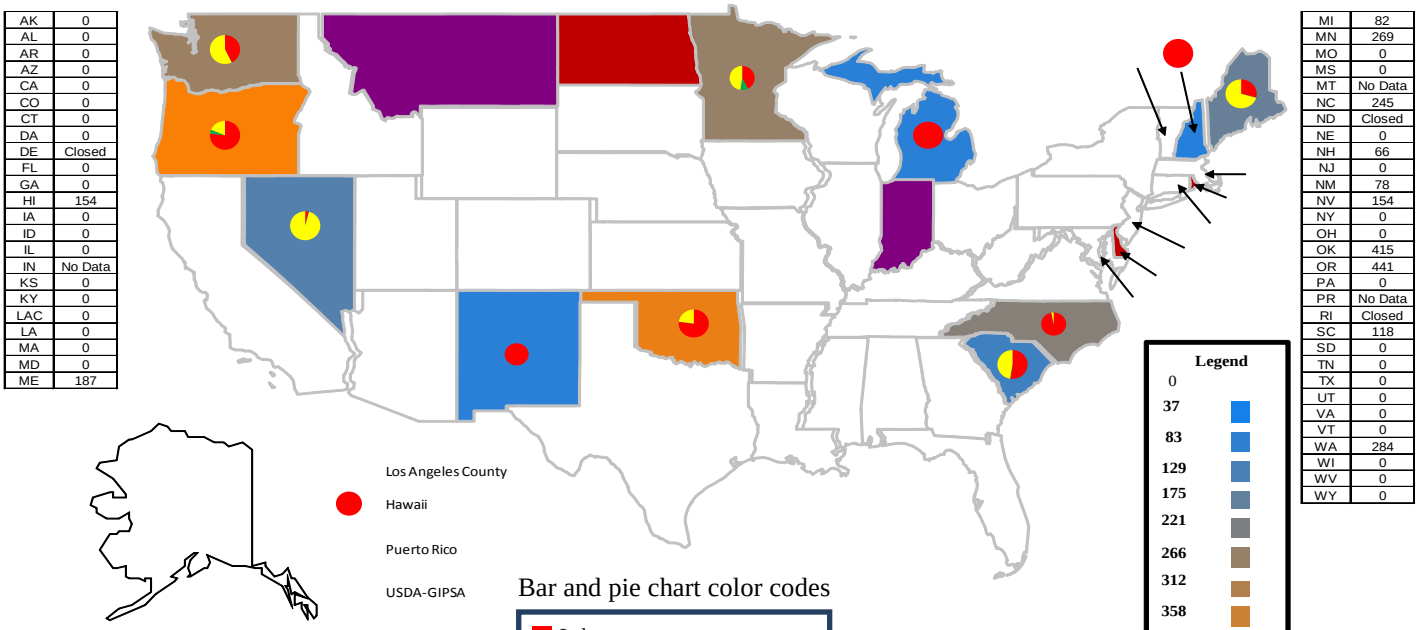
Notes and Comments

- 66 % of all Mass I standards were calibrated for internal use by the laboratory.
- 2 % of all Mass I standards were calibrated for the weight and measures program.
- 32 % of all Mass I standards were calibrated for external customers.

Mass Echelon I

AK	0
AL	0
AR	0
AZ	0
CA	0
CO	0
CT	0
DA	0
DE	Closed
FL	0
GA	0
HI	154
IA	0
ID	0
IL	0
IN	No Data
KS	0
KY	0
LAC	0
LA	0
MA	0
MD	0
ME	187

MI	82
MN	269
MO	0
MS	0
MT	No Data
NC	245
ND	Closed
NE	0
NH	66
NJ	0
NM	78
NV	154
NY	0
OH	0
OK	415
OR	441
PA	0
PR	No Data
RI	Closed
SC	118
SD	0
TN	0
TX	0
UT	0
VA	0
VT	0
WA	284
WI	0
WV	0
WY	0



Bar and pie chart color codes

- Laboratory
- Weights and Measures
- External

1637 Laboratory Support

47 W&M Program Support

809 For external customers

2493 total devices calibrated in 12 labs

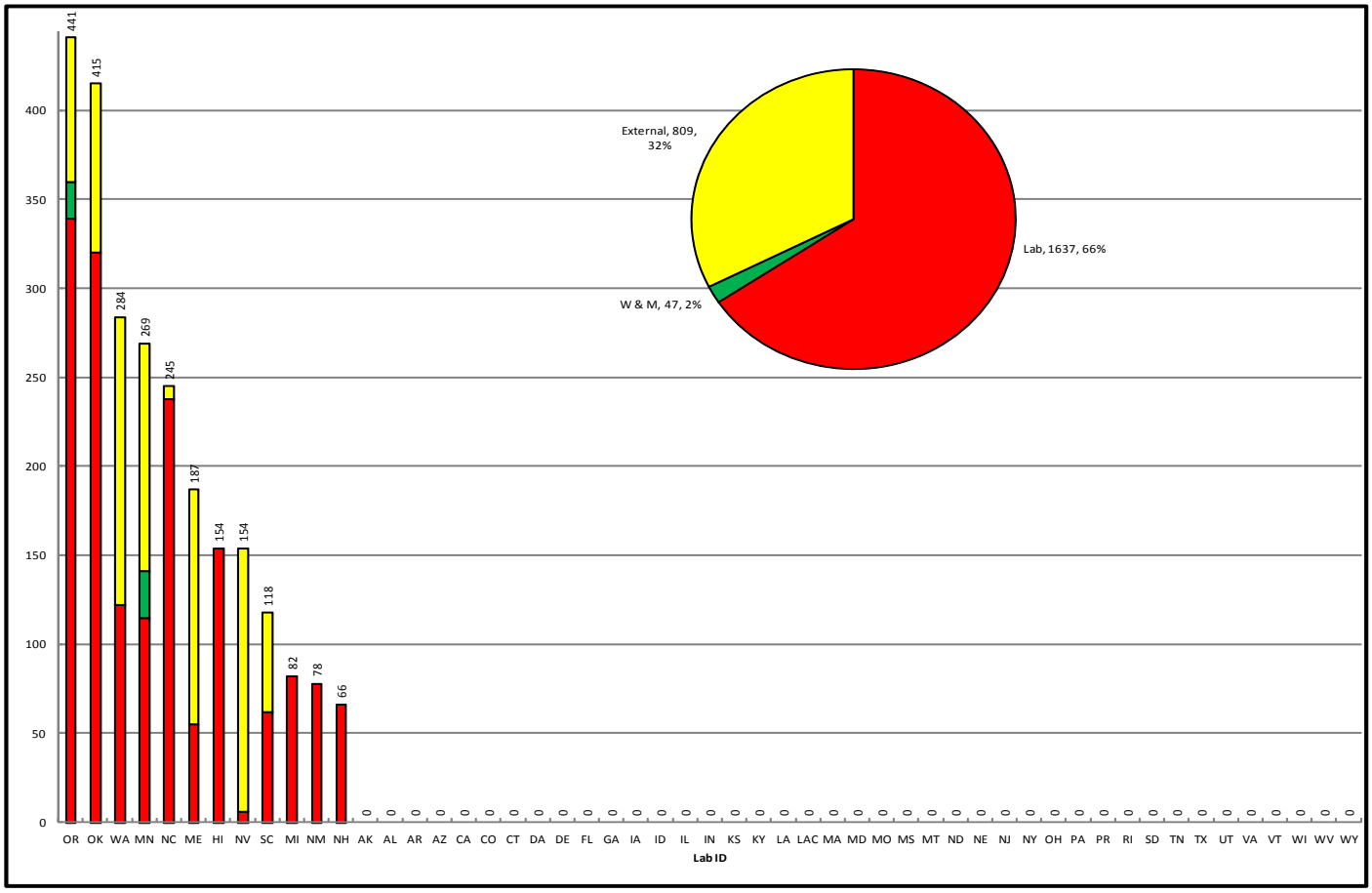


Figure 10: Mass Echelon I tests.

Mass Echelon II

Description

The graphs on the following page represent the total number of Mass Echelon II standards tested by the 47 reporting laboratories. The map graph gives a geographical distribution of these standards. There are pie graphs located on the map for each individual lab and a larger pie graph that reflects the totals. The pie graphs provide a breakdown into the customer categories of Lab, W&M, and External. The bar graph at the bottom of the page shows the same breakdown along with the total number of devices tested by each laboratory.

- Lab – work done for the internal use of the metrology laboratory.
- W&M – work done for the weights and measures enforcement program.
- External – work done for customers who do not fall into any of the above categories.

Findings

Of the 47 reporting laboratories, 30 labs tested a total of 18,222 mass standards

Comparison of previous surveys

Year	# Labs	Total Devices
1996	38	37662
1998	36	24926
1999	35	25807
2000	38	26428
2002	37	25847
2004	32	21714
2005	32	20541
2006	33	22352
2008	32	25371
2010	34	23316
2012	30	18222

Table 7: Echelon II tests reported on previous surveys.

Results for Mass II cannot be compared to the 1996 survey as it did not use Mass Echelon II as a category. 'Precision Mass' was used as the category and it included both Mass Echelon I and Mass Echelon II calibrations.

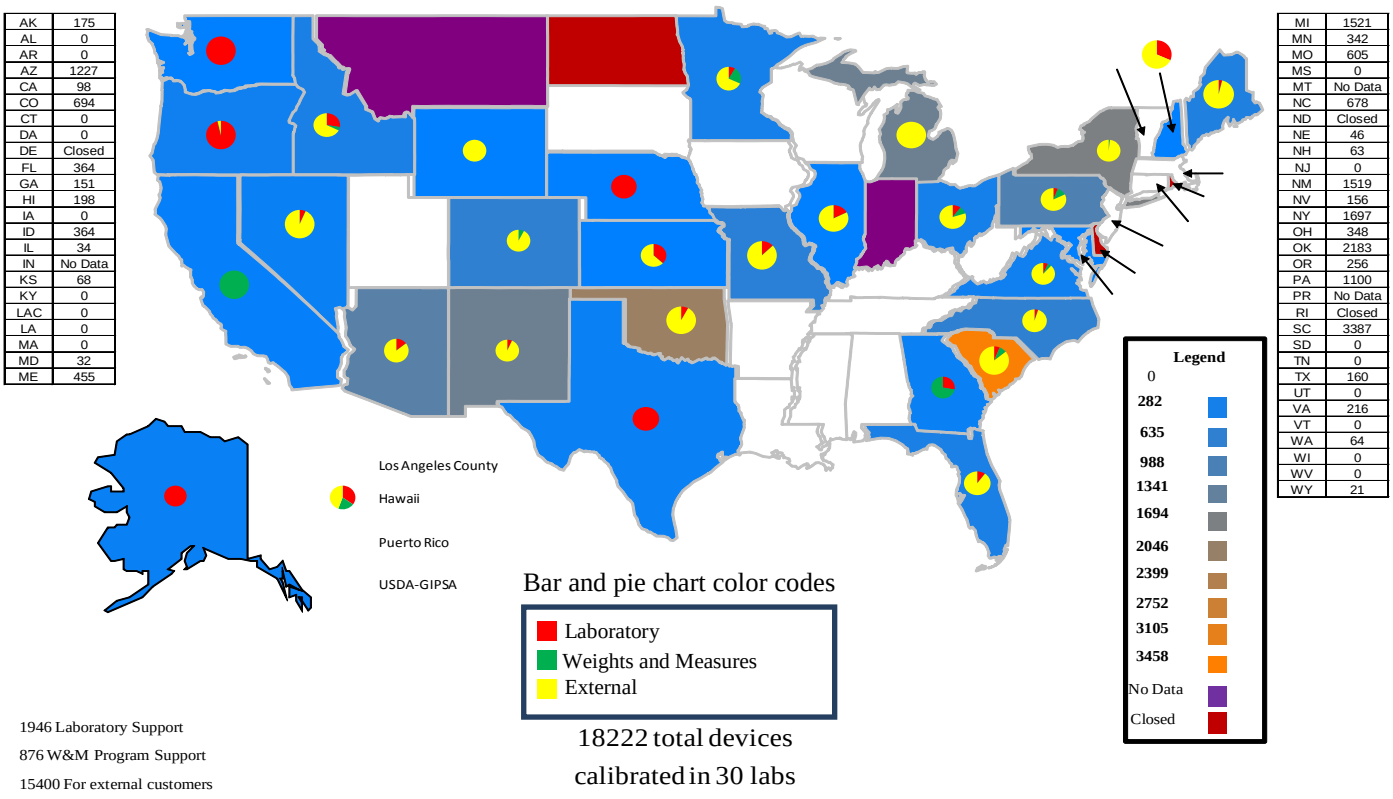
Notes and Comments

- 11 % of all Mass II standards were calibrated for internal use by the laboratory.
- 5 % of all Mass II standards were calibrated for the weight and measures program.
- 84 % of all Mass II standards were calibrated for external customers.

Mass Echelon II

AK	175
AL	0
AR	0
AZ	1227
CA	98
CO	694
CT	0
DA	0
DE	Closed
FL	364
GA	151
HI	198
IA	0
ID	364
IL	34
IN	No Data
KS	68
KY	0
LAC	0
LA	0
MA	0
MD	32
ME	455

MI	1521
MN	342
MO	605
MS	0
MT	No Data
NC	678
ND	Closed
NE	46
NH	63
NJ	0
NM	1519
NV	156
NY	1697
OH	348
OK	2183
OR	256
PA	1100
PR	No Data
RI	Closed
SC	3387
SD	0
TN	0
TX	160
UT	0
VA	216
VT	0
WA	64
WI	0
WV	0
WY	21



1946 Laboratory Support

876 W&M Program Support

15400 For external customers

18222 total devices calibrated in 30 labs

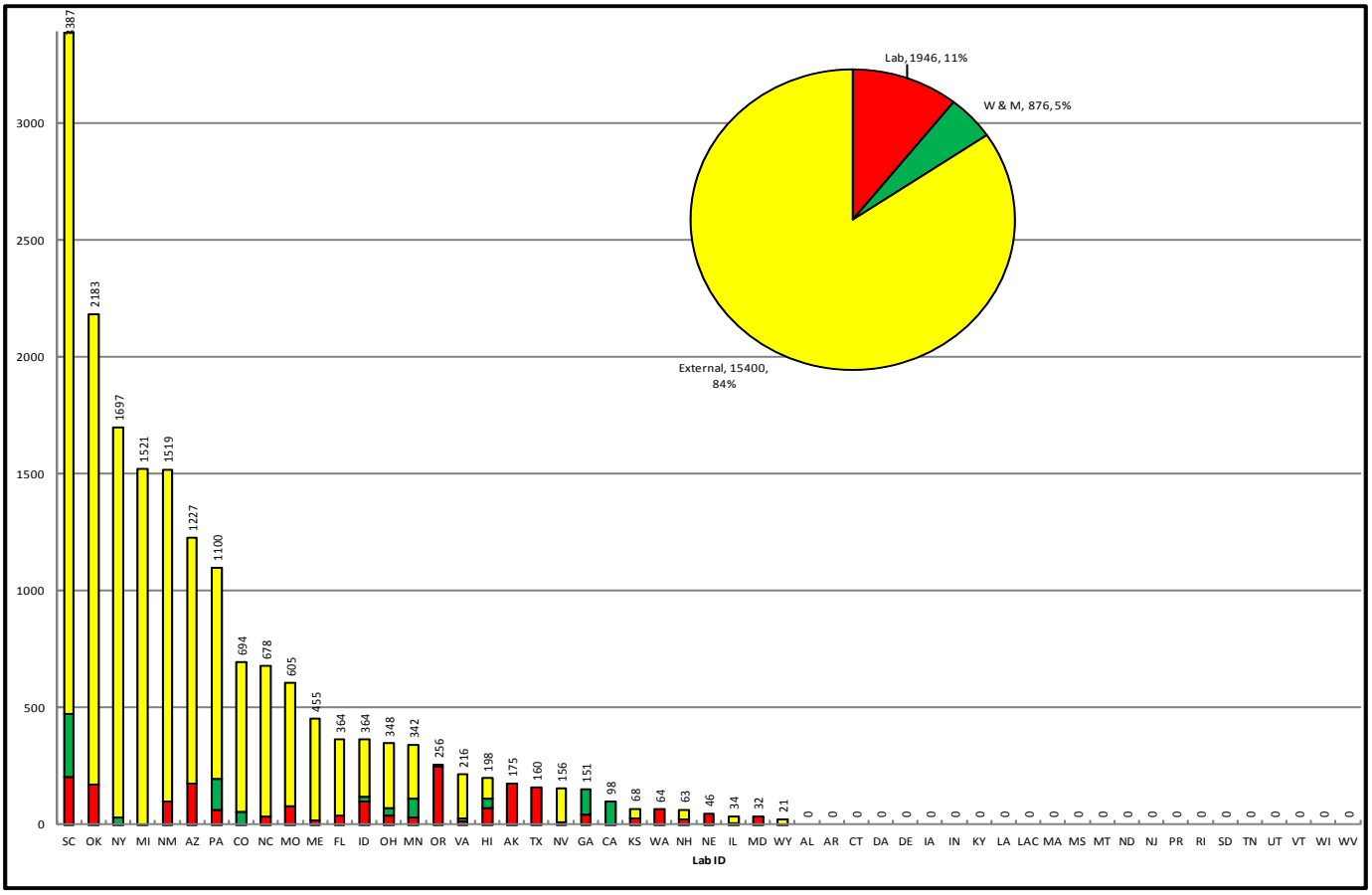


Figure 11: Mass Echelon II tests.

Mass Echelon III

Description

The graphs on the following page represent the total number of Mass Echelon III standards tested by the 47 reporting laboratories. The map graph gives a geographical distribution of these standards. There are pie graphs located on the map for each individual lab and a larger pie graph that reflects the totals. The pie graphs provide a breakdown into the customer categories of Lab, W&M, and External. The bar graph at the bottom of the page shows the same breakdown along with the total number of devices tested by each laboratory.

- Lab – work done for the internal use of the metrology laboratory.
- W&M – work done for the weights and measures enforcement program.
- External – work done for customers who do not fall into any of the above categories.

Findings

Of the 47 reporting laboratories, 47 labs tested a total of 240,550 mass standards

Comparison of previous surveys

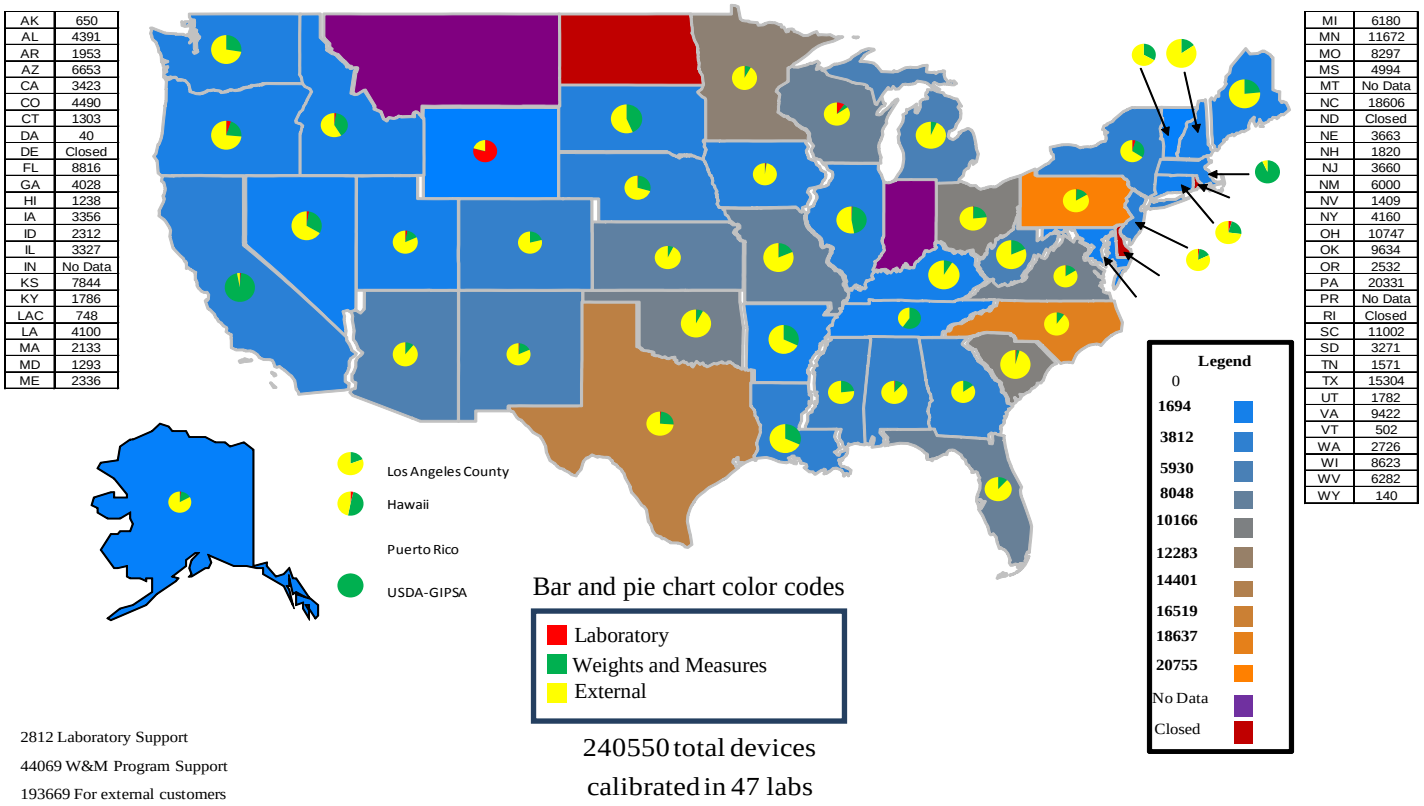
Year	# Labs	Total Devices
1996	51	259713
1998	46	259166
1999	45	257938
2000	45	260072
2002	47	267240
2004	47	248117
2005	46	248650
2006	49	256844
2008	50	254221
2010	47	256094
2012	47	240550

Table 8: Echelon III tests reported on previous surveys.

Notes and Comments

- 1 % of all Mass III standards were calibrated for internal use by the laboratory.
- 18 % of all Mass III standards were calibrated for the weight and measures program.
- 81 % of all Mass III standards were calibrated for external customers.

Mass Echelon III



AK	650
AL	4391
AR	1953
AZ	6653
CA	3423
CO	4490
CT	1303
DA	40
DE	Closed
FL	8816
GA	4028
HI	1238
IA	3356
ID	2312
IL	3327
IN	No Data
KS	7844
KY	1786
LAC	748
LA	4100
MA	2133
MD	1293
ME	2336

MI	6180
MN	11672
MO	8297
MS	4994
MT	No Data
NC	18606
ND	Closed
NE	3663
NH	1820
NJ	3660
NM	6000
NV	1409
NY	4160
OH	10747
OK	9634
OR	2532
PA	20331
PR	No Data
RI	Closed
SC	11002
SD	3271
TN	1571
TX	15304
UT	1782
VA	9422
VT	502
WA	2726
WI	8623
WV	6282
WY	140

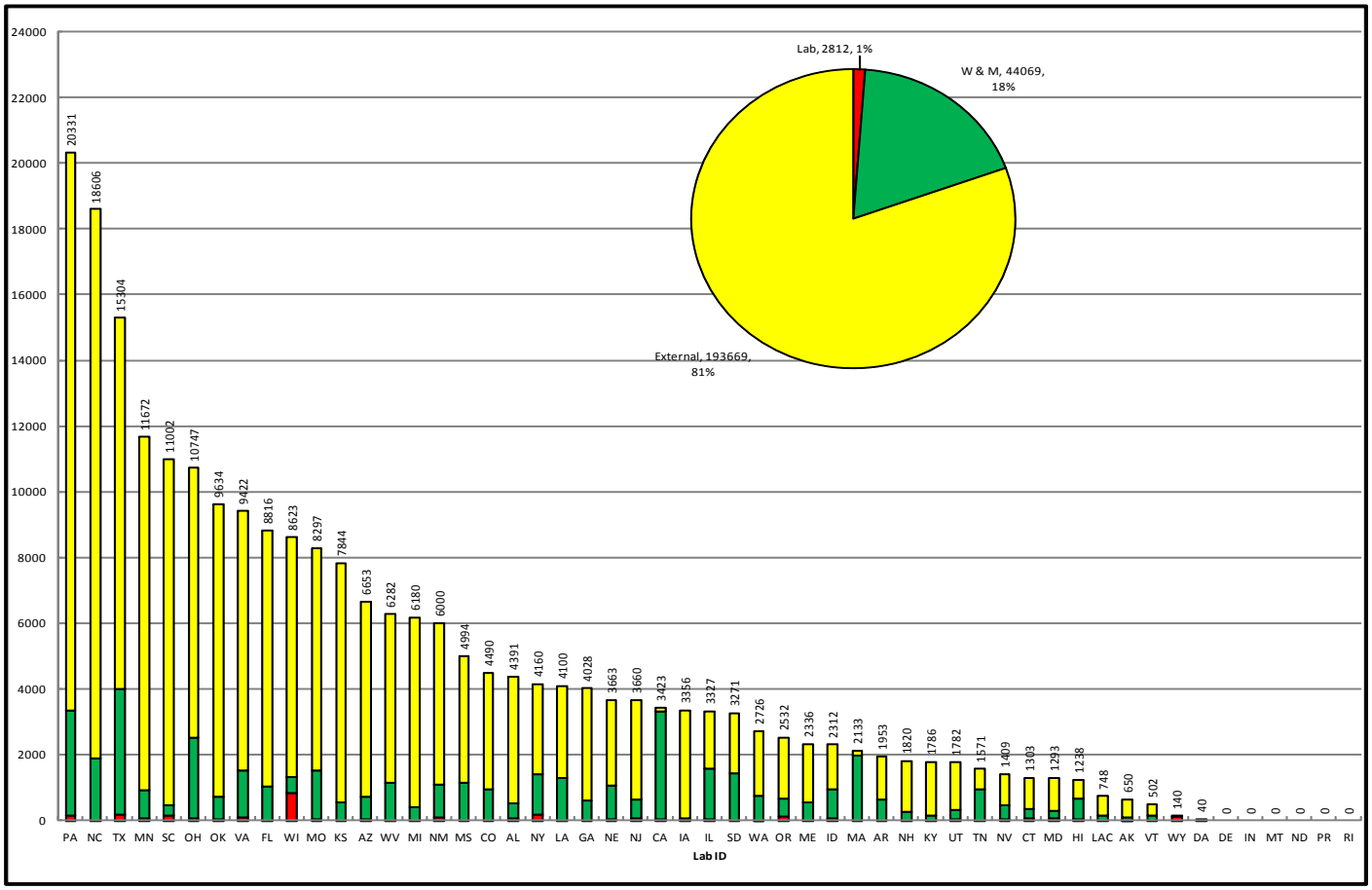


Figure 12: Mass Echelon III tests.

Weight Carts

Description

The graphs on the following page represent the total number of weight carts tested by the 47 reporting laboratories. The map graph gives a geographical distribution of these standards. There are pie graphs located on the map for each individual lab and a larger pie graph that reflects the totals. The pie graphs provide a breakdown into the customer categories of Lab, W&M, and External. The bar graph at the bottom of the page shows the same breakdown along with the total number of devices tested by each laboratory.

- Lab – work done for the internal use of the metrology laboratory.
- W&M – work done for the weights and measures enforcement program.
- External – work done for customers who do not fall into any of the above categories.

Findings

Of the 47 reporting laboratories, 31 labs tested a total of 433 weight carts

Comparison of previous surveys

Year	# Labs	Total Devices
1998	30	297
2000	27	344
2002	29	388
2004	33	365
2005	30	410
2006	31	388
2008	32	445
2010	35	468
2012	31	433

Table 9: Weight Cart tests reported on previous surveys.

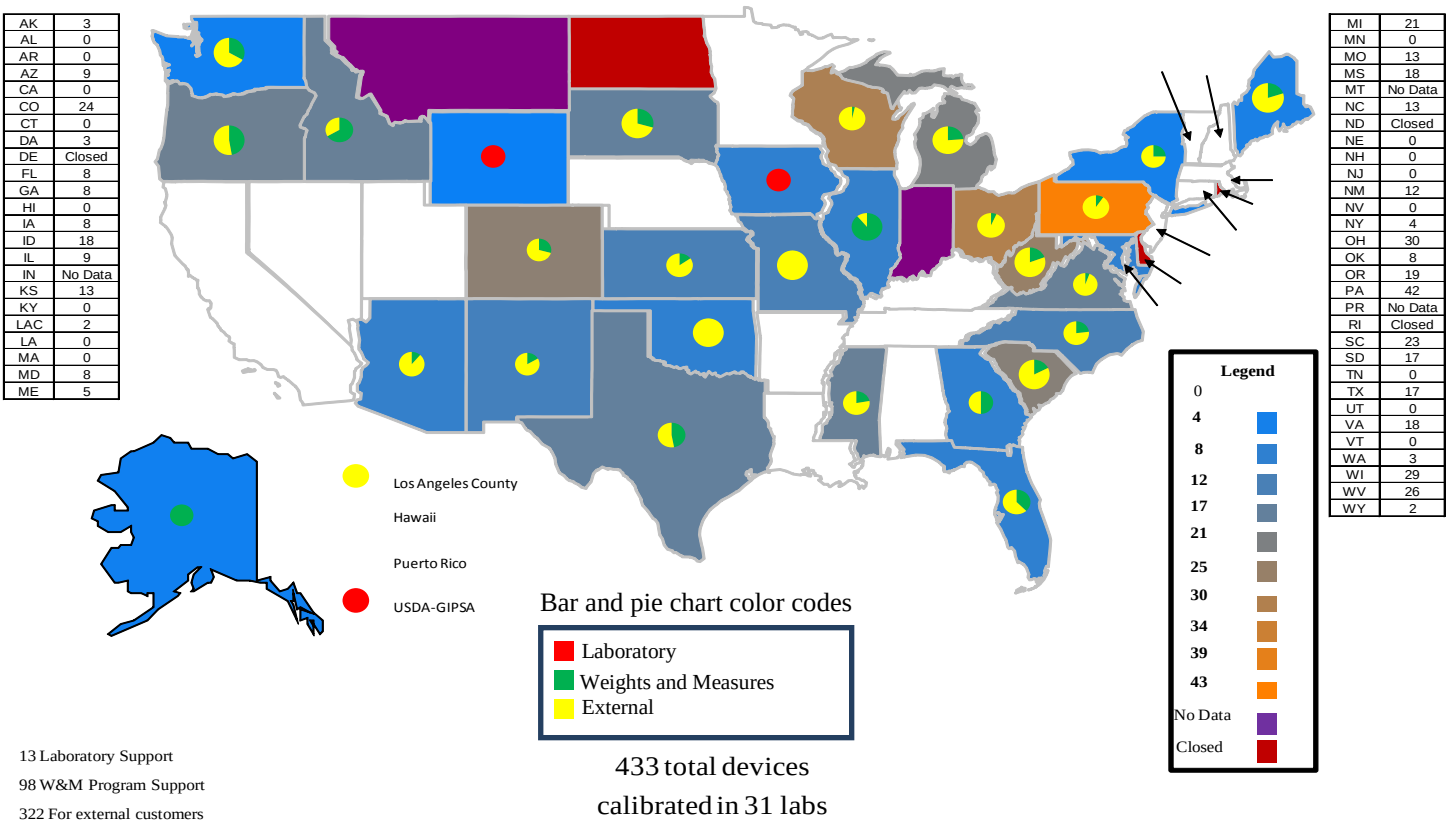
Notes and Comments

- 13 % of all weight carts were calibrated for internal use by the laboratory.
- 23 % of all weight carts were calibrated for the weight and measures program.
- 74 % of all weight carts were calibrated for external customers.

Weight Carts

AK	3
AL	0
AR	0
AZ	9
CA	0
CO	24
CT	0
DA	3
DE	Closed
FL	8
GA	8
HI	0
IA	8
ID	18
IL	9
IN	No Data
KS	13
KY	0
LAC	2
LA	0
MA	0
MD	8
ME	5

MI	21
MN	0
MO	13
MS	18
MT	No Data
NC	13
ND	Closed
NE	0
NH	0
NJ	0
NM	12
NV	0
NY	4
OH	30
OK	8
OR	19
PA	42
PR	No Data
RI	Closed
SC	23
SD	17
TN	0
TX	17
UT	0
VA	18
VT	0
WA	3
WI	29
WV	26
WY	2



Bar and pie chart color codes

- Laboratory
- Weights and Measures
- External

13 Laboratory Support

98 W&M Program Support

322 For external customers

433 total devices calibrated in 31 labs

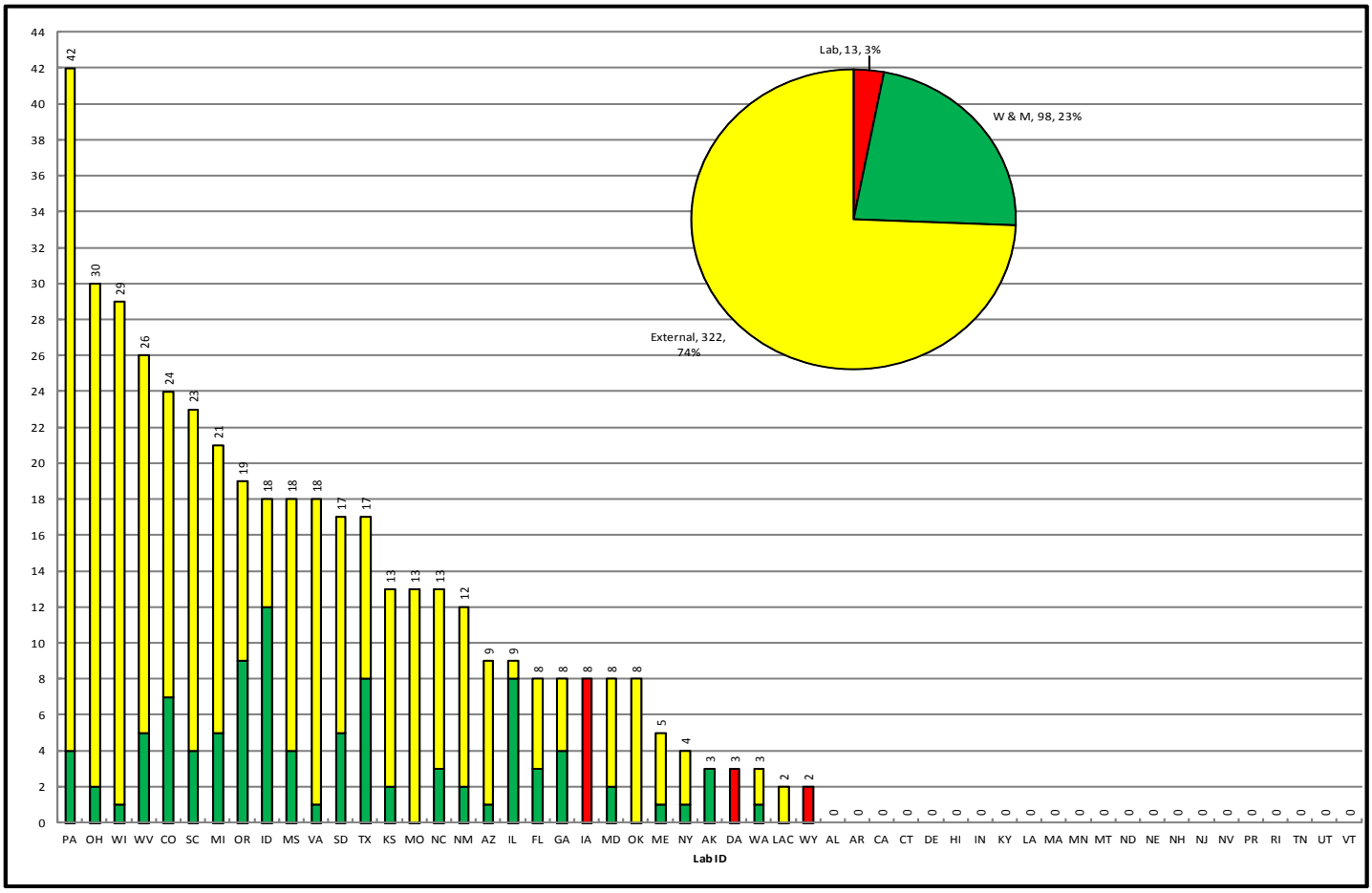


Figure 13: Weight Cart tests.

