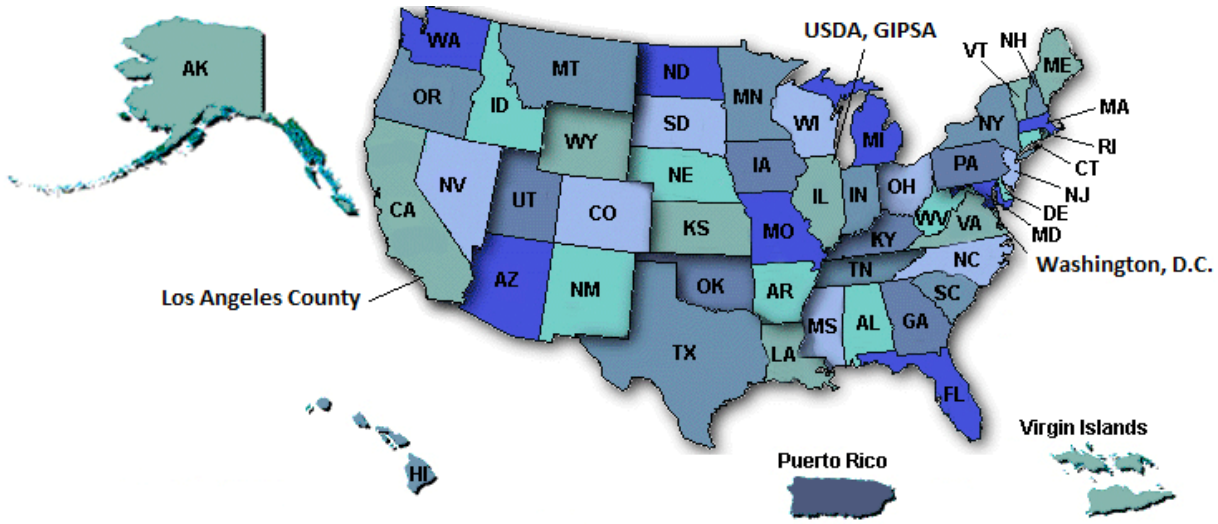
2014

State Laboratory Program Workload Survey



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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 2014 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.

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
2014 State Laboratory Program Workload Survey	2014

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

In 1996, the National Conference on Weights and Measures (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 2014 survey is published in this report beginning on page 123.

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. All data that was not submitted in an Excel spreadsheet was entered into an Excel spreadsheet and returned to the original sender so the data entry could be reviewed for accuracy. All data included in this report is directly imported from Excel spreadsheets.

The NIST Weights and Measures Division provides an initial report of workload data from the NIST Measurement Services Division from 2000 through 2014 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 12.

The participant SLP laboratories in the survey are identified by name location, age, size, and number of customer's served in the opening section of this report. Current contact information for the individual SLP laboratories and their NIST WMD Certificate of Traceability can be found on the NIST Weights and Measures Division website (www.nist.gov/pml/wmd/labmetrology/lab-contacts-ac.cfm n.d.). Each laboratory's participation in previous surveys is reported from 1996 through 2014.

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 33, Length on page 42, Volume on page 48, and all other tests from pages 68 through 80.

All of the SLP laboratories responding to the 2014 SLP workload survey report performing measurement services for hire in addition to the regulatory functions they support. Fee data for 2014 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 2014" beginning on page 81.

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 2014 calendar year including years of experience and the year at which each person is eligible for full retirement. The results are presented in in a series of charts and tables beginning with the section title "Metrology Positions/Title and Salaries" beginning on page 99.

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 the 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 to 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.

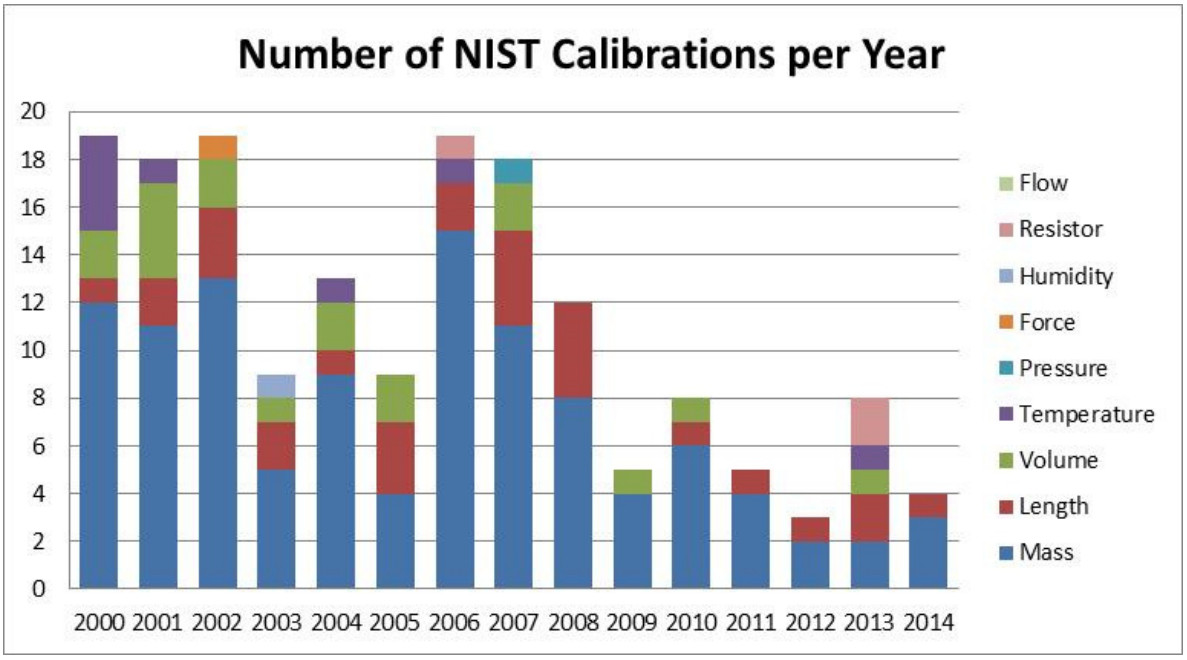
The individual SLP metrology laboratories charge fees for the measurement services they provide. Individual laboratory fees are presented in bar graphs ranked from highest to lowest. Average fees of the responding labs are provided for each measurement service covered in the survey. It can be difficult 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 their years of metrology experience, both inside the SLP and out, and the year they are eligible for retirement. These data are 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 99.

Impact and Leveraging of NIST Calibrations

(Information provided by NIST/OWM)

Calibration data for State laboratories was obtained from the NIST Measurement Services from 2000 to 2014. 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.



Data in the current survey includes measurements and calibrations performed at NIST in non-traditional measurement areas (e.g., those outside of mass, length, and volume).

State weights and measures laboratories account for a small portion of NIST's annual calibrations. The average leveraging impact is approximately 350,516 calibrations per year performed by all of the State labs vs an average of 9 NIST calibrations per year performed for all of the State labs over the past 10 years. Given data obtained in the SLP surveys in the 1990's, about half of the customer workload in the state laboratories was 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 Metrology Laboratory (NMI).

Economic statistics indicate that weights and measures enforcement, supported by these leveraged State weights and measures laboratory calibrations, affects more than half of the $16.77 trillion (2013). 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 regulatory functions (EPA, FDA, DOD, DOE, DOT), and are requisite for 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 (OWM) is to coordinate the Laboratory Metrology Program. 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 that better than 96 % of the laboratory standards are calibrated in a timely manner according to established calibration intervals. A special assessment to catalog and document calibration standards and intervals was completed during the 2011 assessment cycle as a part of a "traceability evaluation" project.

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 and completes several thousand calibrations per year. In this 2014 report, 9,382 volumetric standards were calibrated by the States to support petroleum meter calibrations. Very small fractions of that number are calibrated annually by NIST. For example, in Fiscal Year (FY) 2013, NIST completed 35 volume calibrations and completed 27 in FY 2014. In the area of volume, most State laboratories are capable of deriving and calibrating Volume standards through mass and gravimetric calibrations.

The same kind of leveraging comparison can be made for other measurement areas. For example, NIST calibrated 48 mass units in FY 2013 and 34 units in FY 2014. Given that the "unit" could be a single weight or a complete set of mass standards, even assuming a 32 piece set for each unit, that is likely maximum total of 1536 and 1088 single weights respectively. 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 federal 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 1). 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.

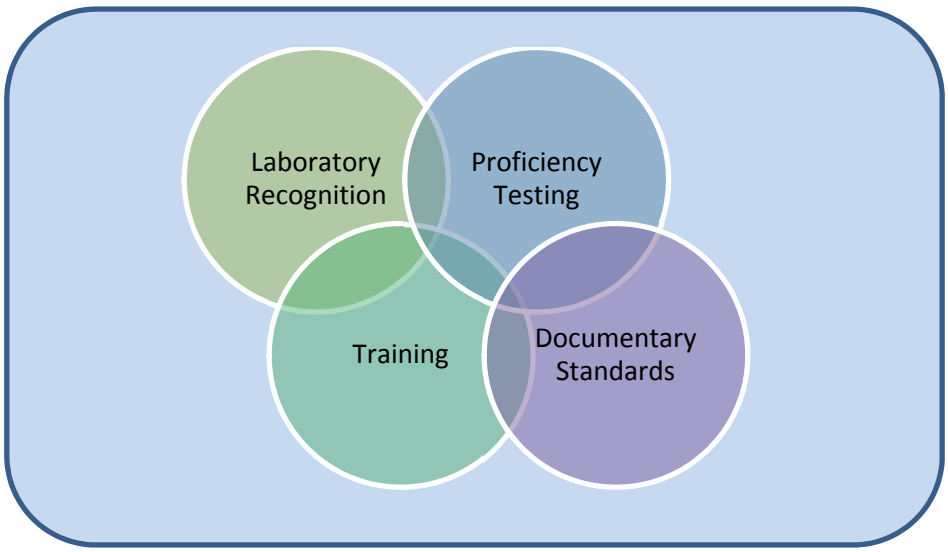


Figure 1. Laboratory Metrology Program Areas.

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 Weights and Measures Division 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.

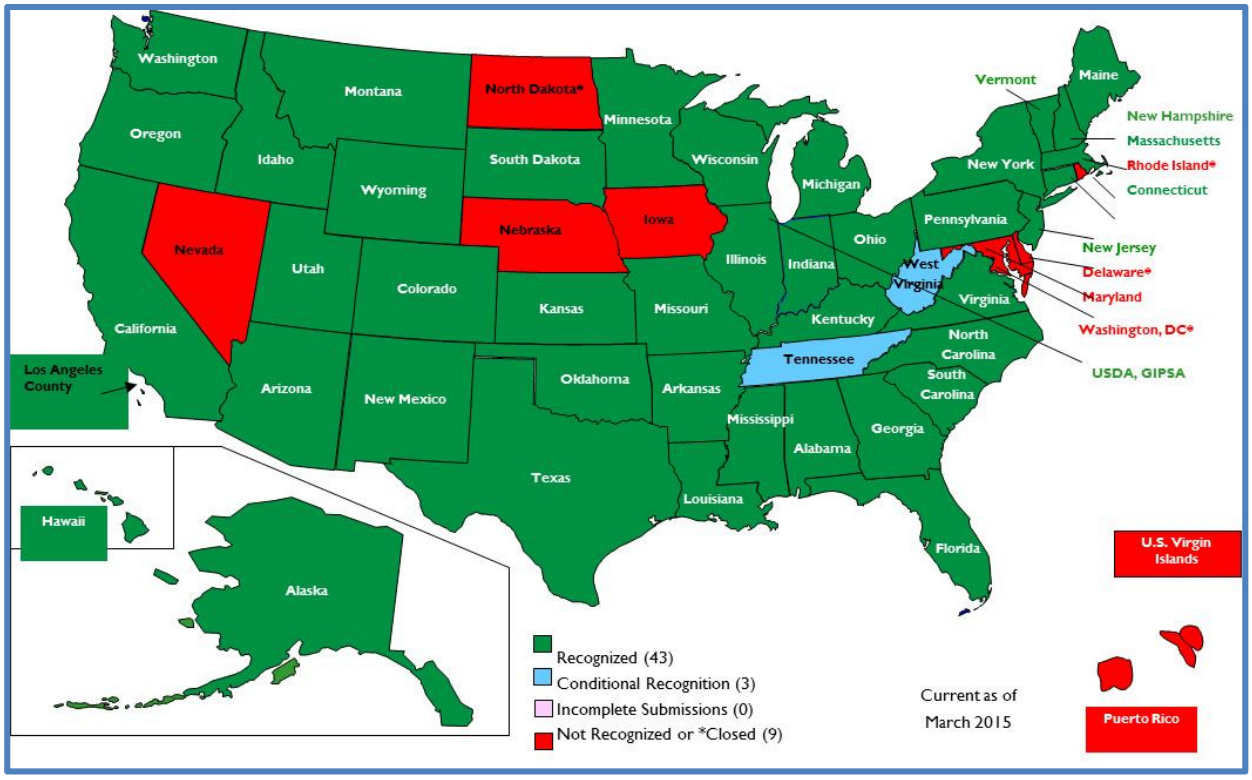


Figure 2. Laboratory Recognition by OWM (NIST Handbook 143, 2014 Sept.).

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.

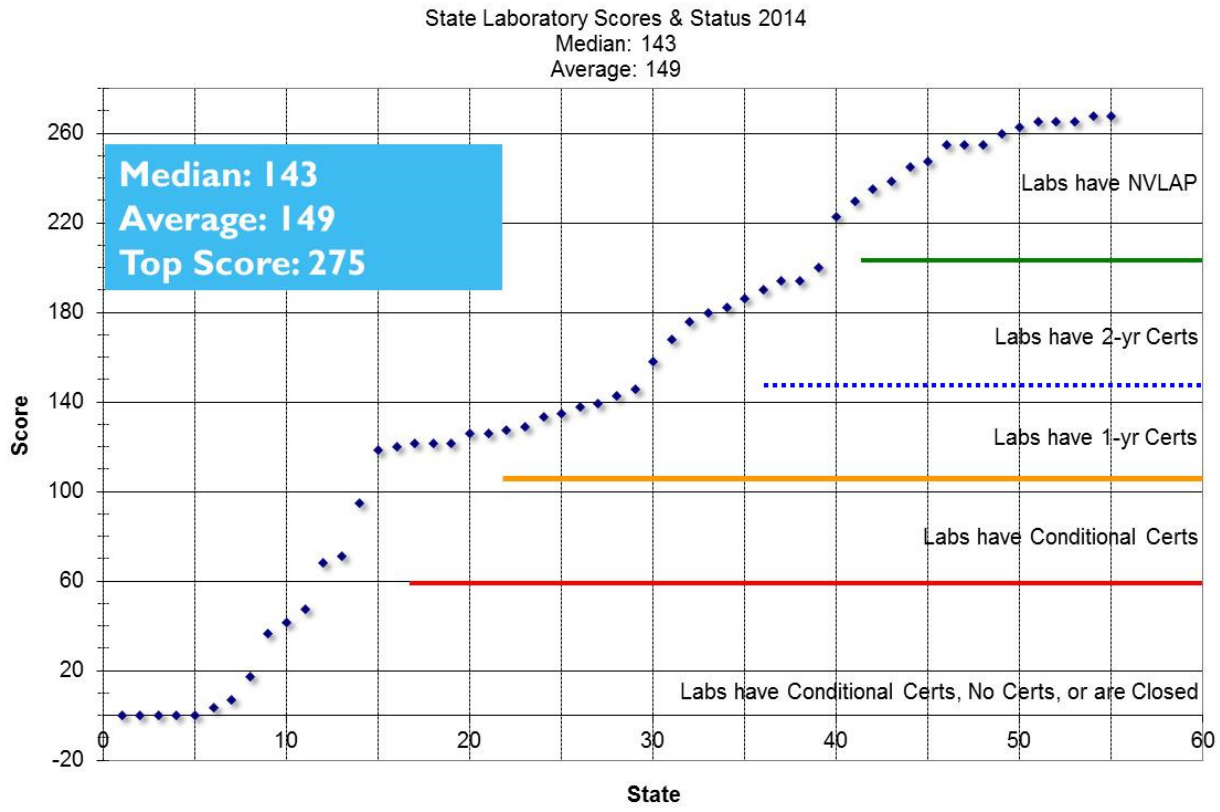


Figure 3. Laboratory Scoring Model (2014 Sept).

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.

Table 2. Laboratory Scoring Model Trends.

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

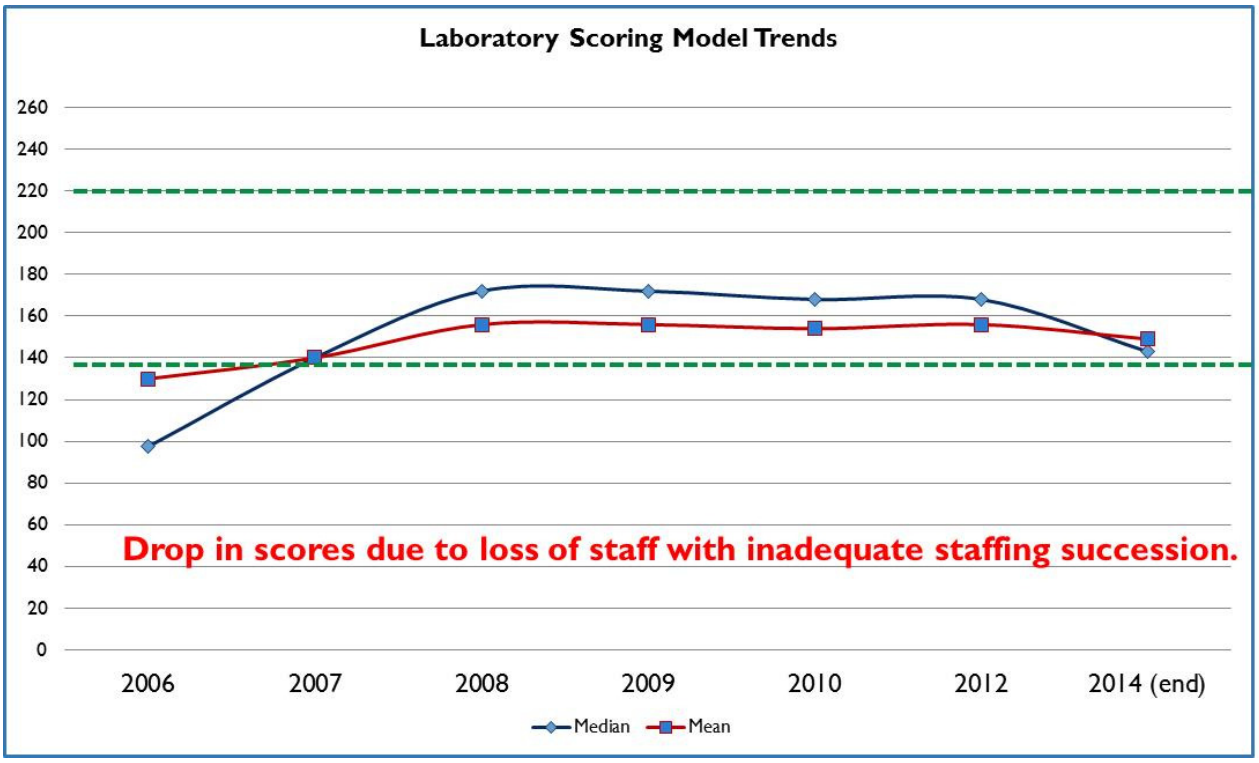


Figure 4. Laboratory Scoring Model Trends.

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.

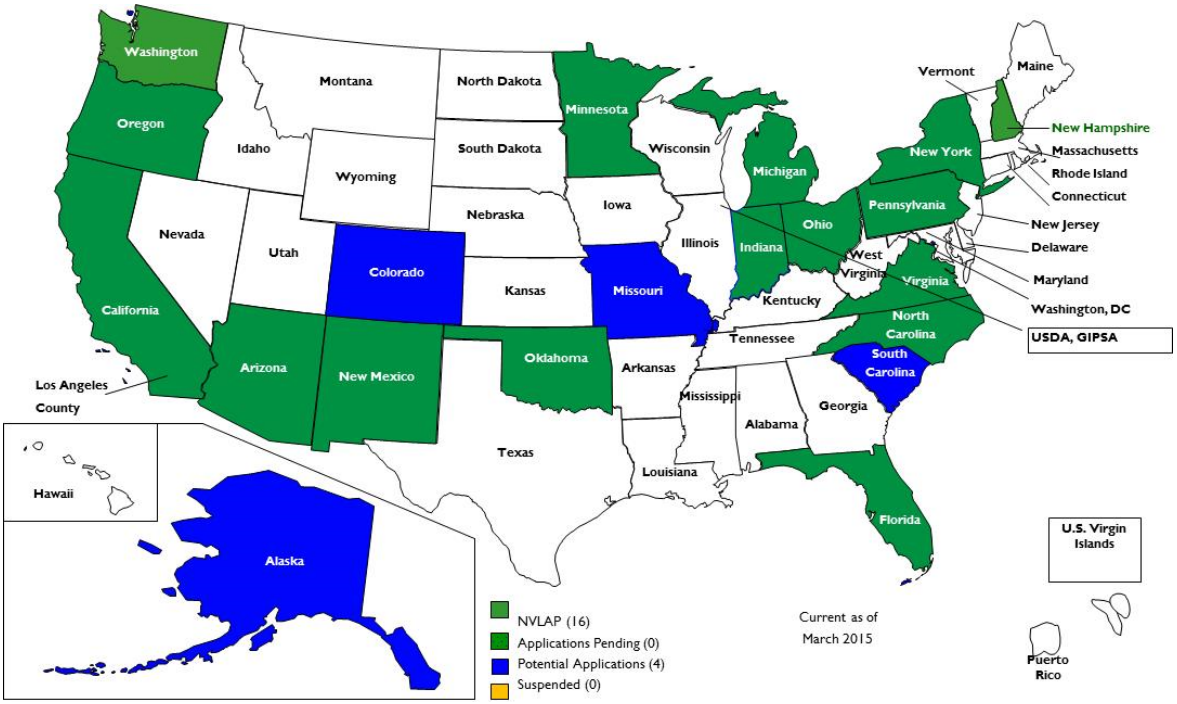


Figure 5. NVLAP Accreditation of State W&M Laboratories (2014 Sept.)

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 6).

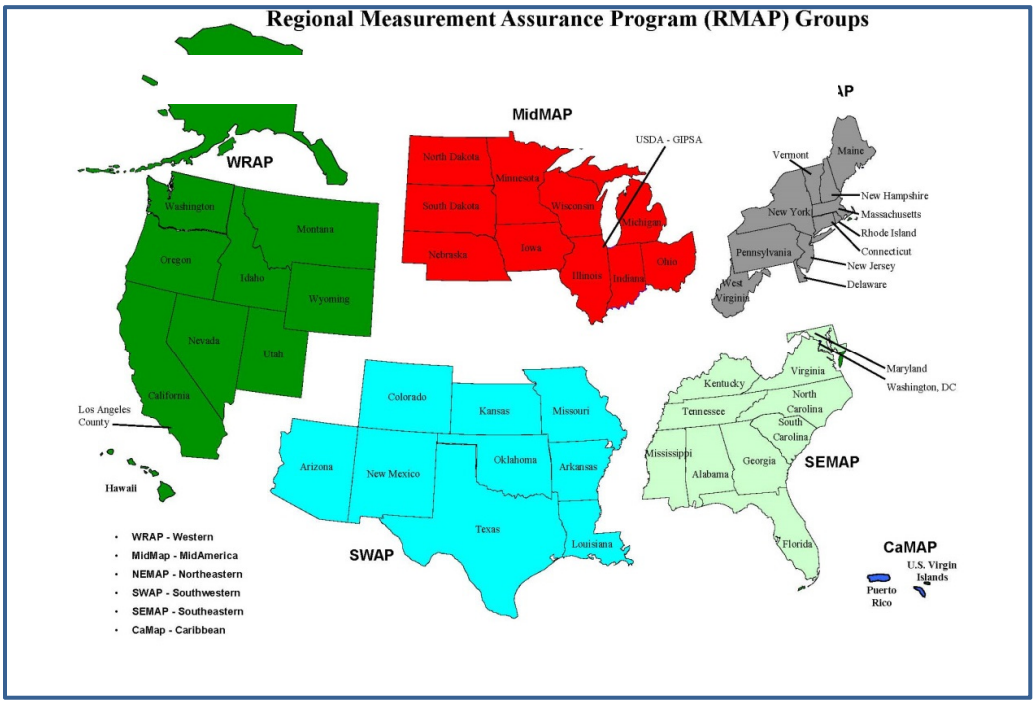


Figure 6. Regional Measurement Assurance Program (RMAP) Groups.

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 7 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.

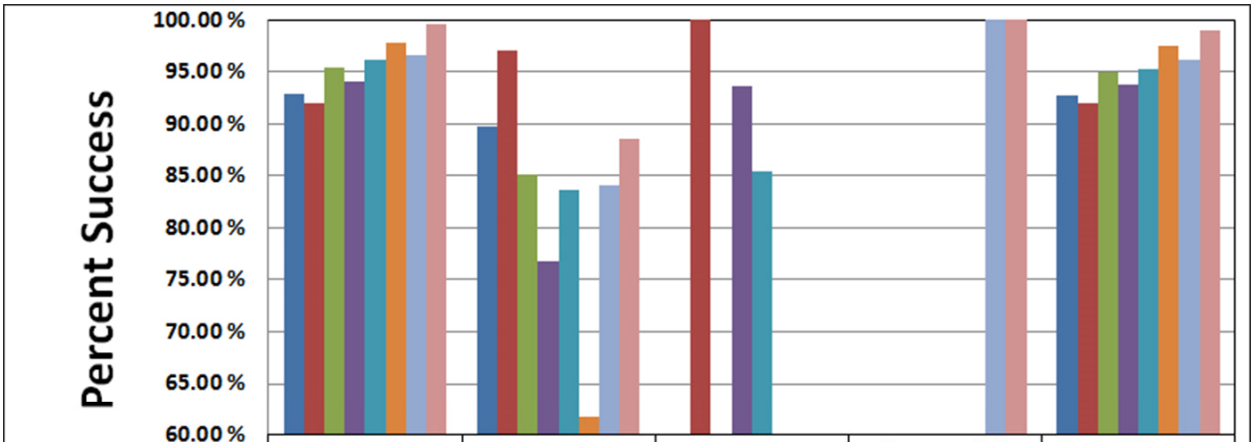
Weeks	1	2	3	4	5	6
***Old* Course Structure**						
		Basic Mass		**Intm. Mass and Volume**	**Adv. Mass**	
		Basic Metrology for States (Mass, Volume, Length)				
***New* Course Structure**						
Math Pre-Test	**Fundamentals of Metrology (2011)**				*with LAP Problems*	
	with LAP Problems	**Mass (Basic and Intm.) (2012)**		*Webinar: SOP 18 Part I and II*	**Adv. Mass* (2015)**	
		Webinar: SOP 8 Part I and II		**Volume (Basic and Intm.) (2013)**		

Figure 7. 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 8. 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.

Table 3. Program Area References.

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

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, 6 are not operational. The Washington DC, Delaware, U.S.-Virgin Islands, Rhode Island, North Dakota, and Iowa metrology laboratories were closed during the 2014 reporting period of the survey.

Notes and Comments

49 metrology laboratories provided data for the 2014 State Program Workload Survey.

Findings

Space dedicated to office use:

- Average 690 ft^2
- Maximum 2700 ft^2
- Minimum 100 ft^2

Space dedicated to laboratory use:

- Average 3784 ft^2
- Maximum 12200 ft^2
- Minimum 525 ft^2

Age of Laboratory Facility

- Average 25 years
- Maximum 80 years
- Minimum 1 years

These laboratories reported serving 9,149 customers in 2014.

Laboratory	Address	Telephone	Website	Age	Office Space	Lab Space	Customers
State of Alaska	12050 Industry Way Bldg. O #6 Anchorage ,Al 99515	907-365-1233 N/A Fax	http//www.dot.state.ak.us/mscve/main	1	350	1740	48
Alabama Dept. of Agi.	1445 Federal Dr. Montgomery ,Al 36107	334-240-3729 334-240-7175 Fax	www.alabama.gov.	42	314	588	163
Arkansas Bureau of Standards	4608 W 61st Little Rock ,AR 72209	501-570-1191 501-562-7605 Fax	www.plantboard.arkansas.gov	48	400	1500	70
Arizona Department Weights and Measures Metrology Laboratory	4425 W Olive Ave Ste 134 Glendale ,AZ 85302	602-771-4938 623-463-0440 Fax	www.azdwm.gov	15	500	5500	168
State of California Metrology Laboratory	6790 Florin Perkins Road, Suite 100 Sacramento ,CA 95828	916-229-3022 916-229-3064 Fax	WWW.cdfa.ca.gov/DMS	10	309	3903	130
Colorado Metrology Laboratory	3125 Wyandot St Denver ,CO 80211	303-867-9244 303-477-4248 Fax	https://www.colorado.gov/pacific/aginspection/metrology-laboratory	43	1979	1927	192
State of Connecticut, Metrology Laboratory	9 Windsor Avenue Windsor ,CT 06095	860-246-9620 860-706-1236 Fax	www.ct.gov/dcp	2	130	1862	50
Florida Metrology Laboratory	3125 Conner Blvd Lab 2 Tallahassee ,FL 32399	850-921-1580 850-921-1593 Fax	www.freshfromflorida.com	45	260	3500	297
Georgia Metrology Laboratory	P.O. Box 1507 Tifton ,GA 31793	229-386-3601 229-386-3365 Fax	http://agr.georgia.gov/weights-measures.aspx	3.5	0	0	54
Hawaii Measurement Standards Laboratory	1851 Auiki St. Honolulu ,HI 96819	808-832-0682 808-832-0683 Fax	www.hdoa.hawaii.gov/qad/measurement-standards-branch/	14	443	2602	32
ISDA Metrology Laboratory	2216 Kellogg Lane Boise ,ID 83701	208-332-8692 208-334-2378 Fax	www.agril.idaho.gov	47	720	1900	71
State of Illinois	801 Sangamon Avenue East Springfield ,IL 62702	217-785-8480 217-785-3136 Fax		37/20	1200	3320	362
IN Weights and Measures Laboratory	2525 N Shadeland Ave #D3 Indianapolis ,IN 46219	317-356-7078 x226 317-351-2877 Fax	http://www.in.gov/isdh/23288.htm	15	2141	3859	0

Laboratory	Address	Telephone	Website	Age	Office Space	Lab Space	Customers
Kansas Metrology Laboratory	6531 SE Forbes Ave, Ste B Topeka ,KS 66619	785-862-2415 785-862-2460 Fax	http://agriculture.ks.gov/divisions-programs/weight-measures/metrology-lab	16	213	3574	147
Kentucky Department of Agriculture	107 Corporate Dr Frankfort ,KY 40601	502-573-0282 502-573-0303 Fax	www.kyagr.com	14	400	2395	53
Louisiana Dept. of Agriculture Metrology lab	5825 Florida Blvd. Tallahassee ,FL 70806	225 9221380 225-923-4877 Fax	www.ldaf.state.la.us	26	192	1568	220
Los Angeles County	11012 Garfield Ave South Gate ,CA 90280	562-622-0419 562-861-0278 Fax	http://acwm.lacounty.gov	38	168	2922	30
Massachusetts Division of Standards Laboratory	661 (rear) Highland Avenue Needham ,MA 02494	781-444-0219 781-444-0891 Fax	www.mass.gov/standards	3.5	160	2192	103
MD Dept of Agriculture, Weights & Measures Laboratory	50 Harry S Truman Pkwy Annapolis ,MD 21401	410-841-5790 410-841-2765 Fax	www.mda.state.gov	24	930	4870	21
Maine Metrology Laboratory	333 Cony Road Augusta ,ME 04333	207-287-7587 207-624-5040 Fax	http://www.maine.gov/dacf/qar/laboratory_testing/metrology.shtml	52	285	11500	164
State of Michigan	940 Venture Lane Williamston ,MI 48895	517-655-8202 517-655-8303 Fax	http://www.michigan.gov/wminfo	16	2000	12200	350
Minnesota	14305 Southcross Drive Suite 150 Burnsville ,MN 55306	651-539-1560 952-435-4040 Fax	http://mn.gov/commerce/weights-and-measures	8	1120	4706	287
Missouri Metrology Lab	1616 Missouri Blvd Jefferson City ,MO 65109	573-751-9487 573-751-0281 Fax	mda.mo.gov	25	385	2433	538
Mississippi	1000 ASU Dr. Lorman ,MS 39096	601-877-3802 601-877-3872 Fax		14	320	3752	124
Montana Bureau of Weights and Measures	2801 North Cooke Street Helena ,MT 59601	406-449-2582 N/A Fax	http://bsd.dli.mt.gov/bc/ms_index.asp	29	300	1000	0
NCDA&CS Standards Laboratory	1051 Mail Service Center Raleigh ,NC 27699	919-733-4411 919-733-8804 Fax	www.ncstandards.org	30	2700	4800	432

Laboratory	Address	Telephone	Website	Age	Office Space	Lab Space	Customers
Nebraska Standards Laboratory	3721 West Cuming Street Lincoln ,NE 68524	402-471-2087 402-471-6685 Fax	http://www.nda.nebraska.gov/	0	437	1672	0
New Hampshire Metrology Laboratory	25 Capitol St. Concord ,NH 03301	603-271-0894 603-271-1109 Fax	http://agriculture.nh.gov/divisions/weights_measures/metrology.htm	42	0	700	67
State of New Jersey Metrology Laboratory	1261 Rts. 1&9 South Avenel ,NJ 07076	908-403-5798 732-382-5298 Fax		26	400	2700	524
New Mexico Department of Agriculture	3190 S. Espina Las Cruces ,NM 88003	575 646 1616 575 646 2361 Fax		36	120	947	403
Nevada Metrology Laboratory	2150 Frazier Avenue Sparks ,NV 89431	775-353-3794 775-353-3798 Fax	http://agri.nv.gov/Protection/Weights_and_Measures/Metrology_Lab/	41	170	1044	90
New York State	10B Airline Dr. Albany ,NY 12235	518-457-3452 518-457-2552 Fax	www.agriculture.ny.gov	2	975	4240	141
Ohio Dept of Agriculture, Division of Weights and Measures	8995 E Main St, Bldg 5 Reynoldsburg ,OH 43068	614-728-6290 614-728-6424 Fax	http://www.agri.ohio.gov/divs/weights/weights.aspx	56	2500	3047	212
Oklahoma Bureau of Standards	2800 N. Lincoln Blvd. Oklahoma City ,Ok 73105	405-522-5459 405-522-5457 Fax	http://www.ag.ok.gov/lab/bos.htm	6	400	5807	213
Oregon Department of Agriculture, Weights and Measures Program	635 Capitol St NE Salem ,OR 97301	503-986-4669 503-986-4784 Fax	http://www.oregon.gov/ODA/programs/ISCP/Pages/Metrology.aspx	16	367	2038	103
Pennsylvania Standards Laboratory	2221 Forster Street, Room G-44A Harrisburg ,PA 17125	717-787-4707 717-705-0882 Fax	www.dgs.pa.gov	17	1568	3780	707
Puerto Rico Weights & Measures Laboratory	140 Federico Costa ST. San Juan ,PR 00918	787-725-4414 787-7254414 Fax		3	2125	2915	110
South Carolina Department of Agriculture	237 Catawba Street Columbia ,SC 29201	803-253-4052 803-253-4052 Fax	agriculture.sc.gov	28	208	3500	651
South Dakota Metrology Laboratory	118 West Capitol Pierre ,SD 57501	605-773-3170 605-773-6631 Fax	http://dps.sd.gov/licensing/weights_and_measures/	40	0	525	52

Laboratory	Address	Telephone	Website	Age	Office Space	Lab Space	Customers
Tennessee Weights and Measures Laboratory	430 Hogan Road Nashville ,TN 37220	615-837-5159 615-837-5015 Fax		45	256	837	181
Texas Department of Agriculture; Giddings Metrology Laboratory	P.O. Box 1518/1258 CR 226 Giddings ,TX 78942	979-542-3231 888-205-7741 Fax	www.texasagriculture.gov	12	1200	11077	266
USDA/GIPSA/FGIS Master Scale Depot	5800 W. 69th Street Chicago ,IL 60638	708-458-0655 708-458-0749 Fax		80	800	2000	0
Utah Metrology Lab	350 North Redwood Rd Salt Lake City ,UT 84116	801-538-7153 801-538-4949 Fax	ag.utah.gov	32	150	1350	62
Virginia Standards Laboratory	600 North 5th Street Richmond ,VA 23219	804-786-0479 804-371-0206 Fax	http://www.vdacs.virginia.gov/standards/services.shtml#metlab	13	400	3000	172
Vermont Weights & Measures Metrology Laboratory	322 Industrial Lane Berlin ,VT 05641	802-828-2426 802-828-5983 Fax	www.Agriculture.Vermont.gov	3	100	1700	57
State of Wisconsin Weights and Measures Laboratory	3601 Galleon Run Madison ,WI 53718	608-224-4913 608-224-4912 Fax	http://datcp.wi.gov/Consumer/Weights_and_Measures/	8	550	3700	472
West Virginia Weights & Measures Metrology Laboratory	570 MacCorkle Ave W St. Albans ,WV 25177	304-722-0602 304-722-0605 Fax	www.wvlabor.com	44	231	1769	269
Wyoming Department of Agriculture	6607 Campstool Rd Cheyenne ,WY 82002	307-777-7556 307-777-1943 Fax	http://agriculture.wy.gov/	3	650	1660	42
WA St. Dept. of Agriculture Metrology Laboratory	2747 29th Ave. SW Tumwater ,WA 98512	360-753-5042 360-586-4728 Fax		37	230	2734	249

Table 4: Provides information regarding the participant laboratories including location, age[1], size, and total number of customers served as of the 2014 calendar year.

