2010
State Laboratory Program
Workload Survey

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Acknowledgements

This report was prepared with the help of the members of the NCSLi Committee 181 - Legal Metrology Committee. Special thanks must be given to the metrology professionals working in the State Laboratory Program who generously gave of their time to complete the 2010 State Program Workload Survey thus providing the data essential to making this report possible. Thanks also go to the staff of the National Institute of Standards and Technology Weights and Measures Division who has provided considerable support in collecting data and preparing and publishing this report.

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

Objectives and History

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

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

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

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

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

Presentation and Analysis of Data

SLP laboratories submitted their data using a Microsoft Excel spreadsheet, or a Microsoft Word document, or an Acrobat PDF file. This was done to accommodate as many of the participants as possible. The 2010 survey is published in this report beginning on page 96.

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

The NIST Weights and Measures Division provides an initial report workload data from the NIST Measurement Services Division from 2000 through 2010 covering a range measurements including mass, volume, temperature, pressure, etc. It describes the value of each measurement performed and the value of the SLP laboratories in assisting in providing metrologically traceable measurements in support of commerce. The SLP removes a burden from the NIST Measurement Services, as is evidenced by the sheer number of devices tested, and provides a relatively convenient source of traceable measurements for the local industry. This report also outlines training and laboratory accreditation goals and quantifies their progress towards meeting these goals. The NIST report begins with "Impact and Leveraging of NIST Calibrations" on page 10.

The participant SLP laboratories in the survey are identified by name location, age, size, and number of customer's served in the opening section of the survey. 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 (3). Each laboratory's participation in previous surveys is reported from 1996 through 2010.

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 29, Length on page 38, Volume on page 43, and all other tests from pages 58 through 68.

All of the SLP laboratories responding to the 2010 SLP workload survey report performing measurement services for hire in addition to the regulatory functions it supports. Fee data for 2010 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 (2010)" beginning on page 69.

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 2010 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 83.

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 94 detailing each laboratory's calibration certificate acceptance policy.

A supplementary section of questions is included in the 2010 survey. When authorizing the use of measurement and test equipment many of the SLP laboratories utilize various standards detailing the construction and tolerances applied to this equipment. The 2010 survey provides a list of NIST 105 series handbooks (page 97), ASTM

(formerly American Society for Testing and Materials) standards (page 98), and International Organization of Legal Metrology (OIML) publications (page 99). The number of responses were tallied and reported here in table form.

> *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 provided this information in table form sorted by laboratory code.

Impact and Leveraging of NIST Calibrations

(Information provided by NIST/WMD)

Calibration data for State laboratories was obtained from the NIST Measurement Services Division from 2000 to 2010. One of the measures of impact of NIST calibrations is to quantify the number and impact of downstream calibrations. How many additional calibrations are made by other laboratories using these calibrations? The answer to this question is a measure of the national impact of NIST calibration services and training. This leveraging of NIST calibrations to industry by the State weights and measures laboratories contributes greatly to the economy of the United States.

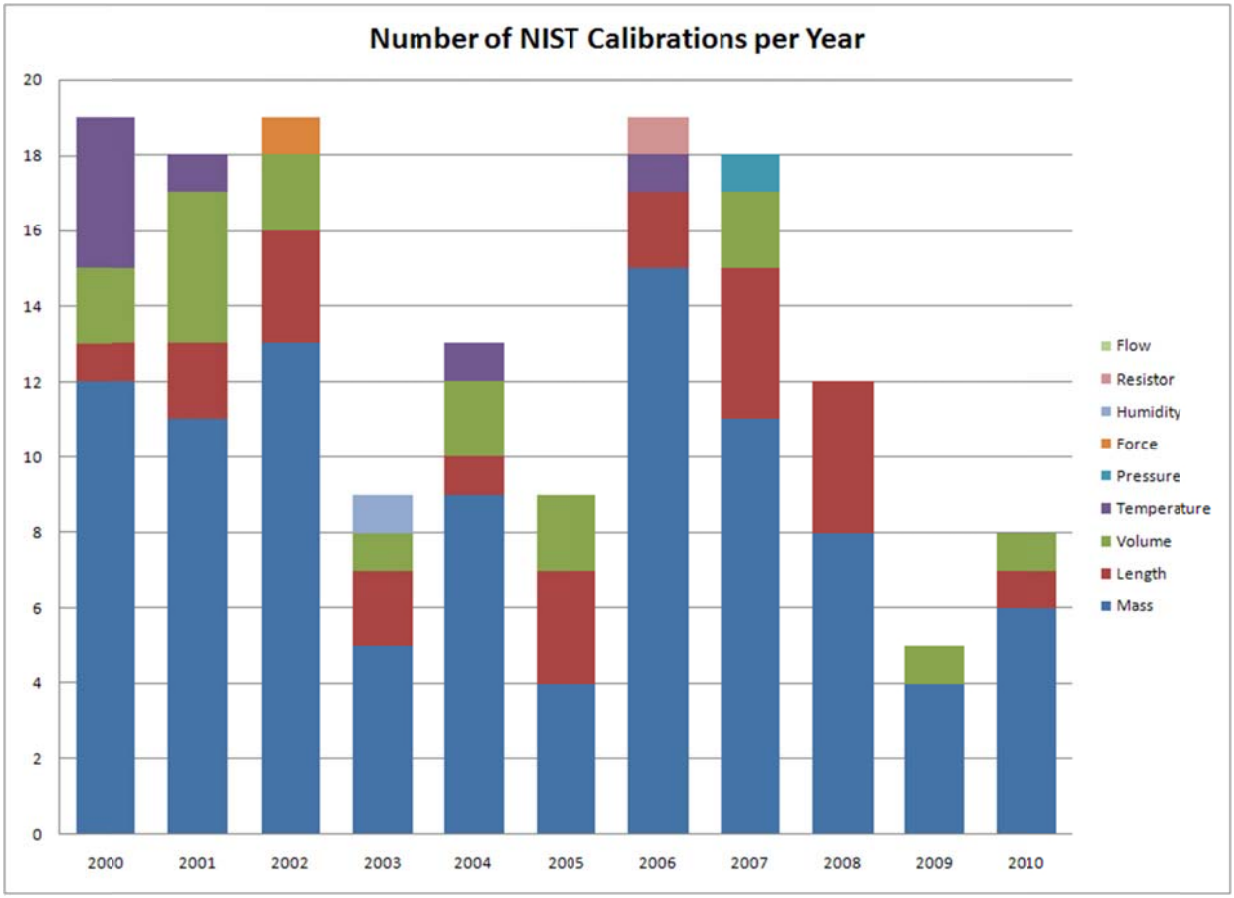


Figure 1: Number of NIST Calibrations per Year

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

State weights and measures laboratories account for a small portion of NIST's annual calibrations. The average leveraging impact is approximately 28,000:1. Given data obtained in the early SLP surveys, about half of the customer workload in the state laboratories is for industry and other government agencies (i.e., not weights and measures enforcement efforts). Many of these customers are the same customers who in other countries must obtain calibrations from the National 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 $13.2 trillion U.S. GDP (2006). 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 Weights and Measures Division (WMD) is to coordinate the SLP . Each state laboratory that is recognized by WMD or accredited by NVLAP is required to have calibrations from acceptable sources, which are most often from NIST. WMD 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 these established calibration intervals.

A special assessment to catalog and document calibration standards and intervals will be 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. In the 2006 report, 8,800 volumetric standards were calibrated by the States to support petroleum meter calibration. Very small fractions of that number are calibrated annually by NIST. The same kind of leveraging comparison can be made for other measurement areas. It would require a very significant expansion of NIST facilities, equipment, and staffing just to handle the number of standards calibrated by the State weights and measures laboratories. Also, the economic impact of cost and downtime to ship standards from all over the United States to NIST for calibration would be crippling to U.S. industry.

The recognition of this evolving reality was the primary driving force behind the 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.

National Institute of Standards and Technology
Weights & Measures Division
(Information provided by NIST/WMD)

NIST Weights and Measures Division follows an operational plan as a part of its effort to comply with the Baldrige quality framework. There are four program areas in support of the State Laboratory Program (SLP). They are:

1. Laboratory Recognition
2. Metrology Training
3. Proficiency Testing
4. Development of Documentary Publications for Field Standards (105-x series NIST Handbooks)

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.)

Program 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).

Strategy: To operate a comprehensive system of laboratory program assessment, metrology training, proficiency testing, and technical development to increase and measure the knowledge, performance, and services of state metrology laboratories and demonstrate their impact.

Based on the WMD efforts and measures, and to promote more effective synergy and awareness of program objectives, additional information is included in this SLP Workload Survey. The WMD measures include the following graphs:

1. Map of laboratories Recognized by WMD.
2. Map of laboratories accredited by NVLAP.
3. Graph and Indices of Laboratory Scoring Model.
4. Laboratory Metrology Training.
5. Proficiency Testing (PT/ILC) Measures

NIST Weights and Measures Division
Certificates of Measurement Traceability
(as of May 2011)

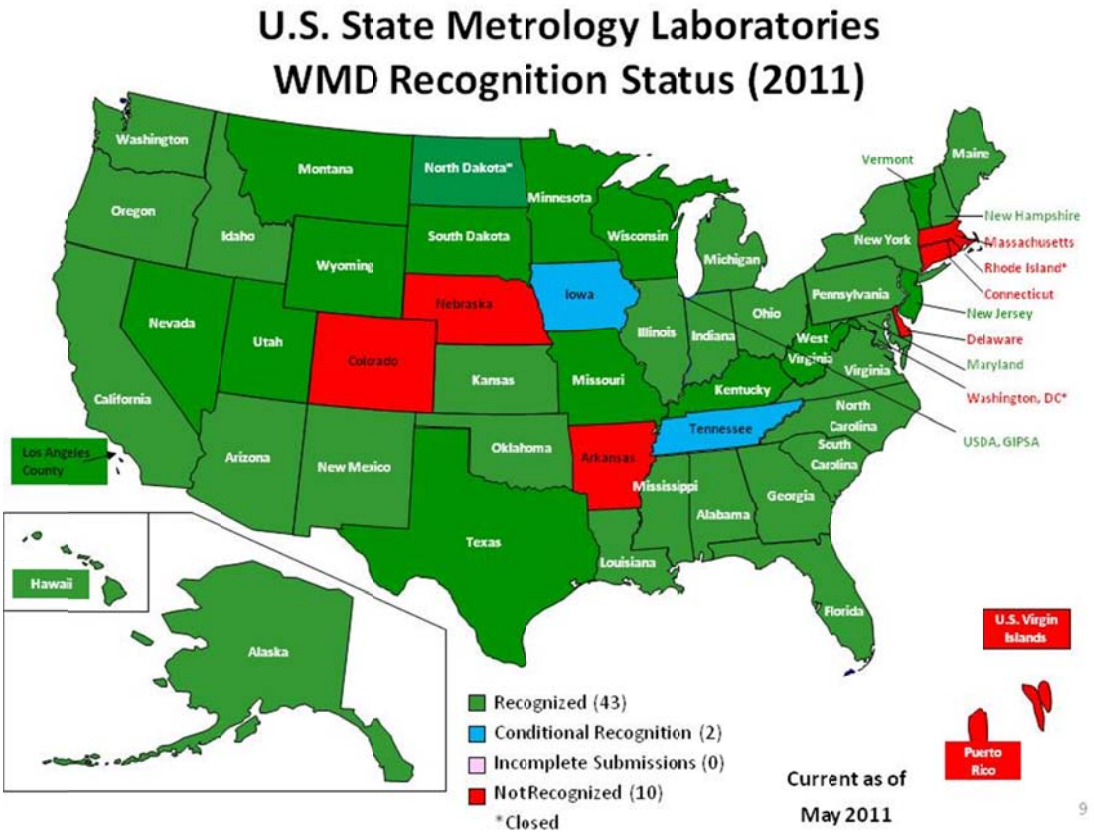


Figure 2: US State Metrology Laboratories, WMD Recognition Status (2011)

Comments:

Conditional Recognition (primarily based on facility limitations):
Iowa
Tennessee

Not Recognized:
Arkansas
Connecticut
Delaware [CLOSED]
Colorado
Massachusetts
Nebraska
Puerto Rico
Rhode Island [CLOSED]
U.S. Virgin Islands
Washington D.C. [CLOSED]

Laboratory Scoring Model

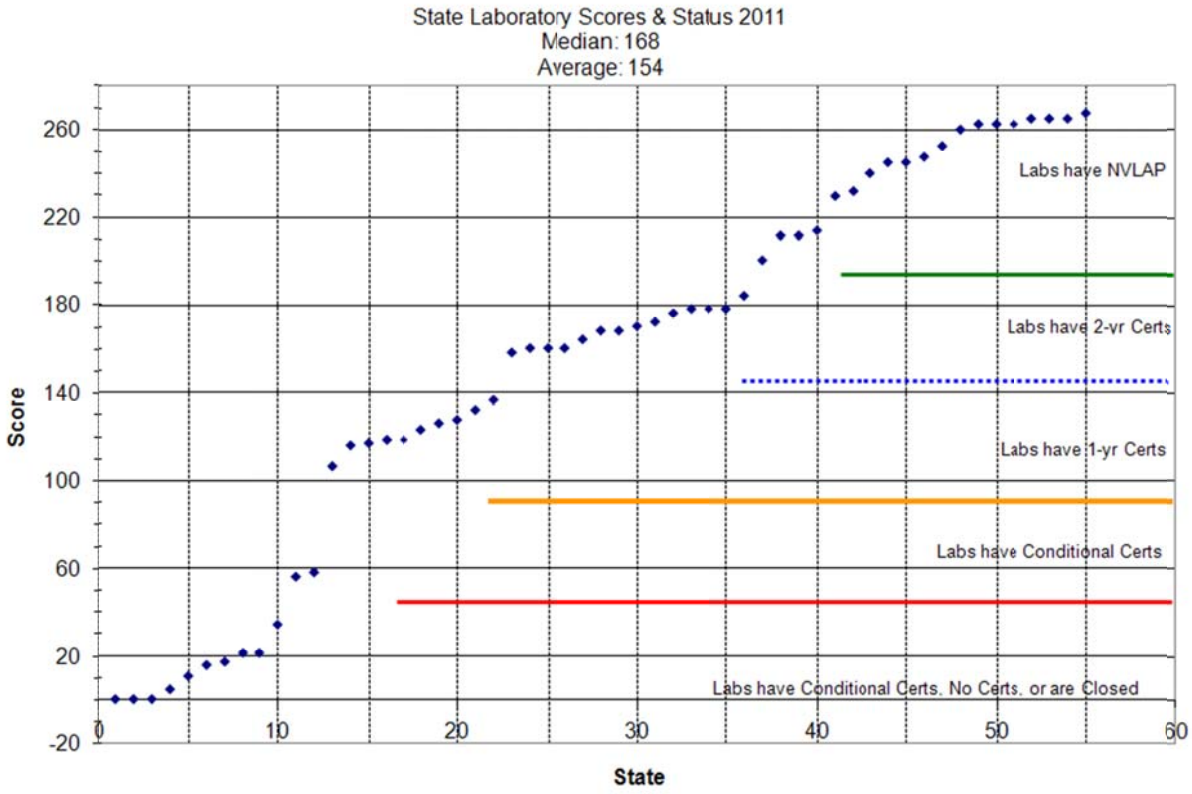


Figure 3: State Laboratory Scores & Status 2011

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 Handbook

143. The outline for the scoring model is contained on the following pages.

Points are awarded in the following categories:

• Quality Management System
• Administrative Procedures
• Facility
• Equipment
• Standards
• Staff
• Management Support
• Proficiency Tests (PTs)
• Extra Credit – Timely Submissions
• Multipliers (NVLAP accreditation with 2 year WMD Recognition, 2.5; NVLAP Accreditation with 1 year WMD Recognition, 2.25; WMD, 2 year recognition, 2; WMD, 1 year recognition, 1.5; WMD, 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 past 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.

Scoring Model Trends

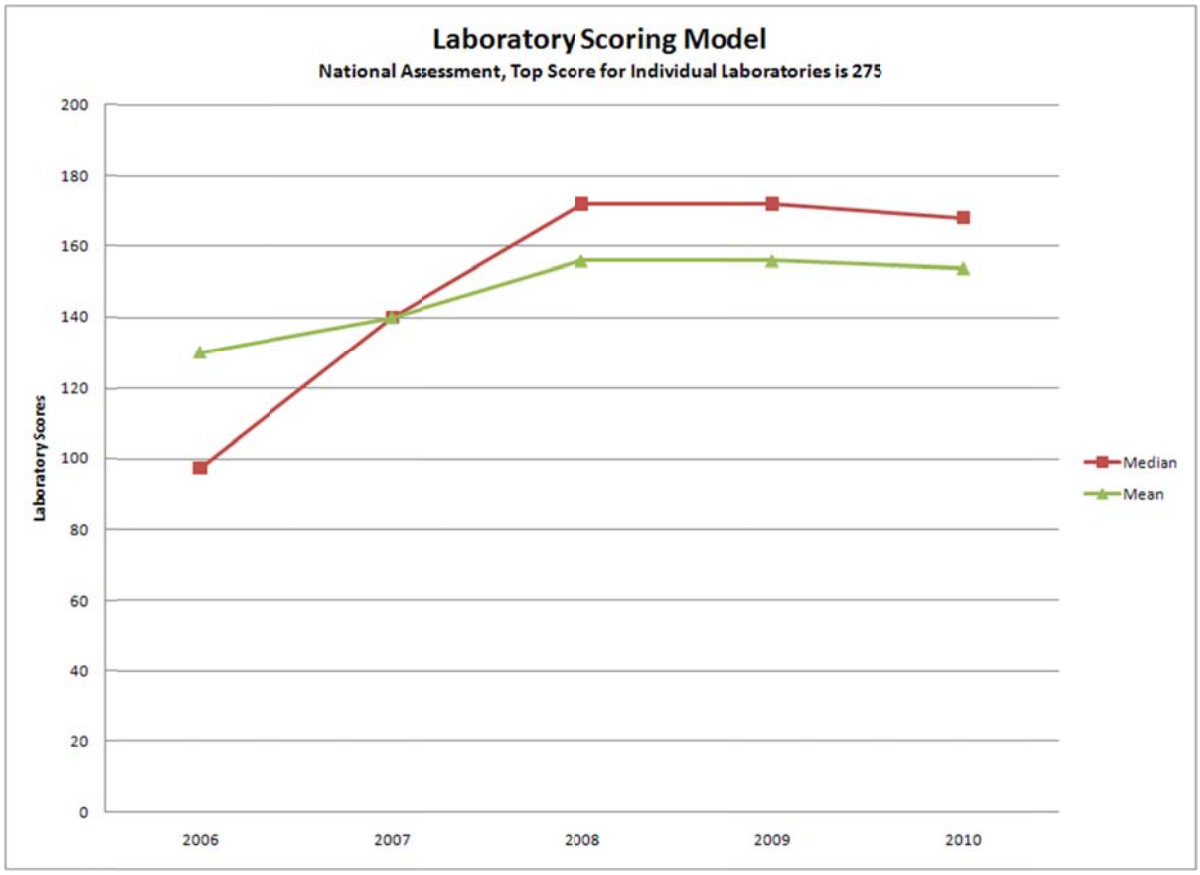


Figure 4: Laboratory scoring model trends.

Year	Median	Mean
2006	97.5	130
2007	140	140
2008	172	156
2009	172	156
2010	168	154

Table 2: Laboratory scoring model trends.

The WMD goal is to see the laboratory scores increase. Note: At this time, specific coding is not provided for identifying laboratories. In the latest assessment, we note that three laboratories that were previously Recognized failed to submit evaluation packages, which reduces the overall quality in the State laboratory system.

NIST NVLAP
Accreditation Status
(as of May 2011)

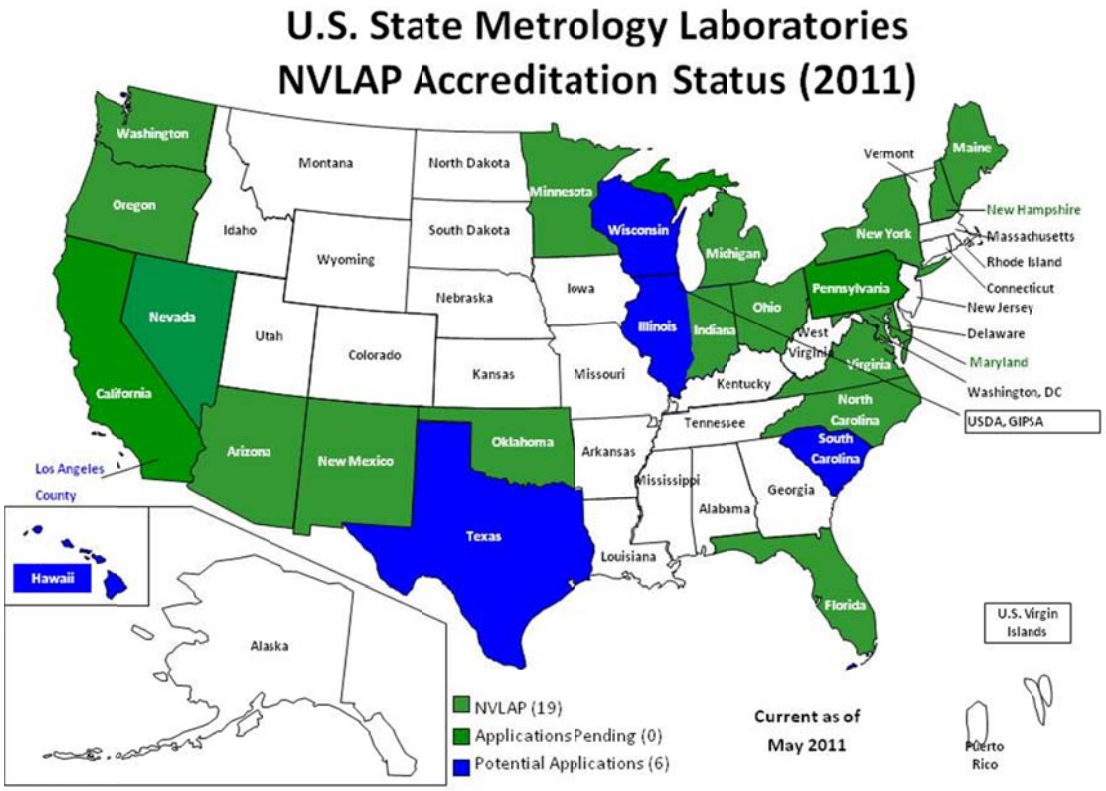


Figure 5: US State Metrology Laboratories, NVLAP accreditation status (2011).

Comments:

There are 19 laboratories currently accredited by NVLAP:

Arizona, California, Florida, Indiana, Maine, Maryland, Michigan, Minnesota, Nevada, New Hampshire, New Mexico, New York, North Carolina, Ohio, Oklahoma,

Oregon, Pennsylvania, Virginia, and Washington

There are 6 laboratories that have indicated plans to apply or have been encouraged to apply for NVLAP accreditation:

Hawaii, Illinois, Los Angeles County, South Carolina, Texas, Wisconsin

Metrology Training

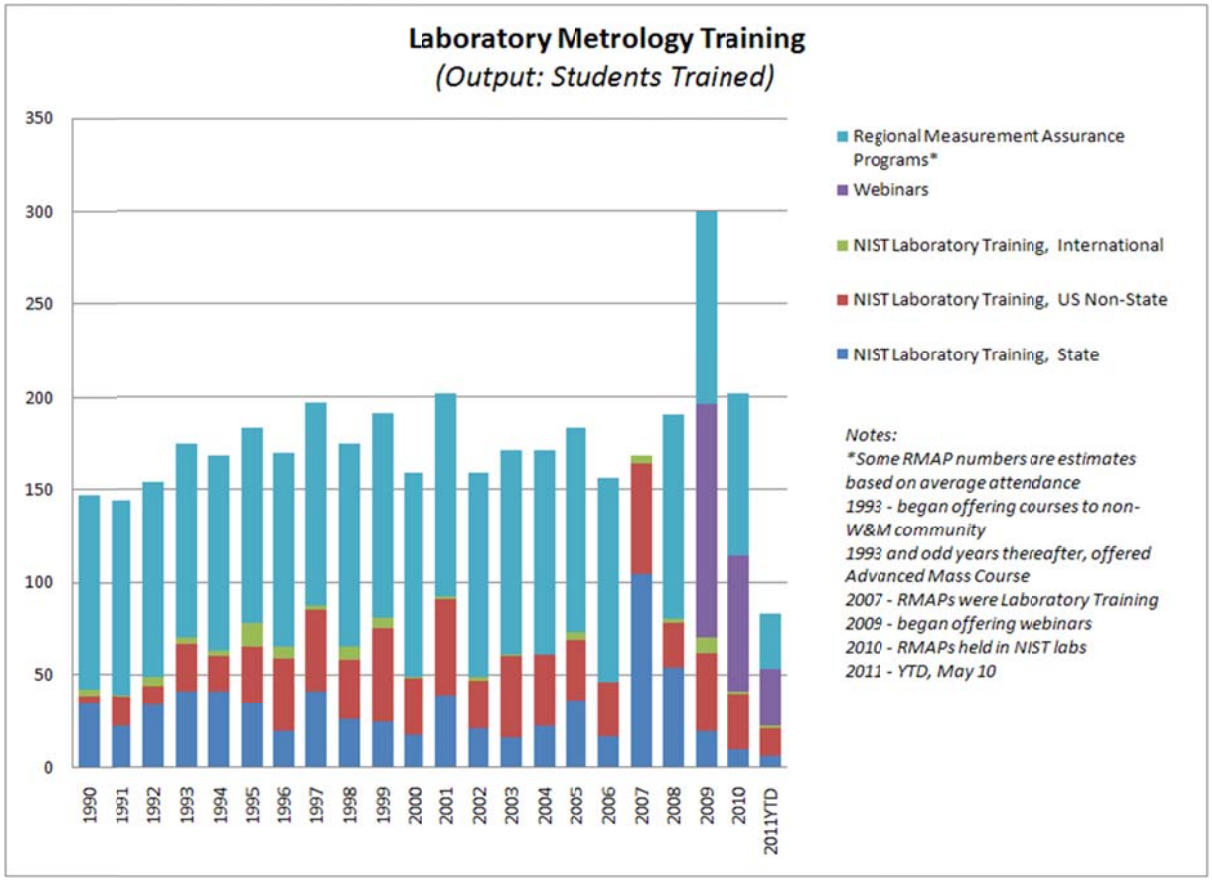


Figure 6: Laboratory metrology training.

The training graph shows the number of metrologists and categories of training at NIST since 1990. The training numbers are somewhat cyclical, primarily because the Advanced Mass course has been taught every other year since 1993. Nearly half of all students are from State weights and measures laboratories. The rest are from aerospace, pharmaceutical, defense, energy, biomedical industries and foreign governments. The mix of students is very similar to the non weights and measures calibration customers of the State laboratories.

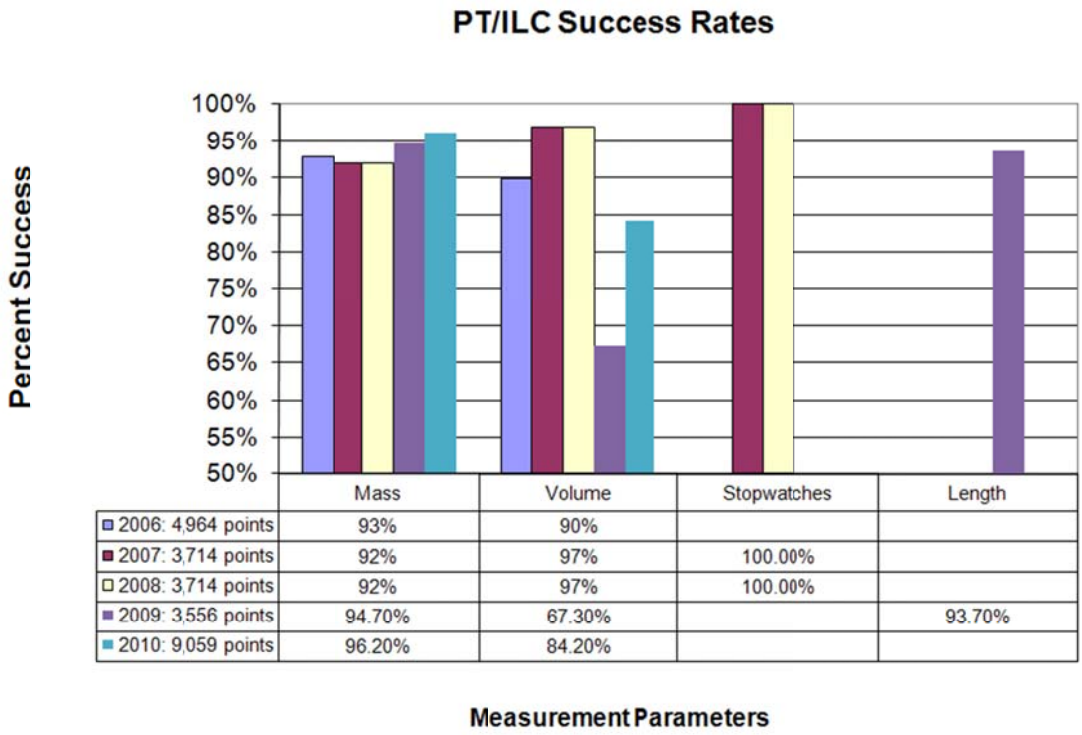
In addition to training at NIST in the Training and Demonstration laboratory, NIST also provides training at Regional Measurement Assurance Program (RMAP) meetings in six regional groups where attendance is required for ongoing laboratory Recognition and participation in the proficiency testing is required. The percentage of State laboratory staff in functional laboratories who are trained through the hands-on laboratory courses at NIST and in the RMAP training sessions is routinely maintained at over 98 %. The success goal is 100 %.