Length

SLP Laboratories normally test two distinct classes of length standards, steel tape measures (surveyor's tapes or pi tapes for example) and rigid steel rules.

A typical measurement procedure for calibrating a rigid steel rule (for example see SOP No. 10 in National Bureau of Standards (NBS) Handbook 145) involves the side by side comparison of two rigid steel rules with the aid of a microscope. Two measurement procedures are commonly employed by the SLP laboratories to test steel tape measures. One involves the direct comparison of two flat steel tapes (for example see SOP No. 12 in National Bureau of Standards (NBS) Handbook 145) the other a direct comparison of a surveyor tape to a fixed length bench calibrated at 1 ft intervals out to 16 ft (for example see SOP No. 11 in National Bureau of Standards (NBS) Handbook 145).

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Steel Tape Measures

Description

The graphs on the following page represent the total number of tape measures tested by the 47 reporting laboratories. The map graph gives a geographical distribution of these standards. There are pie graphs located on the map for each individual lab and a larger pie graph that reflects the totals. The pie graphs provide a breakdown into the customer categories of Lab, W&M, and External. The bar graph at the bottom of the page shows the same breakdown along with the total number of devices tested by each laboratory.

- Lab – work done for the internal use of the metrology laboratory.
- W&M – work done for the weights and measures enforcement program.
- External – work done for customers who do not fall into any of the above categories.

Findings

Of the 47 reporting laboratories, 12 labs tested a total of 353 tape measures

Comparison of previous surveys

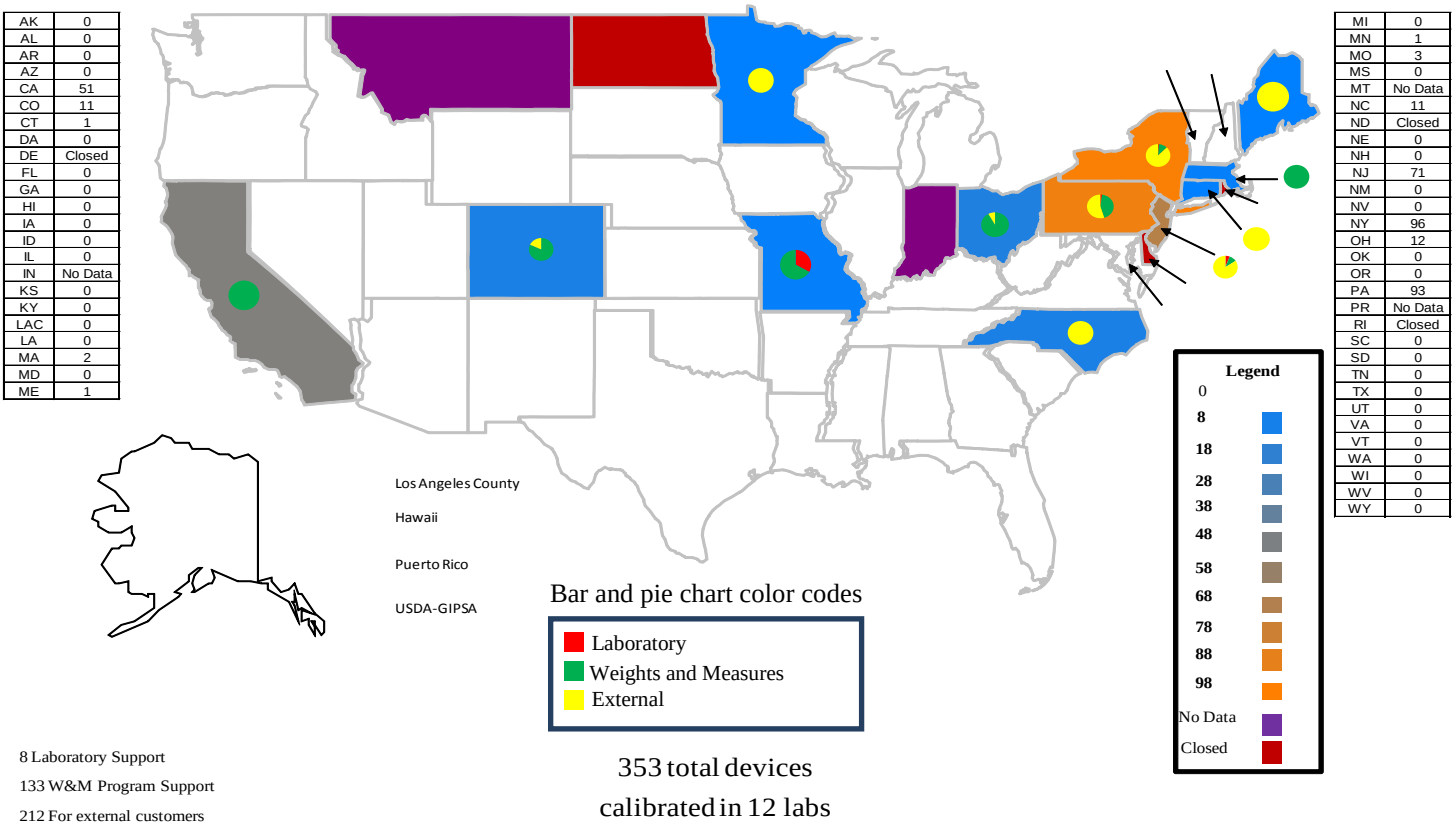
Year	# Labs	Total Devices
1996	27	707
1998	29	537
1999	21	566
2000	22	487
2002	21	584
2004	21	319
2005	19	304
2006	18	339
2008	17	425
2010	15	310
2012	12	353

Table 10: Tape measure tests reported on previous surveys.

Notes and Comments

- 2 % of all tape measures were tested for internal use by the laboratory.
- 38 % of all tape measures were tested for the weight and measures program.
- 60 % of all tape measures were tested for external customers.

Tapes



AK	0
AL	0
AR	0
AZ	0
CA	51
CO	11
CT	1
DA	0
DE	Closed
FL	0
GA	0
HI	0
IA	0
ID	0
IL	0
IN	No Data
KS	0
KY	0
LAC	0
LA	0
MA	2
MD	0
ME	1

MI	0
MN	1
MO	3
MS	0
MT	No Data
NC	11
ND	Closed
NE	0
NH	0
NJ	71
NM	0
NV	0
NY	96
OH	12
OK	0
OR	0
PA	93
PR	No Data
RI	Closed
SC	0
SD	0
TN	0
TX	0
UT	0
VA	0
VT	0
WA	0
WI	0
WV	0
WY	0

8 Laboratory Support
133 W&M Program Support
212 For external customers

353 total devices calibrated in 12 labs

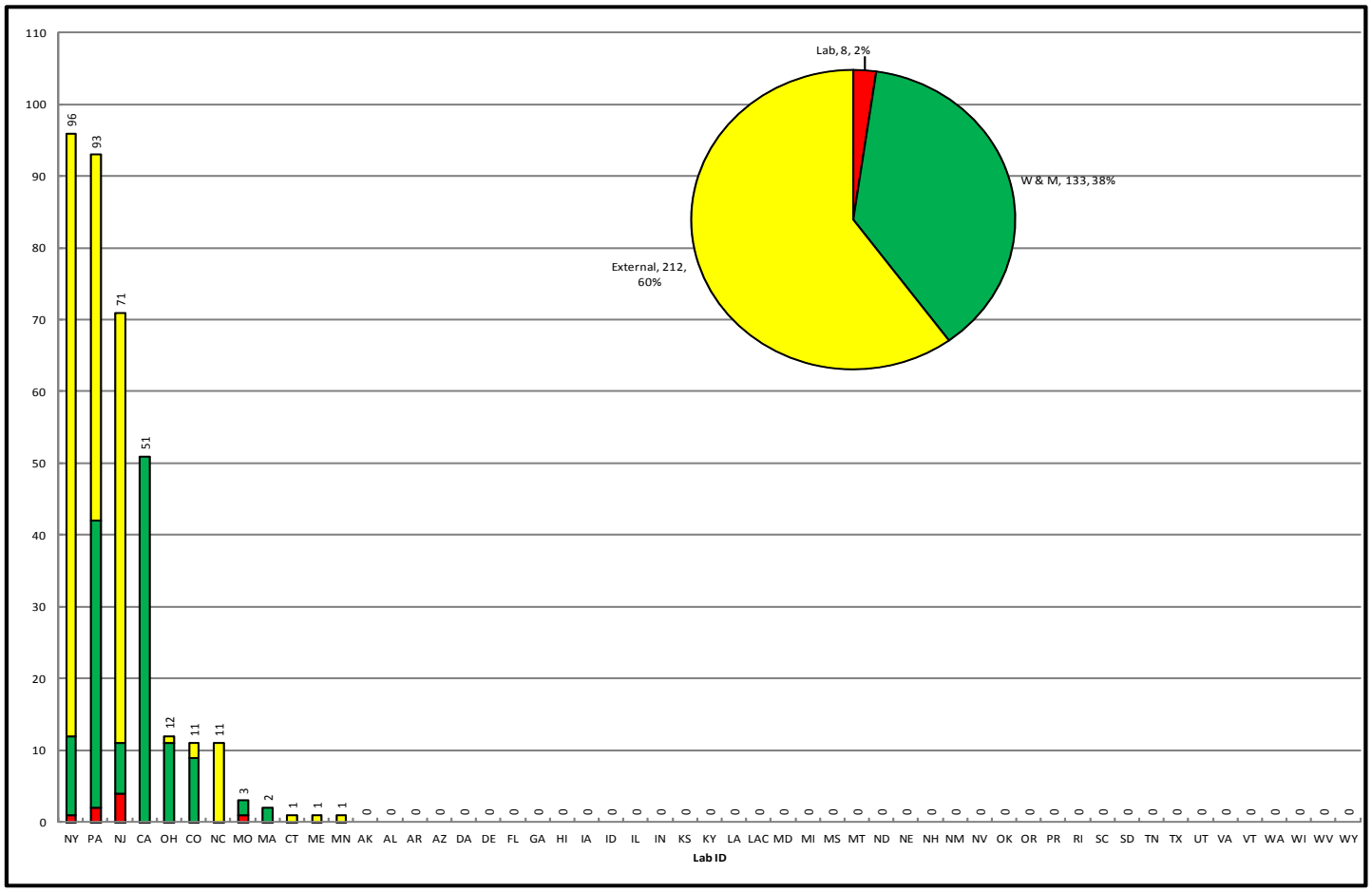


Figure 14: Tape Measure tests.

Rigid Rules

Description

The graphs on the following page represent the total number of rigid rules tested by the 47 reporting laboratories. The map graph gives a geographical distribution of these standards. There are pie graphs located on the map for each individual lab and a larger pie graph that reflects the totals. The pie graphs provide a breakdown into the customer categories of Lab, W&M, and External. The bar graph at the bottom of the page shows the same breakdown along with the total number of devices tested by each laboratory.

- Lab – work done for the internal use of the metrology laboratory.
- W&M – work done for the weights and measures enforcement program.
- External – work done for customers who do not fall into any of the above categories.

Findings

Of the 47 reporting laboratories, 3 labs tested a total of 85 rigid rules.

Comparison of previous surveys

Year	# Labs	Total Devices
1996	26	582
1998	29	269
1999	20	413
2000	16	169
2002	14	138
2004	12	98
2005	11	85
2006	11	122
2008	11	88
2010	8	89
2012	3	85

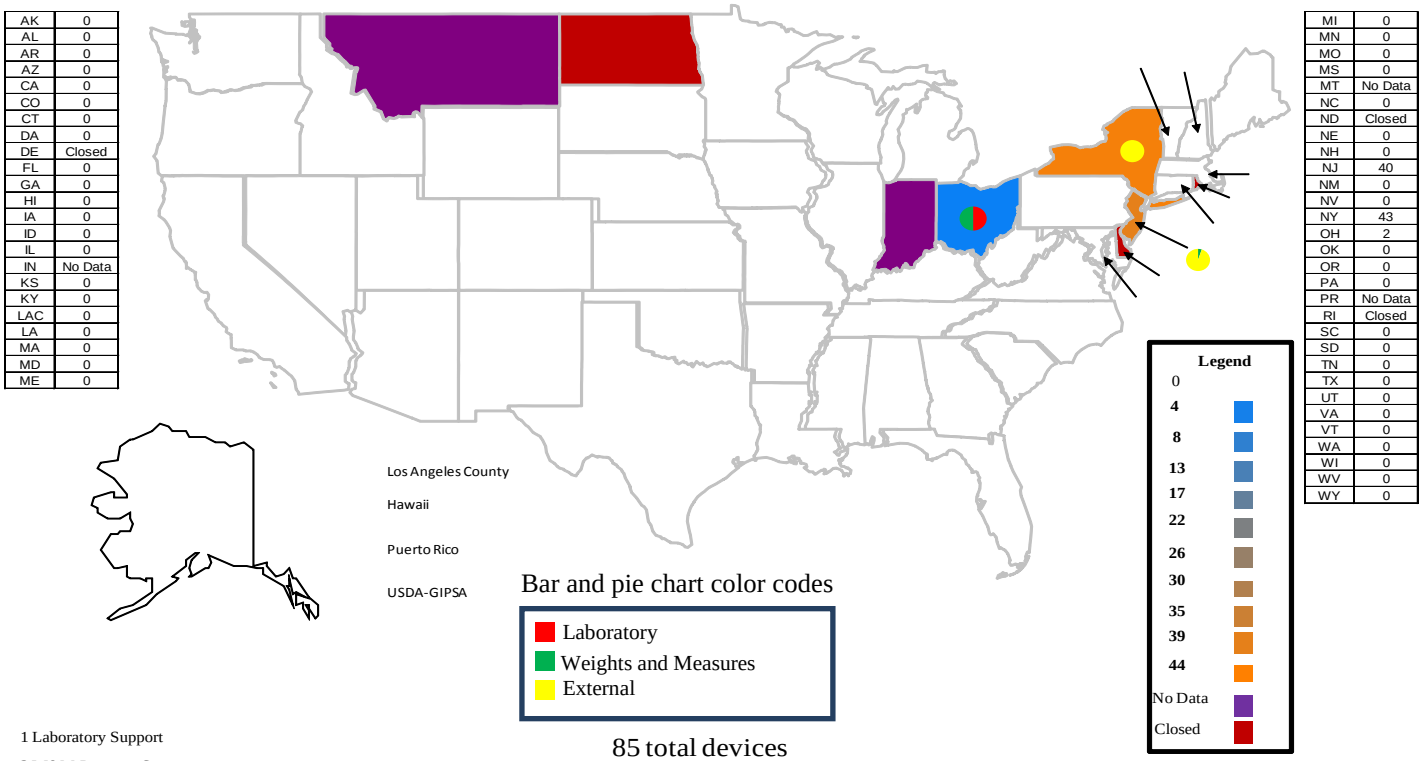
Table 11: Rigid rule tests reported in previous surveys.

Notes and Comments

- 1 % of all rigid rules were tested for internal use by the laboratory.
- 4 % of all rigid rules were tested for the weight and measures program.
- 95 % of all rigid rules were tested for external customers.

Rigid Rules

AK	0
AL	0
AR	0
AZ	0
CA	0
CO	0
CT	0
DA	0
DE	Closed
FL	0
GA	0
HI	0
IA	0
ID	0
IL	0
IN	No Data
KS	0
KY	0
LAC	0
LA	0
MA	0
MD	0
ME	0



MI	0
MN	0
MO	0
MS	0
MT	No Data
NC	0
ND	Closed
NE	0
NH	0
NJ	40
NM	0
NV	0
NY	43
OH	2
OK	0
OR	0
PA	0
PR	No Data
RI	Closed
SC	0
SD	0
TN	0
TX	0
UT	0
VA	0
VT	0
WA	0
WI	0
WV	0
WY	0

1 Laboratory Support

3 W&M Program Support

81 For external customers

85 total devices calibrated in 3 labs

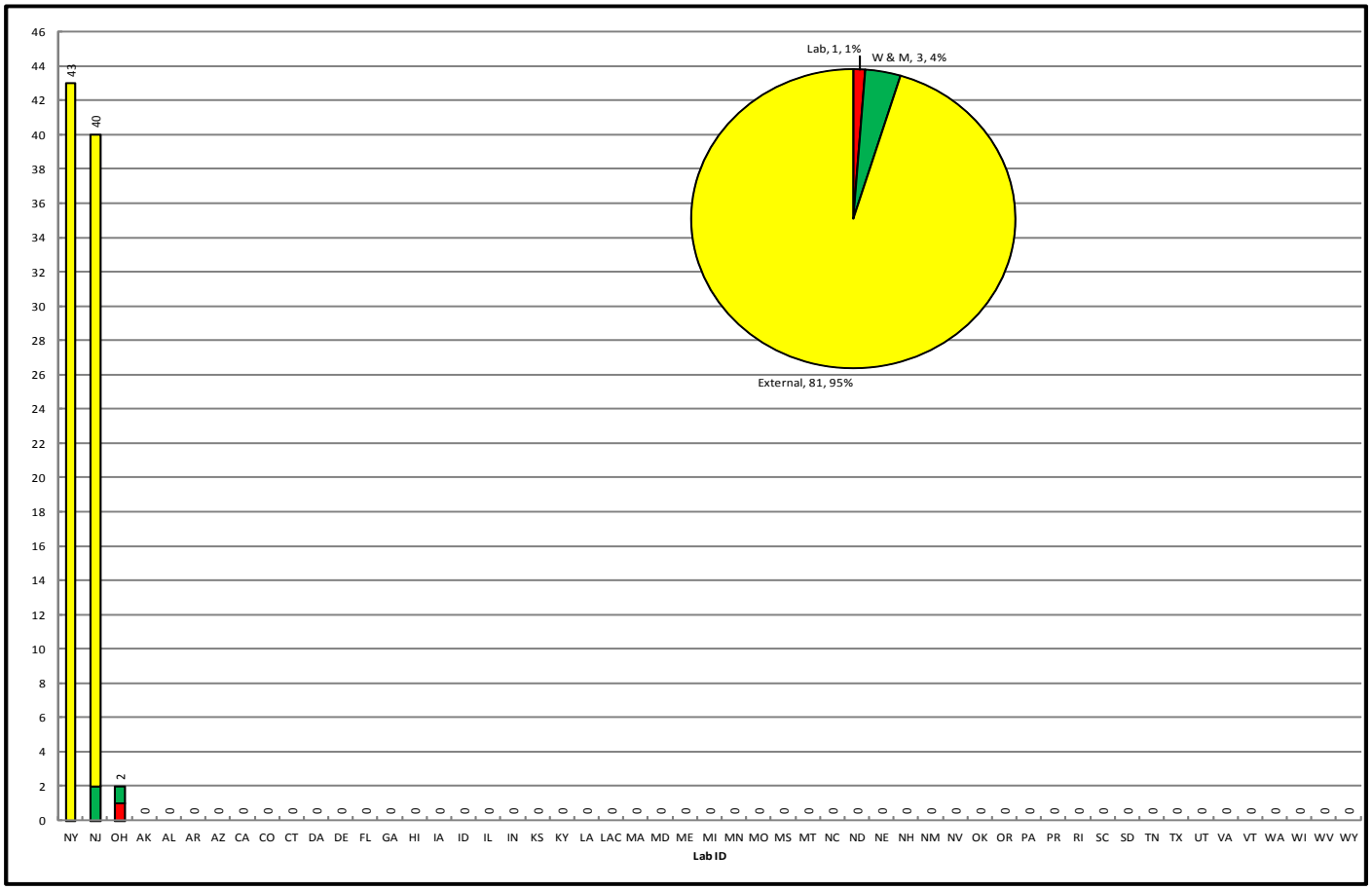


Figure 15: Rigid rule tests.

Volume

Of the measurement services provided by the SLP, volume measurement service is the second most common next to mass measurement. Volume measurement is broken down into distinct categories based on the class of device tested. They are glassware, volume test measures (≤ 5 gallon), medium volume provers (>5 gallon and ≤ 100 gallon), and large volume provers (> 100 gallon).

Glassware consists of laboratory glassware (see for example ASTM E288 (10)) and field measuring flasks (as described in NIST Handbook 105-2 (11)). Steel graduated neck test measures are described in NIST Handbook 105-3 and in American Petroleum Institute's Manual of Petroleum Measurement Standards (Chapter 4) (12). These are normally the steel 5 gallon capacity test measures used to test motor fuel dispensers at the retail level. Steel graduated neck provers are generally distinguished from test measures by their bottom drain design. Test measures are emptied by lifting and pouring; Provers are usually mounted and drained through a butterfly valve at the bottom of the device. Since provers do not require lifting, these are the only devices manufactured in suitable sizes for testing high volume meters. Liquefied Petroleum Gas (LPG) Provers are described in HIST Handbook 105-4 and are separated as a distinct class of devices as they are pressure vessels. LPG is liquid at ambient temperatures only at elevated pressures (typical LPG provers incorporate a pressure gauge reading up to 200 psi). Dynamic small volume provers are described in NIST Handbook 105-7. Slicker plate standards may also be included in these sections but they are not explicitly broken out into a separate category. These devices do not have a graduated neck; a slicker plate is used to skim off the meniscus formed at the top of the vessel when filled. It is not useful for testing liquid meters as it is designed to dispense a fixed amount of liquid when the bottom valve is opened and the slicker plate is removed. They are used to calibrate graduated neck provers.

Volume tests are further subdivided into two measurement categories. Volume standards are calibrated by transferring a known quantity of liquid (usually clean water) into them (See SOP's 16, 18, and 19 of NIST Internal Report 7383). Alternatively the volume standard may be tested by filling it with a well characterized liquid (typically distilled water) and weighed (See SOPs 13 and 14 of NIST Internal Report 7383). The testing of LPG provers is covered under a separate volume transfer procedure because of the need to pressurize the vessel during calibration (see SOP 21 of NIST Internal Report 7383). The testing of a dynamic small volume prover is covered under a separate gravimetric procedure because of the need to minimize uncertainties during calibration (see SOP 26 of NIST Internal Report 7383).

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Glassware

Description

The graphs on the next two pages represent the total number of volume tests performed on glassware by the 47 reporting laboratories using either a volume transfer (page 57) or gravimetric method (page 58). Each map graph gives a geographical distribution of these standards. There are pie graphs located on each map for each individual lab and a larger pie graph that reflects the totals. The pie graphs provide a breakdown into the customer categories of Lab, W&M, and External. The bar graph at the bottom of the page shows the same breakdown along with the total number of devices tested by each laboratory.

- Lab – work done for the internal use of the metrology laboratory.
- W&M – work done for the weights and measures enforcement program.
- External – work done for customers who do not fall into any of the above categories.

Findings

- Of the 47 reporting laboratories, 3 labs performed a total of 170 volume transfer tests.
- Of the 47 reporting laboratories, 6 labs performed a total of 78 gravimetric volume tests. (NY did both.)

Comparison of previous surveys

Year	# Labs	Volume Transfer	Gravimetric	Total
1996	29			1205
1998	24			844
1999	25			853
2000	27			668
2002	24			555
2004	17			332
2005	20	69	140	209
2006	18	82	172	254
2008	18	42	183	225
2010	16	43	288	331
2012	8	170	78	248

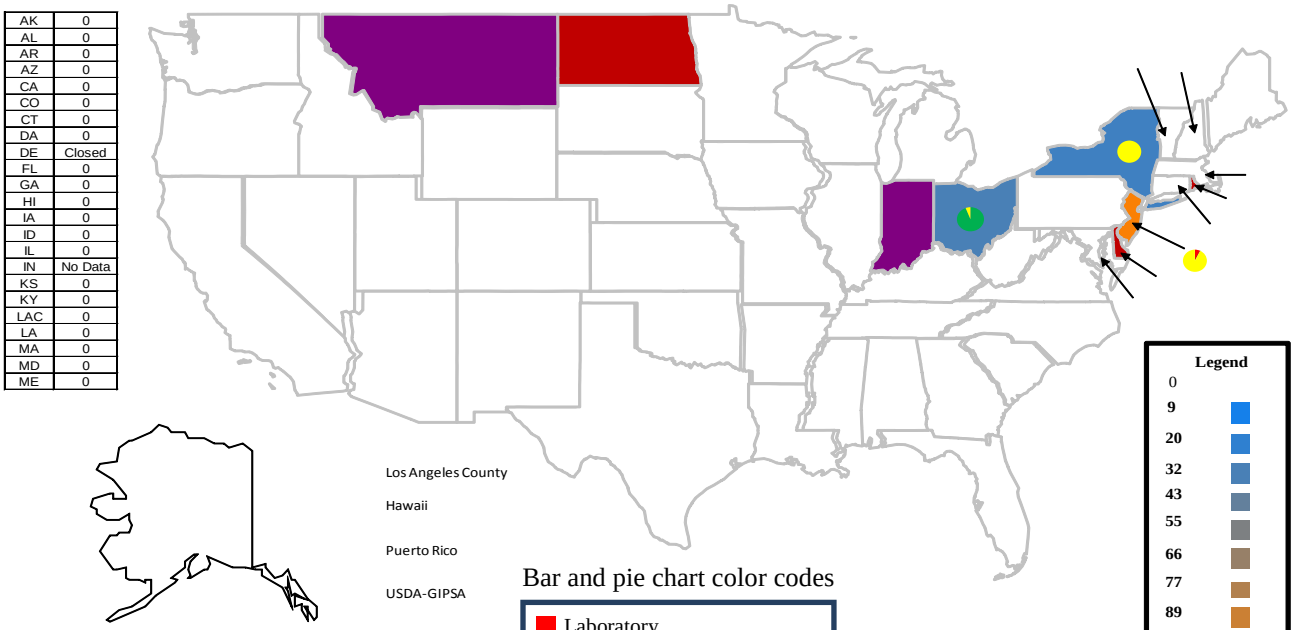
Table 12: Glassware calibrations from previous surveys.

Notes and Comments

- 10 % of all glassware standards were tested for the laboratory
- 30 % of all glassware standards were tested for Weights and Measures enforcement programs.
- 60 % of all glassware standards were tested for external customers.

Glassware
Volume Transfer

AK	0
AL	0
AR	0
AZ	0
CA	0
CO	0
CT	0
DA	0
DE	Closed
FL	0
GA	0
HI	0
IA	0
ID	0
IL	0
IN	No Data
KS	0
KY	0
LAC	0
LA	0
MA	0
MD	0
ME	0



MI	0
MN	0
MO	0
MS	0
MT	No Data
NC	0
ND	Closed
NE	0
NH	0
NJ	109
NM	0
NV	0
NY	28
OH	33
OK	0
OR	0
PA	0
PR	No Data
RI	Closed
SC	0
SD	0
TN	0
TX	0
UT	0
VA	0
VT	0
WA	0
WI	0
WV	0
WY	0

Los Angeles County

Hawaii

Puerto Rico

USDA-GIPSA

Bar and pie chart color codes

- Laboratory
- Weights and Measures
- External

8 Laboratory Support

31 W&M Program Support

131 For external customers

170 total devices
calibrated in 3 labs

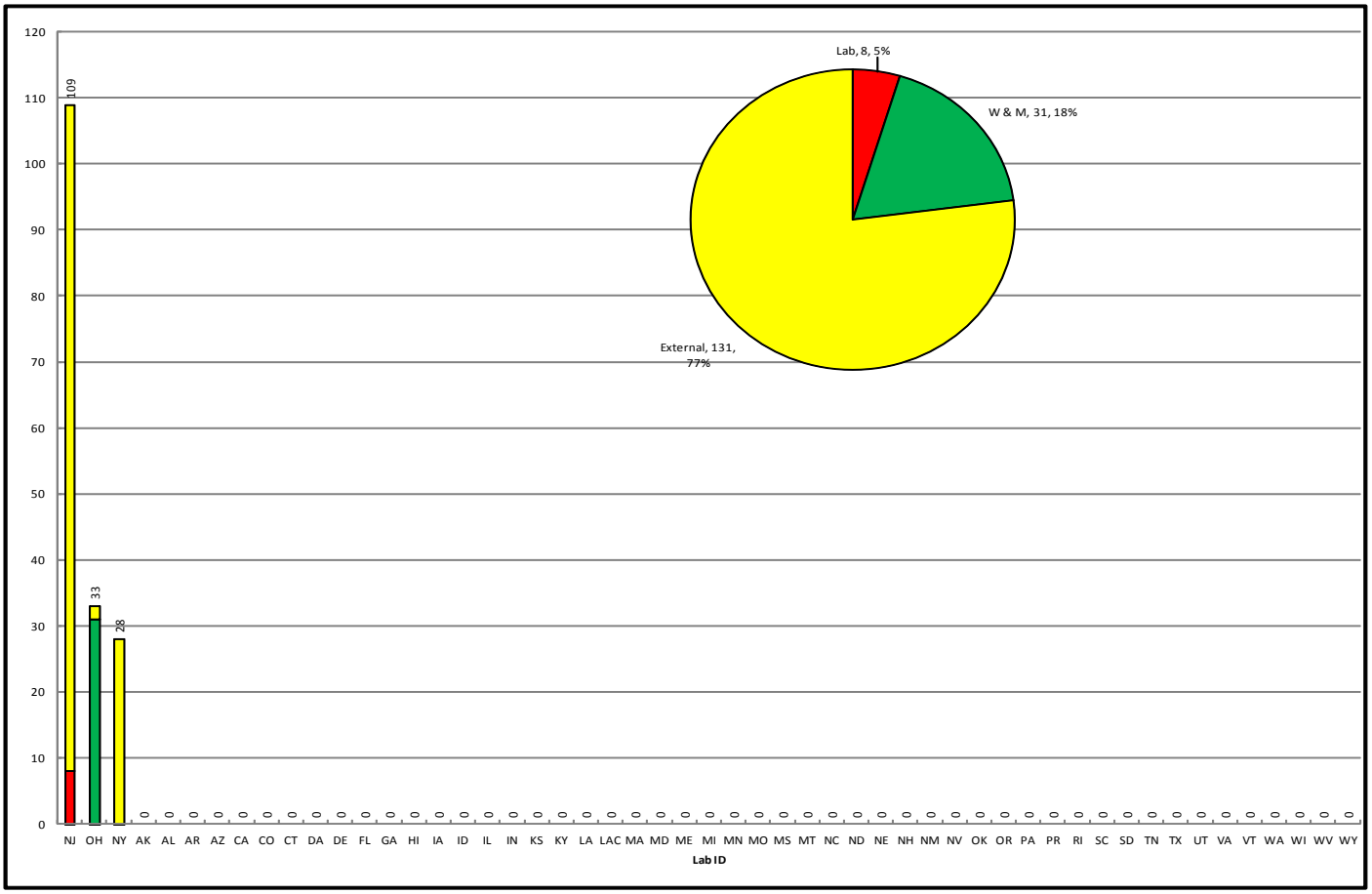
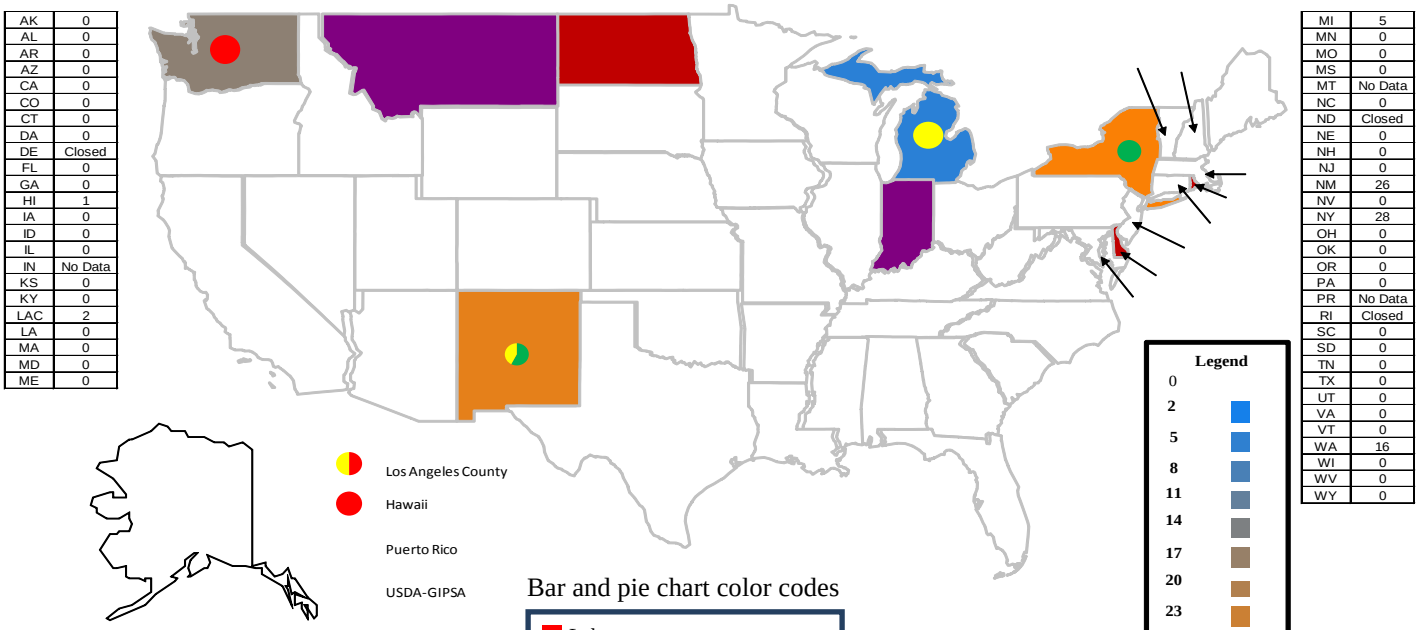


Figure 16: Glassware calibrations, volume transfer method

Glassware
Gravimetric

AK	0
AL	0
AR	0
AZ	0
CA	0
CO	0
CT	0
DA	0
DE	Closed
FL	0
GA	0
HI	1
IA	0
ID	0
IL	0
IN	No Data
KS	0
KY	0
LAC	2
LA	0
MA	0
MD	0
ME	0

MI	5
MN	0
MO	0
MS	0
MT	No Data
NC	0
ND	Closed
NE	0
NH	0
NJ	0
NM	26
NV	0
NY	28
OH	0
OK	0
OR	0
PA	0
PR	No Data
RI	Closed
SC	0
SD	0
TN	0
TX	0
UT	0
VA	0
VT	0
WA	16
WI	0
WV	0
WY	0



Bar and pie chart color codes

- Laboratory
- Weights and Measures
- External

78 total devices
calibrated in 6 labs

18 Laboratory Support
43 W&M Program Support
17 For external customers

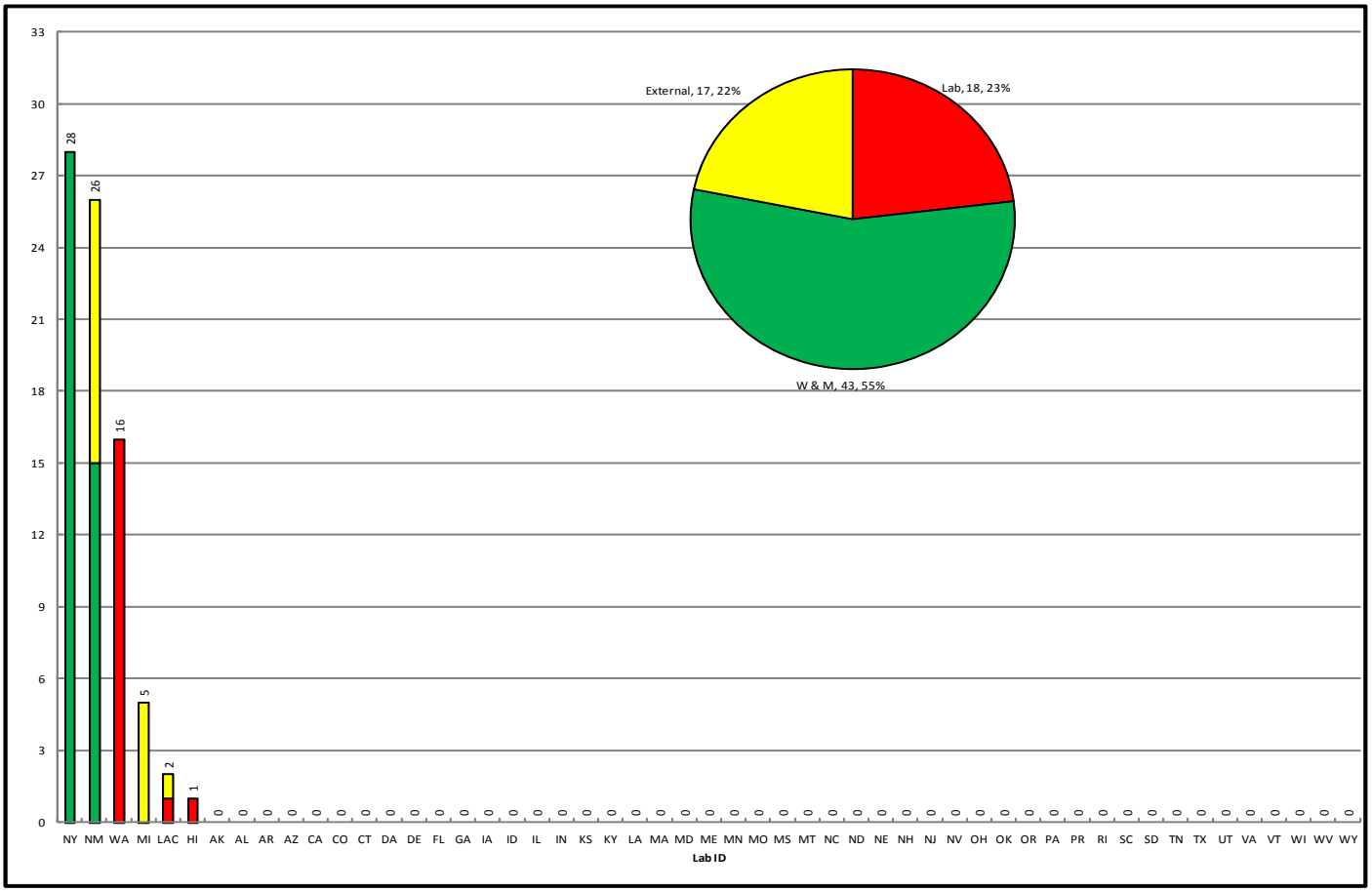


Figure 17: Glassware calibrations, gravimetric method.