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

Lab Code/Year	1996	1998	1999	2000	2002	2004	2005	2006	2008	2010	2012	2014
AK	Yes		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
AL	Yes				Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
AR	Yes	Yes	Yes	Yes	Yes	Yes		Yes	Yes	Yes	Yes	Yes
AZ	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
CA	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
CO	Yes		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
CT	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
DE	(inactive)	(inactive)	(inactive)	(inactive)	(inactive)	(inactive)	(inactive)	(inactive)	(inactive)	(inactive)	(inactive)	(inactive)
FL	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
GA	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
HI	Yes	Yes	Yes	(inactive)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
IA	Yes	Yes	Yes		(inactive)	Yes	Yes	Yes	Yes	Yes	Yes	(inactive)
ID	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
IL	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
IN	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes		Yes
KS	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
KY	Yes	Yes	Yes	Yes	Yes	(inactive)	(inactive)	Yes	Yes	Yes	Yes	Yes
LA	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
MA	Yes		Yes	Yes	Yes	Yes	Yes	Yes	Yes		Yes	Yes
MD	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
ME	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
MI	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
MN	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
MO	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Lab Code/Year	1996	1998	1999	2000	2002	2004	2005	2006	2008	2010	2012	2014
MS	Yes	Yes		(inactive)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
MT	Yes	Yes	Yes	Yes	Yes	Yes			Yes	Yes		Yes
NC	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
ND	Yes	Yes	Yes	Yes	Yes	(inactive)	Yes	Yes	Yes		(inactive)	(inactive)
NE	Yes	Yes			Yes	Yes	Yes	Yes			Yes	Yes
NH	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
NJ	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
NM	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
NV	Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
NY	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
OH	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
OK	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
OR	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
PA	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
RI	(inactive)	(inactive)	(inactive)	(inactive)	(inactive)	(inactive)	(inactive)	(inactive)	(inactive)	(inactive)	(inactive)	(inactive)
SC	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
SD	Yes	Yes			(inactive)	Yes	Yes	Yes	Yes	Yes	Yes	Yes
TN	Yes	Yes	Yes	Yes	Yes	(inactive)	Yes	Yes	Yes		Yes	Yes
TX	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
UT	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
VA	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
VT	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
WA	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
WI	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Lab Code/Year	1996	1998	1999	2000	2002	2004	2005	2006	2008	2010	2012	2014
WV	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
WY	Yes	Yes	Yes	Yes	Yes	Yes		Yes	Yes	Yes	Yes	Yes
USDA-GIPSA	Yes					Yes	Yes	Yes	Yes	Yes	Yes	Yes
Wash. DC	(inactive)	(inactive)	(inactive)	(inactive)	(inactive)	(inactive)	(inactive)	(inactive)	(inactive)	(inactive)	(inactive)	(inactive)
Virgin Islands	(inactive)	(inactive)	(inactive)	(inactive)	(inactive)	(inactive)	(inactive)	(inactive)	(inactive)	(inactive)	(inactive)	(inactive)
Puerto Rico	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes		Yes
LA County	Yes	Yes	Yes	Yes	Yes	(inactive)	(inactive)	(inactive)	Yes	Yes	Yes	Yes
TOTAL	51	46	45	45	48	47	46	49	50	47	47	49

Table 5: Listing of SLP member laboratories and their participation status in previous surveys (blanks indicate non 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 and NIST Technical Note 952, that are solved using numerical least squares approximations, and employ air buoyancy corrections. 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 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 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 (Harris and Torres, NIST IR 6969, "Selected Laboratory and Measurement Practices, and Procedures, to Support Basic Mass Calibrations" 2003), SOP 4 and SOP 7 (Harris and Torres, NIST IR 6969, "Selected Laboratory and Measurement Practices, and Procedures, to Support Basic Mass Calibrations" 2003).

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 (Harris and Torres, NIST IR 6969, "Selected Laboratory and Measurement Practices, and Procedures, to Support Basic Mass Calibrations" 2003). 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 (NIST Handbook 105-8 "Specifications and Tolerances for Field Standard Weight Carts" 2003) 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.

Mass Echelon I

Description

The graphs on the following page represent the total number of Mass Echelon I standards tested by the 49 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 49 reporting laboratories, 13 labs tested a total of 2,980 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
2014	13	2980

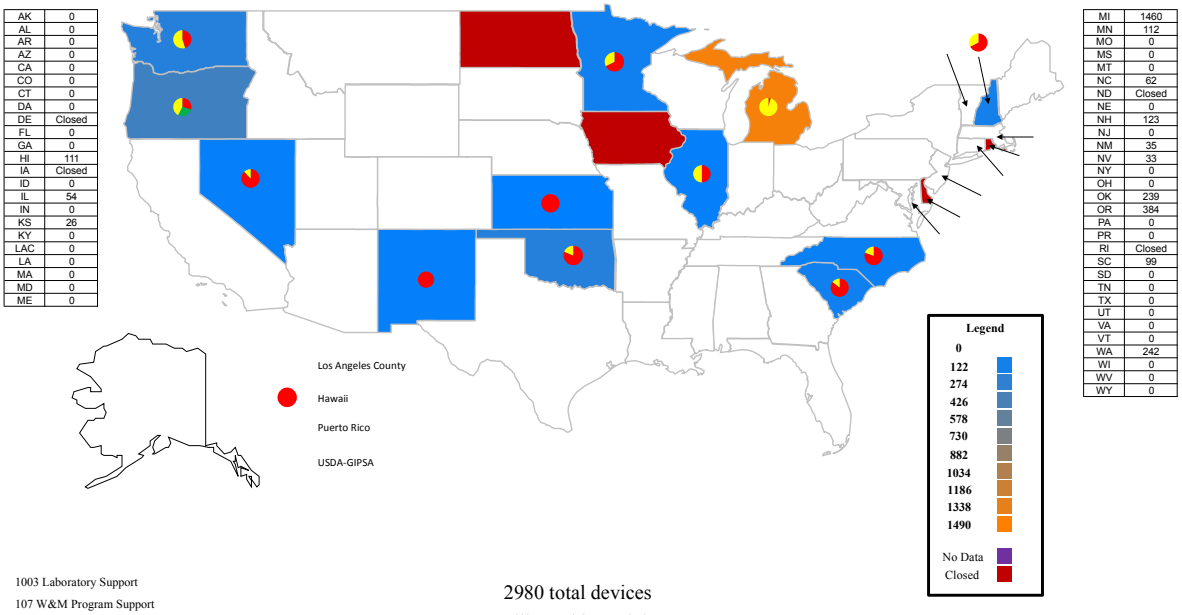
Table 6: Summary of echelon I tests reported on previous surveys.

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

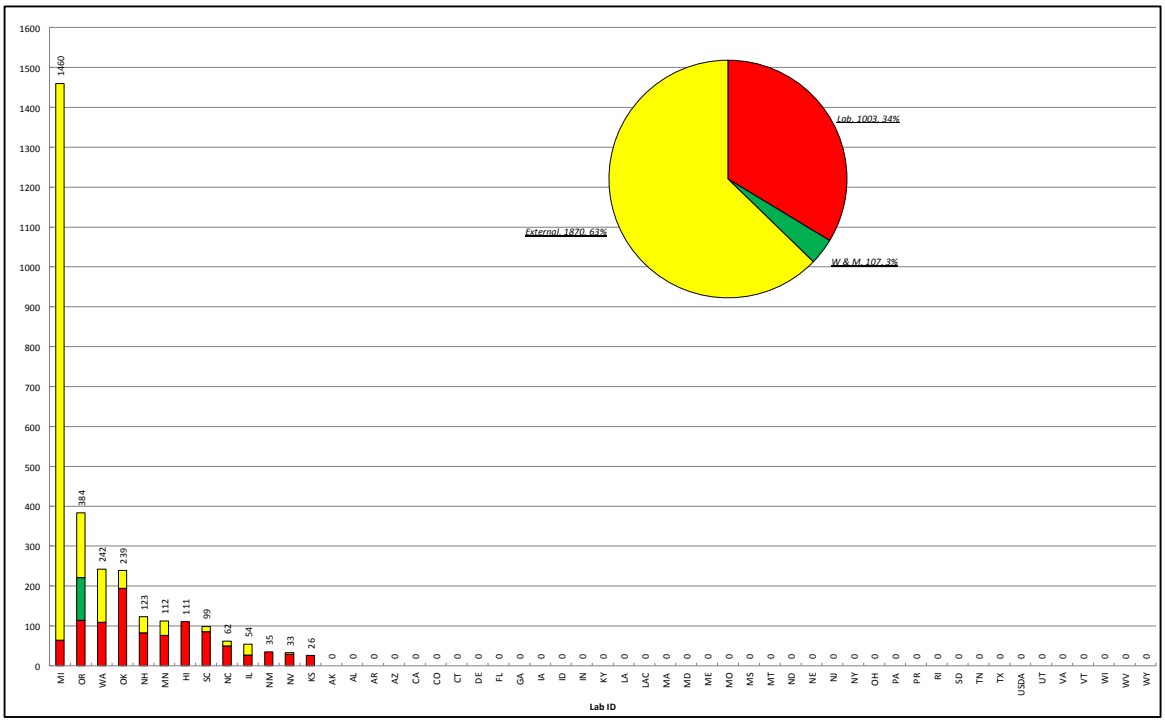
- 34 % of all Mass I standards were calibrated for internal use by the laboratory.
- 3 % of all Mass I standards were calibrated for the weight and measures program.
- 63 % of all Mass I standards were calibrated for external customers.

Mass Echelon I



1003 Laboratory Support
107 W&M Program Support
1870 For external customers

2980 total devices
calibrated in 13 labs



Bar and pie chart color codes

- Laboratory
- Weights and Measures
- External

Figure 9: 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 49 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 49 reporting laboratories, 26 labs tested a total of 16,832 mass standards

Comparison of previous surveys

Year	# Labs	Total Devices
1996	38	37,662
1998	36	24,926
1999	35	25,807
2000	38	26,428
2002	37	25,847
2004	32	21,714
2005	32	20,541
2006	33	22,352
2008	32	25,371
2010	34	23,316
2012	30	18,222
2014	26	16,832

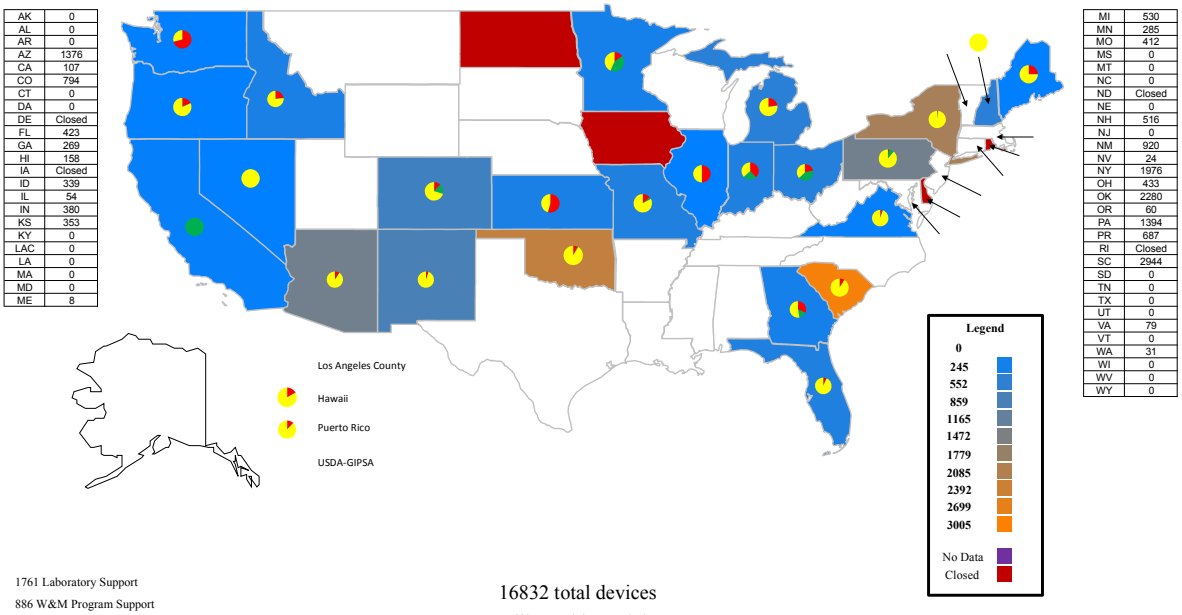
Table 7: Echelon II tests reported on previous surveys.

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

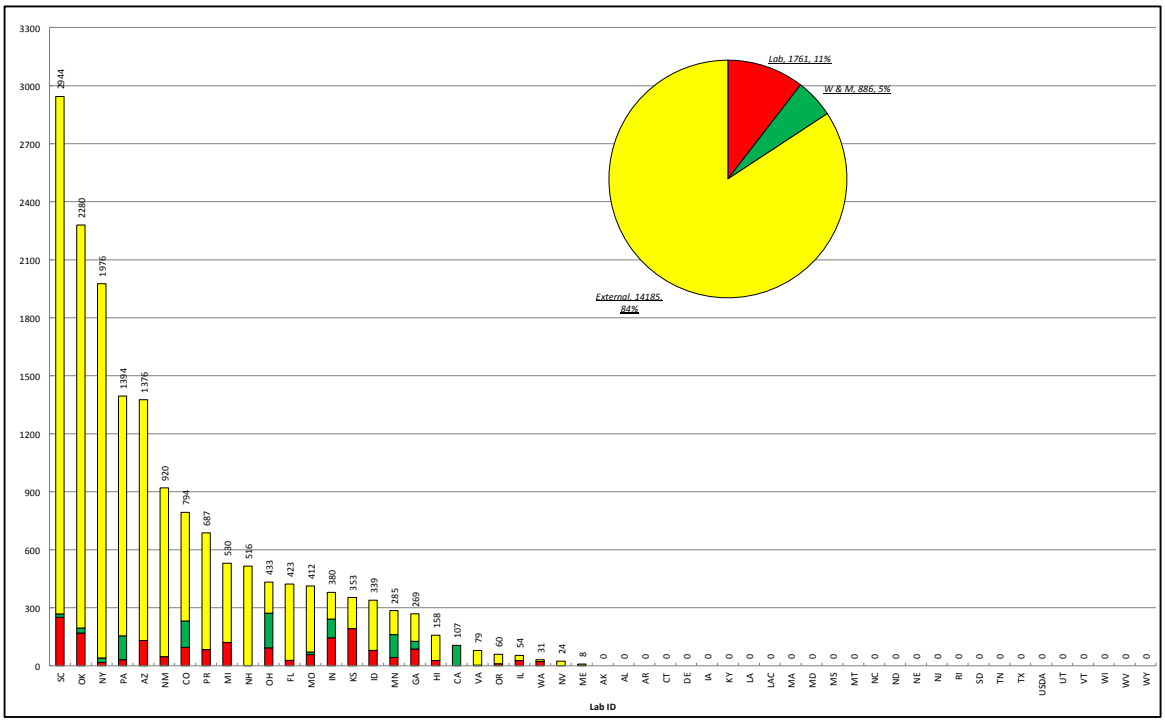


AK	0
AL	0
AR	0
AZ	1376
CA	107
CO	794
CT	0
DA	0
DE	Closed
FL	423
GA	269
HI	158
IA	Closed
ID	339
IL	54
IN	380
KS	353
KY	0
LAC	0
LA	0
MA	0
MD	0
ME	8

MI	530
MN	285
MO	412
MS	0
MT	0
NC	0
ND	Closed
NE	0
NH	516
NJ	0
NM	920
NV	24
NY	1976
OH	433
OK	2280
OR	60
PA	1394
PR	687
RI	Closed
SC	2944
SD	0
TN	0
TX	0
UT	0
VA	79
VT	0
WA	31
WI	0
WV	0
WY	0

1761 Laboratory Support
886 W&M Program Support
14185 For external customers

16832 total devices
calibrated in 26 labs



Bar and pie chart color codes

- Laboratory
- Weights and Measures
- External

Figure 10: 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 49 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 49 reporting laboratories, 47 labs tested a total of 244,985 mass standards

Comparison of previous surveys

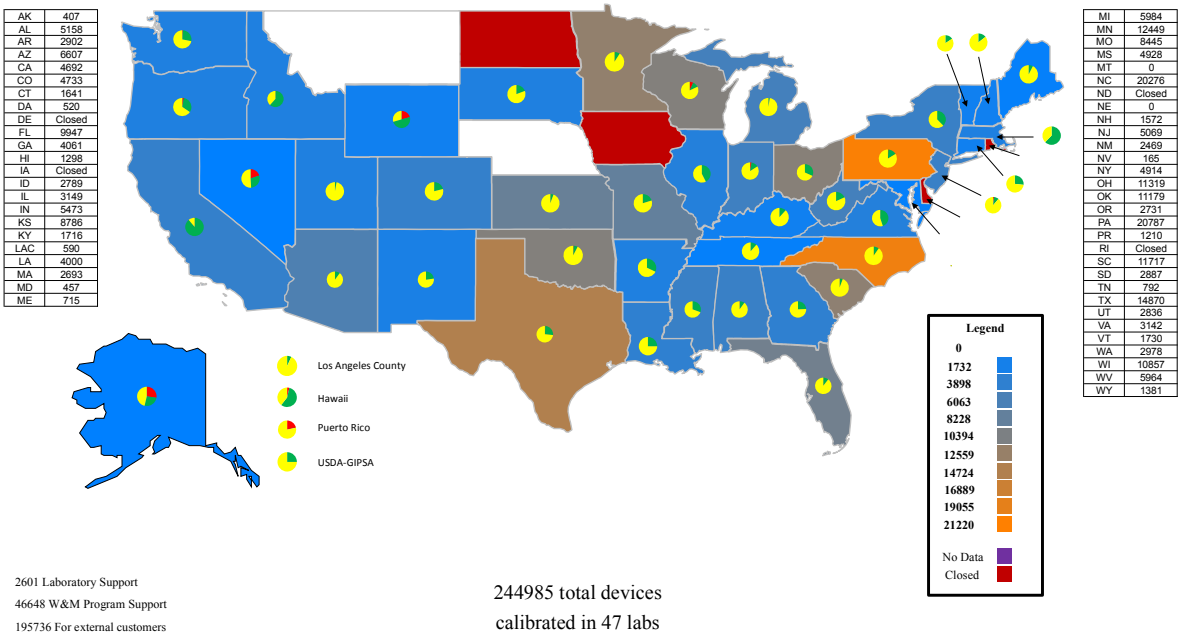
Year	# Labs	Total Devices
1996	51	259,713
1998	46	259,166
1999	45	257,938
2000	45	260,072
2002	47	267,240
2004	47	248,117
2005	46	248,650
2006	49	256,844
2008	50	254,221
2010	47	256,094
2012	47	256,094
2014	47	244,985

Table 8: Echelon III tests reported on previous surveys.

Notes and Comments

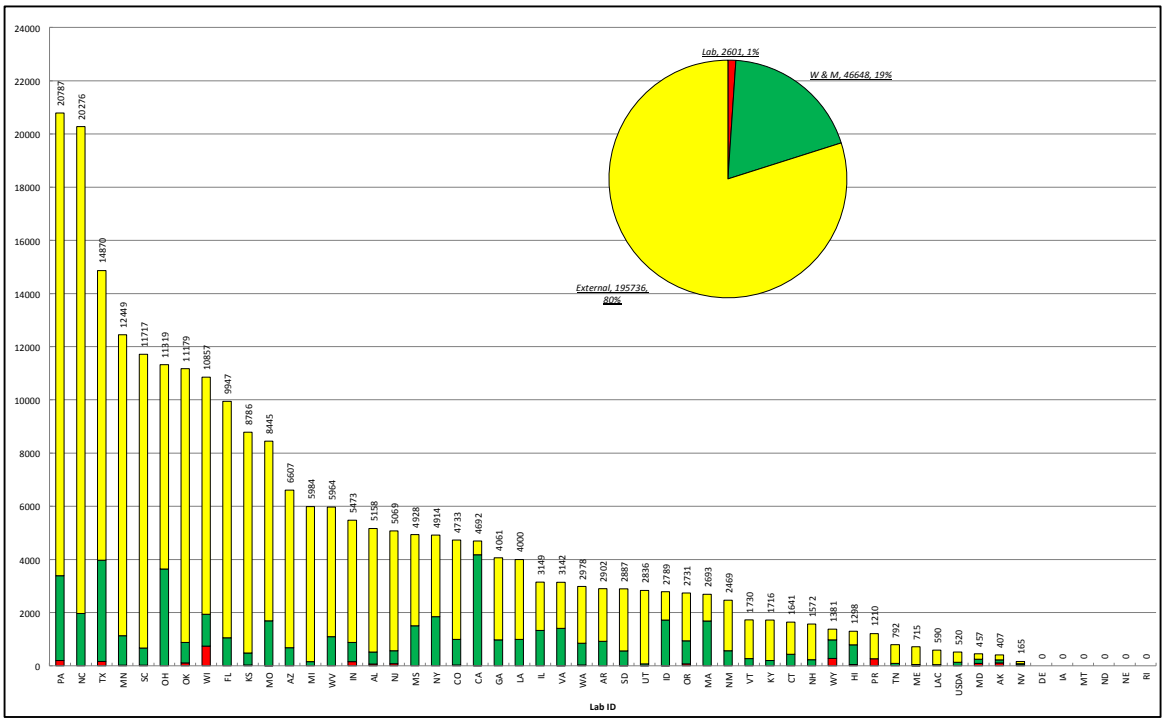
- 1 % of all Mass III standards were calibrated for internal use by the laboratory.
- 19 % of all Mass III standards were calibrated for the weight and measures program.
- 80 % of all Mass III standards were calibrated for external customers.

Mass Echelon III



2601 Laboratory Support
46648 W&M Program Support
195736 For external customers

244985 total devices
calibrated in 47 labs



Bar and pie chart color codes

- Laboratory
- Weights and Measures
- External

Figure 11: Mass Echelon III tests.

Weight Carts

Description

The graphs on the following page represent the total number of weight carts tested by the 49 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 49 reporting laboratories, 30 labs tested a total of 517 weight carts

Comparison of previous surveys

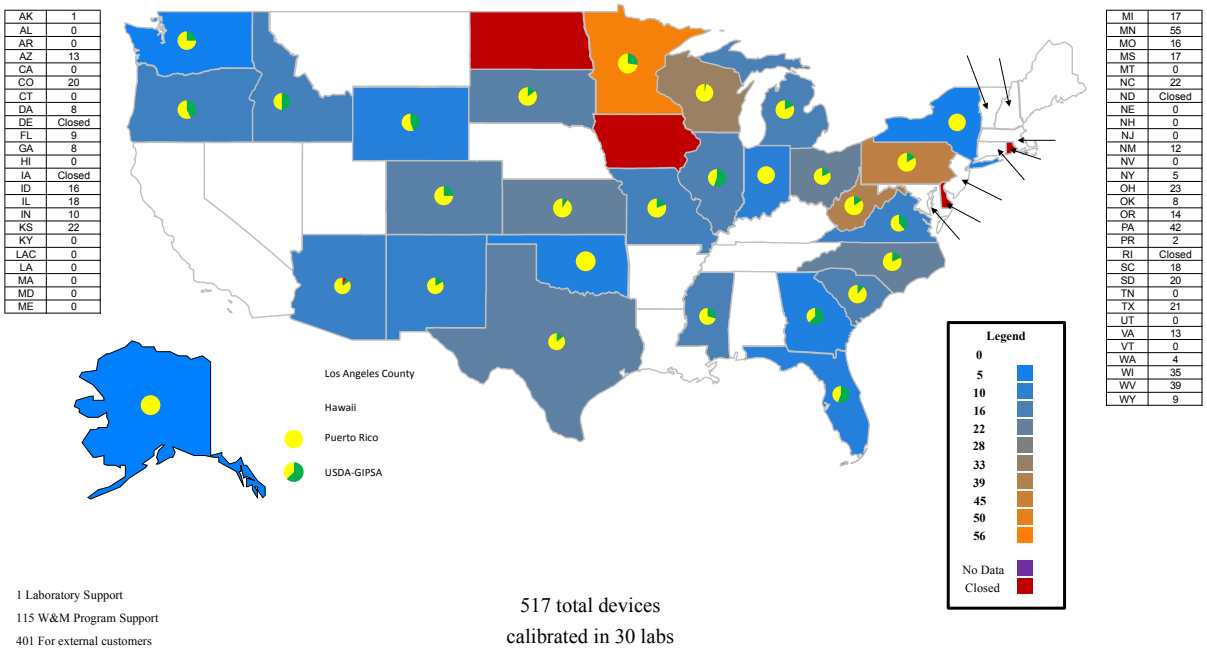
Year	# Labs	Total Devices
1998	30	297
2000	27	344
2002	29	388
2004	33	365
2005	30	410
2006	31	388
2008	32	445
2010	35	468
2012	31	433
2014	30	517

Table 9: Weight Cart tests reported on previous surveys.

Notes and Comments

- 1 % of all weight carts were calibrated for internal use by the laboratory.
- 22 % of all weight carts were calibrated for the weight and measures program.
- 78 % of all weight carts were calibrated for external customers.

Weight Carts

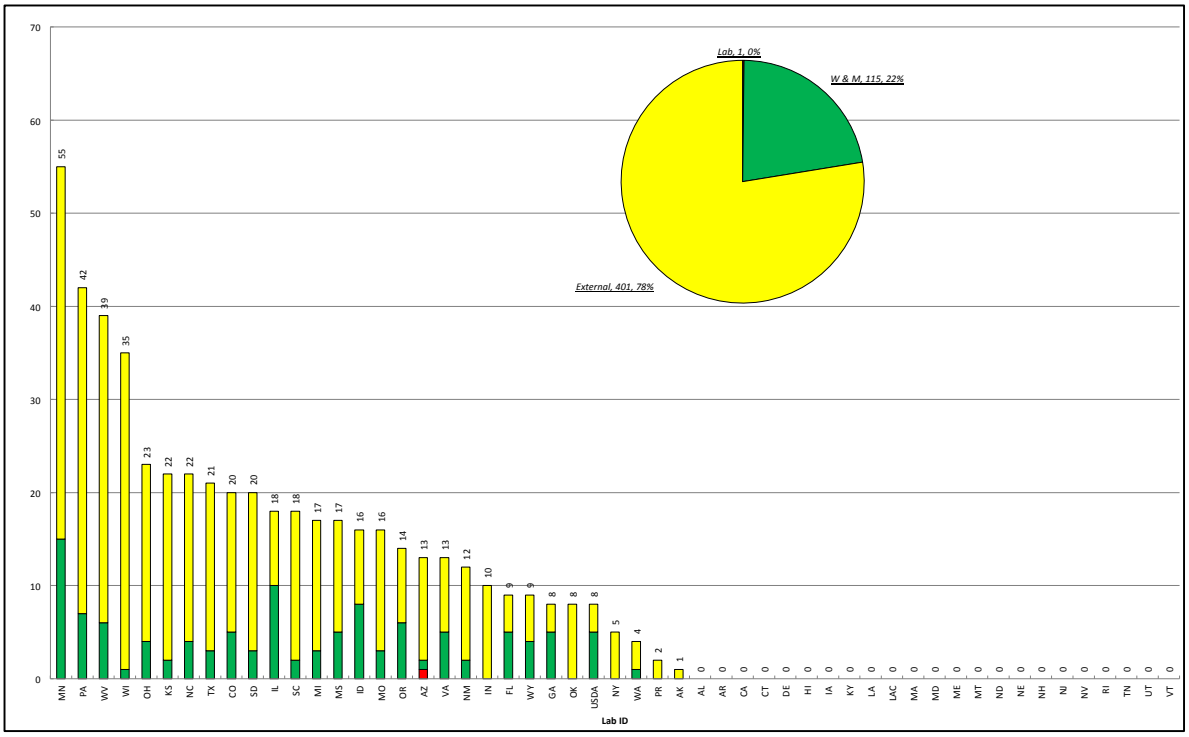


AK	1
AL	0
AR	0
AZ	13
CA	0
CO	20
CT	0
DA	8
DE	Closed
FL	9
GA	8
HI	0
IA	Closed
ID	16
IL	18
IN	10
KS	22
KY	0
LAC	0
LA	0
MA	0
MD	0
ME	0

MI	17
MN	55
MO	16
MS	17
MT	0
NC	22
ND	Closed
NE	0
NH	0
NJ	0
NM	12
NV	0
NY	5
OH	23
OK	8
OR	14
PA	42
PR	2
RI	Closed
SC	18
SD	20
TN	0
TX	21
UT	0
VA	13
VT	0
WA	4
WI	35
WV	39
WY	9

1 Laboratory Support
115 W&M Program Support
401 For external customers

517 total devices
calibrated in 30 labs



Bar and pie chart color codes

- Laboratory
- Weights and Measures
- External

Figure 12: 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 49 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 49 reporting laboratories, 9 labs tested a total of 323 tape measures

Comparison of previous surveys

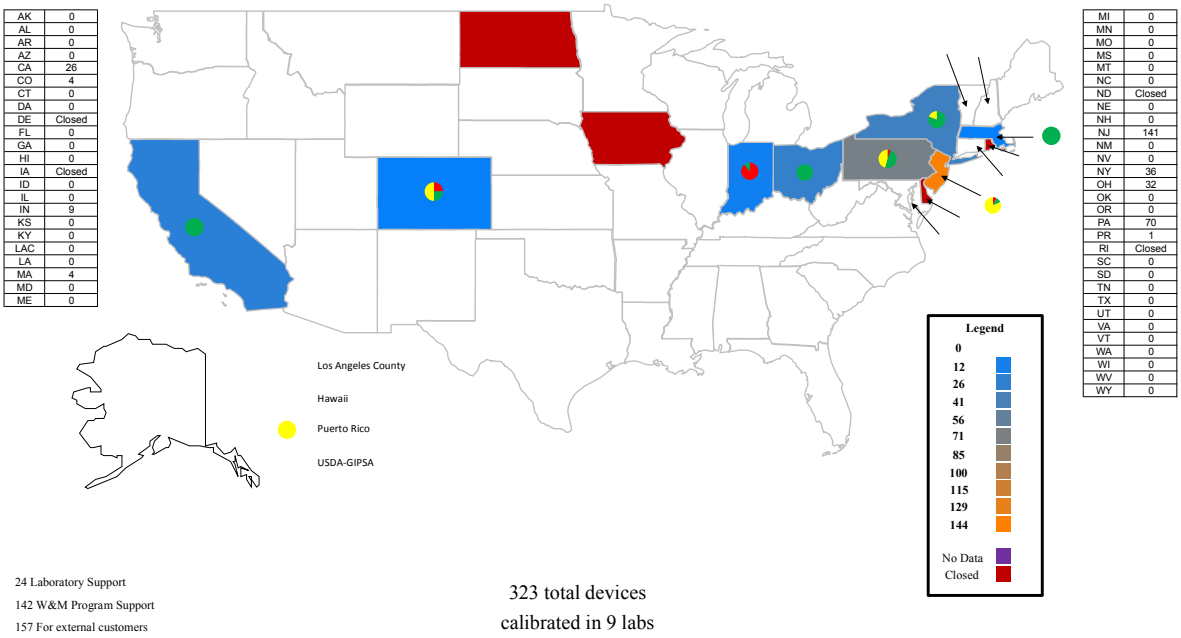
Year	# Labs	Total Devices
1996	27	707
1998	29	537
1999	21	566
2000	22	487
2002	21	584
2004	21	319
2005	19	304
2006	18	339
2008	17	425
2010	15	310
2012	12	353
2014	9	323

Table 10: Tape measure tests reported on previous surveys.

Notes and Comments

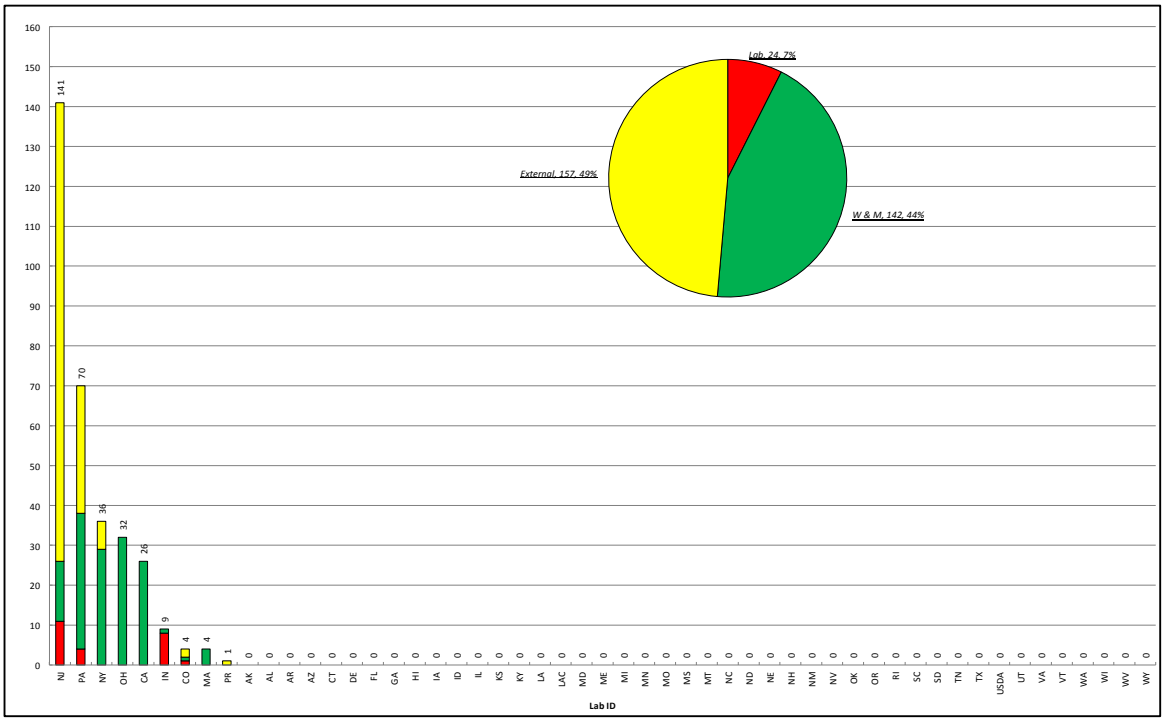
- 7 % of all tape measures were tested for internal use by the laboratory.
- 44 % of all tape measures were tested for the weight and measures program.
- 49 % of all tape measures were tested for external customers.

Tapes



24 Laboratory Support
142 W&M Program Support
157 For external customers

323 total devices
calibrated in 9 labs



Bar and pie chart color codes

- Laboratory
- Weights and Measures
- External

Figure 13: Tape Measure tests.

Rigid Rules

Description

The graphs on the following page represent the total number of rigid rules tested by the 49 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 49 reporting laboratories, 3 labs tested a total of 54 rigid rules.

Comparison of previous surveys

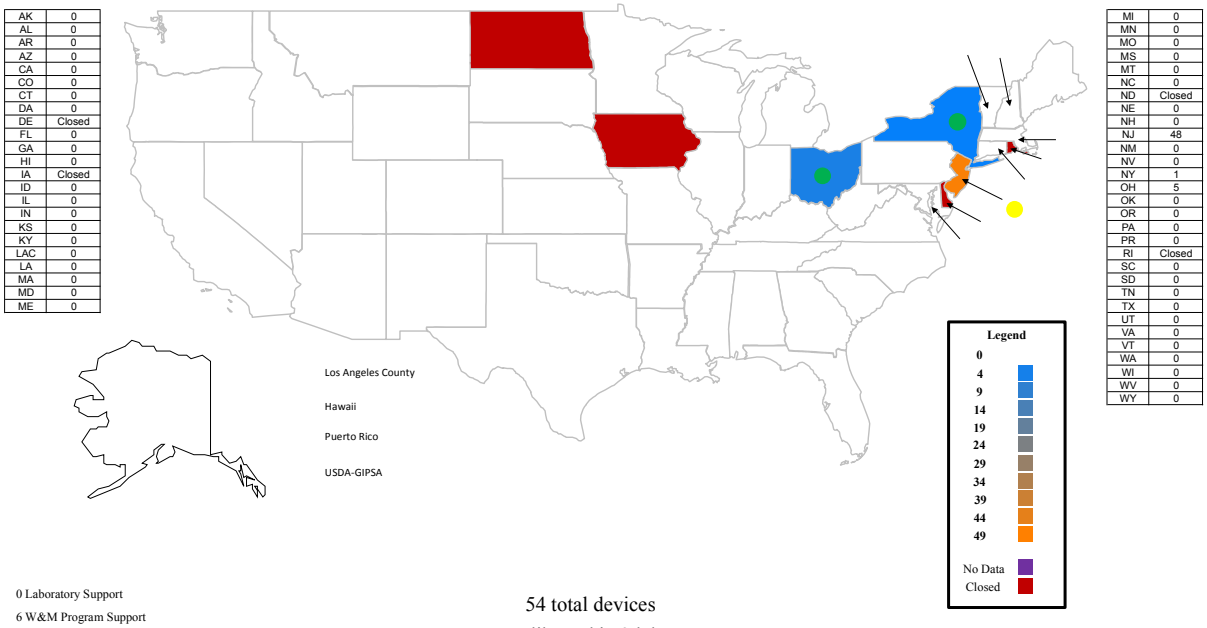
Year	# Labs	Total Devices
1996	26	582
1998	29	269
1999	20	413
2000	16	169
2002	14	138
2004	12	98
2005	11	85
2006	11	122
2008	11	88
2010	8	89
2012	3	85
2014	3	54

Table 11: Rigid rule tests reported in previous surveys.