A new course was added in 2008: Laboratory Administration Workshop. The course was designed to assist laboratories in complying with the requirements of ISO/IEC 17025 (through Handbook 143, State Laboratory Program Handbook). The course is a one-week workshop with group interactions and working sessions on laboratory quality/management and technical documentation and covers auditing and submission requirements for Recognition.

An effort is underway to evaluate the NIST Laboratory Metrology Program training seminars. This SLP Training Redesign Working Group is examining the training program from the 'ground up' using current instructional models. The goal is to provide our training in a format that will produce the most competent laboratory metrologists possible. Input from past seminar attendees, as well as working group input, will be considered as plans are made to implement improvements to the training offerings.

NIST began offering Webinars in 2009 and has continued to refine the offering. Webinar courses primarily deal with compliance to the ISO/IEC 17025 criteria in the WMD and NVLAP Program Handbooks rather than specific measurement parameters. These courses are open to all interested parties.

Proficiency Testing Measures



	Mass	Volume	Stopwatches	Length
2006: 4,964 points	93%	90%		
2007: 3,714 points	92%	97%	100.00%	
2008: 3,714 points	92%	97%	100.00%	
2009: 3,556 points	94.70%	67.30%		93.70%
2010: 9,059 points	96.20%	84.20%		

Figure 7: PT/ILC Success Rates

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 Mass, special proficiency tests were begun in 2007 and continued in 2008 at the 20 kg and 500 lb precision levels. These tests have not regularly been conducted and the data shows a decline in performance, reflecting that a number of follow-up corrective actions were required. 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 with a summary report circulated to all laboratories. The top 5 lab actions that were identified from periodic reviews included the need for:

- Obtaining or calibrating standards
- Obtaining updated equipment or service for existing equipment
- Revising uncertainty analyses
- Training on problem areas and review of procedures

- 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.

In 2009, a follow up survey was conducted to assess customer feedback on the PT/ILC program. Data was collected again regarding corrective actions with the following results.

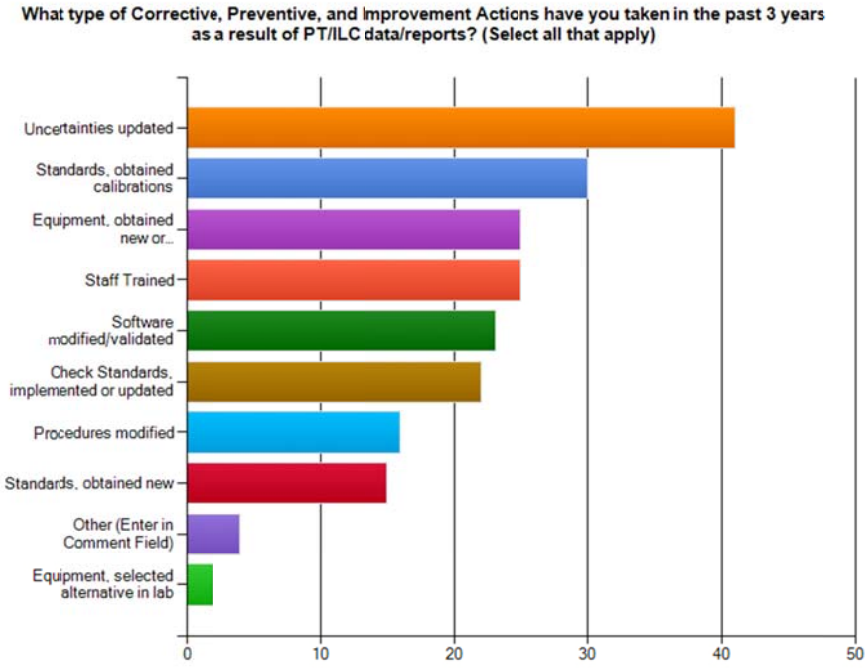


Figure 8: Corrective, Preventative, and Improvement actions taken in the past 3 years as a result of PT/ILC reports.

Participants

The SLP is comprised of 55 metrology laboratories. There are 50 state laboratories and 5 other government laboratories (Puerto Rico, Washington DC, Los Angeles County, USDA-GIPSA (identified as 'DA' in the survey), and U.S.-Virgin Islands). Of these 55 laboratories, 4 are not operational. The Washington DC, Delaware, U.S.-Virgin Islands, and Rhode Island metrology laboratories were not operational during the 2010 reporting period of the survey. The Massachusetts, North Dakota, Nebraska, and Tennessee metrology laboratories did not participate this year. The North Dakota laboratory was open for a portion of the 2010 calendar year; It was, however, closed before survey data solicitation began in December of 2010.

Notes and Comments

47 metrology laboratories provided data for the 2010 State Program Workload Survey.

Table 3 provides information regarding the participant laboratories including location, age[1], size, and aggregate number of customers served as of the 2010 calendar year.

Table 4 indicates laboratory participation in workload surveys conducted from 1996 through 2010.

Findings

Size of Laboratory Facility:

- Average 2950 ft
- Maximum 12200 ft
- Minimum 300 ft

Age of Laboratory Facility

- Average 26 years
- Maximum 82 years
- Minimum 1 years

These laboratories reported serving 9,187 customers in 2010.

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

	Laboratory Name	Address	City	State	Zip	Website	Age of Lab (yrs)	Office Space ft^2	Lab Space ft^2	Customers
1	State of Alaska Metrology Laboratory	12050 Industry Way Bldg. O #6	Anchorage	AK	99515	www.dot.state.ak.us	40	270	900	51
2	Alabama Weights & Measures Laboratory	1445 Federal Dr	Montgomery	AL	36109	www.agi.state.al.us	40	314	588	249
3	Arizona Department of Weights and Measures Metrology Laboratory	4425 W Olive Ave Ste 134	Glendale	AZ	85302	www.azdwm.gov	11	500	5500	198
4	State of California	6790 Florin Perkins Road, Suite 100	Sacramento	CA	95828	www.cdfa.ca.gov/dms/	6	408	3526	189
5	Colorado Metrology Laboratory	3125 Wyandot Street	Denver	CO	80211	www.colorado.gov	39	1979	1927	512
6	State of Connecticut, Metrology Laboratory	165 Capitol Avenue, Room G-15 and G-21	Hartford	CT	06106	www.ct.gov/dcp	43	0	2500	19
7	Hawaii Measurement Standards Lab	1851 Auiki St.	Honolulu	HI	96819	hawaii.gov/hdoa/qad/ms	10	443	2602	38
8	Iowa Metrology Ellsworth Community College	1100 College Ave.	Iowa Falls	IA	50126		1	175.5	2764	274
9	ISDA Metrology Lab	2216 Kellogg Ln.	Boise	ID	83712	www.agir.idaho.gov	41	720	1900	92
10	State of Illinois - Department of Agriculture Metrolo	801 Sangamon Avenue East	Springfield	IL	62702		33	1200	3320	269
11	IN Weights and Measures Laboratory	2525 N Shadeland Ave #D3	Indianapolis	IN	46219	www.in.gov/isdh/23288.htm	11	2141	3859	223
12	[state of] Kansas Metrology Laboratory	BLDG 282, I Street, Forbers Field	Topeka	KS	66619		13	217	3404	272
13	Kentucky Department of Agriculture	107 Corporate Dr	Frankfort	KY	40601	www.kyagr.com	10	400	2395	46
14	Louisiana Metrology Laboratory	PO Box 3098	Baton Rouge	LA	70821	www.ldaf.state.la.us	22	192	1568	116

	Laboratory Name	Address	City	State	Zip	Website	Age of Lab (yrs)	Office Space ft^2	Lab Space ft^2	Customers
15	County of Los Angeles	11012 Garfield Av Blldg A	South Gate	CA	90280	acwm.lacounty.gov	36	168	2922	51
16	MD Weights and Measures	50 Harry S.Truman Parkway	Annapolis	MD	21401	www.mda.state.md.us	20	2639	6138	66
17	Maine Metrology Laboratory	333 Cony Road	Augusta	ME	04330	www.maine.gov/agriculture/qar/metrology.html	34	1068	2100	284
18	State Of Michigan	940 Venture Lane	Williamston	MI	48895	www.michigan.gov/wminfo	13	2000	12200	680
19	Minnesota Metrology Laboratory	14305 Southcross Drive W #150	Burnsville	MN	55306		4	1120	4706	308
20	Missouri Metrology Lab	1616 Missouri Blvd	Jefferson City	MO	65109	mda.mo.gov	21	385	2433	196
21	Mississippi	1000 ASU Drive	Lorman	MS	39096		10			
22	Montana Metrology Laboratory	2801 North Cooke Street	Helena	MT	59601		25	300	1000	71
23	NCDA&CS Standards Laboratoy	4040 District Drive	Raleigh	NC	27607	www.ncstandards.org	26	2700	4800	493
24	New Hampshire Metrology Laboratory	25 Capitol St.	Concord	NH	03301		38	0	700	89
25	New Jersey Office of Weights and Measures	1261 Rts. 1&9 South	Avenel	NJ	07001		22	200	2700	1367
26	New Mexico	3190 South Espina	Las Cruces	NM	88003		37	0	1600	
27	Nevada Metrology Laboratory	2150 Frazier Avenue	Sparks	NV	89431	agri.nv.gov/Measurement_MetrologyLab.htm	39	170	1044	70
28	New York State	Harriman Campus, Suite 122	Albany	NY	12206	www.agmkt.state.ny.us	40	1100	2400	85
29	Ohio Dept. of Agriculture	8995 East Main Street	Reynoldsburg	OH	43068	www.ohioagriculture.gov	52	2500	3047	301

	Laboratory Name	Address	City	State	Zip	Website	Age of Lab (yrs)	Office Space ft^2	Lab Space ft^2	Customers
30	Oklahoma Bureau of Standards	2800 N. Lincoln Blvd.	Oklahoma City	OK	73105	www.oda.state.ok.us/lab/	2	400	5807	185
31	Oregon Dept. of Agriculture, MSD Metrology Laboratory	635 Capitol St NE	Salem	OR	97301	www.oregon.gov/ODA/MSD/	12	367	2038	89
32	Pennsylvania Standards Laboratory	2221 Forster Street, Room G-44A	Harrisburg	PA	17125	www.portal.state.pa.us	13	1568	3780	542
33	Laboratorio de Pesas y Medidas	722 Hoare St	San Juan	PR	00909		40	2412	2000	50
34	South Carolina Department of Agriculture	237 Catawba Street	Columbia	SC	29201	agriculture.sc.gov	24	208	3500	382
35	South Dakota Metrology Lab	Physical:1500 N Garfield, Mailing:118 W Captiol	Pierre	SD	57501	dps.sd.gov/licensing/weights_and_measures/metrology_laboratory.aspx	25 +	0	585	22
36	Texas Department of Agriculture - Metrology Laboratory	P.O. Box 1518	Giddings	TX	78942	www.texasagriculture.gov	7	1200	11077	318
37	Utah Metrology Laboratory	PO Box 146500, 350 North Redwood Road	Salt Lake City	UT	84114	ag.utah.gov	27	150	1350	55
38	VT Agency of Agriculture Laboratory	103 South Main	Waterbury	VT	5671		21	0	888	85
39	Wisconsin Weights & Measures Laboratory	3601 Galleon Run	Madison	WI	53718	www.state.datcp.wi.us	4	600	3100	225
40	WV Weights and Measures, State Measurement Laboratory	570 McCorkle Avenue	St. Alban	WV	25177	www.wvlabor.org	40	231	1769	280
41	Wyoming Department of Agriculture	1510 Campstool Rd	Cheyenne,	WY	82002	wyagric.state.wy.us	23	504	1670	25
42	Commonwealth of Virginia, Office of Weights and Measures	600 N. 5th Street, Room 162	Richmond	VA	23219	www.vdacs.virginia.gov/standards/services	9		3637	161
43	Georgia Weights & Measures Laboratory	16 Forest Parkway	Forest Park	GA	30297	agr.georgia.gov	41		3700	408
44	Florida	3125 Conner Blvd, Lab 2	Tallahassee	FL	32399	www.doac.state.fl.us	37	260	3240	

	Laboratory Name	Address	City	State	Zip	Website	Age of Lab (yrs)	Office Space ft^2	Lab Space ft^2	Customers
45	Arkansas Bureau of Standards	4608 West 61st Street	Little Rock	AR		www.plantboard.arkansas.org	42	1900	1700	59
46	WA St. Dept. of Agriculture Metrology Laboratory	2747 29th Ave. SW	Tumwater	WA	98512		33	230	2734	
47	GIPSA Master Scale Depot	USDA/FGIS 5800 W 69th ST	Bedford Park	IL	60638		82	200	300	

Table 3: Laboratory Facilities

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

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

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

Table 4: Listing of SLP member laboratories and their participation status in previous surveys.

Mass

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

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

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

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

Weight Carts are motorized carts used to transport a load of field test weights to facilitate the field testing of larger capacity scales. Weight carts are often subject to the specifications and tolerances found in NIST Handbook 105-8 (9) 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 47 reporting laboratories. The map graph gives a geographical distribution of these standards. There are pie graphs located on the map for each individual lab and a larger pie graph that reflects the totals. The pie graphs provide a breakdown into the customer categories of Lab, W&M, and External. The bar graph at the bottom of the page shows the same breakdown along with the total number of devices tested by each laboratory.

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

Findings

Of the 47 reporting laboratories, 19 labs tested a total of 2,309 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

Table 5: 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.

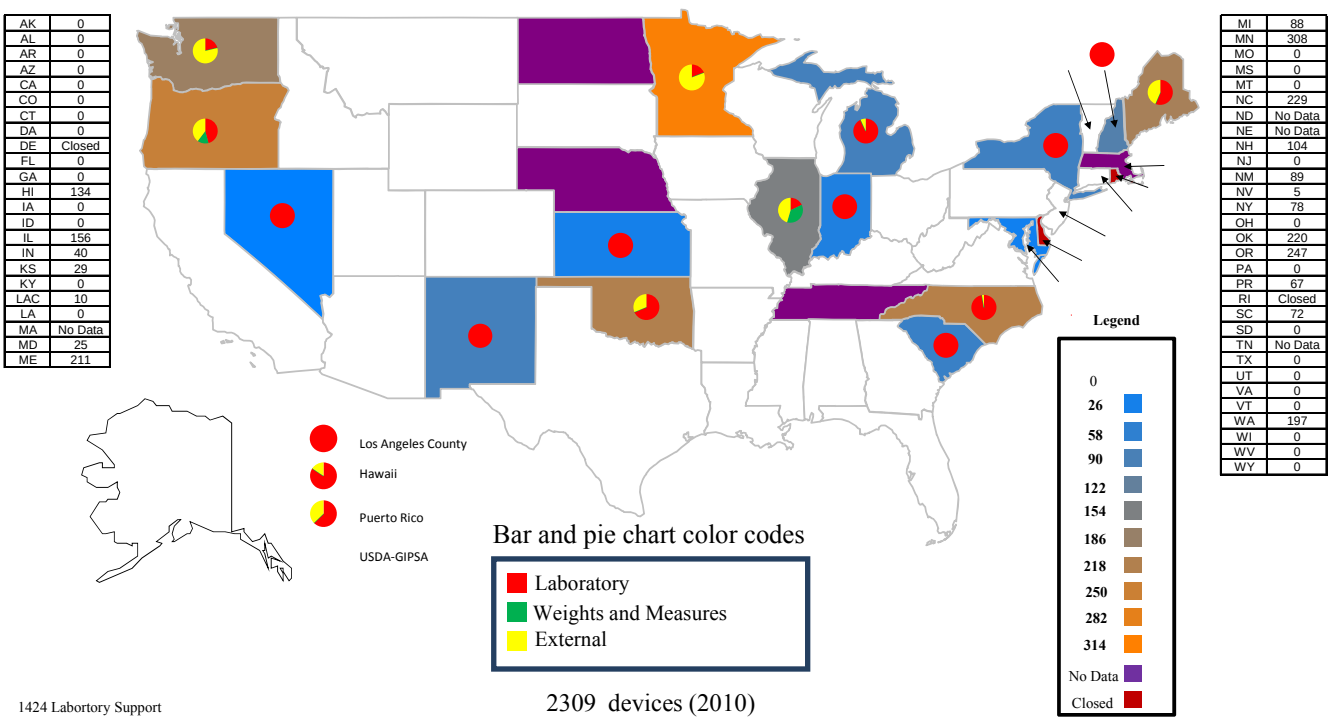
Notes and Comments

- 62 % of all Mass I standards were calibrated for internal use by the laboratory.
- 4 % of all Mass I standards were calibrated for the weight and measures program.
- 34 % of all Mass I standards were calibrated for external customers.

Mass Echelon I

AK	0
AL	0
AR	0
AZ	0
CA	0
CO	0
CT	0
DA	0
DE	Closed
FL	0
GA	0
HI	134
IA	0
ID	0
IL	156
IN	40
KS	29
KY	0
LAC	10
LA	0
MA	No Data
MD	25
ME	211

MI	88
MN	308
MO	0
MS	0
MT	0
NC	229
ND	No Data
NE	No Data
NH	104
NJ	0
NM	89
NV	5
NY	78
OH	0
OK	220
OR	247
PA	0
PR	67
RI	Closed
SC	72
SD	0
TN	No Data
TX	0
UT	0
VA	0
VT	0
WA	197
WI	0
WV	0
WY	0



1424 Labortory Support

93 W&M Program Support

792 For external customers

2309 devices (2010)
calibrated in 19 labs

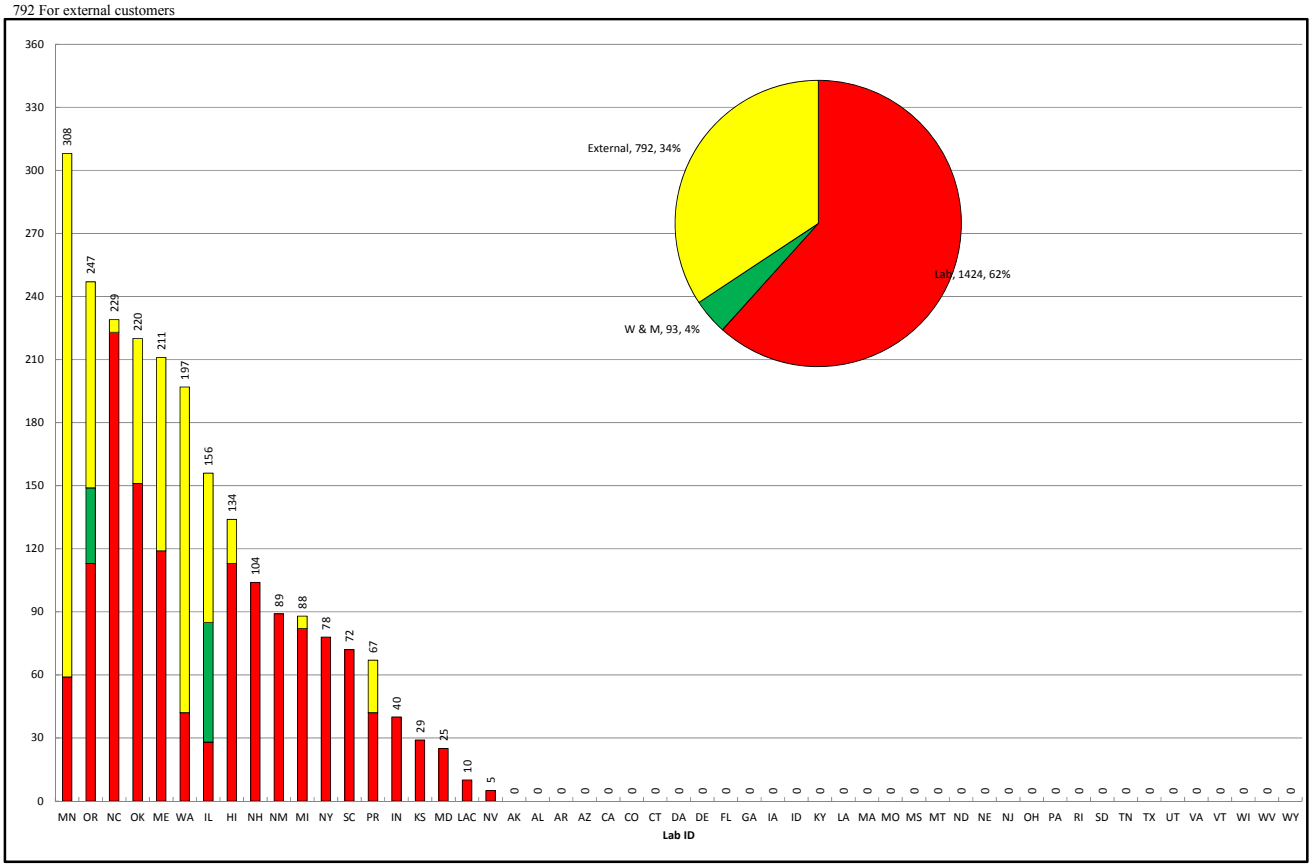


Figure 9: Mass Echelon I tests.

Mass Echelon II

Description

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

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

Findings

Of the 47 reporting laboratories, 34 labs tested a total of 23,316 mass standards

Comparison of previous surveys

Year	# Labs	Total Devices
1996	38	37662
1998	36	24926
1999	35	25807
2000	38	26428
2002	37	25847
2004	32	21714
2005	32	20541
2006	33	22352
2008	32	25371
2010	34	23318

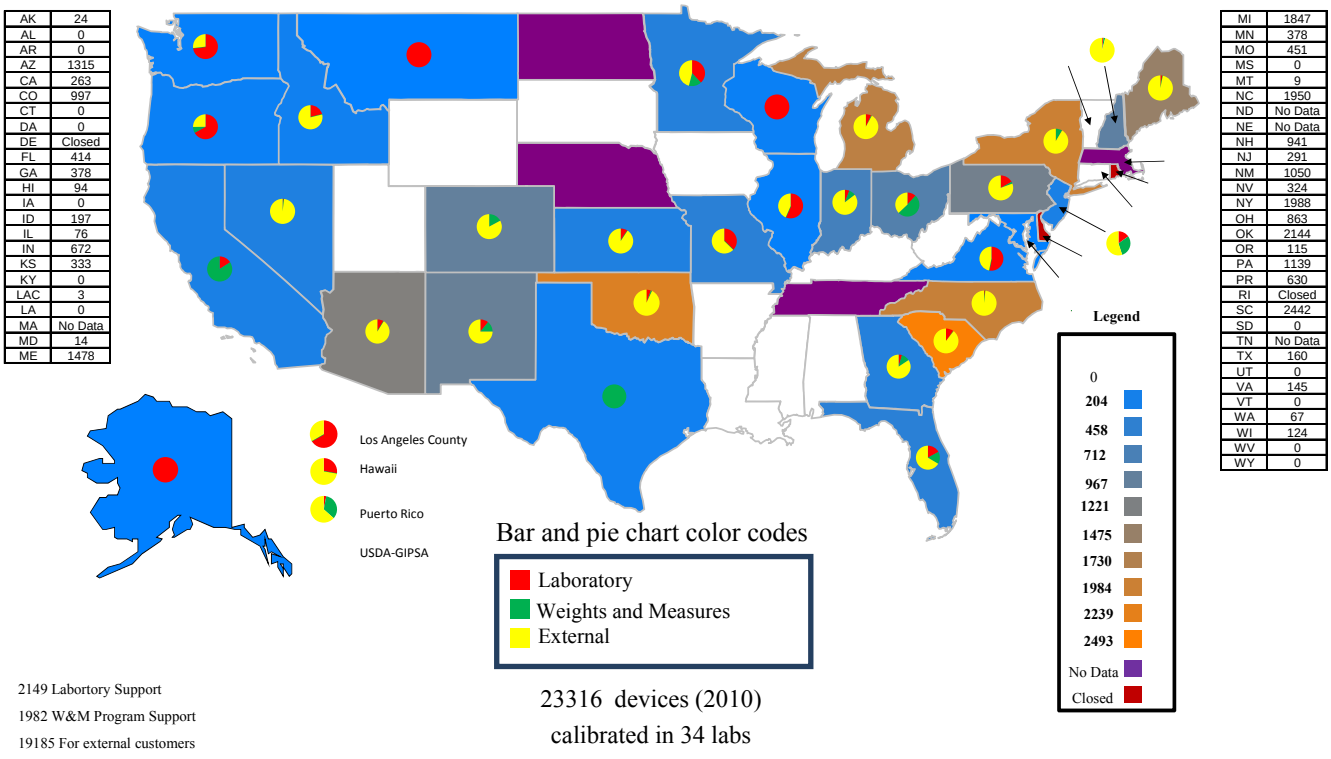
Table 6: Echelon II tests reported on previous surveys.

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

Notes and Comments

- 9 % of all Mass II standards were calibrated for internal use by the laboratory.
- 9 % of all Mass II standards were calibrated for the weight and measures program.
- 82 % of all Mass II standards were calibrated for external customers.