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Test Measures (≤5 gallon)

Description

The graphs on the next two pages represent the total number of volume tests performed on metal volume test measures[3] by the 47 reporting laboratories using either a volume transfer (page 61) or gravimetric method (page 62). Each map graph gives a geographical distribution of these standards. There are pie graphs located on each map for each individual lab and a larger pie graph that reflects the totals. The pie graphs provide a breakdown into the customer categories of Lab, W&M, and External. The bar graph at the bottom of the page shows the same breakdown along with the total number of devices tested by each laboratory.

- Lab – work done for the internal use of the metrology laboratory.
- W&M – work done for the weights and measures enforcement program.
- External – work done for customers who do not fall into any of the above categories.

Findings

- Of the 47 reporting laboratories, 46 labs performed a total of 7533 volume transfer tests.
- Of the 47 reporting laboratories, 18 labs performed a total of 93 gravimetric volume tests.

Comparison of previous surveys

Year	# Labs	Volume Transfer	Gravimetric	Total
1996	48	8290		8290
1998	46	6861		6861
1999	45	6986		6986
2000	45	7368		7368
2002	48	6966		6966
2004	46	6400		6400
2005	42	6925	75	7000
2006	46	7532	77	7609
2008	49	7321	69	7390
2010	45	8216	73	8289
2012	46	7533	93	7626

Table 13: Test Measure (≤ 5 gallon) volume tests from previous surveys.

Notes and Comments

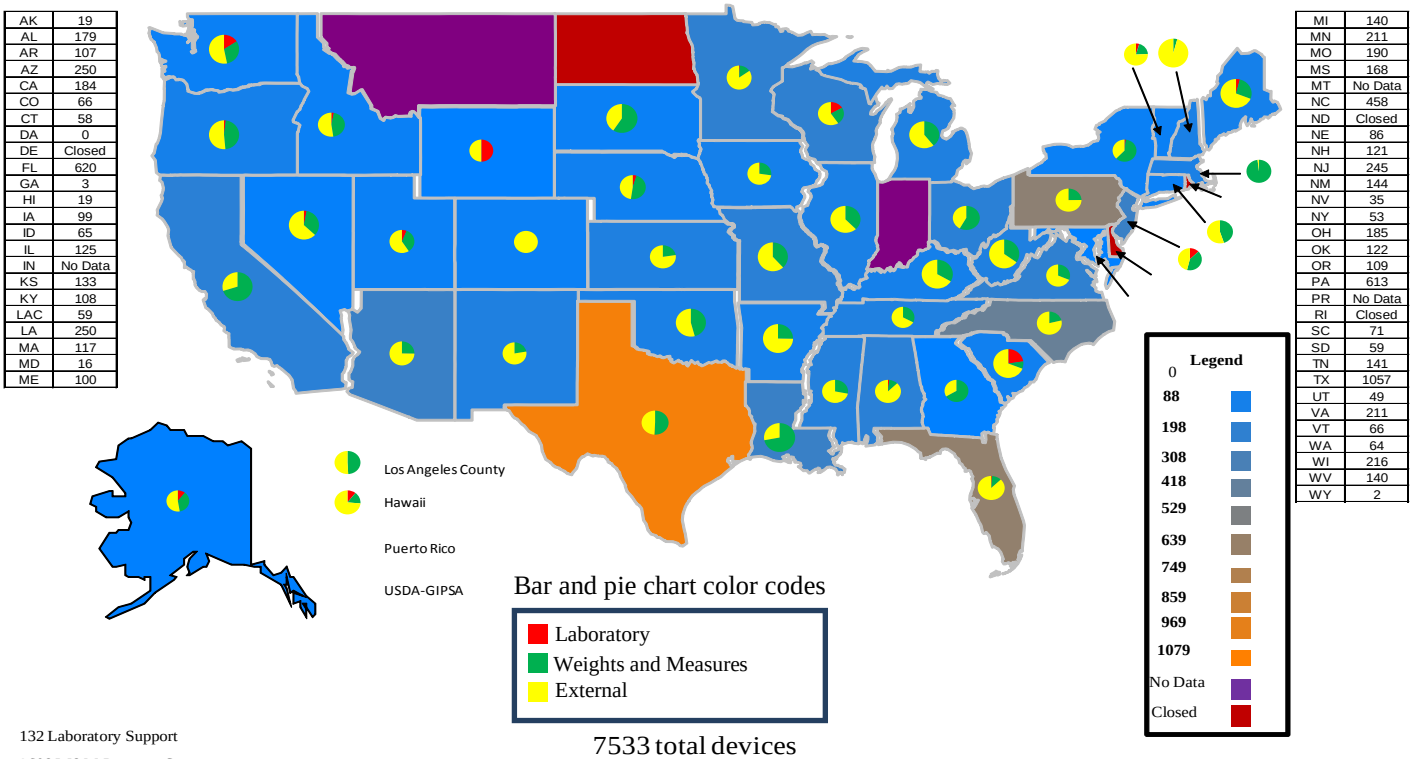
- 2 % of all test measures were tested for the laboratory
- 34 % of all test measures were tested for Weights and Measures enforcement programs.
- 64 % of all test measures were tested for external customers.

[3] This includes small bottom drain provers and laboratory slicker plate standards falling in this range of volumes.

Open Neck Volumetric Test Measures (≤5 gallon)
Volume Transfer

AK	19
AL	179
AR	107
AZ	250
CA	184
CO	66
CT	58
DA	0
DE	Closed
FL	620
GA	3
HI	19
IA	99
ID	65
IL	125
IN	No Data
KS	133
KY	108
LAC	59
LA	250
MA	117
MD	16
ME	100

MI	140
MN	211
MO	190
MS	168
MT	No Data
NC	458
ND	Closed
NE	86
NH	121
NJ	245
NM	144
NV	35
NY	53
OH	185
OK	122
OR	109
PA	613
PR	No Data
RI	Closed
SC	71
SD	59
TN	141
TX	1057
UT	49
VA	211
VT	66
WA	64
WI	216
WV	140
WY	2



132 Laboratory Support
2608 W&M Program Support
4793 For external customers

7533 total devices
calibrated in 46 labs

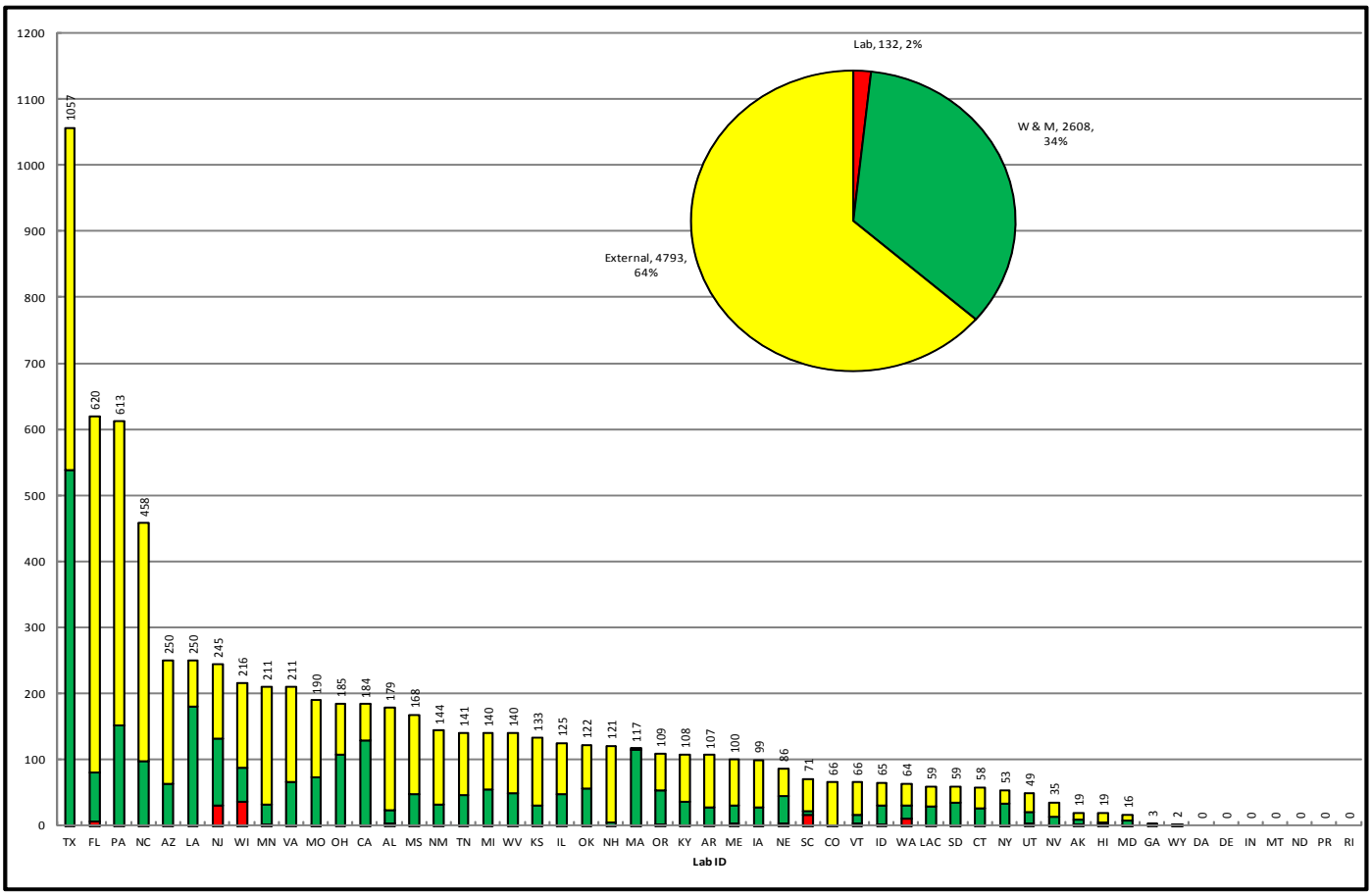
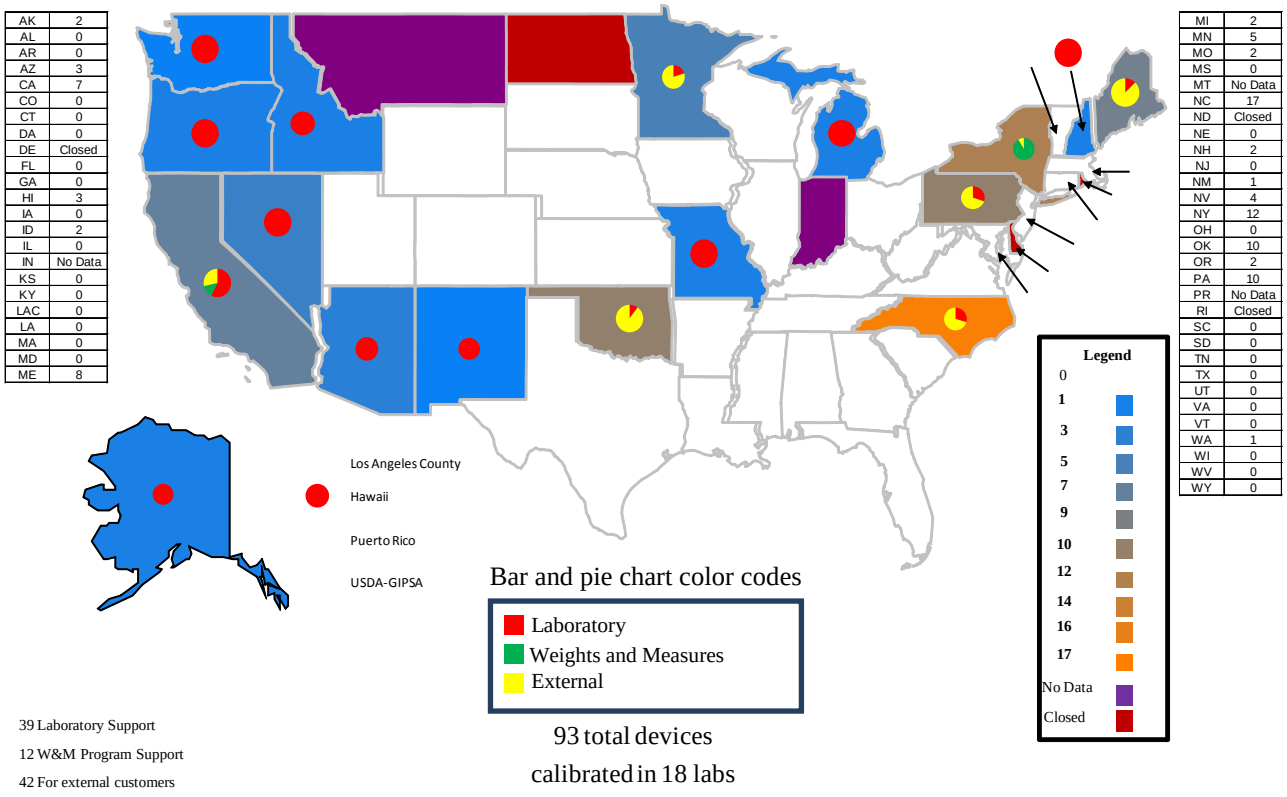


Figure 18: Test Measure tests (≤ 5 gallon), volume transfer.

Open Neck Volumetric Test Measures (≤5 gallon)
Gravimetric



AK	2
AL	0
AR	0
AZ	3
CA	7
CO	0
CT	0
DA	0
DE	Closed
FL	0
GA	0
HI	3
IA	0
ID	2
IL	0
IN	No Data
KS	0
KY	0
LAC	0
LA	0
MA	0
MD	0
ME	8

MI	2
MN	5
MO	2
MS	0
MT	No Data
NC	17
ND	Closed
NE	0
NH	2
NJ	0
NM	1
NV	4
NY	12
OH	0
OK	10
OR	2
PA	10
PR	No Data
RI	Closed
SC	0
SD	0
TN	0
TX	0
UT	0
VA	0
VT	0
WA	1
WI	0
WV	0
WY	0

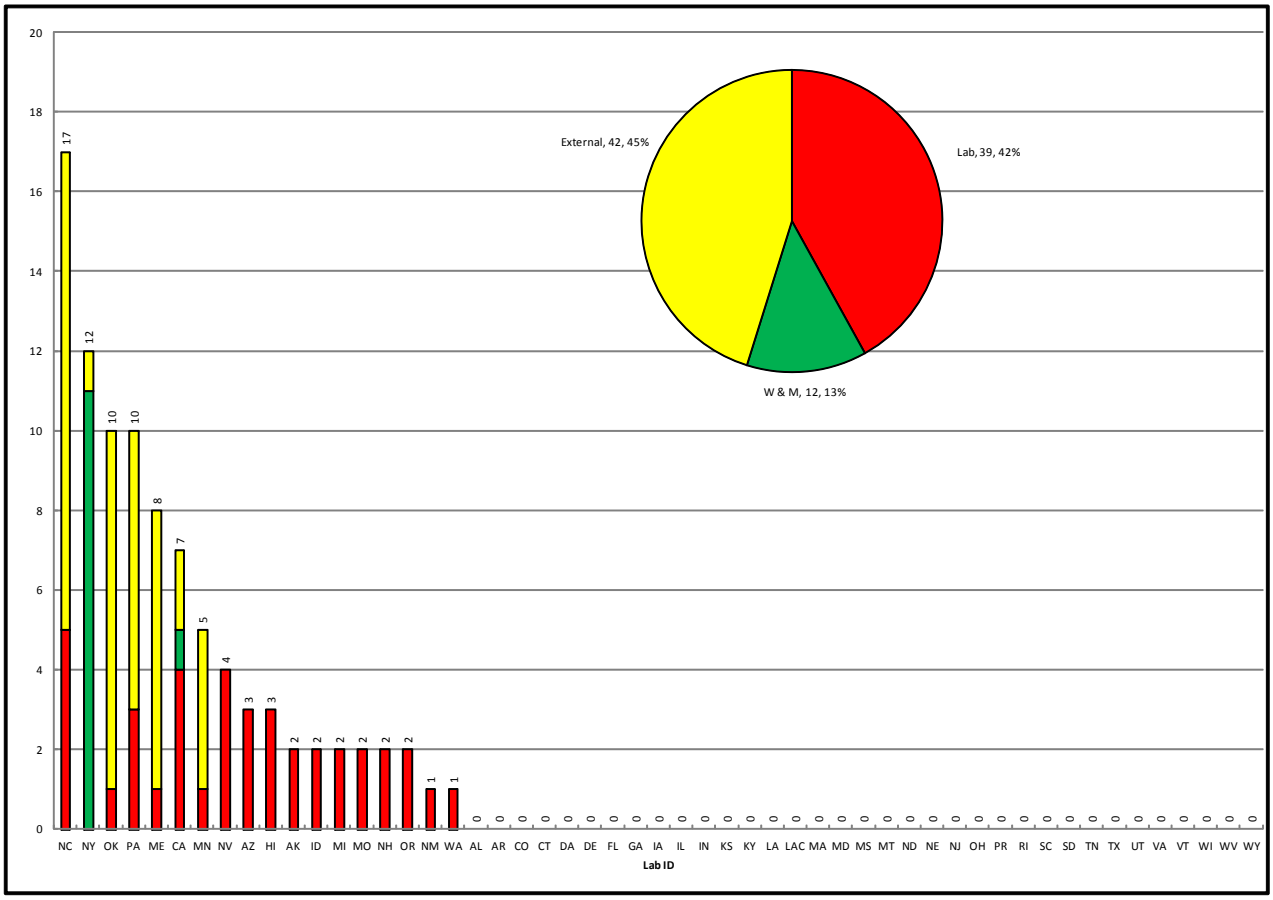


Figure 19: Test Measure tests (≤ 5 gallon), gravimetric.

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Provers (> 5 gallon and ≤ 100 gallon)

Description

The graphs on the next two pages represent the total number of volume tests performed on medium sized metal volume provers by the 47 reporting laboratories using either a volume transfer (page 65) or gravimetric method (page 66). The individual map graphs give a geographical distribution of these standards. There are pie graphs located on each map for each individual lab and a larger pie graph that reflects the totals. The pie graphs provide a breakdown into the customer categories of Lab, W&M, and External. The bar graph at the bottom of the page shows the same breakdown along with the total number of devices tested by each laboratory.

- Lab – work done for the internal use of the metrology laboratory.
- W&M – work done for the weights and measures enforcement program.
- External – work done for customers who do not fall into any of the above categories.

Findings

- Of the 47 reporting laboratories, 39 labs performed a total of 713 volume transfer tests.
- Of the 47 reporting laboratories, 5 labs performed a total of 31 gravimetric volume tests.

Comparison of previous surveys

Year	# Labs	Volume Transfer	Gravimetric	Total
2005		726	47	773
2006		760	81	841
2008		737	46	783
2010	41	711	49	760
2012	39	713	31	744

Table 14: Provers (> 5 gallon and ≤ 100 gallon) volume tests from previous surveys.

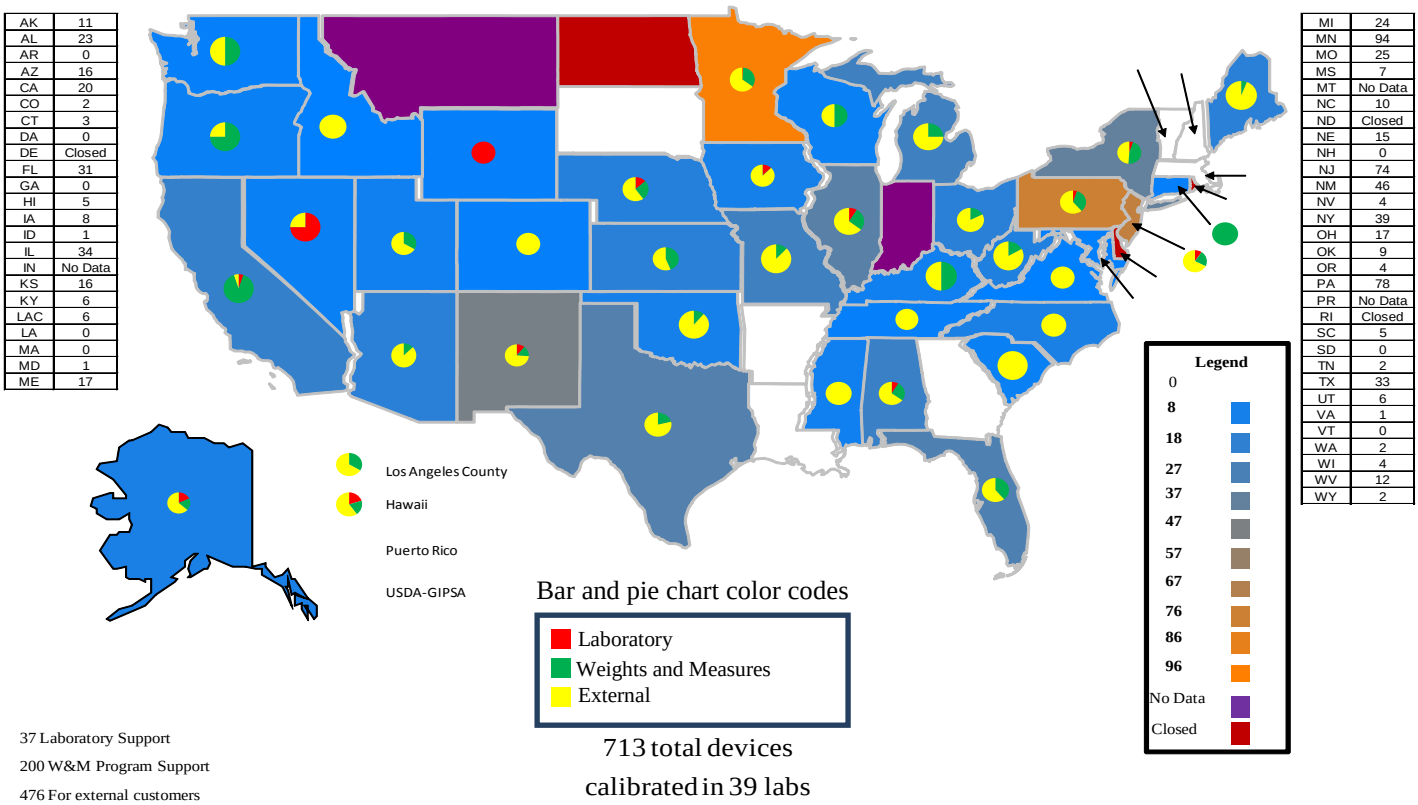
Notes and Comments

- 6 % of all provers (> 5 gallon and ≤ 100 gallon) were tested for the laboratory
- 27 % of all provers (> 5 gallon and ≤ 100 gallon) were tested for Weights and Measures enforcement programs.
- 67 % of all provers (> 5 gallon and ≤ 100 gallon) were tested for external customers.

Open Neck Volumetric Provers (>5 gallon and ≤100 gallon)
Volume Transfer

AK	11
AL	23
AR	0
AZ	16
CA	20
CO	2
CT	3
DA	0
DE	Closed
FL	31
GA	0
HI	5
IA	8
ID	1
IL	34
IN	No Data
KS	16
KY	6
LAC	6
LA	0
MA	0
MD	1
ME	17

MI	24
MN	94
MO	25
MS	7
MT	No Data
NC	10
ND	Closed
NE	15
NH	0
NJ	74
NM	46
NV	4
NY	39
OH	17
OK	9
OR	4
PA	78
PR	No Data
RI	Closed
SC	5
SD	0
TN	2
TX	33
UT	6
VA	1
VT	0
WA	2
WI	4
WV	12
WY	2



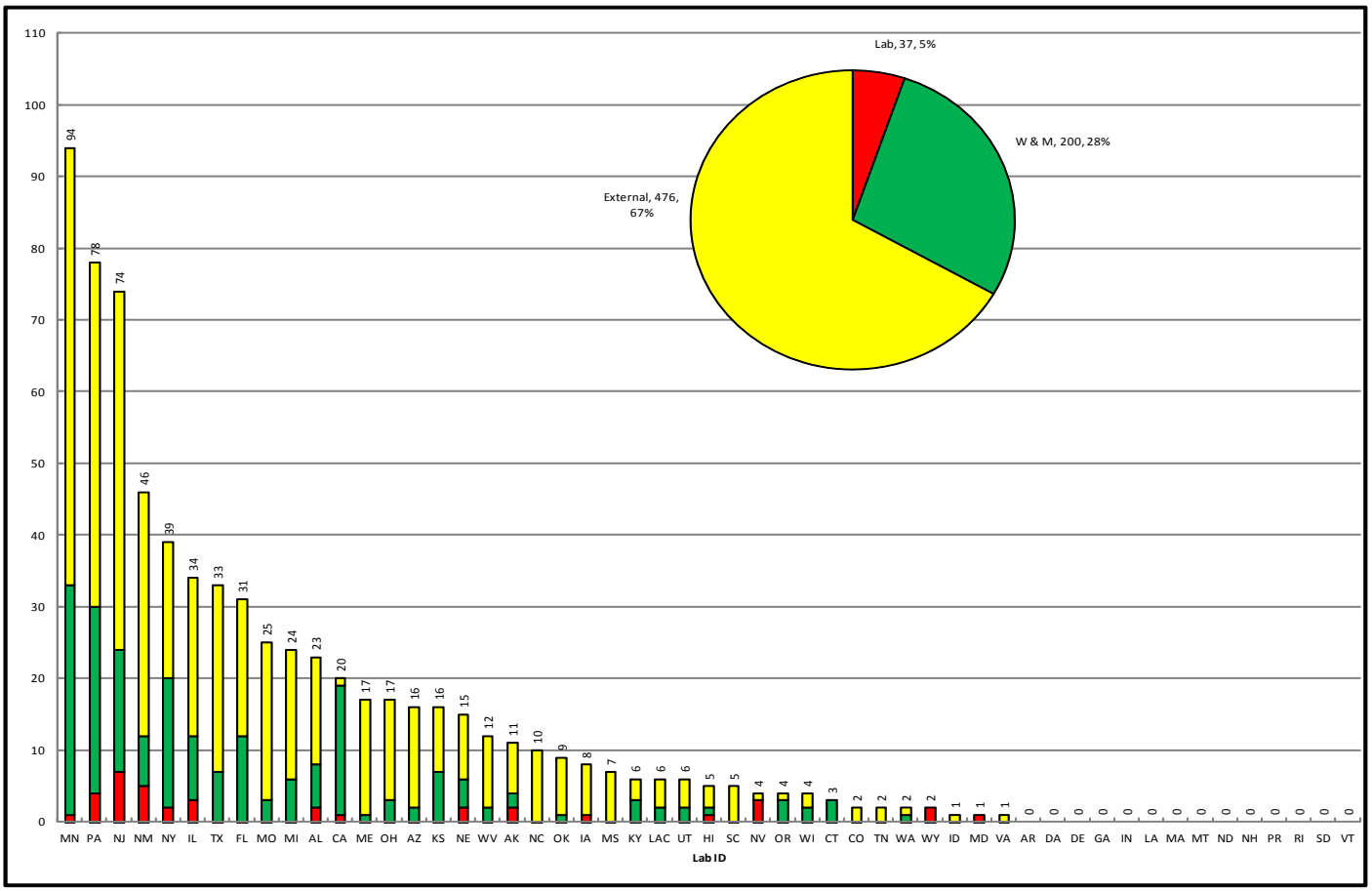
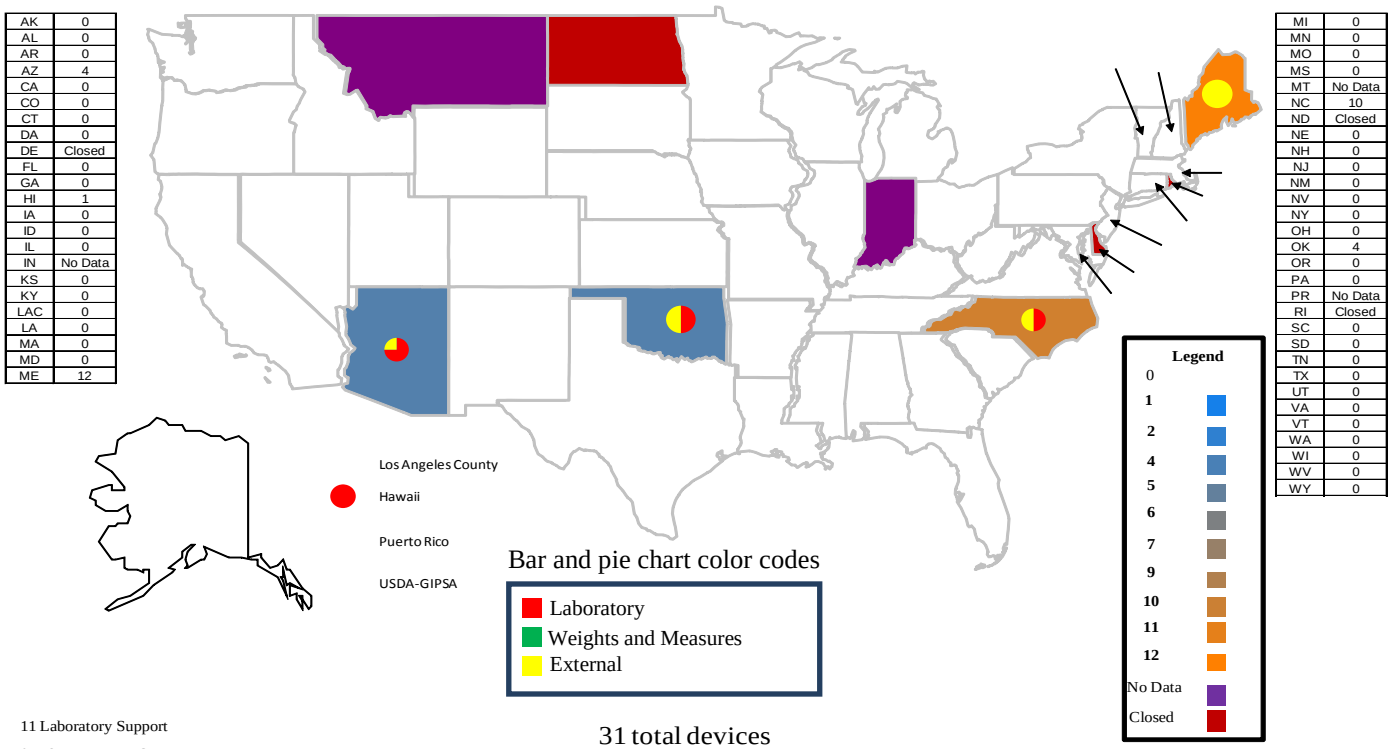


Figure 20: Prover (> 5 gallon and ≤ 100 gallon) tests, volume transfer.

Open Neck Volumetric Provers (>5 gallon and ≤100 gallon)
Gravimetric

AK	0
AL	0
AR	0
AZ	4
CA	0
CO	0
CT	0
DA	0
DE	Closed
FL	0
GA	0
HI	1
IA	0
ID	0
IL	0
IN	No Data
KS	0
KY	0
LAC	0
LA	0
MA	0
MD	0
ME	12

MI	0
MN	0
MO	0
MS	0
MT	No Data
NC	10
ND	Closed
NE	0
NH	0
NJ	0
NM	0
NV	0
NY	0
OH	0
OK	4
OR	0
PA	0
PR	No Data
RI	Closed
SC	0
SD	0
TN	0
TX	0
UT	0
VA	0
VT	0
WA	0
WI	0
WV	0
WY	0



11 Laboratory Support
0 W&M Program Support
20 For external customers

31 total devices
calibrated in 5 labs

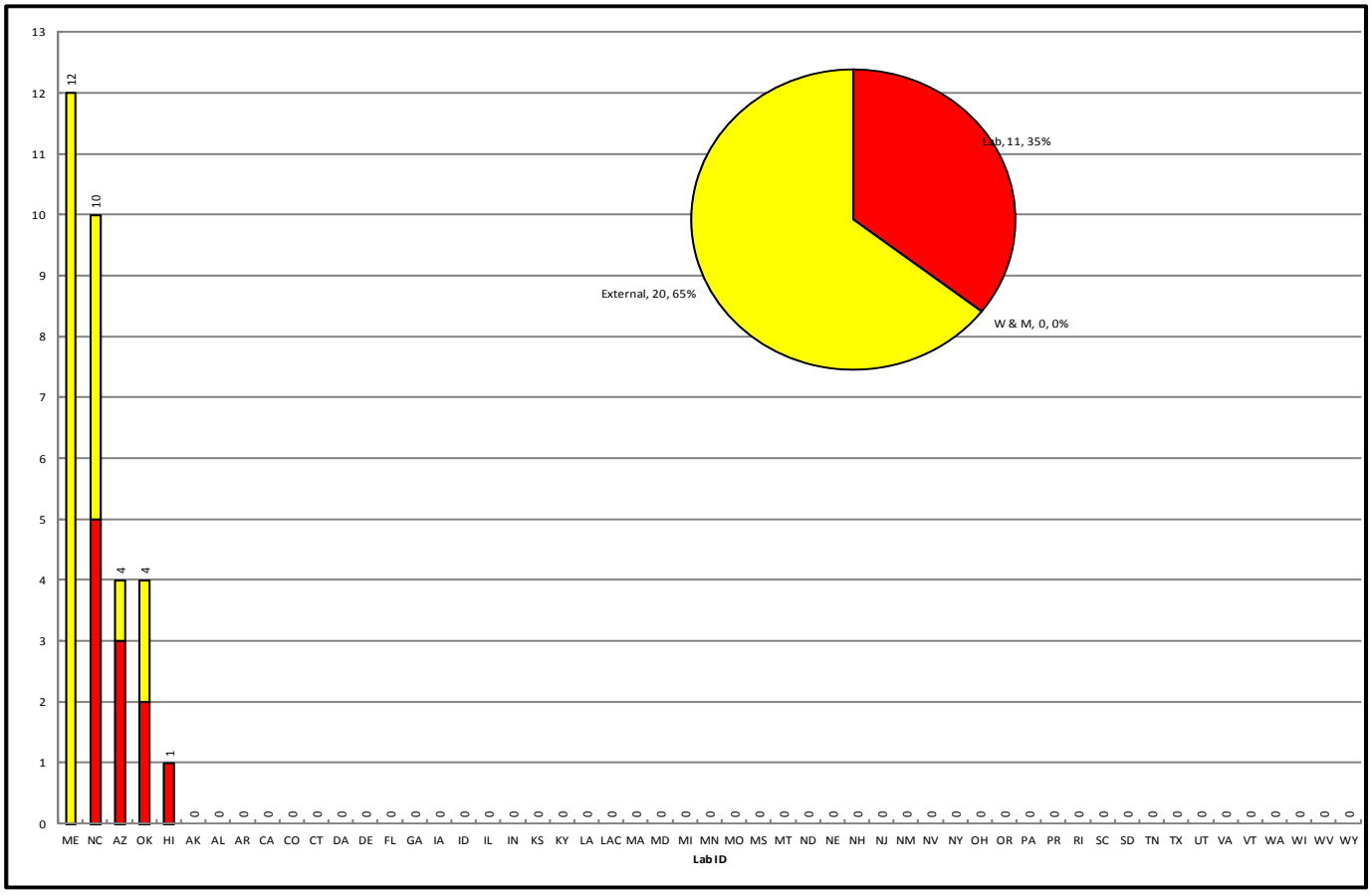


Figure 21: Prover (> 5 gallon and ≤ 100 gallon) tests, gravimetric

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Provers (> 100 gallon)

Description

The graphs on the next two pages represent the total number of volume tests performed on large metal volume provers by the 47 reporting laboratories using either a volume transfer or gravimetric method. The map graph gives a geographical distribution of these standards. There are pie graphs located on the map for each individual lab and a larger pie graph that reflects overall totals. The pie graphs provide a breakdown into the customer categories of Lab, W&M, and External. The bar graph at the bottom of the page shows the same breakdown along with the total number of devices tested by each laboratory.