Notes and Comments

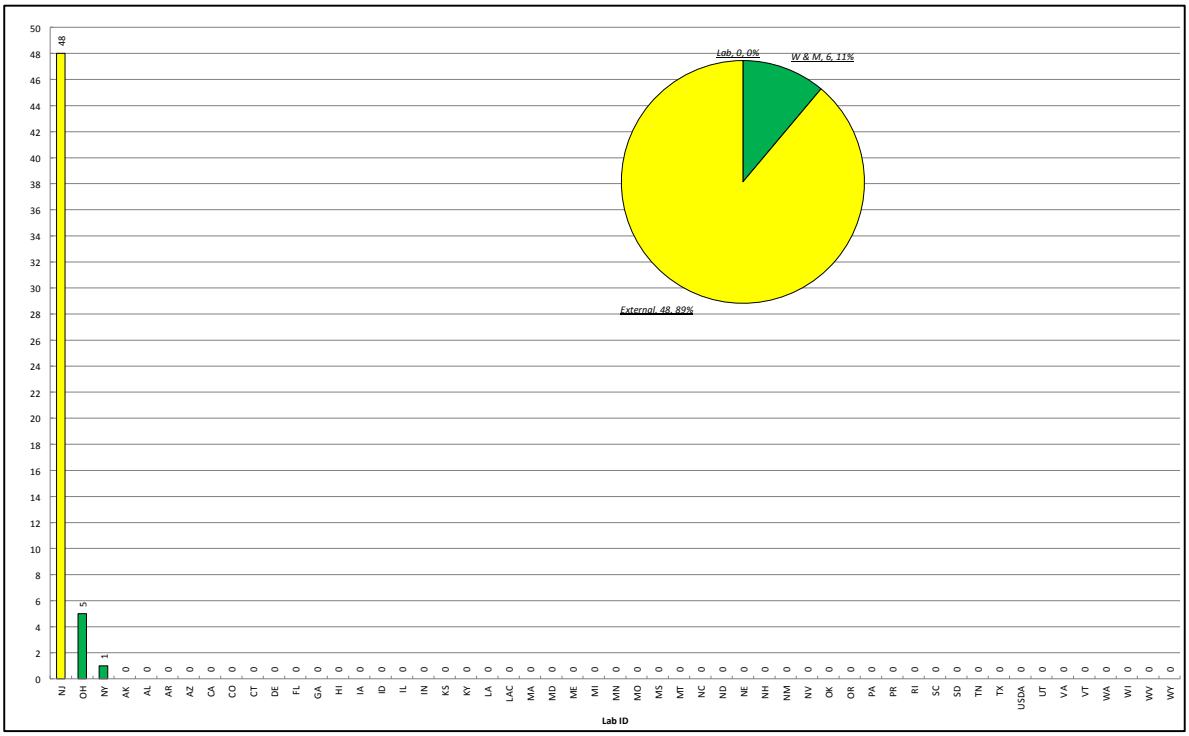
- 0 % of all rigid rules were tested for internal use by the laboratory.
- 11 % of all rigid rules were tested for the weight and measures program.
- 89 % of all rigid rules were tested for external customers.

Rigid Rules



0 Laboratory Support
6 W&M Program Support
48 For external customers

54 total devices
calibrated in 3 labs



Bar and pie chart color codes

- Laboratory
- Weights and Measures
- External

Figure 14: Rigid rule tests.

Volume

Of the measurement services provided by the SLP volume measurement service are the 2nd 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 gallons), medium volume provers (>5 gallons and ≤ 100 gallons), and large volume provers (> 100 gallons).

Glassware consists of laboratory glassware (see for example ASTM E288) and field measuring flasks (as described in NIST Handbook 105-2. 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). 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. Liquified 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).

Glassware

Description

The graphs on the next two pages represent the total number of volume tests performed on glassware by the 49 reporting laboratories using either a volume transfer (page 50) or gravimetric method (page 51). 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 49 reporting laboratories, 3 labs performed a total of 124 volume transfer tests.
- Of the 49 reporting laboratories, 7 labs performed a total of 119 gravimetric volume tests.

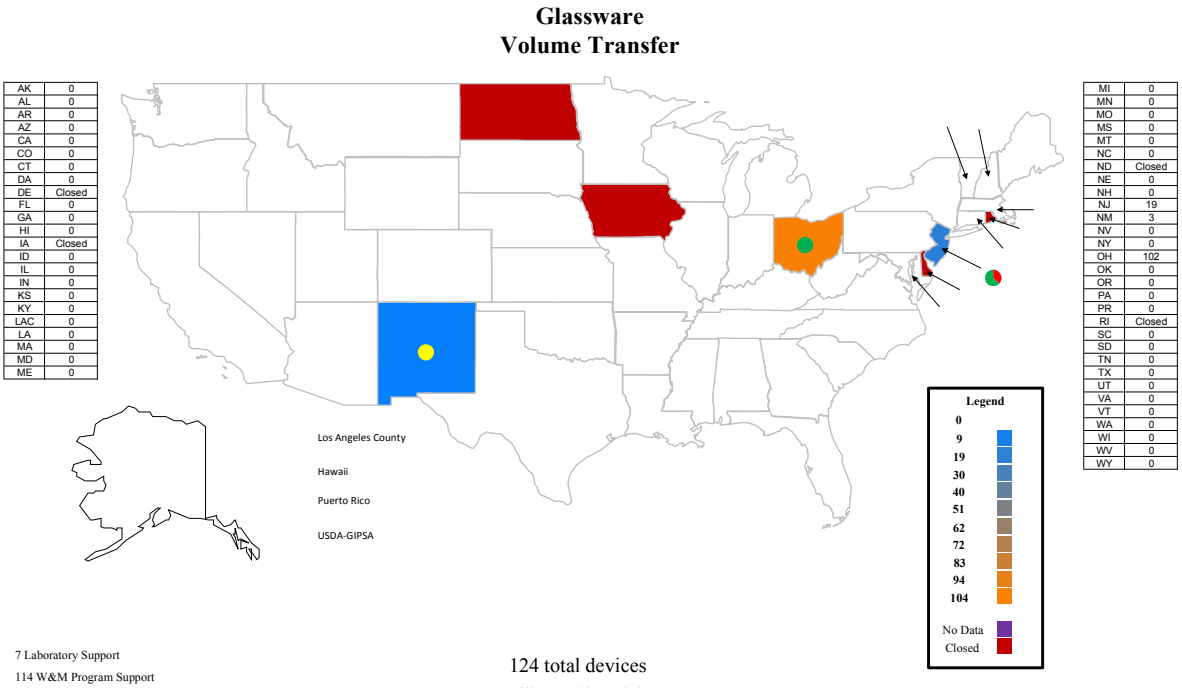
Comparison of previous surveys

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
2010	16	43	288	331
2012	8	170	78	248
2014	9	124	119	243

Table 12: Glassware calibrations from previous surveys.

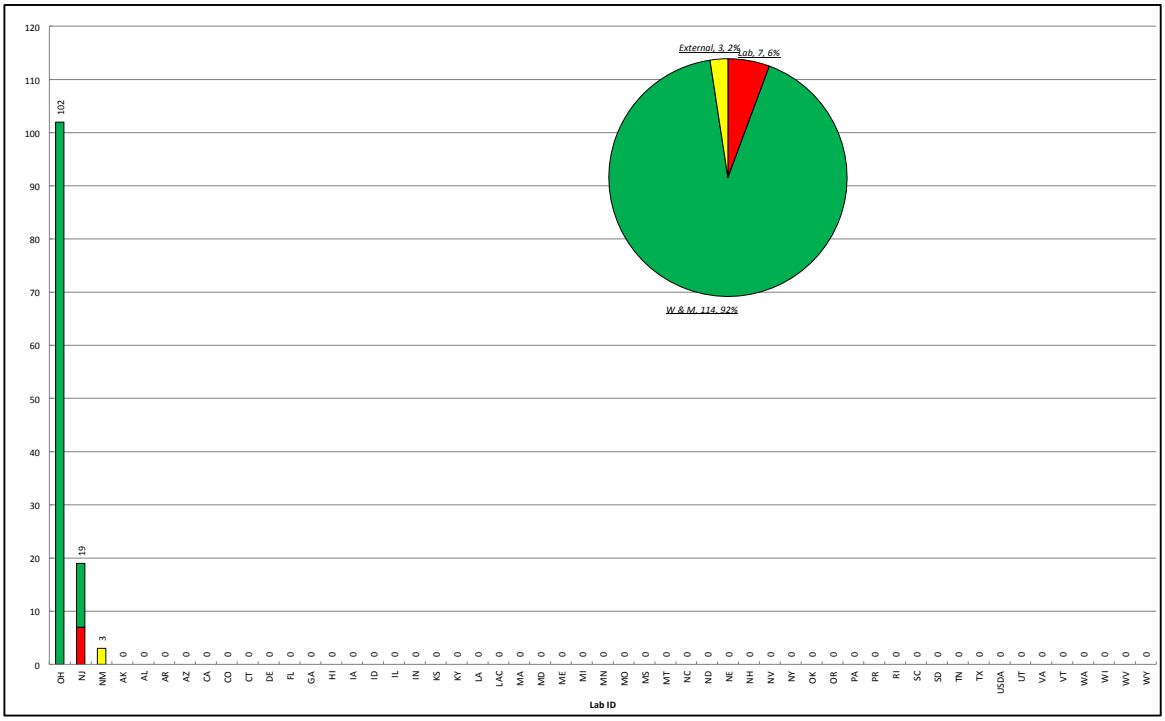
Notes and Comments

- 15% of all glassware standards were tested for the laboratory
- 80% of all glassware standards were tested for Weights and Measures enforcement programs.
- 5% of all glassware standards were tested for external customers.



7 Laboratory Support
114 W&M Program Support
3 For external customers

124 total devices
calibrated in 3 labs



Bar and pie chart color codes

- Laboratory
- Weights and Measures
- External

Figure 15: Glassware calibrations, volume transfer method

Gravimetric

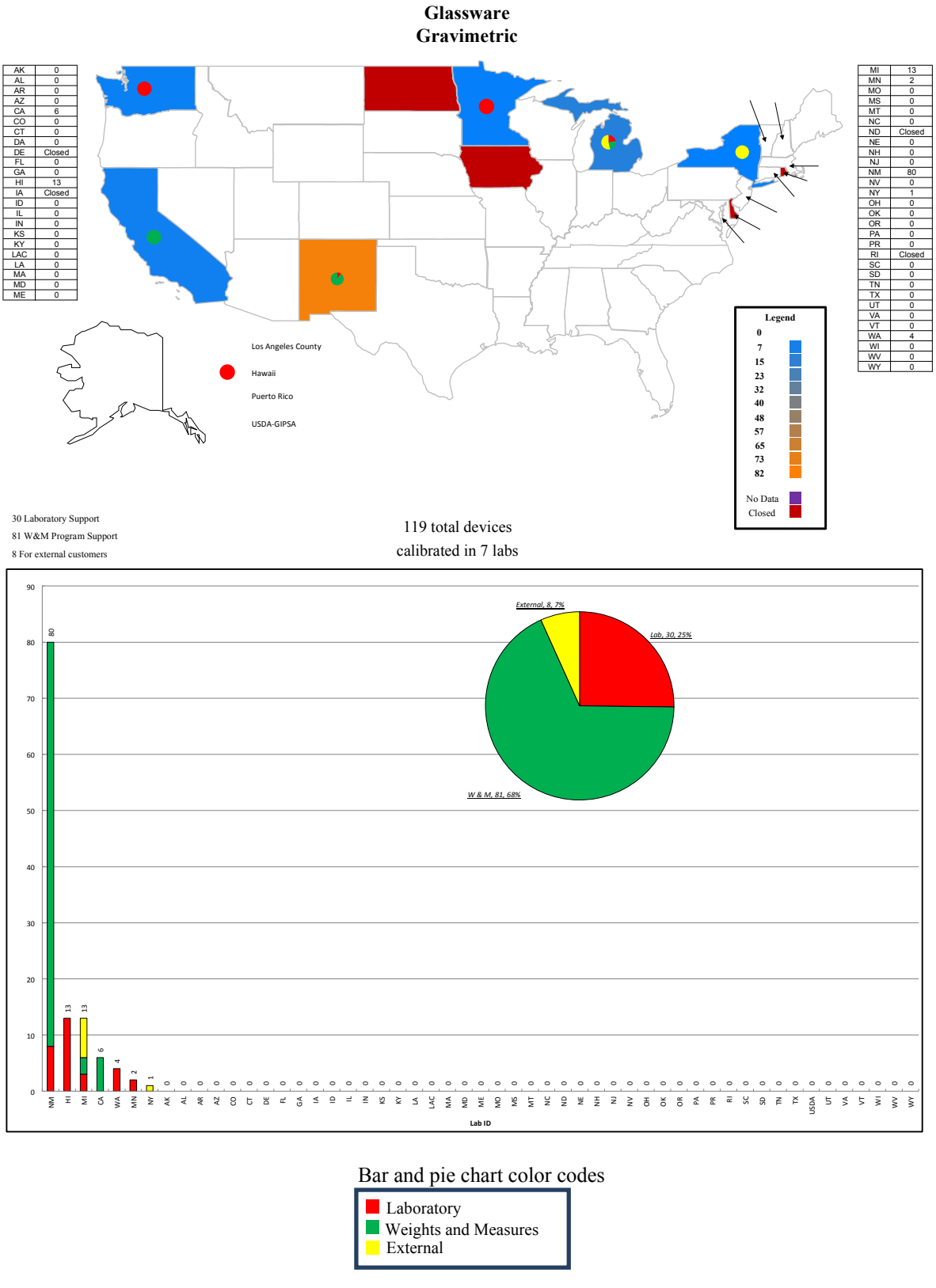


Figure 16: Glassware calibrations, gravimetric method.

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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 49 reporting laboratories using either a volume transfer (page 54) or gravimetric method (page 55). 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 49 reporting laboratories, 46 labs performed a total of 7863 volume transfer tests.
- Of the 49 reporting laboratories, 19 labs performed a total of 128 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
2014	46	7863	128	7991

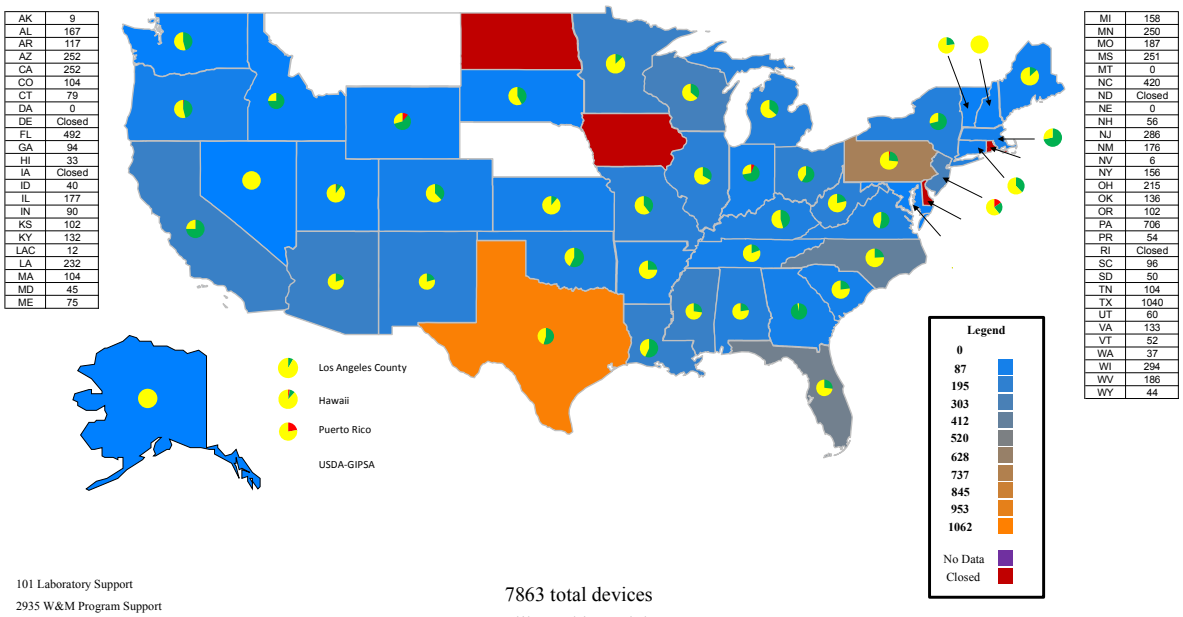
Table 13: Test Measure (5 ≤ gal.) volume tests from previous surveys.

Notes and Comments

- 2% of all test measures were tested for the laboratory
- 37% of all test measures were tested for Weights and Measures enforcement programs.
- 62% 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

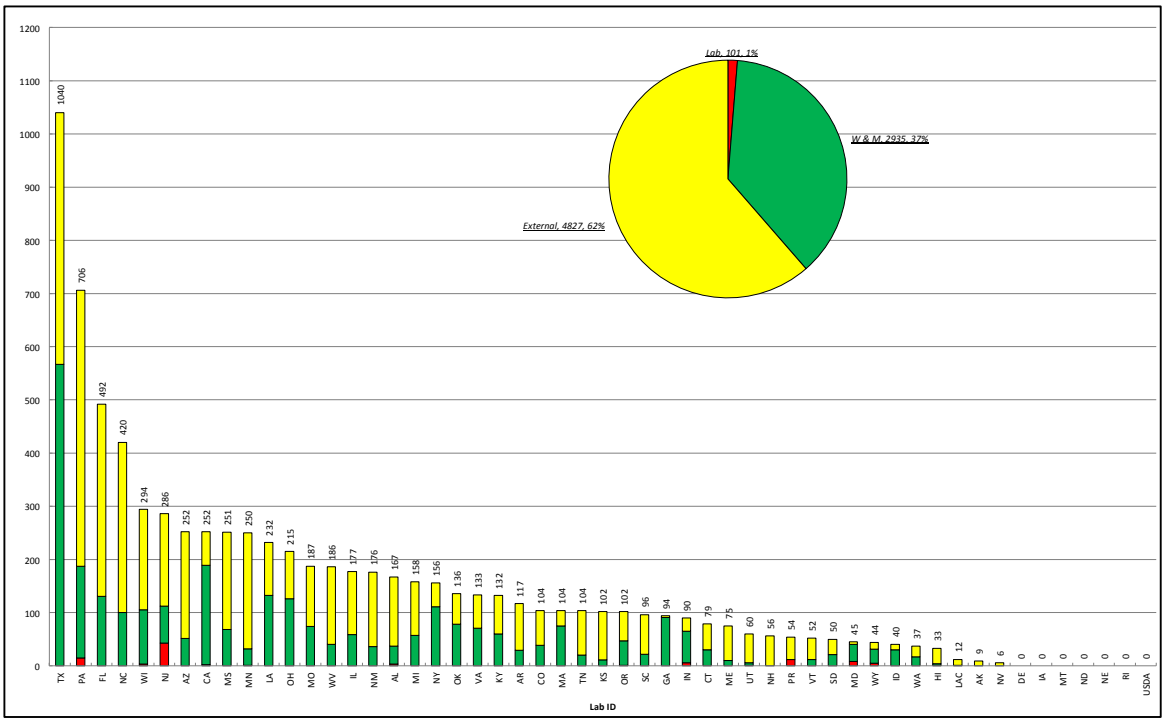


AK	9
AL	167
AR	117
AZ	252
CA	252
CO	104
CT	79
DA	0
DE	Closed
FL	492
GA	94
HI	33
IA	Closed
ID	40
IL	177
IN	90
KS	102
KY	132
LAC	12
LA	232
MA	104
MD	45
ME	75

MI	158
MN	250
MO	187
MS	251
MT	0
NC	420
ND	Closed
NE	0
NH	56
NJ	286
NM	176
NV	6
NY	156
OH	215
OK	136
OR	102
PA	706
PR	54
RI	Closed
SC	96
SD	50
TN	104
TX	1040
UT	60
VA	133
VT	52
WA	37
WI	294
WV	186
WY	44

101 Laboratory Support
2935 W&M Program Support
4827 For external customers

7863 total devices
calibrated in 46 labs

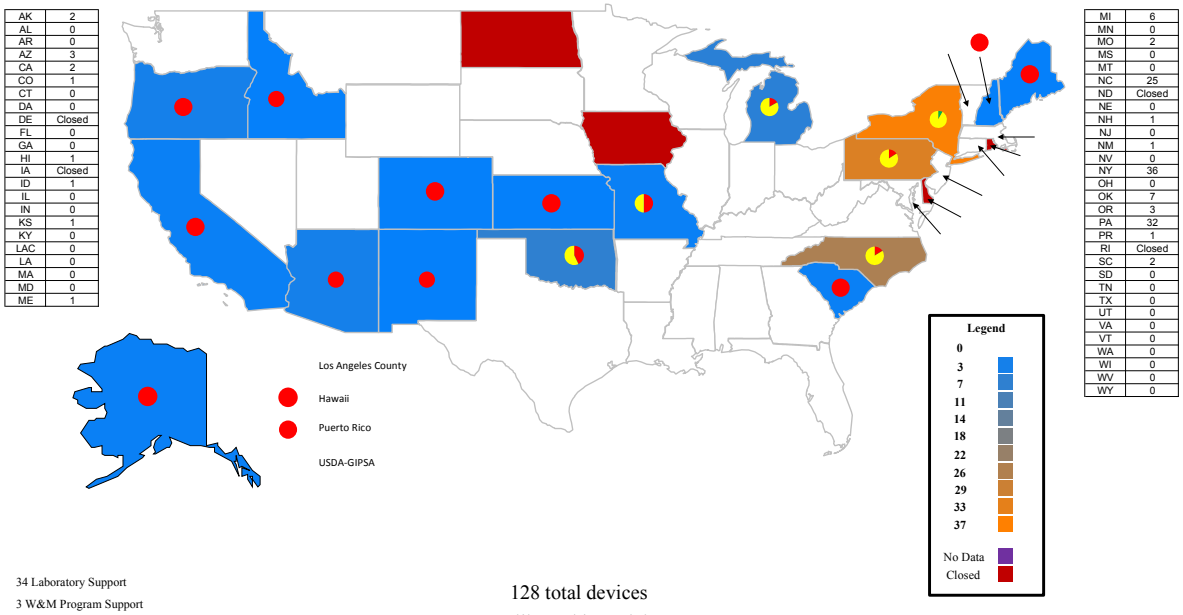


Bar and pie chart color codes

- Laboratory
- Weights and Measures
- External

Figure 17: Test Measure tests (≤5 gallon), volume transfer.

Open Neck Volumetric Test Measures (≤5 gallon)
Gravimetric

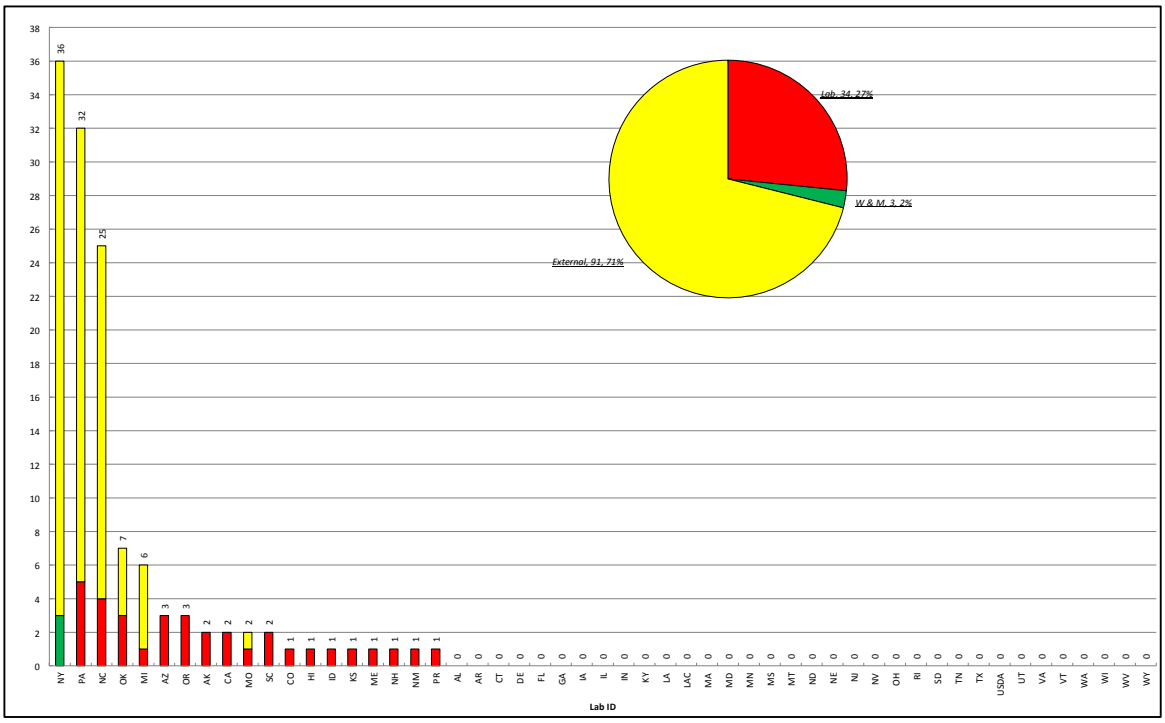


AK	2
AL	0
AR	0
AZ	3
CA	2
CO	1
CT	0
DA	0
DE	Closed
FL	0
GA	0
HI	1
IA	Closed
ID	1
IL	0
IN	0
KS	1
KY	0
LAC	0
LA	0
MA	0
MD	0
ME	1

MI	6
MN	0
MO	2
MS	0
MT	0
NC	25
ND	Closed
NE	0
NH	1
NJ	0
NM	1
NV	0
NY	36
OH	0
OK	7
OR	3
PA	32
PR	1
RI	Closed
SC	2
SD	0
TN	0
TX	0
UT	0
VA	0
VT	0
WA	0
WI	0
WV	0
WY	0

34 Laboratory Support
3 W&M Program Support
91 For external customers

128 total devices
calibrated in 19 labs



Bar and pie chart color codes

- Laboratory
- Weights and Measures
- External

Figure 18: 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 49 reporting laboratories using either a volume transfer (page 58) or gravimetric method (59). 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 49 reporting laboratories, 37 labs performed a total of 828 volume transfer tests.
- Of the 49 reporting laboratories, 5 labs performed a total of 57 gravimetric volume tests.

Comparison of previous surveys

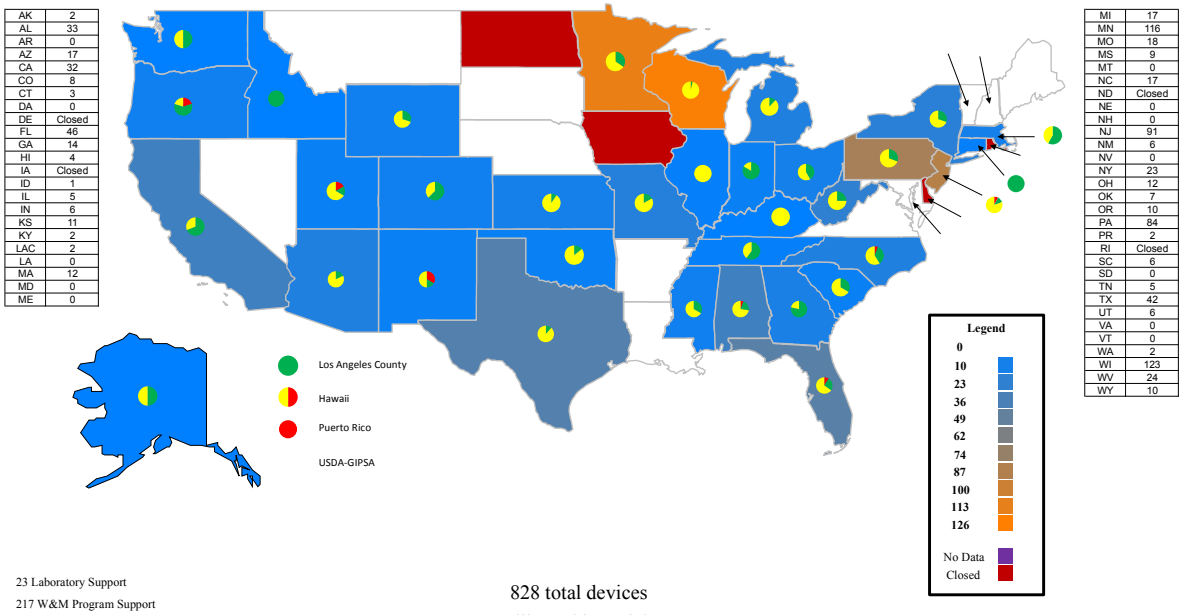
Year	# Labs	Volume Transfer	Gravimetric	Total
2005		726	47	773
2006		760	81	841
2008		737	46	783
2010	41	711	49	760
2012	39	713	31	744
2014	37	828	57	885

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

Notes and Comments

- 4% of all provers (>5 gal. and ≤ 100 gal.) were tested for the laboratory
- 27% of all provers (>5 gal. and ≤ 100 gal.) were tested for Weights and Measures enforcement programs.
- 69% of all provers (>5 gal. and ≤ 100 gal.) were tested for external customers.

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

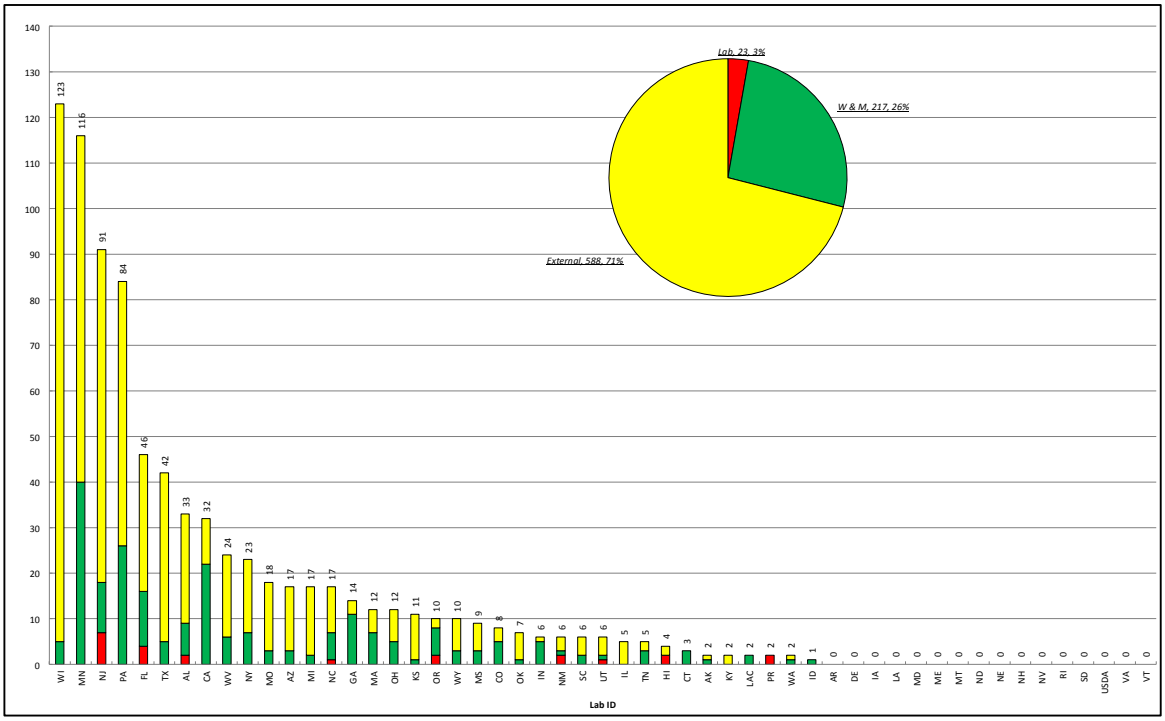


AK	2
AL	33
AR	0
AZ	17
CA	32
CO	8
CT	3
DA	0
DE	Closed
FL	46
GA	14
HI	4
IA	Closed
ID	1
IL	5
IN	6
KS	11
KY	2
LAC	2
LA	0
MA	12
MD	0
ME	0

MI	17
MN	116
MO	18
MS	9
MT	0
NC	17
ND	Closed
NE	0
NH	0
NJ	91
NM	6
NV	0
NY	23
OH	12
OK	7
OR	10
PA	84
PR	2
RI	Closed
SC	6
SD	0
TN	5
TX	42
UT	6
VA	0
VT	0
WA	2
WI	123
WV	24
WY	10

23 Laboratory Support
217 W&M Program Support
588 For external customers

828 total devices
calibrated in 37 labs

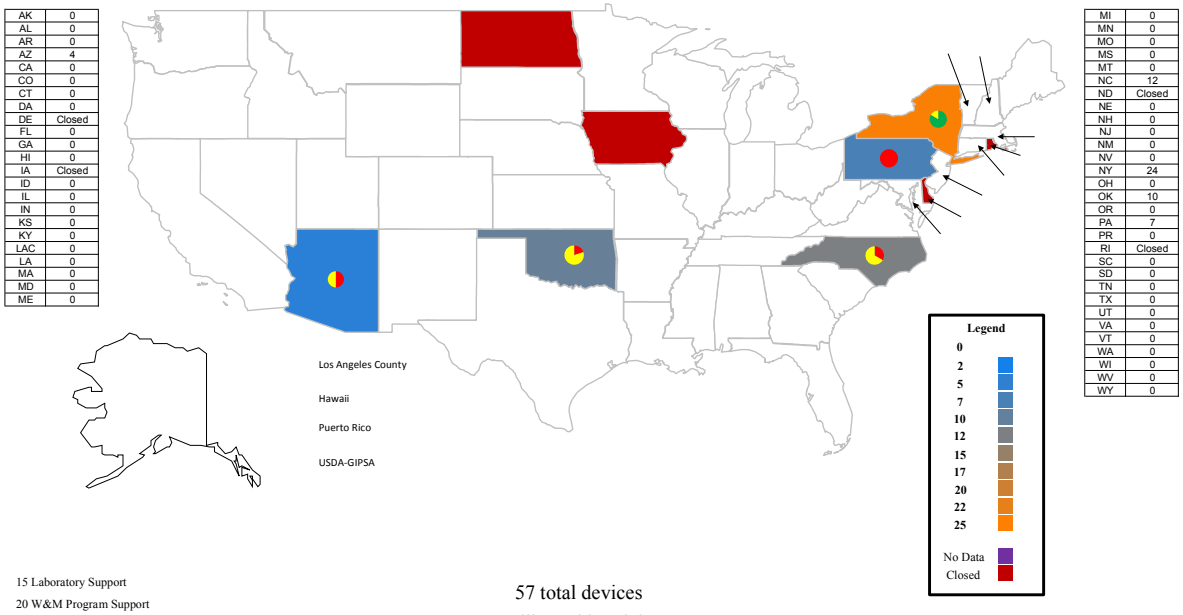


Bar and pie chart color codes

- Laboratory
- Weights and Measures
- External

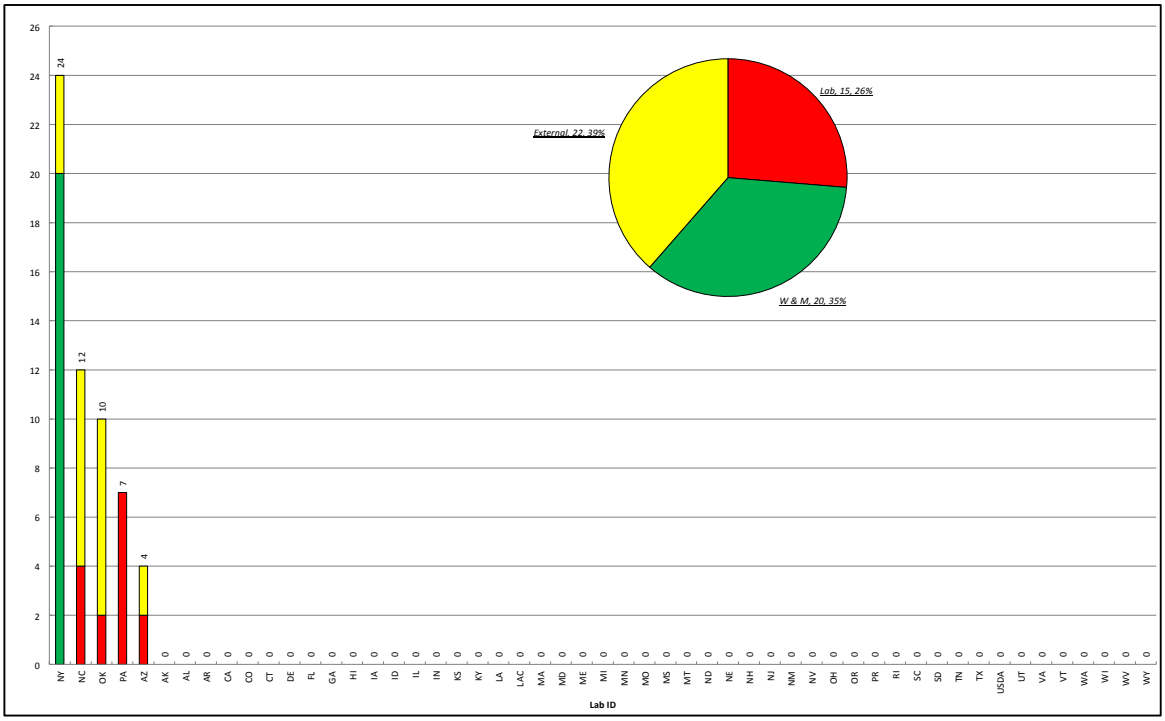
Figure 19: Prover (≥5 gal. and < 100 gal.) tests, volume transfer.

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



15 Laboratory Support
20 W&M Program Support
22 For external customers

57 total devices
calibrated in 5 labs



Bar and pie chart color codes

- Laboratory
- Weights and Measures
- External

Figure 20: Prover (≥5 gal. and < 100 gal.) tests, gravimetric.

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Provers (> 100 gallon)

Description

The graphs on page 62 represent the total number of volume tests performed on large metal volume provers by the 49 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 49 reporting laboratories, 30 labs performed a total of 237 volume transfer tests.
- Of the 49 reporting laboratories, 1 lab performed gravimetric volume tests.