Mass Echelon II



AK	24
AL	0
AR	0
AZ	1315
CA	263
CO	997
CT	0
DA	0
DE	Closed
FL	414
GA	378
HI	94
IA	0
ID	197
IL	76
IN	672
KS	333
KY	0
LAC	3
LA	0
MA	No Data
MD	14
ME	1478

MI	1847
MN	378
MO	451
MS	0
MT	9
NC	1950
ND	No Data
NE	No Data
NH	941
NJ	291
NM	1050
NV	324
NY	1988
OH	863
OK	2144
OR	115
PA	1139
PR	630
RI	Closed
SC	2442
SD	0
TN	No Data
TX	160
UT	0
VA	145
VT	0
WA	67
WI	124
WV	0
WY	0

2149 Labortory Support
1982 W&M Program Support
19185 For external customers

23316 devices (2010)
calibrated in 34 labs

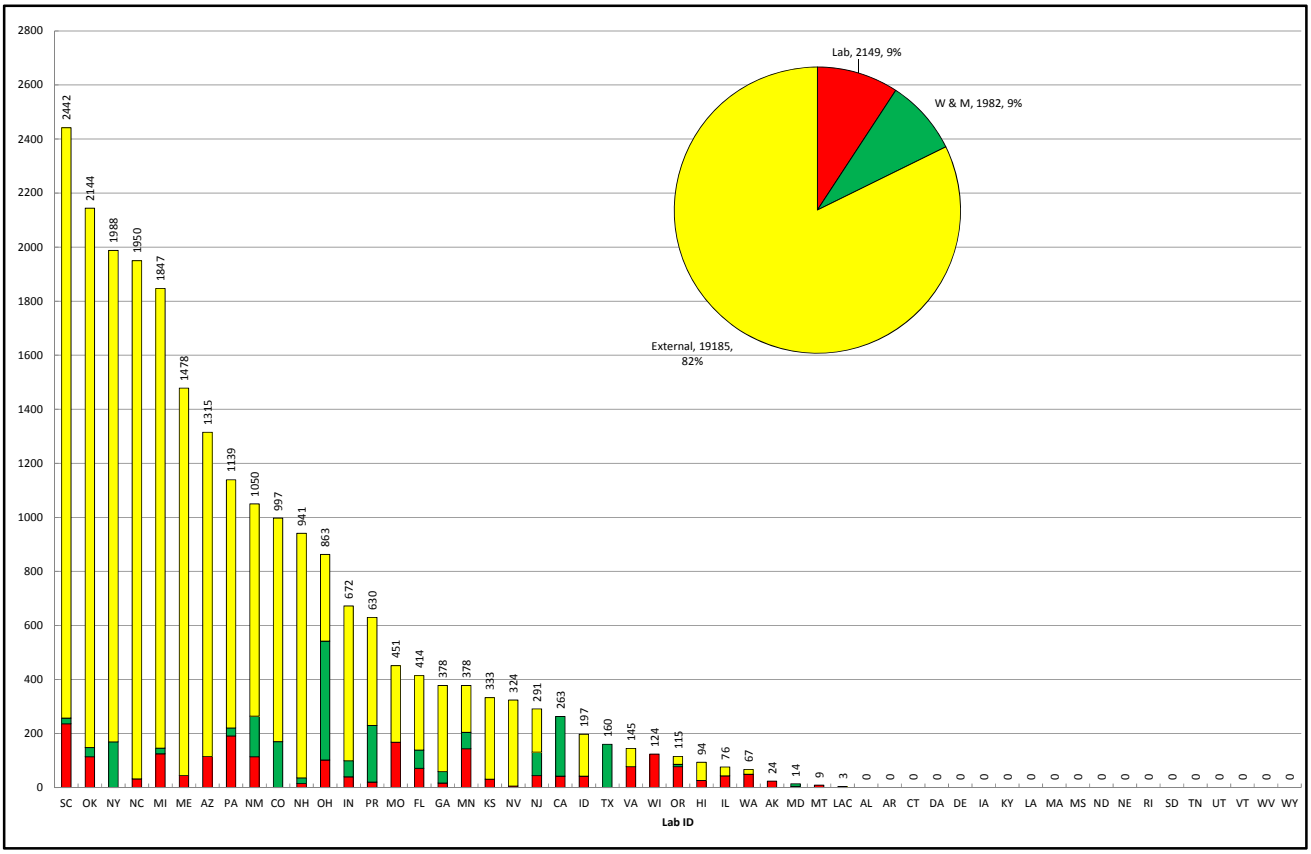


Figure 10: Mass Echelon II tests.

Mass Echelon III

Description

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

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

Findings

Of the 47 reporting laboratories, 47 labs tested a total of 256,094 mass standards

Comparison of previous surveys

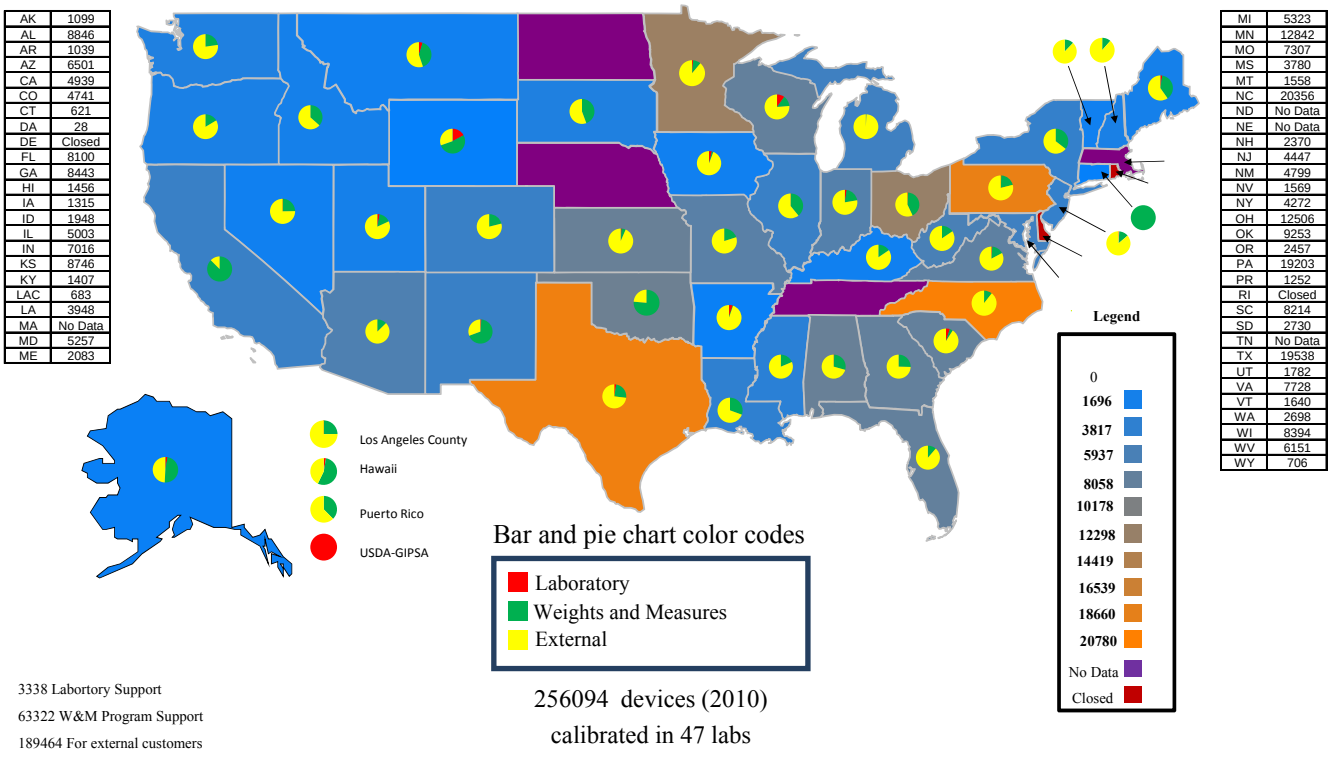
Year	# Labs	Total Devices
1996	51	259713
1998	46	259166
1999	45	257938
2000	45	260072
2002	47	267240
2004	47	248117
2005	46	248650
2006	49	256844
2008	50	254221
2010	47	256094

Table 7: Echelon III tests reported on previous surveys.

Notes and Comments

- 1 % of all Mass III standards were calibrated for internal use by the laboratory.
- 25 % of all Mass III standards were calibrated for the weight and measures program.
- 71 % of all Mass III standards were calibrated for external customers.

Mass Echelon III



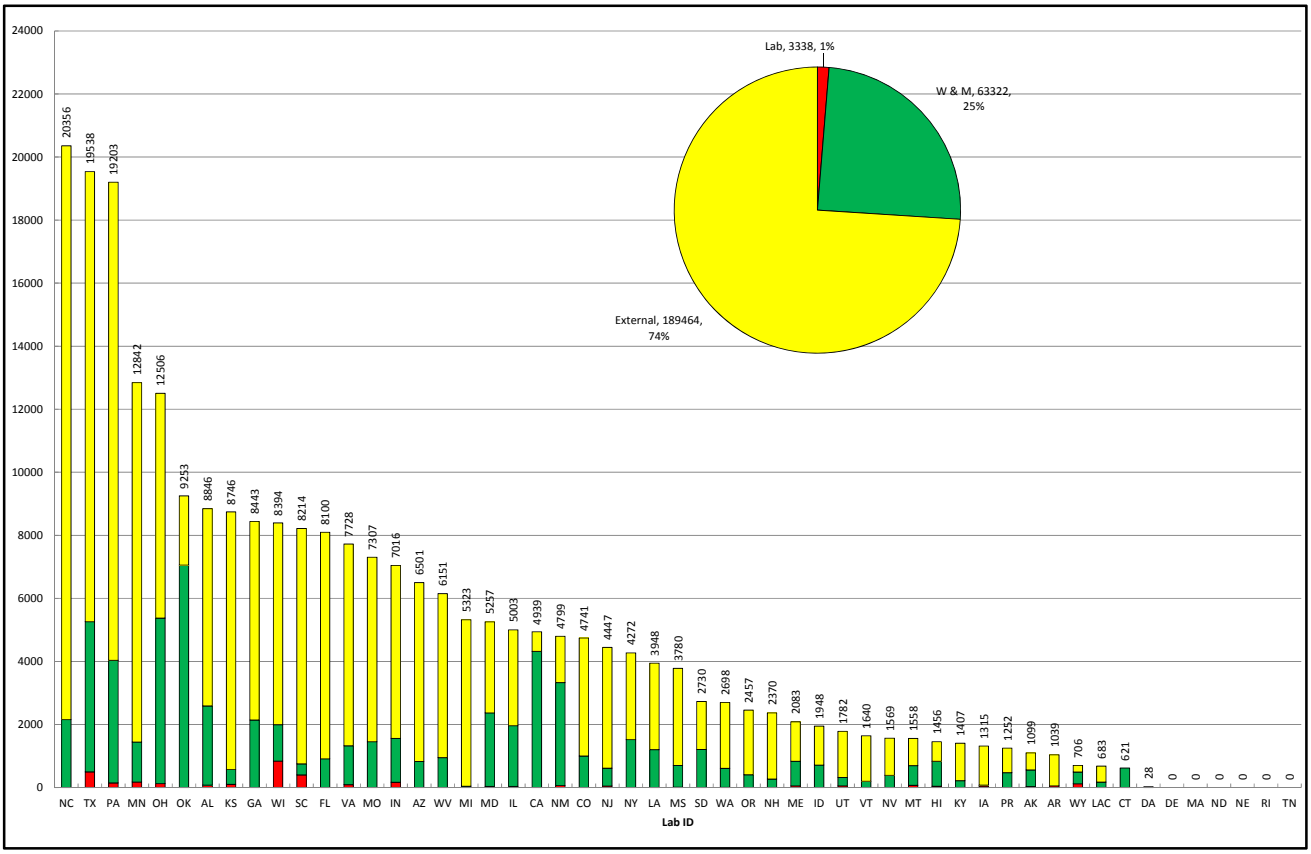


Figure 11: Mass Echelon III tests.

Weight Carts

Description

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

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

Findings

Of the 47 reporting laboratories, 35 labs tested a total of 468 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

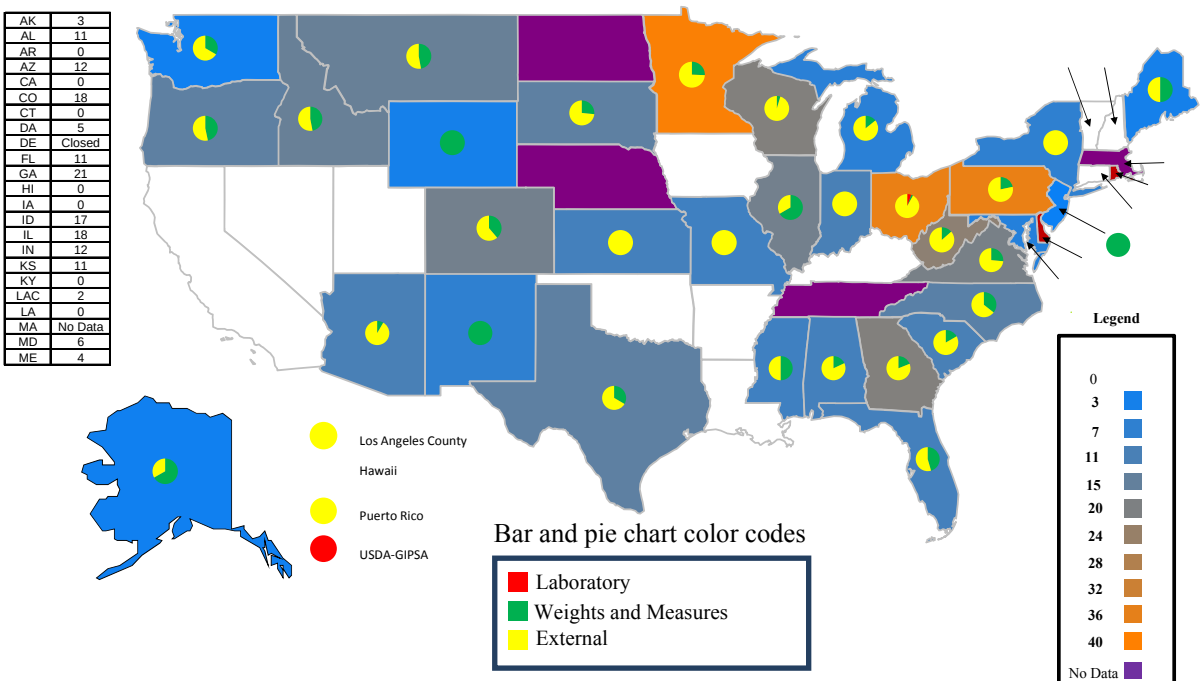
Table 8: Weight Cart tests reported on previous surveys.

Notes and Comments

- 7 % of all weight carts were calibrated for internal use by the laboratory.
- 26 % of all weight carts were calibrated for the weight and measures program.
- 72 % of all weight carts were calibrated for external customers.

Weight Carts

AK	3
AL	11
AR	0
AZ	12
CA	0
CO	18
CT	0
DA	5
DE	Closed
FL	11
GA	21
HI	0
IA	0
ID	17
IL	18
IN	12
KS	11
KY	0
LAC	2
LA	0
MA	No Data
MD	6
ME	4



MI	7
MN	39
MO	10
MS	10
MT	17
NC	14
ND	No Data
NE	No Data
NH	0
NJ	2
NM	8
NV	0
NY	8
OH	37
OK	0
OR	15
PA	37
PR	2
RI	Closed
SC	12
SD	15
TN	No Data
TX	15
UT	0
VA	19
VT	0
WA	3
WI	21
WV	22
WY	4

7 Labortory Support

124 W&M Program Support

337 For external customers

468 devices (2010)
calibrated in 35 labs

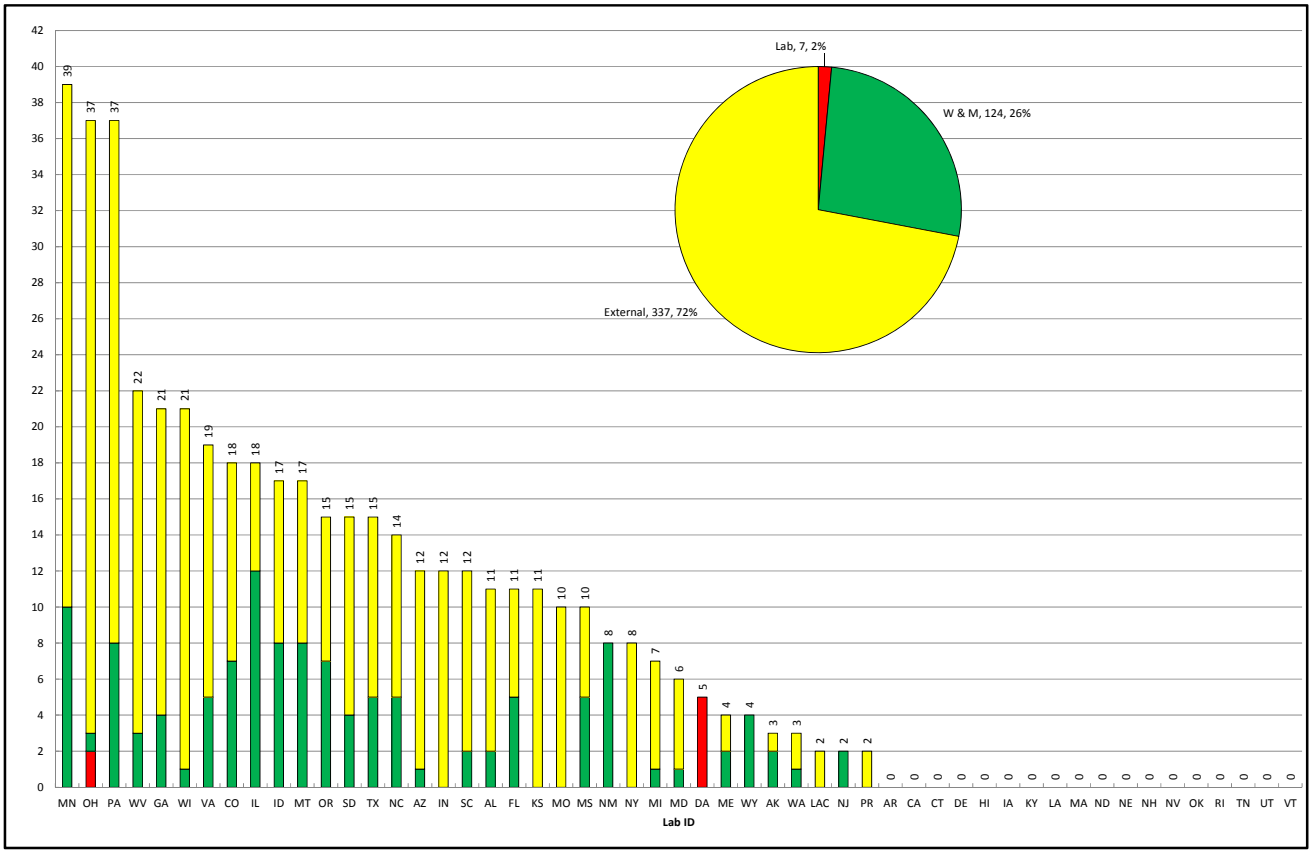


Figure 12: Weight Cart tests.

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).

Steel Tape Measures

Description

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

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

Findings

Of the 47 reporting laboratories, 15 labs tested a total of 310 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

Table 9: Tape measure tests reported on previous surveys.

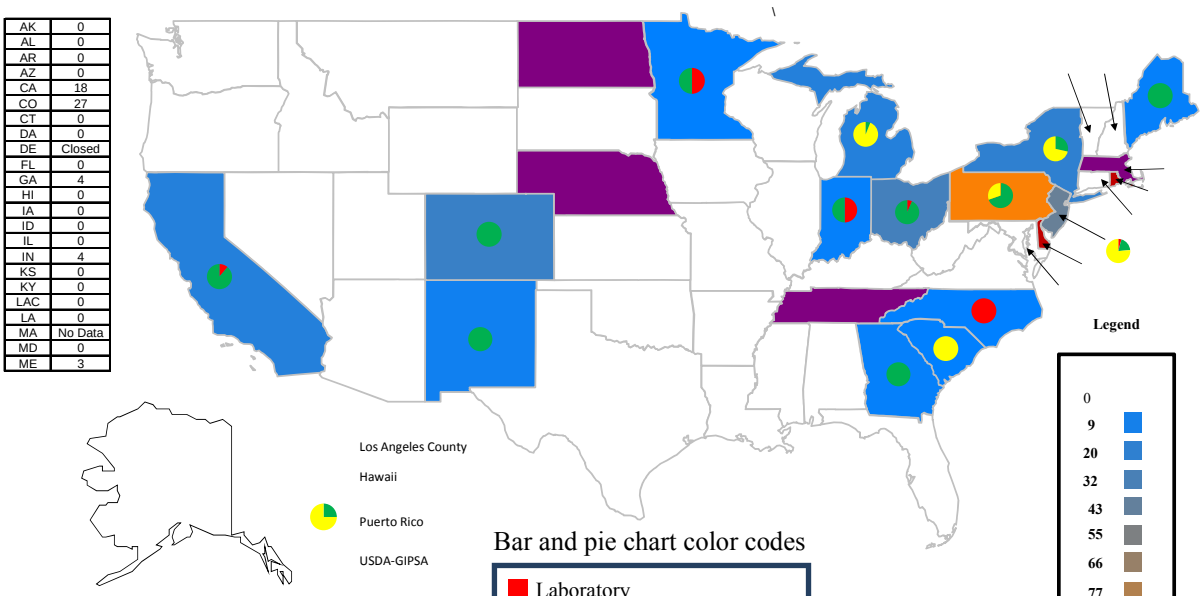
Notes and Comments

- 4 % of all tape measures were tested for internal use by the laboratory.
- 59 % of all tape measures were tested for the weight and measures program.
- 37 % of all tape measures were tested for external customers.

Tapes

AK	0
AL	0
AR	0
AZ	0
CA	18
CO	27
CT	0
DA	0
DE	Closed
FL	0
GA	4
HI	0
IA	0
ID	0
IL	0
IN	4
KS	0
KY	0
LAC	0
LA	0
MA	No Data
MD	0
ME	3

MI	17
MN	2
MO	0
MS	0
MT	0
NC	1
ND	No Data
NE	No Data
NH	0
NJ	46
NM	7
NV	0
NY	21
OH	30
OK	0
OR	0
PA	109
PR	20
RI	Closed
SC	1
SD	0
TN	No Data
TX	0
UT	0
VA	0
VT	0
WA	0
WI	0
WV	0
WY	0



Bar and pie chart color codes

- Laboratory
- Weights and Measures
- External

11 Labortory Support

184 W&M Program Support

115 For external customers

310 devices (2010)
calibrated in 15 labs

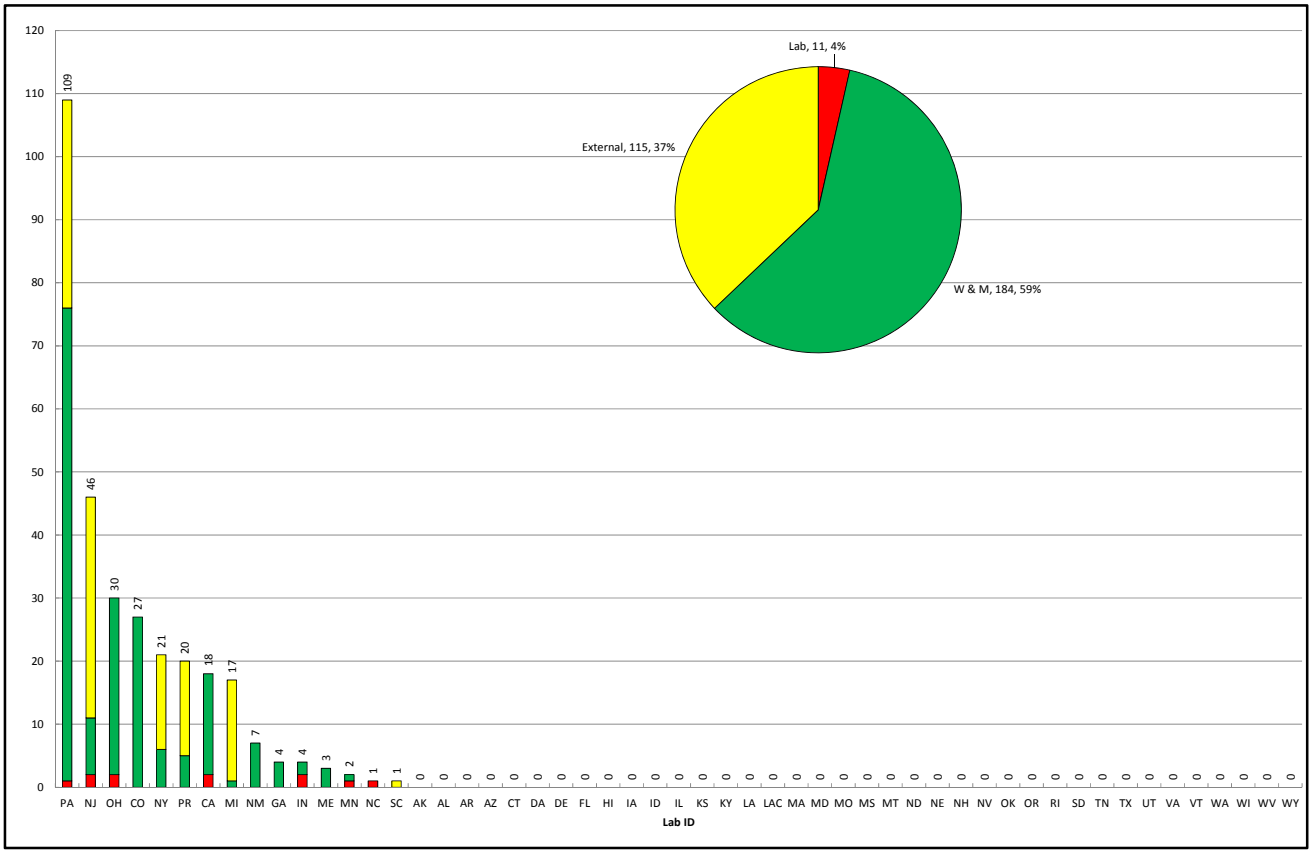


Figure 13: Tape Measure tests.

Rigid Rules

Description

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

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

Findings

Of the 47 reporting laboratories, 8 labs tested a total of 89 rigid rules.

Comparison of previous surveys

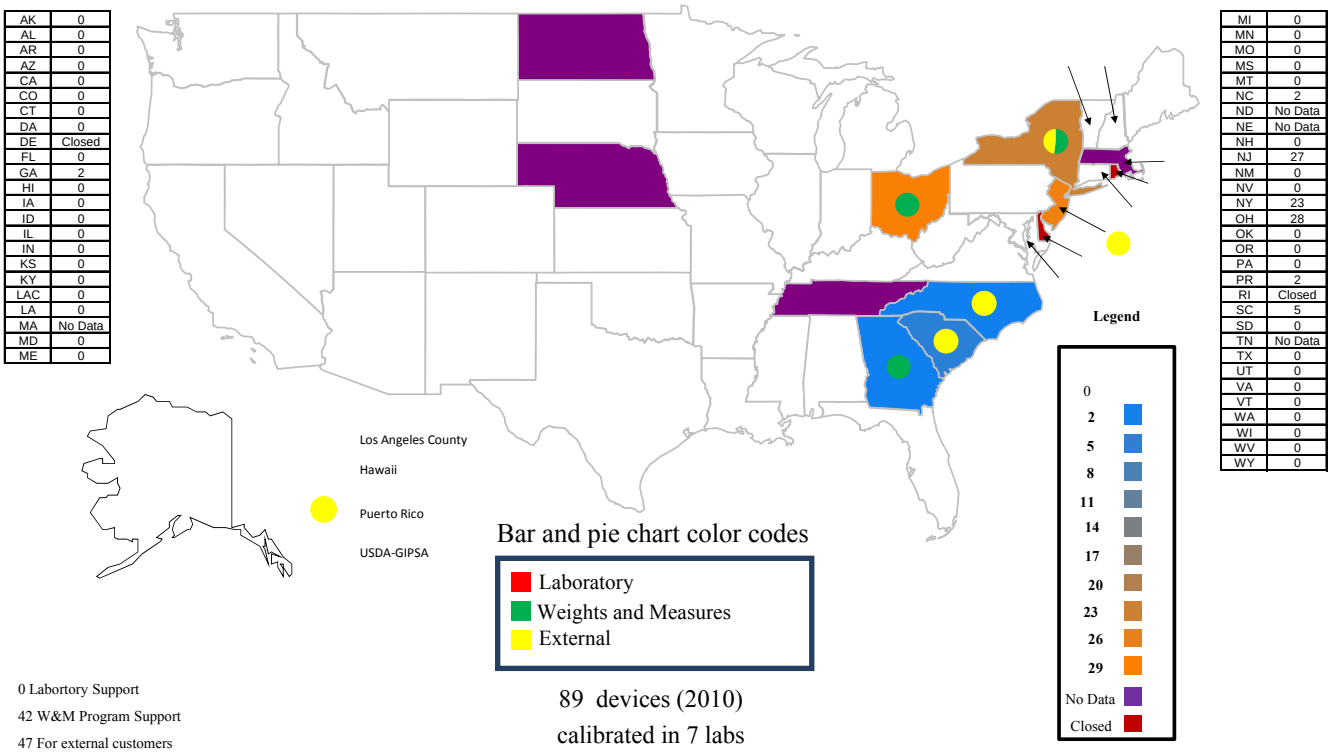
Year	# Labs	Total Devices
1996	26	582
1998	29	269
1999	20	413
2000	16	169
2002	14	138
2004	12	98
2005	11	85
2006	11	122
2008	11	88
2010	8	89

Table 10: Rigid rule tests reported in previous surveys.

Notes and Comments

- 0 % of all rigid rules were tested for internal use by the laboratory.
- 47 % of all rigid rules were tested for the weight and measures program.
- 53 % of all rigid rules were tested for external customers.