- Lab – work done for the internal use of the metrology laboratory.
- W&M – work done for the weights and measures enforcement program.
- External – work done for customers who do not fall into any of the above categories.

Findings

- Of the 47 reporting laboratories, 30 labs performed a total of 237 volume transfer tests.
- Of the 47 reporting laboratories, 1 lab performed 1 gravimetric volume test.

Comparison of previous surveys

Year	# Labs	Volume Transfer	Gravimetric	Total
2005		201	1	202
2006		202	0	202
2008	34	284	0	284
2010	33	287	0	287
2012	30	237	1	238

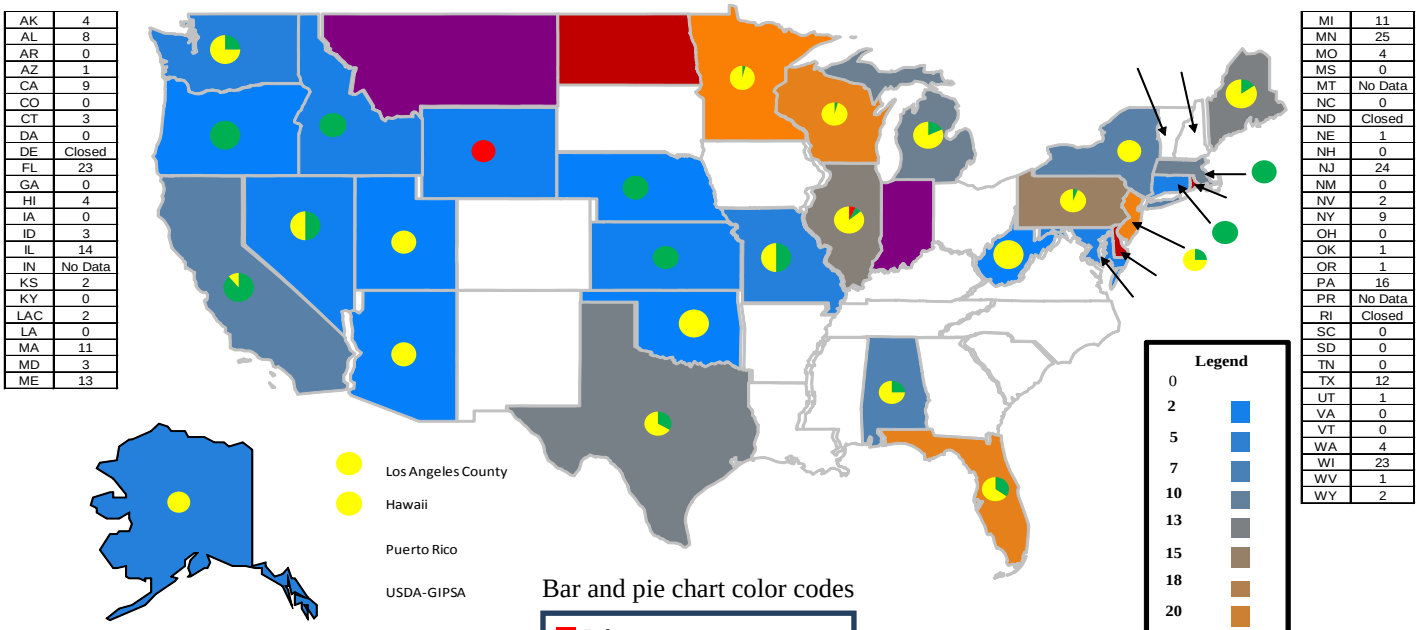
Table 15: Provers (> 100 gallon) tests from previous surveys.

Notes and Comments

- 1 % of all provers (> 100 gallon) were tested for the laboratory
- 26 % of all provers (> 100 gallon) were tested for Weights and Measures enforcement programs.
- 73 % of all provers (> 100 gallon) were tested for external customers.

Open Neck Volumetric Provers (>100 gallon)
Volume Transfer

AK	4
AL	8
AR	0
AZ	1
CA	9
CO	0
CT	3
DA	0
DE	Closed
FL	23
GA	0
HI	4
IA	0
ID	3
IL	14
IN	No Data
KS	2
KY	0
LAC	2
LA	0
MA	11
MD	3
ME	13



MI	11
MN	25
MO	4
MS	0
MT	No Data
NC	0
ND	Closed
NE	1
NH	0
NJ	24
NM	0
NV	2
NY	9
OH	0
OK	1
OR	1
PA	16
PR	No Data
RI	Closed
SC	0
SD	0
TN	0
TX	12
UT	1
VA	0
VT	0
WA	4
WI	23
WV	1
WY	2

Bar and pie chart color codes

- Laboratory
- Weights and Measures
- External

237 total devices
calibrated in 30 labs

3 Laboratory Support
61 W&M Program Support
173 For external customers

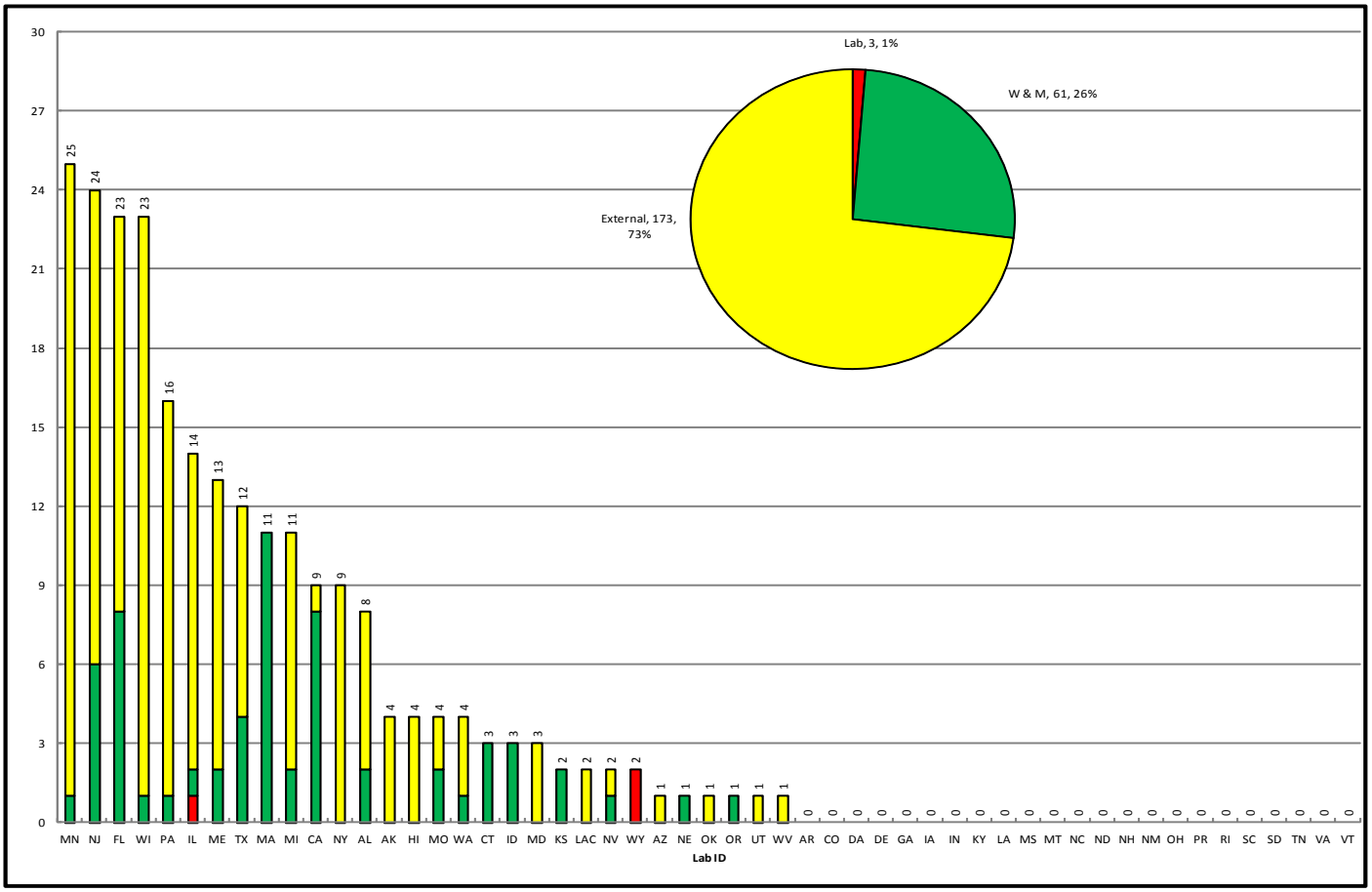
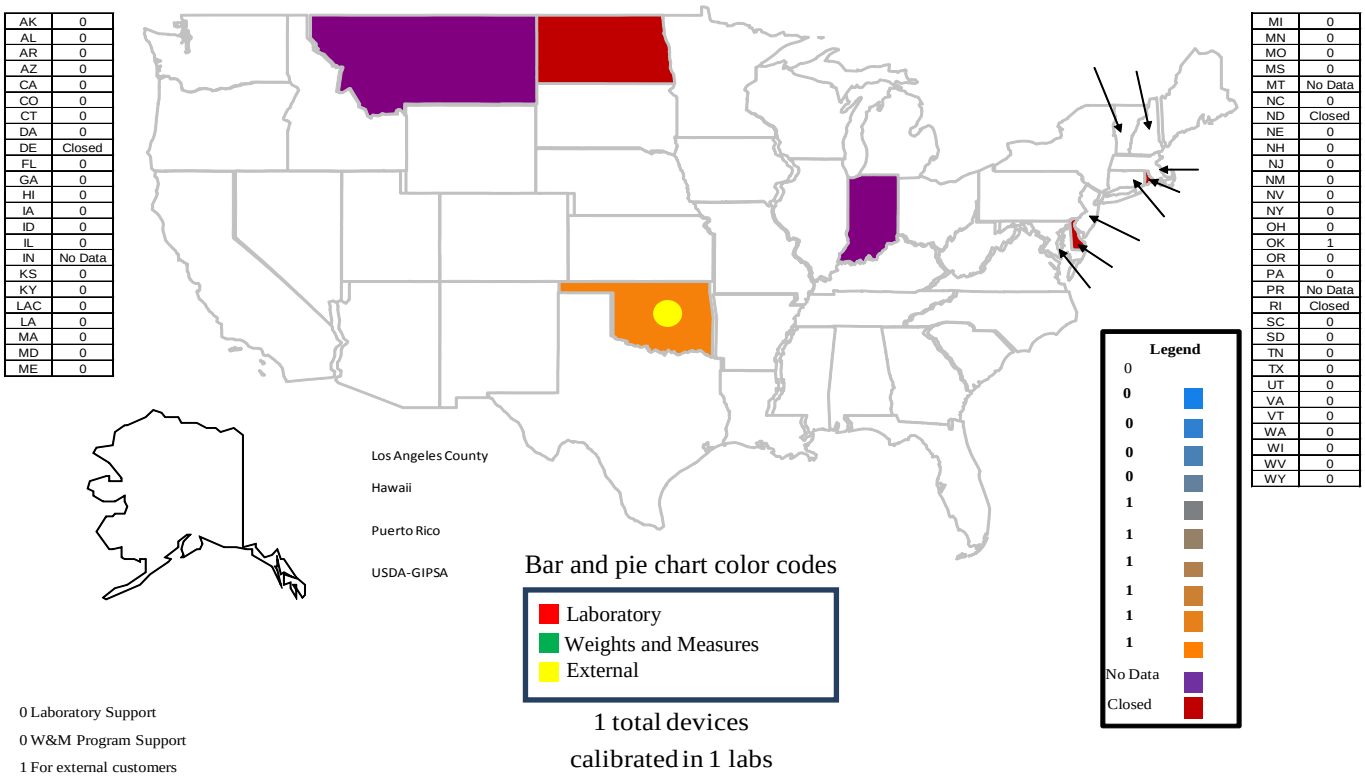


Figure 22: Prover (> 100 gallon) tests, volume transfer

Open Neck Volumetric Provers (>100 gallon)
Gravimetric



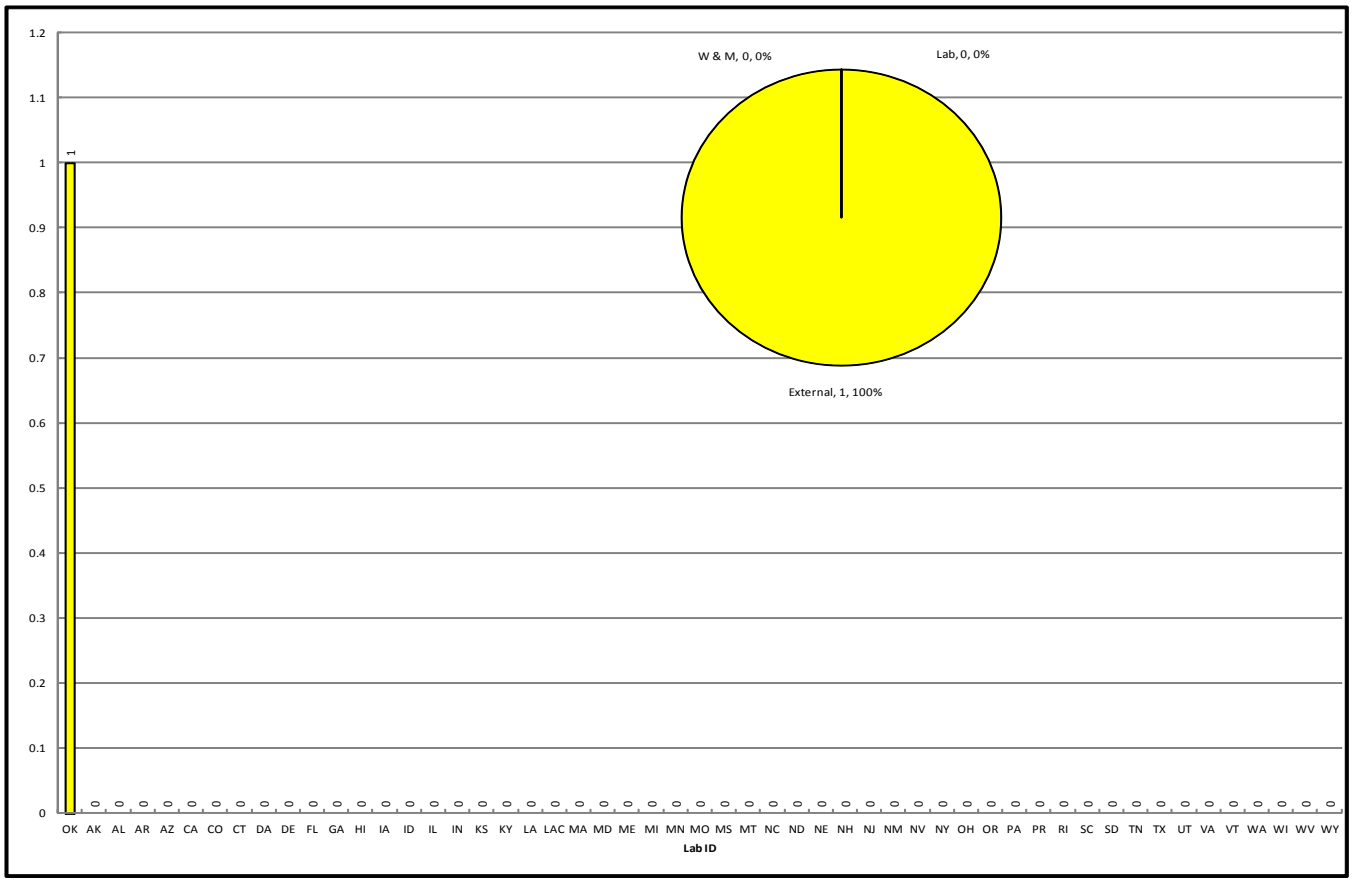


Figure 23: Prover (> 100 gallon) tests, gravimetric

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Liquefied Petroleum Gas (LPG) Prover

Description

The graphs on the following page represent the total number of volume tests performed on LPG provers by the 47 reporting laboratories using a special volume transfer method. The map graph gives a geographical distribution of these standards. There are pie graphs located on the map for each individual lab and a larger pie graph that reflects overall totals. The pie graphs provide a breakdown into the customer categories of Lab, W&M, and External. The bar graph at the bottom of the page shows the same breakdown along with the total number of devices tested by each laboratory.

- Lab – work done for the internal use of the metrology laboratory.
- W&M – work done for the weights and measures enforcement program.
- External – work done for customers who do not fall into any of the above categories.

Findings

- Of the 47 reporting laboratories, 24 labs performed a total of 228 volume transfer tests.

Comparison of previous surveys

Year	# Labs	Special Volume Transfer Method
2005		226
2006		239
2008	27	249
2010	33	304
2012	24	228

Table 16: LPG Prover volume tests from previous surveys.

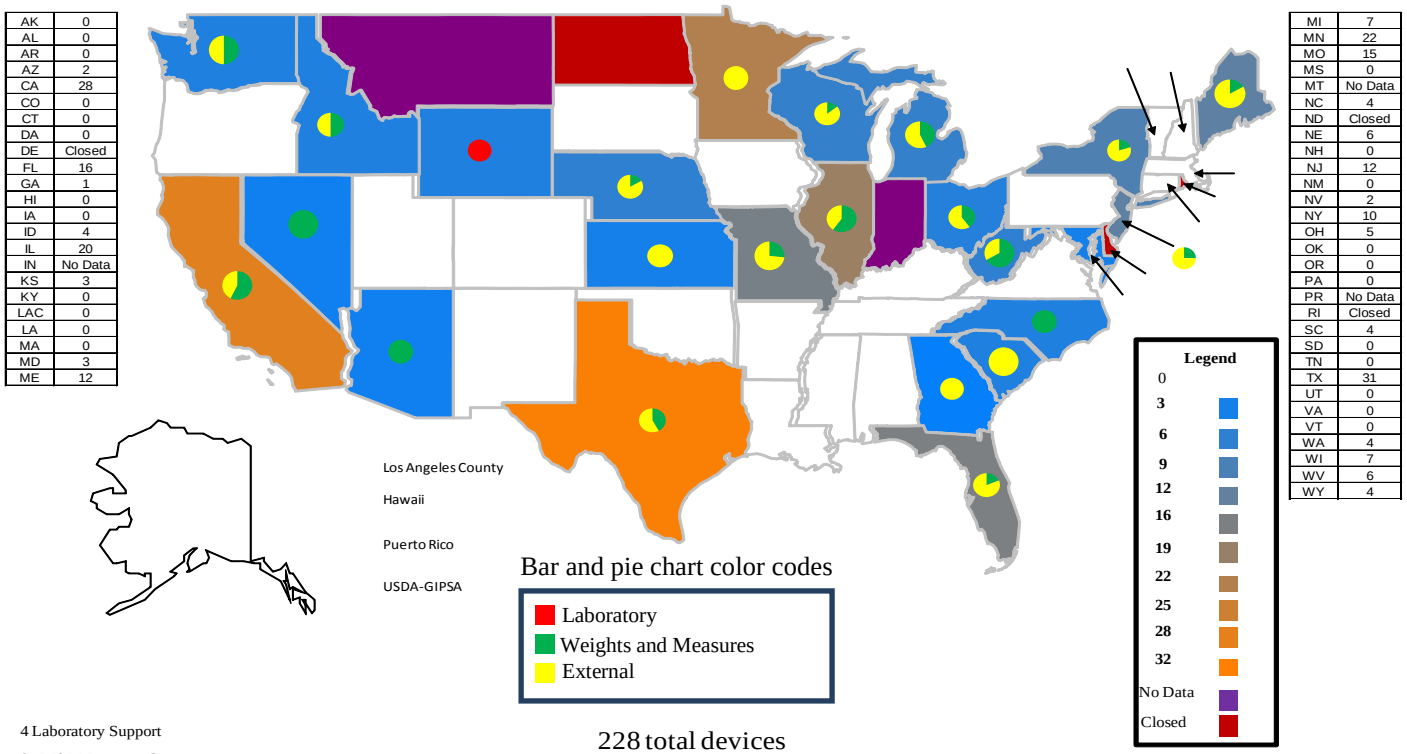
Notes and Comments

- 2 % of all LPG provers were tested for the laboratory
- 35 % of all LPG provers were tested for Weights and Measures enforcement programs.
- 63 % of all LPG provers were tested for external customers.

Liquid Propane Gas (LPG) Provers
Volume Transfer

AK	0
AL	0
AR	0
AZ	2
CA	28
CO	0
CT	0
DA	0
DE	Closed
FL	16
GA	1
HI	0
IA	0
ID	4
IL	20
IN	No Data
KS	3
KY	0
LAC	0
LA	0
MA	0
MD	3
ME	12

MI	7
MN	22
MO	15
MS	0
MT	No Data
NC	4
ND	Closed
NE	6
NH	0
NJ	12
NM	0
NV	2
NY	10
OH	5
OK	0
OR	0
PA	0
PR	No Data
RI	Closed
SC	4
SD	0
TN	0
TX	31
UT	0
VA	0
VT	0
WA	4
WI	7
WV	6
WY	4



4 Laboratory Support
81 W&M Program Support
143 For external customers

228 total devices
calibrated in 24 labs

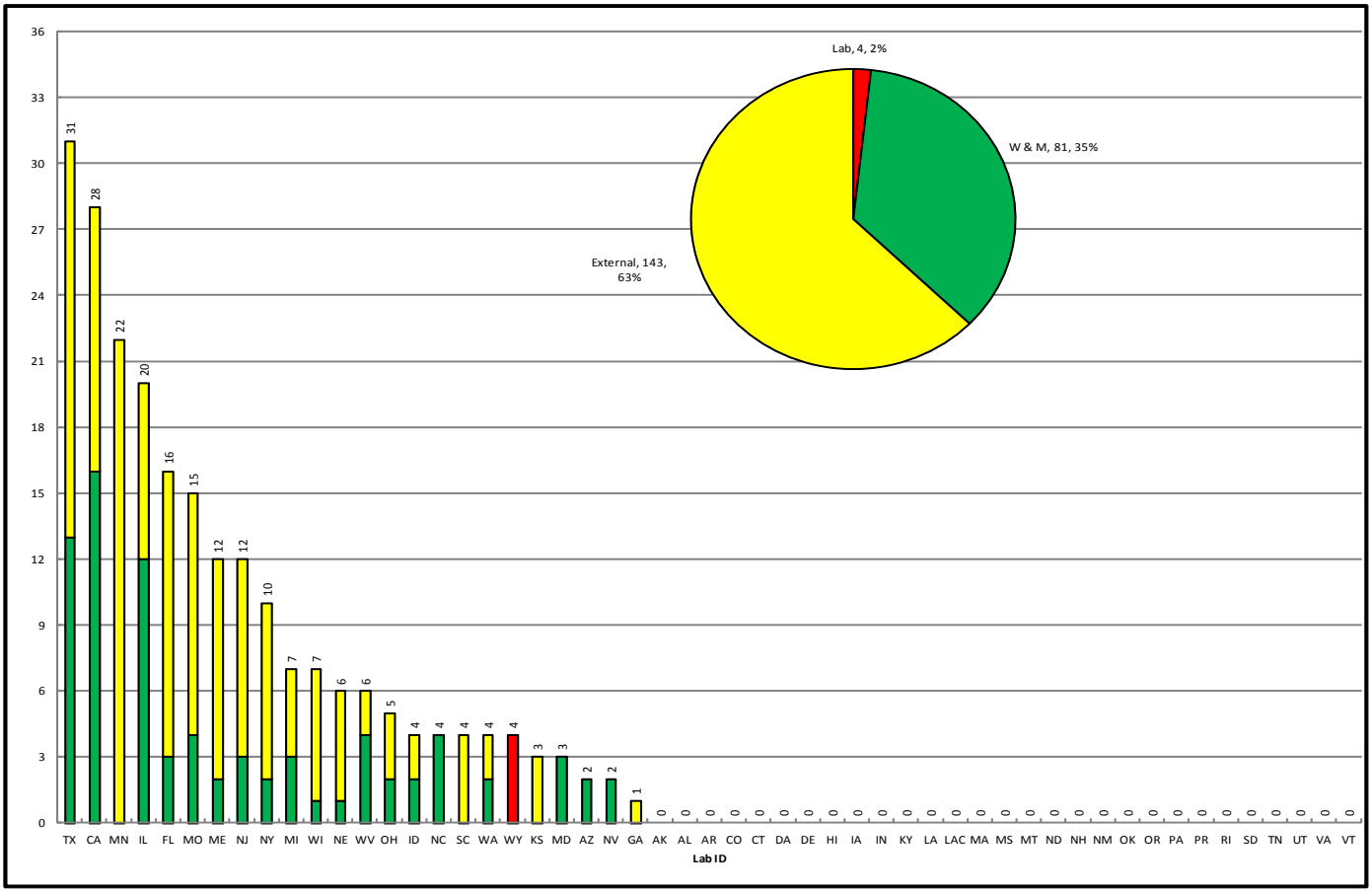


Figure 24: LPG Prover tests, volume transfer

Dynamic Small Volume Prover (SVP)

Description

The graphs on the following page represent the total number of volume tests performed on dynamic small volume provers by the 47 reporting laboratories using a special gravimetric method. The map graph gives a geographical distribution of these standards. There are pie graphs located on the map for each individual lab and a larger pie graph that reflects overall totals. The pie graphs provide a breakdown into the customer categories of Lab, W&M, and External. The bar graph at the bottom of the page shows the same breakdown along with the total number of devices tested by each laboratory.

- Lab – work done for the internal use of the metrology laboratory.
- W&M – work done for the weights and measures enforcement program.
- External – work done for customers who do not fall into any of the above categories.

Findings

- Of the 47 reporting laboratories, 3 labs performed a total of 57 gravimetric tests.

Comparison of previous surveys

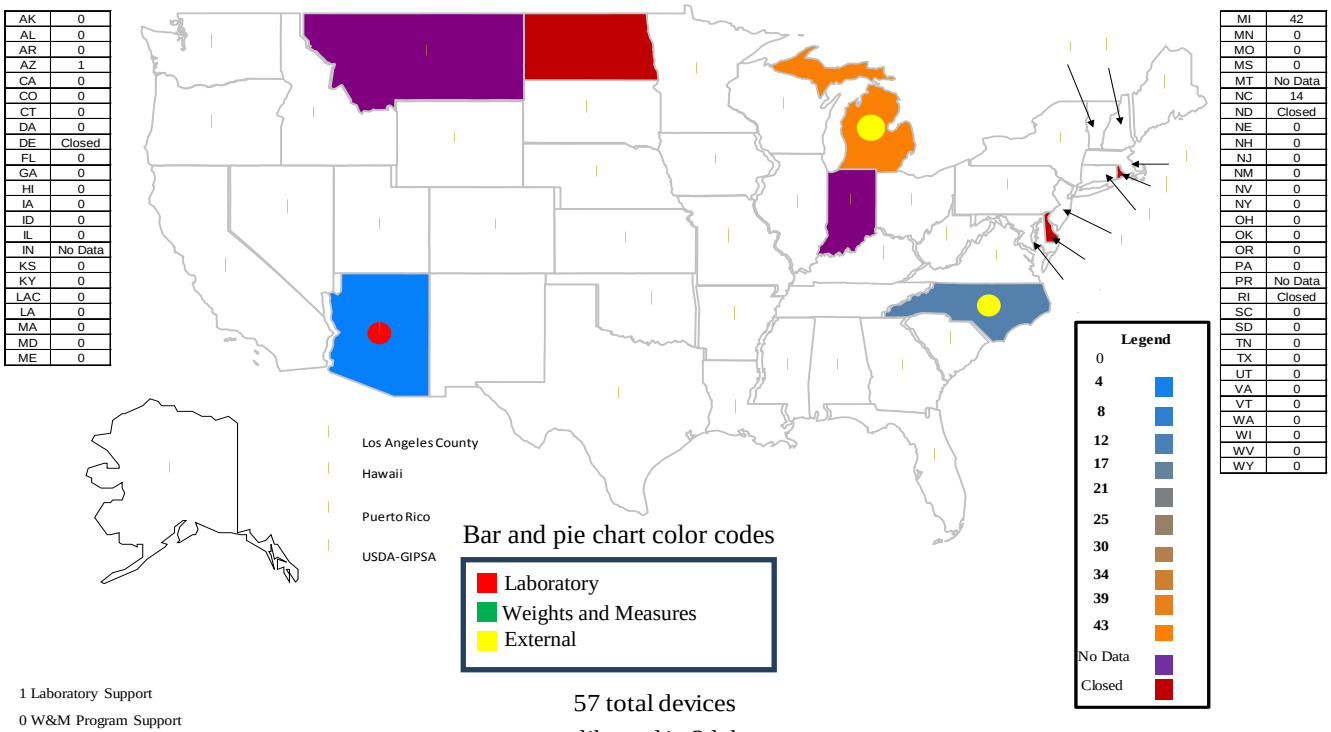
Year	# Labs	Gravimetric	Volume Transfer	Total
2005		11	0	11
2006		20	0	20
2008	3	16	11	27 [MI,NC,VT]
2010	2	30	0	30 [MI,NC]
2012	3	57	0	57

Table 17: SVP tests from previous surveys.

Small Volume Provers (SVP)
Gravimetric

AK	0
AL	0
AR	0
AZ	1
CA	0
CO	0
CT	0
DA	0
DE	Closed
FL	0
GA	0
HI	0
IA	0
ID	0
IL	0
IN	No Data
KS	0
KY	0
LAC	0
LA	0
MA	0
MD	0
ME	0

MI	42
MN	0
MO	0
MS	0
MT	No Data
NC	14
ND	Closed
NE	0
NH	0
NJ	0
NM	0
NV	0
NY	0
OH	0
OK	0
OR	0
PA	0
PR	No Data
RI	Closed
SC	0
SD	0
TN	0
TX	0
UT	0
VA	0
VT	0
WA	0
WI	0
WV	0
WY	0



1 Laboratory Support
0 W&M Program Support
56 For external customers

57 total devices
calibrated in 3 labs

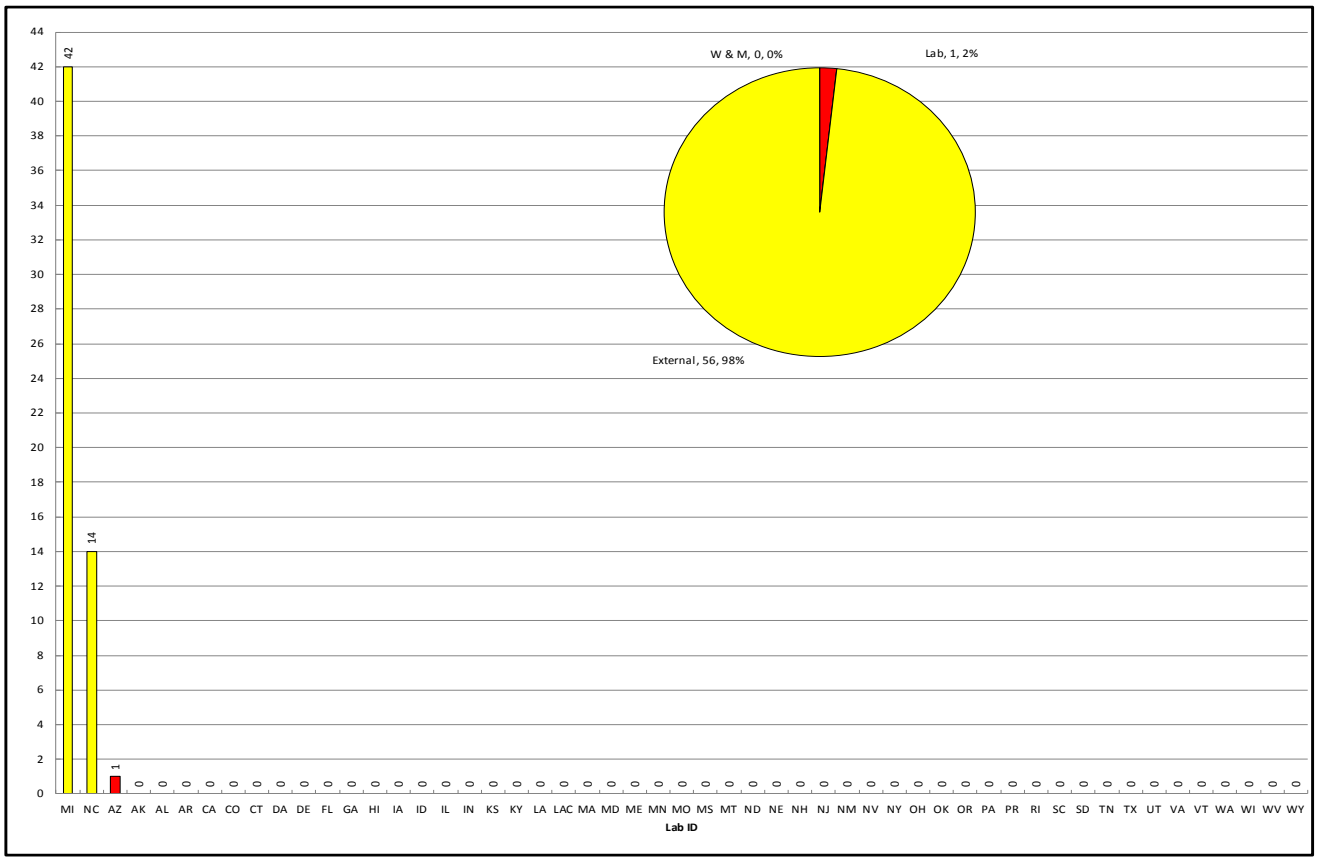


Figure 25: SVP gravimetric

Temperature

Description

The graphs on the following page represent the total number of temperature standards tested by the 47 reporting laboratories. The map graph gives a geographical distribution of these standards. There are pie graphs located on the map for each individual lab and a larger pie graph that reflects the totals. The pie graphs provide a breakdown into the customer categories of Lab, W&M, and External. The bar graph at the bottom of the page shows the same breakdown along with the total number of devices tested by each laboratory.

- Lab – work done for the internal use of the metrology laboratory.
- W&M – work done for the weights and measures enforcement program.
- External – work done for customers who do not fall into any of the above categories.

Findings

Of the 47 reporting laboratories, 7 labs tested a total of 191 temperature standards

Comparison of previous surveys

Year	# Labs	Total Devices
1996	20	447
1998	11	378
1999	12	514
2000	16	460
2002	13	456
2004	12	315
2005	15	418
2006	12	281
2008	13	498
2010	11	465
2012	7	191

Table 18: Temperature standard tests from previous surveys.