Comparison of previous surveys

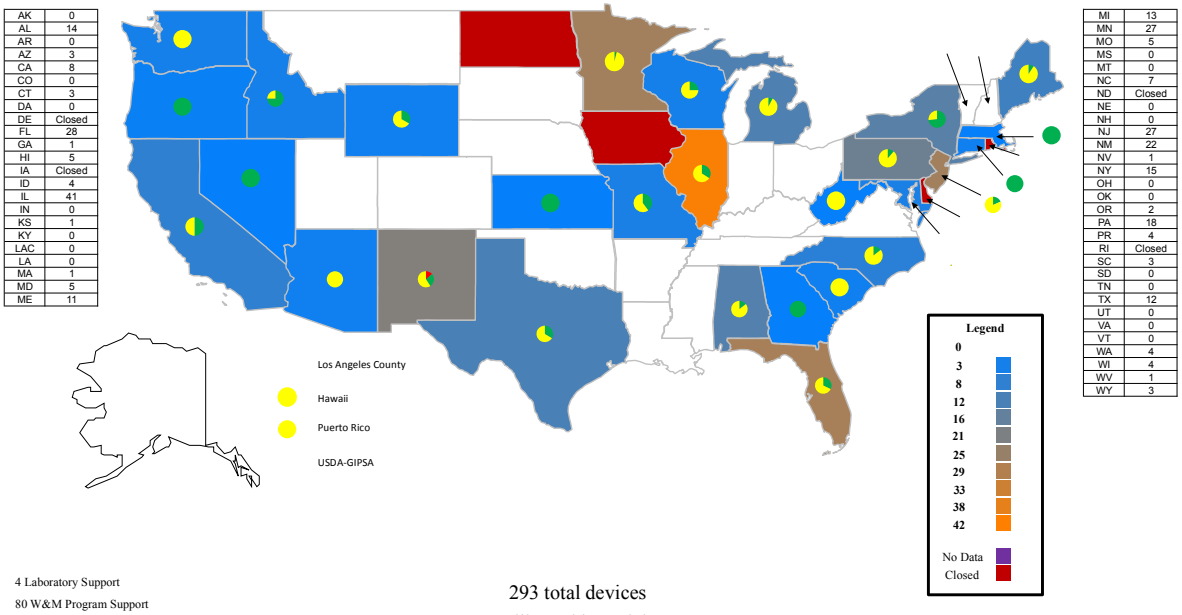
Year	# Labs	Volume Transfer	Gravimetric	Total
2005		201	1	202
2006		202	0	202
2008	34	284	0	284
2010	33	287	0	287
2012	30	237	1	238
2014	30	239	1	240

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

Notes and Comments

- 1% of all provers (> 100 gal.) were tested for the laboratory.
- 27% of all provers (> 100 gal.) were tested for Weights and Measures enforcement programs.
- 71% of all provers (> 100 gal.) were tested for external customers.

Open Neck Volumetric Provers (>100 gallon)
Volume Transfer

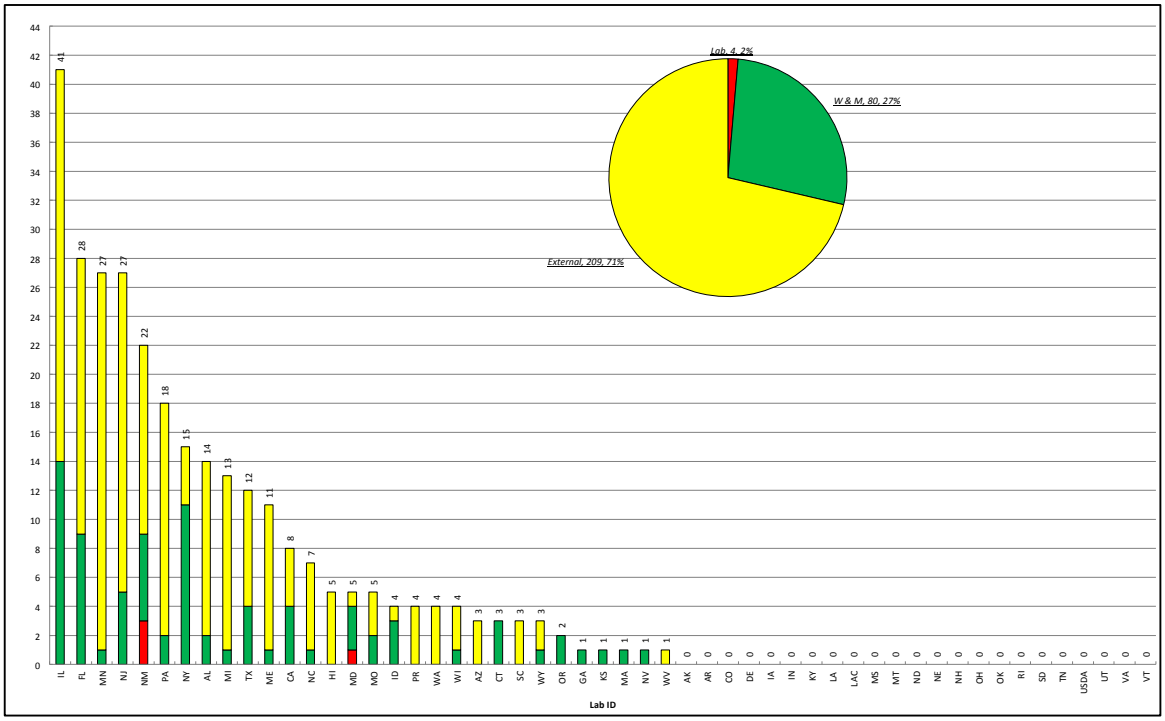


AK	0
AL	14
AR	0
AZ	3
CA	8
CO	0
CT	3
DA	0
DE	Closed
FL	28
GA	1
HI	5
IA	Closed
ID	4
IL	41
IN	0
KS	1
KY	0
LAC	0
LA	0
MA	1
MD	5
ME	11

MI	13
MN	27
MO	5
MS	0
MT	0
NC	7
ND	Closed
NE	0
NH	0
NJ	27
NM	22
NV	1
NY	15
OH	0
OK	0
OR	2
PA	18
PR	4
RI	Closed
SC	3
SD	0
TN	0
TX	12
UT	0
VA	0
VT	0
WA	4
WI	4
WV	1
WY	3

4 Laboratory Support
80 W&M Program Support
209 For external customers

293 total devices
calibrated in 30 labs

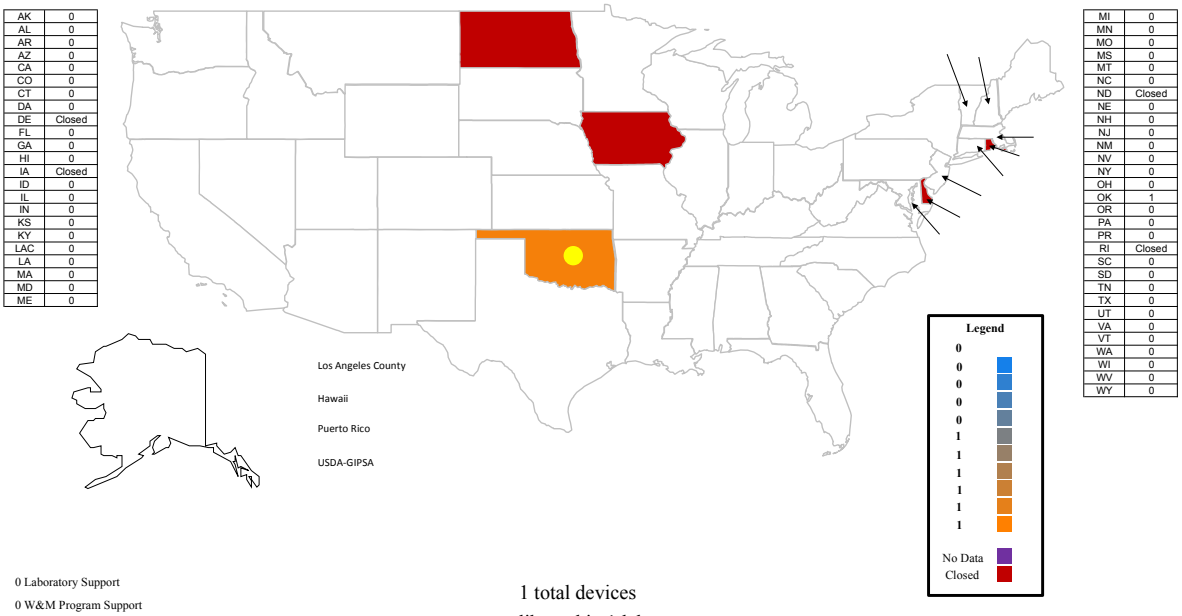


Bar and pie chart color codes

- Laboratory
- Weights and Measures
- External

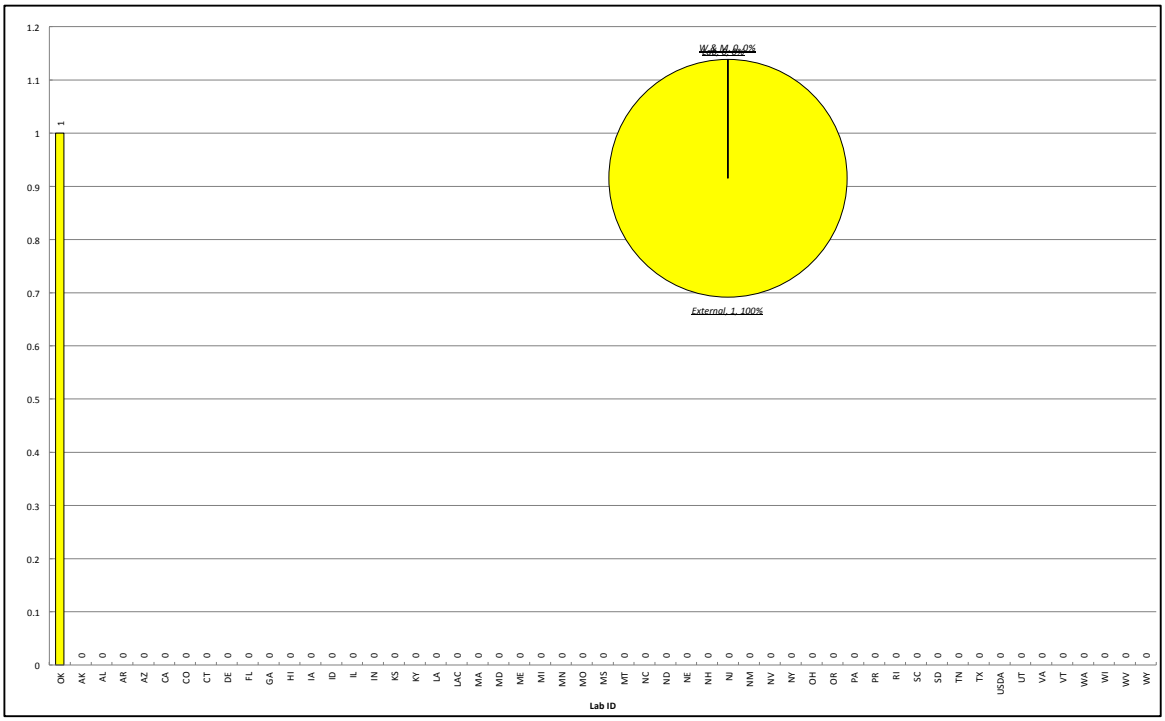
Figure 21: Prover (>100 gal.) tests, volume transfer

Open Neck Volumetric Provers (>100 gallon)
Gravimetric



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

1 total devices
calibrated in 1 labs



Bar and pie chart color codes

- Laboratory
- Weights and Measures
- External

Figure 22: Prover (>100 gal.) tests, gravimetric

Liquefied Petroleum Gas (LPG) Provers

Description

The graph on page 65 represent the total number of volume tests performed on LPG provers by the 49 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 49 reporting laboratories, 25 labs performed a total of 231 volume transfer tests.
- Of the 49 reporting laboratories, 0 labs performed gravimetric volume tests.

Comparison of previous surveys

Year	# Labs	Volume Transfer	Gravimetric	Total
2005		226	0	226
2006		239	0	239
2008	27	249	0	249
2010	33	304	0	304
2012	24	228	0	228
2014	25	231	0	231

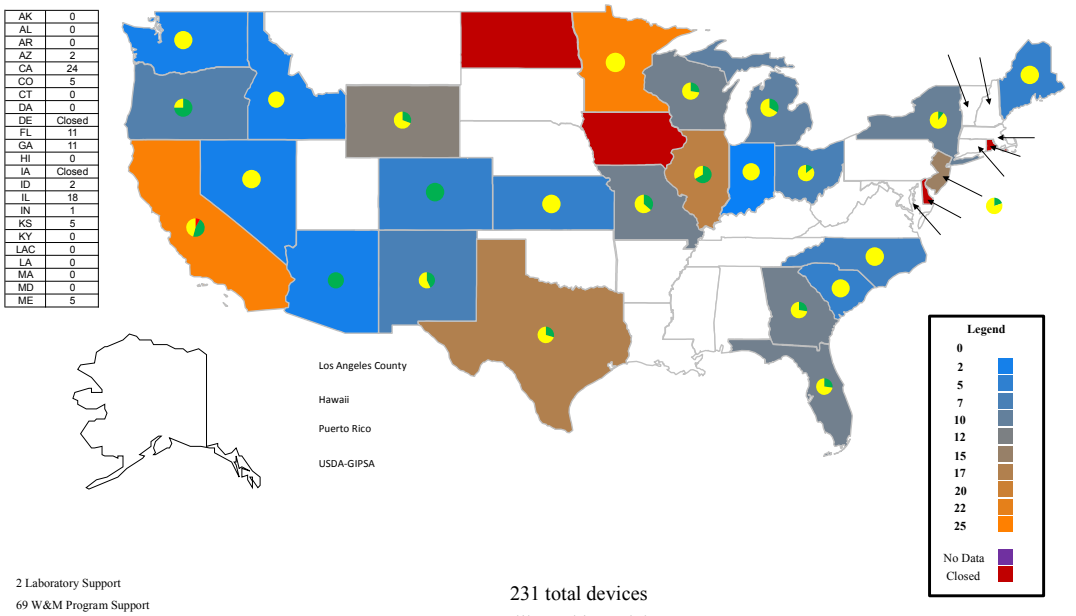
Table 16: LPG Prover volume tests from previous surveys.

Notes and Comments

- 1% of all LPG provers were tested for the laboratory.
- 30% of all LPG provers were tested for Weights and Measures enforcement programs.
- 69% of all LPG provers were tested for external customers.

Liquid Propane Gas (LPG) Provers
Volume Transfer

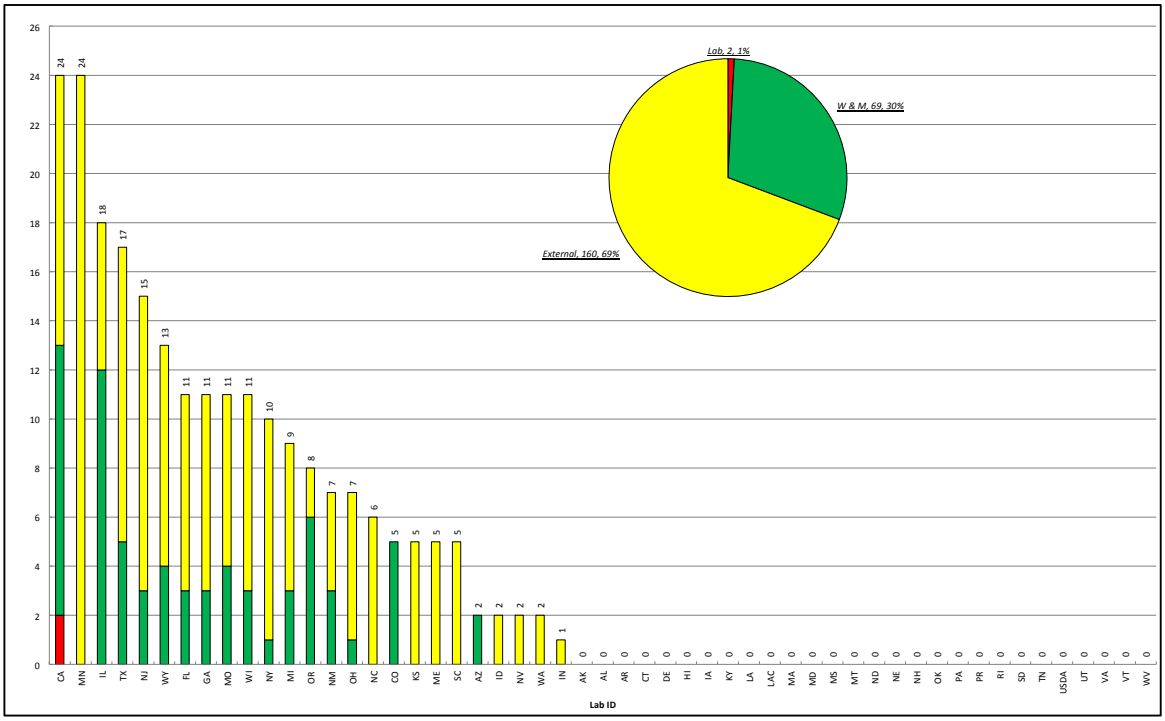
AK	0
AL	0
AR	0
AZ	2
CA	24
CO	5
CT	0
DA	0
DE	Closed
FL	11
GA	11
HI	0
IA	Closed
ID	2
IL	18
IN	1
KS	5
KY	0
LAC	0
LA	0
MA	0
MD	0
ME	5



MI	9
MN	24
MO	11
MS	0
MT	0
NC	6
ND	Closed
NE	0
NH	0
NJ	15
NM	7
NV	2
NY	10
OH	7
OK	0
OR	8
PA	0
PR	0
RI	Closed
SC	5
SD	0
TN	0
TX	17
UT	0
VA	0
VT	0
WA	2
WI	11
WV	0
WY	13

2 Laboratory Support
69 W&M Program Support
160 For external customers

231 total devices
calibrated in 25 labs



Bar and pie chart color codes

- Laboratory
- Weights and Measures
- External

Figure 23: LPG Prover tests,volume transfer

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Dynamic Small Volume Provers (SVP)

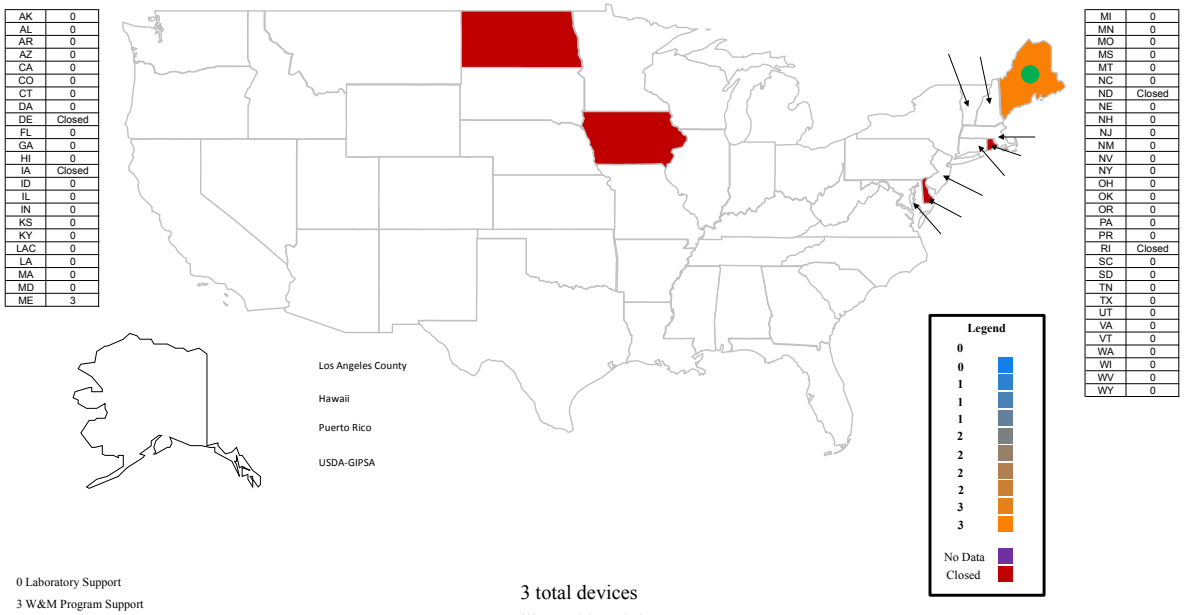
Findings

This section covers the testing of dynamic small volume provers either by gravimetric or volume transfer procedure. No graphs were generated due to the limited number of laboratories performing these calibrations. In 2010, only 2 of the 47 reporting laboratories performed 30 gravimetric calibrations of dynamic small volume provers. 100% of these calibrations were performed for external clients. No volume transfer tests were reported.

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
2014	4	32	3	35

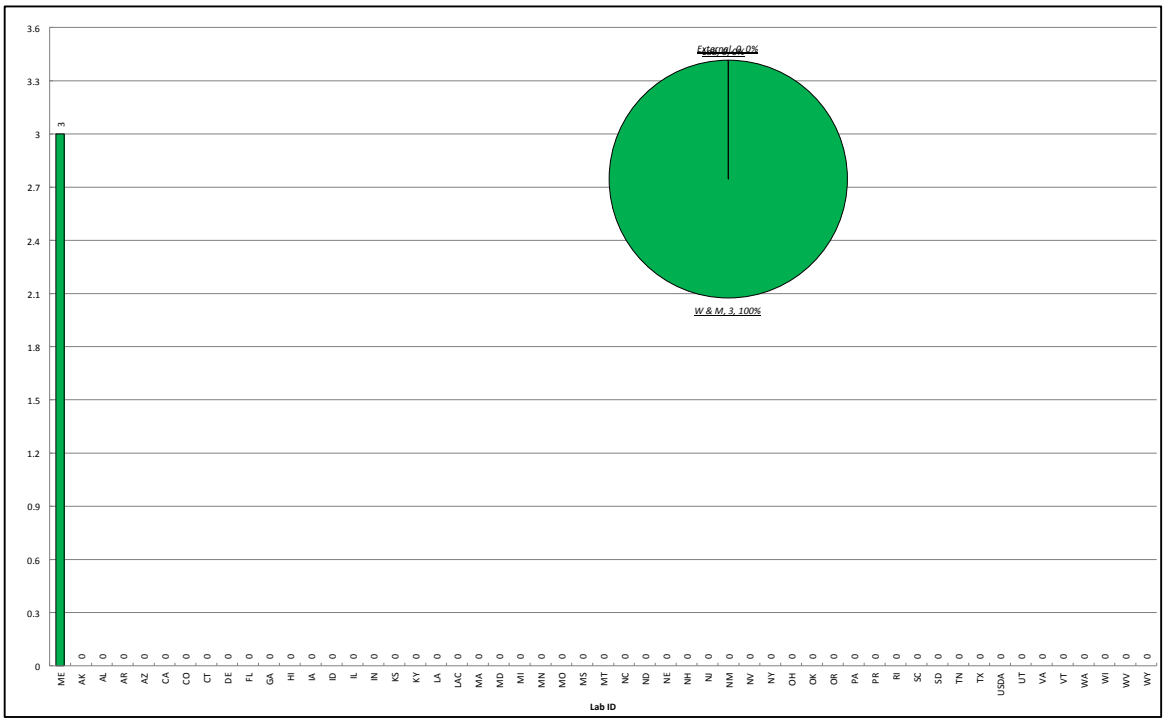
Table 17: SVP tests from previous surveys.

Small Volume Provers (SVP)
Volume transfer



0 Laboratory Support
3 W&M Program Support
0 For external customers

3 total devices
calibrated in 1 labs

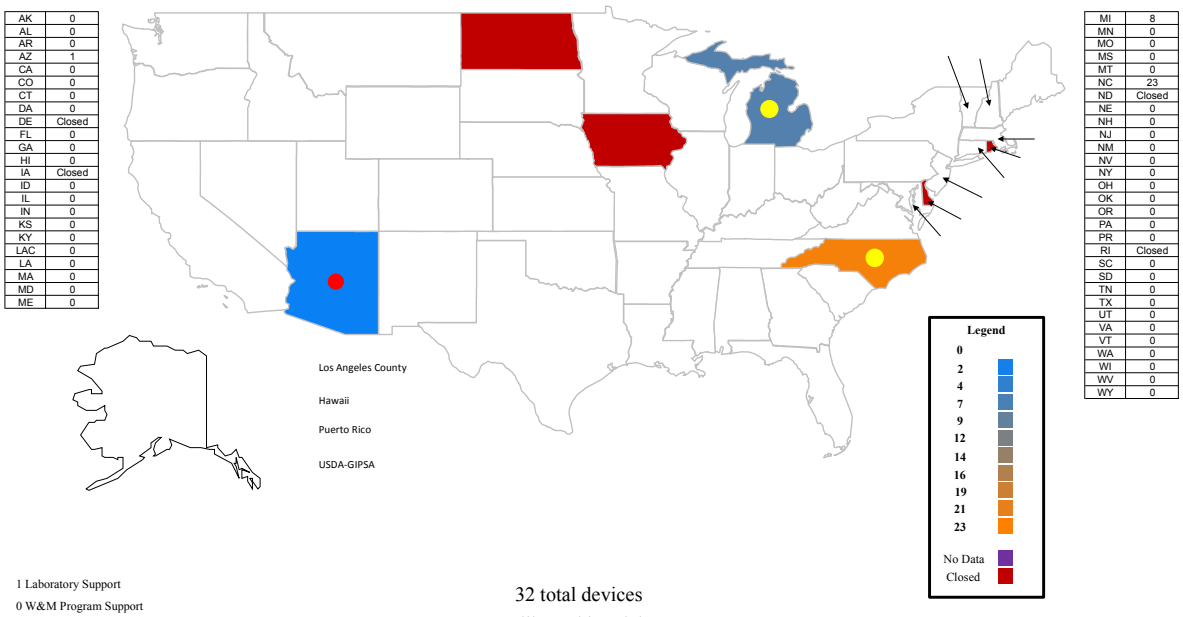


Bar and pie chart color codes

- Laboratory
- Weights and Measures
- External

Figure 24: Small Volume Prover tests,volume transfer.

Small Volume Provers (SVP)
Gravimetric

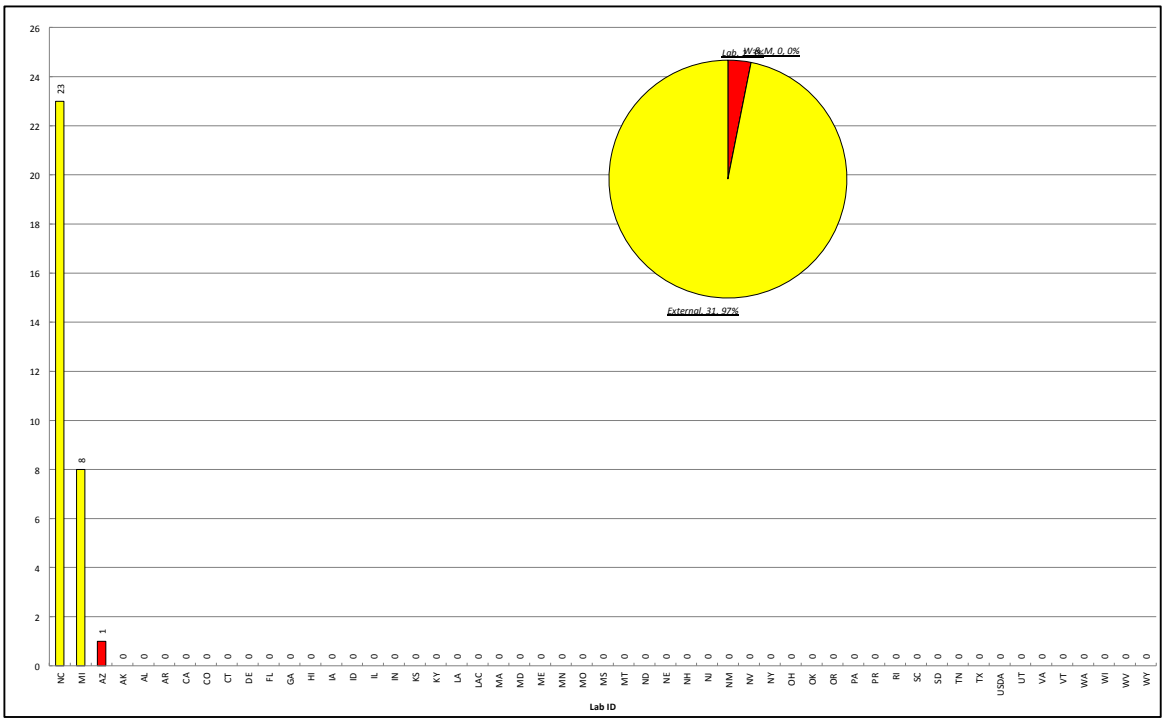


AK	0
AL	0
AR	0
AZ	1
CA	0
CO	0
CT	0
DA	0
DE	Closed
FL	0
GA	0
HI	0
IA	Closed
ID	0
IL	0
IN	0
KS	0
KY	0
LAC	0
LA	0
MA	0
MD	0
ME	0

MI	8
MN	0
MO	0
MS	0
MT	0
NC	23
ND	Closed
NE	0
NH	0
NJ	0
NM	0
NV	0
NY	0
OH	0
OK	0
OR	0
PA	0
PR	0
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
31 For external customers

32 total devices
calibrated in 3 labs



Bar and pie chart color codes

- Laboratory
- Weights and Measures
- External

Figure 25: Small Volume Prover tests,gravimetric.

Temperature

Description

The graphs on the following page represent the total number of temperature standards tested by the 49 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 49 reporting laboratories, 6 labs tested a total of 192 temperature standards

Comparison of previous surveys

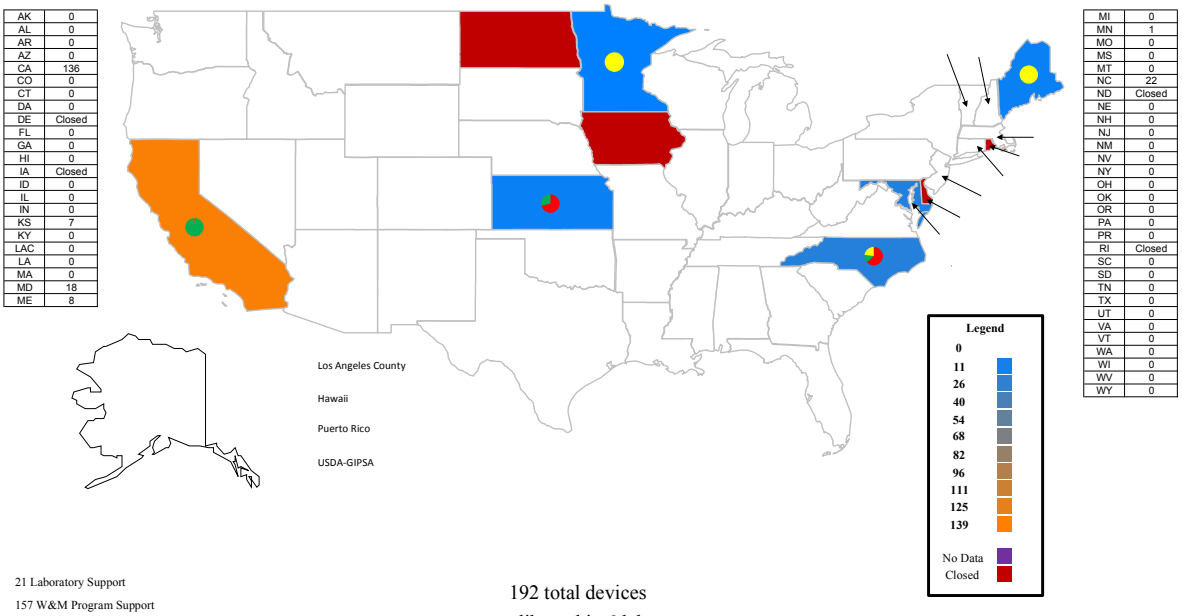
Year	# Labs	Total Devices
1996	20	447
1998	11	378
1999	12	514
2000	16	460
2002	13	456
2004	12	315
2005	15	418
2006	12	281
2008	13	498
2010	11	465
2012	7	191
2014	6	192

Table 18: Temperature standard tests from previous surveys.

Notes and Comments

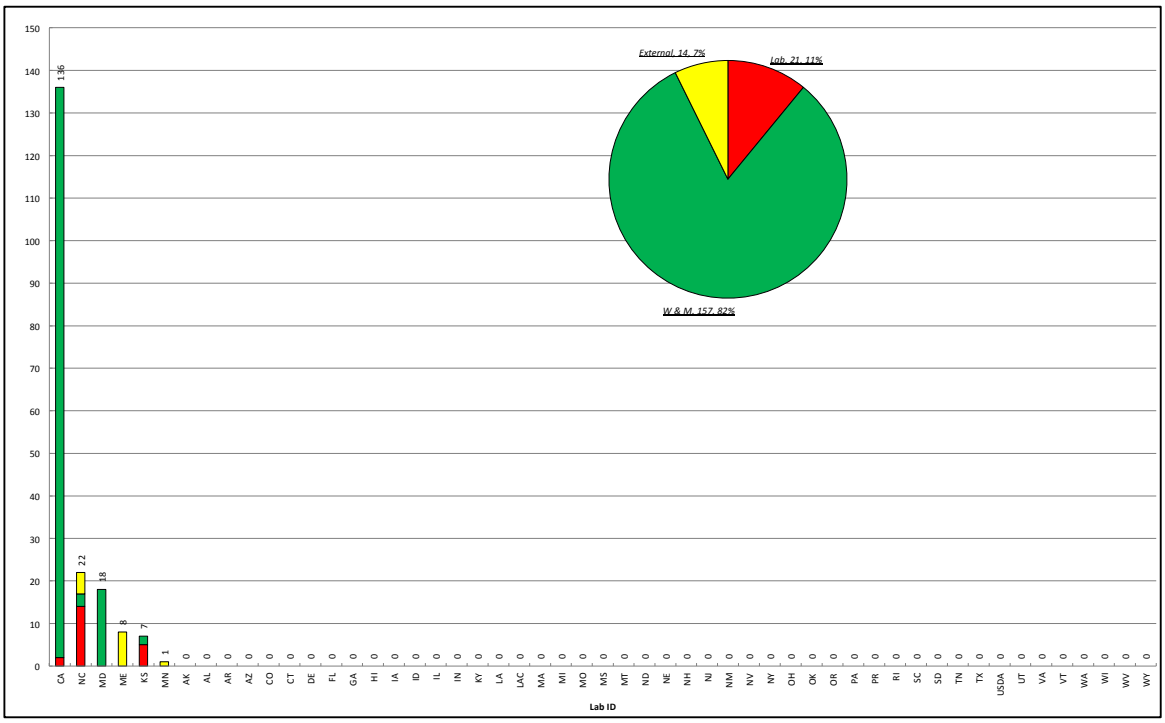
- 7 % of all temperature standards were tested for internal use by the laboratory.
- 11 % of all temperature standards were tested for the weight and measures program.
- 82 % of all temperature standards were tested for external customers.

Temperature



21 Laboratory Support
157 W&M Program Support
14 For external customers

192 total devices
calibrated in 6 labs



Bar and pie chart color codes

- Laboratory
- Weights and Measures
- External

Figure 26: Temperature standard tests.