Rigid Rules



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

MI	0
MN	0
MO	0
MS	0
MT	0
NC	2
ND	No Data
NE	No Data
NH	0
NJ	27
NM	0
NV	0
NY	23
OH	28
OK	0
OR	0
PA	0
PR	2
RI	Closed
SC	5
SD	0
TN	No Data
TX	0
UT	0
VA	0
VT	0
WA	0
WI	0
WV	0
WY	0

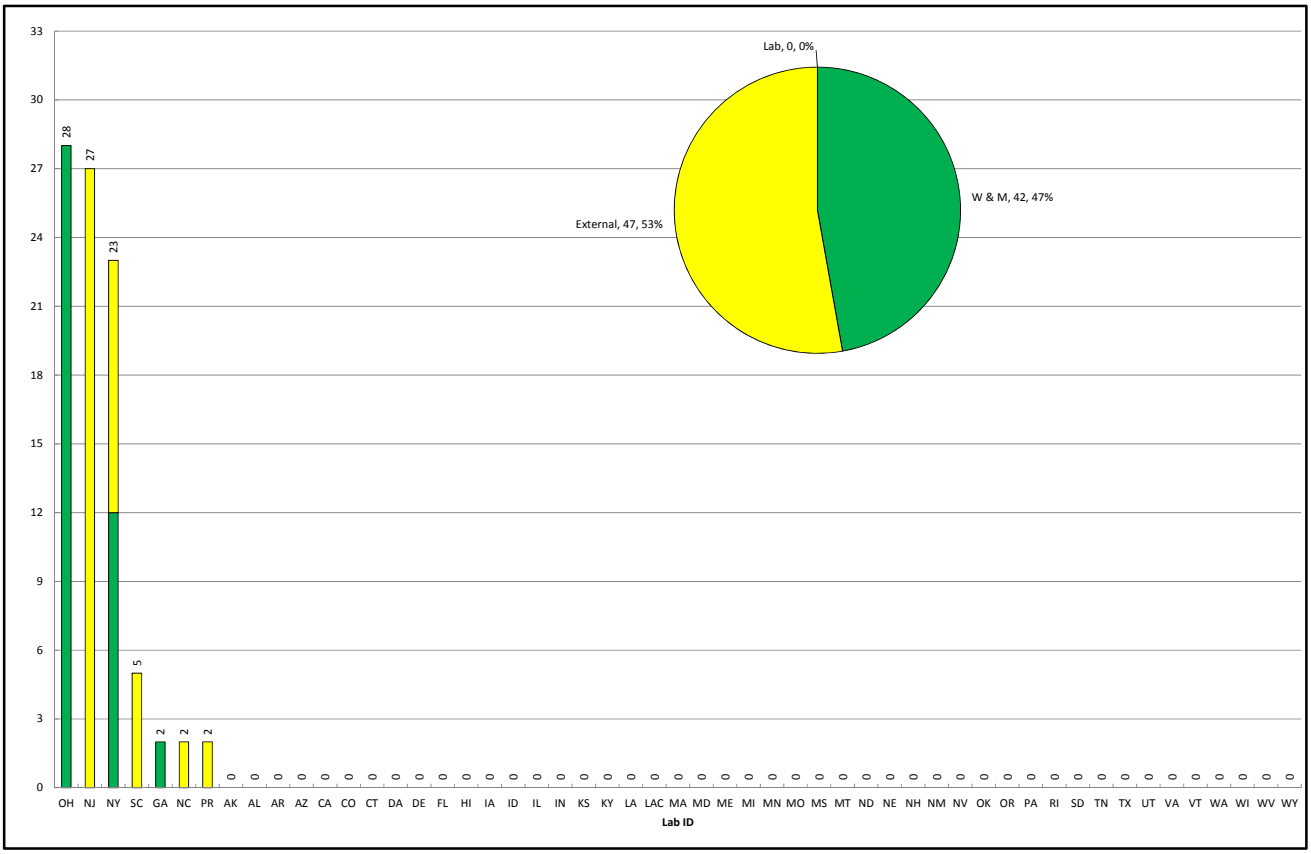


Figure 14: Rigid rule tests.

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 (10)), field measuring flasks (as described in NIST Handbook 105-2 (11)). Steel graduated neck test measures are described in NIST Handbook 105-3 and in American Petroleum Institute's Manual of Petroleum Measurement Standards (Chapter 4) (12). These are normally the steel 5 gallon capacity test measures used to test motor fuel dispensers at the retail level. Steel graduated neck provers are generally distinguished from test measures by their bottom drain design. Test measures are emptied by lifting and pouring; Provers are usually mounted and drained through a butterfly valve at the bottom of the device. Since provers do not require lifting, these are the only devices manufactured in suitable sizes for testing high volume meters. 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.

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 47 reporting laboratories using either a volume transfer (page 45) or gravimetric method (page 46). Each map graph gives a geographical distribution of these standards. There are pie graphs located on each map for each individual lab and a larger pie graph that reflects the totals. The pie graphs provide a breakdown into the customer categories of Lab, W&M, and External. The bar graph at the bottom of the page shows the same breakdown along with the total number of devices tested by each laboratory.

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

Findings

- Of the 47 reporting laboratories, 4 labs performed a total of 43 volume transfer tests.
- Of the 47 reporting laboratories, 12 labs performed a total of 288 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

Table 11: Glassware calibrations from previous surveys.

Notes and Comments

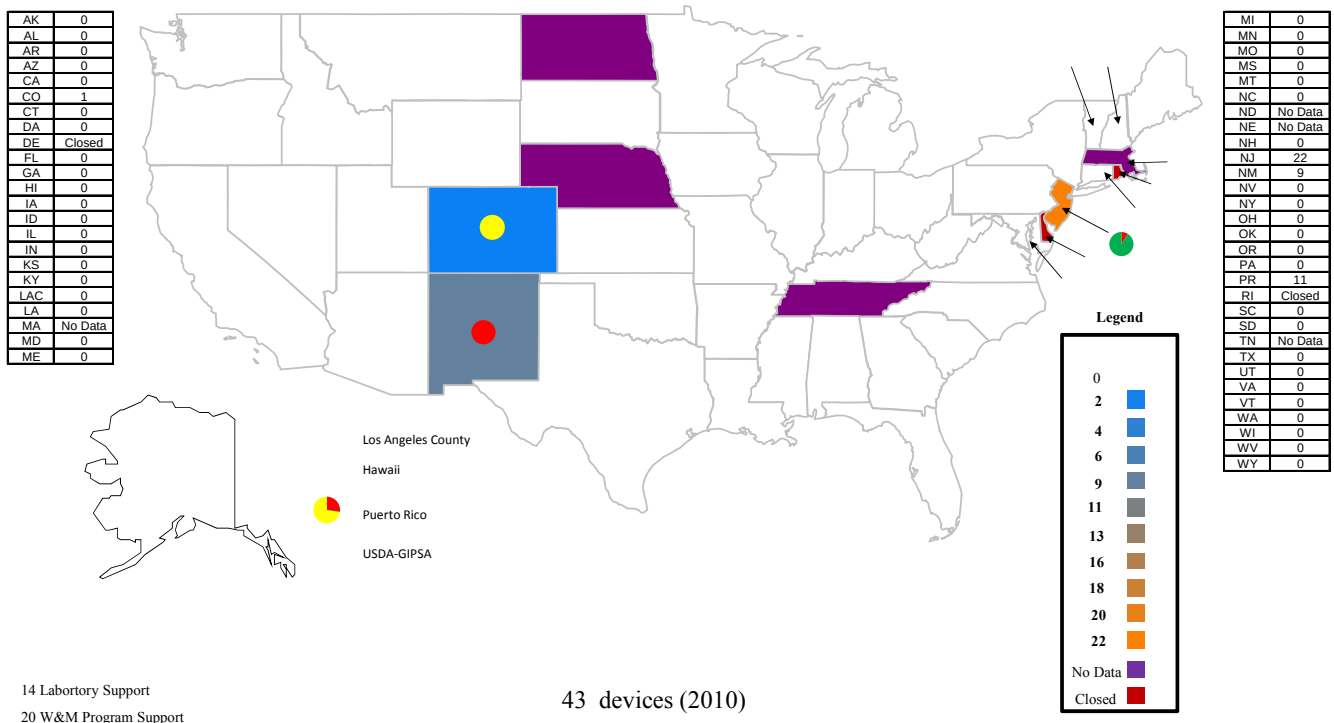
- 12% of all glassware standards were tested for the laboratory
- 71% of all glassware standards were tested for Weights and Measures enforcement programs.
- 16% of all glassware standards were tested for external customers.

Volume Transfer

Volume - Glassware

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

MI	0
MN	0
MO	0
MS	0
MT	0
NC	0
ND	No Data
NE	No Data
NH	0
NJ	22
NM	9
NV	0
NY	0
OH	0
OK	0
OR	0
PA	0
PR	11
RI	Closed
SC	0
SD	0
TN	No Data
TX	0
UT	0
VA	0
VT	0
WA	0
WI	0
WV	0
WY	0



14 Labortory Support
20 W&M Program Support
9 For external customers

43 devices (2010)
calibrated in 4 labs

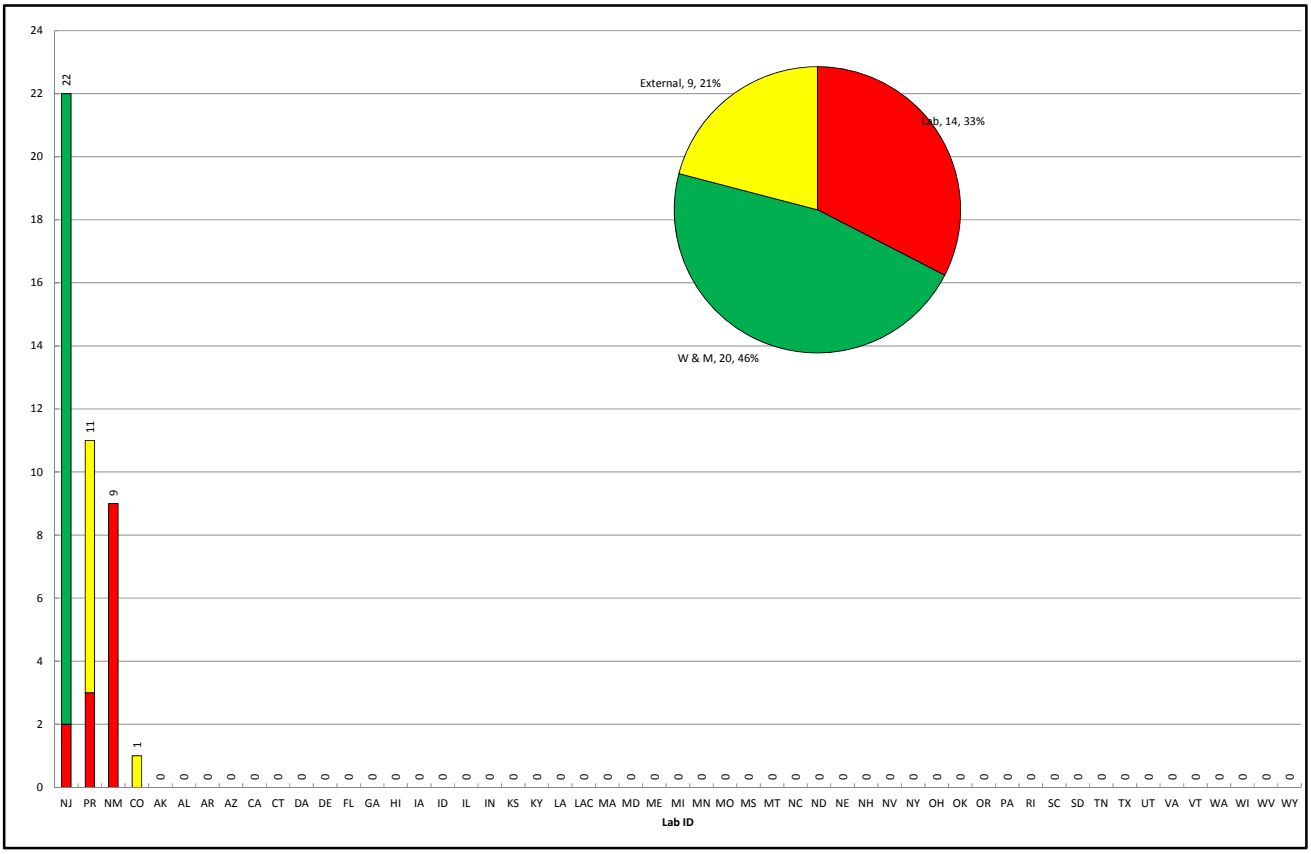
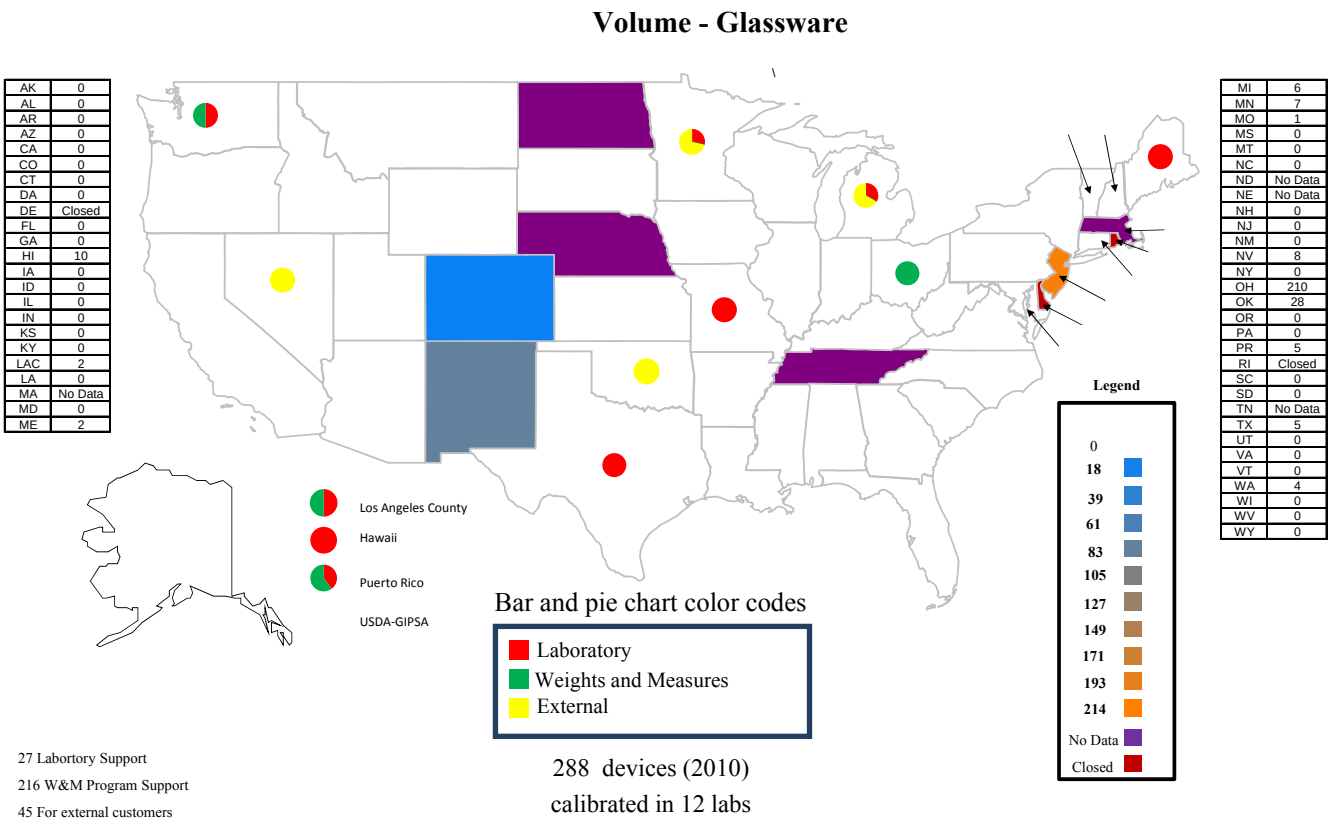


Figure 15: Glassware calibrations, volume transfer method

Gravimetric



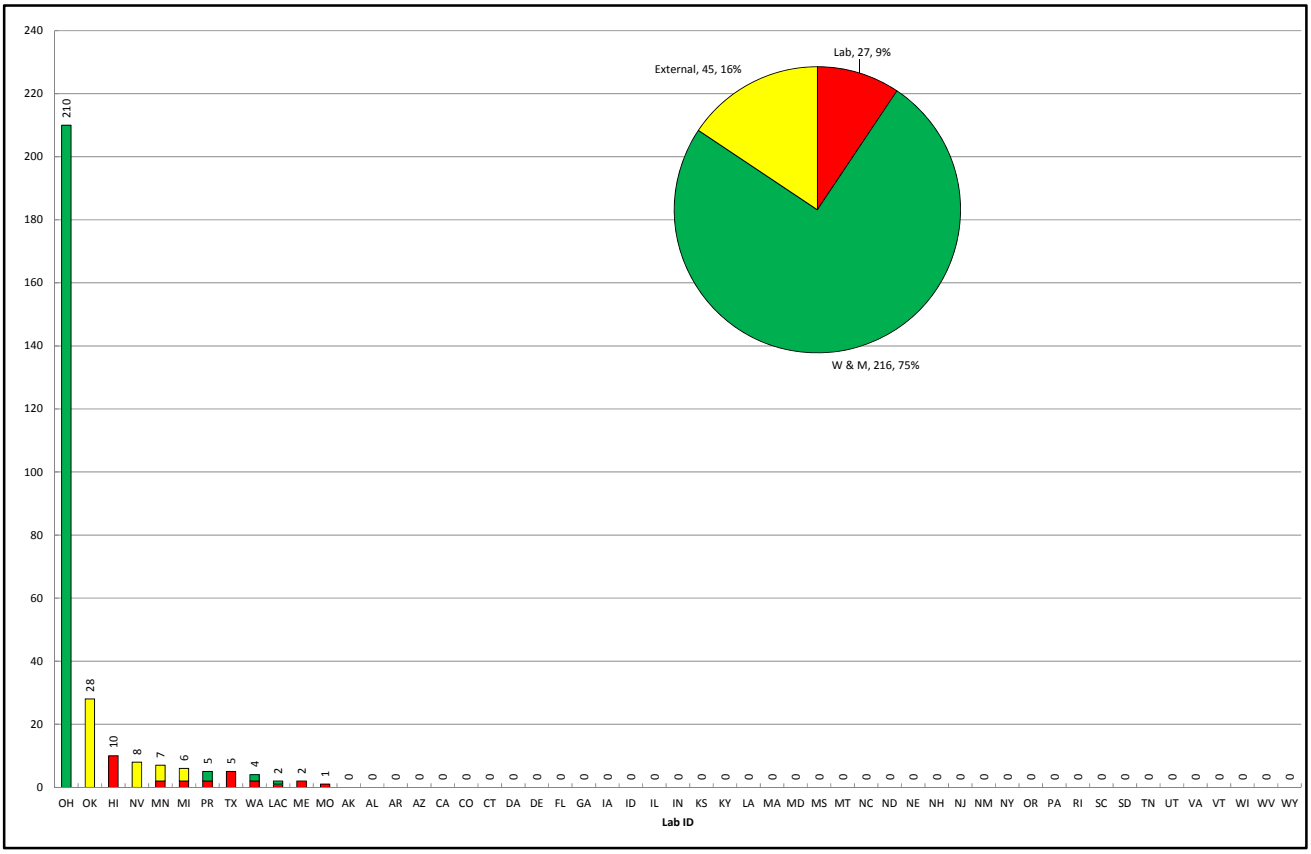


Figure 16: Glassware calibrations, gravimetric method.

Test Measures (≤5 gallon)

Description

The graphs on the next two pages represent the total number of volume tests performed on metal volume test measures[3] by the 47 reporting laboratories using either a volume transfer (page 48) or gravimetric method (page 49). Each map graph gives a geographical distribution of these standards. There are pie graphs located on each map for each individual lab and a larger pie graph that reflects the totals. The pie graphs provide a breakdown into the customer categories of Lab, W&M, and External. The bar graph at the bottom of the page shows the same breakdown along with the total number of devices tested by each laboratory.

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

Findings

- Of the 47 reporting laboratories, 45 labs performed a total of 8216 volume transfer tests.
- Of the 47 reporting laboratories, 16 labs performed a total of 73 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	8009	73	8082

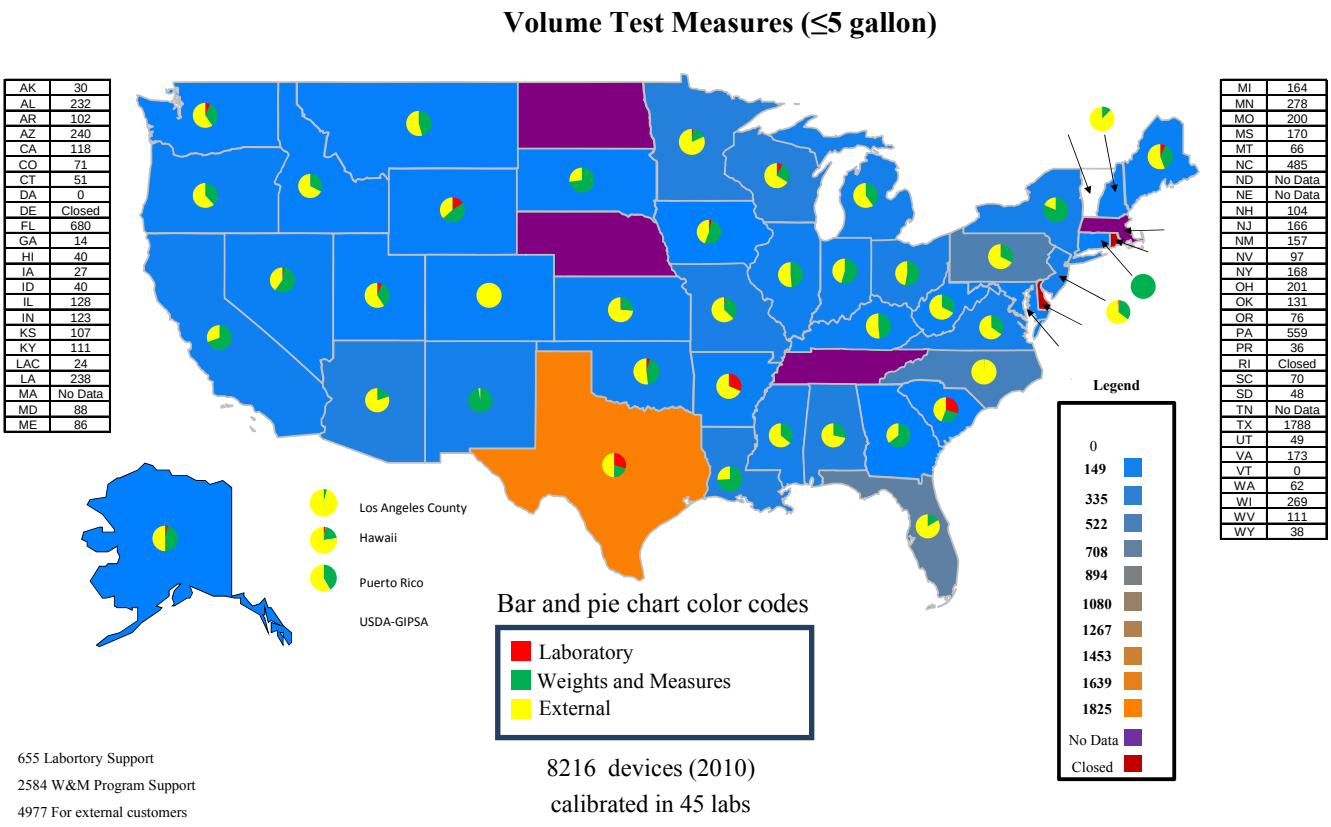
Table 12: Test Measure (5 ≤ gal.) volume tests from previous surveys.

Notes and Comments

- 8% of all test measures were tested for the laboratory
- 31% of all test measures were tested for Weights and Measures enforcement programs.
- 60% 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.

Volume Transfer



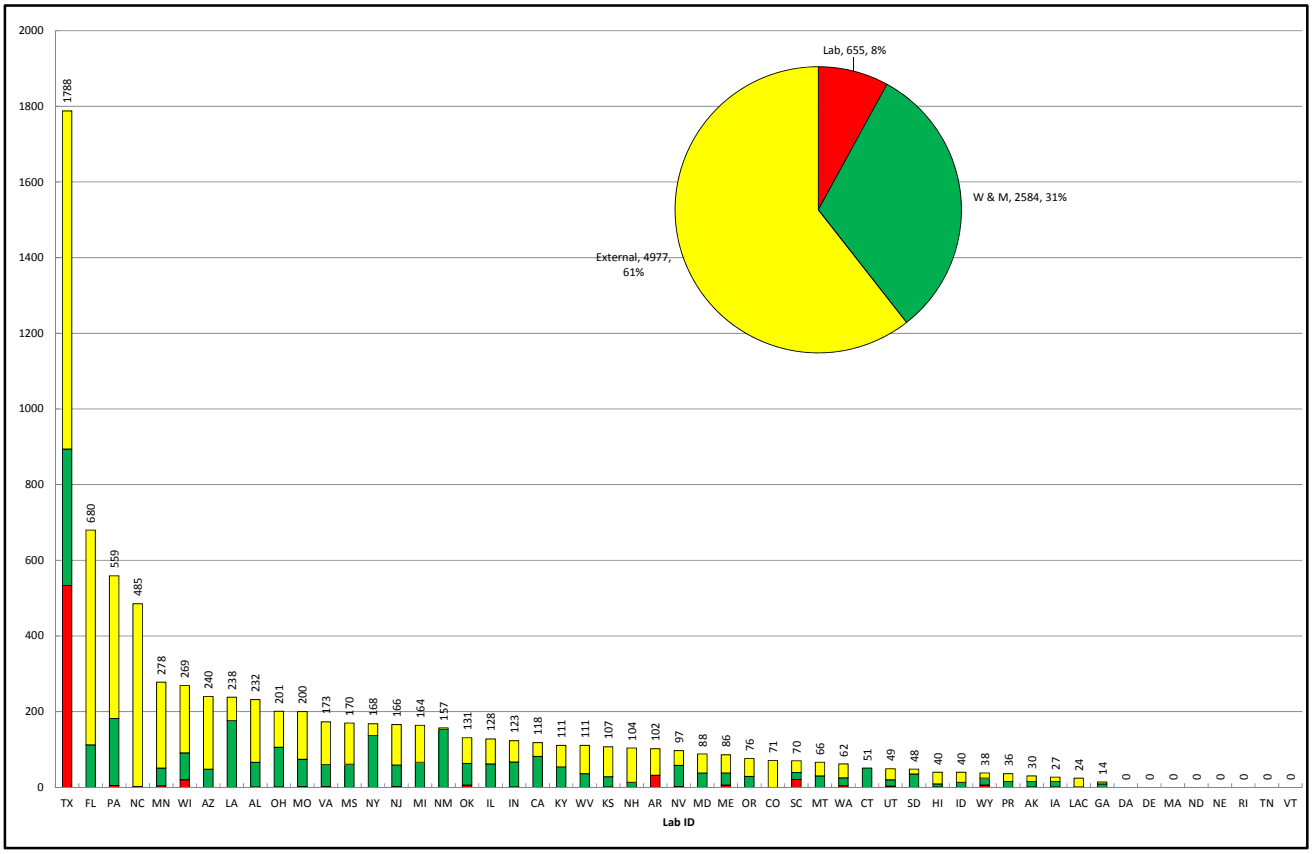
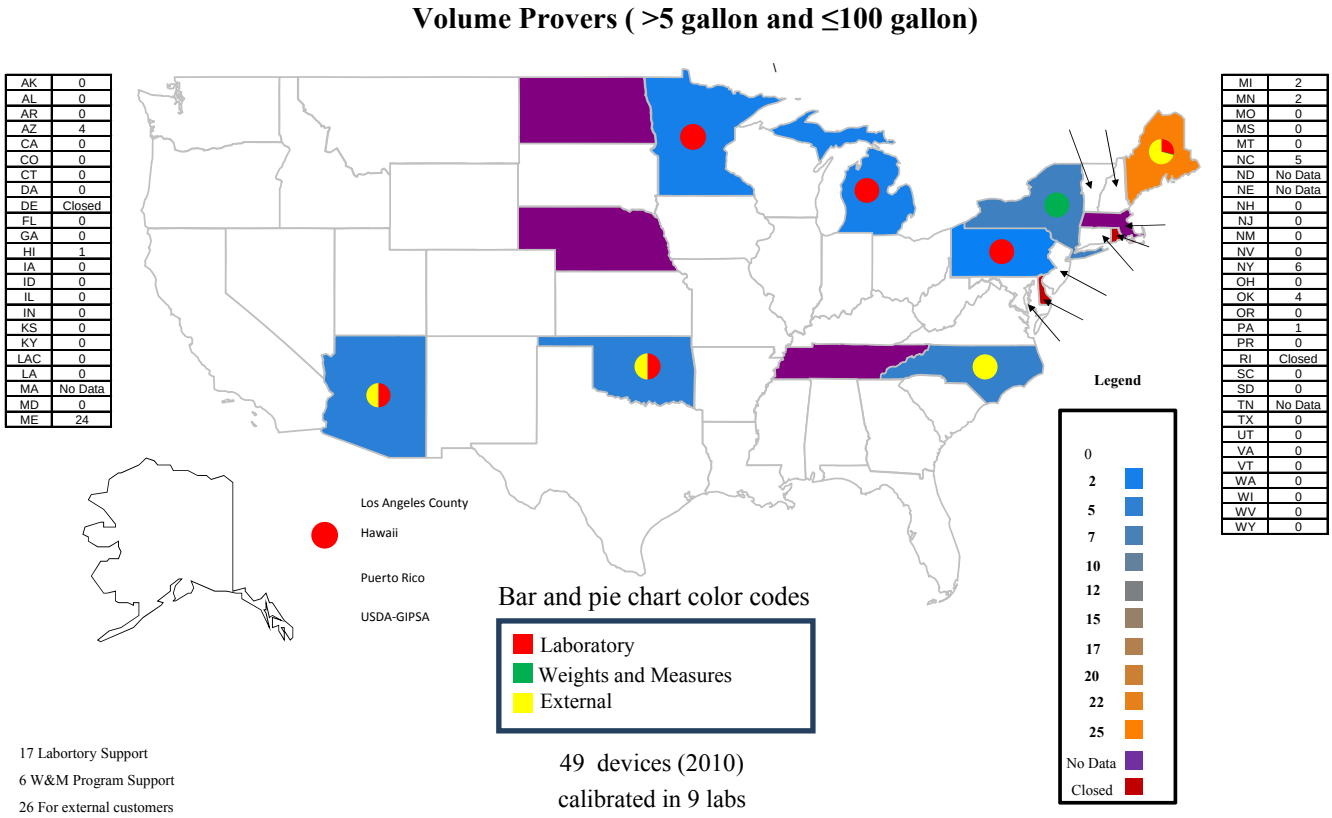


Figure 17: Test Measure tests (≤5 gallon), volume transfer.