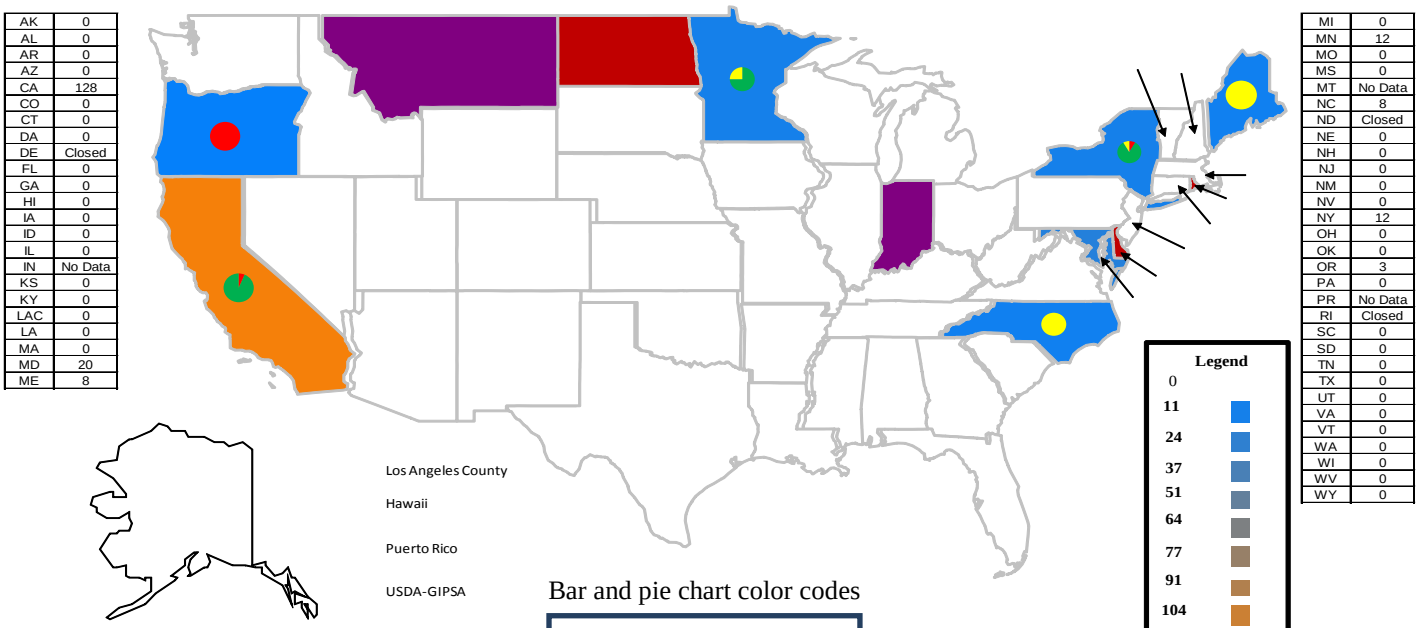
Notes and Comments

- 9 % of all temperature standards were tested for internal use by the laboratory.
- 11 % of all temperature standards were tested for the weight and measures program.
- 80 % of all temperature standards were tested for external customers.

Temperature

AK	0
AL	0
AR	0
AZ	0
CA	128
CO	0
CT	0
DA	0
DE	Closed
FL	0
GA	0
HI	0
IA	0
ID	0
IL	0
IN	No Data
KS	0
KY	0
LAC	0
LA	0
MA	0
MD	20
ME	8

MI	0
MN	12
MO	0
MS	0
MT	No Data
NC	8
ND	Closed
NE	0
NH	0
NJ	0
NM	0
NV	0
NY	12
OH	0
OK	0
OR	3
PA	0
PR	No Data
RI	Closed
SC	0
SD	0
TN	0
TX	0
UT	0
VA	0
VT	0
WA	0
WI	0
WV	0
WY	0



Los Angeles County

Hawaii

Puerto Rico

USDA-GIPSA

Bar and pie chart color codes

- Laboratory
- Weights and Measures
- External

191 total devices calibrated in 7 labs

18 Laboratory Support

153 W&M Program Support

20 For external customers

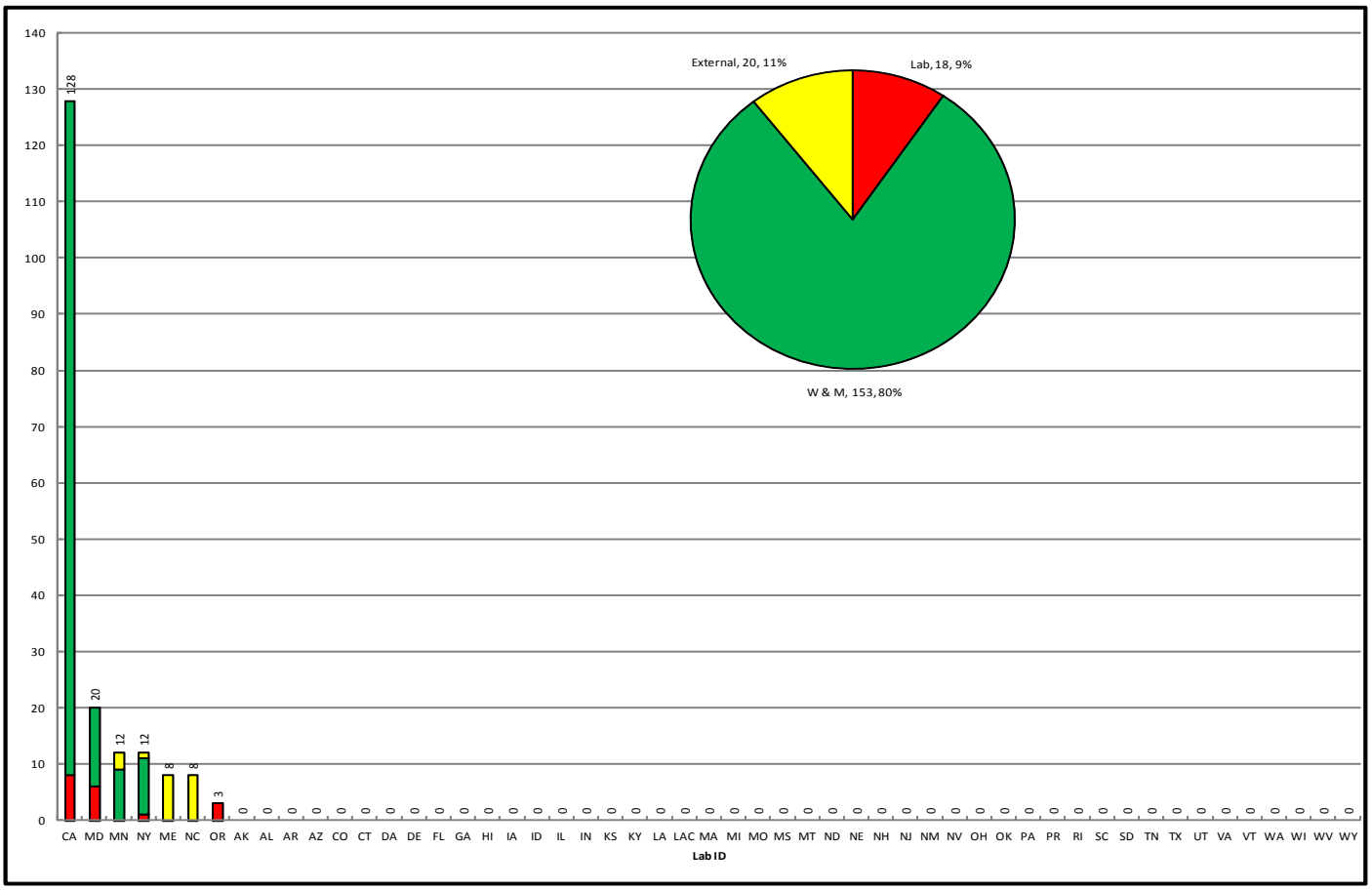


Figure 26: Temperature standard tests.

Frequency

Description

The graphs on the following page represent the total number of frequency standards tested by the 47 reporting laboratories. The map graph gives a geographical distribution of these standards. There are pie graphs located on the map for each individual lab and a larger pie graph that reflects the totals. The pie graphs provide a breakdown into the customer categories of Lab, W&M, and External. The bar graph at the bottom of the page shows the same breakdown along with the total number of devices tested by each laboratory.

- Lab – work done for the internal use of the metrology laboratory.
- W&M – work done for the weights and measures enforcement program.
- External – work done for customers who do not fall into any of the above categories.

Findings

Of the 47 reporting laboratories, 4 labs tested a total of 14,177 frequency standards

Comparison of previous surveys

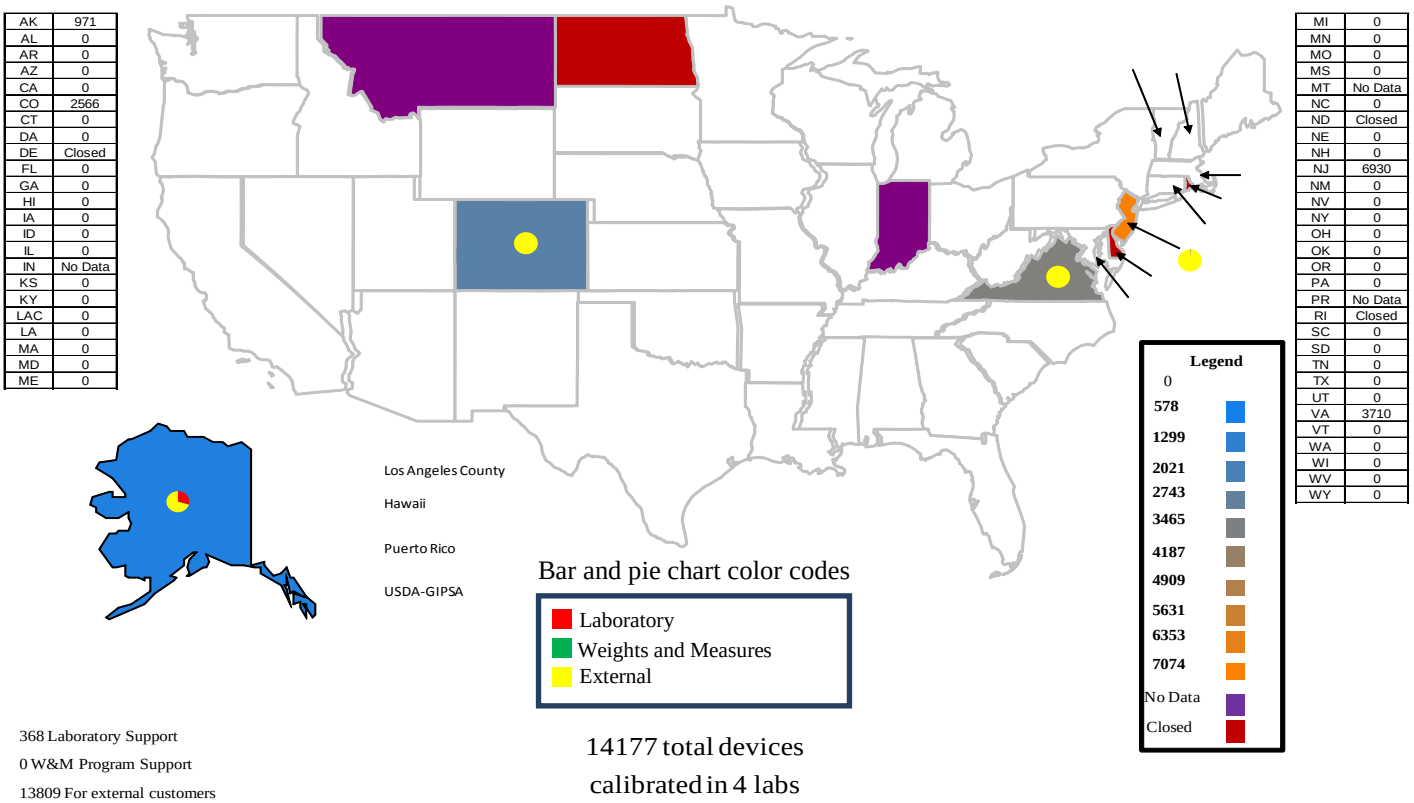
Year	# Labs	Total Devices
1996	6	12518
1998	4	11561
1999	5	13518
2000	7	14670
2002	6	13785
2004	3	14772
2005	4	15162
2006	4	14832
2008	4	15058
2010	4	17580
2012	4	14177

Table 19 Frequency standard tests from previous surveys.

Notes and Comments

- 3 % of all frequency standards were tested for internal use by the laboratory.
- 0 % of all frequency standards were tested for the weight and measures program.
- 97 % of all frequency standards were tested for external customers.

Frequency



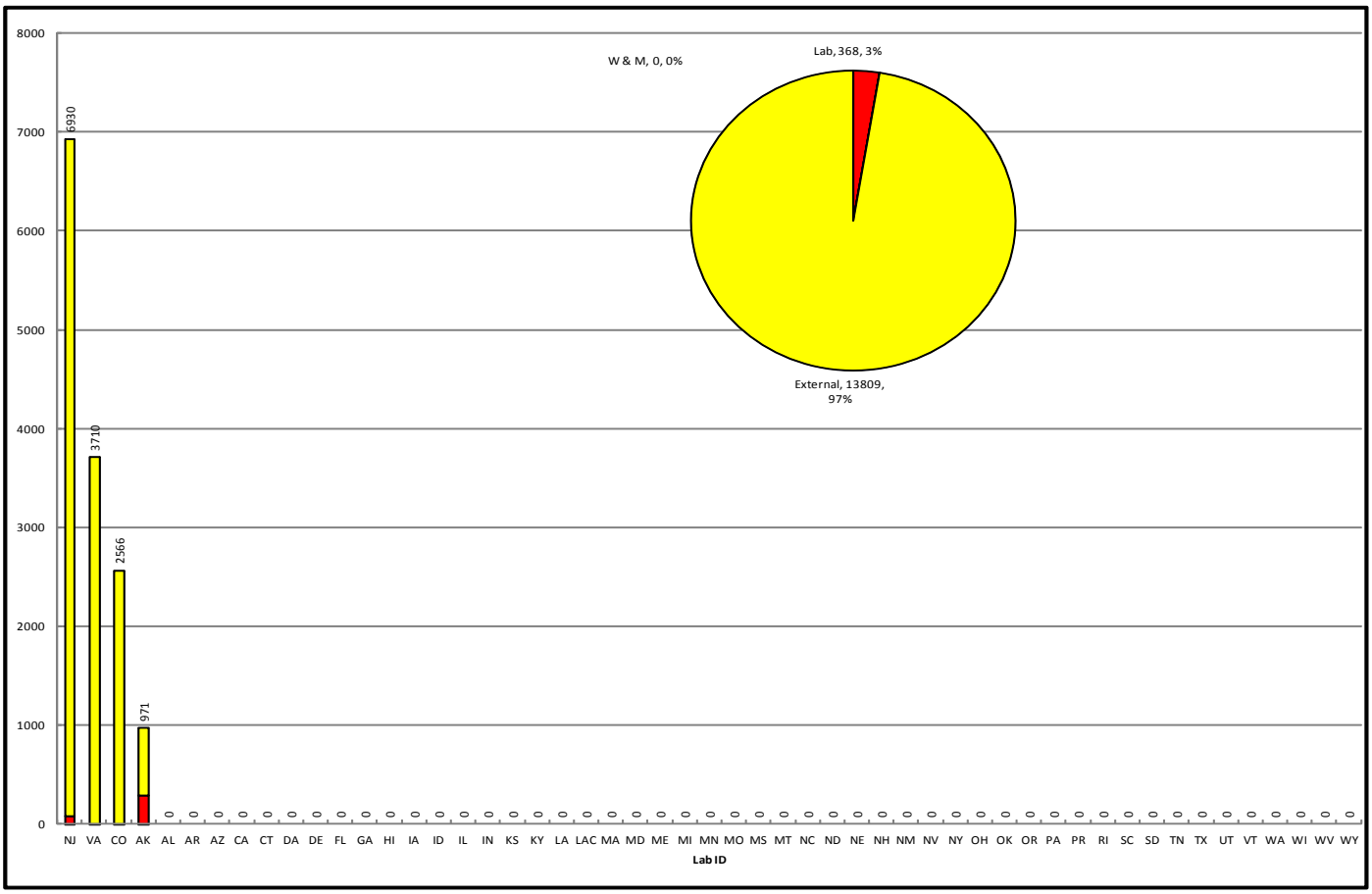


Figure 27: Frequency standard tests

Timing Devices

Description

The graphs on the following page represent the total number of timing devices tested by the 47 reporting laboratories. The map graph gives a geographical distribution of these standards. There are pie graphs located on the map for each individual lab and a larger pie graph that reflects the totals. The pie graphs provide a breakdown into the customer categories of Lab, W&M, and External. The bar graph at the bottom of the page shows the same breakdown along with the total number of devices tested by each laboratory.

- Lab – work done for the internal use of the metrology laboratory.
- W&M – work done for the weights and measures enforcement program.
- External – work done for customers who do not fall into any of the above categories.

Findings

Of the 47 reporting laboratories, 10 labs tested a total of 577 timing devices

Comparison of previous surveys

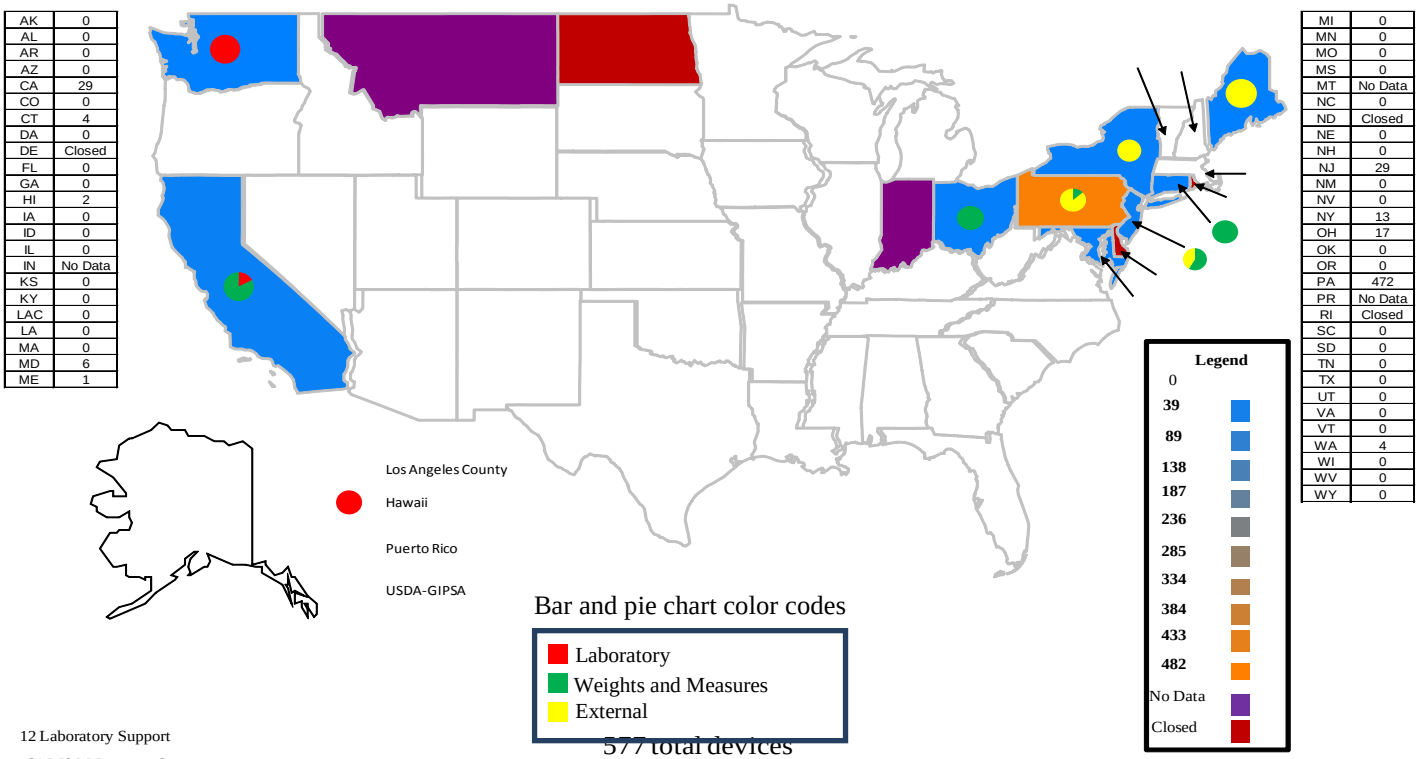
Year	# Labs	Total Devices
1996	13	161
1998	11	380
1999	14	451
2000	13	554
2002	11	479
2004	9	951
2005	8	387
2006	11	365
2008	11	401
2010	9	339
2012	10	577

Table 20: Timing devices tests from previous surveys

Notes and Comments

- 2 % of all timing devices were tested for internal use by the laboratory.
- 23 % of all timing devices were tested for the weight and measures program.
- 75 % of all timing devices were tested for external customers.

Timing Devices



AK	0
AL	0
AR	0
AZ	0
CA	29
CO	0
CT	4
DA	0
DE	Closed
FL	0
GA	0
HI	2
IA	0
ID	0
IL	0
IN	No Data
KS	0
KY	0
LAC	0
LA	0
MA	0
MD	6
ME	1

MI	0
MN	0
MO	0
MS	0
MT	No Data
NC	0
ND	Closed
NE	0
NH	0
NJ	29
NM	0
NV	0
NY	13
OH	17
OK	0
OR	0
PA	472
PR	No Data
RI	Closed
SC	0
SD	0
TN	0
TX	0
UT	0
VA	0
VT	0
WA	4
WI	0
WV	0
WY	0

Bar and pie chart color codes

- Laboratory
- Weights and Measures
- External

12 Laboratory Support

132 W&M Program Support

433 For external customers

577 total devices calibrated in 10 labs

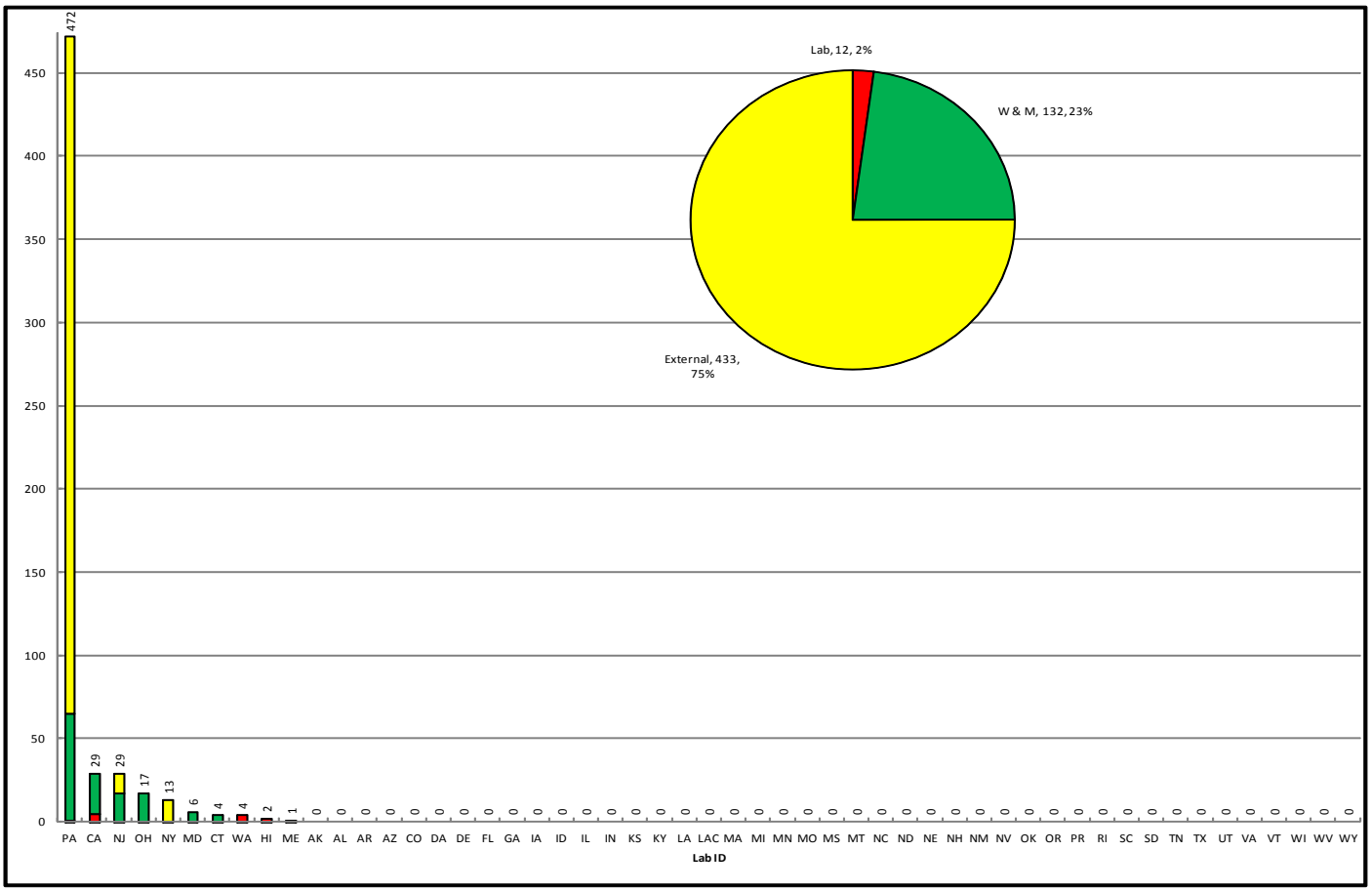


Figure 28: Timing device tests

Wheel Load Weighers

Description

The graphs on the following page represent the total number of wheel load weighers tested by the 47 reporting laboratories. The map graph gives a geographical distribution of these standards. There are pie graphs located on the map for each individual lab and a larger pie graph that reflects the totals. The pie graphs provide a breakdown into the customer categories of Lab, W&M, and External. The bar graph at the bottom of the page shows the same breakdown along with the total number of devices tested by each laboratory.

- Lab – work done for the internal use of the metrology laboratory.
- W&M – work done for the weights and measures enforcement program.
- External – work done for customers who do not fall into any of the above categories.

Findings

Of the 47 reporting laboratories, 17 labs tested a total of 7050 wheel load weighers.

Comparison of previous surveys

Year	# Labs	Total Devices
1998	19	12178
1999	20	12781
2000	22	13699
2002	23	10350
2004	21	10884
2005	19	9748
2006	20	10567
2008	22	10191
2010	20	10815
2012	17	7050

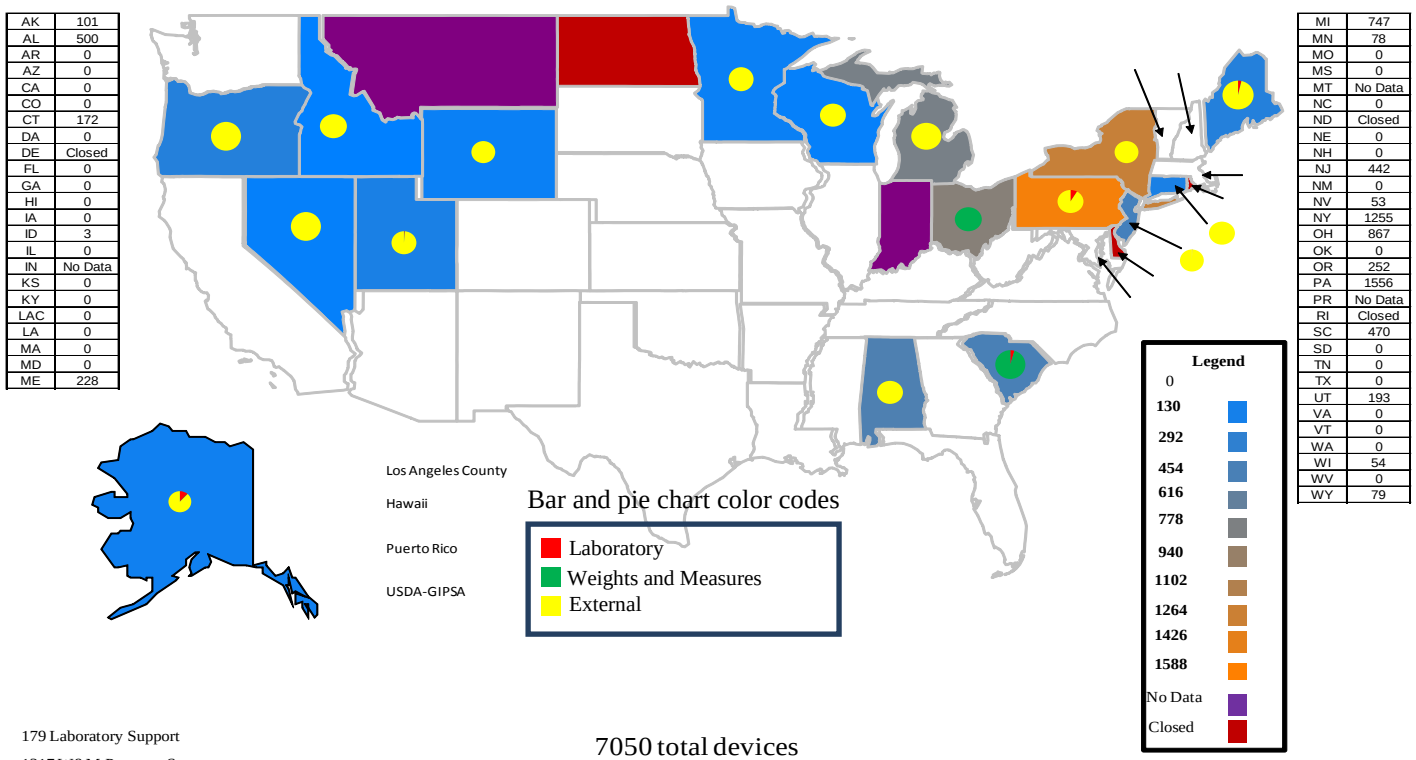
Table 21: Wheel load weigher tests from previous surveys

Notes and Comments

- 2 % of all wheel load weighers were tested for internal use by the laboratory.
- 19 % of all wheel load weighers were tested for the weight and measures program.
- 79 % of all wheel load weighers were tested for external customers.

Wheel Load Weighers

AK	101
AL	500
AR	0
AZ	0
CA	0
CO	0
CT	172
DA	0
DE	Closed
FL	0
GA	0
HI	0
IA	0
ID	3
IL	0
IN	No Data
KS	0
KY	0
LAC	0
LA	0
MA	0
MD	0
ME	228



MI	747
MN	78
MO	0
MS	0
MT	No Data
NC	0
ND	Closed
NE	0
NH	0
NJ	442
NM	0
NV	53
NY	1255
OH	867
OK	0
OR	252
PA	1556
PR	No Data
RI	Closed
SC	470
SD	0
TN	0
TX	0
UT	193
VA	0
VT	0
WA	0
WI	54
WV	0
WY	79

179 Laboratory Support
1317 W&M Program Support
5554 For external customers

7050 total devices
calibrated in 17 labs

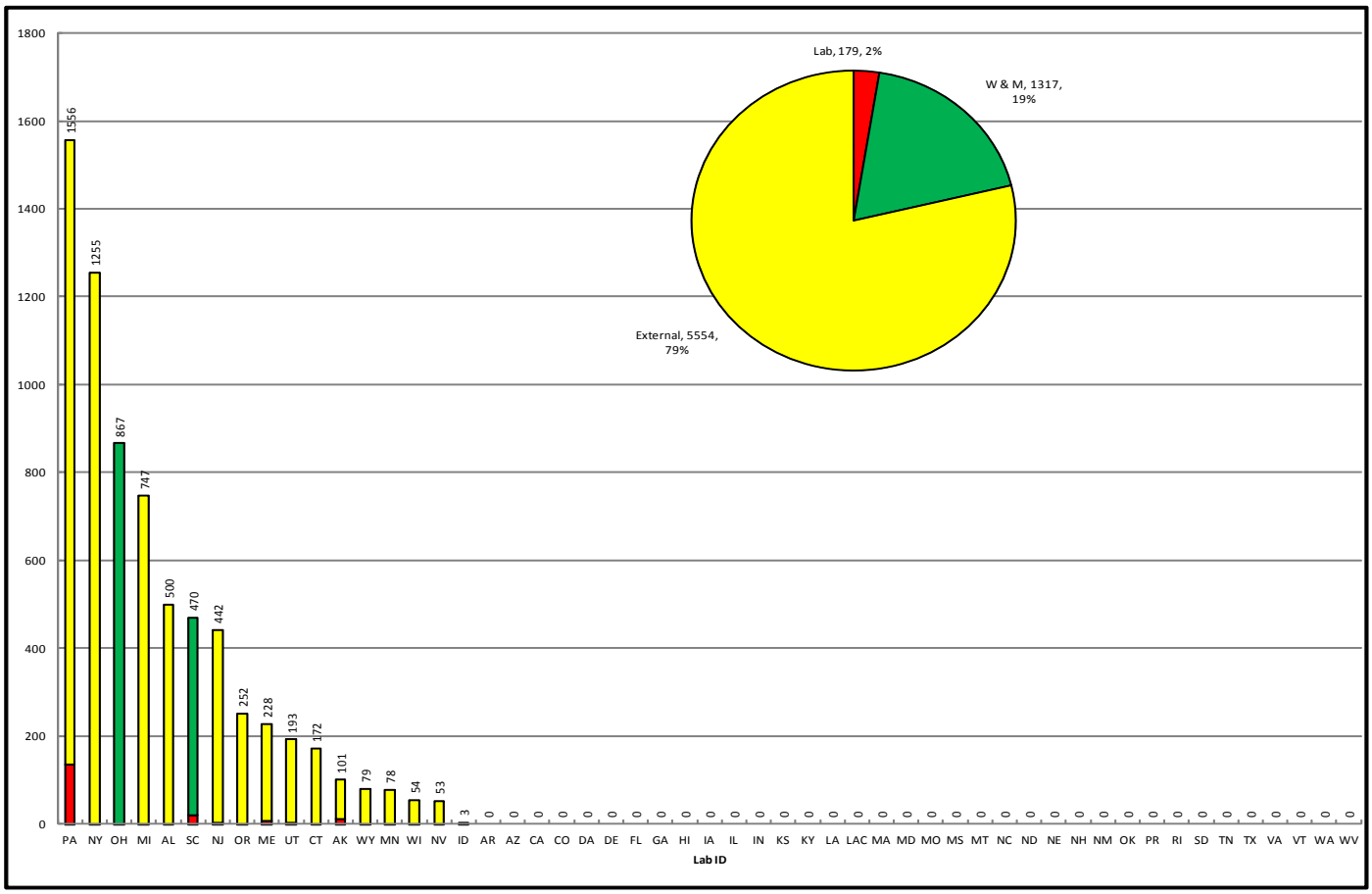


Figure 29: Wheel load weigher tests

Lottery Balls

Description

The graphs on the following page represent the total number of lottery balls tested by the 47 reporting laboratories. A lottery ball test may involve checking it for size, weight, or both. The map graph gives a geographical distribution of these standards. There are pie graphs located on the map for each individual lab and a larger pie graph that reflects the totals. The pie graphs provide a breakdown into the customer categories of Lab, W&M, and External. The bar graph at the bottom of the page shows the same breakdown along with the total number of devices tested by each laboratory.

- Lab – work done for the internal use of the metrology laboratory.
- W&M – work done for the weights and measures enforcement program.
- External – work done for customers who do not fall into any of the above categories.