Frequency

Description

The graphs on the following page represent the total number of frequency standards tested by the 49 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 49 reporting laboratories, 4 labs tested a total of 13,282 frequency standards

Comparison of previous surveys

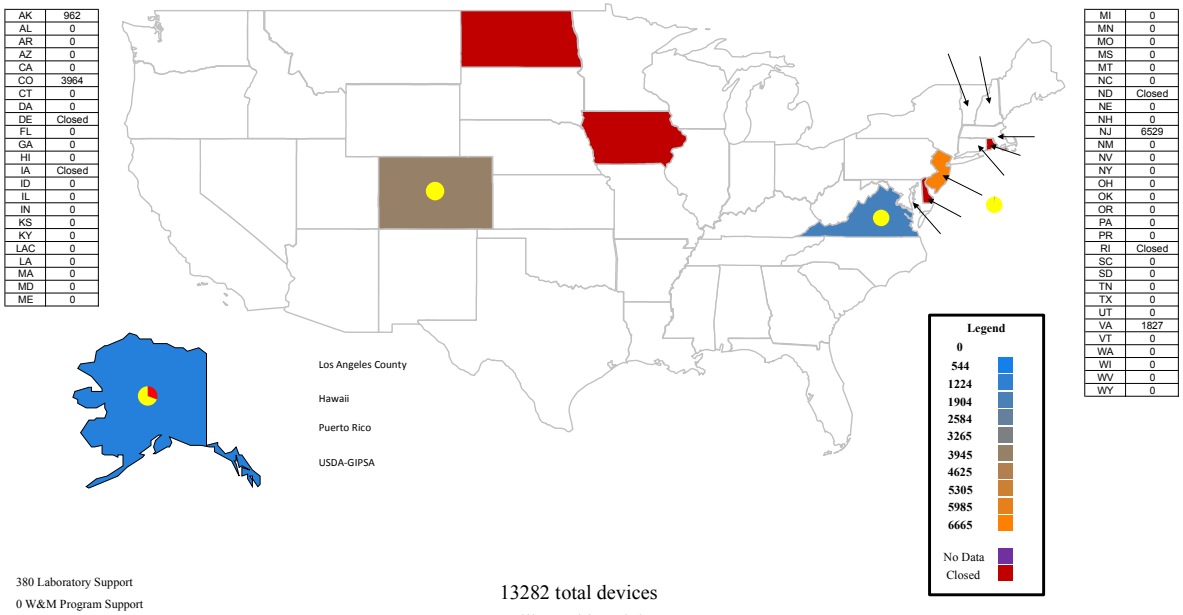
Year	# Labs	Total Devices
1996	6	12518
1998	4	11561
1999	5	13518
2000	7	14670
2002	6	13785
2004	3	14772
2005	4	15162
2006	4	14832
2008	4	15058
2010	4	17580
2012	4	14177
2014	4	13282

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

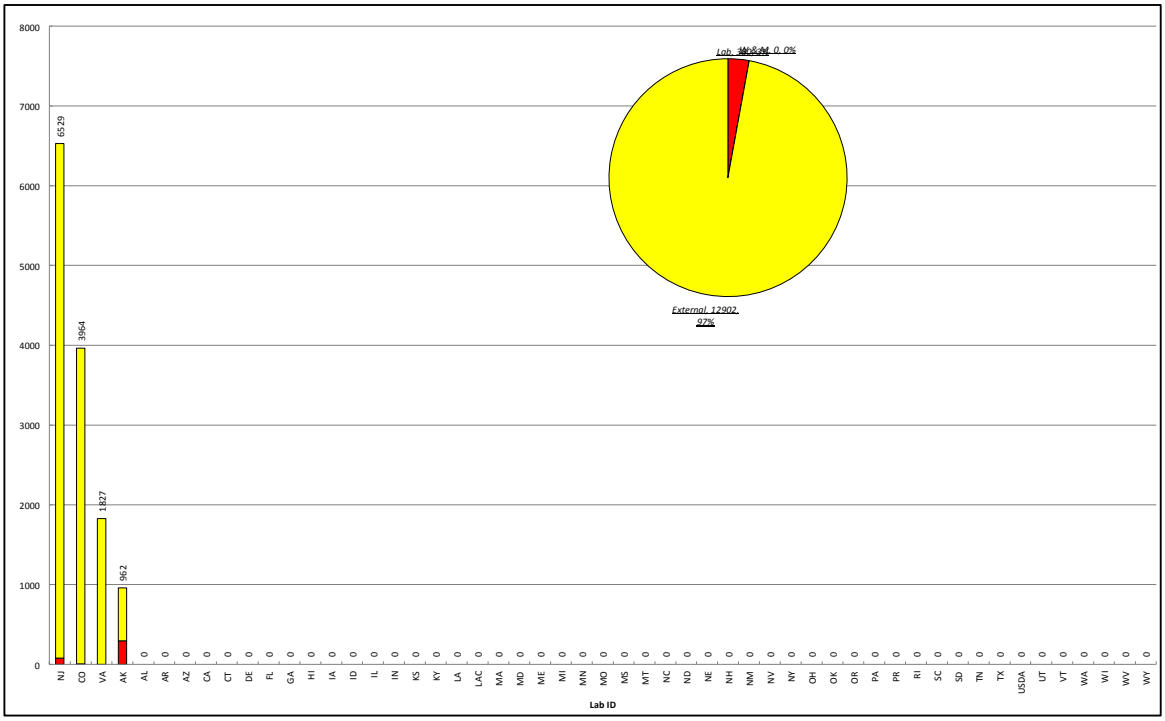


AK	962
AL	0
AR	0
AZ	0
CA	0
CO	3964
CT	0
DA	0
DE	Closed
FL	0
GA	0
HI	0
IA	Closed
ID	0
IL	0
IN	0
KS	0
KY	0
LAC	0
LA	0
MA	0
MD	0
ME	0

MI	0
MN	0
MO	0
MS	0
MT	0
NC	0
ND	Closed
NE	0
NH	0
NJ	6529
NM	0
NV	0
NY	0
OH	0
OK	0
OR	0
PA	0
PR	0
RI	Closed
SC	0
SD	0
TN	0
TX	0
UT	0
VA	1827
VT	0
WA	0
WI	0
WV	0
WY	0

380 Laboratory Support
0 W&M Program Support
12902 For external customers

13282 total devices
calibrated in 4 labs



Bar and pie chart color codes

- Laboratory
- Weights and Measures
- External

Figure 27 Frequency standard tests

Timing Devices

Description

The graphs on the following page represent the total number of timing devices tested by the 49 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 49 reporting laboratories, 7 labs tested a total of 600 timing devices

Comparison of previous surveys

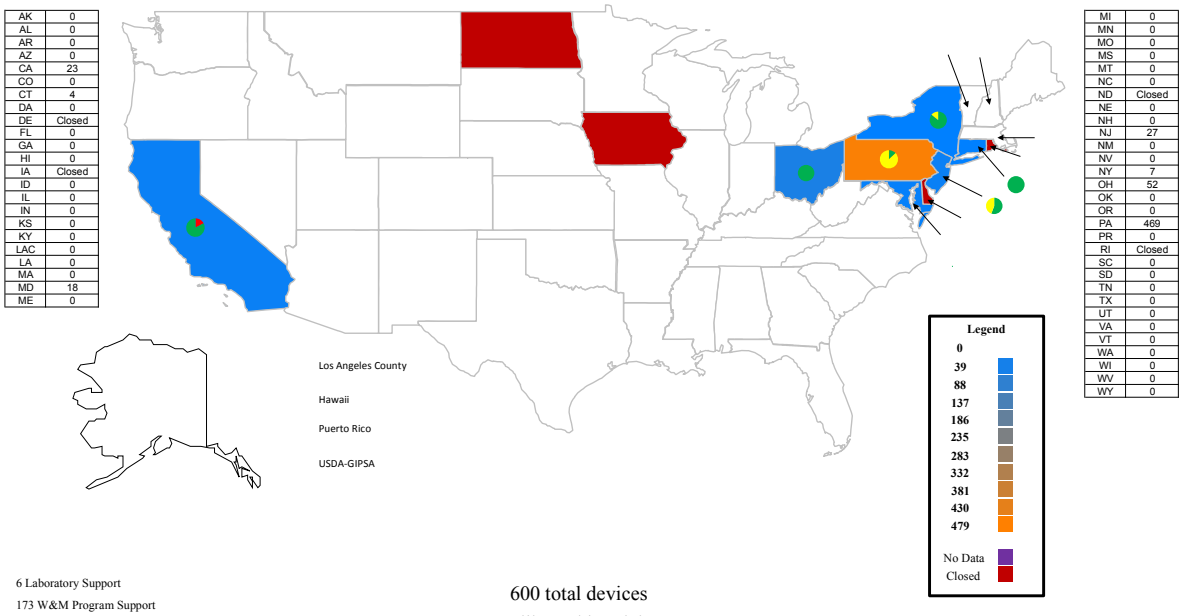
Year	# Labs	Total Devices
1996	13	161
1998	11	380
1999	14	451
2000	13	554
2002	11	479
2004	9	951
2005	8	387
2006	11	365
2008	11	401
2010	9	339
2012	10	577
2014	7	600

Table 20: Timing devices tests from previous surveys

Notes and Comments

- 4 % of all timing devices were tested for internal use by the laboratory.
- 48 % of all timing devices were tested for the weight and measures program.
- 48 % of all timing devices were tested for external customers.

Timing Devices

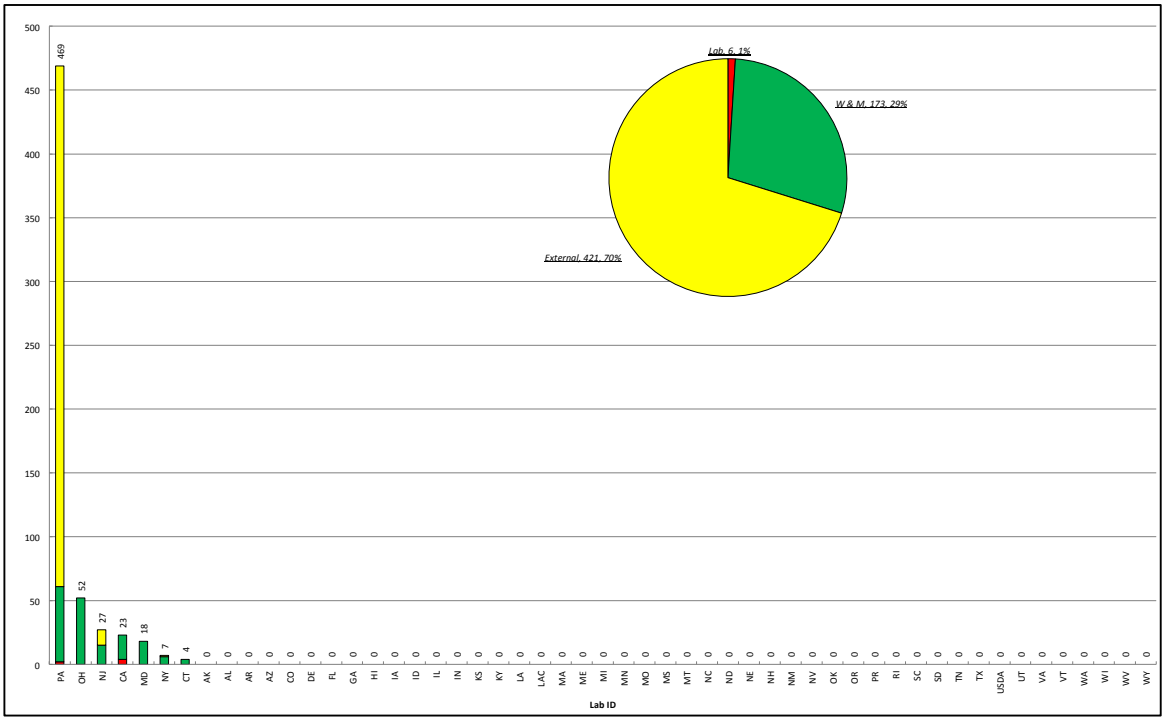


AK	0
AL	0
AR	0
AZ	0
CA	23
CO	0
CT	4
DA	0
DE	Closed
FL	0
GA	0
HI	0
IA	Closed
ID	0
IL	0
IN	0
KS	0
KY	0
LAC	0
LA	0
MA	0
MD	18
ME	0

MI	0
MN	0
MO	0
MS	0
MT	0
NC	0
ND	Closed
NE	0
NH	0
NJ	27
NM	0
NV	0
NY	7
OH	52
OK	0
OR	0
PA	469
PR	0
RI	Closed
SC	0
SD	0
TN	0
TX	0
UT	0
VA	0
VT	0
WA	0
WI	0
WV	0
WY	0

6 Laboratory Support
173 W&M Program Support
421 For external customers

600 total devices
calibrated in 7 labs



Bar and pie chart color codes

Laboratory
Weights and Measures
External

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 49 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 49 reporting laboratories, 16 labs tested a total of 6515 wheel load weighers.

Comparison of previous surveys

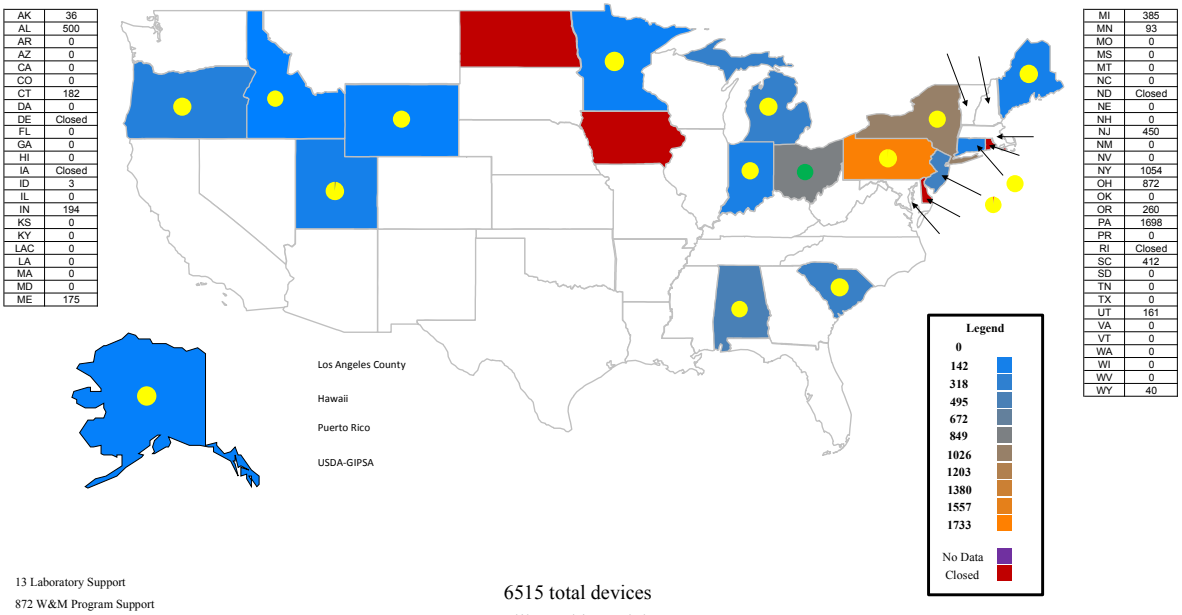
Year	# Labs	Total Devices
1998	19	12178
1999	20	12781
2000	22	13699
2002	23	10350
2004	21	10884
2005	19	9748
2006	20	10567
2008	22	10191
2010	20	10815
2012	17	7050
2014	16	6515

Table 21: Wheel load weigher tests from previous surveys

Notes and Comments

- 0 % of all wheel load weighers were tested for internal use by the laboratory.
- 13 % of all wheel load weighers were tested for the weight and measures program.
- 87 % of all wheel load weighers were tested for external customers.

Wheel Load Weighers

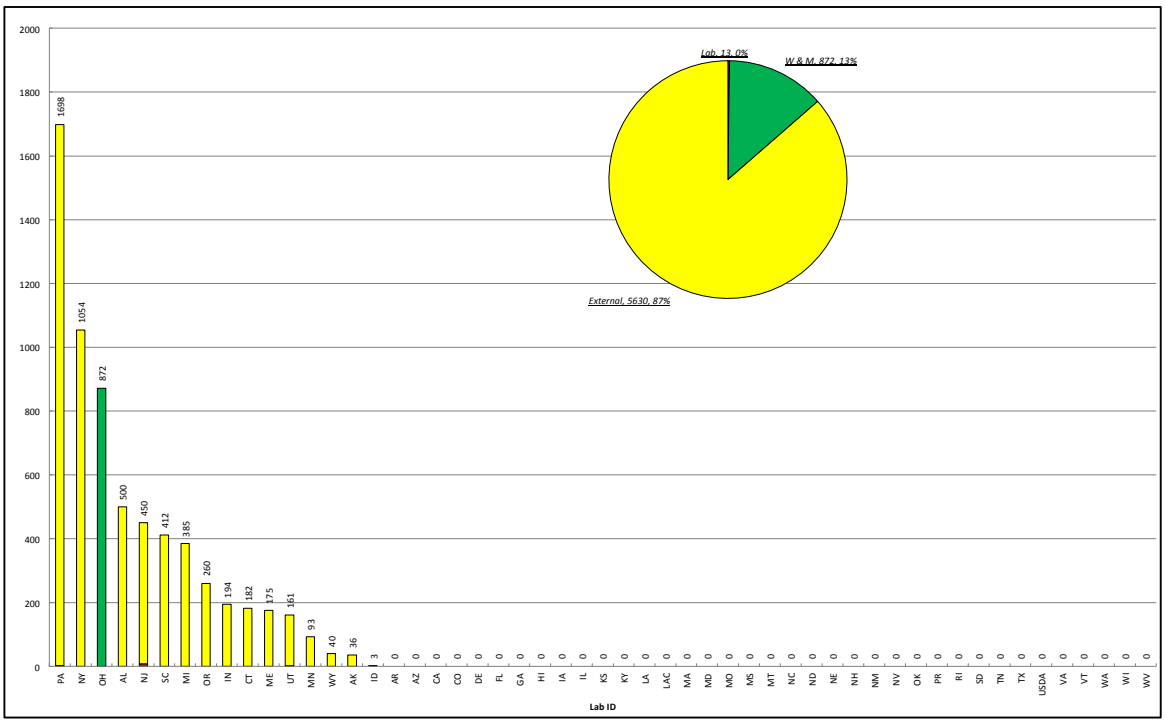


AK	36
AL	500
AR	0
AZ	0
CA	0
CO	0
CT	182
DA	0
DE	Closed
FL	0
GA	0
HI	0
IA	Closed
ID	3
IL	0
IN	194
KS	0
KY	0
LAC	0
LA	0
MA	0
MD	0
ME	175

MI	385
MN	93
MO	0
MS	0
MT	0
NC	0
ND	Closed
NE	0
NH	0
NJ	450
NM	0
NV	0
NY	1054
OH	872
OK	0
OR	260
PA	1698
PR	0
RI	Closed
SC	412
SD	0
TN	0
TX	0
UT	161
VA	0
VT	0
WA	0
WI	0
WV	0
WY	40

13 Laboratory Support
872 W&M Program Support
5630 For external customers

6515 total devices
calibrated in 16 labs



Bar and pie chart color codes

- Laboratory
- Weights and Measures
- External

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 49 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 49 reporting laboratories, 8 labs tested a total of 40,899 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
2014	8	40899

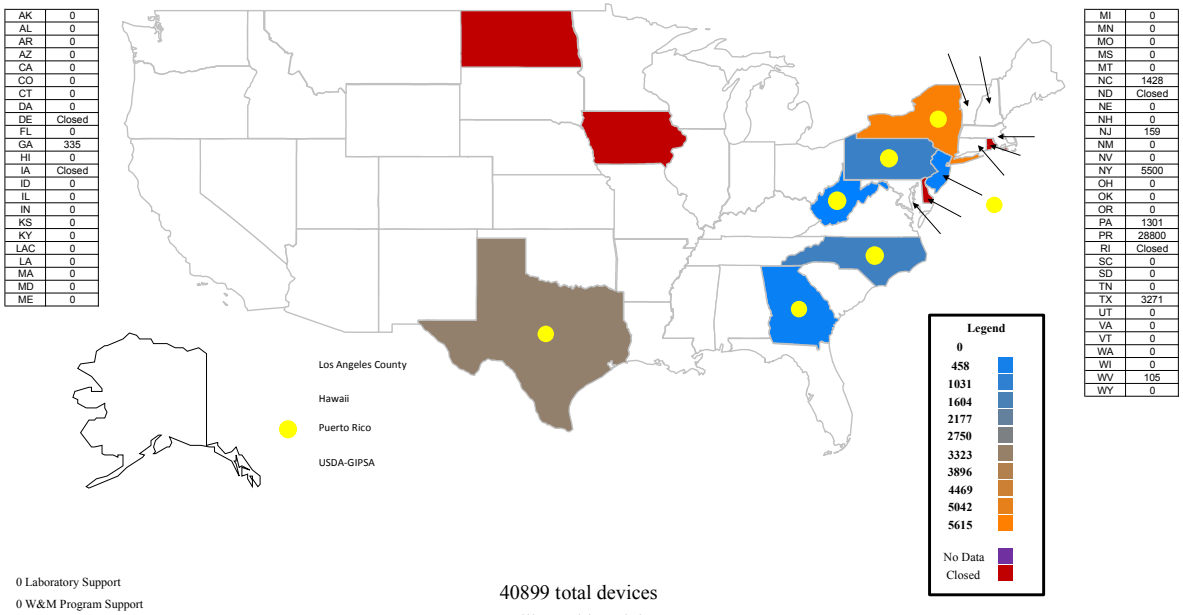
Table 22: Lottery balls tests from previous surveys

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, which performs 65% (approximately 30,000) of the total number of lottery balls tests, did not report in 2012.

Lottery Balls

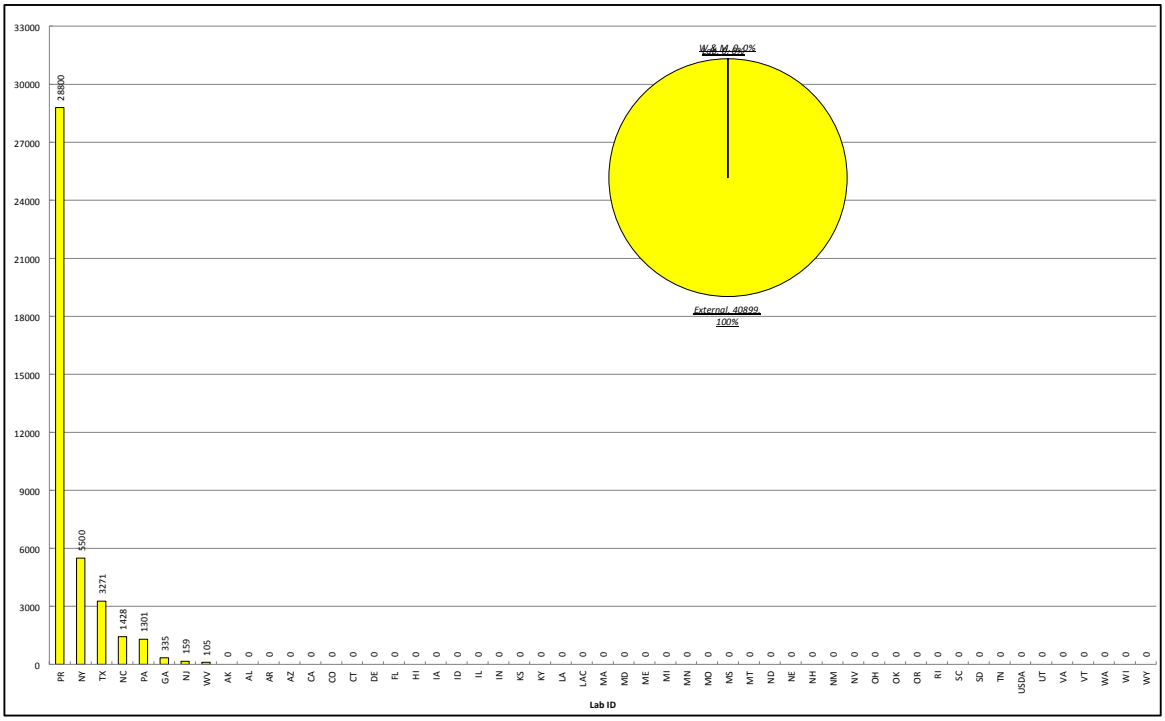


AK	0
AL	0
AR	0
AZ	0
CA	0
CO	0
CT	0
DA	0
DE	Closed
FL	0
GA	335
HI	0
IA	Closed
ID	0
IL	0
IN	0
KS	0
KY	0
LAC	0
LA	0
MA	0
MD	0
ME	0

MI	0
MN	0
MO	0
MS	0
MT	0
NC	1428
ND	Closed
NE	0
NH	0
NJ	159
NM	0
NV	0
NY	5500
OH	0
OK	0
OR	0
PA	1301
PR	28800
RI	Closed
SC	0
SD	0
TN	0
TX	3271
UT	0
VA	0
VT	0
WA	0
WI	0
WV	105
WY	0

0 Laboratory Support
0 W&M Program Support
40899 For external customers

40899 total devices
calibrated in 8 labs



Bar and pie chart color codes

Laboratory
Weights and Measures
External

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
Watt Hour Meters (Witness)	AK	1
LIDARS for law enforcement speed detection	AK	82
Master Meters	AZ	40
Scales	CT	11
Water Meter Tanks	CT	2
Fish, Liner	ME	53
Fish, Volume	ME	44
Rail Test Cars	MN, MO, OR	11
Load Cells (Highway Patrol)	NC	8
Police Accident Drag Sled	NH	1
Scales < 1000 lb	NJ	67
Laser Distance Devices	NJ	236
Mulch Boxes	OH	10
Package Checking Scales	OH	48
Neck Calibrations (Volume Transfer Testing Equipment)	TX	96
Hydrometers (Tolerance tested for maple industry)	VT	6000

Table 23: Other tests reported by the participating laboratories

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Laboratory Fees (2014)

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 charged 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, however, when using hourly rates as 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, for example, to calibrate a particular widget will vary significantly between laboratories because of differences in the available weight handling and measurement equipment. Both 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, for example, 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 asked each lab, in the more recent surveys, to quote the typical fee that they would charge for the various routine measurements instead of relying 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, the following laboratories report charging higher rates for out-of- state customers. Details on labs charging higher rates for out-of-state customers can be found in Table 24.

[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.

GA	Out-of-state customers are charged double. Customers that both are located out-of-state and perform no service in Georgia are considered out-of-state customers. Exceptions may be made for companies that do not have an available in-state NIST Traceable calibration laboratory.
NC	Fees are doubled for out of state customers. Any special tests or additional work required will be billed at a rate of $70 per hour with a minimum half hour ($35) charge.
OK	Out of state customers fees are charged at twice the in state fee.
SD	We have a minimum charge of 1 hr ($96.00) for out of State customers and 1/2 hour ($48) minimum for in State Customers.
VT	Instate Charges: $60.00/Hour. Out of state: $75.00/hour. 5 gallon volume transfer: Instate: $45.00. Out of State: $60.00.
WY	Fees listed are for in-state customers. Out-of-state customers are charged double the in-state rate for all calibrations listed.

Table 24: SLP member laboratories charging additional fees to out-of-state customers.

Mass Echelon I

Description

Each laboratory was asked to estimate the fee charged for testing a precision weight kit containing 21 pieces from 100g to 1mg 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%
2014	15	$870.90	+6%

Table 25: Average fee charged for echelon I mass testing from 2004 through 2014.

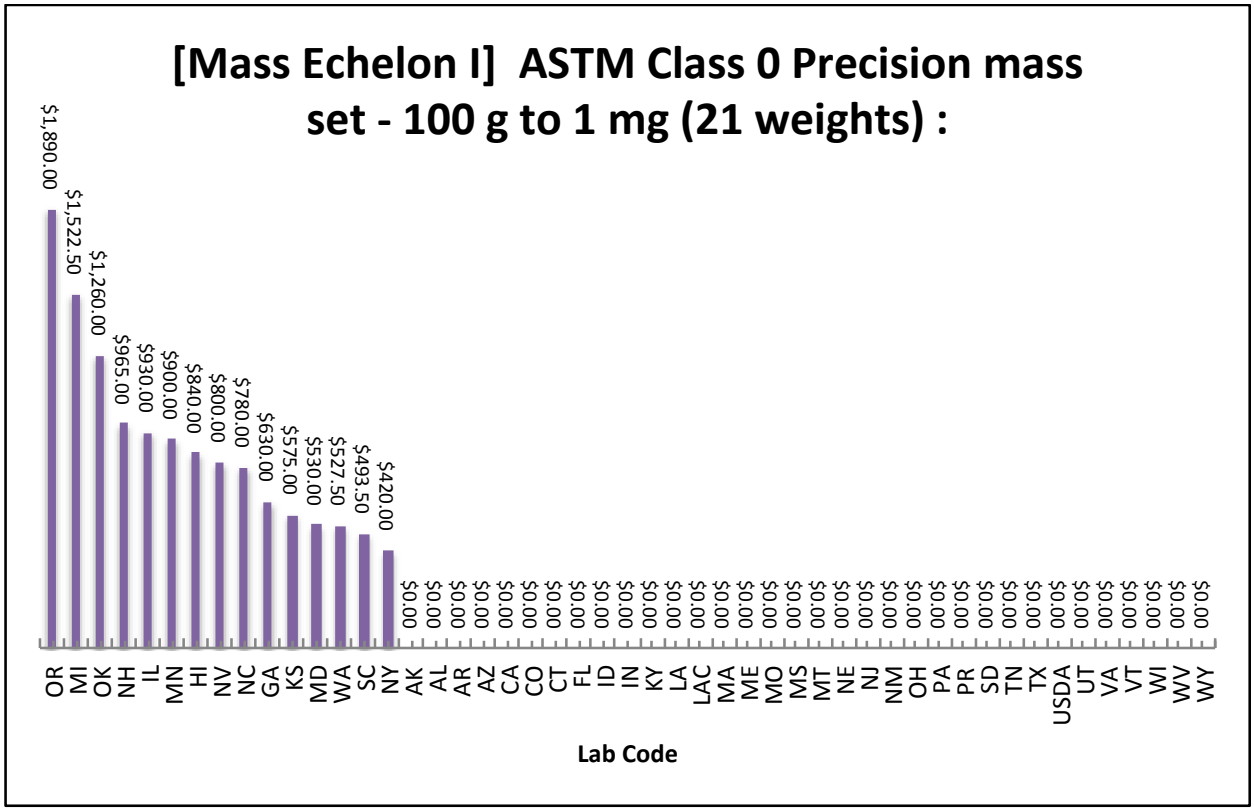

Figure 31: Fees charge for calibrating a precision weight kit containing 21 individual weights ranging from 100 g to 1 mg to ASTM Class 0 tolerances using echelon I testing techniques.

Mass Echelon II

Description

Each laboratory was asked to estimate the fee charged for testing a precision weight kit containing 21 pieces from 100g to 1mg 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%
2014	27	$601.17	-6%

Table 26: Average fee charged for echelon II mass testing from 2000 through 2014.

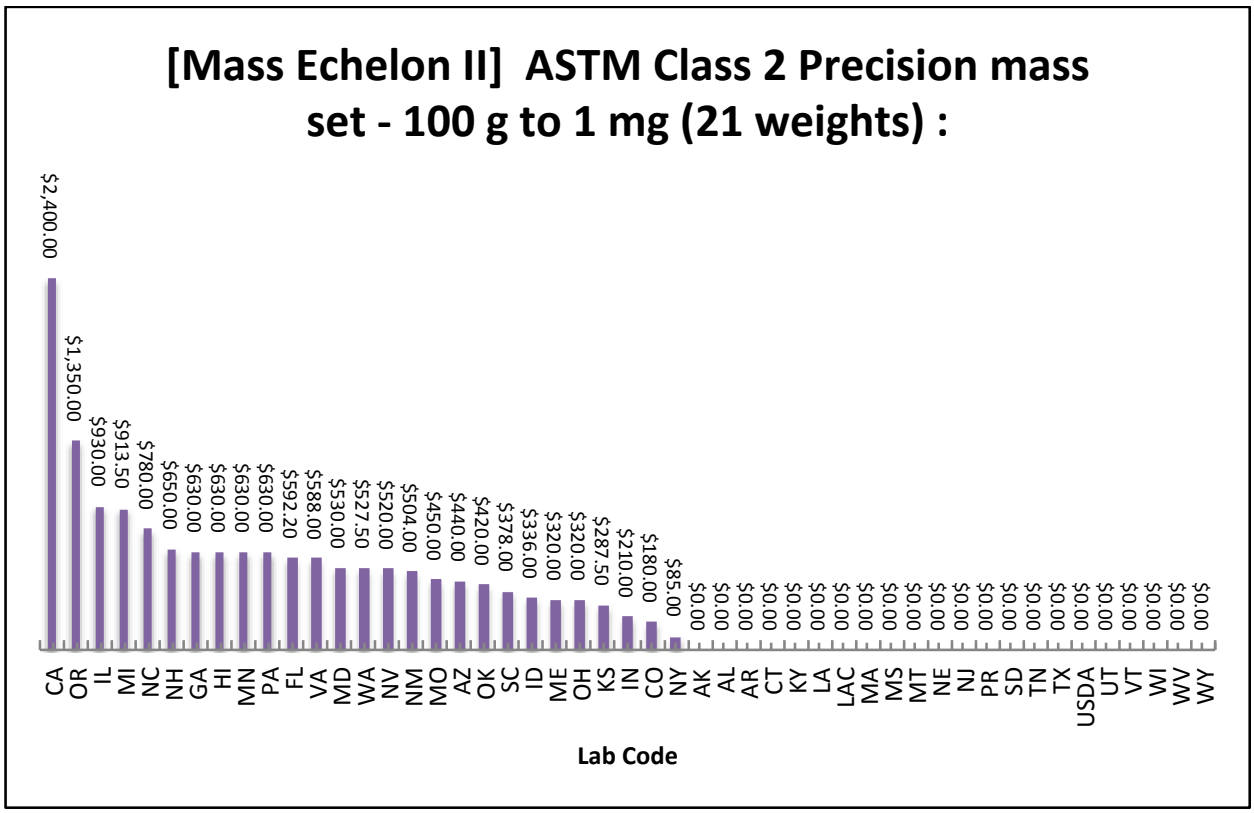

Figure 32: Fees charge for calibrating a precision weight kit containing 21 individual weights ranging from 100 g to 1 mg to ASTM Class 2 tolerances using echelon II testing techniques.

Mass Echelon III (30 lb kits)

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 (NIST Handbook 105-1 "Specifications for Field Standard Test Weights (NIST Class F)" 1990) 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%
2014	46	$187.56	> 1% change

Table 27 Average fee charged for echelon III mass testing from 2000 through 2014.

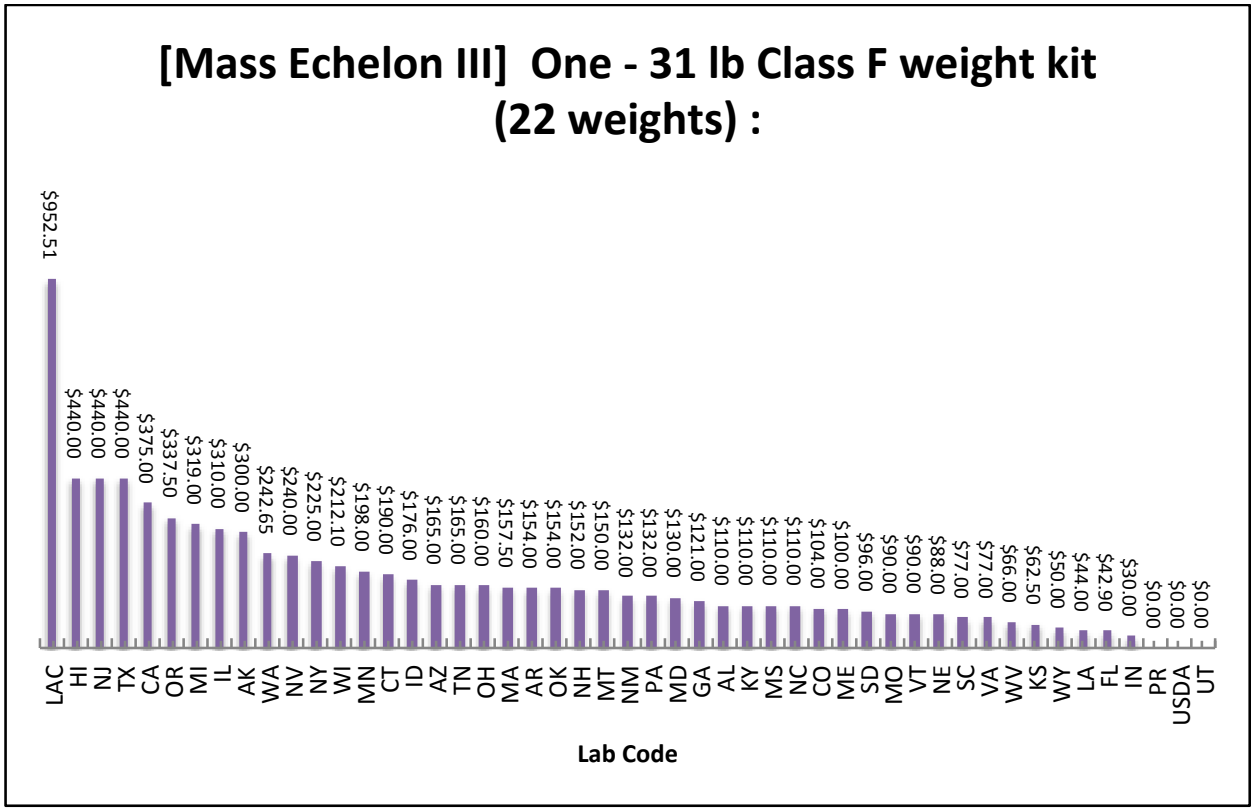

Figure 33: Fees charged for testing a 31 lb weight kit containing 22 pieces to NIST HB 105-1 Class F tolerances using mass echelon III procedures.

Mass Echelon III (50 lb Test Weights)

Description

Each laboratory was asked to estimate the fee charged for testing a set of 20 50 lb cast iron pipe-handle style test weights according to NIST Class F (NIST Handbook 105-1 "Specifications for Field Standard Test Weights (NIST Class F)" 1990) tolerances using echelon III procedures. Each lab was asked to provide an estimate assuming that 5 of the weights were adjusted.

Comparison of Previous Surveys

Survey	Labs Reporting	Average Fee	%Change
2014	47	$294.67	--

Table 28 Average fee charged for testing 20 50 lb cast iron pipe-handle test weights in 2014.

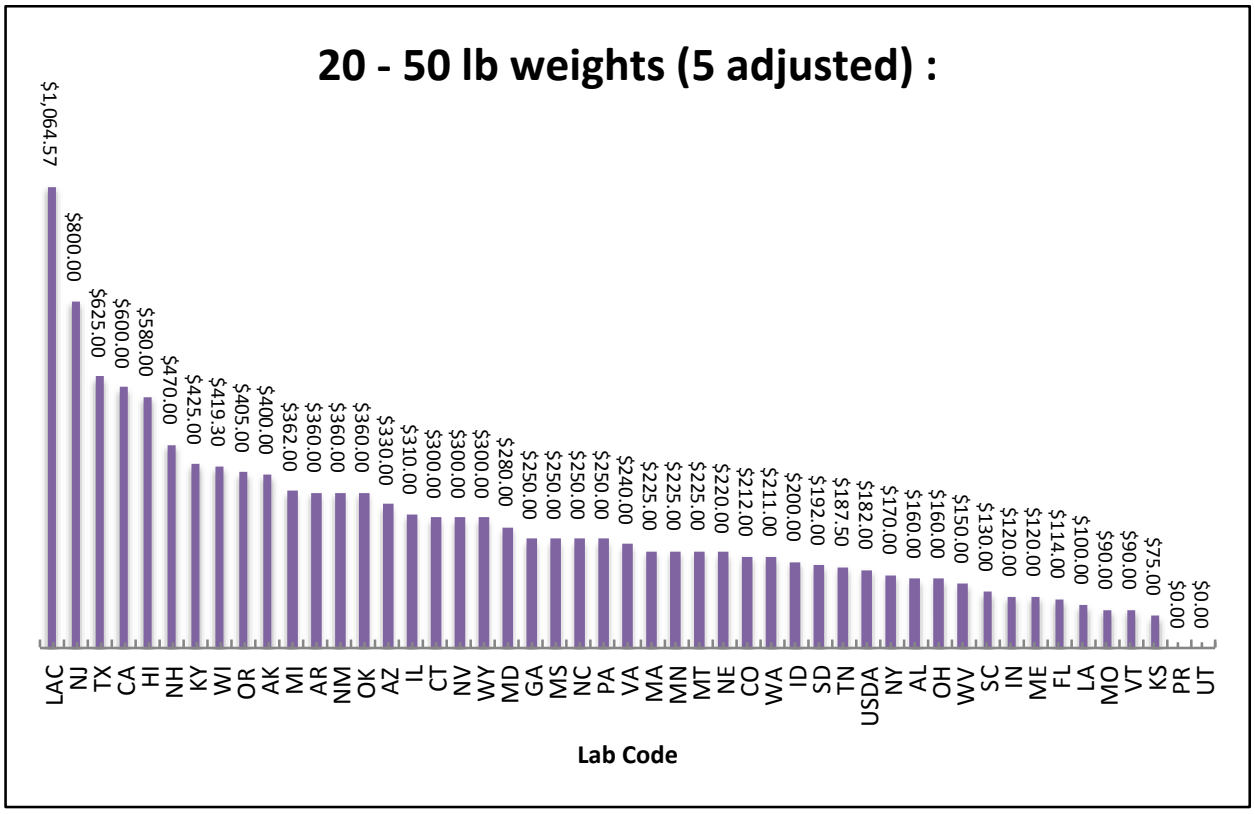

Figure 34: Fees charged for testing a set of 20 50 lb cast iron pipe-handle style test weights to NIST HB 105-1 Class F tolerances (NIST Handbook 105-1 "Specifications for Field Standard Test Weights (NIST Class F)" 1990) using mass echelon III procedures. 5 Adjustments were assumed.