Gravimetric



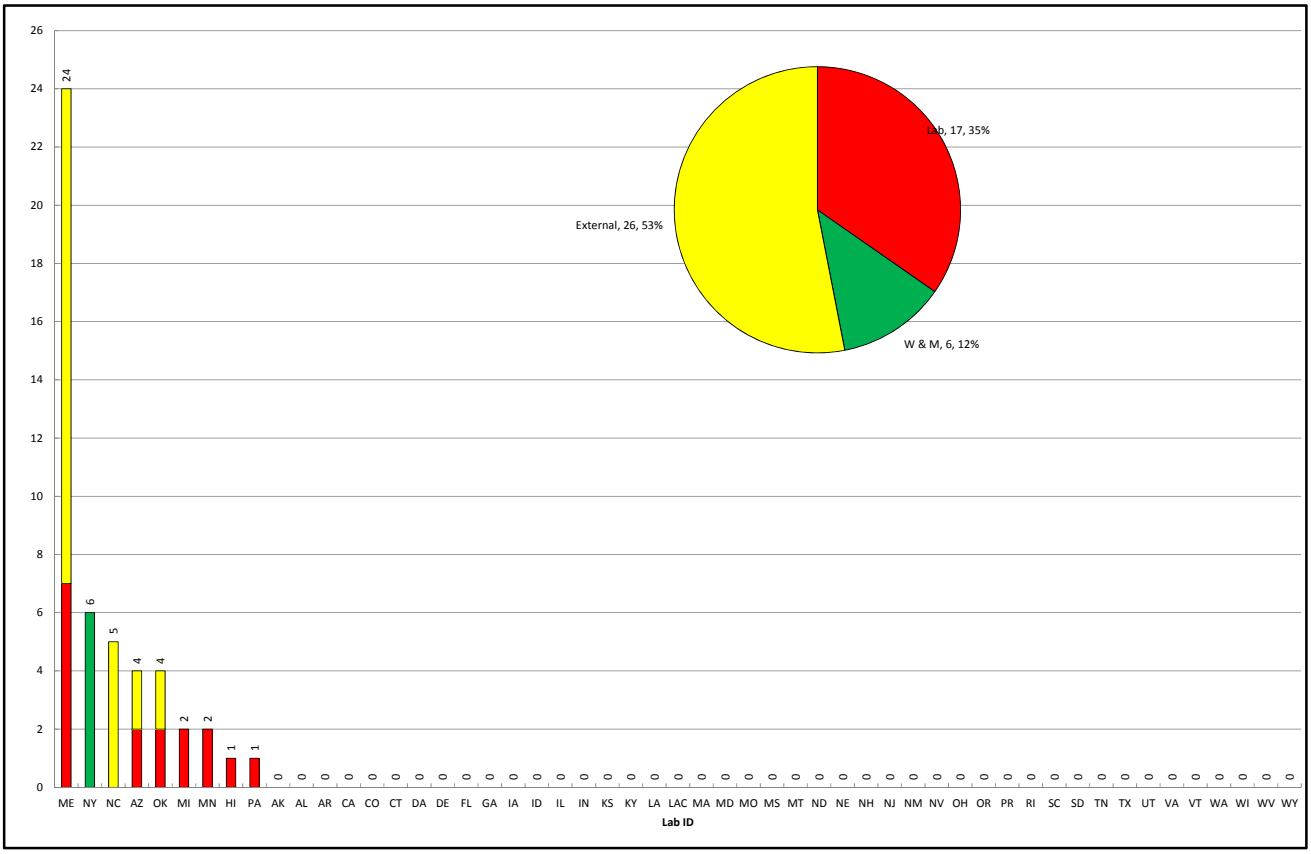


Figure 20: Prover (≥5 gal. and < 100 gal.) tests, gravimetric

Provers (> 5 gallon and ≤ 100 gallon)

Description

The graphs on the next two pages represent the total number of volume tests performed on medium sized metal volume provers by the 47 reporting laboratories using either a volume transfer (page 51) or gravimetric method (52). The individual map graphs give a geographical distribution of these standards. There are pie graphs located on each map for each individual lab and a larger pie graph that reflects the totals. The pie graphs provide a breakdown into the customer categories of Lab, W&M, and External. The bar graph at the bottom of the page shows the same breakdown along with the total number of devices tested by each laboratory.

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

Findings

- Of the 47 reporting laboratories, 41 labs performed a total of 711 volume transfer tests.
- Of the 47 reporting laboratories, 9 labs performed a total of 49 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

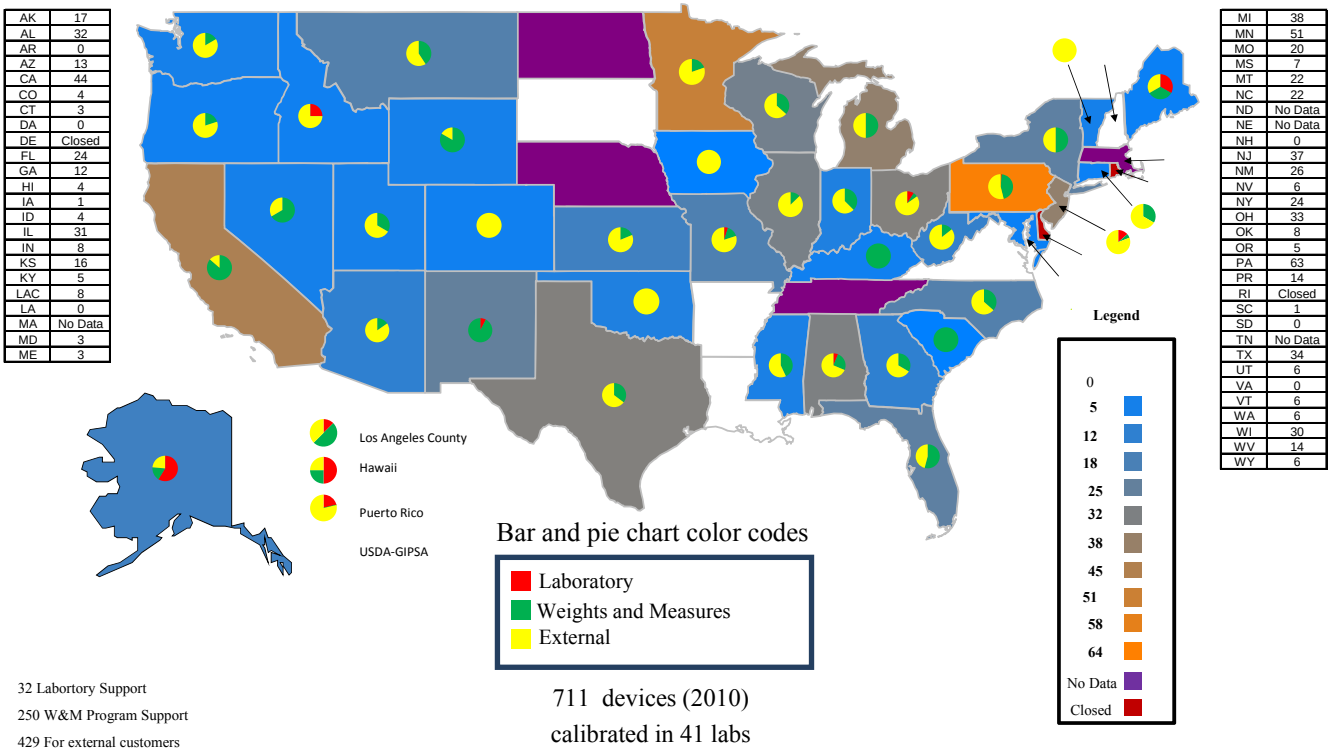
Table 13: Provers (>5 gal. and ≤ 100 gal.) volume tests from previous surveys.

Notes and Comments

- 6% of all provers (>5 gal. and ≤ 100 gal.) were tested for the laboratory
- 34% of all provers (>5 gal. and ≤ 100 gal.) were tested for Weights and Measures enforcement programs.
- 60% of all provers (>5 gal. and ≤ 100 gal.) were tested for external customers.

Volume Transfer

Volume Provers (>5 gallon and ≤100 gallon)



AK	17
AL	32
AR	0
AZ	13
CA	44
CO	4
CT	3
DA	0
DE	Closed
FL	24
GA	12
HI	4
IA	1
ID	4
IL	31
IN	8
KS	16
KY	5
LAC	8
LA	0
MA	No Data
MD	3
ME	3

MI	38
MN	51
MO	20
MS	7
MT	22
NC	22
ND	No Data
NE	No Data
NH	0
NJ	37
NM	26
NV	6
NY	24
OH	33
OK	8
OR	5
PA	63
PR	14
RI	Closed
SC	1
SD	0
TN	No Data
TX	34
UT	6
VA	0
VT	6
WA	6
WI	30
WV	14
WY	6

32 Labortory Support
250 W&M Program Support
429 For external customers

711 devices (2010)
calibrated in 41 labs

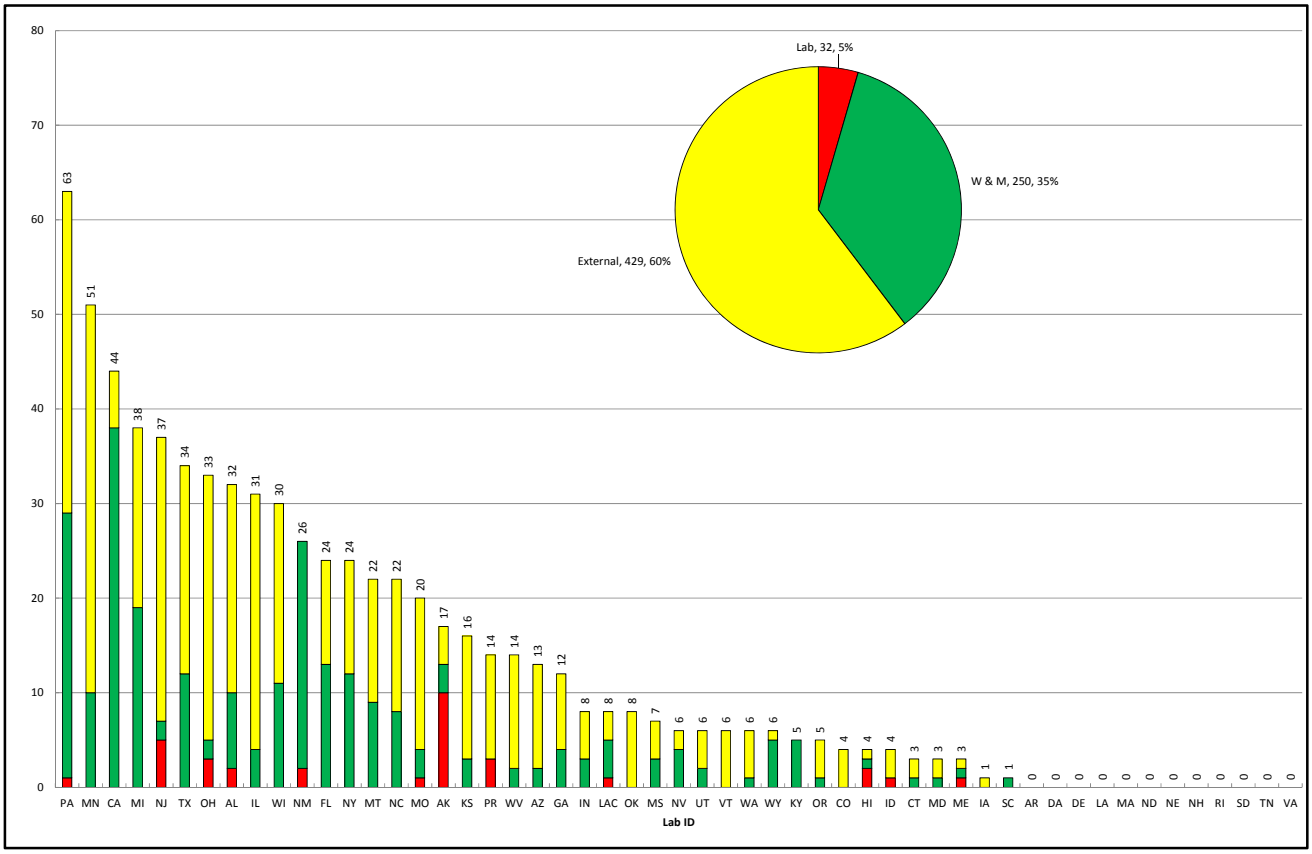


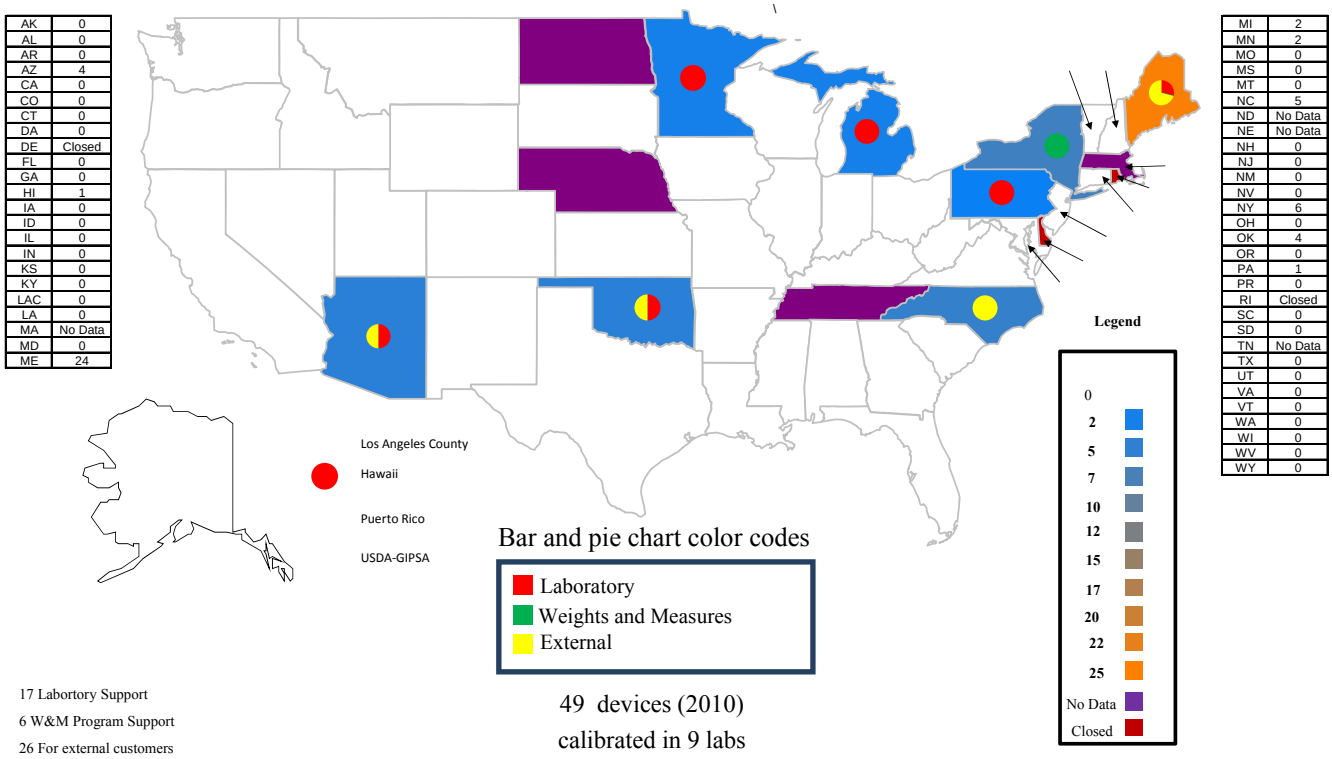
Figure 19: Prover (≥5 gal. and < 100 gal.) tests, volume transfer.

Gravimetric

Volume Provers (>5 gallon and ≤100 gallon)

AK	0
AL	0
AR	0
AZ	4
CA	0
CO	0
CT	0
DA	0
DE	Closed
FL	0
GA	0
HI	1
IA	0
ID	0
IL	0
IN	0
KS	0
KY	0
LAC	0
LA	0
MA	No Data
MD	0
ME	24

MI	2
MN	2
MO	0
MS	0
MT	0
NC	5
ND	No Data
NE	No Data
NH	0
NJ	0
NM	0
NV	0
NY	6
OH	0
OK	4
OR	0
PA	1
PR	0
RI	Closed
SC	0
SD	0
TN	No Data
TX	0
UT	0
VA	0
VT	0
WA	0
WI	0
WV	0
WY	0



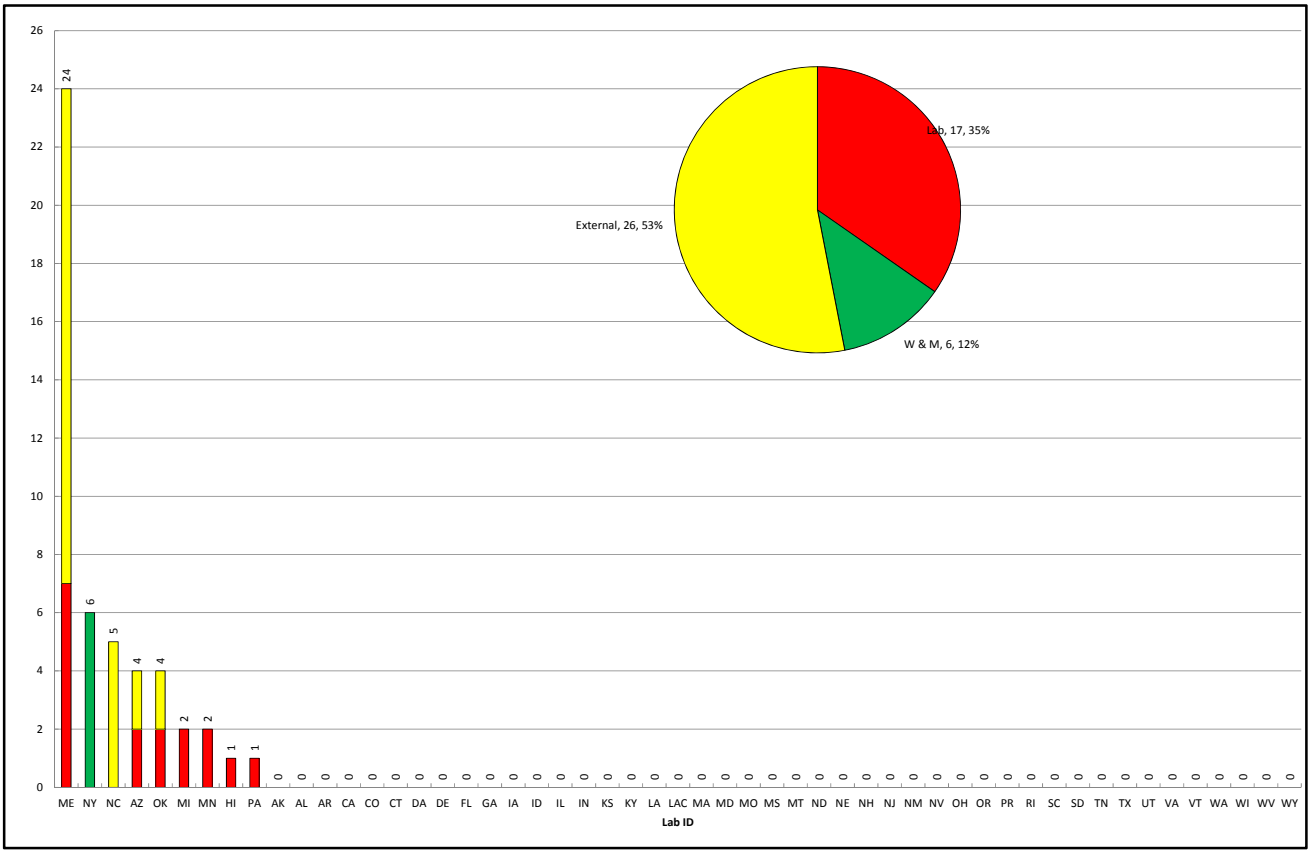


Figure 20: Prover (≥5 gal. and < 100 gal.) tests, gravimetric

Provers (> 100 gallon)

Description

The graphs on page 54 represent the total number of volume tests performed on large metal volume provers by the 47 reporting laboratories using either a volume transfer or gravimetric method. The map graph gives a geographical distribution of these standards. There are pie graphs located on the map for each individual lab and a larger pie graph that reflects overall totals. The pie graphs provide a breakdown into the customer categories of Lab, W&M, and External. The bar graph at the bottom of the page shows the same breakdown along with the total number of devices tested by each laboratory.

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

Findings

- Of the 47 reporting laboratories, 33 labs performed a total of 287 volume transfer tests.
- Of the 47 reporting laboratories, 0 labs 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

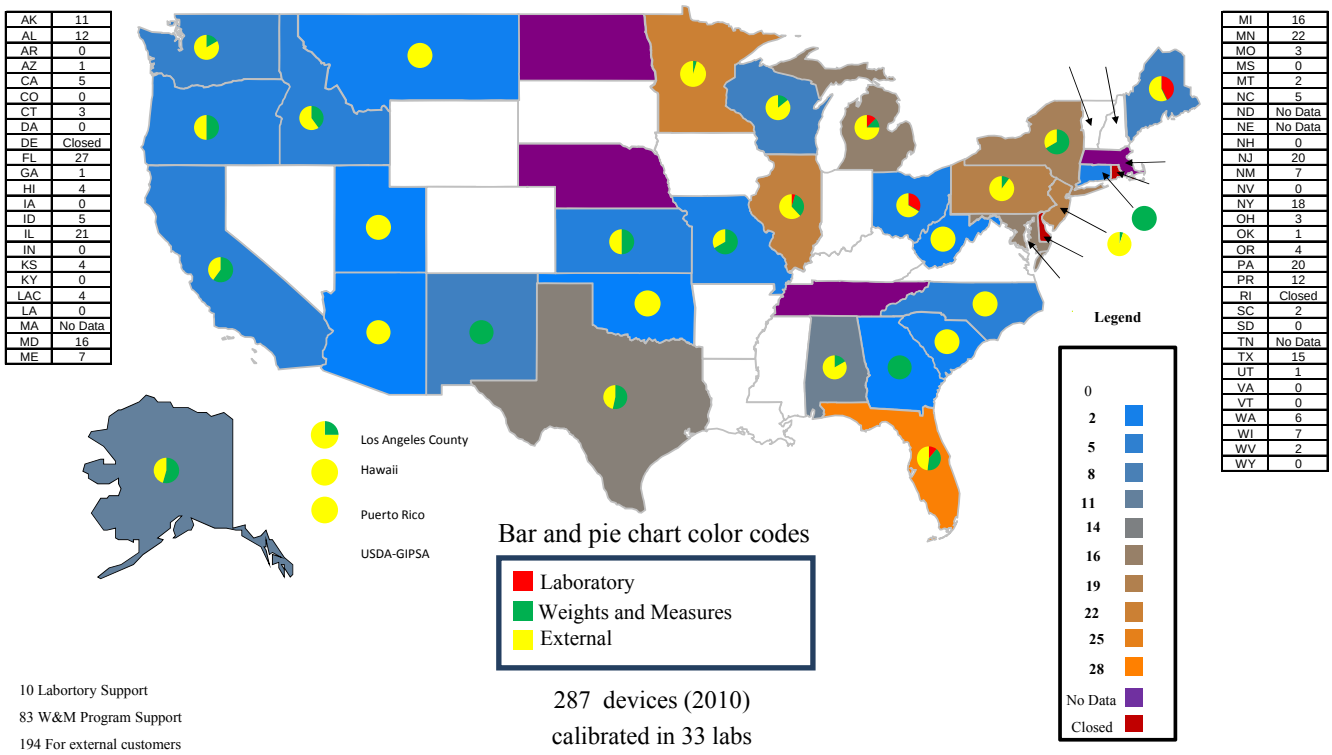
Table 14: Provers (> 100 gal.) tests from previous surveys.

Notes and Comments

- 3% of all provers (> 100 gal.) were tested for the laboratory
- 29% of all provers (> 100 gal.) were tested for Weights and Measures enforcement programs.
- 68% of all provers (> 100 gal.) were tested for external customers.