Findings

Of the 47 reporting laboratories, 7 labs tested a total of 13,924 lottery balls

Comparison of previous surveys

Year	# Labs	Total Devices
1999	9	19982
2000	13	24702
2002	11	35818
2004	11	40939
2005	9	47920
2006	9	41068
2008	10	42553
2010	8	46515
2012	7	13924

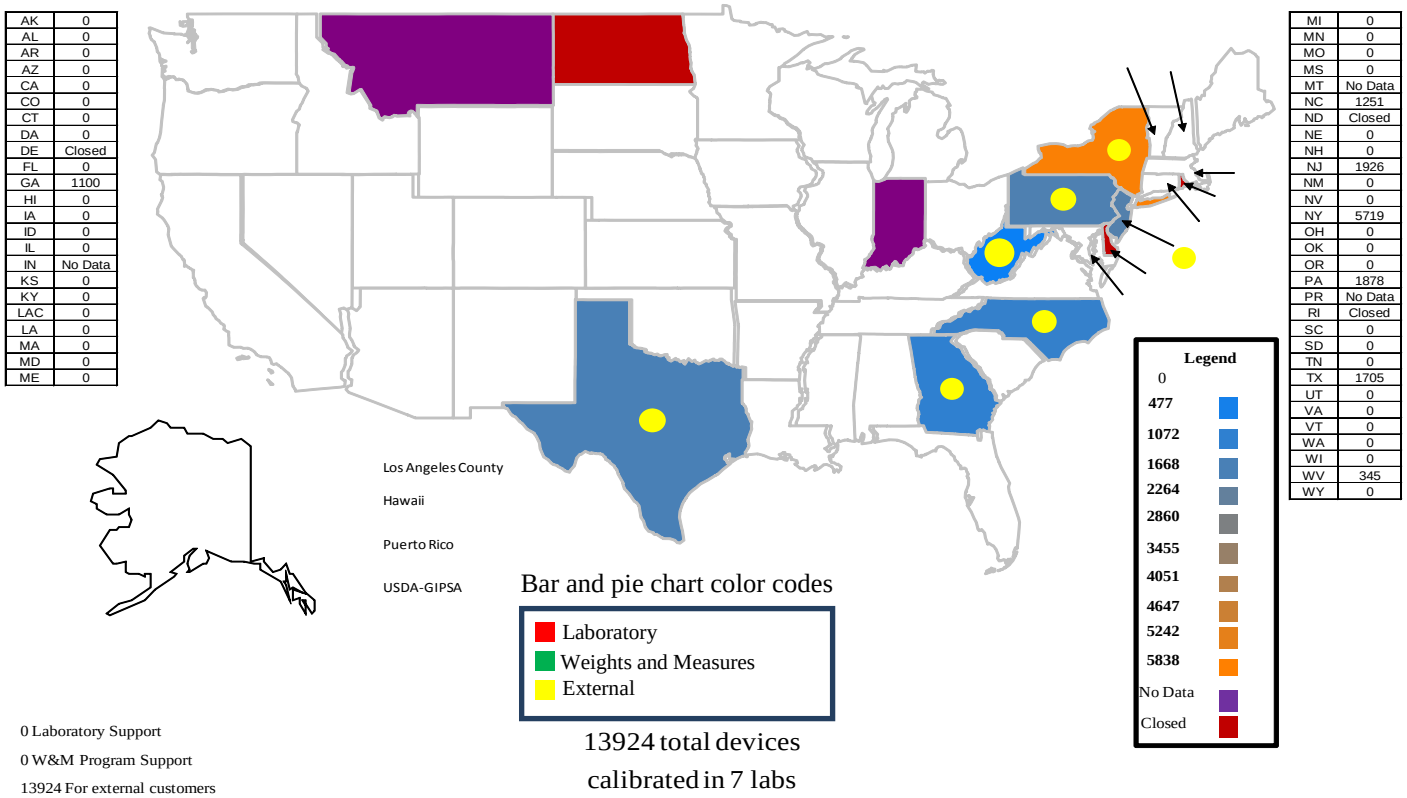
Table 22: Lottery balls tests from previous surveys

Notes and Comments

- 0 % of all lottery balls were tested for internal use by the laboratory.
- 0 % of all lottery balls were tested for the weight and measures program.
- 100 % of all lottery balls were tested for external customers.

The Puerto Rico metrology laboratory performed 30,200 tests on lottery balls in 2010. Puerto Rico did not submit any data for the 2012 survey.

Lottery Balls



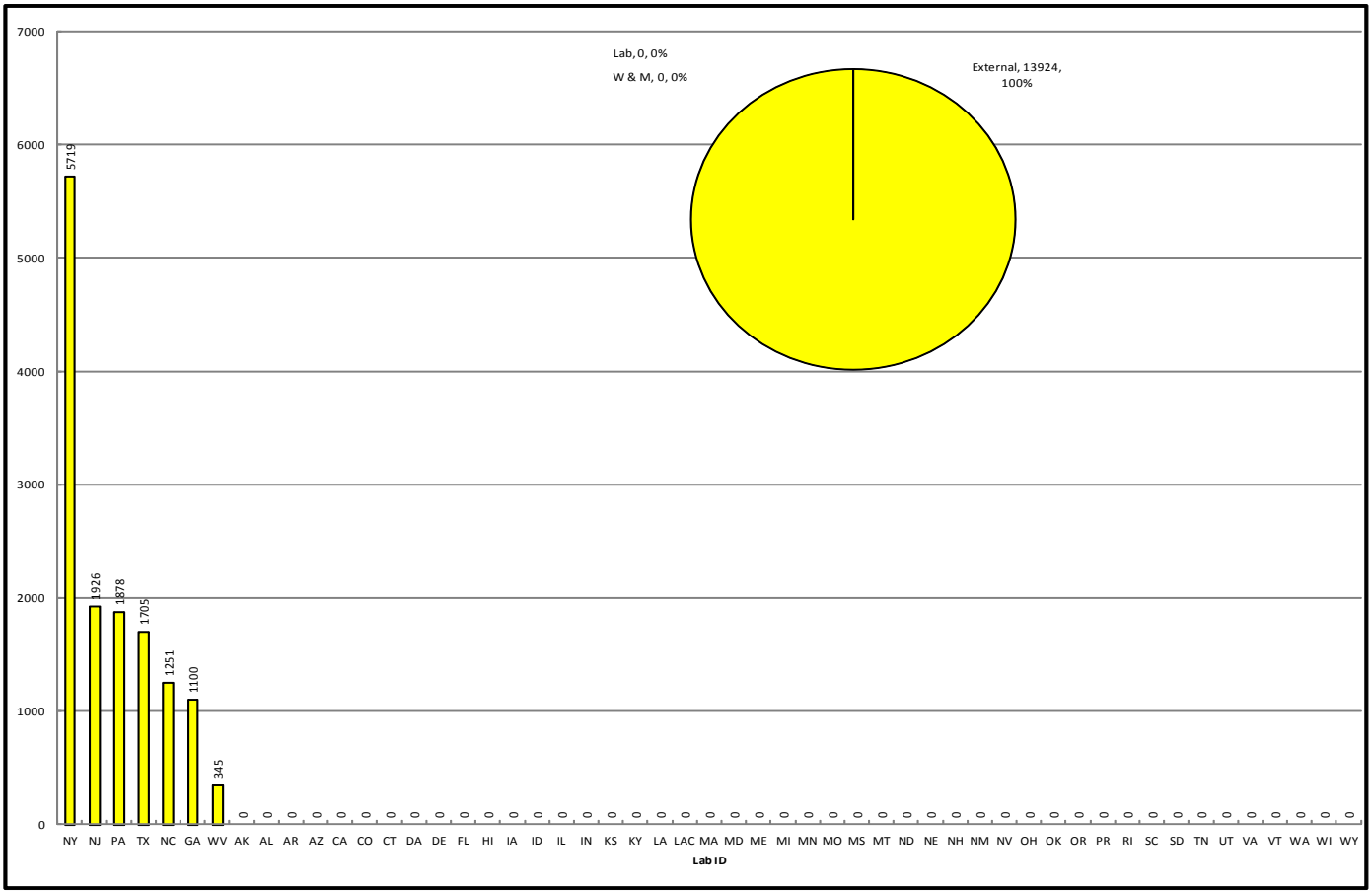


Figure 30: Lottery Ball tests

Summary Other Tests

The category of "Other Tests" was for tests performed by the metrology laboratory that did not fit into any of the listed categories in the survey. This list is probably incomplete as it was left up to each laboratory to determine which tests were worth reporting.

"Other Test" – ID	Lab ID	Tests
Air Quality Filters	ME	2728
Density Measurements	MN	19
Fish Measures	ME	75
Grain Moisture Tests	CO, WI	55
Hydrometers	VT	7559
Laser Distance Devices	NJ	107
Master Meters	AZ, ME	33
Mulch Box	OH	4
Octane Analyzer	TX	94
Rail Road Test Cars	MN, MO, WY	40
Scales, Balances, and Load Cells	CT, MA, MN, NC, NJ, OH, WI	216
Water Meter Tank	CT	4
Watt Hour Meters	AK	5

Table 23: Other tests reported by the participating laboratories

Laboratory Fees (2012)

Description

This information is provided as guidance for labs attempting to adjust fees for measurement services and to potential clients whom use the member laboratories services. Data from prior SLP Workload Surveys are included where sufficient similarity between individual historical survey questions and those found in this survey regarding fees charged exists.

The SLP laboratories often, if not always, charge a fee for routine calibration work. They may provide an hourly rate and bill real time, they may provide an hourly rate and bill based on the typical time to complete a calibration, they may charge a fixed fee for routine work, etc. SLP laboratories may charge additional fees for cleaning, repair, adjusting, packaging, etc. which are outside of that required by normal well cared for measurement standards.

In some previous surveys a lab's fee schedule or its hourly rate was used to calculate fees charged for certain routine work. Significant problems arise when using hourly rates since the survey analysts were not able to accurately estimate fees without additional data on each laboratory's equipment, policies, and procedures. The time it takes to calibrate a particular widget will vary significantly between laboratories because of differences in the available weight handling and measurement equipment. The number of employees and their experience varies significantly among the laboratories and may significantly impact the time required to complete a calibration. In some cases there are significant variations in how calibration time is tracked and billed; One lab may track the total time required to log in, unpack, collect data, adjust, prepare a certificate, re-pack, and log out an item while another state may only track the actual time required to complete the test. The estimation of fees based on hourly rate alone was thus abandoned in favor of requesting typical fees charged for specific routine services performed.

We now ask each lab to quote the typical fee that they would charge for the various routine measurements instead of relying on published hourly rates. This provides each lab with a similar set of assumptions when quoting fees for the survey, enabling a more meaningful comparison of fee data between the individual SLP laboratories[4].

Additional Notes:

Only those labs responding to this section of the survey are represented. Labs providing a blanket per hour service fee are not included, nor are any labs that did not respond to the survey, or are currently closed. No effort was made to extrapolate from previous surveys or to estimate calibration times for each requested service.

The fees quoted are based on in-state calibration work. Most of the member labs charge fees based solely on the measurement services provided, however, some report charging higher rates for out-of- state customers. North Carolina, Oklahoma, and Vermont reported that additional charges apply to out-of-state customers.

[4] Actual fees may differ from those indicated for a variety of reasons including but not limited to the number of required adjustments and the condition of the equipment under test.

Mass Echelon I

Description

Each laboratory was asked to estimate the fee charged for testing a precision weight kit containing 21 pieces from 100 g to 1 mg to ASTM Class 0 tolerances using Echelon I procedures.

Comparison of Previous Surveys

Survey	Labs Reporting Mass Echelon I	Average Fee	%Change
2004	15	$617.87	--
2006	16	$758.75	+23 %
2008	14	$700.07	-8 %
2010	15	$780.83	+10 %
2012	14	$820.18	+5 %

Table 24: Average fee charged for Echelon I mass testing from 2004 through 2012.

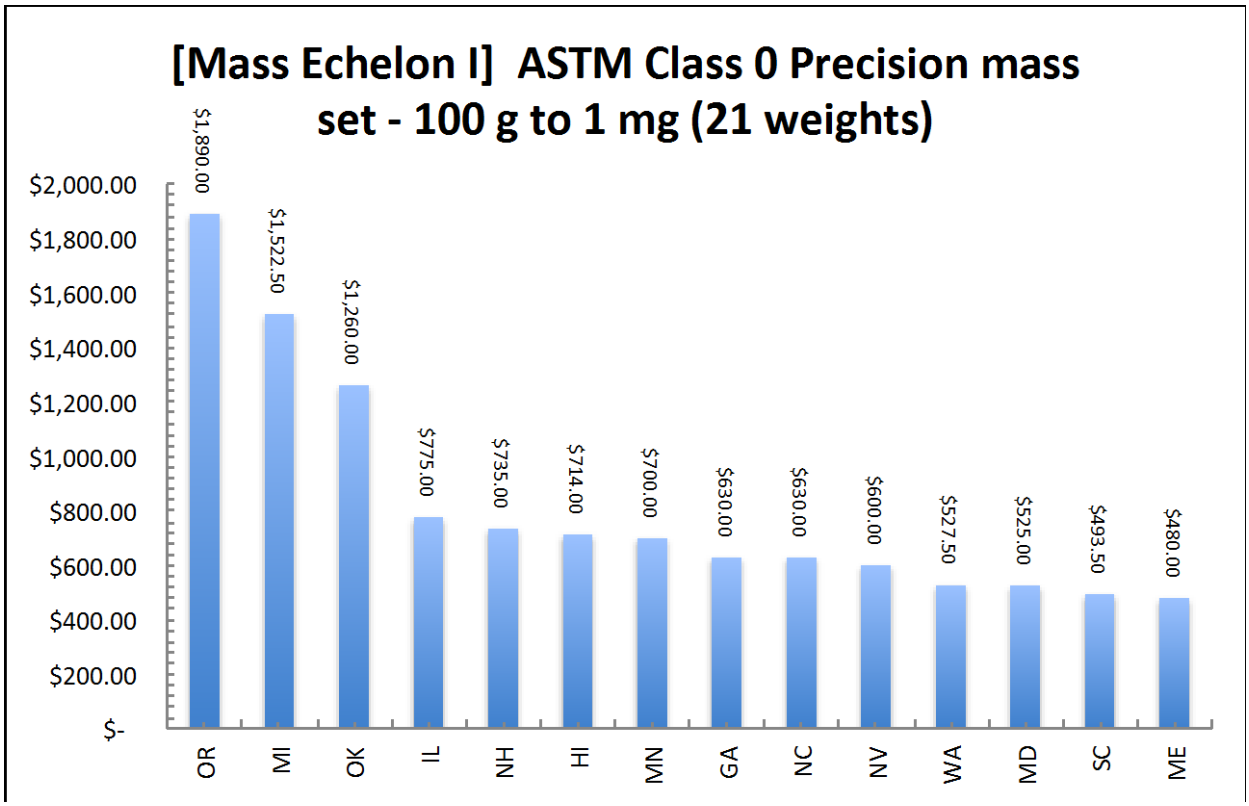


Figure 31: Fees charged for calibration of a precision weight kit containing 21 individual weights ranging from 100 g to 1 mg to ASTM Class 0 tolerances using Echelon I testing techniques.

Mass Echelon II

Description

Each laboratory was asked to estimate the fee charged for testing a precision weight kit containing 21 pieces from 100 g to 1 mg to ASTM Class 2 tolerances using Echelon II procedures.

Comparison of Previous Surveys

Survey	Labs Reporting Mass Echelon II	Average Fee	%Change
2000	33	$334.00	--
2002	39	$414.32	+24 %
2004	30	$431.43	+4 %
2006	31	$482.87	+12 %
2008	29	$496.18	+3 %
2010	29	$522.09	+5 %
2012	25	$636.25	+22 %

Table 25: Average fee charged for Echelon II mass testing from 2000 through 2012

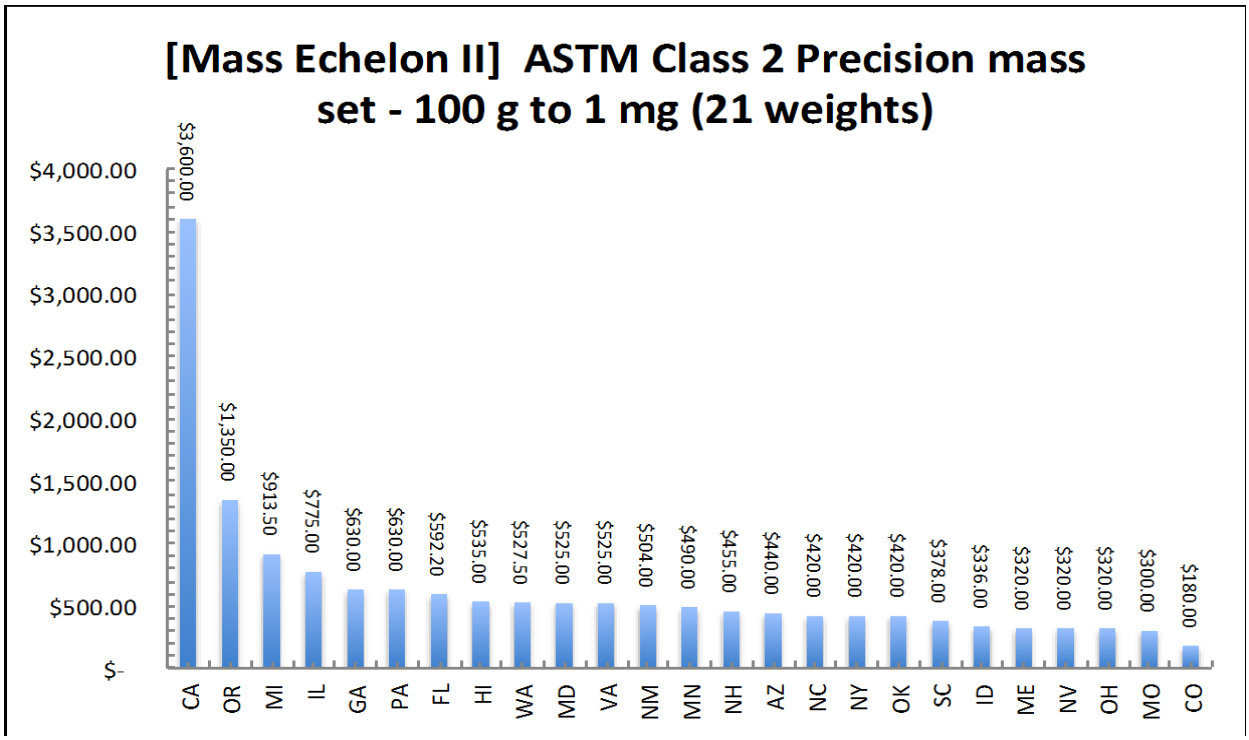


Figure 32: Fees charged for calibrating a precision weight kit containing 21 individual weights ranging from 100 g to 1 mg to ASTM Class 2 tolerances using Echelon II testing techniques.

Mass Echelon III

Description

Each laboratory was asked to estimate the fee charged for testing a 31 lb weight kit containing 22 pieces according to NIST Class F (10) tolerances using Echelon III procedures.

Comparison of Previous Surveys

Survey	Labs Reporting Mass Echelon III	Average Fee	%Change
2000	36	$77.00	--
2002	41	$94.99	+23 %
2004	38	$121.13	+28 %
2006	42	$135.64	+12 %
2008	44	$156.93	+15 %
2010	41	$179.30	+14 %
2012	43	$186.93	+4 %

Table 26: Average fee charged for Echelon III mass testing from 2000 through 2012.

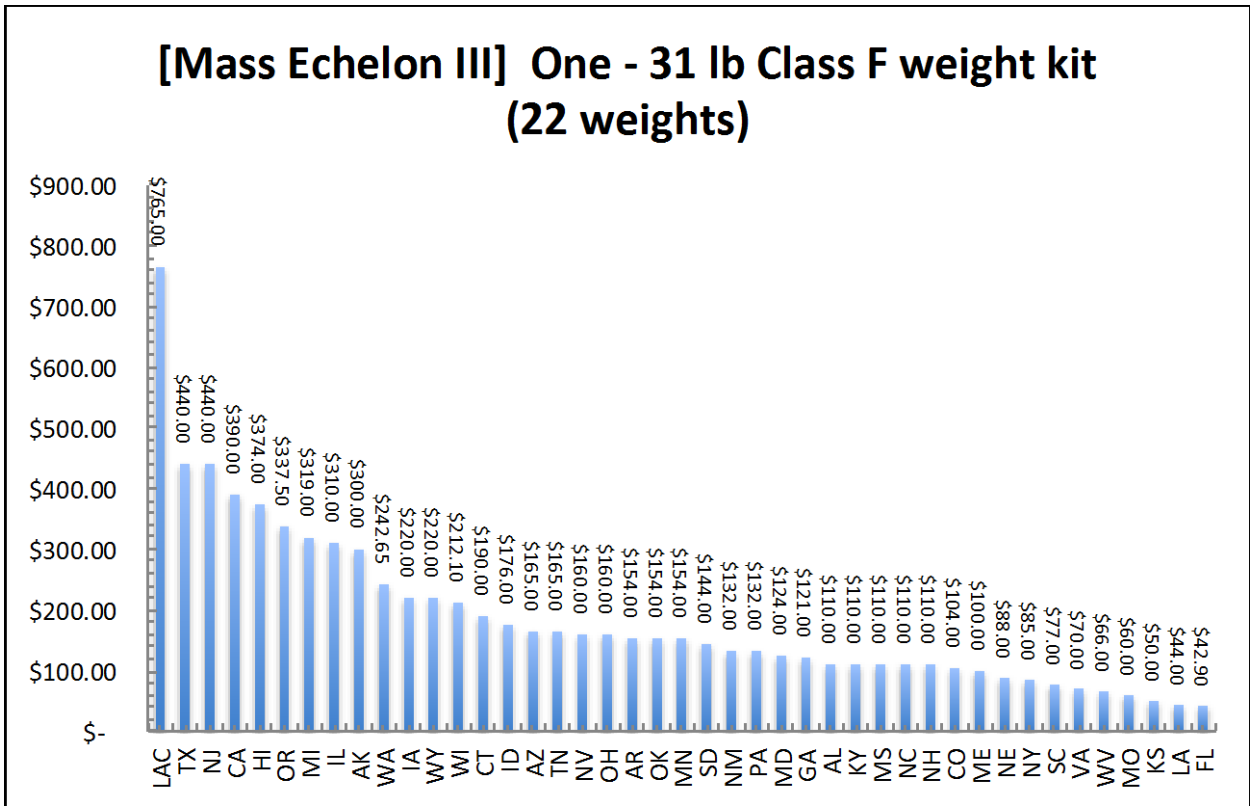


Figure 33: Fees charged for testing a 31 lb weight kit containing 22 pieces to NIST HB 105-1 Class F tolerances (10) using mass Echelon III procedures.

5,000 lb Weight Cart

Description

Each laboratory was asked to estimate the fee charged for testing a 5,000 lb weight cart according to NIST HB 105-8 tolerances (9) using Echelon III procedures.

Comparison of Previous Surveys

Survey	Labs Reporting Weight Carts	Average Fee	%Change
2004	28	$163.27	--
2006	31	$205.74	+23 %
2008	31	$185.80	+28 %
2010	34	$225.09	+21 %
2012	30	$201.65	-10 %

Table 27: Average fee charged for a 5,000 lb weight cart testing from 2004 through 2012.

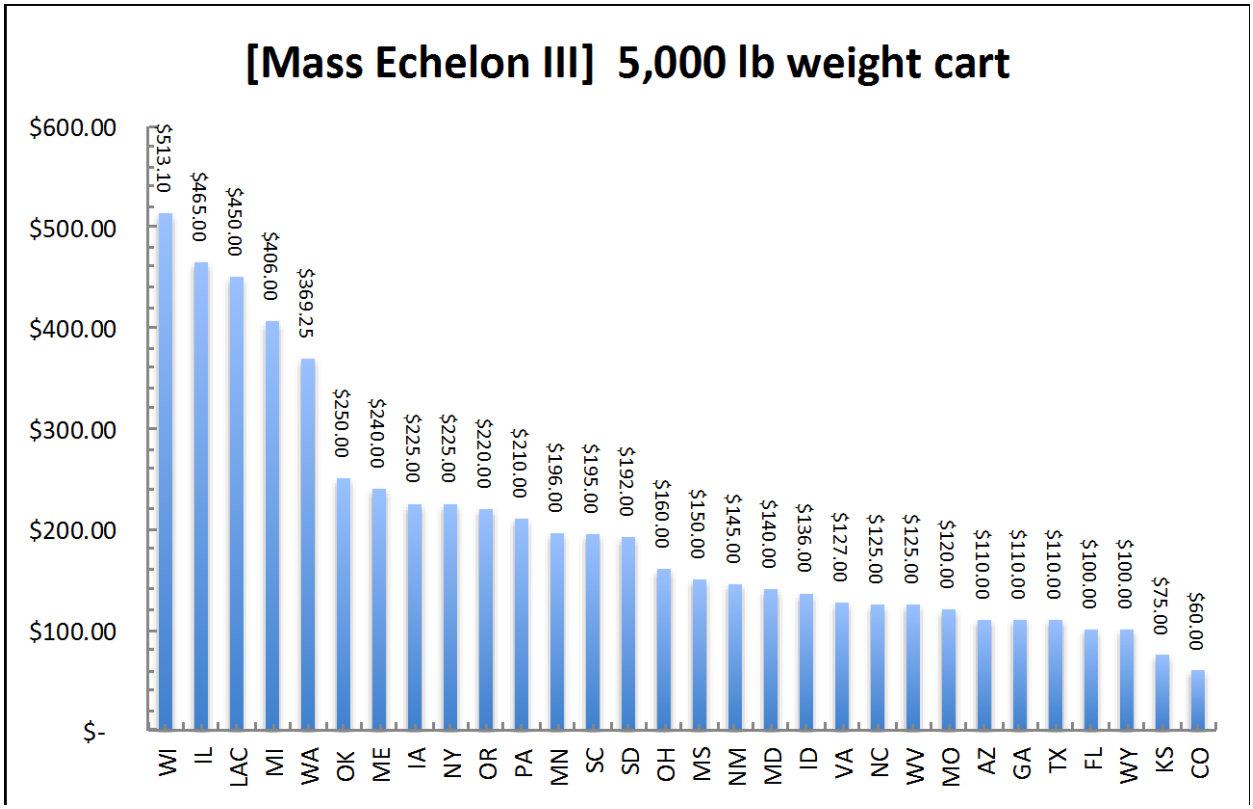


Figure 34: Fees charged for testing a 5,000 lb weight cart according to NIST HB 105-8 (9) tolerances using mass Echelon III procedures.

Scale Truck Calibration Class F

Description

Each laboratory was asked to estimate the fee charged for testing the measurement equipment contained in a single scale truck. The truck was assumed to carry 24 1,000 lb class F cast cube weights requiring 5 adjustments, 20 50 lb class F pipe-handle weights requiring 5 adjustments, and 2 31 lb weight kits containing 22 pieces each. Echelon III mass calibration procedures were requested for all measurements.

Comparison of Previous Surveys

Survey	Labs Reporting Scale Trucks	Average Fee	%Change
2004	39	$1,050.56	--
2006	43	$1,060.77	+23 %
2008	42	$1,300.30	+28 %
2010	44	$1,455.69	+12 %
2012	42	$1,520.41	+4 %

Table 28: Average fee charged for typical scale truck testing from 2004 through 2012.

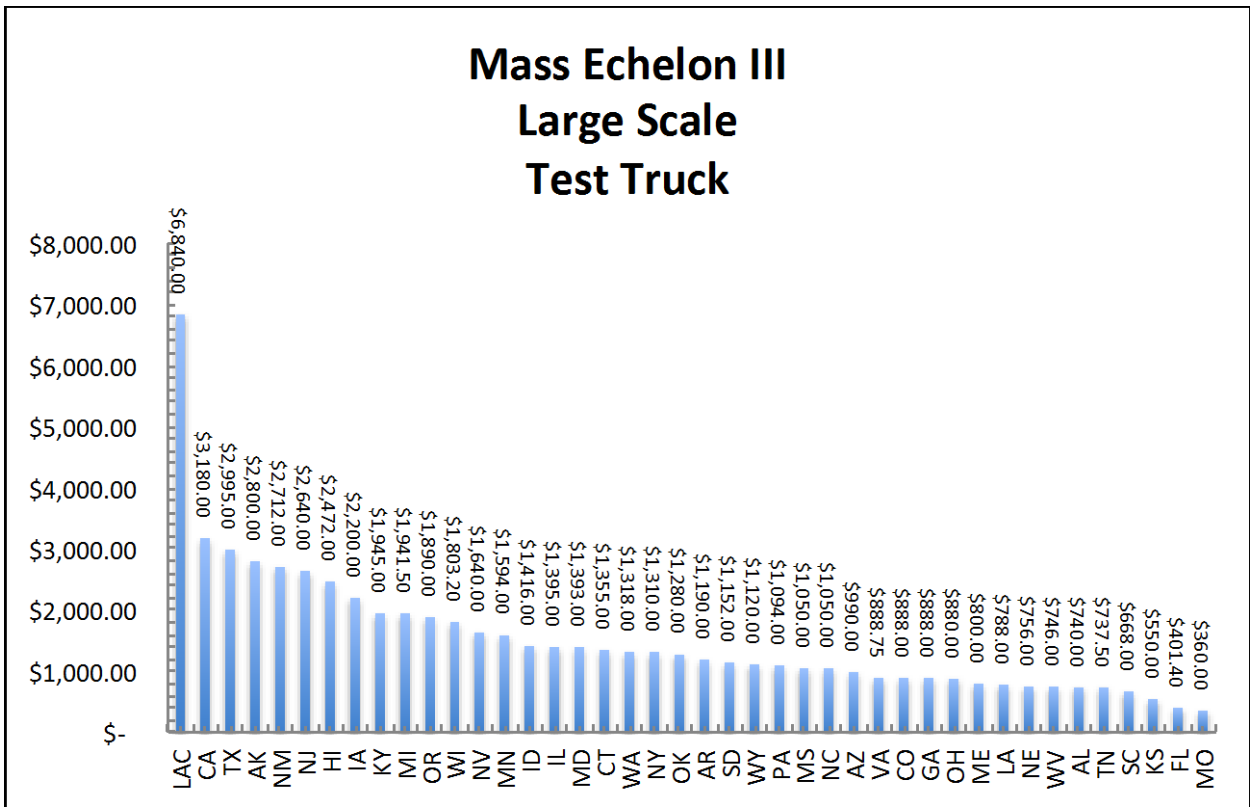


Figure 35: Fees charged for testing a typical scale truck according mass Echelon III procedures.

Length 100 ft Steel Tape

Description

Each laboratory was asked to estimate the fee charged for 19 point testing of a 100 ft tape. Measurement points were requested at 1 ft intervals up to and including 10 ft then at 10 ft intervals up to and including 100 ft. It was left up to each lab to decide how best to test the steel tape, only the fee charged is reported here.

Comparison of Previous Surveys

Survey	Labs Reporting 100 ft Tapes	Average Fee	%Change
2000	33	$133.00	--
2002	36	$173.03	+30 %
2004	22	$250.89	+45 %
2006	22	$261.23	+4 %
2008	18	$244.86	-6 %
2010	16	$234.16	-4 %
2012	10	$246.00	+5 %

Table 29: Average fee charged for typical 19 point testing of a 100 ft steel tape from 2000 through 2012.

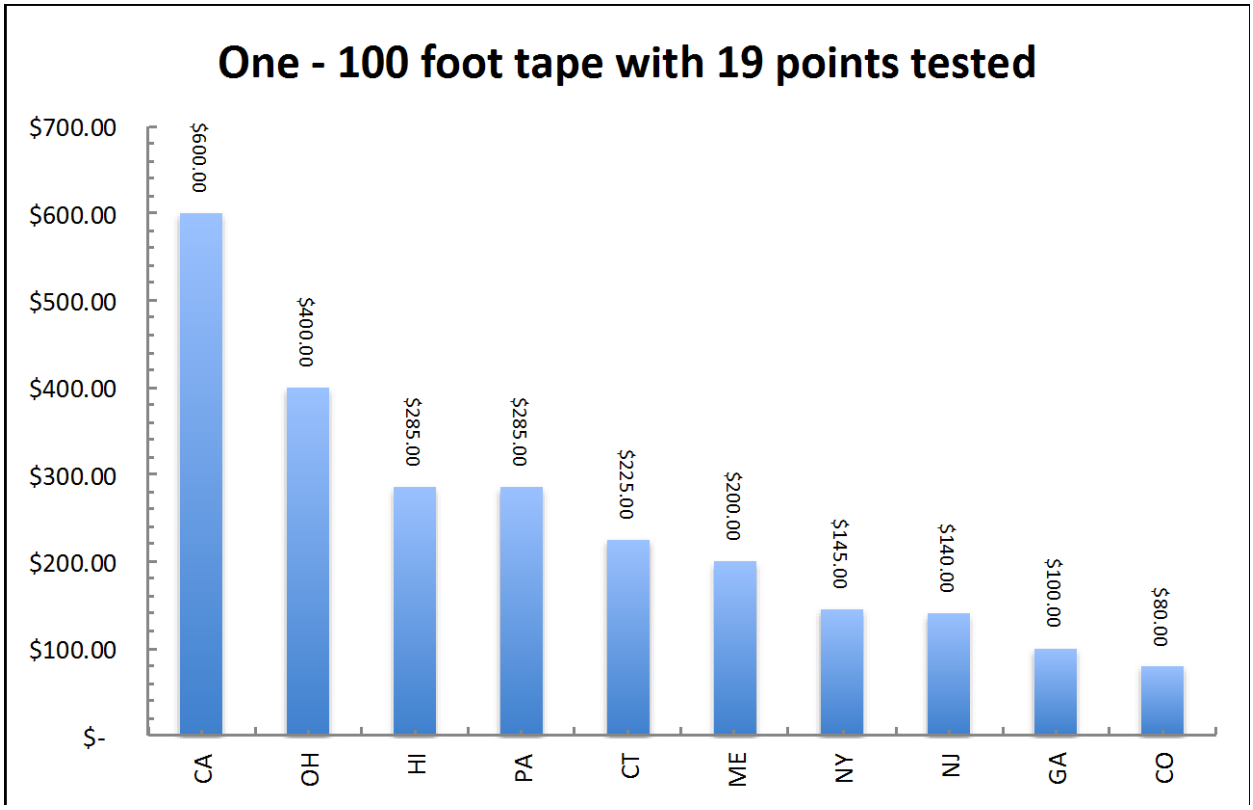


Figure 36: Fees charged for testing a steel 100 ft tape.

5 gallon test measures – Volume Transfer

Description

Each laboratory was asked to estimate the fee charged for testing a single 5 gallon field test measure according to NIST HB 105-3 (14) tolerances using a volume transfer calibration technique (for example SOP No. 18 in ref. (12)).

Comparison of Previous Surveys

Survey	Labs Reporting 5 gallon volume transfer fees	Average Fee	%Change
2000	35	$35.00	--
2002	41	$41.46	+18 %
2004	39	$42.06	+1 %
2006	43	$43.93	+4 %
2008	43	$56.89	+30 %
2010	44	$64.44	+13 %
2012	44	$63.61	-1 %

Table 30: Average fee charged for testing of a 5 gallon field test measure via volume transfer from 2000 through 2012.

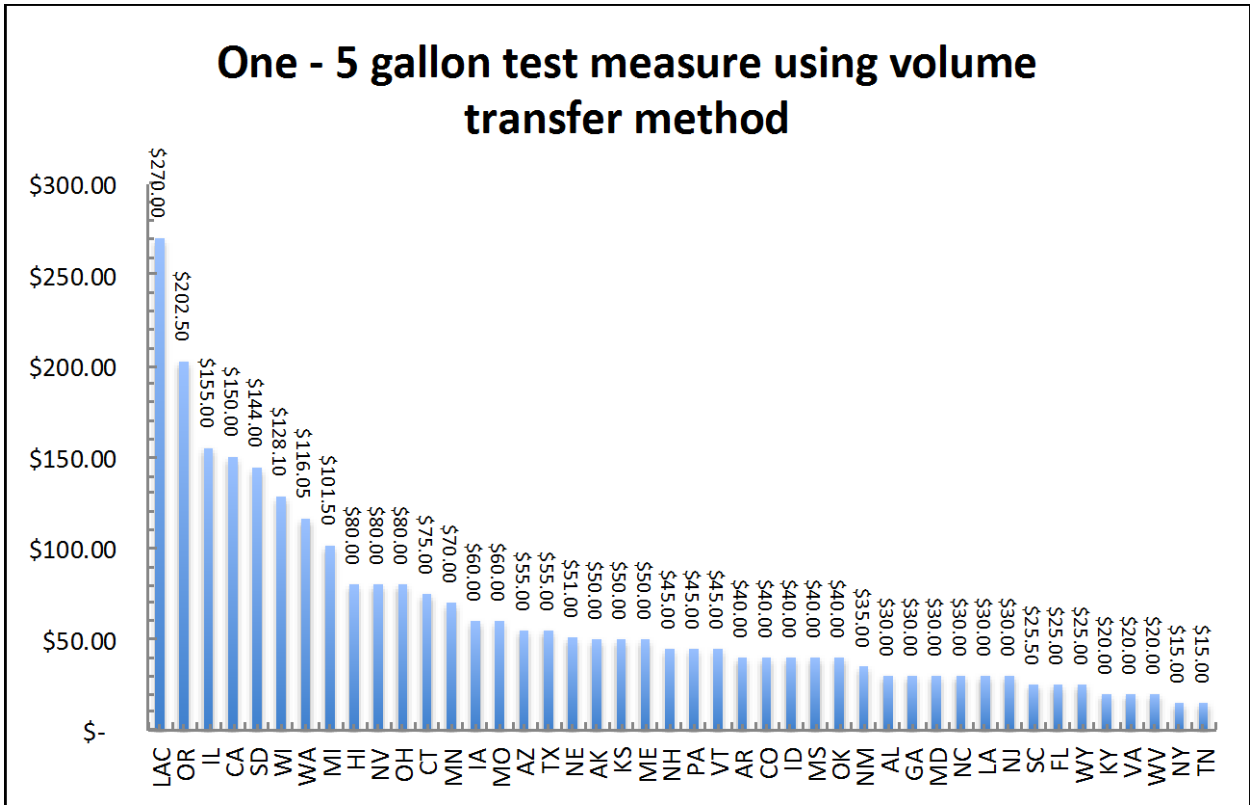


Figure 37: Fees charged for testing a 5 gallon field standard steel prover via volume transfer technique.