Mass Echelon III (1000 lb Test Weights)

Description

Each laboratory was asked to estimate the fee charged for testing a set of 24 1,000 lb cast iron test weights according to NIST Class F tolerances using echelon III procedures. Each lab was asked to provide an estimate assuming that 5 of the weights were adjusted.

Comparison of Previous Surveys

Survey	Labs Reporting	Average Fee	%Change
2014	46	$1,058.00	--

Table 29 Average fee charged for testing 24 1,000 lb cast iron test weights in 2014.

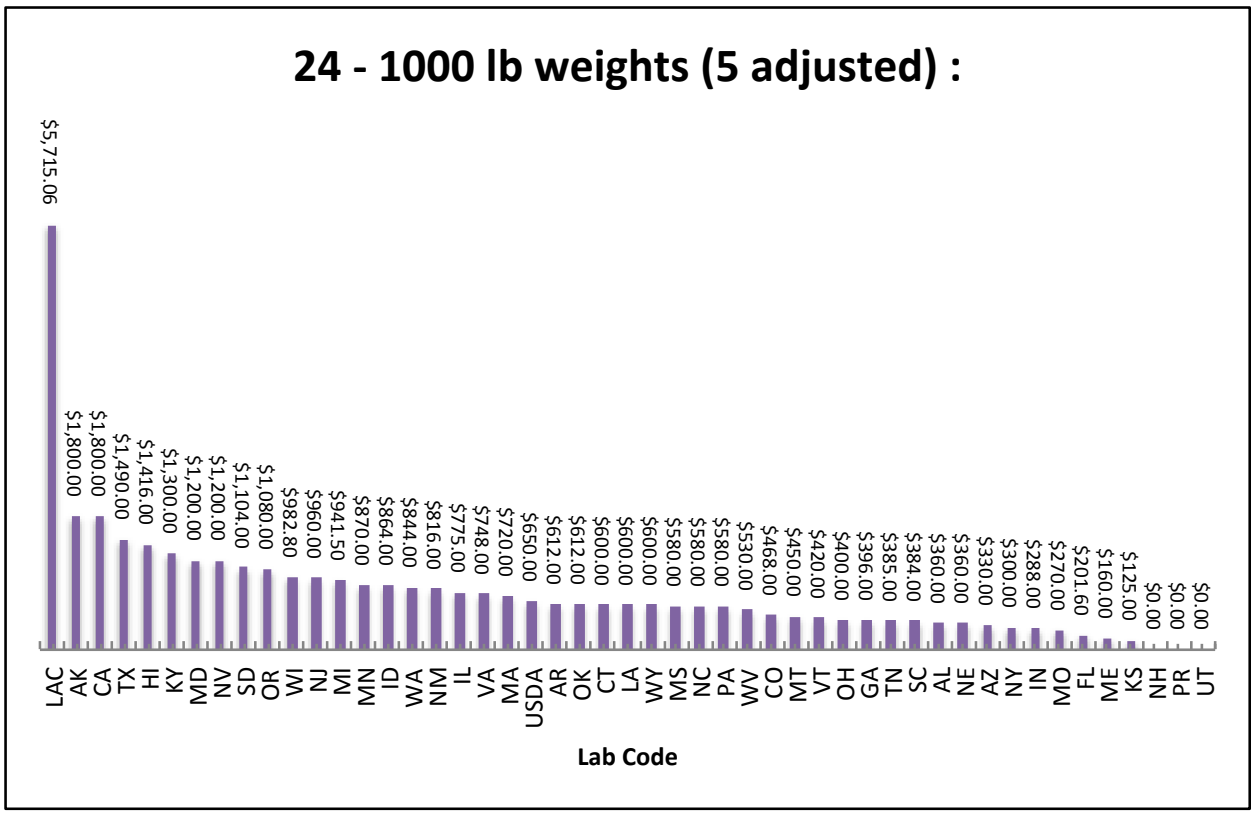

Figure 35: Fees charged for testing a set of 24 1,000 lb cast iron test weights to NIST HB 105-1 Class F tolerances using mass echelon III procedures. 5 Adjustments were assumed.

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 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%
2014	31	$203.97	+1%

Table 30: Average fee charged for a 5,000 lb weight cart testing from 2004 through 2014.

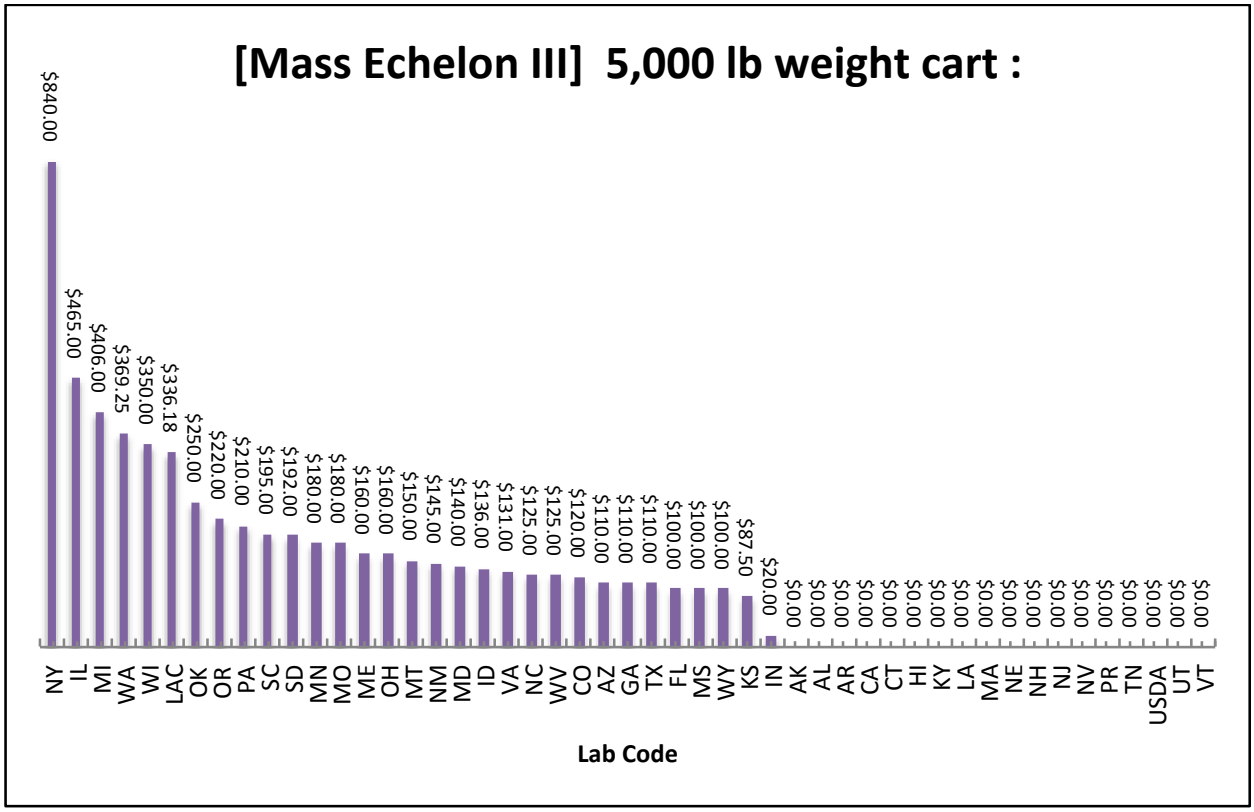

Figure 36: Fees charged for testing a 5,000lb weight cart according to NIST HB 105-8 tolerances using mass echelon III procedures.

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%
2014	45	$1,472.13	-3%

Table 31: Average fee charged for typical scale truck testing from 2004 through 2014.

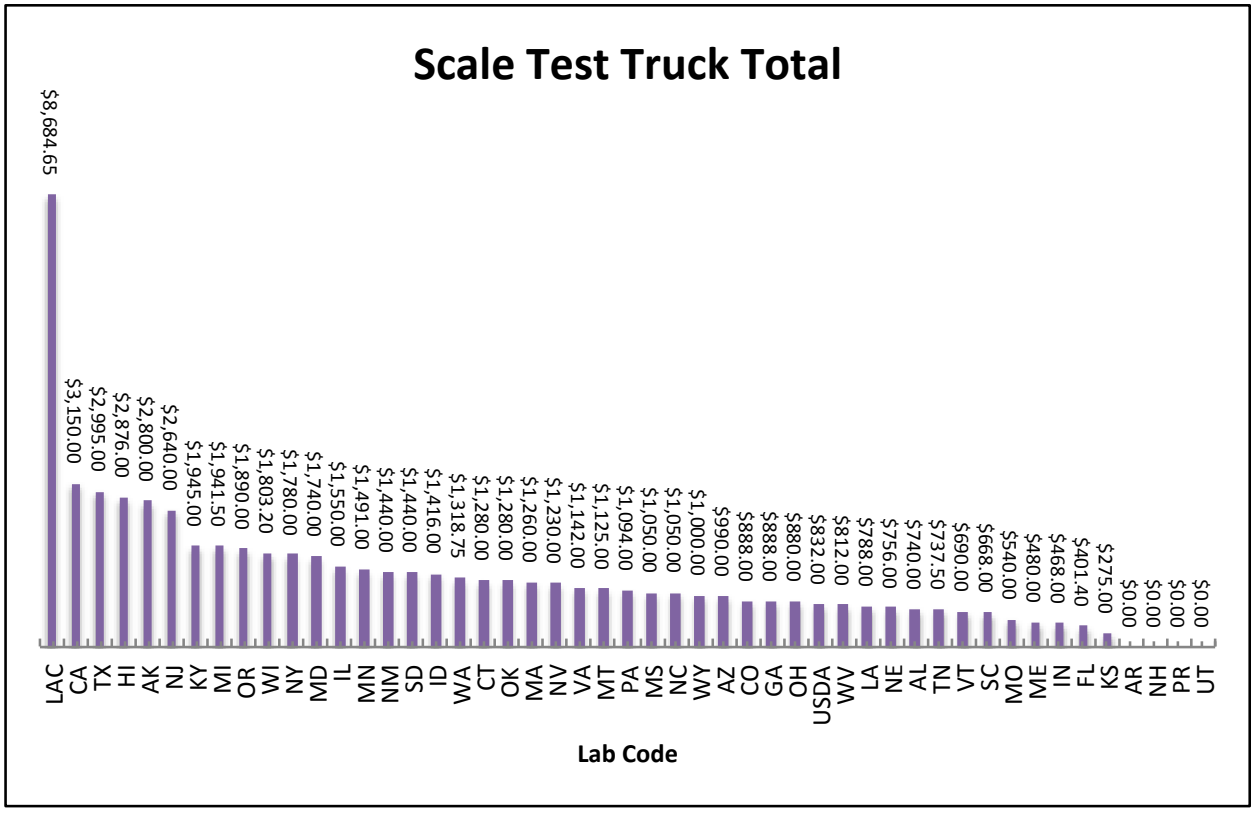

Figure 37: Fees charged for testing a typical scale truck according mass echelon III procedures.

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%
2014	9	$198.56	-19%

Table 32: Average fee charged for typical 19 point testing of a 100 ft steel tape from 2000 through 2014.

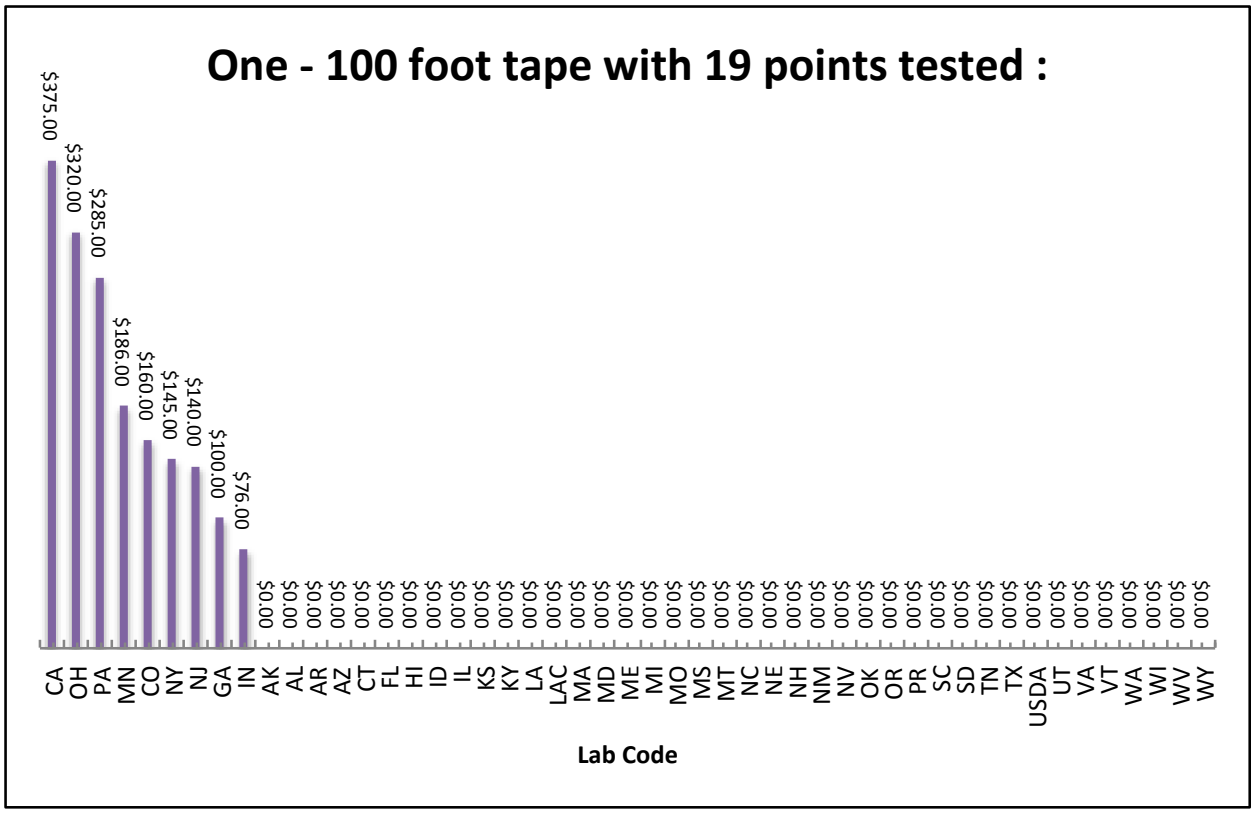

Figure 38: Fees charged for testing a steel 100 ft tape.

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 (NIST Handbook 105-3, "Specifications and Tolerance Graduated Neck Type Volumetric Field Standards" 2010) tolerances using a volume transfer calibration technique (for example SOP No. 18 in ref. (Harris, NIST Internal Report 7383, "Selected Procedures for Volumetric Calibrations" 2006)).

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%
2014	46	$62.52	-2%

Table 33: Average fee charged for testing of a 5 gallon field test measure via volume transfer from 2000 through 2014.

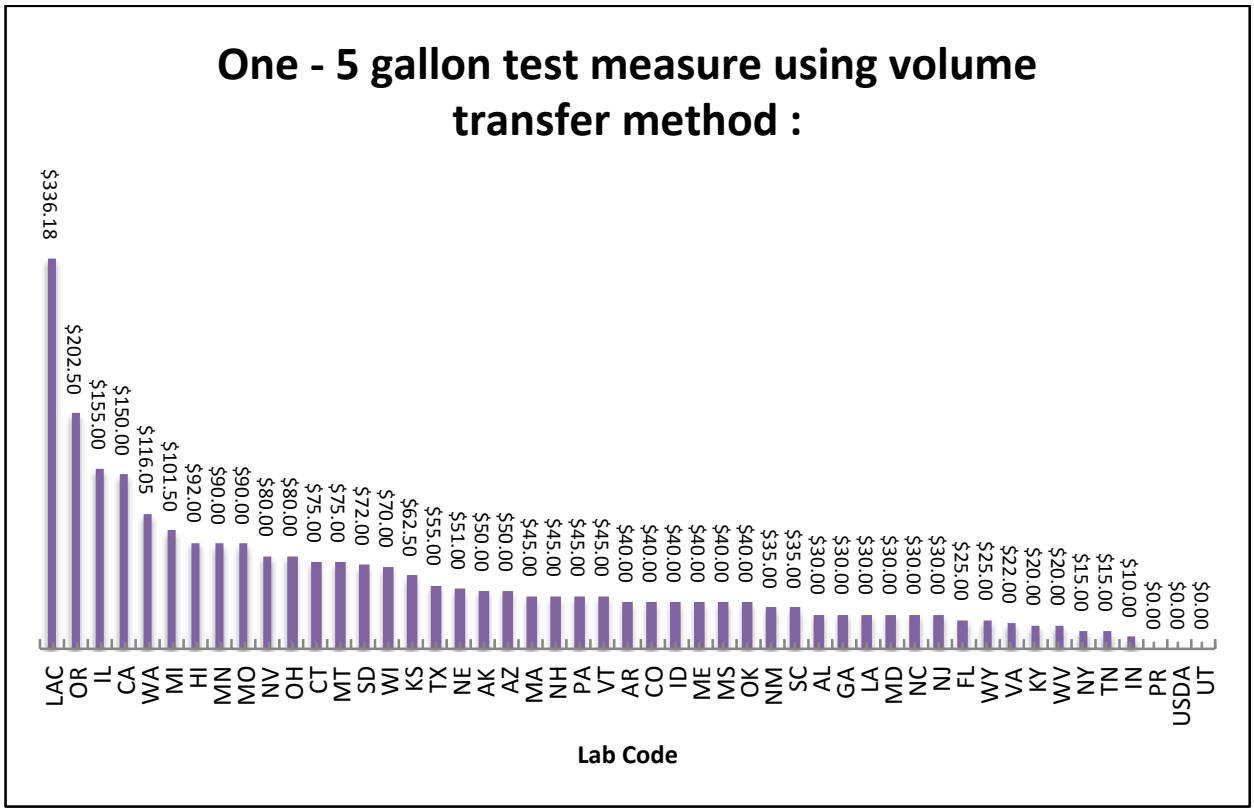

Figure 39: Fees charged for testing a 5 gallon field standard steel prover via volume transfer technique.

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%
2014	22	$200.95	-7%

Table 34: Average fee charged for testing of a 5 gallon field test measure via gravimetric method from 2000 through 2014.

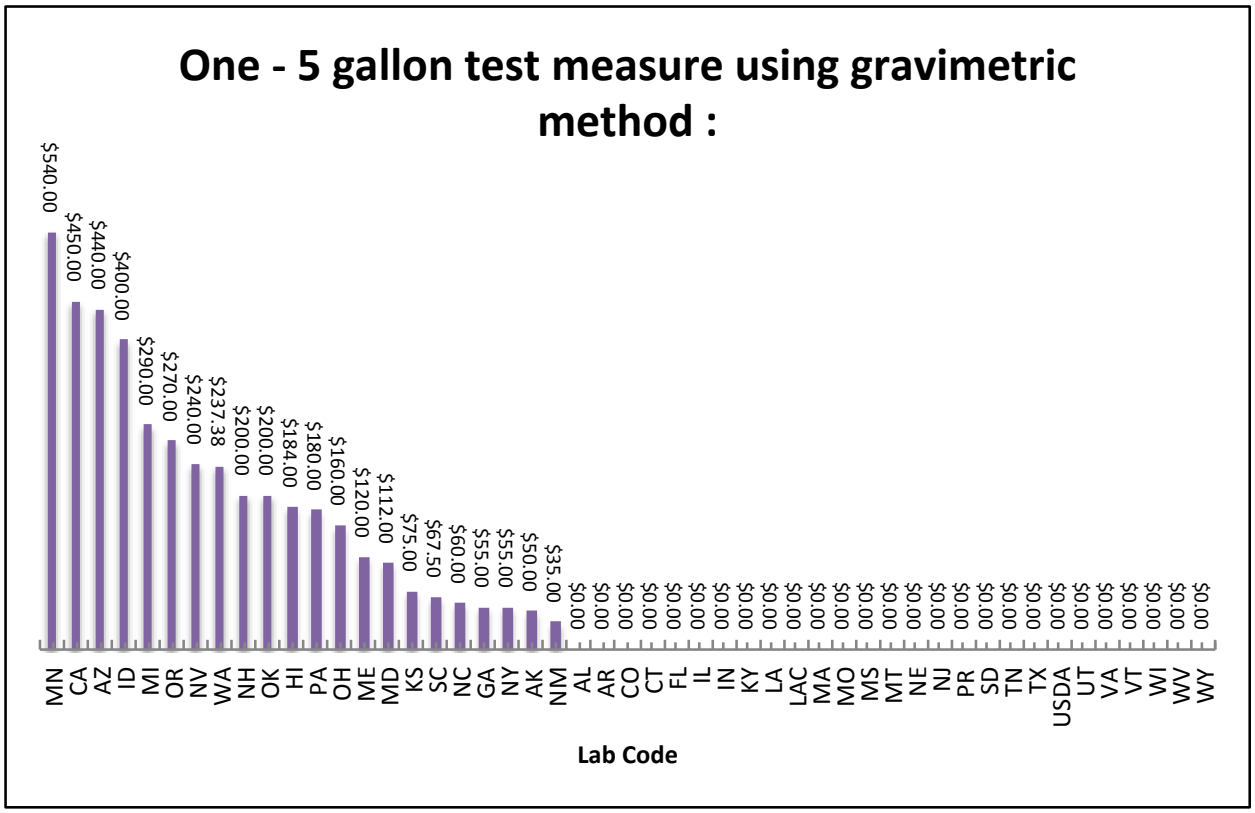

Figure 40 Fees charged for gravimetrically testing a 5 gallon field test measure.

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%
2014	40	$217.01	+5%

Table 35: Average fee charged for testing of a 100 gallon field standard prover via volume transfer from 2000 through 2014.

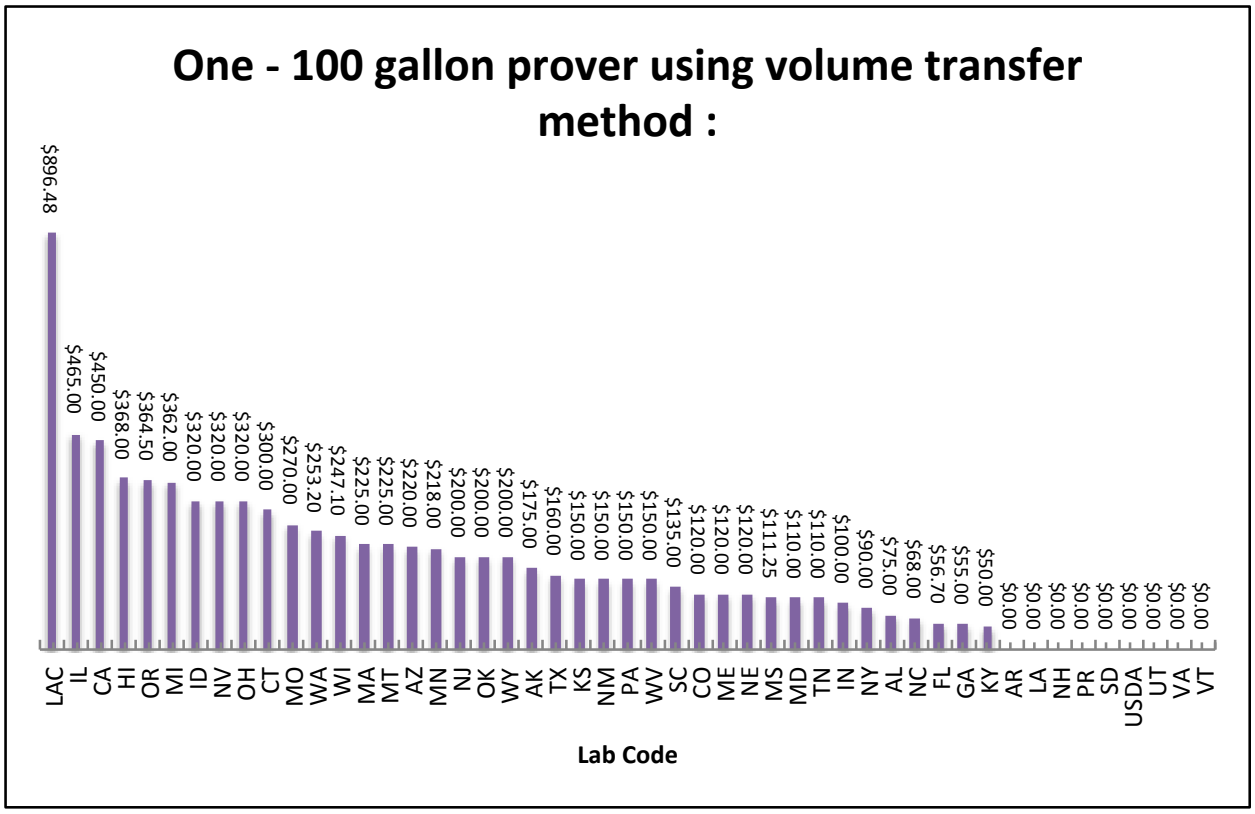

Figure 41: Fees charged for testing a 100 gallon field standard prover via volume transfer technique.

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%
2014	8	$670.63	+50%

Table 36: Average fee charged for testing of a 100 gallon field test standard prover via gravimetric method from 2006 through 2014.

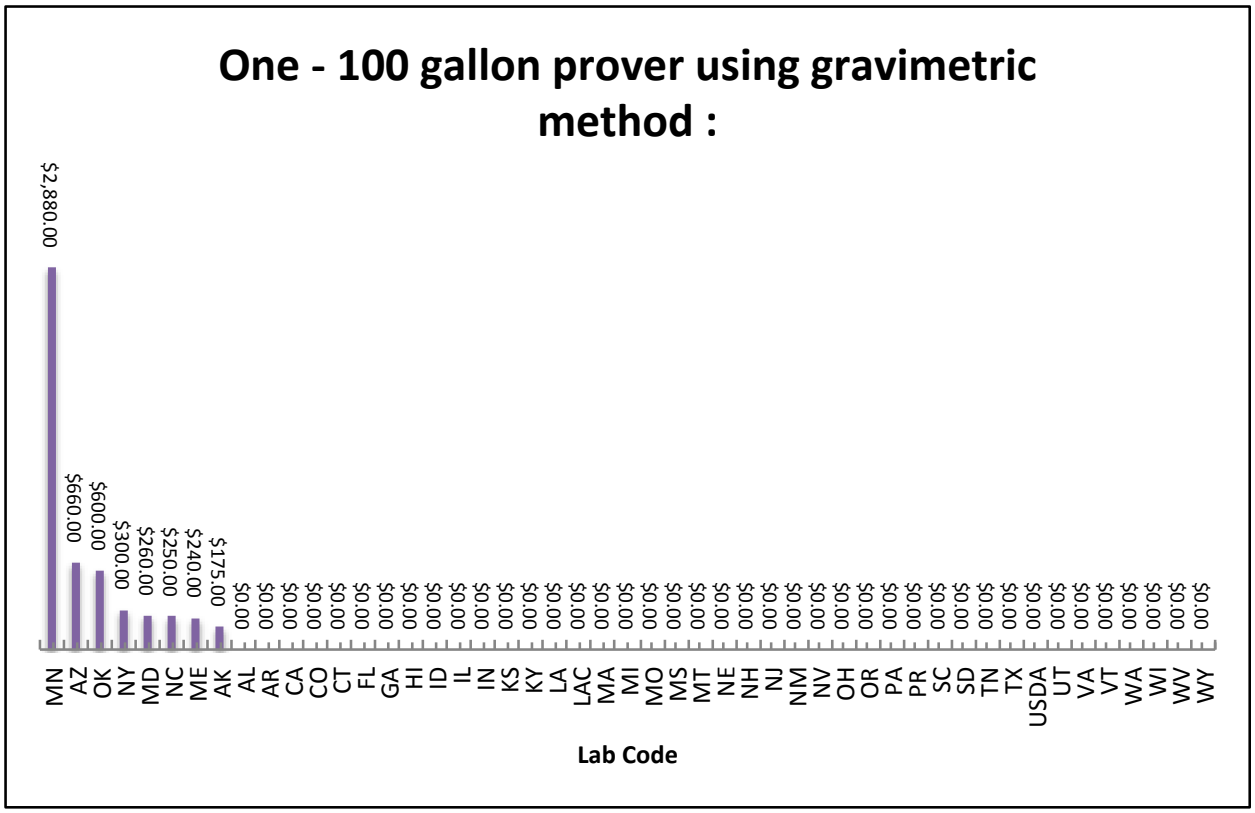

Figure 42: Fees charged for gravimetrically testing a 100 gallon field standard steel prover.

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%
2014	31	$347.05	< 1% change

Table 37: Average fees charged for the testing of a 100 gallon LPG prover from via volume transfer from 2006 through 2014.

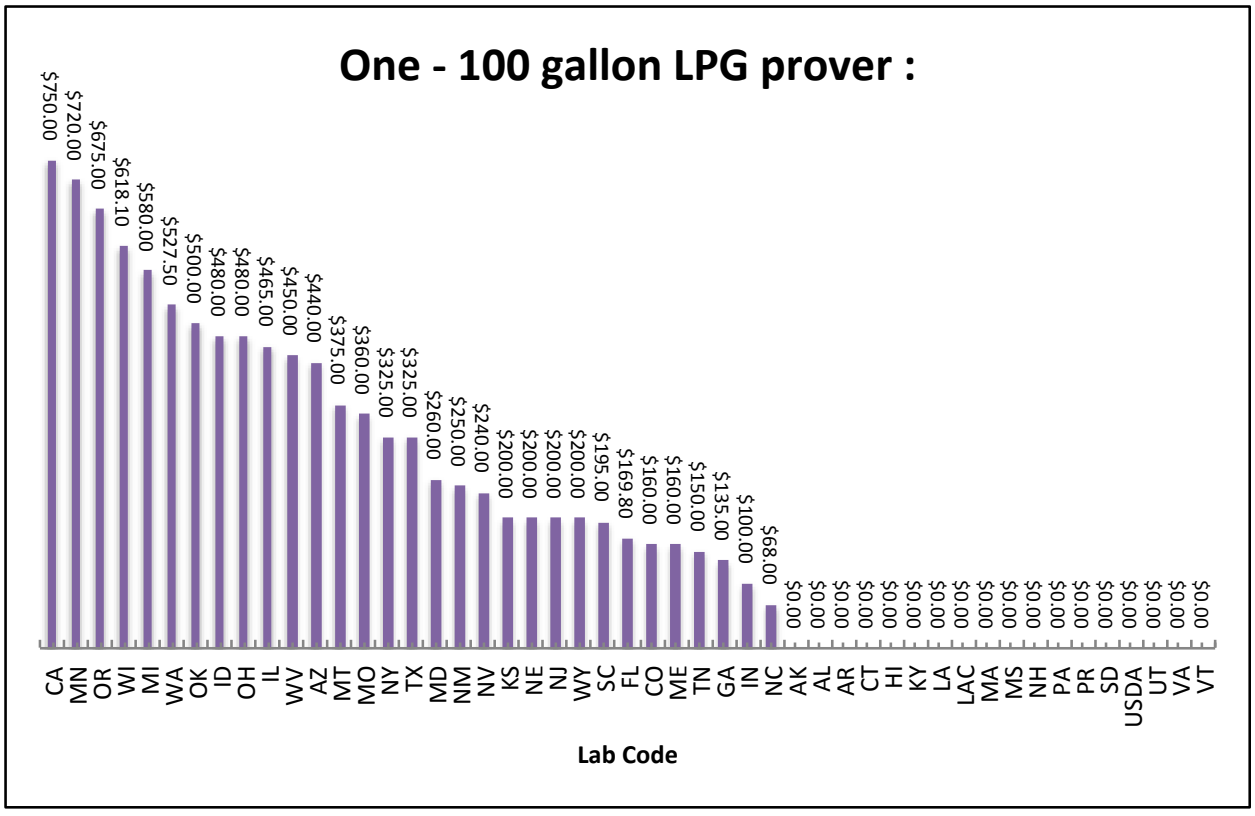

Figure 43: Fees charged for testing a 100 gallon LPG prover.

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

Description

Each lab was asked to estimate the fee for tesing 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 38

Lab ID	Fee
MN	$540.00
CO	$120.00
NM	$120.00
ME	$100.00

Table 38: 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%
2014	4	$220.00	+10%

Table 39: Average fee charged for testing a SVP via volume transfer from 2006 through 2014.

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 40.

Lab ID	Fee
MN	$1,800.00
MI	$870.00
AZ	$770.00
ME	$200.00
NC	$140.00

Table 40: 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%
2014	5	$756.00	+27%

Table 41: Average fee charged for testing a SVP gravimetrically from 2006 through 2014.

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.

Table 42: Metrologist position titles and salary ranges per month.