Volume Transfer

Volume Provers (>100 gallon)



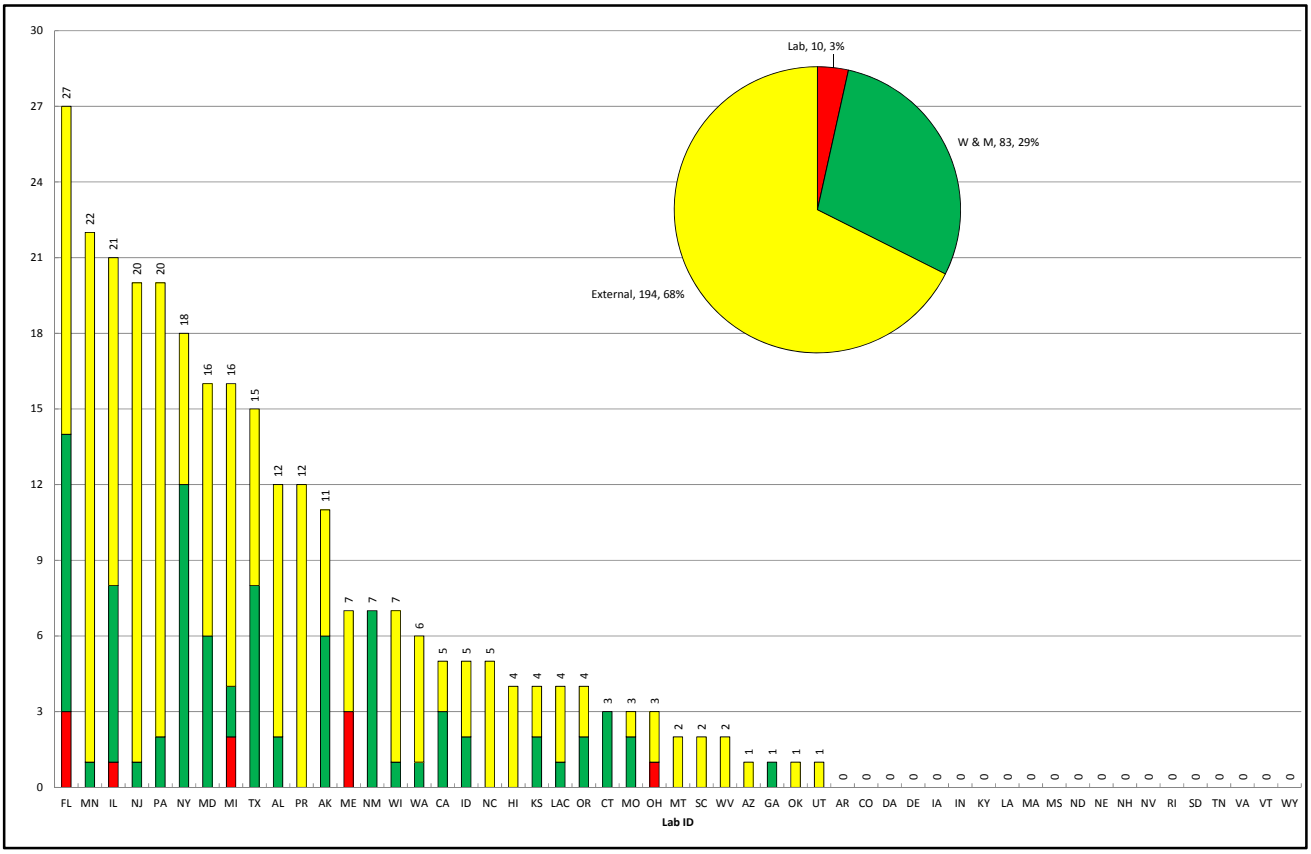


Figure 21: Prover (≥100 gal.) tests, volume transfer

Liquefied Petroleum Gas (LPG) Provers

Description

The graph on page 56 represent the total number of volume tests performed on LPG provers by the 47 reporting laboratories using either a volume transfer or gravimetric method. The map graph gives a geographical distribution of these standards. There are pie graphs located on the map for each individual lab and a larger pie graph that reflects overall totals. The pie graphs provide a breakdown into the customer categories of Lab, W&M, and External. The bar graph at the bottom of the page shows the same breakdown along with the total number of devices tested by each laboratory.

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

Findings

- Of the 47 reporting laboratories, 27 labs performed a total of 304 volume transfer tests.
- Of the 47 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

Table 15: LPG Prover volume tests from previous surveys.

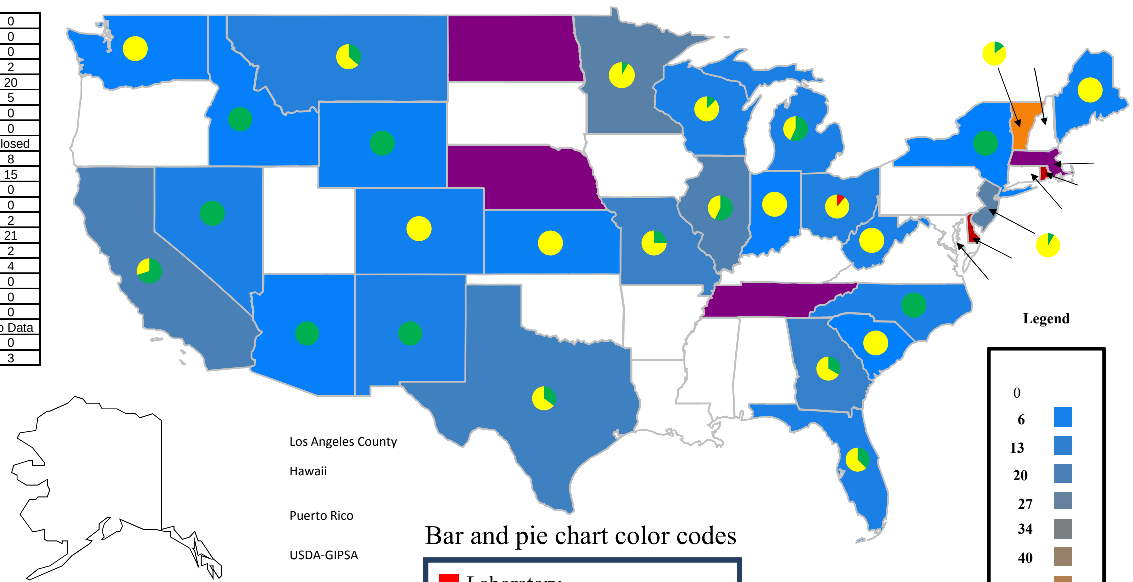
Notes and Comments

- 0% of all LPG provers were tested for the laboratory
- 33% of all LPG provers were tested for Weights and Measures enforcement programs.
- 67% of all LPG provers were tested for external customers.

Volume Transfer

Volume LPG

AK	0
AL	0
AR	0
AZ	2
CA	20
CO	5
CT	0
DA	0
DE	Closed
FL	8
GA	15
HI	0
IA	0
ID	2
IL	21
IN	2
KS	4
KY	0
LAC	0
LA	0
MA	No Data
MD	0
ME	3



MI	7
MN	25
MO	16
MS	0
MT	11
NC	8
ND	No Data
NE	No Data
NH	0
NJ	24
NM	7
NV	8
NY	1
OH	9
OK	0
OR	0
PA	0
PR	0
RI	Closed
SC	1
SD	0
TN	No Data
TX	17
UT	0
VA	0
VT	67
WA	2
WI	8
WV	7
WY	4

Legend

0
6
13
20
27
34
40
47
54
61
68
No Data
Closed

Bar and pie chart color codes

- Laboratory
- Weights and Measures
- External

1 Labortory Support
99 W&M Program Support
204 For external customers

304 devices (2010)
calibrated in 27 labs

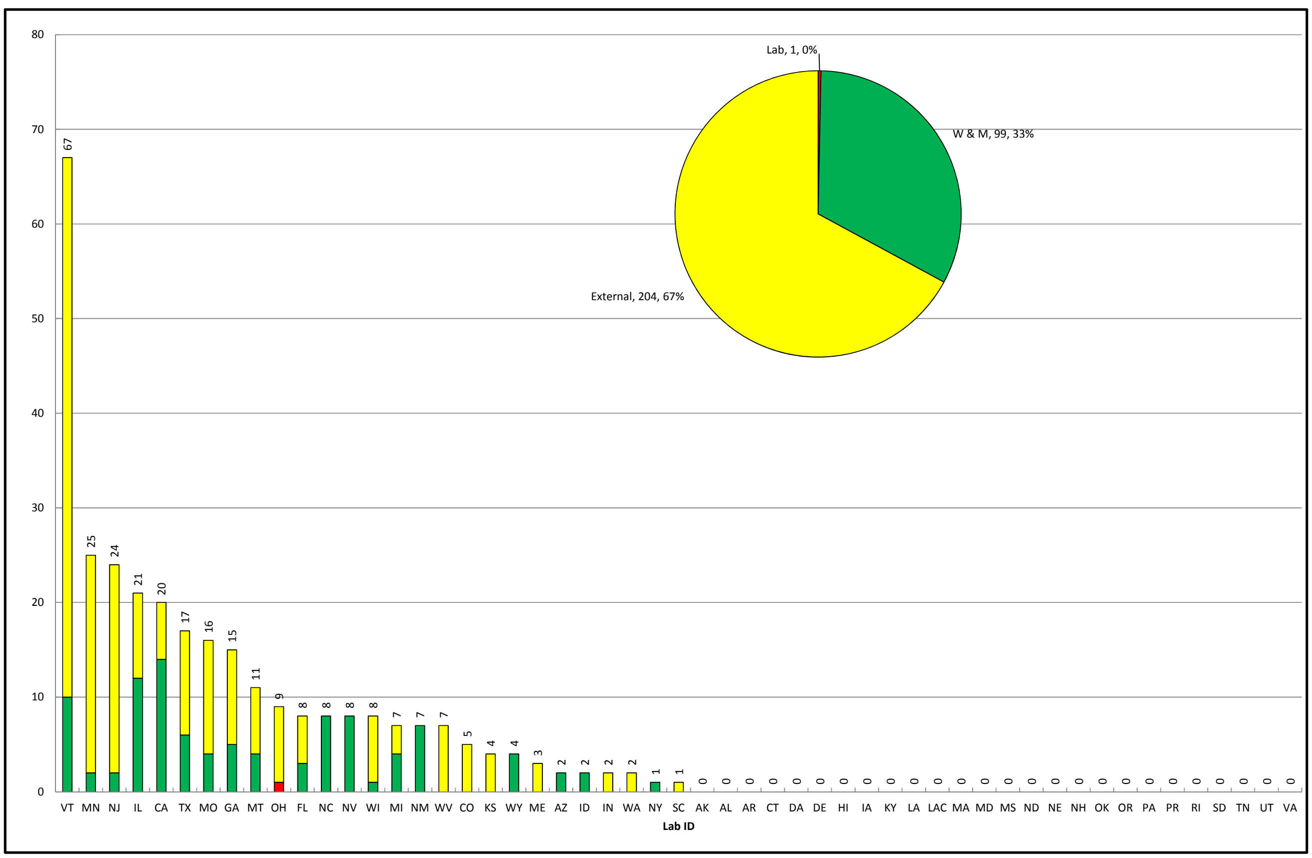


Figure 22: LPG Prover tests,volume transfer

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	3	30	0	30 [MI,NC]

Table 16: SVP tests from previous surveys.

Temperature

Description

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

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

Findings

Of the 47 reporting laboratories, 11 labs tested a total of 465 temperature standards

Comparison of previous surveys

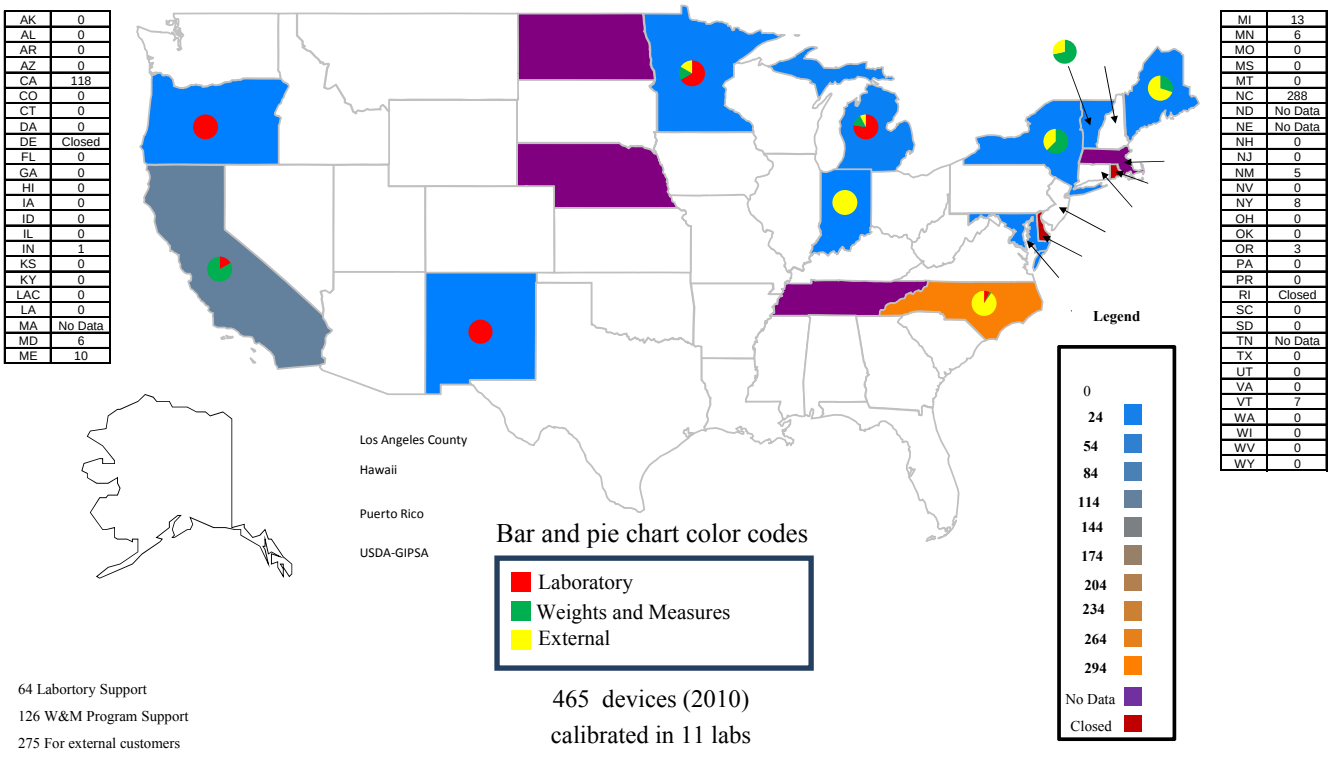
Year	# Labs	Total Devices
1996	20	447
1998	11	378
1999	12	514
2000	16	460
2002	13	456
2004	12	315
2005	15	418
2006	12	281
2008	13	498
2010	11	465

Table 17: Temperature standard tests from previous surveys.

Notes and Comments

- 14 % of all temperature standards were tested for internal use by the laboratory.
- 27 % of all temperature standards were tested for the weight and measures program.
- 59 % of all temperature standards were tested for external customers.

Temperature



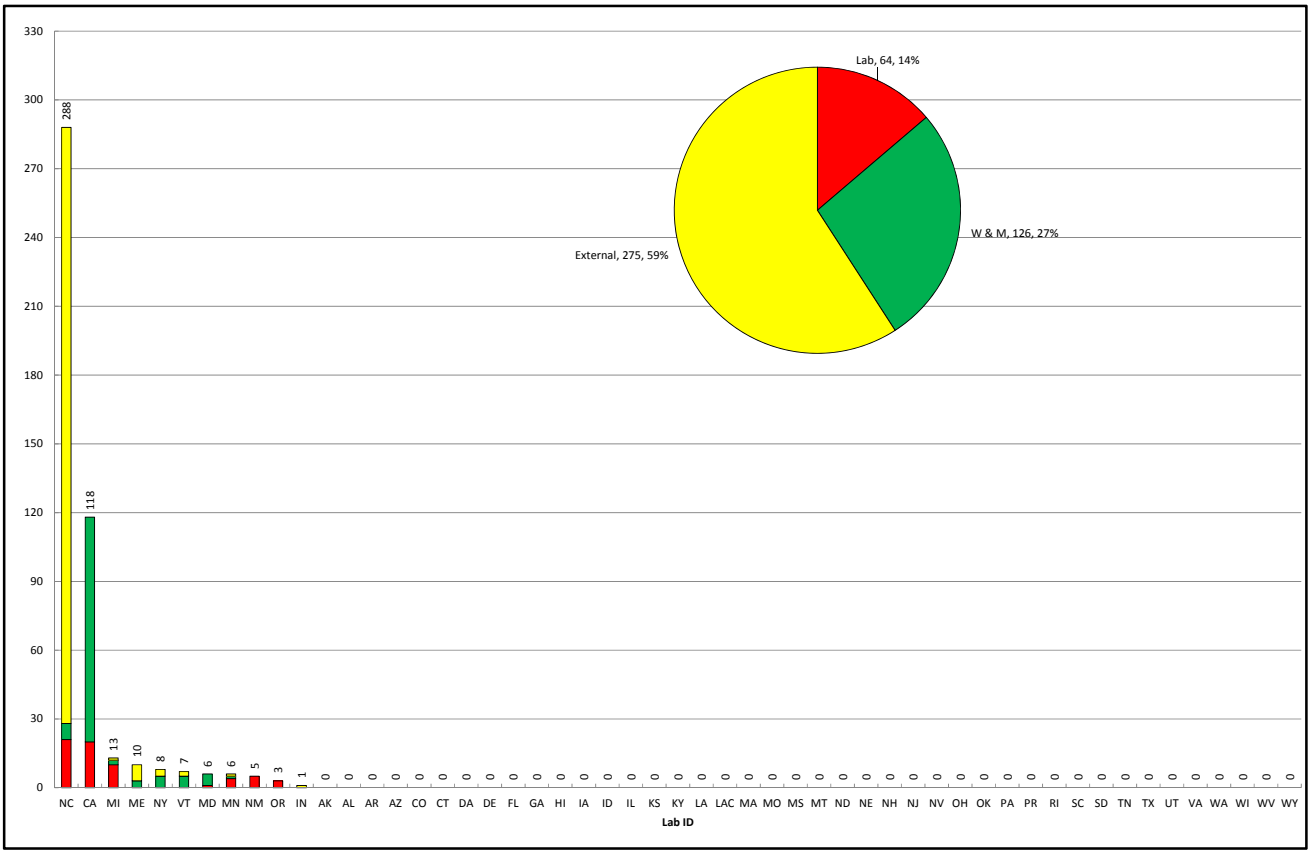


Figure 23: Temperature standard tests.

Frequency

Description

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

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

Findings

Of the 47 reporting laboratories, 4 labs tested a total of 17,580 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

Table 18 Frequency standard tests from previous surveys.

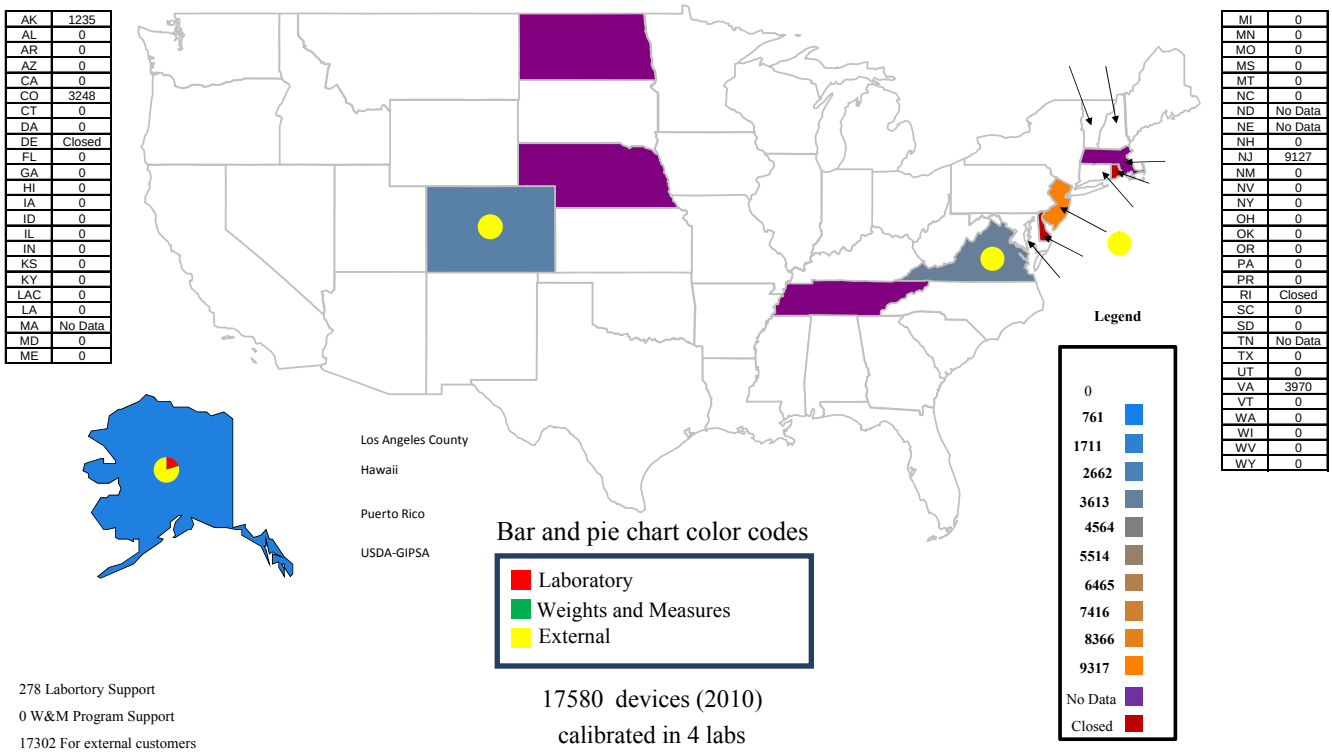
Notes and Comments

- 2 % 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.
- 98 % of all frequency standards were tested for external customers.

Frequency

AK	1235
AL	0
AR	0
AZ	0
CA	0
CO	3248
CT	0
DA	0
DE	Closed
FL	0
GA	0
HI	0
IA	0
ID	0
IL	0
IN	0
KS	0
KY	0
LAC	0
LA	0
MA	No Data
MD	0
ME	0

MI	0
MN	0
MO	0
MS	0
MT	0
NC	0
ND	No Data
NE	No Data
NH	0
NJ	9127
NM	0
NV	0
NY	0
OH	0
OK	0
OR	0
PA	0
PR	0
RI	Closed
SC	0
SD	0
TN	No Data
TX	0
UT	0
VA	3970
VT	0
WA	0
WI	0
WV	0
WY	0



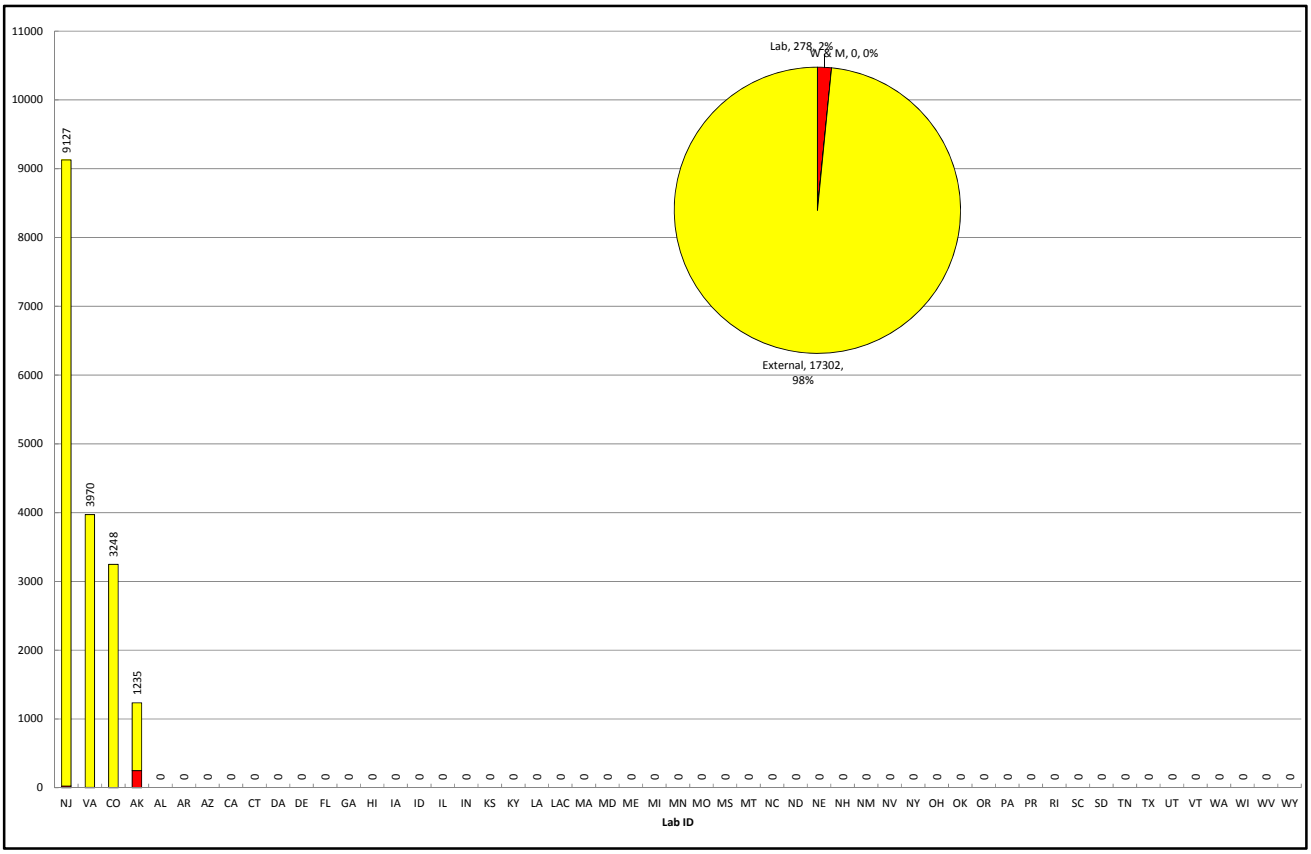


Figure 24 Frequency standard tests

Timing Devices

Description

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

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

Findings

Of the 47 reporting laboratories, 9 labs tested a total of 339 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

Table 19: Timing devices tests from previous surveys

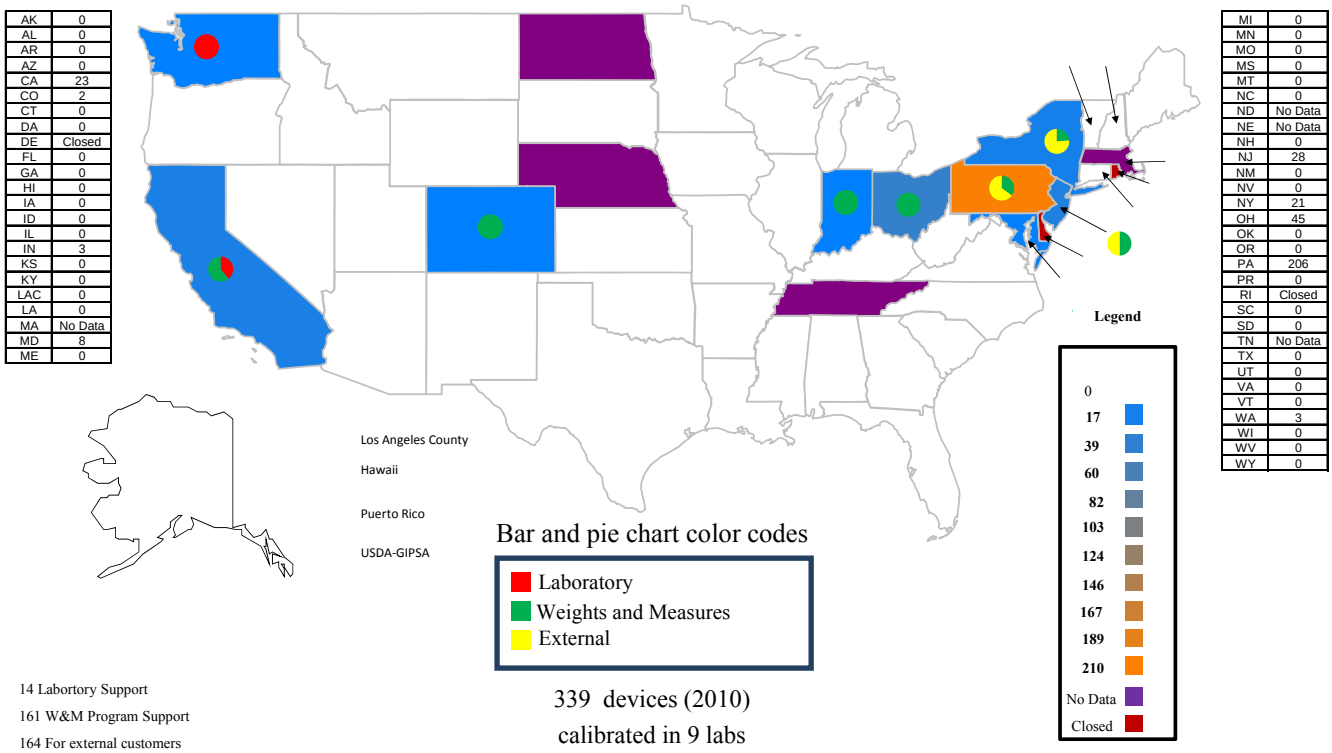
Notes and Comments

- 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	2
CT	0
DA	0
DE	Closed
FL	0
GA	0
HI	0
IA	0
ID	0
IL	0
IN	3
KS	0
KY	0
LAC	0
LA	0
MA	No Data
MD	8
ME	0

MI	0
MN	0
MO	0
MS	0
MT	0
NC	0
ND	No Data
NE	No Data
NH	0
NJ	28
NM	0
NV	0
NY	21
OH	45
OK	0
OR	0
PA	206
PR	0
RI	Closed
SC	0
SD	0
TN	No Data
TX	0
UT	0
VA	0
VT	0
WA	3
WI	0
WV	0
WY	0



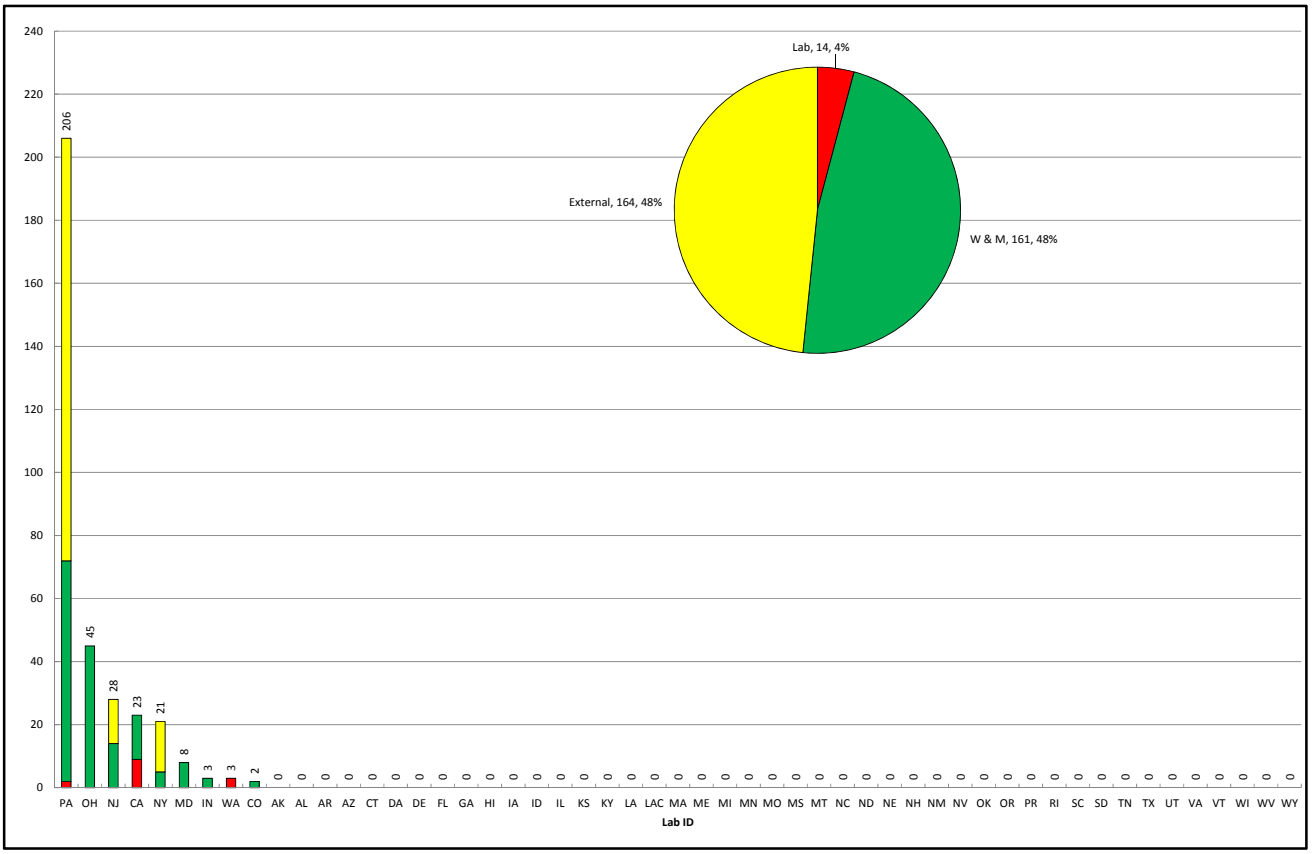


Figure 25 Timing device tests

Wheel Load Weighers

Description

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

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

Findings

Of the 47 reporting laboratories, 20 labs tested a total of 10815 wheel load weighers.