5 gallon test measure - Gravimetric

Description

Each laboratory was asked to estimate the fee charged for testing a single 5 gallon field standard test measure according to NIST HB 105-3 tolerances using a gravimetric measurement technique.

Comparison of Previous Surveys

Survey	Labs Reporting 5 gallon gravimetric calibration fees	Average Fee	%Change
2006	20	$177.95	--
2008	17	$173.65	+23 %
2010	21	$209.25	+21 %
2012	18	$215.24	+3 %

Table 31: Average fee charged for testing of a 5 gallon field test measure via gravimetric method from 2000 through 2012.

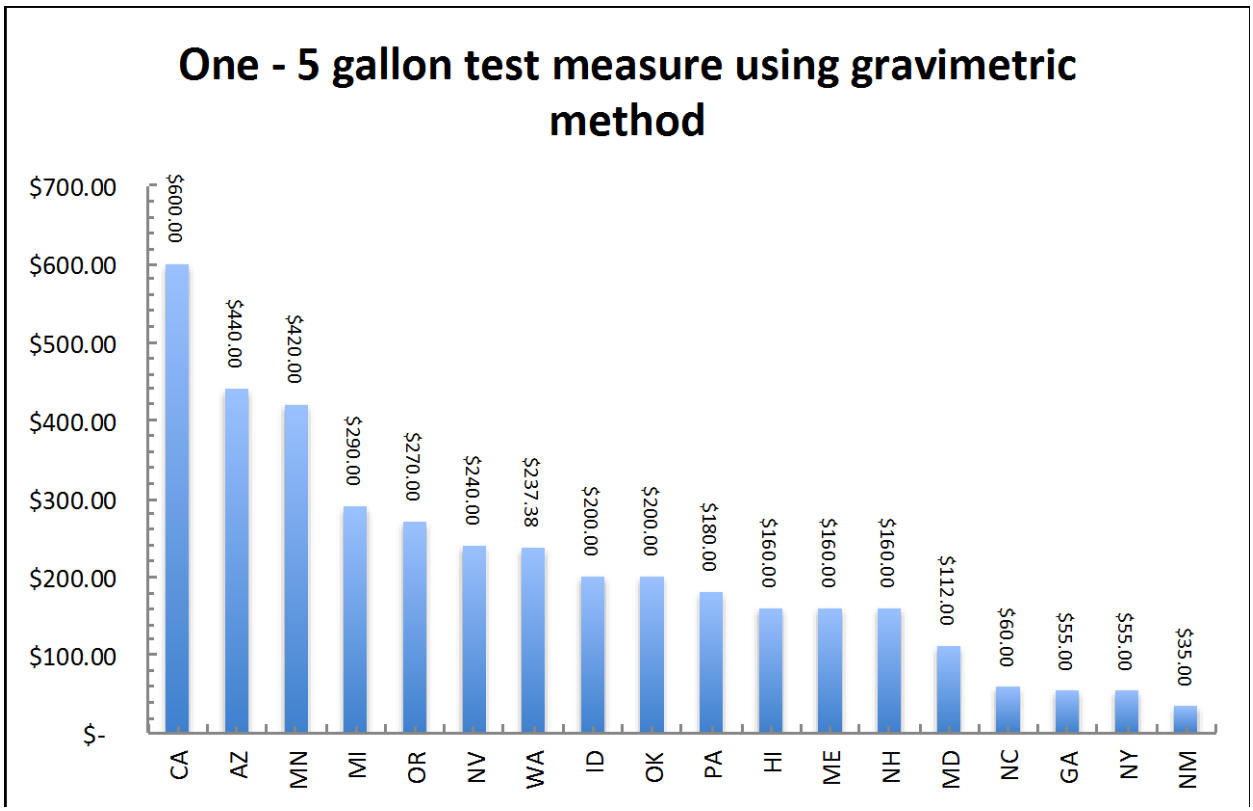


Figure 38: Fees charged for gravimetrically testing a 5 gallon field test measure.

100 gallon field standard prover – Volume Transfer

Description

Each laboratory was asked to estimate the fee charged for testing a 100 gallon field standard prover according to NIST HB 105-3 tolerances using a volume transfer calibration technique.

Comparison of Previous Surveys

Survey	Labs Reporting 100 gallon volume transfer fees	Average Fee	%Change
2000	35	$108.00	--
2002	40	$125.19	+16 %
2004	35	$138.73	+11 %
2006	37	$145.32	+5 %
2008	36	$191.83	+32 %
2010	38	$219.76	+15 %
2012	38	$206.35	- 6 %

Table 32: Average fee charged for testing of a 100 gallon field standard prover via volume transfer from 2000 through 2012.

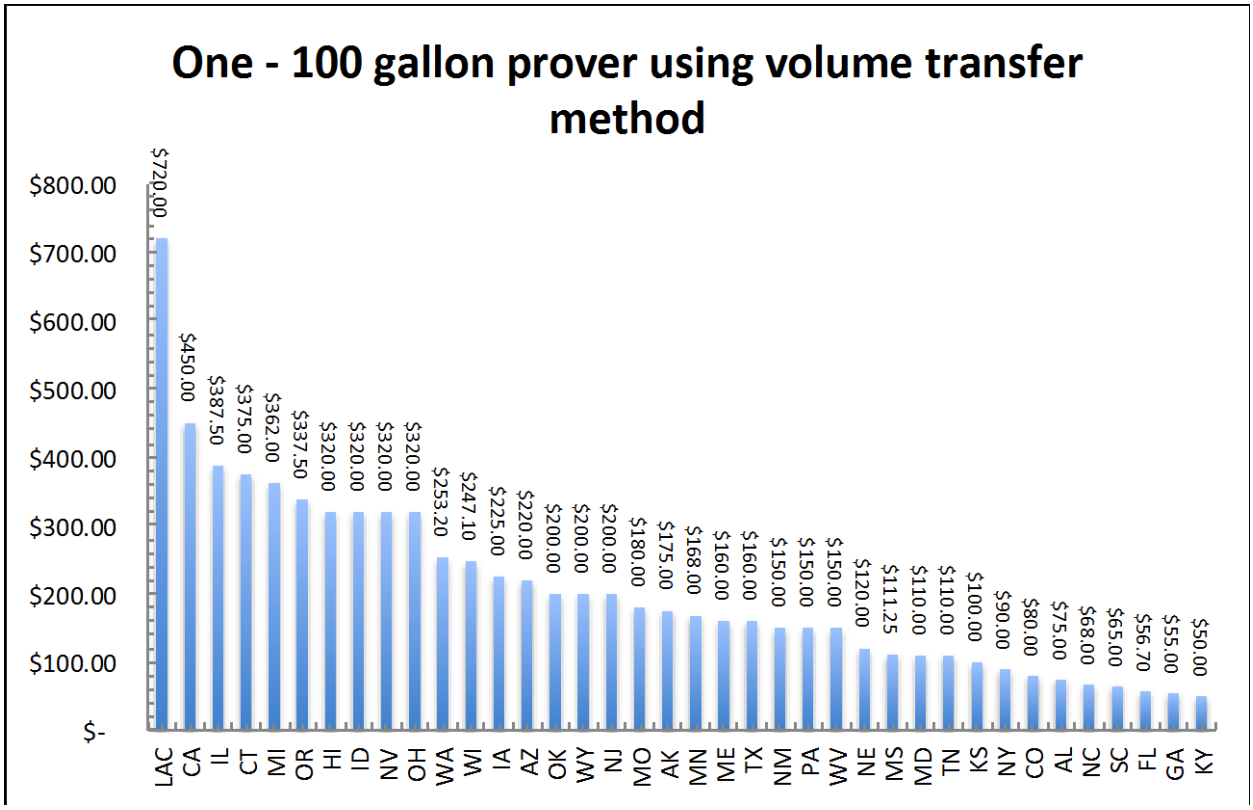


Figure 39: Fees charged for testing a 100 gallon field standard prover via volume transfer technique.

100 gallon field standard prover- Gravimetric

Description

Each laboratory was asked to estimate the fee charged for testing a 100 gallon field standard prover according to NIST HB 105-3 tolerances using a gravimetric calibration technique.

Comparison of Previous Surveys

Survey	Labs Reporting 100 gallon gravimetric fees	Average Fee	%Change
2006	4	$265.00	+5 %
2008	7	$434.29	+64 %
2010	7	$597.14	+37 %
2012	7	$447.14	-25 %

Table 33: Average fee charged for testing of a 100 gallon field test standard prover via gravimetric method from 2006 through 2012.

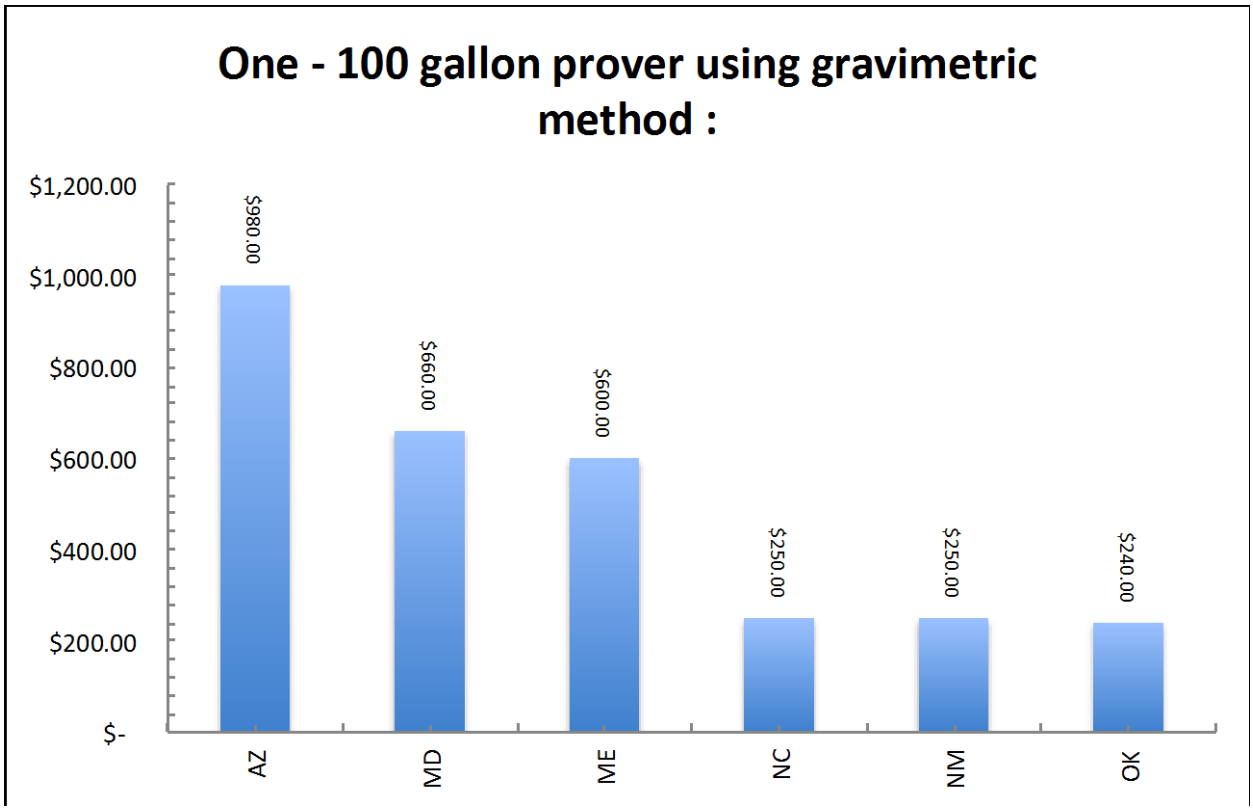


Figure 40: Fees charged for gravimetrically testing a 100 gallon field standard steel prover.

100 gallon field standard prover LPG – Volume Transfer

Description

Each laboratory was asked to estimate the fee charged for testing a 100 gallon liquefied petroleum gas (LPG) field standard prover according to NIST HB 105-4 tolerances using a volume transfer calibration technique.

Comparison of Previous Surveys

Survey	Labs Reporting 100 gallon LPG	Average Fee	%Change
2006	32	$255.78	--
2008	31	$295.39	+23 %
2010	38	$219.75	-26 %
2012	29	$348.05	+58 %

Table 34: Average fees charged for the testing of a 100 gallon LPG prover via volume transfer from 2006 through 2012.

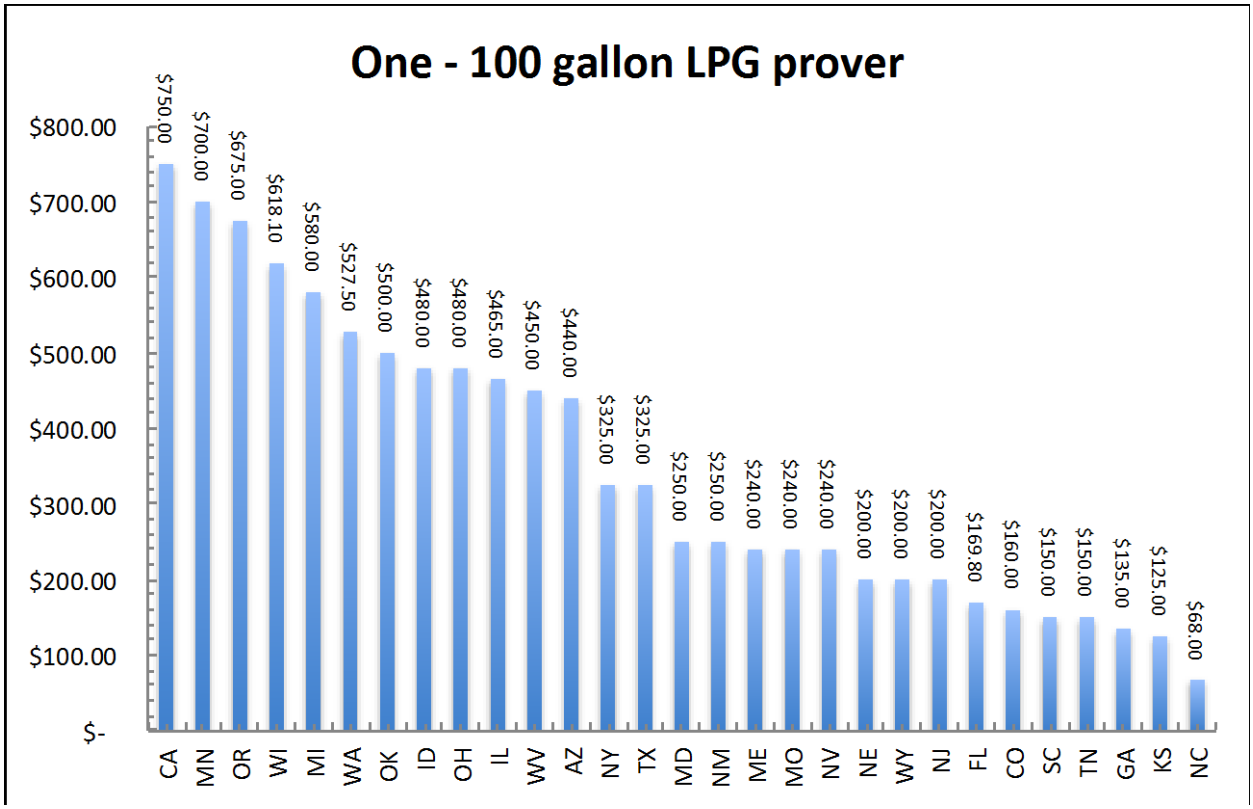


Figure 41: Fees charged for testing a 100 gallon LPG prover.

20 gallon Dynamic Small Volume Prover (SVP) - Volume Transfer

Description

Each lab was asked to estimate the fee for testing a 20 gallon SVP according to NIST HB 105- 7 tolerances using a volume transfer calibration method. The sole reported fee is given in Table 35

Lab ID	Fee
CO	$80.00
ID	$320.00

Table 35: Fees charged for testing a SVP via volume transfer.

Comparison of Previous Surveys

Survey	Labs Reporting SVP Volume Transfer	Average Fee	%Change
2006	3	$113.33	--
2008	2	$123.75	+9 %
2010	1	$100.00	-19 %
2012	2	$200.00	+100 %

Table 36: Average fee charged for testing a SVP via volume transfer from 2006 through 2012.

20 gallon Dynamic Small Volume Prover (SVP) – Volume Gravimetric

Description

Each lab was asked to provide a fee for testing one 20 gallon SVP according to HB 105- 7 tolerances using a gravimetric calibration method. The reported fees are given in Table 37.

Lab ID	Fee
MI	$870.00
AZ	$770.00
NC	$140.00

Table 37: Fees charged for testing a SVP gravimetrically.

Comparison of Previous Surveys

Survey	Labs Reporting SVP Volume Gravimetric	Average Fee	%Change
2006	3	$470.00	--
2008	3	$470.00	0 %
2010	3	$593.33	+26 %
2012	3	$593.33	0 %

Table 38: Average fee charged for testing a SVP gravimetrically from 2006 through 2012

Metrology Positions/Title and Salaries

Each laboratory was asked to provide position titles and salary ranges for personnel employed by the lab. They were asked to categorize each position according to the metrology function performed.

Lab ID	Position Title	Minimum	Maximum	Category
AK	State Metrologist II	$ 4,569.00	$ 6,503.00	Laboratory Supervisor
AK	State Metrologist I	$ 3,967.00	$ 5,693.00	Metrology/Calibration Technician
AL	Laboratory Supervisior	$ 2,690.60	$ 4,077.00	
AL	Comsumer W & M Protection Specialist: Lab	$ 2,376.40	$ 3,979.80	
AR	Metrology Laboratory Supervisor	$ 2,892.00	$ 5,530.00	
AR	Metrologist	$ 2,245.00	$ 4,298.00	
AZ	Admin Services Officer II	$ 3,882.80	$ 6,618.70	Laboratory Supervisor
CA	Principal State Metrologist	$ 6,105.00	$ 6,732.00	Laboratory Supervisor
CA	Measurement Standards Specialist III	$ 3,971.00	$ 4,826.00	Metrology/Calibration Engineer
CA	Measurement Standards Specialist II	$ 3,304.00	$ 3,968.00	Metrology/Calibration Technician
CA	Measurement Standards Specialist I	$ 2,888.00	$ 3,458.00	Metrology/Calibration Technician
CO	Metrologist III	$ 4,148.00	$ 5,712.00	Metrology/Calibration Engineer
CO	Metrologist II	$ 3,859.00	$ 5,314.00	Metrology/Calibration Engineer
CO	Metrologist I	$ 3,590.00	$ 4,943.00	Metrology/Calibration Engineer
CT	Metrologist	$ 4,176.25	$ 5,624.50	Metrology/Calibration Engineer
CT	Weights and Measures Inspector	$ 4,692.25	$ 5,925.67	Metrology/Calibration Engineer
DA	Industrial Specilist	$ 6,283.58	$ 8,168.50	Metrology/Calibration Engineer
FL	Senior Metrologist	$ 2,763.49	$ 4,617.01	Metrology/Calibration Engineer
FL	Metrologist	$ 2,350.39	$ 3,717.22	Metrology/Calibration Technician
FL	Laboratory Technician IV	$ 2,125.81	$ 3,308.32	Support Staff
GA	State Metrologist	$ 3,253.17	$ 5,960.25	Laboratory Supervisor
GA	Assistant State Metrologist	$ 2,964.11	$ 5,192.82	Laboratory Supervisor
GA	Metrologist 2 (vacant)	$ 2,222.67	$ 3,062.08	Metrology/Calibration Engineer
GA	Metrologist 1 (vacant)	$ 2,026.83	$ 2,790.25	Metrology/Calibration Technician
HI	Metrologist 1	$ 3,249.00	$ 4,809.00	Metrology/Calibration Technician
HI	Metrologist 2	$ 3,511.00	$ 5,202.00	Metrology/Calibration Engineer
HI	Metrologist 3	$ 3,798.00	$ 5,624.00	Laboratory Supervisor
IA	Metrologist	$ 5,208.33	$ 5,413.66	Metrology/Calibration Engineer
IL	Public Service Administrator - Option 8Z	$ 4,400.00	$ 6,253.00	Lab Supervisor-Metrology Cal Engineer
IL	Products & Standards Inspector	$ 3,578.00	$ 4,928.00	Metrology Calibration Technician
KS	Section Manager/Metrologist	$ 4,394.00	$ 8,083.00	Laboratory Supervisor
KS	Ag Program Specialist	$ 3,670.00	$ 6,750.00	Metrology/Calibration Technician
KY	Program Coordintaor	$ 2,670.20	$ 4,439.20	Laboratory Supervisor
KY	Agricutural Inspector I	$ 1,823.90	$ 3,008.54	Metrology/Calibration Technician
KY	Metrology Lab Supervisor	$ 3,230.84	$ 5,329.36	Laboratory Supervisor
KY	Metrology Lab Technician I	$ 2,006.08	$ 3,309.32	Metrology/Calibration Technician
KY	Metrology Lab Technician II	$ 2,427.44	$ 4,004.00	Metrology/Calibration Engineer
LA	Assistant Division Director	$ 4,277.00	$ 8,285.00	
LA	Metrologist	$ 2,851.00	$ 5,520.00	
LAC	Senior Metrologist	$ 4,620.73	$ 5,588.36	Laboratory Supervisor
LAC	Metrologist	$ 4,036.45	$ 5,294.00	Metrology/Calibration Technician
LAC	Agricultural/Weights and Measures Inspector III	$ 4,313.00	$ 5,657.00	Laboratory Supervisor
LAC	Agricultural/Weights and Measures Inspector II	$ 3,872.00	$ 5,076.00	Metrology/Calibration Technician
LAC	Agricultural/Weights and Measures Inspector I	$ 3,669.00	$ 4,554.00	Metrology/Calibration Technician
LAC	Associate Weights and Measures Inspector	$ 3,223.83	$ 3,223.83	Metrology/Calibration Technician
MA	Manager of Laboratory and Training	$ 4,000.00	$ 6,000.00	Laboratory Supervisor

Lab ID	Position Title	Minimum	Maximum	Category
MD	Metrologist Trainee	$ 2,276.58	$ 3,554.42	Metrology/Calibration Technician
MD	Metrologist I	$ 2,899.67	$ 4,585.25	Metrology/Calibration Technician
MD	Metrologist II	$ 3,083.83	$ 4,893.25	Metrology/Calibration Technician
MD	Laboratory Supervisor	$ 3,491.33	$ 5,573.33	Laboratory Supervisor
ME	Metrologist	$ 3,526.00	$ 4,787.50	Laboratory Supervisor
ME	Consumer Protection Inspector	$ 2,609.00	$ 3,515.00	Metrology/Calibration Technician
MI	Metrologisti Manager - 14	$ 4,208.00	$ 6,192.00	Laboratory Supervisor
MI	Metrology Specialist - 13	$ 3,945.60	$ 5,792.00	Metrology/Calibration Engineer
MI	Metrologist - 12	$ 3,636.80	$ 5,300.80	Metrology/Calibration Engineer
MI	Metrologist - P11	$ 3,462.40	$ 4,875.20	Metrology/Calibration Engineer
MI	Metrologist - 10	$ 2,992.00	$ 4,217.60	Metrology/Calibration Engineer
MI	Metrologist - 9	$ 2,892.80	$ 4,126.40	Metrology/Calibration Engineer
MN	Deputy Director	$ 4,895.00	$ 7,035.00	Laboratory Supervisor
MN	State Program Administrator, Technical Specialist	$ 2,802.00	$ 3,945.00	Metrology/Calibration Technician
MN	State Program Administrator, Principle	$ 3,859.00	$ 5,688.00	Metrology/Calibration Engineer
MO	Metrologist	$ 3,040.00	$ 4,945.00	Laboratory Supervisor
MO	Metrology Specialist	$ 2,625.00	$ 3,706.00	Metrology/Calibration Technician
MS	Lab Director	$ 3,762.91	$ 6,585.09	Laboratory Supervisor
MS	Metrologist	$ 2,413.52	$ 4,223.66	Metrology/Calibration Technician
NC	Lab Manager	$ 3,600.00	$ 5,900.00	Laboratory Supervisor
NC	Quality Manager	$ 2,900.00	$ 4,700.00	Metrology/Calibration Engineer
NC	Metrologist I	$ 2,700.00	$ 4,300.00	Metrology/Calibration Technician
NC	Grain Moisture Supervisor	$ 2,900.00	$ 4,700.00	Metrology/Calibration Engineer
NC	Processing Assistant III	$ 2,500.00	$ 3,800.00	Support Staff
NH	Weights & Measures Metrologist	$ 2,795.00	$ 3,711.50	Metrology/Calibration Engineer
NH	Weights & Measures Metrologist - Part Time	$ -	$ -	Metrology/Calibration Technician
NJ	Supervisor of Licensing and Metrology	6308	9148	Laboratory Supervisor
NJ	Inspector 2	4943	7169	Metrology/Calibration Technician
NJ	Inspector 3	4270	6194	Metrology/Calibration Engineer
NM	Regulatory Lab Manager, Metrologist	$ 4,583.34	$ 6,833.34	Laboratory Supervisor
NM	Metrologist, Intermediate	$ 3,000.00	$ 4,500.00	Metrology/Calibration Technician
NV	Chief State Metrologist	$ 3,403.00	$ 5,562.00	Laboratory Supervisor
NV	Las Vegas Satellite Lab Metrologist	$ 2,500.00	$ 3,300.00	Metrology/Calibration Technician
NY	Specialist I (Metrologist)	$ 3,872.00	$ 4,803.00	Metrology/Calibration Technician
NY	Director (Lab Manager)	$ 6,864.00	$ 8,673.00	Laboratory Supervisor
OH	Weights and Measures Technologist	$ 2,938.00	$ 3,819.00	Metrology/Calibration Technician
OK	Metrologist I	$ 2,144.17	$ 3,573.67	Metrology/Calibration Technician
OK	Metrologist II	$ 2,576.67	$ 4,294.50	Metrology/Calibration Technician
OK	Metrologist III	$ 3,146.00	$ 5,243.33	Metrology/Calibration Engineer
OR	Lead Metrologist	$ 4,856.00	$ 7,107.00	Metrology/Calibration Technician
OR	Metrologist	$ 4,413.00	$ 6,463.00	Metrology/Calibration Technician
PA	Laboratory Supervisor	$ 3,978.83	$ 6,044.00	Laboratory Supervisor
PA	Metrologist	$ 3,947.83	$ 5,620.25	Metrology/Calibration Technician
PA	Metrologist (with NIST Basic Training)	$ 4,128.75	$ 5,620.25	Metrology/Calibration Engineer
PA	Metrologist (with NIST Intermediate Training)	$ 4,311.33	$ 5,620.25	Metrology/Calibration Engineer
PA	Laboratory Administrative Assistant	$ 2,534.66	$ 3,780.00	Support Staff
SC	Program Coordinator I	$ 2,598.50	$ 4,807.92	Laboratory Supervisor
SC	Lab Technician II	$ 2,598.50	$ 4,807.92	Metrology/Calibration Technician
SD	State Lead Inspector	$ 2,492.55	$ 4,130.13	Laboratory Supervisor
TN	State Metrologist	$ 2,941.00	$ 4,707.00	Metrology/Calibration Engineer
TX	Coordinator for Metrology & Licensed Service Co.	$ -	$ -	Laboratory Supervisor
TX	Inspector IV	$ -	$ -	Metrology/Calibration Engineer
TX	Administrative Assistant III	$ -	$ -	Support Staff
UT	State Metrologist	$ 3,650.00	$ 5,791.00	Metrology/Calibration Technician
VA	Lab Research Practitioner II	$ 2,917.00	$ 4,000.00	Metrology/Calibration Engineer
VA	Compliance Manager	$ 4,167.00	$ 5,000.00	Laboratory Supervisor
VT	Weights and Measures Specialist/Metrologist	$ 3,572.00	$ 5,581.00	Laboratory Supervisor
VT	Consumer Protection Specilaist	$ 3,194.00	$ 4,974.00	Support Staff

Lab ID	Position Title	Minimum	Maximum	Category
WA	State Metrologist	$ 2,994.00	$ 3,918.00	Laboratory Supervisor
WI	Metrologist	$ 3,818.00	$ 8,780.00	
WV	Labor Inspector II - Assigned to the Lab	$ 2,076.00	$ 3,841.00	Metrology/Calibration Technician
WY	Inspection Supervisor	$ 5,001.00	$ 7,060.00	Laboratory Supervisor

Table 39: Metrologist position titles and salary range.

2012 State Laboratory Program Metrologists

The survey requested data on each metrologist on staff in the SLP. This data included details on his or her experience (in years) both in the SLP and outside of it, and the calendar year when he or she will be eligible for full retirement, and what measurements the metrologist is authorized to perform.

The SLP has lost several of its senior metrologists between 2008 and 2012. Some 20 % of the metrologists listed in this survey will be eligible for full retirement by 2014. Some have already retired.

The NIST Office of Weights and Measures offers a comprehensive training program for all metrologists in the SLP. Completion of specific training modules is requirements for inclusion of a measurement discipline on a laboratory's certificate of measurement traceability. We noted that some metrologists are authorized to perform measurements on behalf of a laboratory for which they have not received the required NIST training.

State	Name	email	What Year Eligible for Retirement?	State Lab Metrology	Other Metrology	Total Metrology Experience		Mass I	Mass II	Mass III	Vol Trans	Vol Grav	Length	Time/Frequency	Temperature	Grain Moisture
AK	Garret Brown	garret.brown@alaska.gov	2023	8	8	16		N	P	F	F	P	N	F	N	N
AK	Roger Holland	roger.holland@alaska.gov	2022	3	0	3		N	P	F	F	P	N	F	N	N
AL	Michael Bridges	michael.bridges@agi.alabama.gov	2027	3		3				F	F					
AL	Wes Seals	wes.seals@agi.alabama.gov	2030	7		7				F	F					
AR	Nikhil Soman	nikhil.soman@aspb.ar.gov	2028	1		1				F	F					
AR	Charles Hawkins	charles.hawkins@aspb.ar.gov	2028	3		3				F	F					
AR	Randy Burns	randy.burns@aspb.ar.gov	2014													F
AR	Dorothy Lawson	dorothy.lawson@aspb.ar.gov	2014													F
AZ	Brian Sellers	bsellers@azdwm.gov	2024	8.5		8.5			F	F	F	F				
CA	Greg Boers	gboers@cdfa.ca.gov	2015	15		15		N	F	F	F	F	F	F	F	N
CA	Anthony Gruneisen	agruneisen@cdfa.ca.gov	2033	11		11		N	F	F	F	F	F	F	F	N
CO	Diane Wise	Diane.Wise@state.co.us	2013	20	0	20		N	F	F	F	F	F	F	N	F
CO	Kate Smetana	Kate.Smetana@state.co.us	2040	1	0	1		N	P	P	P	N	N	F	N	F
CT	Ana Maria Feliciano	ana.feliciano@ct.gov	2039	2	0	2				F	F		F	F		
CT	Ion Daha	ion.daha@ct.gov	2031	3	0	3				P	P					
DA	Marcus Harwitz	Marcus.Harwitz@usda.gov						N	N	P	N	N	N	N	N	N
DA	Al Rupert	Al.L.Rupert@usda.gov						N	N	P	N	N	N	N	N	N
FL	Davis Terry	davis.terry@freshfromflorida.com	2019	13	0	13		N	F	F	F	F	F	N	N	F
FL	Megan Faircloth	megan.faircloth@freshfromflorida.com		<1				N	N	P	P	N	N	N	N	N
FL	Eric Westbrook	eric.westbrook@freshfromflorida.com						N	N	N	N	N	N	N	N	N
GA	Kontz Bennett	kontz.bennett@agr.geogia.gov	2033	12.5	0	12.5		N	F	F	F	F	N	N	N	N
GA	Brian Grace	brian.grace@agr.georgia.gov	2039	6.5	0	6.5		N	P	F	F	F	N	N	N	F
HI	Michael Tang	michael.tang@hawaii.gov	2019	12		12		F	F	F	F	F	N	F	N	N
IA	Andrew Blackburn	andrew.blackburn@iavalley.edu		7	17	24				F	F					
IL	Mike Rockford	Mike.rockford@illinois.gov	2014	24		24		F	F	F	F	N	N	N	N	N
IL	Matt Williams	Matt.williams@illinois.gov	2013	12		12		N	N	F	F	N	N	N	N	N
IL	Karl Cunningham	Karl.cunningham@illinois.gov	2027	8		8		N	N	F	F	N	N	N	N	N
KS	Keith Arkenberg	keith.arkenberg@kda.ks.gov	2042	0	0	0		N	P	F	F	N	N	N	N	N
KS	Kevin Uphoff	kevin.uphoff@kda.ks.gov	2036	1	0	1		N	F	F	F	P	N	N	N	N
KY	Jason Glass	jason.glass@ky.gov	2029	9	0	9		N	N	F	F	N	N	N	N	N
KY	Chester watson	Chester Watson@ky.gov	2034	5	0	5		N	N	F	F	N	N	N	N	N
KY	Bill Baker	bill.baker@ky.gov	2035	5	0	5		N	N	F	F	N	N	N	N	N
LA	Richert Williams	richer_w@ladf.state.la.us						N	N	F	F	N	N	N	N	N
LA	Carl Decker	cdecker@ldaf.state.la.us						N	N	F	F	N	N	N	N	N
LAC	Kai-cheung (KC) Chow	Kchow@acwm.lacounty.gov	2011	12	0	12		P	P	F	F	P	N	N	N	N
LAC	Donald Franks	Dfranks@acwm.lacounty.gov	2021	6	0	6		P	P	F	F	P	N	N	N	N
LAC	Lina Ng	Lng@acwm.acwm.lacounty.gov	2038	4	0	4		N	P	F	F	P	N	N	N	N
MA	Raymond Costa	ray.costa@state.ma.us	2022	1.5	36	37.5		N	N	F	F	N	F	N	N	N