Lab ID	Position Title	Minimum	Maximum	Category
AK	State Metrologist II	$4,661.00	$6,636.00	Laboratory Supervisor
AK	State Metrologist I	$4,047.00	$5,807.00	Metrology/Calibration Technician
AL	Laboratory Supervisior	$2,690.60	$4,077.00	Laboratory Supervisor
AL	Comsumer W & M Protection Specialist: Lab	$2,376.40	$3,979.80	Metrology/Calibration Technician
AL	Labour	$750.00	$1,125.00	Support Staff
AR	Metrology Manager	$3,600.00	$5,800.00	Laboratory Supervisor
AR	Metrologist	$2,700.00	$4,600.00	Metrology/Calibration Technician
AR	Agriculture Program Manager	$3,000.00	$5,000.00	Metrology/Calibration Technician
AZ	State Metrologist	$3,882.80	$6,618.70	Laboratory Supervisor
AZ	Assistant State Metrologist	$3,014.00	$5,665.20	Metrology/Calibration Technician
CA	Principal State Metrologist	$6,439.00	$7,313.00	Laboratory Supervisor
CA	Measurement Standards Specialist III	$4,188.00	$5,243.00	Metrology/Calibration Technician
CA	Measurement Standards Specialist II	$3,416.00	$4,226.00	Metrology/Calibration Technician
CO	Metrologist I	$3,590.00	$5,067.00	Metrology/Calibration Engineer
CO	Metrologist II	$3,859.00	$5,447.00	Metrology/Calibration Engineer
CO	Metrologist III	$4,148.00	$5,855.00	Metrology/Calibration Engineer
CO	Program Administrator/Laboratory Supervisor	$5,960.00	$9,035.00	Laboratory Supervisor
CT	Metrologist	$4,430.67	$5,967.08	Metrology/Calibration Engineer
CT	Weights and Measures Inspector	$4,978.08	$6,286.67	Metrology/Calibration Technician
FL	Laboratory Manager	$3,567.78	$7,403.93	Laboratory Supervisor
FL	Senior Metrologist	$2,653.96	$4,609.18	Metrology/Calibration Technician
FL	Metrologist	$2,257.26	$3,710.90	Metrology/Calibration Technician
FL	Laboratory Technician IV	$2,041.58	$3,500.88	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 (DELETED)	$2,222.67	$3,062.08	Metrology/Calibration Engineer
GA	Metrologist 1 (DELETED)	$2,026.83	$2,790.25	Metrology/Calibration Engineer
HI	Metrologist I	$3,379.00	$5,001.00	Metrology/Calibration Technician
HI	Metrologist II	$3,651.00	$5,410.00	Metrology/Calibration Engineer
HI	Metrologist III	$3,950.00	$5,849.00	Laboratory Supervisor
ID	Section Manager/Metrologist	$4,440.80	$8,162.27	Laboratory Supervisor
ID	Ag Program Specialist	$3,707.60	$6,817.20	Metrology/Calibration Technician
IL	Public Service Administrator	$4,400.00	$6,253.00	Metrology/Calibration Engineer
IL	Products & Standards Inspector	$3,578.00	$4,928.00	Metrology/Calibration Technician
IN	Metrologist	$2,010.67	$3,581.50	
IN	Inspector I	$2,084.33	$3,555.50	
KS	Metrologist	$2,889.60	$2,889.60	Metrology/Calibration Engineer
KS	State Metrologist	$3,305.60	$3,305.60	Laboratory Supervisor
KY	Program Coordintaor	$2,670.20	$4,439.20	
KY	Agricutural Inspector I	$1,823.90	$3,008.54	
KY	Metrology Lab Supervisor	$3,230.84	$5,329.36	
KY	Metrology Lab Technician I	$2,006.08	$3,309.32	
KY	Metrology Lab Technician II	$2,427.44	$4,004.00	
LA	Assistanet Division Director	$4,277.00	$8,285.00	
LA	Metrologist	$2,851.00	$5,520.00	
LAC	Senior Metrologist	$4,432.00	$5,813.00	Laboratory Supervisor
LAC	Metrologist	$4,189.00	$5,506.00	Metrology/Calibration Technician
LAC	Agricultural/Weights and Measures Inspector III	$4,487.45	$5,885.73	Laboratory Supervisor

Lab ID	Position Title	Minimum	Maximum	Category
LAC	Agricultural/Weights and Measures Inspector II	$4,026.55	$5,281.00	Metrology/Calibration Technician
LAC	Agricultural/Weights and Measures Inspector I	$3,186.36	$4,737.64	Metrology/Calibration Technician
LAC	Associate Weights and Measures Inspector	$3,354.08	$3,354.08	Metrology/Calibration Technician
MA	Manager of Laboratory and Training	$4,000.00	$6,000.00	Laboratory Supervisor
MD	Lab Manager	$2,986.67	$5,040.08	Laboratory Supervisor
MD	Metrologist II	$3,176.42	$5,040.08	Metrology/Calibration Technician
MD	Metrologist I	$2,986.67	$4,722.83	Metrology/Calibration Technician
MD	Metrologist Trainee	$2,489.50	$3,897.83	Metrology/Calibration Technician
ME	Metrologist	$3,320.00	$4,336.00	Laboratory Supervisor
MI	Metrologist Manager - 14	$4,268.00	$6,811.00	
MI	Metrology Specialist - 13	$4,340.00	$6,371.00	
MI	Metrologist - 12	$4,000.00	$5,830.00	
MI	Metrologist - P11	$3,808.00	$5,363.00	
MI	Metrologist - 10	$3,291.00	$4,639.00	
MI	Metrologist - 9	$3,182.00	$4,539.00	
MN	State Program Administrator, Senior	$3,533.92	$5,183.50	Metrology/Calibration Technician
MN	State Program Administrator, Principal	$4,054.17	$5,975.17	Metrology/Calibration Engineer
MN	Deputy Director (Lab supervisor)	$5,507.08	$7,925.67	Laboratory Supervisor
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
MT	Metrologist	$3,375.00	$4,385.00	Laboratory Supervisor
NC	Laboratory Manager	$3,600.00	$5,900.00	Laboratory Supervisor
NC	Quality Assurance 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 Program Supervisor	$2,900.00	$4,700.00	Metrology/Calibration Engineer
NC	Processing Assistant III	$2,500.00	$3,800.00	Support Staff
NE	Metrologist	$3,725.11	$5,497.79	Metrology/Calibration Technician
NH	Weights & Measures Metrologist	$2,967.25	$3,939.00	Metrology/Calibration Engineer
NH	Weights & Measures Metrologist - Part Time			Metrology/Calibration Technician
NJ	Raymond Szpond	$5,370.54	$9,340.91	Laboratory Supervisor
NJ	Michael Cecere	$5,114.66	$7,417.56	Metrology/Calibration Engineer
NM	Lab manager	$4,583.33	$6,833.33	
NM	Metrologist Intermediat	$3,000.00	$4,500.00	
NV	Chief State Metrologist	$4,000.00	$5,000.00	Metrology/Calibration Engineer
NV	Inspector/Lab Metrologist	$3,500.00	$4,200.00	Metrology/Calibration Technician
NY	Specialist I	$4,357.75	$5,541.17	Metrology/Calibration Technician
NY	Specialist II (Lab Manager)	$5,641.92	$7,136.25	Laboratory Supervisor
NY	Director	$7,000.00	$8,846.00	Laboratory Supervisor
OH	Weights and Measures Technologist	$2,938.00	$3,819.00	Metrology/Calibration Technician
OK	Metrologist I	$2,208.51	$4,048.94	Metrology/Calibration Technician
OK	Metrologist II	$2,653.99	$4,865.64	Laboratory Supervisor
OK	Metrologist III	$3,240.38	$5,940.70	Metrology/Calibration Engineer
OR	Lead Metrologist	$5,028.00	$7,358.00	Metrology/Calibration Technician
OR	Metrologist	$4,569.00	$6,691.00	Metrology/Calibration Technician
PA	Laboratory Supervisor	$4,286.92	$6,508.58	Laboratory Supervisor
PA	Metrologist	$4,066.83	$5,789.75	Metrology/Calibration Technician
PA	Metrologist (with NIST Basic Training)	$4,254.33	$5,789.75	Metrology/Calibration Engineer
PA	Metrologist (with NIST Intermediate Training)	$4,440.08	$5,789.75	Metrology/Calibration Engineer
PA	Laboratory Administrative Assistant	$2,611.25	$3,895.67	Support Staff
PR	Lab Technician			Metrology/Calibration Technician
SC	Program Coordinator I	$2,650.00	$4,874.00	Laboratory Supervisor
SC	Laboratory Technician III	$3,225.00	$5,967.00	Metrology/Calibration Technician
SC	Laboratory Technician II	$2,650.00	$4,874.00	Metrology/Calibration Technician

Lab ID	Position Title	Minimum	Maximum	Category
SC	Field Inspector II	$2,178.00	$4,030.00	Support Staff
SD	State Inspector	$2,644.35	$3,305.43	Metrology/Calibration Engineer
TN	State Metrologist	$3,023.00	$4,835.00	Metrology/Calibration Engineer
TX	Metrology Lab Coordinator	$4,023.17	$6,418.92	Laboratory Supervisor
TX	Metrologist	$3,081.33	$4,231.33	Metrology/Calibration Engineer
TX	Laboratory Technician	$2,075.83	$2,973.25	Support Staff
TX	Administrative Assistant	$2,748.00	$4,231.33	Support Staff
USDA	Industrial Specialist GS-13	$7,622.25	$9,908.75	
USDA	Industrial Specialist GS-12	$6,659.92	$8,333.33	
UT	State Metrologist	$3,650.00	$5,790.00	Metrology/Calibration Engineer
VA	Metrologist	$2,583.33	$5,916.67	Metrology/Calibration Technician
VT	Weights and Measures Specialist/Metrologist	$4,354.00	$6,829.00	Laboratory Supervisor
WI	Metrologist			
WI	Chief Metrologist			
WI	Laboratory Director			
WV	Program Specialist - Head Metrologist	$2,708.00	$3,841.00	Metrology/Calibration Technician
WV	Labor Inspector II - Assistant Metrologist	$2,076.00	$3,658.00	Metrology/Calibration Technician
WY	Inspection Supervisor	$5,001.00	$7,060.00	Laboratory Supervisor
WA	State Metrologist	$3,549.00	$4,770.00	Laboratory Supervisor

2014 State Laboratory Program Metrologists

The survey requested data on each metrologists on staff in the SLP. These data include details on what measurements the metrologist is authorized to perform, 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.

State	Name	email	What Year Eligible for Retirement?	State Lab Metrology Experience	Other Metrology Experience	Total Metrology	Mass I	Mass II	Mass III	Vol Trans	Vol Grav	Length	Time/Frequency	Temperature	Grain Moisture
AK	Garret Brown	garret.brown@alaska.gov	2023	10	8	18	N	P	F	F	F	N	F	N	N
AK	Roger Holland	roger.holland@alaska.gov	2022	5	0	5	N	P	F	P	F	N	F	N	N
AL	Michael Bridges	michael.bridges@agi.alabama.gov	2027	7	0	7			F	F					
AL	Deandre White	deandre.white@agi.alabama.gov	2038	1	0	1			P	P					
AR	Nikhil Soman	nikhil.soman@aspb.ar.gov	2032	3	0	3			F		F				
AR	Charles Hawkins	charles.hawkins@aspb.ar.gov	2032	5	0	5			F		F				
AR	Jill Franke	jill.franke@aspb.ar.gov	2032	1	0	1			N		N				
AR	Randall Burns	randy.burns@aspb.ar.gov	2016	39	0	39									F
AZ	Brian Sellers	bsellers@azdwm.gov	2024	10.5	0	10.5		F	F	F	F				
AZ	Eric Gaedert	egaedert@azdwm.gov	2037	0.1	0	0.1									
CA	Greg Boers	gboers@cdfa.ca.gov	2015	17	0	17	N	F	F	F	F	F	F	F	N
CA	Anthony Gruneisen	agruneisen@cdfa.ca.gov	2025	13	0	13	N	F	F	F	F	F	F	F	N
CA	Thomas Mendleski	tmendleski@cdfa.ca.gov	2035	0	0	0	N	N	N	N	N	N	N	N	N
CO	Diane C. Wise	diane.wise@state.co.us	2012	22	0	22	N	F	F	F	F	F	F	N	F
CO	Kate Smetana	kate.smetana@state.co.us	2038	2.5	0	2.5	N	F	F	F	F	N	F	N	F
CT	Ana Maria Feliciano	ana.feliciano@ct.gov	2039	4	0	4	N	N	F	N	F	N	F	N	N
CT	Ion Daha	ion.daha@ct.gov	2031	4	0	4	N	N	P	N	P	N	N	N	N
FL	Davis Terry	Davis.Terry@freshfromflorida.com	2029	15	0	15	N	F	F	F	F	N	N	N	N
FL	Megan Faircloth	Megan.Faircloth@freshfromflorida.com	2042	2	0	2	N	F	F	F	F	N	N	N	N
FL	Amy Smith	Amy.Smith@freshfromflorida.com	2036	2	0	2	N	P	P	P	P	N	N	N	N
FL	Michael Kruse	Michael.Kruse@freshfromflorida.com	2043	0.5	0	0.5	N	N	P	N	P	N	N	N	N
GA	Kontz Bennett	kontz.bennett@agr.georgia.gov	2030	14	0	14	N	F	F	F	P	P	N	N	N
GA	Brian Grace	brian.grace@agr.georgia.gov	2036	8.5	0	8.5	N	P	F	F	P	P	N	N	F
HI	Michael Tang	michael.tang@hawaii.gov	2019	14	0	14	F	F	F	F	F	N	F	N	N
ID	Kevin Merritt	kevin.merritt@agri.idaho.gov	2013	21	0	17	N	F	F	F	F	N	N	N	N
ID	Stacie Ybarra	stacie.ybarra@agri.idaho.gov	2034	3	0	3	N	F	F	F	F	N	N	N	N
IL	Mike Rockford	mike.rockford@illinois.gov	2014	26	0	26	F	F	F		F				
IL	Matt Williams	matt.williams@illinois.gov	2013	14	0	14			P		F				
IL	Karl Cunningham	karl.cunningham@illinois.gov	2027	10	0	10			F		F				F
IN	Jerry L. Clingaman, Jr.	jclingam@isdh.in.gov	2012	23	13	36		F	F	F	F	F	F	F	
IN	Joshua A. Reagin	jreagin@isdh.in.gov	2043	1.8	0	1.8		P	P	P	P	P	P	P	
IN	Doug Stevens								P						
KS	Keith Arkenberg	keith.arkenberg@kda.ks.gov	2042	2	0	2	N	F	F	F	P	N	N	N	N
KS	Kevin Uphoff	kevin.uphoff@kda.ks.gov	2036	3	0	3	N	F	F	F	F	N	N	N	N
KY	Jason Glass	jason.glass@ky.gov	2029	11	0	11	N	N	F	N	F	N	N	N	N

State	Name	email	What Year Eligible for Retirement?	State Lab Metrology Experience	Other Metrology Experience	Total Metrology	Mass I	Mass II	Mass III	Vol Trans	Vol Grav	Length	Time/Frequency	Temperature	Grain Moisture
KY	Chester Watson	Chester Watson@ky.gov	2034	7	0	7	N	N	F	N	F	N	N	N	N
KY	Bill Baker	bill.baker@ky.gov	2035	7	0	7	N	N	F	N	F	N	N	N	N
KY	Casey Logsdon	casey.logsdon@ky.gov	2041	1	0	1	N	N	P	N	N	N	N	N	N
LA	Carl Decker	cdecker@ldaf.state.la.us		23	0	23			F		F				
LA	Richert Williams	richer_dw@ldaf.state.la.us		15	0	15			F		F				
LAC	Kai-cheung (KC) Chow	Kchow@acwm.lacounty.gov	2011	12	0	12	N	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	3.5	36	39.5	N	N	F	N	F	P	N	N	N
MD	Elizabeth Koncki	elizabeth.koncki@maryland.gov	2038	1	0	1	N	N	P	P	N	N	N	N	F
MD	Joe Eccleston	joseph.eccleston@maryland.gov	2035	1	0	1	N	N	P	P	N	N	N	N	N
MD	Zenon Waclawiw	zenon.waclawiw@maryland.gov	2028	15	0	15	N	N	F	F	P	N	N	N	N
MD	Zach Tripoulas	zachary.tripoulas@maryland.gov	2040	1	0	1	N	N	F	P	P	N	N	N	N
ME	Bradford Bachelder	bradford.bachelder@maine.gov	2050	3	0	3	N	F	F	F	F	N	N	N	N
MI	Craig VanBuren	vanburenc9@michigan.gov		15	0	15	F	F	F	F	F				
MI	Neil Jones	jonesn@michigan.gov		15	0	15	F	F	F	F	F				
MI	Nick Santini	santinin@michigan.gov		4	0	4		F	F	F	F				
MI	Ryanne Hartman	hartmanr9@michigan.gov		4	0	4		F	F	F	F				
MI	Scott Ferguson	fergusons9@michigan.gov		4	0	4		F	F	F	F				
MN	Mark Nicollet	mark.nicollet@state.mn.us	2038	9	0	9	P	F	F	F	F	N	N	N	N
MN	Heidi Jones	heidi.jones@state.mn.us	2023	15	0	15	N	N	P	N	N	N	N	N	N
MN	Peter Whebbe	peter.whebbe@state.mn.us	2018	0	0	0	N	N	P	P	P	N	N	N	N
MN	Benjamin FitzPatrick	benjamin.fitzpatrick@state.mn.us	2047	1	0	1	N	F	F	F	F	N	N	N	N
MO	Kevin Hanson	Kevin.Hanson@mda.mo.gov	2021	15	4	19	N	F	F	F	P	F	N	N	P
MO	Tom Hughes	Tom.Hughes@mda.mo.gov	2022	16	0	16	N	F	F	F	P	F	N	N	F
MS	Mel Iasigi	Mel@mdac.ms.gov	2020	14	0	14			F		F				
MS	William Bell	WilliamBe@mdac.ms.gov	2030	10	0	10			F		F				
MT	David Fraser	dafraser@mt.gov	2030	2	0	2			F		F				
NC	Sharon Woodard	sharon.woodard@ncagr.gov	2022	22.5	0	22.5	F	F	F	F	F	F	N	F	P
NC	Spurgeon Van Hyder	van.hyder@ncagr.gov	2024	20.5	0	20.5	F	F	F	F	F	F	N	P	N
NC	Ashley Lessard	ashley.lessard@ncagr.gov	2041	3.75	0	3.75	P	P	F	F	F	F	N	N	N
NC	Robert Rogers	robert.rogers@ncagr.gov	2041	3.17	0	3.17	P	P	F	F	F	N	N	P	N
NC	April Lee	april.lee@ncagr.gov	2042	2.42	0	2.42	N	N	N	N	N	N	N	N	F
NC	Sherry Teachey	sherry.teachey@ncagr.gov	2025	12	0	12	P	P	F	F	F	F	N	P	N
NE	Kellen Novak	kellen.novak@nebraska.gov	2049	0.5	0	0.5	N			N	N	N	N	N	N
NH	Tim Osmer	timothy.osmer@agr.nh.gov	2041	9.5	0	9.5	F	F	F	F	F	N	N	N	N

State	Name	email	What Year Eligible for Retirement?	State Lab Metrology Experience	Other Metrology Experience	Total Metrology	Mass I	Mass II	Mass III	Vol Trans	Vol Grav	Length	Time/Frequency	Temperature	Grain Moisture
NH	Richard Cote			19	0	19	P	F	F	F	F	N	N	N	N
NJ	Raymond Szpond	szpondr@dca.lps.state.nj.us	2021	18	0	18	N	P	F	F	F	F	F	N	N
NJ	Michael Cecere	cecerem@dca.lps.state.nj.us	2017	8	0	8	N	P	F	F	F	F	F	N	N
NM	Steve Sumner	ssumner@nmda.nmsu.edu	2015	18	20	38	F	F	F	P	P	N	N	N	N
NM	Clay Ivey	civey@nmda.nmsu.edu	2030	5	0	5	N	F	F	P	P	N	N	N	N
NV	Mary E. Gonzales	m.gonzales@agri.nv.gov	2022	0.3	6	6.3	N	N	N	N	N	N	N	N	N
NV	James Kellames	jkellames@agri.nv.gov	2035	0.9	0	0.9	N	N	N	N	N	N	N	N	N
NY	Robert Acheson	robert.acheson@agriculture.ny.gov	2009	22	0	22	P	F	F	F	F	F	F	F	
NY	Bruce Davidson	bruce.davidson@agriculture.ny.gov	2018	3	0	3	N	N	P	P	P	P	P	P	
NY	Eric Morabito	eric.morabito@agriculture.ny.gov	2019	3	0	3	P	F	F	F	F	F	F	F	
NY	Mike Sikula	mike.sikula@agriculture.ny.gov	2019	15	7	22	P	F	F	F	F	F	F	F	
OH	Ken Johnson	johnson@agri.ohio.gov	2020	26	6	32	N	F	F	F	F	F	F	N	N
OH	Dan Walker	daniel.walker@agri.ohio.gov	2042	4	10	14	N	F	F	F	F	F	F	N	N
OK	Richard Gonzales	richard.gonzales@ag.ok.gov	2012	28	0	28	F	F	F	F	F	N	N	P	N
OK	Jeremy Nading	jeremy.nading@ag.ok.gov	2037	9	0	9	F	F	F	F	F	N	N	P	N
OK	James Willson	james.willson@ag.ok.gov	2019	5	0	5	N	N	F	N	F	N	N	N	N
OR	Aaron Aydelotte	aaydelotte@oda.state.or.us	2029	14	0	14	F	F	F	F	F	N	N	F	N
OR	Ray Nekuda	rnekuda@oda.state.or.us	2037	7	0	7	F	F	F	F	F	N	N	N	N
PA	James P. Gownley	jgownley@pa.gov	2030	13	0	13	N	F	F	F	F	F	F	N	N
PA	Christopher J. Drupp	cdrupp@pa.gov	2034	7	0	7	N	F	F	F	F	F	F	N	N
PA	Richard M. Radel, Jr.	riradel@pa.gov	2025	6.5	0	6.5	N	F	F	F	F	F	F	N	N
PA	David Welker	dawelker@pa.gov	2022	1.25	0	1.25	N	N	P	P	P	F	F	N	N
PA	Dustin Claycomb	duclaycomb@pa.gov	2031	0.5	5	5.5	N	N	P	P	P	F	F	N	N
PR	Abner Rodriguez	abrodriguez@daco.gobierno.pr		10	0	10		F	F	F	F	F			
SC	Robert McGee	rmcgee@scda.sc.gov	2023	20	0	20	F	F	F	F	F	F	N	N	F
SC	Terry Wessinger	twessing@scda.sc.gov	2022	1	0	1	N	P	F	F	P	N	N	N	P
SC	Tim Jones	tjones@scda.sc.gov	2042	0	0	0	N	N	P	P	N	N	N	N	N
SC	Billy Kennington	bkenning@scda.sc.gov	2015	36	0	36	N	F	F	F	F	F	N	N	F
SD	Ron Peterson	ron.peterson@state.sd.us	2025	3	0	3	N	N	F	N	F	N	N	N	N
TN	Kenneth R Wilmoth	kenneth.wilmoth@tn.gov	2011	11	0	11			F		F				
TX	Harvey Fischer	harvey.fischer@texasagriculture.gov	2009	9	27	36	N	P	F	P	F	N	N	N	N
TX	Daniel Gibbons	daniel.gibbons@texasagriculture.gov	2024	11	0	11	N	F	F	F	F	N	N	N	N
TX	Preston Adachi	preston.adachi@texasagriculture.gov	2015	9	30	39	N	F	F	F	F	N	N	N	N
TX	Lisa Corn	lisa.corn@texasagriculture.gov	2035	7	0	7	N	F	F	F	F	N	N	N	N
TX	Kayla Michalec	kayla.michalec@texasagriculture.gov	2041	0	0	0	N	N	N	N	N	N	N	N	N

State	Name	email	What Year Eligible for Retirement?	State Lab Metrology Experience	Other Metrology Experience	Total Metrology	Mass I	Mass II	Mass III	Vol Trans	Vol Grav	Length	Time/Frequency	Temperature	Grain Moisture
USDA	Marcus Harwitz	Marcus.Harwitz@usda.gov	2021	14	8	22			F						
USDA	Al Rupert	Al.L.Rupert@usda.gov							F						
UT	Bill Rigby	brigby@utah.gov	2030	10	0	10	N	N	F	N	F	N	N	N	N
VA	William Loving	William.Loving@VDACS.Virginia.gov	2019	15	0	15	N	F	F	N	F	N	F	N	N
VT	Marc Paquette	marc.paquette@state.vt.us	2018	4	0	4	N	N	F	N	F	N	N	N	N
VT	Scott Dolan	scott.dolan@state.vt.us	2041	2	0	2			P		P				
WI	Justin Lien	Justin.Lien@wisconsin.gov	2044	1	0	1	N	N	N	N	N	N	N	N	N
WI	Richard McCann	Richard.Mccann@wisconsin.gov	2026	14	0	14	N	N	F	N	F	N	N	N	N
WI	Jeff Houser	Jeff.Houser@wisconsin.gov	2016	7	0	7	N	N	F	N	F	N	N	N	N
WV	Anthony O'Brien	anthony.p.obrien@wv.gov	2025	17	0	17	N	N	F	N	F	N	N	N	N
WV	Tory Brewer	tory.d.brewer@wv.gov	2046	2	0	2	N	N	F	N	F	N	N	N	N
WY	Robert Weidler	robert.weidler@wyo.gov	2029	7	0	7			F		F				
WA	Dan Wright	dwright@agr.wa.gov	2014	20	16	36	F	F	F	F	F	F	F	N	N

Table 43: Listing of SLP metrologists as of 2014. 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.

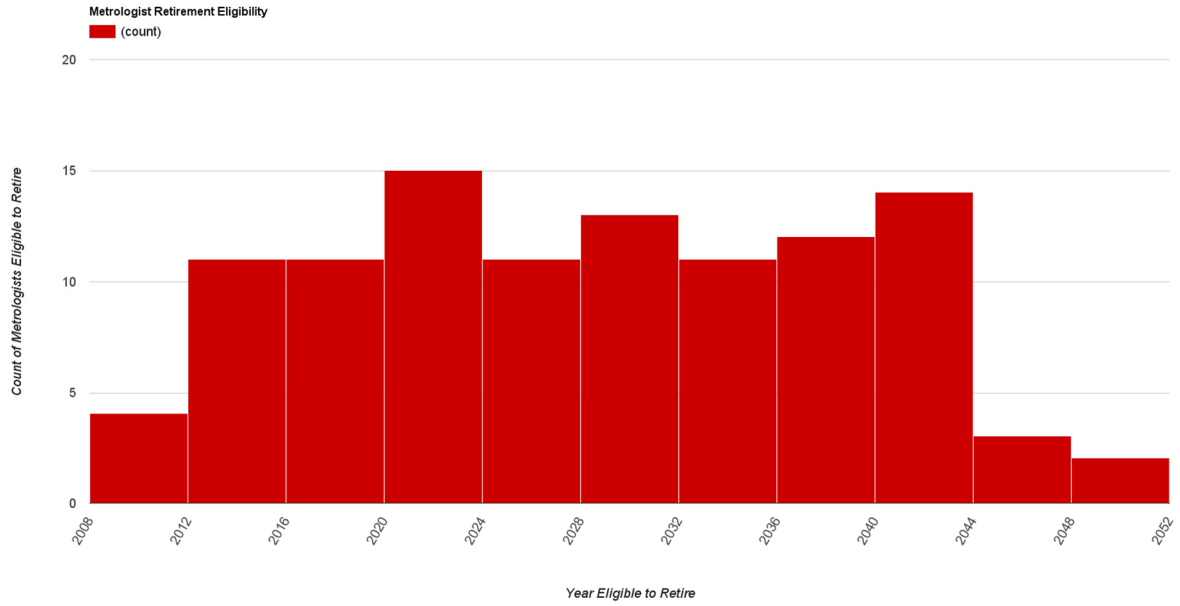

Figure 44: Retirement Eligibility Histogram. Of the 118 metrologists, 107 reported the year they would be eligible for full retirement. This may not reflect when any one person actually plans to leave the SLP.

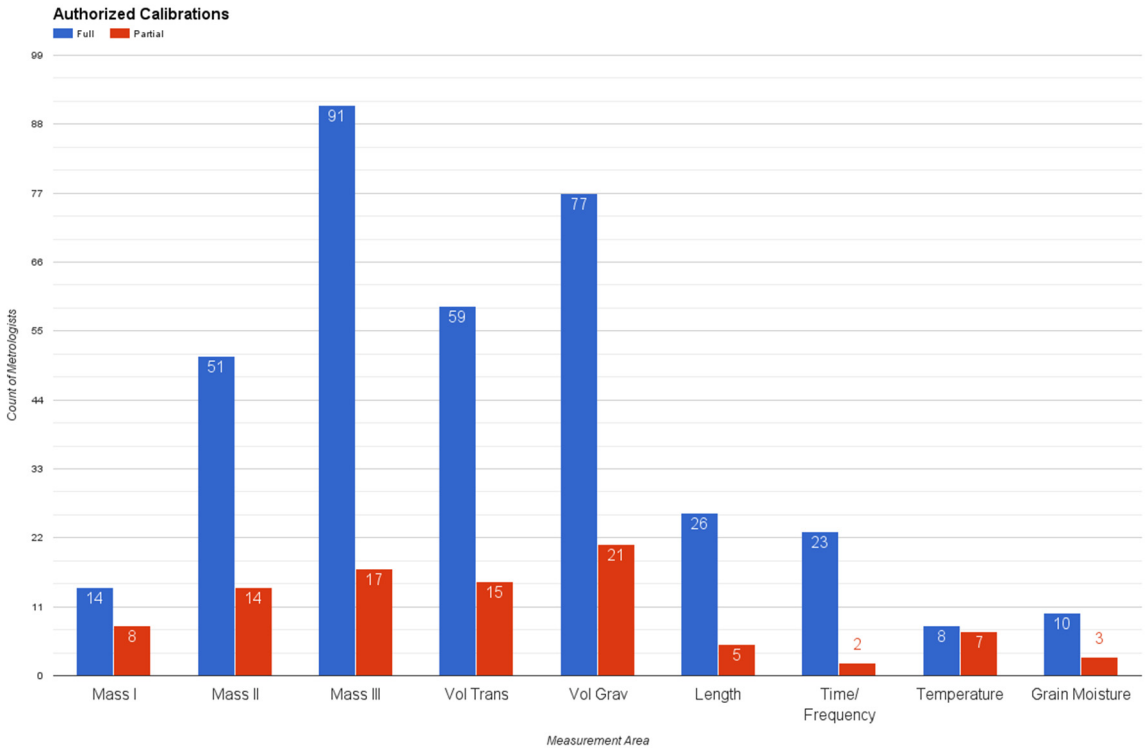

Figure 45: 118 Metrologists reporting. Metrologists were asked to indicate which type of calibrations they are authorized to perform on behalf of their laboratories.

State Laboratory Program/Metrology Experience

Description

Total Metrology Experience:

Each metrologist was asked to disclose their metrology experience in years. These data was broken down into two categories, years experience in the SLP, and years metrology experience outside the SLP. Figure 45 ranks the SLP metrologists by total metrology experience.

Comparison of previous surveys

Year	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
2014	118	9.2	1.7	10.9

Table 44: Comparison matrix summarizing metrology experience reported by metrologists from 2000 to 2014.

Comments:

- Data was collected for 118 metrologist in the SLP from 49 laboratories.
- Each metrologist reports an average of 9.2 years the SLP experience each.
- Each metrologist reports an average of 1.7 years “other” experience each.
- Each of the 14 metrologist reporting “other” experience reports an average of 14 years other experience.
- Each metrologists report an average of 11.4 years total experience each.

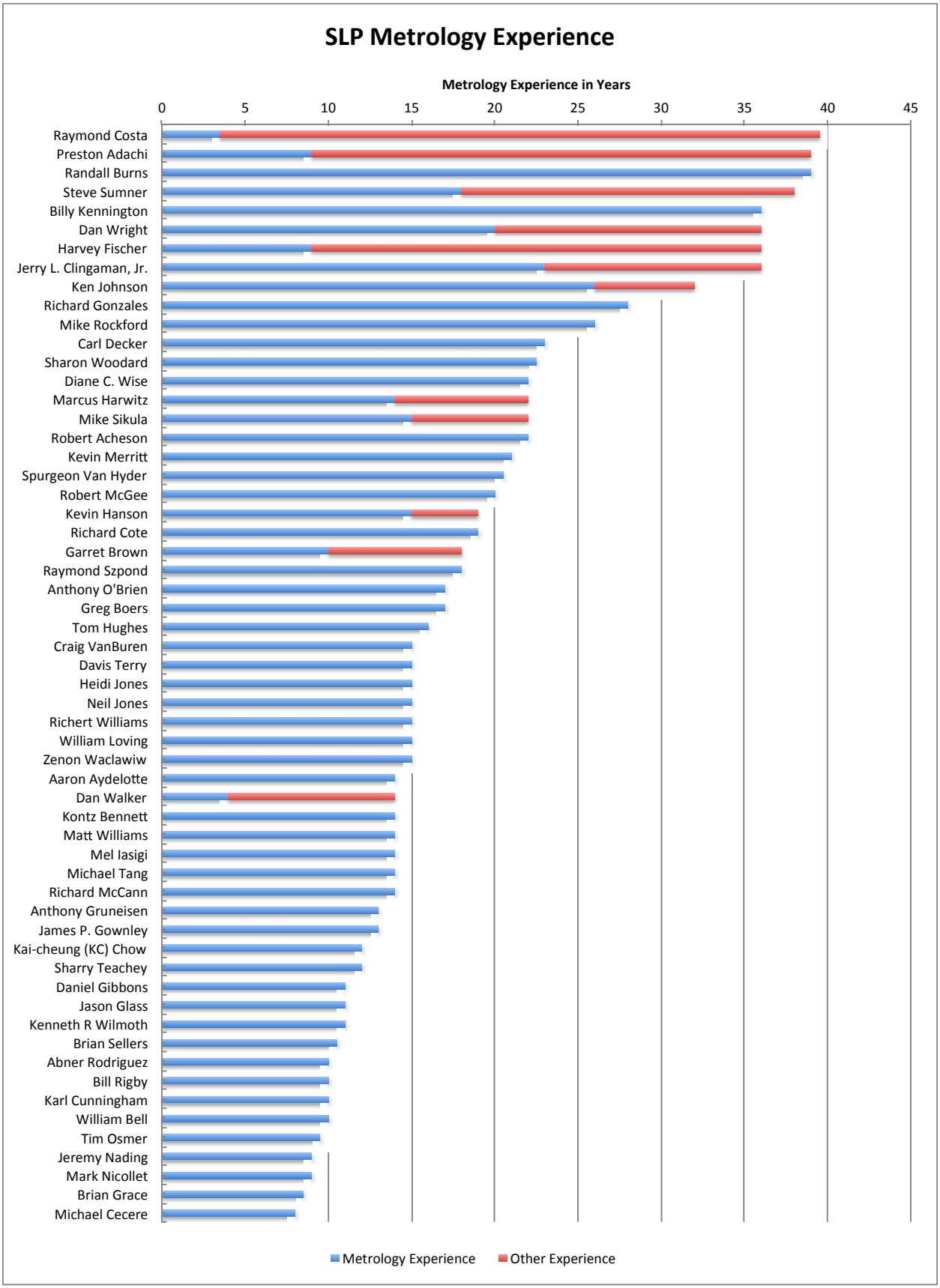

Figure 46: SLP metrologists ranked by years of experience. Blue indicates experience in the SLP, Red indicates other metrology experience.

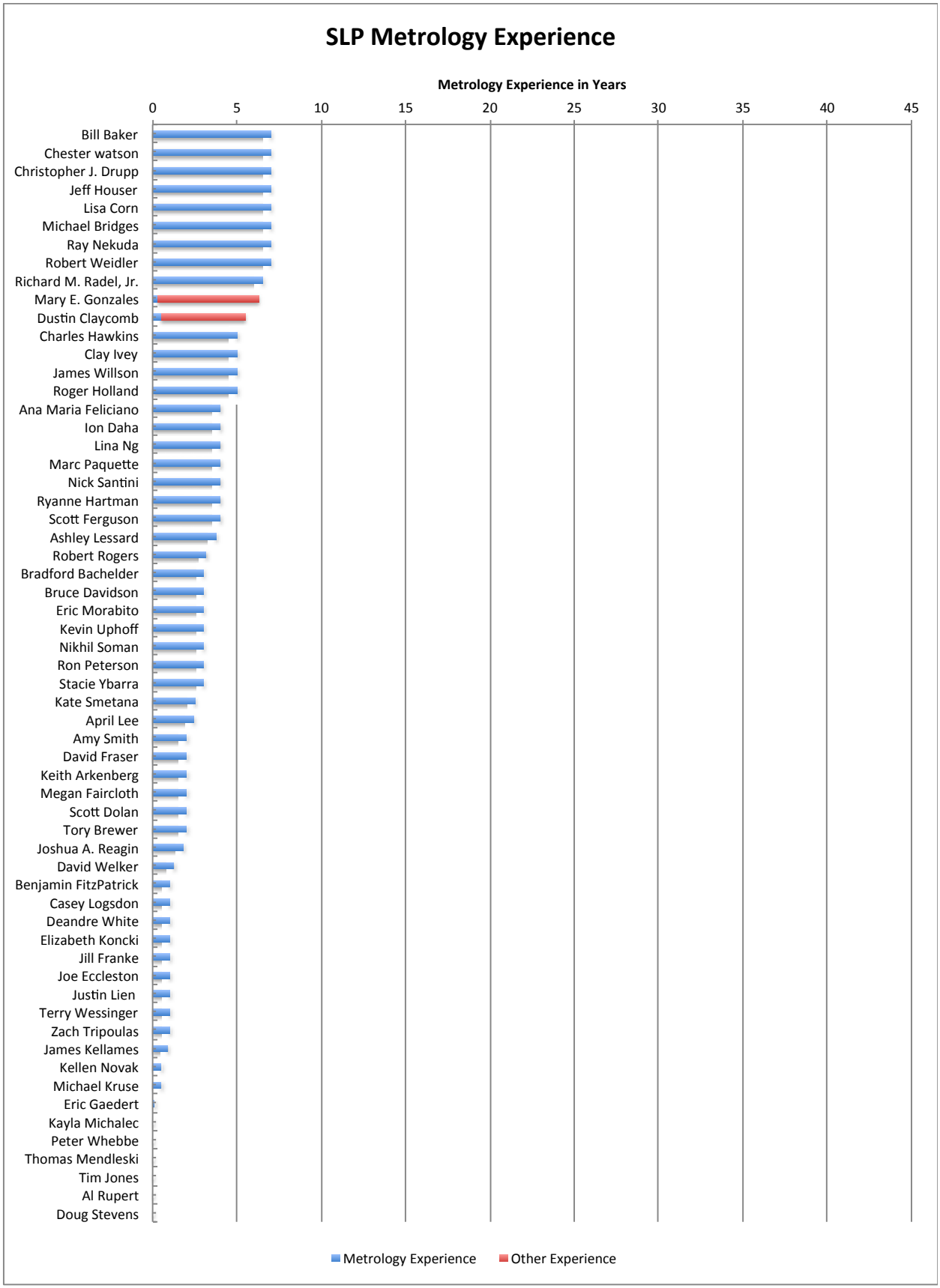

Figure 47: SLP metrologists ranked by years of experience. Blue indicates experience in the SLP, Red indicates other metrology experience.

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/WMD recognition.
- Any NVLAP Accredited Lab.
- Any Weight Manufacturer regardless of accreditation status.
- Any laboratory accredited by an accreditation body that is an ILAC signatory.

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		Yes
AZ			Yes	Yes		Yes
CA			Yes	Yes		Yes
CO			Yes	Yes		Yes
CT			Yes	Yes		Yes
FL			Yes	Yes		Yes
GA			Yes			
HI			Yes	Yes		Yes
ID			Yes			Yes
IL			Yes			
IN			Yes			
KS			Yes	Yes		Yes
KY			Yes	Yes		Yes
FL			Yes	Yes		""
CA			Yes	Yes		Yes
MA			Yes	Yes		Yes
MD			Yes			
ME			Yes	Yes		Yes
MI			Yes	Yes		
MN			Yes			
MO			Yes	Yes		Yes
MS			Yes			
MT			Yes	Yes		
NC			Yes	Yes		Yes
NE			Yes	Yes		
NH			Yes	Yes		Yes
NJ			Yes			
NM			Yes	Yes		Yes
NV			Yes	Yes		Yes
NY			Yes	Yes		Yes
OH			Yes	Yes		
OK			Yes	Yes		Yes
OR			Yes	Yes		Yes

[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 Accrediation Body that is an ILAC Signatory
PA			Yes			
PR	Yes					
SC			Yes			
SD			Yes	Yes		Yes
TN			Yes			
TX			Yes	Yes		Yes
IL			Yes	Yes		
UT			Yes	Yes		
VA			Yes	Yes		Yes
VT			Yes	Yes		Yes
WI			Yes			
WV						Yes
WY			Yes	Yes		Yes
WA			Yes	Yes		Yes

Table 45: Calibration Certificate acceptance matrix.

Supplemental Survey Questions

Calibration Times

Each laboratory was asked to estimate the time required to complete a specific type of calibration. This data is useful in comparing procedures and training needs. If a laboratory is significantly different from its peers they may need to analyze the reason. The calibrations we asked the participants to list were calibration of a 21 piece precision weight set beginning with 100 g using echelon I measurement procedures, calibration of a 21 piece precision weight set beginning with 100 g using echelon II measurement procedures, calibration of a 22 piece weight set to NIST Handbook 105-1 Class F tolerances using echelon III measurement procedures, calibration of a 5 gallon test measure by volume transfer, calibration of a 5 gallon slicker plate standard gravimetrically, calibration of a 100 gallon dry bottom prover by volume transfer, calibration of a 100 gallon dry bottom prover gravimetrically, calibration of a 100 gallon liquefied petroleum gas (LPG) prover by volume transfer, and calibration of a 20 gallon captive displacement prover (CDP), method unspecified.

Echelon I 100 g set (21 Weights)

Description

Each laboratory was asked to estimate the time required to complete a calibration of a 21 piece precision weight set beginning with 100 g using echelon I measurement procedures.