Comparison of previous surveys

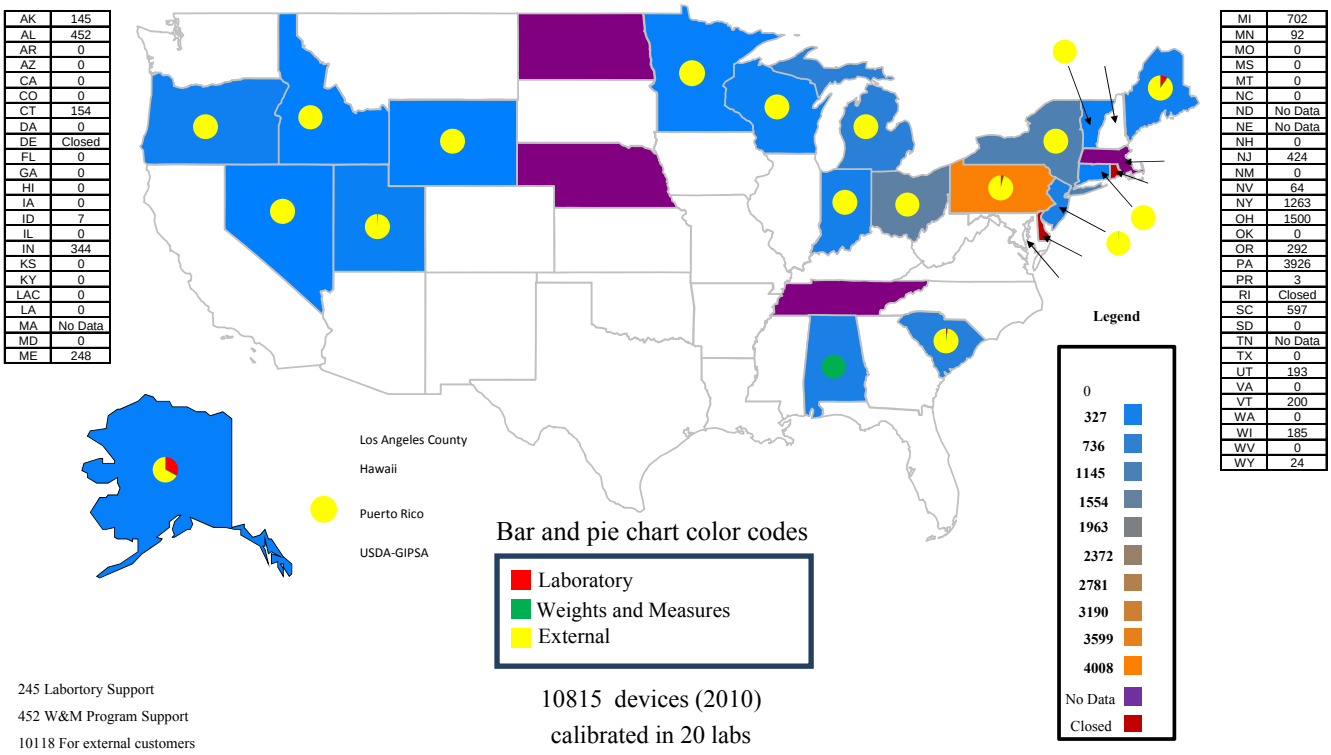
Year	# Labs	Total Devices
1998	19	12178
1999	20	12781
2000	22	13699
2002	23	10350
2004	21	10884
2005	19	9748
2006	20	10567
2008	22	10191
2010	20	10815

Table 20: Wheel load weigher tests from previous surveys

Notes and Comments

- 2 % of all wheel load weighers were tested for internal use by the laboratory.
- 4 % of all wheel load weighers were tested for the weight and measures program.
- 94 % of all wheel load weighers were tested for external customers.

Wheel Load Weighers



AK	145
AL	452
AR	0
AZ	0
CA	0
CO	0
CT	154
DA	0
DE	Closed
FL	0
GA	0
HI	0
IA	0
ID	7
IL	0
IN	344
KS	0
KY	0
LAC	0
LA	0
MA	No Data
MD	0
ME	248

MI	702
MN	92
MO	0
MS	0
MT	0
NC	0
ND	No Data
NE	No Data
NH	0
NJ	424
NM	0
NV	64
NY	1263
OH	1500
OK	0
OR	292
PA	3926
PR	3
RI	Closed
SC	597
SD	0
TN	No Data
TX	0
UT	193
VA	0
VT	200
WA	0
WI	185
WV	0
WY	24

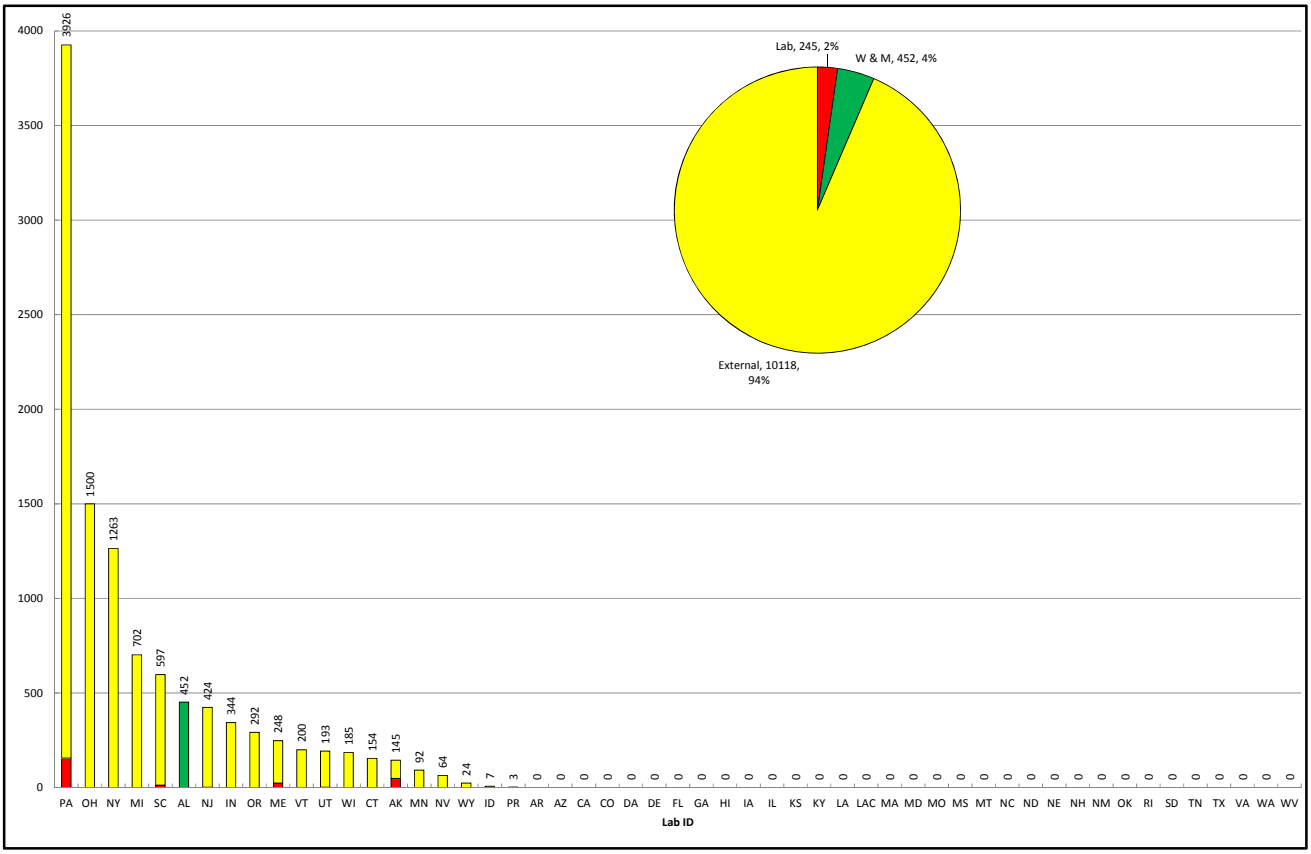


Figure 26: Wheel load weigher tests

Lottery Balls

Description

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

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

Findings

Of the 47 reporting laboratories, 8 labs tested a total of 46,515 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

Table 21: Lottery balls tests from previous surveys

Notes and Comments

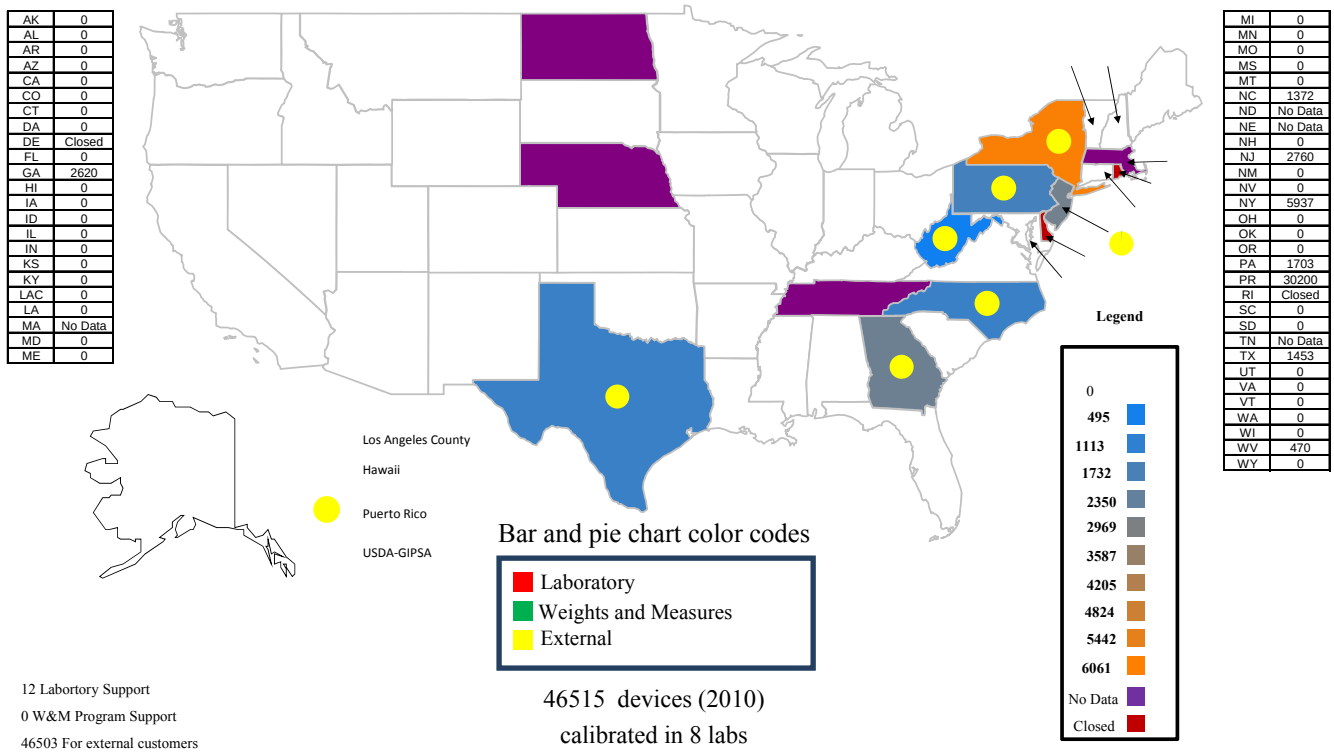
- 0 % of all lottery balls were tested for internal use by the laboratory.
- 0 % of all lottery balls were tested for the weight and measures program.
- 100 % of all lottery balls were tested for external customers.

The Puerto Rico metrology laboratory performed 30,200 tests on lottery balls (65% of the national total).

Lottery Balls

AK	0
AL	0
AR	0
AZ	0
CA	0
CO	0
CT	0
DA	0
DE	Closed
FL	0
GA	2620
HI	0
IA	0
ID	0
IL	0
IN	0
KS	0
KY	0
LAC	0
LA	0
MA	No Data
MD	0
ME	0

MI	0
MN	0
MO	0
MS	0
MT	0
NC	1372
ND	No Data
NE	No Data
NH	0
NJ	2760
NM	0
NV	0
NY	5937
OH	0
OK	0
OR	0
PA	1703
PR	30200
RI	Closed
SC	0
SD	0
TN	No Data
TX	1453
UT	0
VA	0
VT	0
WA	0
WI	0
WV	470
WY	0



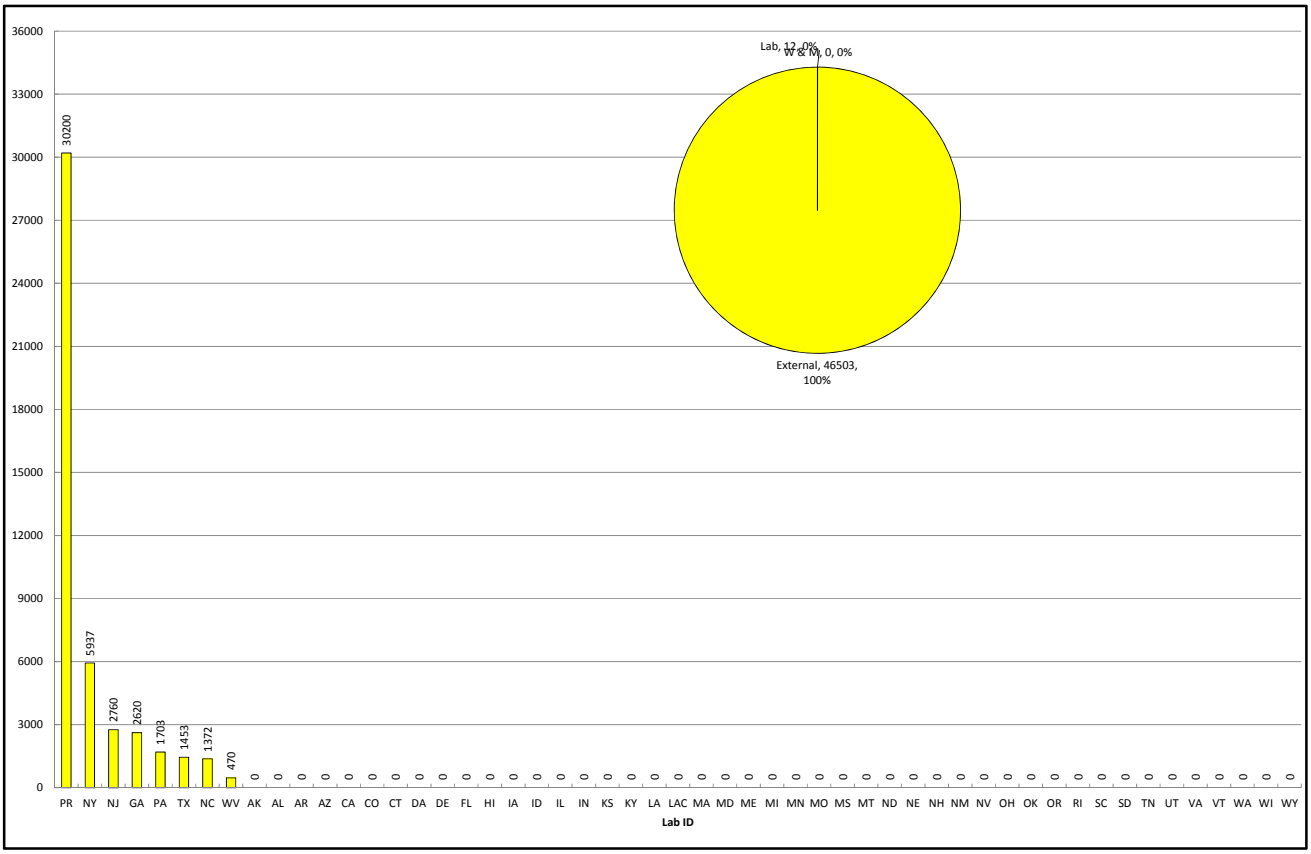


Figure 27 Lottery Ball tests

Summary Other Tests

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

"Other Test" – ID	Lab ID	Tests
Air Quality Filters	ME	2450
Digital Calipers	PR	23
Fish Measures	ME	32
Grain Moisture Tests	CO,WI	163
Hydrometers	VT	6660
Laser Distance Devices	NJ	122
Master Meters	AZ,ME	45
Package Checking Scales	OH,WI	95
Police Drag Sled	NH	1
Police Lidar Units	AK	79
Police Radar Units	AK	626
Rail Road Test Cars	WY,DA,MN,MO	43
Rail Road Weight Carts	MN	4
Scales, Balances, and Load Cells	NJ,PR,NC,CT,MN	140
Trigger-Pull Gauges	PR	21
Watt Hour Meters	CA	10

Table 22: Other tests reported by the participating laboratories

Laboratory Fees (2010)

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 similarity between individual historical survey questions and those found in this survey regarding fees charged are sufficiently similar.

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:

We noted that some laboratories quoted fees for services which do not appear on either their NVLAP Scope of Accreditation (13) or their NIST/WMD Certificate of Measurement Traceability (3). We have not made an attempt to verify each laboratory's status as a part of this survey. Please check with each laboratory individually to discuss your measurement needs before contracting services.

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 which 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.

In 2008 it was reported that Hawaii and Wyoming did not charge calibration fees. Both of these labs reported charging calibration fees in 2010 and provided the requested quotes for routine calibration services.

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:

[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 if they have an operating NIST traceable lab with a current unconditional certificate.
NC	(No comments provided)
OK	The prices for out of state customer is twice the normal fee charged to customers that live or do business within the borders of the state of Oklahoma. This is to offset the time and resources that will be taken away from performing calibrations for in state
VT	$60/hour for out of state. $45/hour for in state servicemen
WY	Out of state customers are charged double the amount for in state customers

Table 23: 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%

Table 24: Average fee charged for echelon I mass testing from 2004 through 2010.

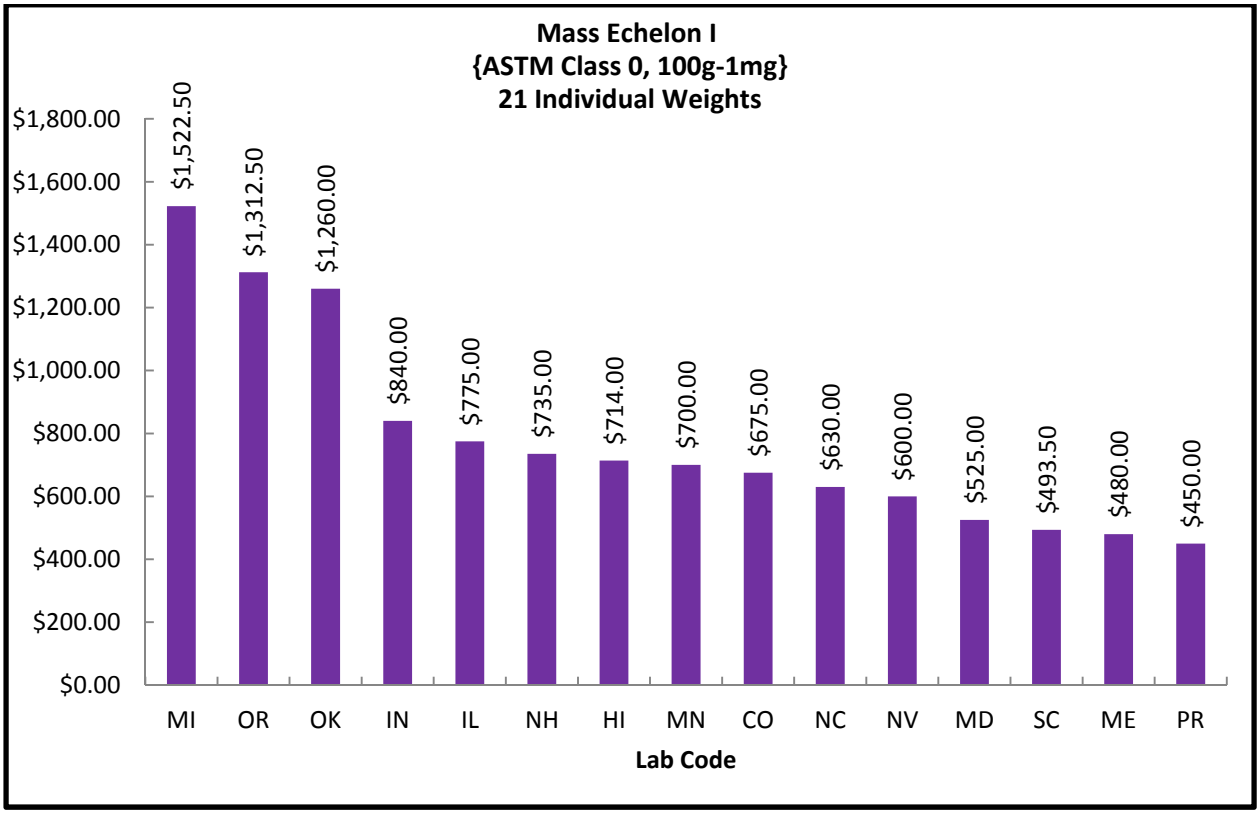


Figure 28: Fees charge for calibrating a precision weight kit containing 21 individual weights ranging from 100 g to 1 mg to ASTM Class 0 tolerances using echelon I testing techniques.

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%

Table 25: Average fee charged for echelon II mass testing from 2000 through 2010.

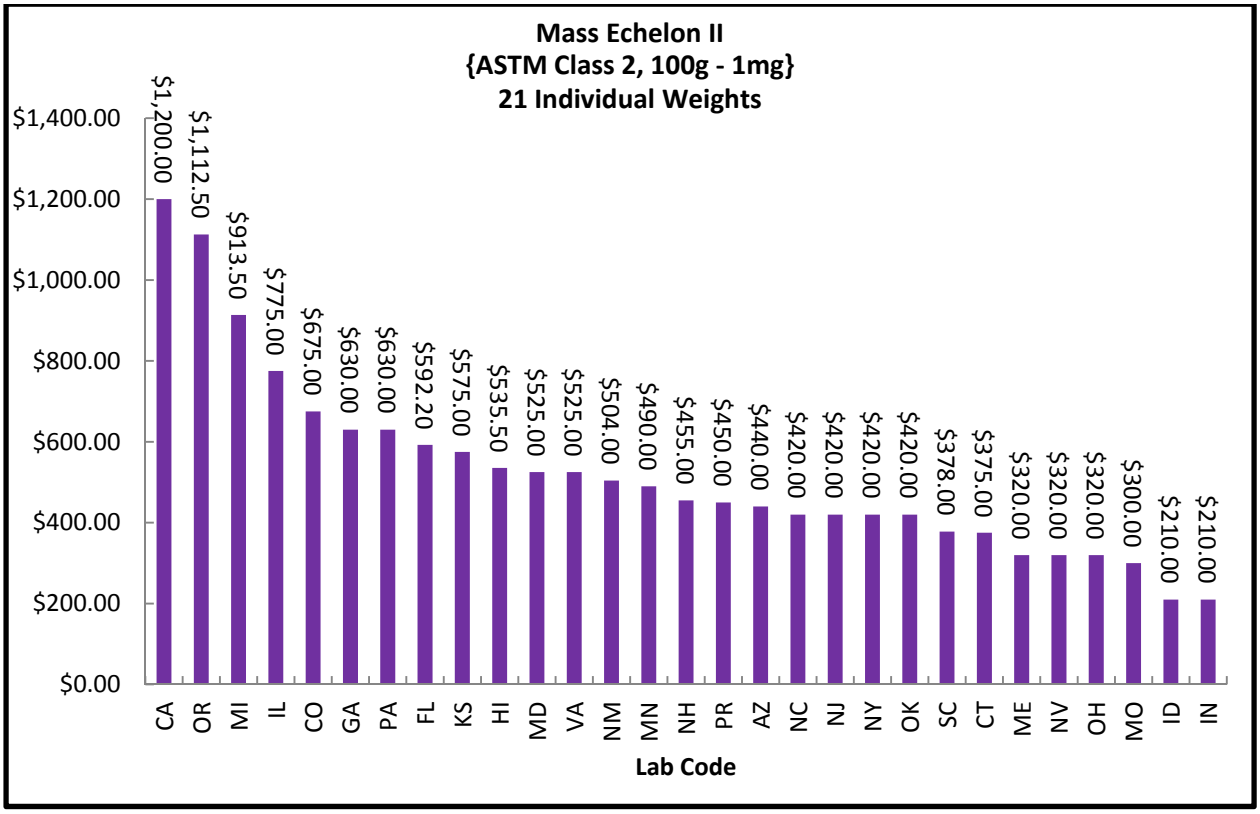


Figure 29: Fees charge for calibrating a precision weight kit containing 21 individual weights ranging from 100 g to 1 mg to ASTM Class 2 tolerances using echelon II testing techniques.