State	Name	email	What Year Eligible for Retirement?	State Lab Metrology	Other Metrology	Total Metrology Experience		Mass I	Mass II	Mass III	Vol Trans	Vol Grav	Length	Time/Frequency	Temperature	Grain Moisture
MD	Stephen Barry	stephen.barry@maryland.gov	2018	24		24		F	F	F	F	F	P	N	F	N
MD	Zenon Waclawiw	zenon.waclawiw@maryland.gov	2028	14		14		F	F	F	F	F	P	N	N	N
ME	Danny Newcombe	danny.newcombe@maine.gov	2010	24		24		F	F	F	F	F	F	F	F	N
ME	Donald Langley	donald.langley@maine.gov	2010	7		7		N	N	P	N	N	N	N	N	N
ME	Bradford Bachelder	bradford.bachelder@maine.gov	2050	1		1		N	N	P	P	N	N	N	N	N
MI	Craig VanBuren	vanburenc9@michigan.gov	2030	13		13		F	F	F	F	F	F		F	
MI	Neil Jones	jonesn@michigan.gov	2010	13		13		F	F	F	F	F	F		F	
MI	Nick Santini	santinin@michigan.gov	2041	2		2			F	F	F	F	F		P	
MI	Ryanne Hartman	hartmanr9@michigan.gov	2035	2		2			P	F	F	P				
MI	Scott Ferguson	fergusons9@michigan.gov	2032	2		2			P	F	F	P				
MN	Steven Harrington	steven.harrington@state.mn.us	2036	8		8		F	F	F	F	F	F	N	F	N
MN	Heidi Jones	heidi.jones@state.mn.us	2023	13		13		N	N	P	N	N	N	N	N	N
MN	Nils Fleming	nils.fleming@state.mn.us	2014	7		7		F	F	F	F	F	F	N	F	N
MN	Bruce Adams	bruce.adams@state.mn.us	2014	22		22		F	F	F	F	F	F	N	F	N
MO	Kevin Hanson	Kevin.Hanson@mda.mo.gov	2021	13	4	17		N	F	F	F	P	F	N	N	
MO	Tom Hughes	Tom.Hughes@mda.mo.gov	2022	14		14		N	F	F	F	P	F	N	N	F
MO	Robert Wittenberger	Bob.Wittenberger@mda.mo.gov	2007	37		37		N	F	F	F	P	F	N	N	
MS	Mel Iasigi	Mel@mdac.ms.gov	2020	12		12		N	N	F	F	N	N	N	N	N
MS	William Bell	WilliamBe@mdac.ms.gov	2030	8		8		N	N	F	F	N	N	N	N	N
NC	Sharon Woodard	sharon.woodard@ncagr.gov	2022	21		21		F	F	F	F	F	N	N	F	P
NC	Spurgeon Van Hyder	van.hyder@ncagr.gov	2024	19		19		F	F	F	F	F	N	N	P	N
NC	Ashley Lessard	ashley.lessard@ncagr.gov	2041	1.75		1.75		N	F	F	F	F	P	N	N	N
NC	Robert Rogers	robert.rogers@ncagr.gov	2041	1.17		1.17		N	N	P	P	N	N	N	P	N
NC	Kristopher Simino	kris.simino@ncagr.gov	2042	0.42		0.42		N	N	P	P	P	N	N	N	N
NC	April Lee	april.lee@ncagr.gov	2042	0.5		0.5		N	N	N	N	N	N	N	N	P
NE	Craig Olsen	craig.olsen@nebraska.gov	2020	26	7	33		N	P	F	F	P	N	N	N	N
NH	Tim Osmer	timothy.osmer@agr.nh.gov	2041	7.5	0	7.5		F	F	F	F	F	N	N	N	N
NH	Richard Cote			17	0	17		P	F	F	F	F	N	N	N	N
NJ	Raymond Szpond	szpondr@dca.lps.state.nj.us	2021	15		15		N	F	F	F	F	F	F	N	N
NJ	W. Craig Gerhartz	gerhartzc@dca.lps.state.nj.us	2013	8	13	21		N	N	F	F	N	F	F	N	N
NJ	Michael Cecere	cecerem@dca.lps.state.nj.us	2017	5		5		N	F	F	F	F	F	F	N	N
NM	Steve Sumner	ssumner@nmda.nmsu.edu	2014	15	20	35		F	F	F	F	F	F	F	F	N
NM	Clay Ivey	civey@nmda.nmsu.edu	2029	3		3		N	P	F	F	F	N	N	P	N
NV	Steve Schultz	boxcar53@agri.nv.gov	2013	9	6	15		N	F	F	F	F	N	N	N	N
NV	Dave Walch	dwalch@agri.nv.gov	2018	13	0	13		N	N	P	P	N	N	N	N	N
NY	Robert Acheson	robert.acheson@agriculture.ny.gov	2009	20		20		P	F	F	F	F	F	F	F	N
NY	Bruce Davidson	bruce.davidson@agriculture.ny.gov	2018	1		1		N	N	P	P	P	P	P	P	N
NY	Eric Morabito	eric.morabito@agriculture.ny.gov	2019	1		1		N	N	P	P	P	P	P	P	N
NY	Mike Sikula	mike.sikula@agriculture.ny.gov	2019	13	7	20		P	F	F	F	F	F	F	F	N
OH	Ken Johnson	johnson@agri.ohio.gov	2020	24	6	30		N	F	F	F	F	F	F	N	N
OH	Dan Walker	daniel.walker@agri.ohio.gov	2042	2	10	12		N	F	F	F	F	F	F	N	N
OH	Joe Morrison	jmorrison@agri.ohio.gov	2027	1	0	1		N	F	F	F	F	N	N	N	N
OK	Richard Gonzales	richard.gonzales@ag.ok.gov	2012	26	0	26		F	F	F	F	F	N	N	P	N
OK	Jeremy Nading	jeremy.nading@ag.ok.gov	2037	7	0	7		P	F	F	F	F	N	N	N	N
OK	James Willson	james.willson@ag.ok.gov	2016	3	0	3		N	N	F	F	N	N	N	N	N
OR	Aaron Aydelotte	aaydelotte@oda.state.or.us	2029	12		12		F	F	F	F	F	N	N	F	N
OR	Ray Nekuda	rnekuda@oda.state.or.us	2037	5		5		P	F	F	F	F	N	N	N	N
PA	James P. Gownley	jgownley@pa.gov	2030	11	0	11		N	F	F	F	F	F	F	N	N
PA	Paul D. Sprout	psprout@pa.gov	2010	9	16	25		N	F	F	F	F	F	F	N	N
PA	Christopher J. Drupp	cdrupp@pa.gov	2034	5	0	5		N	F	F	F	F	F	F	N	N
PA	Richard M. Radel, Jr.	riradel@pa.gov	2025	4.5	0	4.5		N	F	F	F	F	F	F	N	N
SC	Robert L McGee	rmcgee@scda.sc.gov	2023	18		18		F	F	F	F	F	F			F
SC	Edward Mendenhall	emenden@scda.sc.gov	2031	9		9		N	F	F	F	F	F			P
SC	Billy Kennington	bkenning@scda.sc.gov		34		34		N	F	F	F	F	F			F
SD	Brad Stover	brad.stover@state.sd.us	2026	10		10				F	F					
SD	Ron Peterson	ron.peterson@state.sd.us		0		0				P	P					
TN	Kenneth R. Wilmoth	Kenneth.Wilmoth@TN.gov	2011	9	0	9		N	N	F	F	N	N	N	N	N

State	Name	email	What Year Eligible for Retirement?	State Lab Metrology	Other Metrology	Total Metrology Experience		Mass I	Mass II	Mass III	Vol Trans	Vol Grav	Length	Time/Frequency	Temperature	Grain Moisture
TX	Harvey Fischer	harvey.fischer@texasagriculture.gov	2009	7	27	34		N	F	F	F	F	N	N	N	N
TX	Preston Adachi	preston.adachi@texasagriculture.gov	2015	7	30	37		N	F	F	F	F	N	N	N	N
TX	Daniel Gibbons	daniel.gibbons@texasagriculture.gov	2024	9	0	9		N	F	F	F	F	N	N	N	N
TX	Philip Wright	philip.wright@texasagriculture.gov	2029	5	0	5		N	F	F	F	F	N	N	N	N
TX	Lisa Corn	lisa.corn@texasagriculture.gov	2035	5	0	5		N	F	F	F	F	N	N	N	N
UT	Bill Rigby	brigby@utah.gov	2029	6		6		N	N	F	F	N	P	N	N	N
VA	William H. Loving	William.loving@VDACS.virginia.gov	2021	12		12		N	F	F	F	N	N	F	N	N
VA	Dale L. Saunders	Dale.saunders@VDACS.virginia.gov	2014	6		6		N	P	P	P	N	N	P	N	N
VT	Marc H. Paquette	marc.paquette@state.vt.us	2018	2		2		N	N	F	F	N	N	N	N	N
VT	Scott Doan		2040	1		1		N	N	P	N	N	N	N	N	N
WA	Dan Wright	dwright@agr.wa.gov	2014	18	16	34		F	F	F	F	F	F	F	N	N
WI	Jeff Houser	jeff.houser@wi.gov	2018	6	0	6				F	F					
WI	Richard McCann	richard.mccann@wi.gov	2025	9	5	14				F	F					
WV	Anthony O' Brien	Anthony.P.Obrien@wv.gov	2025	14		14		N	N	F	F	N	N	N	N	N
WY	Bob Weidler	robert.weidler@wyo.gov	2029	5		5		N	N	F	F	N	N	N	N	N

Table 40: listing of SLP metrologists as of 2012

Each metrologist was asked to indicate which of the listed calibrations they are authorized to perform ("F" = Full authority, "N" = Not authorized, "P" = partial or limited authority), provide what year they are eligible for retirement, and to provide a measure of their metrology experience.

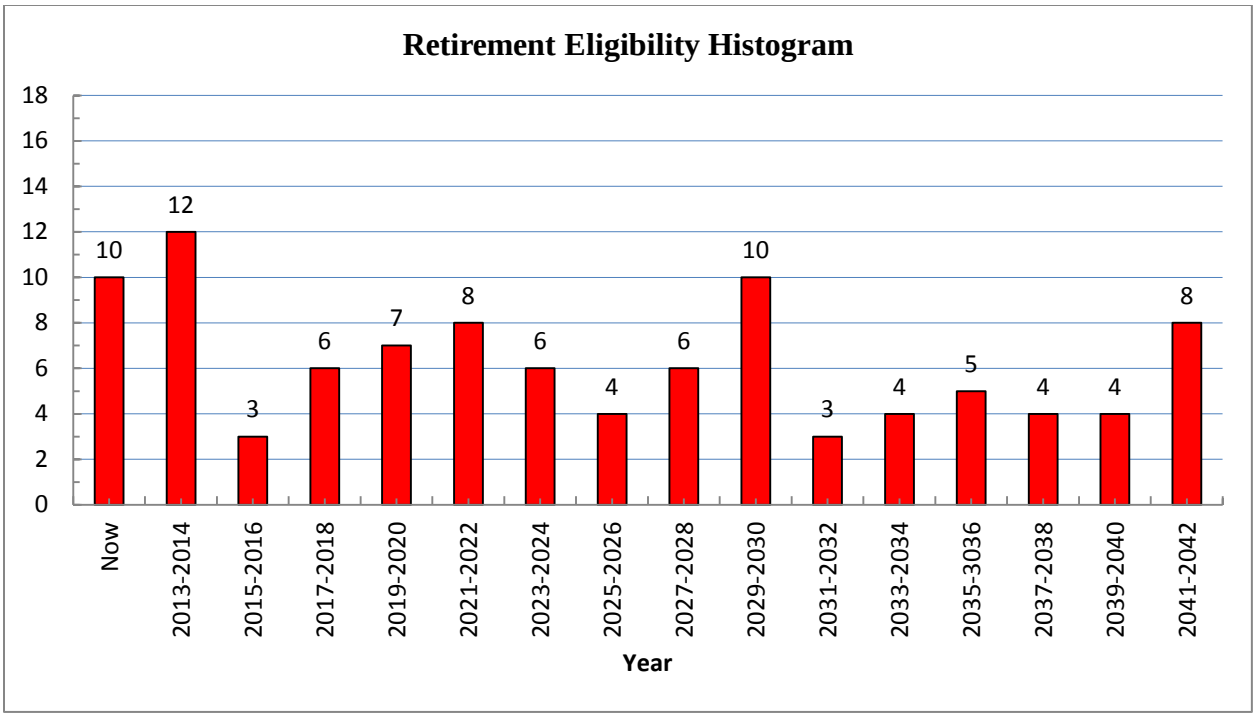


Figure 42: Retirement Eligibility Histogram, 100 metrologists reporting. Metrologists were asked to provide the year which they are eligible for "full" retirement. This may not reflect when any one person actually plans to leave the SLP.

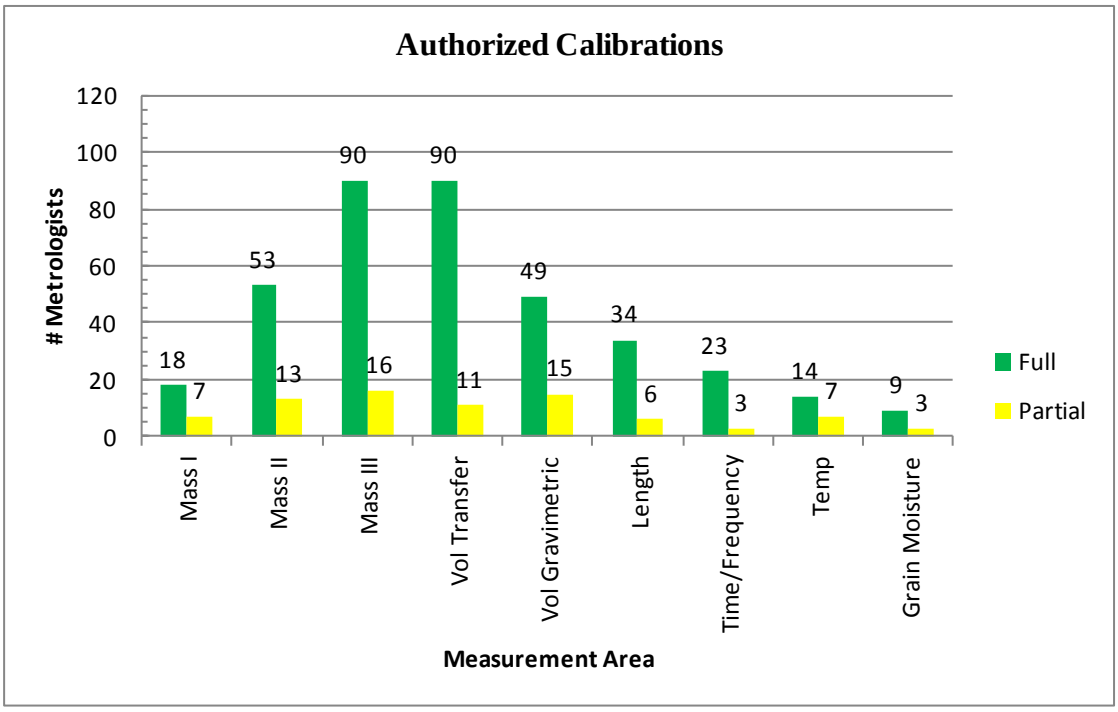


Figure 43: 121 Metrologists reporting. Metrologists were asked to indicate which type of calibrations they are authorized to perform on behalf of their laboratories.

State Laboratory Program/Metrology Experience

Description

Total Metrology Experience:

Each metrologist was asked to disclose his/her metrology experience in years. This data was broken down into two categories, years of experience in the SLP and years of metrology experience outside the SLP. Figure 44 ranks the SLP metrologists by total metrology experience.

Comparison of previous surveys

	Number of Metrologists	Average SLP Experience	Average Other Experience	Average Total Experience
2000	111	8.7	2.4	11.0
2002	113	9.1	2.1	11.2
2004	111	8.1	2.6	10.8
2006	112	8.3	3.1	11.4
2008	125	9.2	2.4	11.6
2010	121	9.5	1.9	11.4
2012	110	8.7	2.1	10.8

Table 41: Comparison matrix summarizing metrology experience reported by metrologists from 2000 to 2012.

Comments:

- Data was collected for 110 metrologists in the SLP from 47 laboratories.
- Each metrologist reports an average of 8.7 years the SLP experience each.
- Each metrologist reports an average of 2.1 years “other” experience each.
- Each of the 16 metrologists reporting “other” experience reports an average of 14.3 years other experience.
- Each metrologist reports an average of 10.8 years total experience.

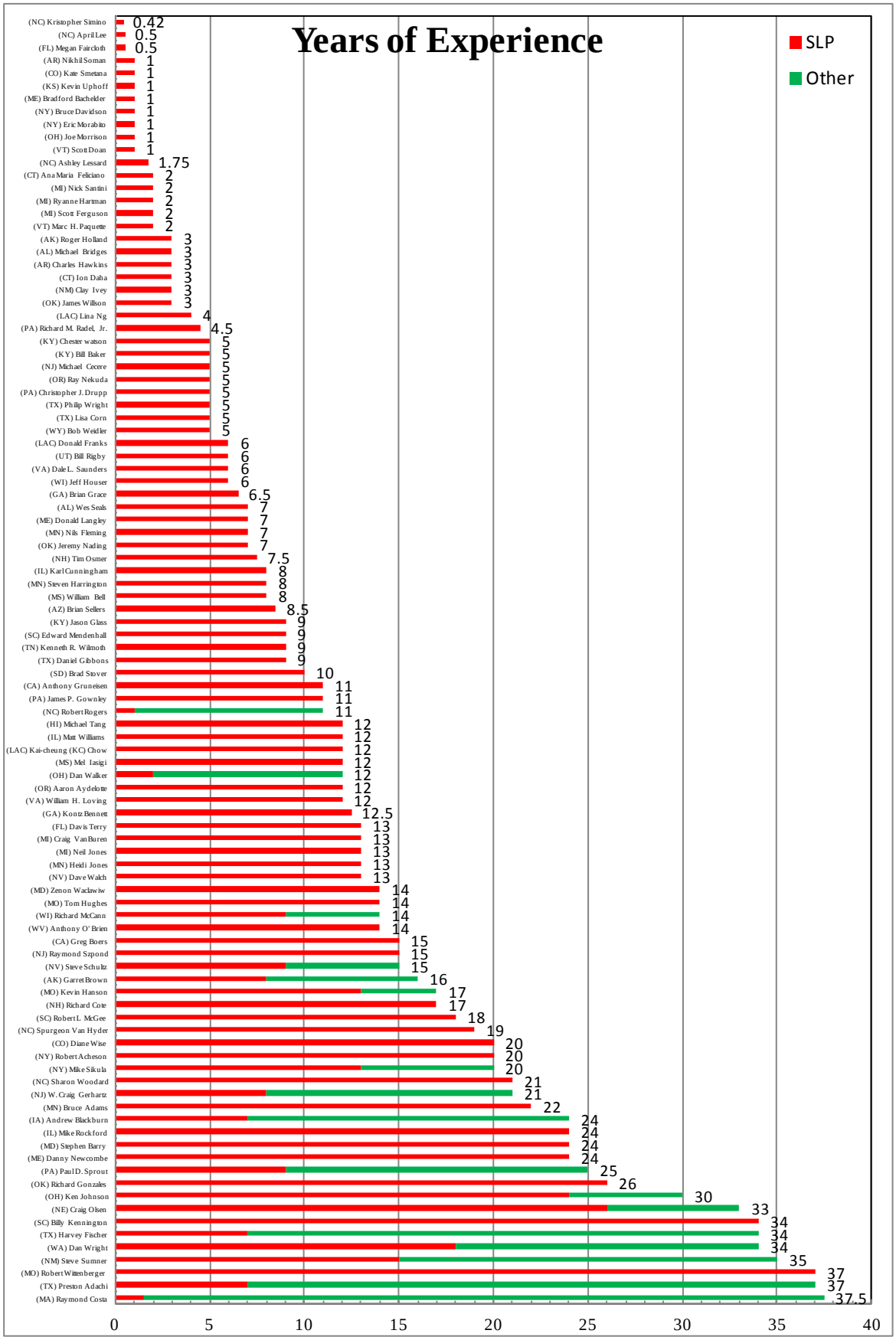


Figure 44: SLP metrologists ranked by years of experience. Red indicates experience in the SLP, green indicates other metrology experience.

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Acknowledgment of Calibration Certificates Matrix

Each member laboratory was asked to identify what laboratories it will accept calibration certificates from. The choices were

- From your laboratory ONLY[5].
- Any of the SLP member labs.
- Any SLP member lab having NIST/OWM (17) recognition (18).
- Any NVLAP Accredited Lab (19).
- Any Weight Manufacturer regardless of accreditation status.
- Any laboratory accredited by an accreditation body that is an ILAC (20) signatory.

[5] This choice should have been exclusive of the other options. Some respondents may have answered this question assuming that this meant they would accept their own certificates in addition to others as identified.

Lab ID	Your State Lab Only	Any State Lab Regardless of Status	Any NIST/WMD Recognized Lab	Any NVLAP Accredited Lab	Any Weight Manufacturer Regardless of Accreditation Status	Any Company or Lab that is Accredited by an Accreditation Body that is an ILAC Signatory
AK			Yes	Yes		Yes
AL			Yes			
AR	Yes		Yes			
AZ			Yes	Yes		Yes
CA			Yes	Yes		Yes
CO			Yes			
CT		Yes	Yes	Yes		Yes
DA						
FL			Yes			
GA			Yes			
HI			Yes	Yes		Yes
IA			Yes			
ID			Yes			Yes
IL		Yes	Yes			
KS			Yes			Yes
KY	Yes		Yes	Yes		Yes
LA			Yes	Yes		
LAC			Yes	Yes		Yes
MA		Yes	Yes	Yes		Yes
MD			Yes			
ME			Yes	Yes		Yes
MI			Yes	Yes		
MN		Yes				
MO			Yes	Yes		Yes
MS			Yes			
NC			Yes	Yes		Yes
NE			Yes	Yes		
NH			Yes	Yes		Yes
NJ			Yes			
NM				Yes		
NV			Yes	Yes		Yes
NY			Yes	Yes		Yes
OH			Yes	Yes		
OK			Yes	Yes		Yes
OR			Yes	Yes		Yes
PA			Yes			
SC			Yes			Yes
SD			Yes	Yes		Yes
TN			Yes			
TX			Yes	Yes		
UT			Yes			
VA			Yes	Yes		
VA			Yes	Yes		
VT			Yes	Yes		Yes
WA			Yes	Yes		Yes
WI			Yes	Yes		
WV						Yes
WY			Yes	Yes		Yes

Table 42: Calibration Certificate acceptance matrix.

2012
Workload Survey Instructions

2012 Workload Survey
State Metrology Laboratories
for
Jan 1, 2012 – Dec 31, 2012

December 22, 2012

To: State Metrology Laboratories

DUE by March 1, 2013

Instructions

This year's workload survey will cover one year of workload data. The preferred time period is Jan 1, 2010 – Dec 31, 2010.

There are two options for submitting your survey results. The preferred method is to use the attached Excel spreadsheet. If you are unable to use the spreadsheet, you may print out the 'Word' document and complete it by hand (make sure it is legible) and fax it to

952-435-4040 Attn: Steven

or mail it to

Weights and Measures
ATTN: Steven Harrington
14305 Southcross Drive W #150
Burnsville, MN 55306

Frequently Asked Questions & General Guidance

Laboratory Data – Sections 1-6:

Contact Information for Person Completing this Survey:

This is needed in case I have a question or need clarification on the information provided in your survey.

Laboratory Information:

This will be used for verifying the mailing address for the lab.

Laboratory Age & Size:

Size of Lab – We are attempting to determine the size of the metrology lab excluding office and warehouse space.

List all Job Titles that could be utilized to perform metrology measurements or functions:

We do not want names of personnel in this section. The results of this section will be used to see the different 'official titles' and associated pay bands of the positions that perform measurements or other metrology functions. This information is not confidential and is usually public records in each state.

Job Titles/Salary Ranges (make sure they are <u>monthly</u> salaries):

Examples

•	Metrologist I	$1,800.00	$2,400.00	Calibration Technician
•	Metrologist II	$2,000.00	$2,800.00	Calibration Engineer
•	Metrologist III	$2,600.00	$3,200.00	Laboratory Supervisor

Number of Laboratory Customers served during the reporting period

This information is used to demonstrate the wide impact of the SLP. Count different locations of the same parent company as separate customers. If there are separate divisions within the same parent company, count each as a separate customer.

From which labs will your State W&M acknowledge calibration certificates?

This is a new question for the survey. Your State W&M program probably requires licensed repairmen to have their standards periodically calibrated. We are trying to determine what criterion is required for the laboratories that perform these calibrations. In this section, check each one that applies to your jurisdiction.

Staff Data - Section 7:

Staff information:

Authorized Calibrations enter F (Full), P (Partial), or N (None).

'Experience' is asking for the number of years of experience in an SLP laboratory and the number of years of other experience in metrology and the total number of years of metrology experience. The "Year eligible for retirement" is the year that the individual will be able to file for full retirement, not necessarily when they plan to actually do so.

Workload Sections 8-29:

The survey covers the workload of your lab for a twelve-month period, preferably Jan 1 through Dec 31, 2010. If the reporting period covers a different period make certain that it is noted in the comments section. Each category is also broken down into the following customers: Lab, W&M Program, and External Customers.

Lab – Those standards calibrated for use by the metrology laboratory, including working standards, surveillance calibrations on primary standards, etc. These tests are also referred to as internal calibrations.

W&M Program – Those standards calibrated for state government weights and measures regulatory agencies.

External Customers – All other standards calibrated by the laboratory.

In general, the survey is asking for the number of individual devices calibrated by the metrology laboratory. Use the following examples as guidelines for reporting numbers for this survey.

1. *Example:* A "31 pound weight kit" is <u>not</u> counted as one device; make sure each weight in the kit is counted.

2. *Example:* A 100 foot tape is counted as one device; <u>do not</u> count each point tested.

3. *Example:* If three double substitutions are used to calibrate a single standard it is counted as one device; <u>do not</u> count it as three devices.

4. *Example:* A 100g standard calibrated using a 3-1 weighing design is counted as one device; <u>do not</u> count the check standard. (Same with advanced weighing designs using Masscode, do not count the check standards as they are used solely for defining the measurement process.)

Workload Categories:

Mass Echelon I – The number of precision mass standards that were calibrated using the Mass Code for data reduction, regardless of accuracy class.

Mass Echelon II – The number of precision mass standards that were calibrated not using the Mass Code for data reduction. The procedures used are typically, SOP 4 using the air buoyancy correction option or SOP 5.

Mass Echelon III – Do not count weight carts in this category; weight carts have their own category.

Volume – All volume calibrations are broken down into two categories, depending on the procedure used; these are categorized as either **volume transfer** or **volume gravimetric** procedures.

We would also like to know of any other work that is done by your metrology laboratory which was not covered in this survey, therefore, there are several "blank categories" at the end of the survey for any calibrations or tests that do not fall into any of the prescribed categories. Please provide enough detail about these additional tests for it to be clear what is being done.

Calibration Fees:

At the end of the survey there is a section for calibration fees. Please include all fees that would normally be charged including cleaning, shipping, packing, etc.

ASSISTANCE/QUESTIONS??

You may contact me at:
Phone: 651-215-1777
Fax: 952-435-4040
Email: steven.harrington@state.mn.us

Weights and Measures
Attn: Steven Harrington
14305 Southcross Drive W #150
Burnsville, MN 55306

Please report any errors found in the survey via email to steven.harrington@state.mn.us

2012 Workload Survey Form

2012 State Laboratory Program Survey
DUE by March 1, 2013

Mail or Fax to:	Weights and Measures
steven.harrington@state.mn.us	Attn: Steven Harrington
Fax: 952-435-4040 ATTN: Steven	Minnesota Weights and Measures
	14305 Southcross Drive W #150
	Burnsville, MN 55306

1. Contact Information for Person Completing this Survey

Name: _____

Phone: _____

Fax: _____

2. Laboratory Information

Laboratory: _____

Mail Address: _____

City, State, Zip: _____

Web Site: Address _____

3. Laboratory Age & Size

Age of Lab: _____ yrs

Office Space: _____ sq ft

Active Lab Space (used for calibration): _____ sq ft

4. List all Job Titles which could be utilized to perform metrology measurements or functions

Job Title	Min Monthly Salary	Max Monthly Salary	(Select – Best Match) Lab Supervisor Metrology/Calibration Engineer Metrology/Calibration Technician Support Staff

5. Number of Laboratory Customers served during the reporting period

Count different locations of the same parent company as separate customers. If there are separate divisions within the same parent company, count each as a separate customer.

Laboratory Customers _____

6. From which labs will your State W&M acknowledge calibration certificates
(Check all that apply)

- ☐ Your State Lab ONLY
- ☐ Any State Lab regardless of status
- ☐ Any NIST/OWM Recognized Lab
- ☐ Any NVLAP accredited Lab
- ☐ Any Weight Manufacturer, regardless of accreditation status
- ☐ Any Company or Lab that is Accredited by an Accreditation Body that is an ILAC signatory (e.g. NVLAP, A2LA, LAB, IAS, ACLASS)

7. Please list all personnel which perform metrology measurements or functions in the laboratory

Name	e-mail	Authorized Calibrations F = Full P = Partial N = None									Year Eligible for Retirement	#Yrs Metrology Experience		
		Mass I	Mass II	Mass III	Vol Trans	Vol Grav	Length	Time/Frequency	Temperature	Grain Moisture		State Lab Metrology	Other Metrology	Total Metrology Experience

2012 Workload Information

NOTE: The following information should be based on a 12 month period, preferably Jan 1, 2012 through Dec 31, 2012 or the most recent fiscal year. Reported data should not be estimates. If unable to quote actual data, please attach your comments to the end of this survey.

Actual Period of Time Covered: From _____ To _____

8. Mass Echelon I			
Number of mass standards calibrated using Advanced Weighing Designs and Mass Code Data Reduction. Regardless of Class.	Lab (Internal)		
	W&M Program		
	External Customers		
	Total		
9. Mass Echelon II			
Number of mass standards. ASTM Class 1, 2, 3 OIML Class E2, F1	Lab (Internal)		
	W&M Program		
	External Customers		
	Total		
10. Mass Echelon III			
Number of mass standards (except weight carts). ASTM Class 4, 5, 6, 7 OIML Class F2, M1, M2, M3 NIST Class F	Lab (Internal)		
	W&M Program		
	External Customers		
	Total		
11. Weight Carts			
Number of weight carts calibrated.	Lab (Internal)		
	W&M Program		
	External Customers		
	Total		
12. Volume – Glassware			
Number of individual pieces of volumetric glassware calibrated. Note: Indicate number of Volume Transfer (V-T) and/or Gravimetric test methods.		Vol-Transfer	Gravimetric
	Lab (Internal)		
	W&M Program		
	External Customers		
	Total		
13. Volume – SVP (Small Volume Provers) (NOT 5 gallon test measures)			
Number of small volume provers calibrated. Note: Indicate number of Volume Transfer (V-T) and/or Gravimetric test methods. If you don't know what a SVP is, your answer is probably zero.		Vol-Transfer	Gravimetric
	Lab (Internal)		
	W&M Program		
	External Customers		
	Total		
14. Volume – LPG			
Number of individual LPG provers calibrated. Note: Indicate number of Volume Transfer (V-T) and/or Gravimetric test methods.		Vol-Transfer	Gravimetric
	Lab (Internal)		
	W&M Program		
	External Customers		
	Total		

15. Volume – Non-Pressurized Small Metal Standards (≤ 5 gallon)			
Number of metal volumetric standards (20 liter / 5 gallon and smaller). Note: Indicate number of Volume Transfer (V-T) and/or Gravimetric test methods.		Vol-Transfer	Gravimetric
	Lab (Internal)		
	W&M Program		
	External Customers		
	Total		

16. Volume – Non-Pressurized Medium Metal Standards (> 5 gallon and ≤ 100 gallon)			
Number of metal volumetric standards (larger than 20 liter / 5 gallon and less than or equal to 400 liter / 100 gallon). Note: Indicate number of Volume Transfer (V-T) and/or Gravimetric test methods.		Vol-Transfer	Gravimetric
	Lab (Internal)		
	W&M Program		
	External Customers		
	Total		

17. Volume – Non-pressurized Large Metal Standards (> 100 gallon)			
Number of metal volumetric standards (greater than 400 liter / 100 gallon). Note: Indicate number of Volume Transfer (V-T) and/or Gravimetric test methods.		Vol-Transfer	Gravimetric
	Lab (Internal)		
	W&M Program		
	External Customers		
	Total		

18. Length - Tapes		
Number of individual tapes (metal, fiberglass, woven fiberglass, cloth, etc.). Please enter #devices tested, NOT number of points tested.	Lab (Internal)	
	W&M Program	
	External Customers	
	Total	

19. Length - Rigid Rules		
Number of rigid rules calibrated.	Lab (Internal)	
	W&M Program	
	External Customers	
	Total	

20. Thermometry		
Number of thermometers tested (mechanical, liquid-in-glass, thermocouples, thermistors, PRTs, SPRTs).	Lab (Internal)	
	W&M Program	
	External Customers	
	Total	

21. Frequency		
Number of frequency standards tested (includes tuning forks).	Lab (Internal)	
	W&M Program	
	External Customers	
	Total	

22. Timing Devices		
Number of timing devices tested (stopwatches).	Lab (Internal)	
	W&M Program	
	External Customers	
	Total	

23. Wheel Load Weighers		
Number of wheel load weighers tested :	Lab (Internal)	
	W&M Program	
	External Customers	
	Total	

24. Lottery Balls		
Number of lottery balls tested : Characteristic Tested: ❑ Mass ❑ Diameter ❑ Other *Describe Other*_____	Lab (Internal)	
	W&M Program	
	External Customers	
	Total	
25. (A) Other Types of Measurements not covered in this survey		
Describe type of measurement:	Lab (Internal)	
	W&M Program	
	External Customers	
	Total	
26. (B) Other Types of Measurements not covered in this survey		
Describe type of measurement:	Lab (Internal)	
	W&M Program	
	External Customers	
	Total	
27. (C) Other Types of Measurements not covered in this survey		
Describe type of measurement:	Lab (Internal)	
	W&M Program	
	External Customers	
	Total	

28. Laboratory Fees		
In this section please estimate the typical fees charged for each of the described examples.		
Does your laboratory charge fees for external customers? YES ❑ NO ❑		
Do you have a minimum fee?		$
[Mass Echelon I] ASTM Class 0 Precision mass set 100 g to 1 mg (21 weights)		$
[Mass Echelon II] ASTM Class 2 Precision mass set 100 g to 1 mg (21 weights)		$
One – 31 lb Class F weight set (22 weights)		$
5,000 lb weight cart		$
Scale test truck:	24-1000 lb weights (5 adjusted)	$
	20 - 50 lb weights (5 adjusted)	$
	2 -31 lb weight sets (22 weights each)	$
	TOTAL	$
One – 5 gallon test measure using volume transfer method:		$
One – 5 gallon test measure using gravimetric method:		$
One – 100 gallon prover using volume transfer method:		$
One – 100 gallon prover using gravimetric method:		$
One – 100 gallon LPG prover:		$
One – 20 gallon SVP (small volume prover) using volume transfer method:		$
One – 20 gallon SVP (small volume prover) using gravimetric method:		$
One- 100 foot tape with 19 points tested:		$

Are out-of-state customers charged more than your in-state customers? YES ❑ NO ❑
If YES, please explain in the comment section.

29. Comments on Survey

MAIL OR FAX COMPLETED SURVEY TO:

Weights and Measures
Attn: Steven Harrington
14305 Southcross Drive W #150
Burnsville, MN 55306

Telephone: 651-215-1777
FAX: 952-435-4040
Email: steven.harrington@state.mn.us

1. *http://www.nist.gov/pml/wmd/labmetrology/lab-resources-archive.cfm.* [Online]

2. www.ncwm.net. [Online]

3. *www.nist.gov/pml/wmd/labmetrology/lab-contacts-ac.cfm.* [Online]

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5. **Cameron, J. M., Croarkin, M. C. and Raybold, R. C.** *NBS Technical Note 952 "Designs for the Calibration of Standards of Mass".* 1977.

6. *OIML D 28, "Conventional value of the Result of Weighing in Air".* 2004.

7. **Varner, R. N. and Raybold, R. C.** *NBS Technical Note 1127 "Mass Calibration Computer Software".* 1980.

8. **Harris, G. L. and Torres, J. A.** *NIST IR 6969, "Selected Laboratory and Measurement Practices, and Procedures, to Support Basic Mass Calibrations".* 2003.

9. *NIST Handbook 105-8 "Specifications and Tolerances for Field Standard Weight Carts".* 2003.

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11. **Taylor, J. K. and Oppermann, H. V.** *NBS Handbook 145 "Handbook for the Quality Assurance of Metrological Measurements".* 1986.

12. **Harris, G. L.** *NIST Internal Report 7383, "Selected Procedures for Volumetric Calibrations".* 2006.

13. *www.nist.gov/pml/nvlap/.* [Online]

14. *NIST Handbook 105-3, "Specifications and Tolerance Graduated Neck Type Volumetric Field Standards".* 2010.

15. *NIST Handbook 105-4, "Specifications and Tolerances for Liquefied Petroleum Gas and Anhydrous Ammonia Liquid Volumetric Provers".* 2010.

16. *NIST Handbook 105-7, "Specifications and Tolerances for Dynamic Small Volume Provers".* 1997.

17. *http://www.nist.gov/pml/wmd/.* [Online]

18. *NIST Handbook 143 "State Weights and Measures Laboratories Program Handbook".* 2010.

19. **Faison, C.D., et al., et al.** *NIST Handbook 150 "National Voluntary Laboratory Accreditation Program Procedures and General Requirements".* 2006.

20. *http://www.ilac.org/.* [Online]

21. *www.nist.gov/pml/wmd/pubs/handbooks.cfm.* [Online]

22. *www.astm.org.* [Online]

23. *www.oiml.org.* [Online]

24. **Harris, G. L. and Torres, J. A.** *NIST Internal Report 6969 "Selected Laboratory and Measurement Practices and Procedures, to Support Basic Mass Calibrations.* 2003.

25. **Fraley, K. L. and Harris, G. L.** *NIST Internal Report 5672 "Advanced Mass Calibration and Measurement Assurance Program for State Calibration Laboratories".* 2005.

26. **Davis, R.S.** Equation for the Determination of the Density of Moist Air (1981/1991). *Metrologia.* 1992, Vol. 29, pp. 67-70.

27. *http://www.itl.nist.gov/div898/handbook/.* [Online]