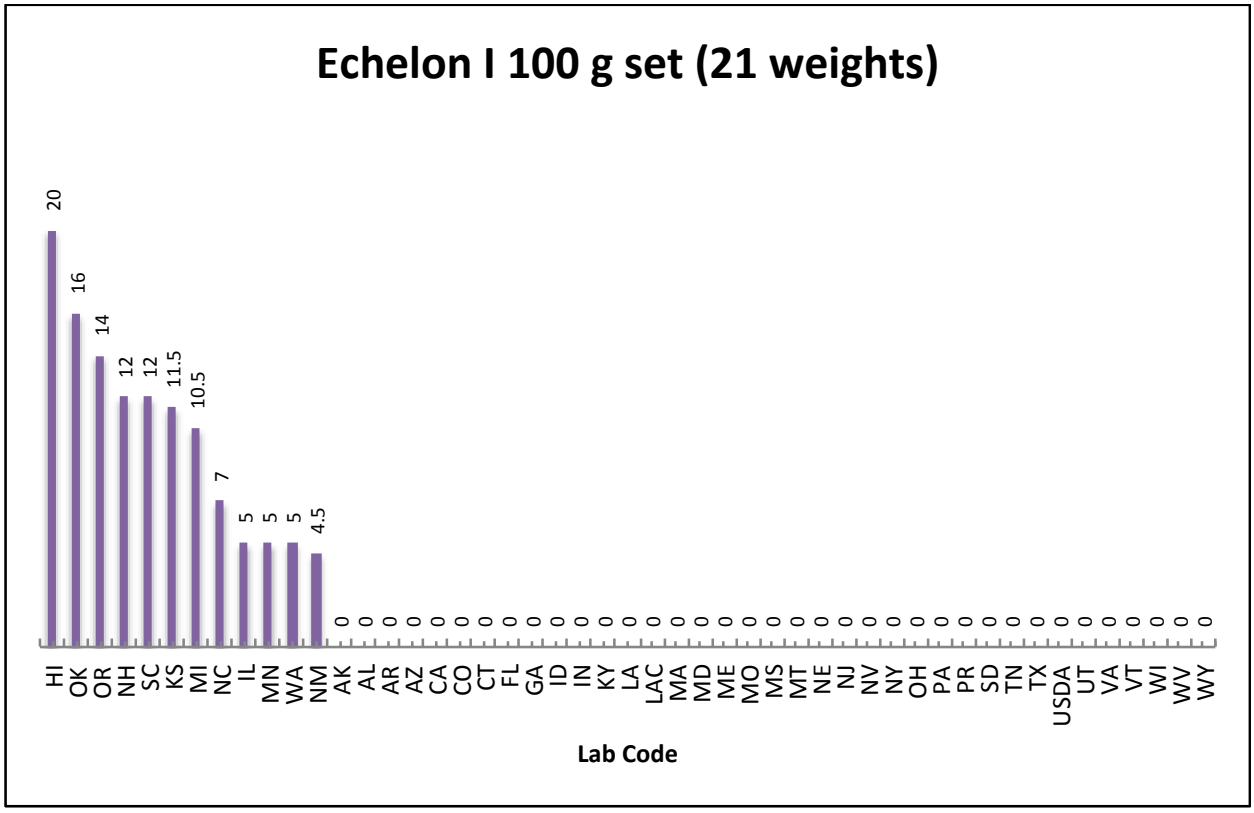

Figure 48: Time to calibrate a 21 piece precision weight kit beginning with 100 g using echelon I measurement procedures. All times reported in hours.

Echelon II 100 g set (21 Weights)

Description

Each laboratory was asked to estimate the time required to complete a calibration of a 21 piece precision weight set beginning with 100 g using echelon II measurement procedures.

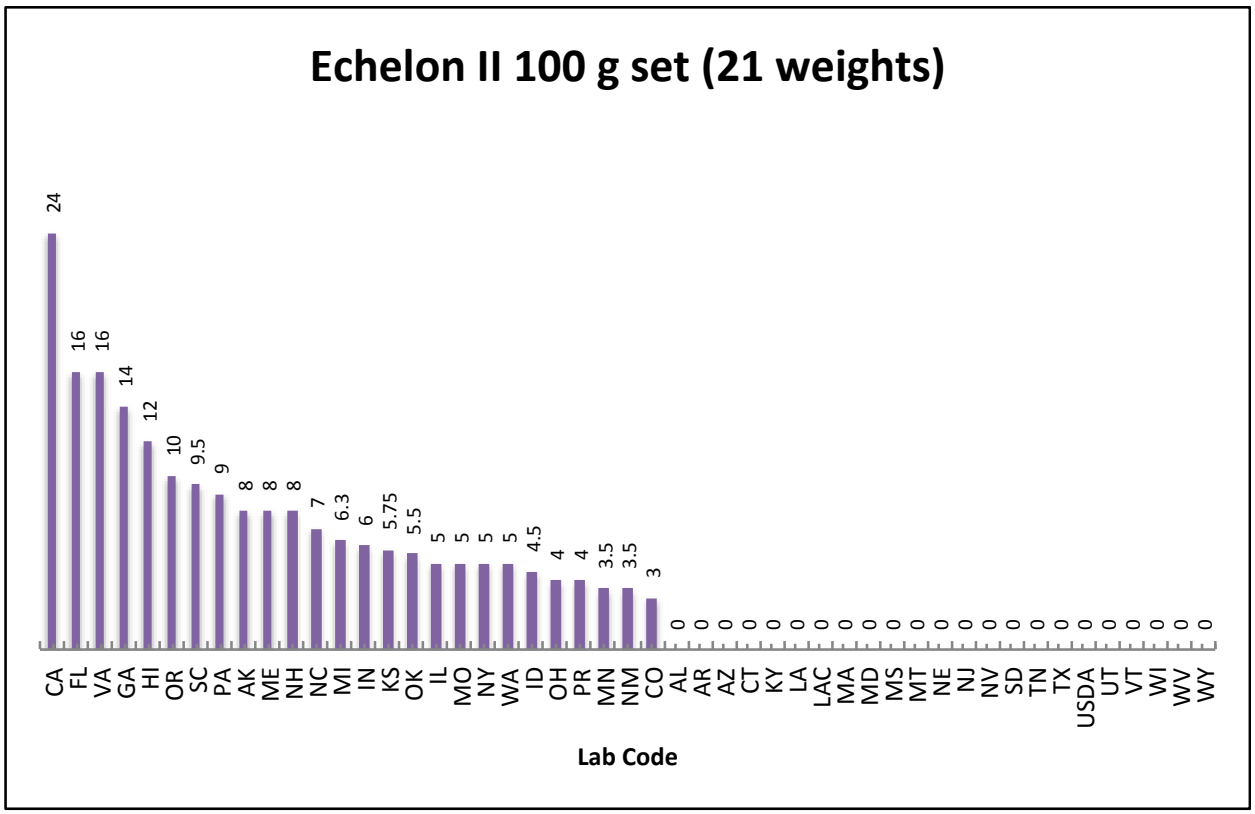

Figure 49: Time to calibrate a 21 piece precision weight kit beginning with 100 g using echelon II measurement procedures. All times reported in hours.

Echelon III 31 lb set (22 Weights)

Description

Each laboratory was asked to estimate the time required to complete a calibration of a 22 piece weight set to NIST Handbook 105-1 Class F tolerances using echelon III measurement procedures.

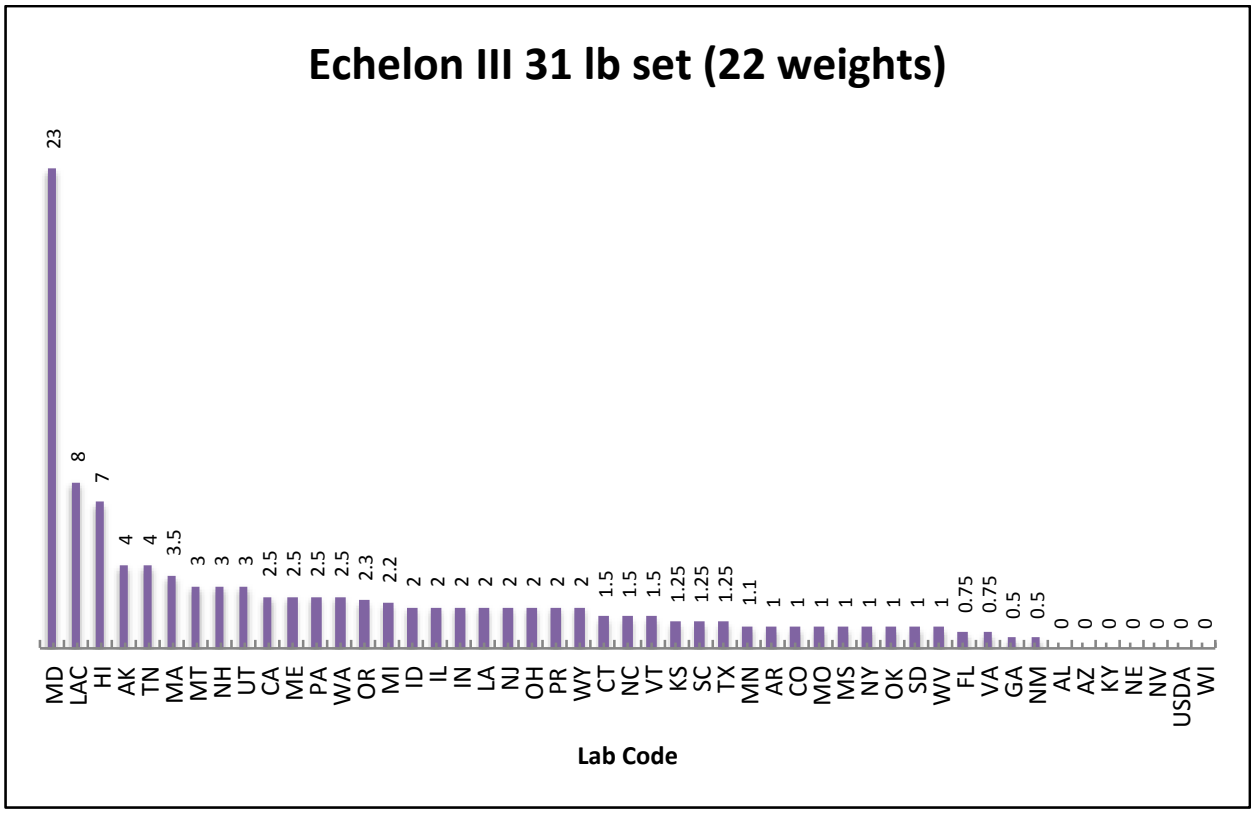

Figure 50: Time to calibrate a 22 piece 31 lb weight kit using echelon III measurement procedures. All times reported in hours.

5 Gallon Test Measure by Volume Transfer

Description

Each laboratory was asked to estimate the time required to complete a calibration of a 5 gallon test measure by volume transfer.

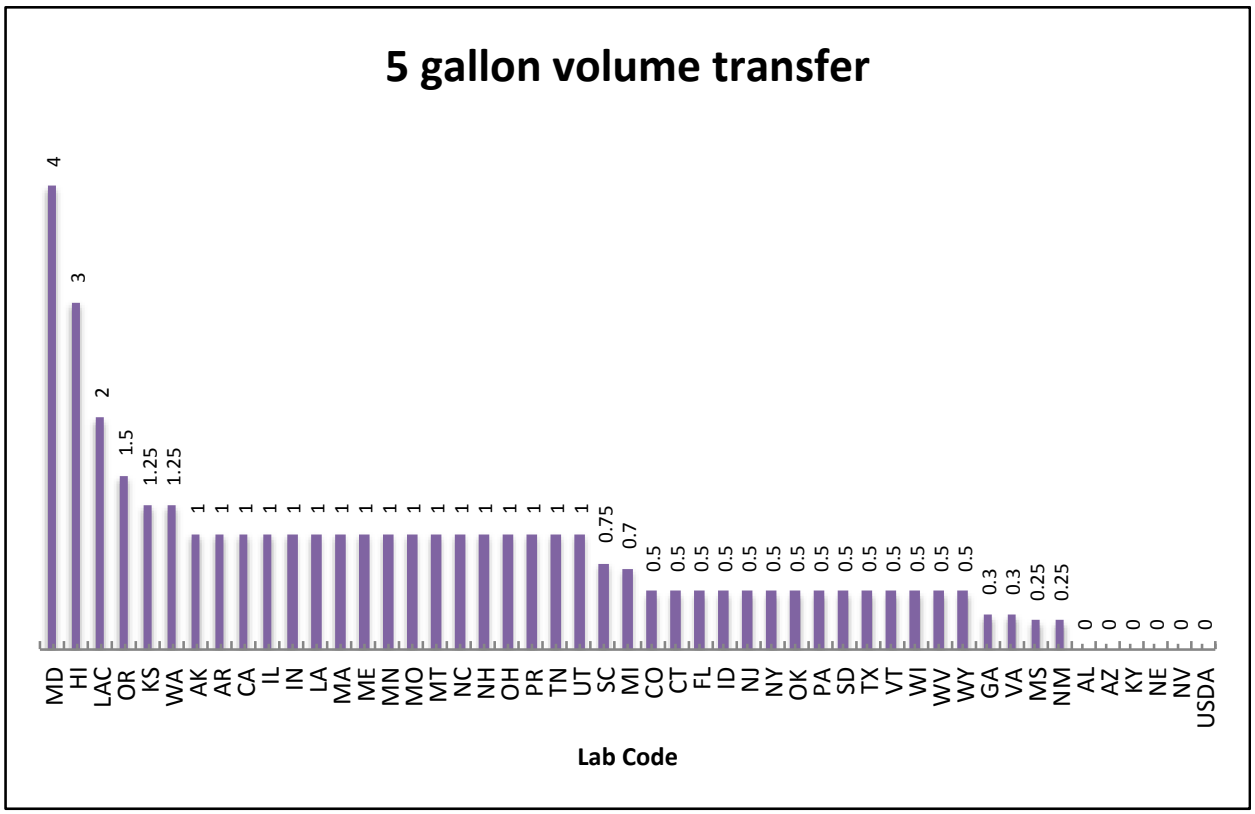

Figure 51: Time to calibrate a 5 gallon test measure by volume transfer. All times reported in hours.

5 Gallon Slicker Plate Standard - Gravimetrically

Description

Each laboratory was asked to estimate the time required to complete a calibration of a 5 gallon slicker plate standard gravimetrically.

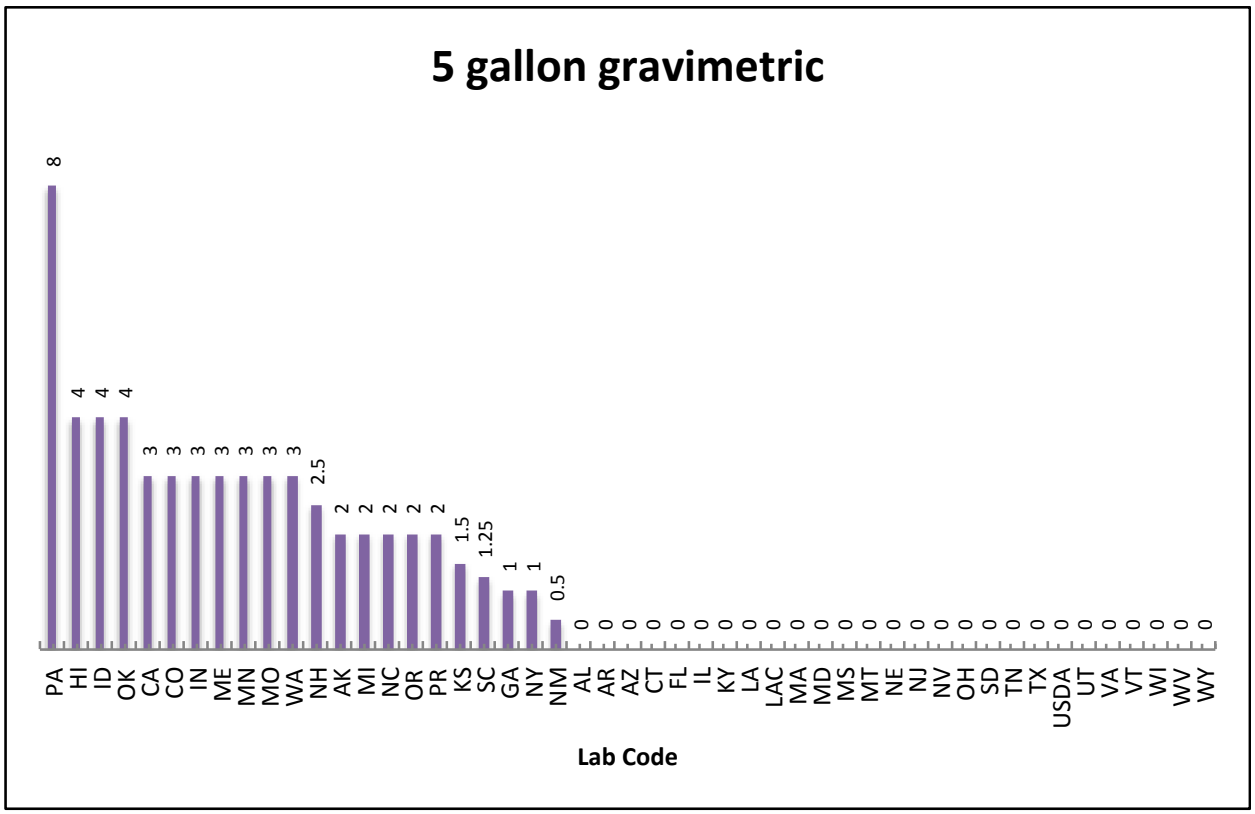

Figure 52: Time to calibrate a 5 gallon slicker plate standard gravimetrically. All times reported in hours.

100 Gallon Dry Bottom Prover by Volume Transfer

Description

Each laboratory was asked to estimate the time required to complete a calibration of a 100 gallon dry bottom prover by volume transfer.

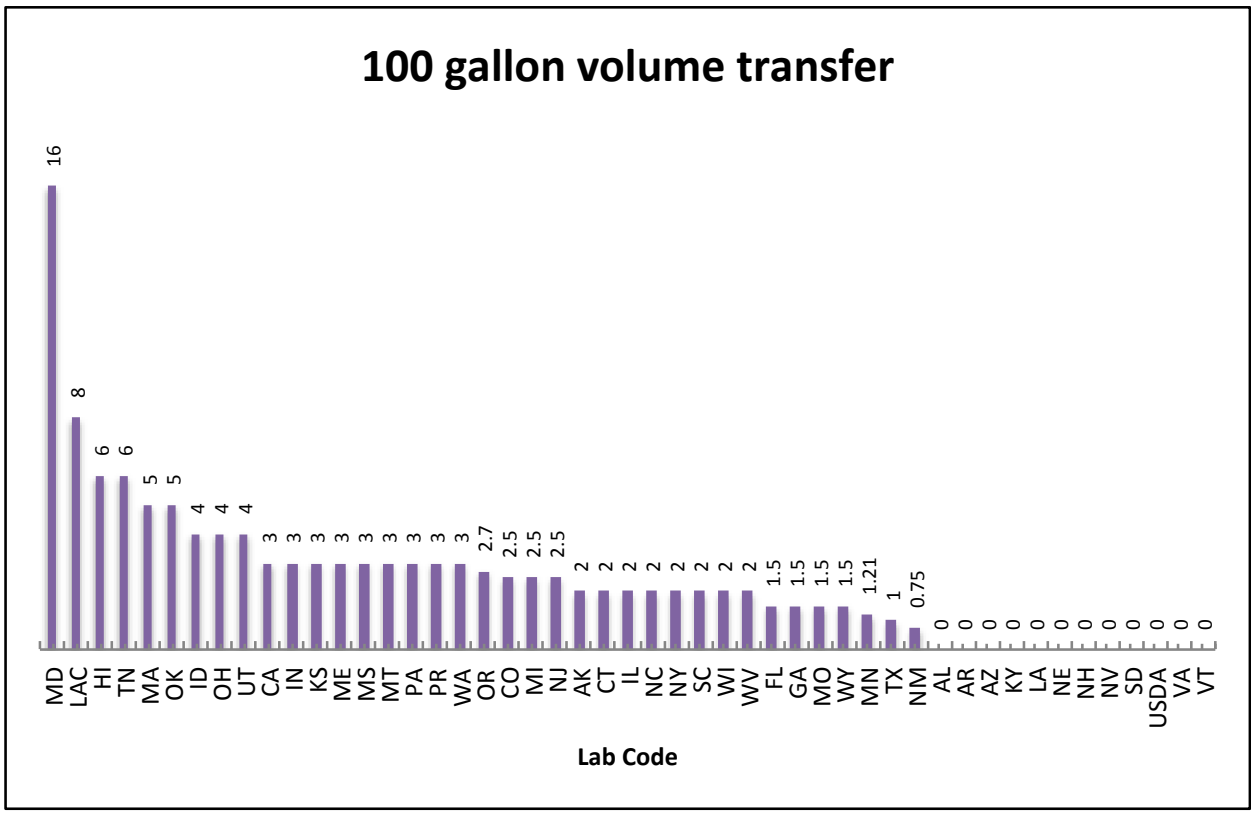

Figure 53: Time to calibrate a 100 gallon dry bottom prover by volume transfer. All times reported in hours.

100 Gallon Dry Bottom Prover - Gravimetrically

Description

Each laboratory was asked to estimate the time required to complete a calibration of a 100 gallon dry bottom prover gravimetrically.

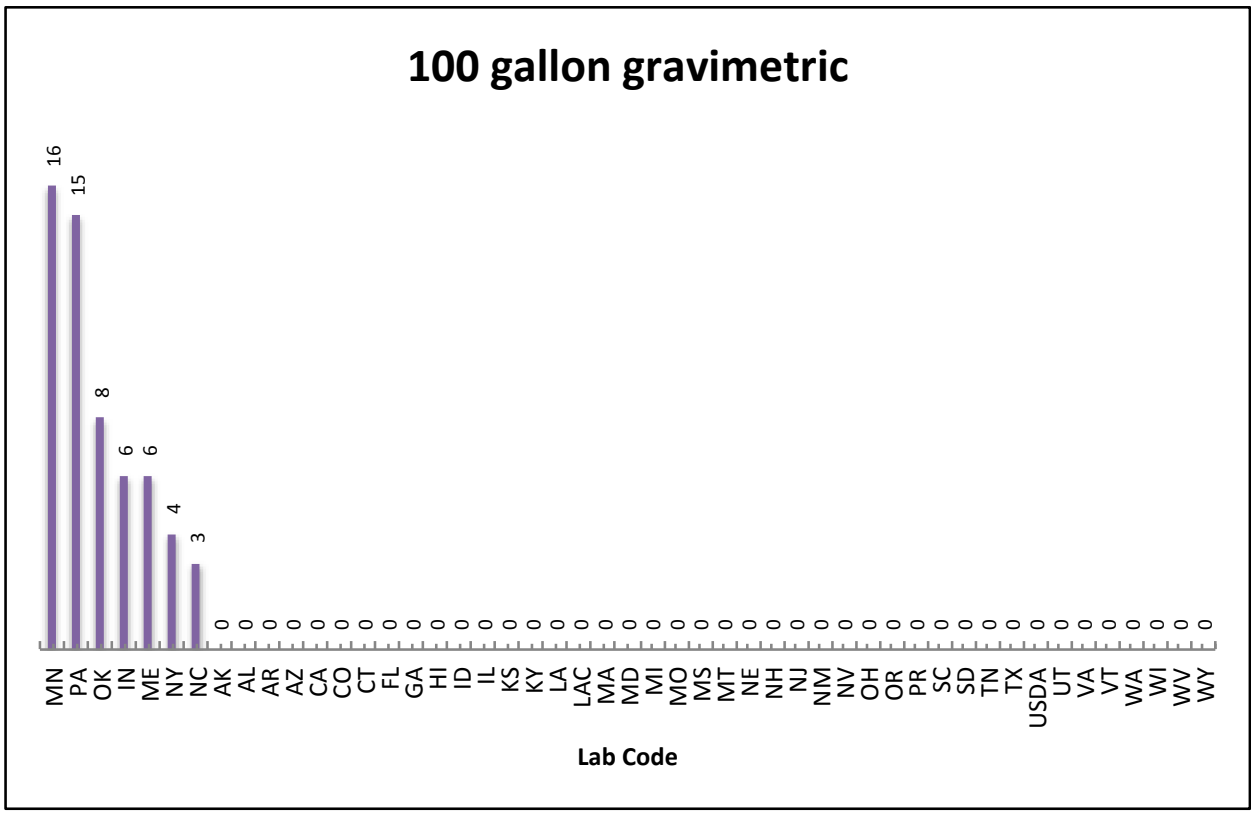

Figure 54: Time to calibrate a 100 gallon dry bottom prover gravimetrically. All times reported in hours.

100 Gallon LPG Prover by Volume Transfer

Description

Each laboratory was asked to estimate the time required to complete a calibration of a 100 gallon liquefied petroleum gas (LPG) prover by volume transfer.

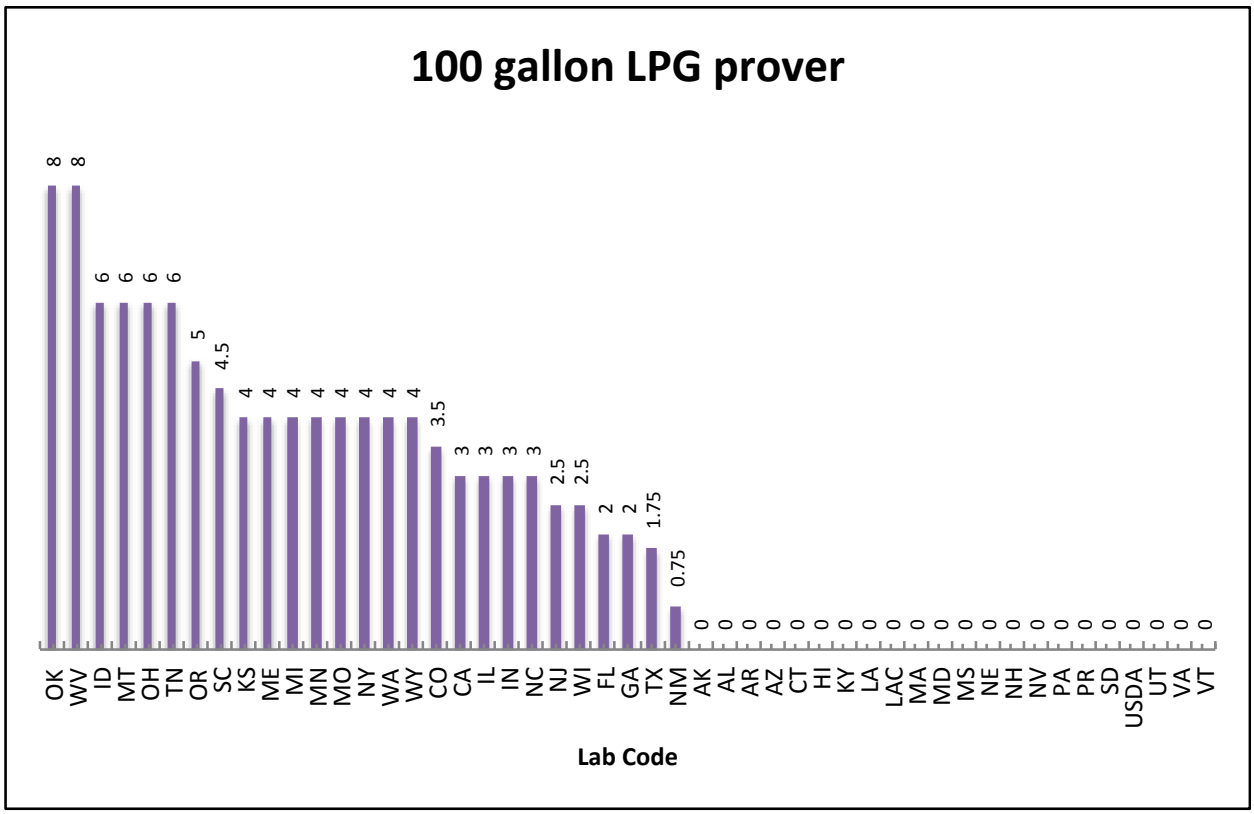

Figure 55: Time to calibrate a 100 gallon LPG prover by volume transfer. All times reported in hours.

20 Gallon CDP

Description

Each laboratory was asked to estimate the time required to complete a calibration of a 20 gallon captive displacement prover (CDP), method unspecified.

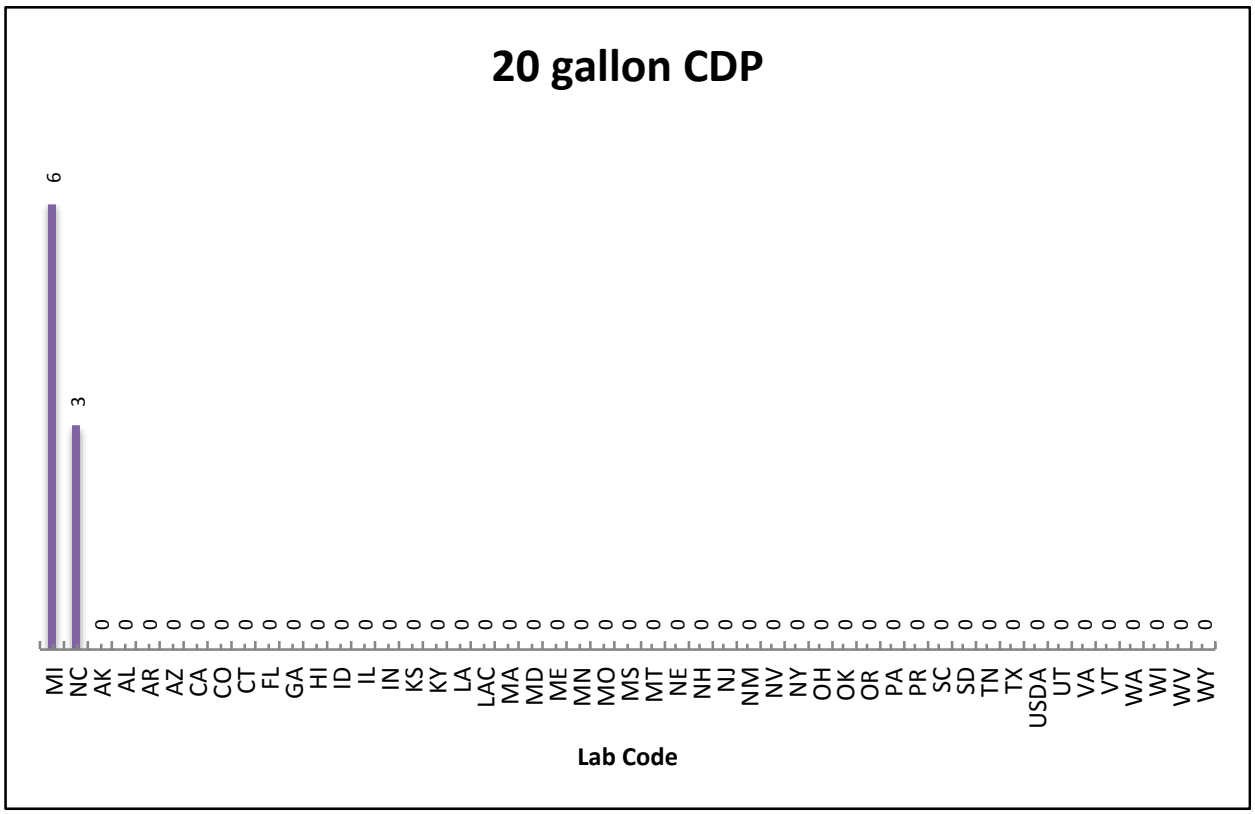

Figure 56: Time to calibrate a 20 gallon CDP. All times reported in hours.

Additional Supplemental Survey Questions

SLP Calibration Providers

Another question raised at the CRMAP in St. Louis was "Who calibrates your standards?" Below is a matrix of the State Laboratory Program (SLP) labs versus their calibration providers. The calibration provider is listed along the header row. Each laboratory in the SLP will potentially use multiple calibration service providers depending on their needs.

Lab ID	NIST	AZ	CO	ME	MI	MN	NH	NY	NC	OK	OR	PA	SC	WA	WI	Rice Lake	Hesser Newegh	Troemner	Fluke	Morehouse	Echelon I Lab	NVLAP Accredited Lab	A2LA Accredited Lab	NIST OWM recognized Lab	Self
AK																			X	X	X				X
AL																									
AR																									
AZ																									
CA	X																					X	X		X
CO										X															X
CT																								X	
FL																						X			X
GA									X				X												X
HI	X																								
ID	X																								X
IL	X																							X	X
IN	X					X				X															
KS	X									X									X						
KY																									
LA																								X	
LAC											X			X		X	X								X
MA								X		X															
MD	X				X		X												X						
ME																								X	X
MI	X																								X
MN																									X
MO	X																							X	X
MS													X												
MT						X								X											
NC	X					X	X			X	X														X
NE					X	X																			
NH	X					X										X									
NJ	X			X			X																		
NM	X																								X
NV																									
NY	X																				X				
OH	X				X					X	X					X									
OK	X																								X
OR	X																								X
PA	X															X	X	X							
PR	X																								
SC	X																								X
SD						X				X															
TN										X			X												
TX		X								X															
USDA	X					X									X										
UT	X										X														
VA	X								X							X									X
VT																								X	
WI					X	X			X	X		X													
WV																						X	X		
WY	X		X																						
WA	X									X							X								X

Table 46: SLP Calibration Provider Matrix.

Requests for Calibrations Outside of the Lab's Scope

The final supplemental question was what requests for calibrations do you get, but cannot provide. Below of a list of the laboratories and the questions the calibrations

Lab ID	**Please list calibration request that you have gotten that were not on your scope.**
AK	Captive Displacement Prover (CDP), Thermometry Echelon II mass
CA	Watthour standards, Bell provers, flow meters, SVP and calipers
CO	3000 lb weights and Echelon I calibrations.
CT	Mass Calibration of higher Echelon that the Lab is recognized and Thermometry.
FL	Thermometry, Small volume gravimetric (pipettes), 2500 lb cast iron, 2000 lb cast iron
HI	Temperature, Pressure
ID	Gauge Blocks, Pressure gauges, thermometer, length
IN	Gauge blocks
KS	Mass I, Thermometry
MA	Accuracy verification and re-calibration (if required) of State Issued Legal for Trade small capacity package checking scales used by our state field inspectors to perform checking package content (weight)
ME	Time, length, temperature.
MN	One request for an echelon I mass kit (post mid 2014).
NH	Large mass, large volume
NJ	Echelon I and II Mass Calibrations, Thermometry Calibrations
NM	Water meters, torque
NY	Thermometers
OH	Mass: ASTM Class 0 and 1
OK	SVP prover, Displacement prover, Gage Block, Length
PA	Pipette, Thermometer, LPG Prover
SC	Gauge Blocks, Thermometers
SD	Class 1 and Class 2 kits
TN	METRIC WEIGHTS <5 KG TORQUE (Bottle Cap)
TX	Captive Displacement Provers, Tape Measures
USDA	Calibration of 500 lb. weights.
VT	Weight carts, 100 gallon volume transfer, field provers.
WI	Echelon II ASTM Class 1 & 2
WY	Mass Echelon II, 5000 lb Mass Echelon III
WA	Small Volume Provers

Table 47: Calibration request.

2014 State Laboratory Program Survey
DUE by March 1, 2015

Email or Mail: **van.hyder@ncagr.gov**	**North Carolina Standards Laboratory** **1051 Mail Service Center** **Raleigh, NC 27699-1051** **Attn: Van Hyder**

1. Contact Information for Person Completing this Survey

Name: _____
Phone: _____
Fax: _____

2. Laboratory Information

Laboratory: _____
Mail Address: _____
City, State, Zip: _____
Web Site: _____

3. Laboratory Age & Size

Age of Lab: _____
Office Space: _____
Active Lab Space (used for calibration): _____

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/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 (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	Volume I	Volume II	Length	Time/Frequency	Temperature	Grain Moisture		State Lab Metrology	Other Metrology	Total Metrology Experience

2014 Workload Information

NOTE: The following information should be based on a 12 month period, preferably Jan 1, 2014 through Dec 31, 2014 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 **_January 1, 2014__** To **_December 31, 2014____**

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	

Mass Echelon II		
Number of mass standards. ASTM Class 1, 2, 3 OIML Class E2, F1	Lab (Internal)	
	W&M Program	
	External Customers	
	Total	

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	

Weight Carts		
Number of weight carts calibrated.	Lab (Internal)	
	W&M Program	
	External Customers	
	Total	

Volume – Glassware			
		Vol-Transfer	Gravimetric
Number of individual pieces of volumetric glassware calibrated. Note: Indicate number of Volume Transfer (V-T) and/or Gravimetric test methods.	Lab (Internal)		
	W&M Program		
	External Customers		
	Total		

Volume – CDP (Captive Displacement Provers) (NOT 5 gallon test measures)			
		Vol-Transfer	Gravimetric
Number of captive displacement provers calibrated. Note: Indicate number of Volume Transfer (V-T) and/or Gravimetric test methods. If you don't know what a CDP is, your answer is probably zero.	Lab (Internal)		
	W&M Program		
	External Customers		
	Total		

Volume – LPG			
		Vol-Transfer	Gravimetric
Number of individual LPG provers calibrated. Note: Indicate number of Volume Transfer (V-T) and/or Gravimetric test methods.	Lab (Internal)		
	W&M Program		
	External Customers		
	Total		

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

Volume – Non-Pressurized Medium Metal Standards (> 5 gallon and ≤ 100 gallon)			
		Vol-Transfer	Gravimetric
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.	Lab (Internal)		
	W&M Program		
	External Customers		
	Total		

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

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

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

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

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

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

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

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

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 CDP (captive displacement prover) using volume transfer method:		$
One – 20 gallon CDP (captive displacement 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.
Fees listed are for in-state customers. Out-of-state customers are charged double the in-state rate for all calibrations listed.

Additional questions for this survey captured at the CRMAP in St. Louis.

Impact of time		
How many hours does each mass calibration take?	Echelon I 100 g set (21 weights)	
	Echelon II 100 g set (21 weights)	
	Echelon III 31 lb set (22 weights)	

Impact of time		
How many hours does each volume calibration take?	5 gallon volume transfer	
	5 gallon gravimetric	
	100 gallon volume transfer	
	100 gallon gravimetric	
	100 gallon LPG prover	
	20 gallon CDP	

Calibration of standards	

Request you cannot provide	
Please list calibration request that you have gotten that were not on your scope.	

8. Comments on Survey

MAIL COMPLETED SURVEY TO:

North Carolina Standards Laboratory
1051 Mail Service Center
Raleigh, NC 27699-1051
Attn: Van Hyder

Telephone: 919.733.4411
Email: van.hyder@ncagr.gov

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