Mass Echelon III

Description

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

Comparison of Previous Surveys

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

Table 26 Average fee charged for echelon III mass testing from 2000 through 2010.

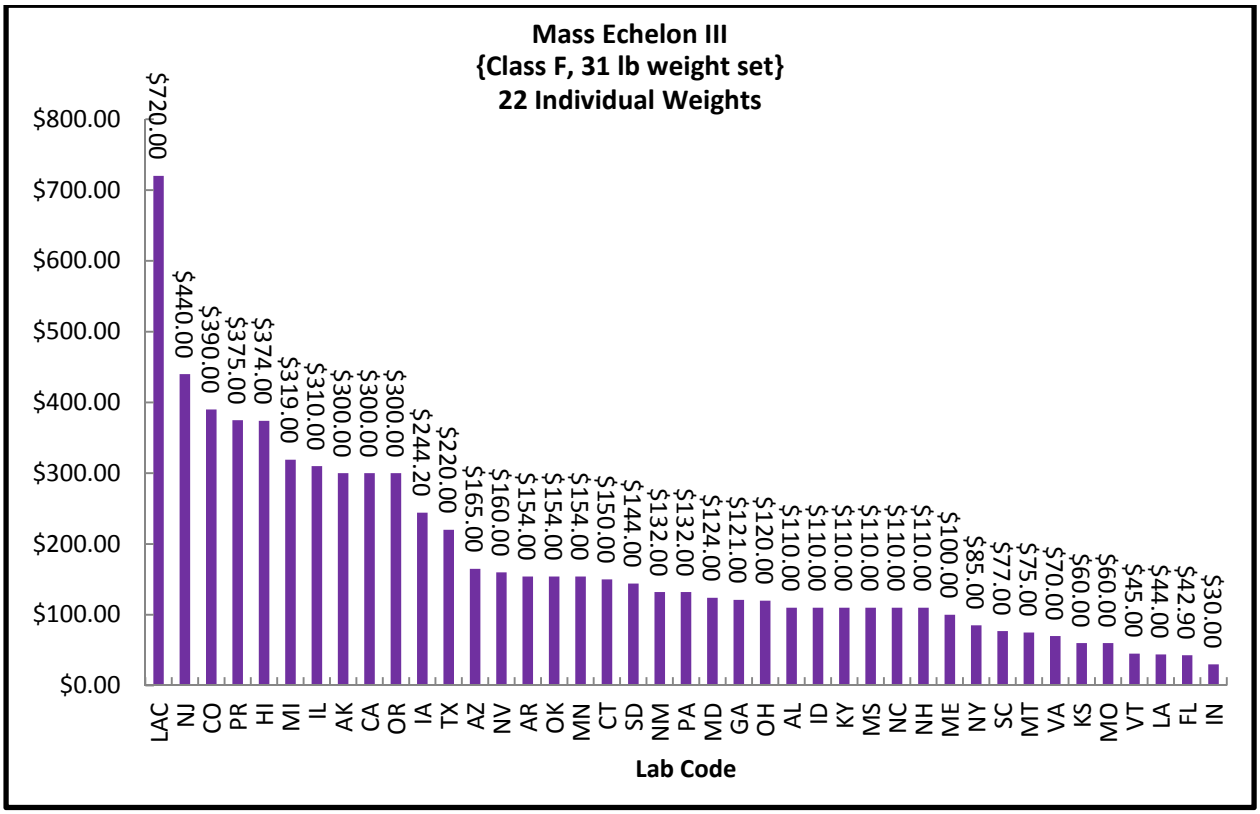


Figure 30: Fees charged for testing a 31 lb weight kit containing 22 pieces to NIST HB 105-1 Class F tolerances (10) using mass echelon III procedures.

5,000 lb Weight Cart

Description

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

Comparison of Previous Surveys

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

Table 27: Average fee charged for a 5,000 lb weight cart testing from 2004 through 2010.

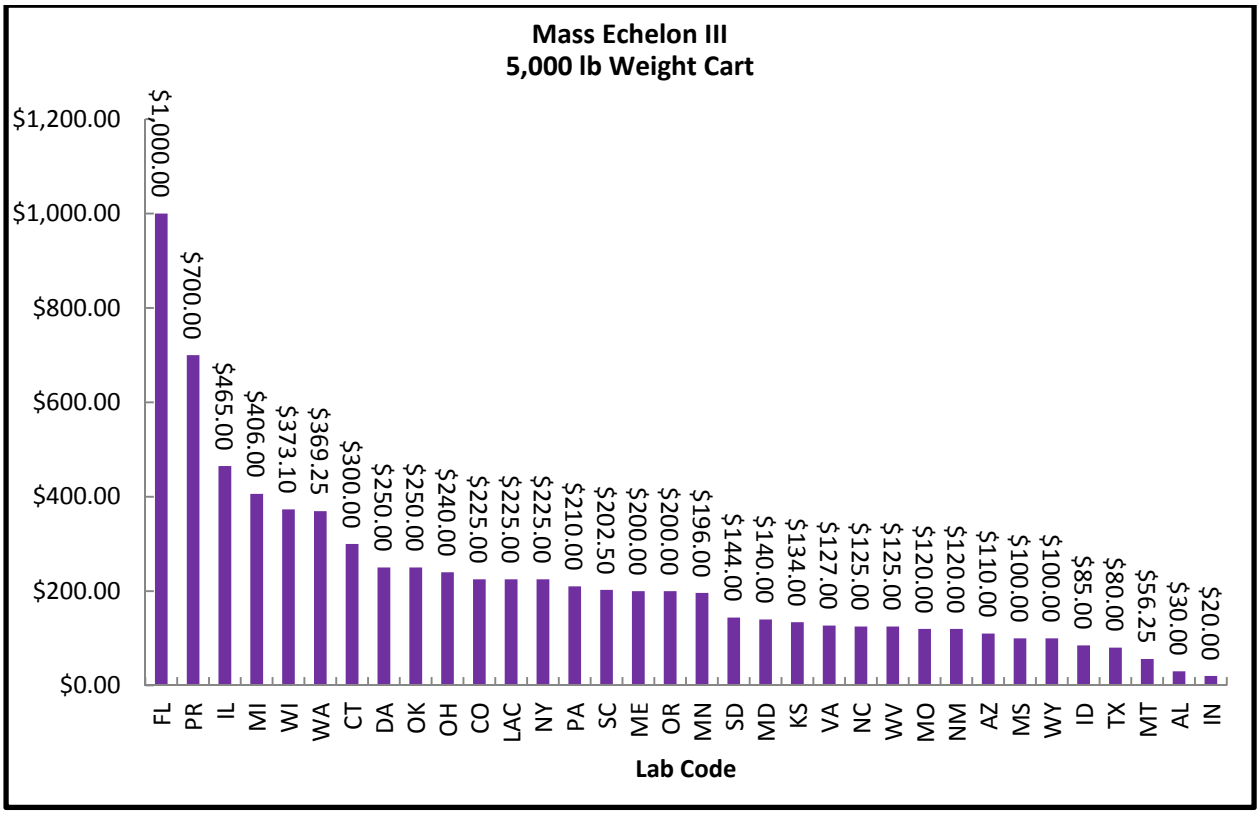


Figure 31: Fees charged for testing a 5,000lb weight cart according to NIST HB 105-8 (9) tolerances using mass echelon III procedures.

Scale Truck Calibration Class F

Description

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

Comparison of Previous Surveys

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

Table 28: Average fee charged for typical scale truck testing from 2004 through 2010.

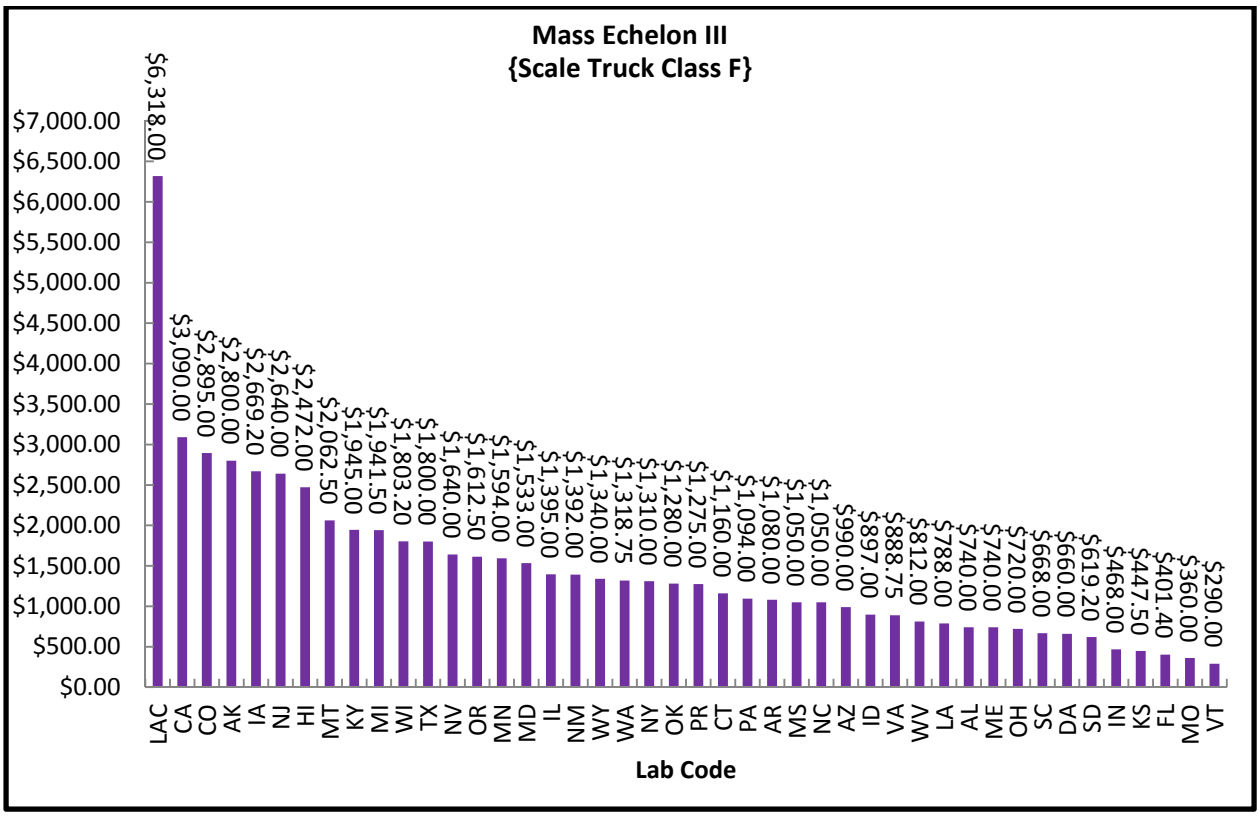


Figure 32: Fees charged for testing a typical scale truck according mass echelon III procedures.

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%

Table 29: Average fee charged for typical 19 point testing of a 100 ft steel tape from 2000 through 2010.

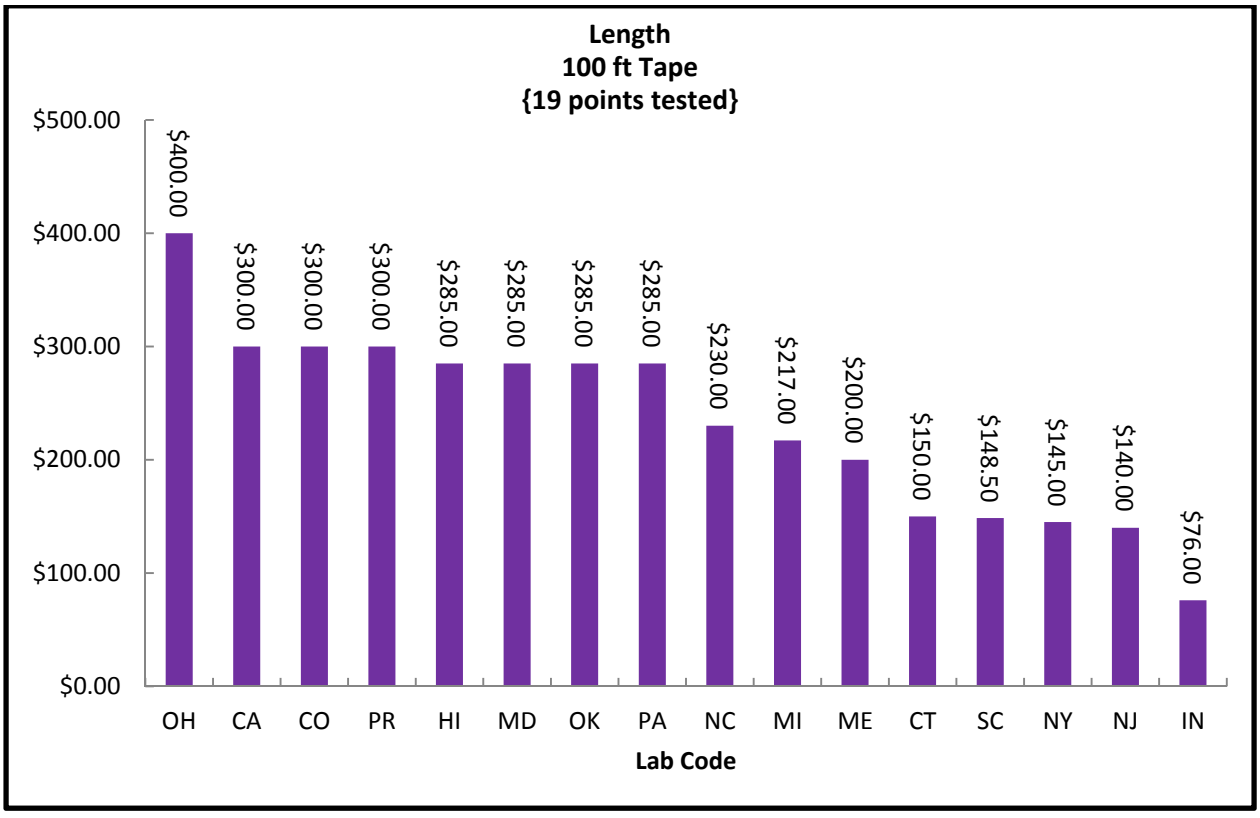


Figure 33: Fees charged for testing a steel 100 ft tape.

5 gallon test measures – Volume Transfer

Description

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

Comparison of Previous Surveys

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

Table 30: Average fee charged for testing of a 5 gallon field test measure via volume transfer from 2000 through 2010.

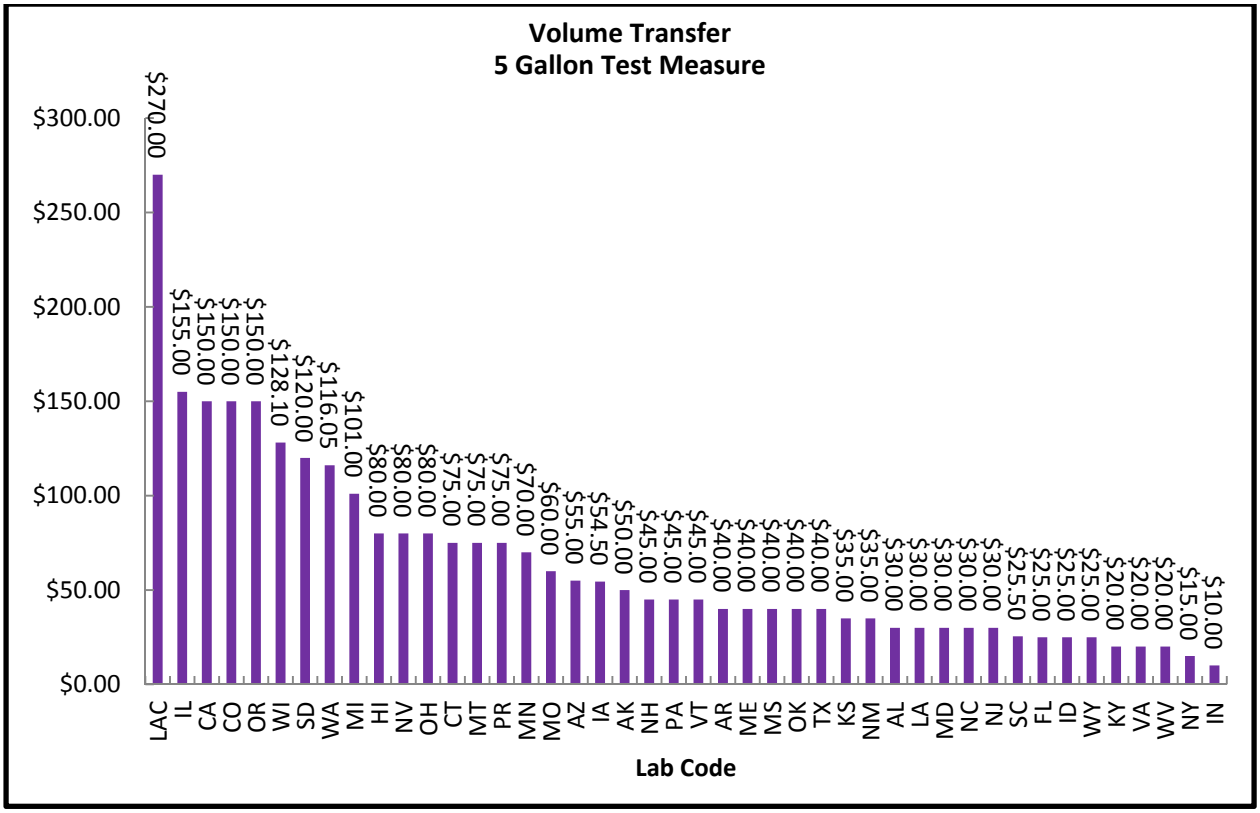


Figure 34: Fees charged for testing a 5 gallon field standard steel prover via volume transfer technique.

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%

Table 31: Average fee charged for testing of a 5 gallon field test measure via gravimetric method from 2000 through 2010.

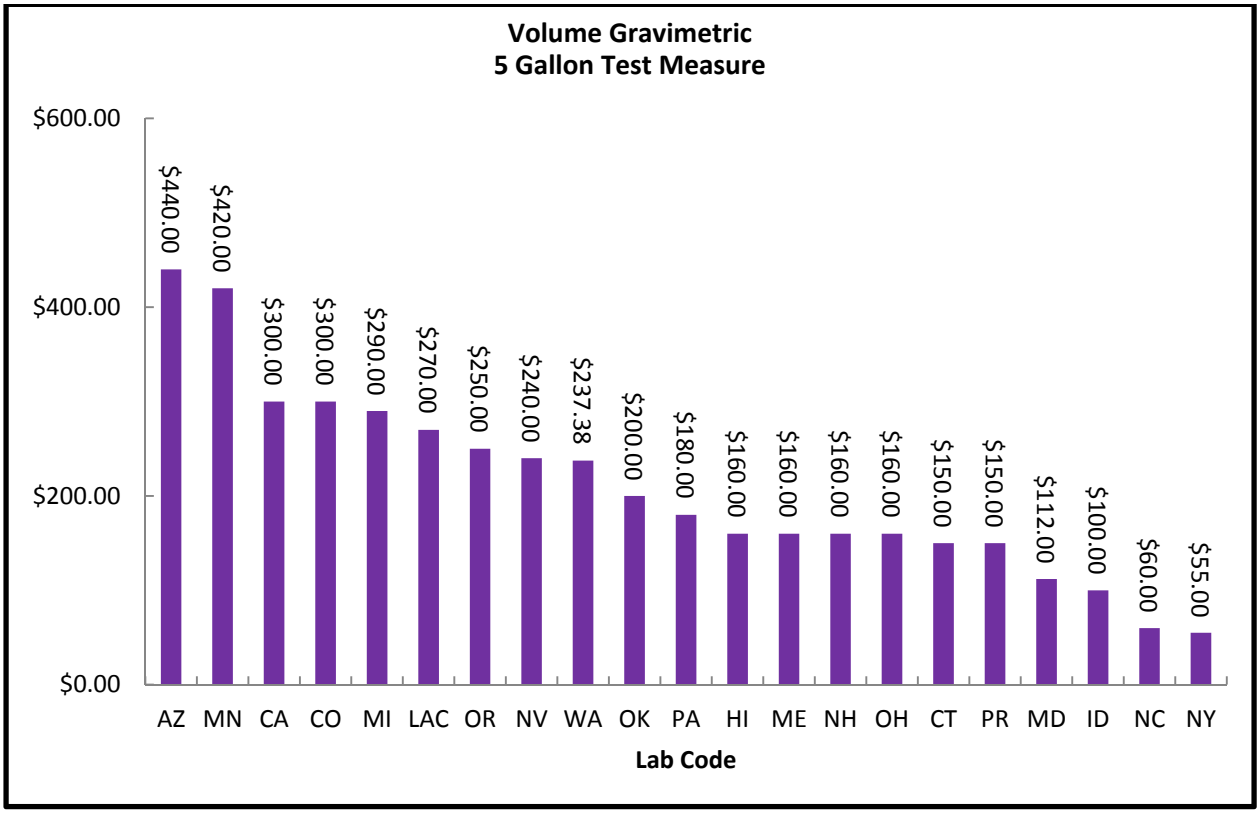


Figure 35 Fees charged for gravimetrically testing a 5 gallon field test measure.

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%

Table 32: Average fee charged for testing of a 100 gallon field standard prover via volume transfer from 2000 through 2010.

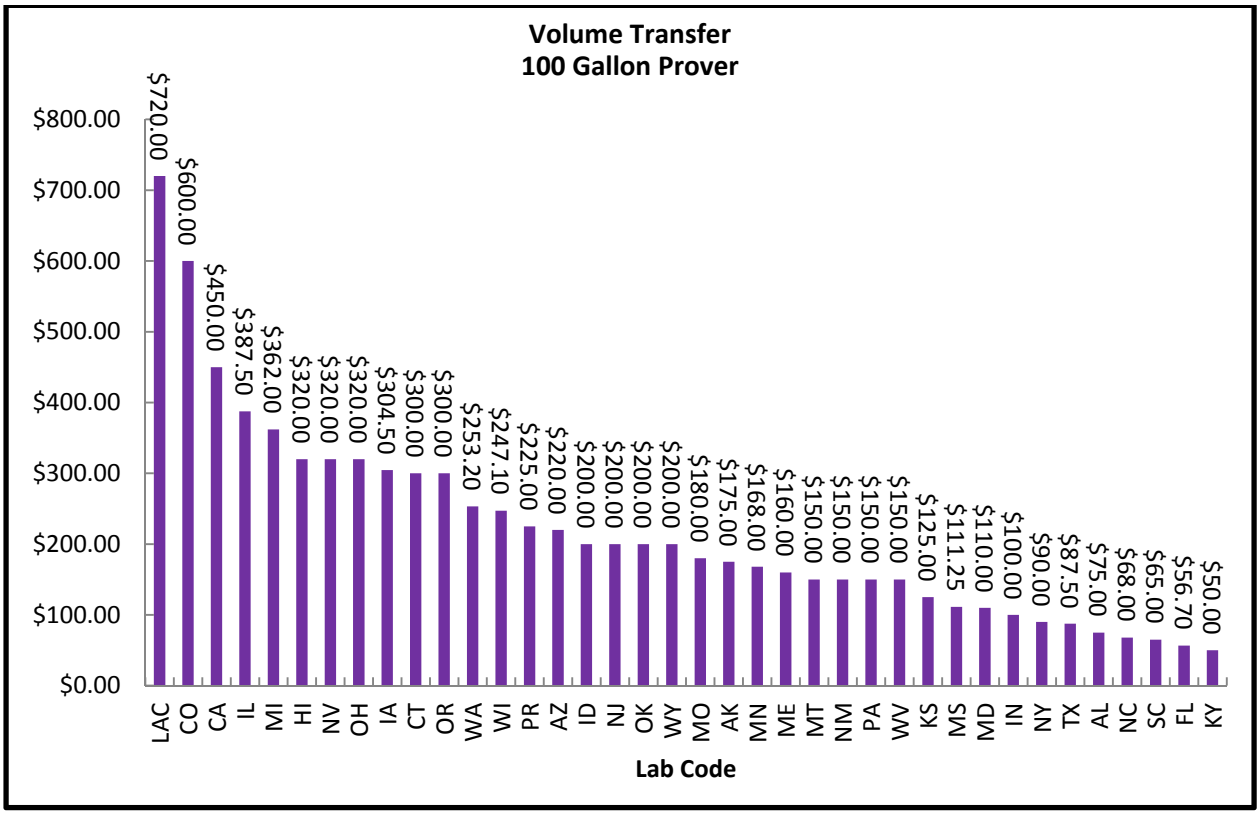


Figure 36: Fees charged for testing a 100 gallon field standard prover via volume transfer technique.

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%

Table 33: Average fee charged for testing of a 100 gallon field test standard prover via gravimetric method from 2006 through 2010.

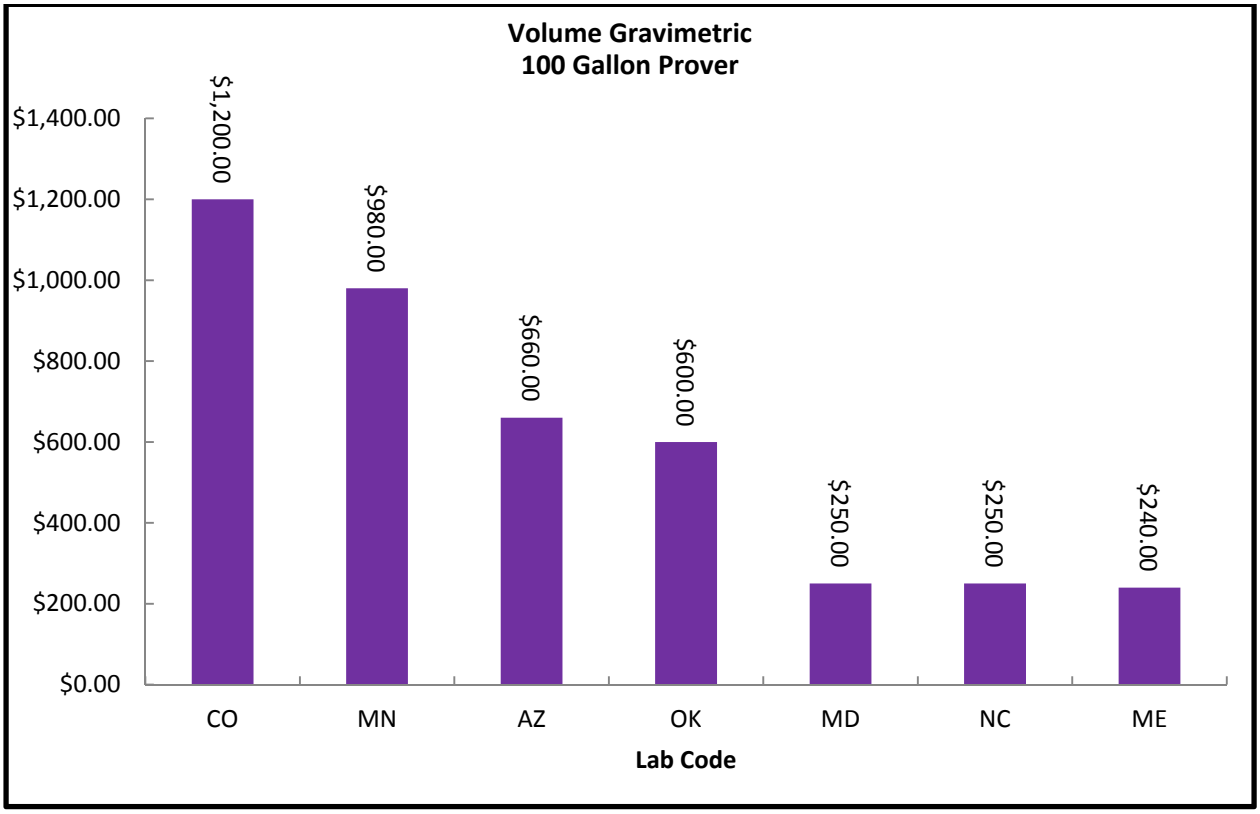


Figure 37: Fees charged for gravimetrically testing a 100 gallon field standard steel prover.

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%

Table 34: Average fees charged for the testing of a 100 gallon LPG prover from via volume transfer from 2006 through 2010.

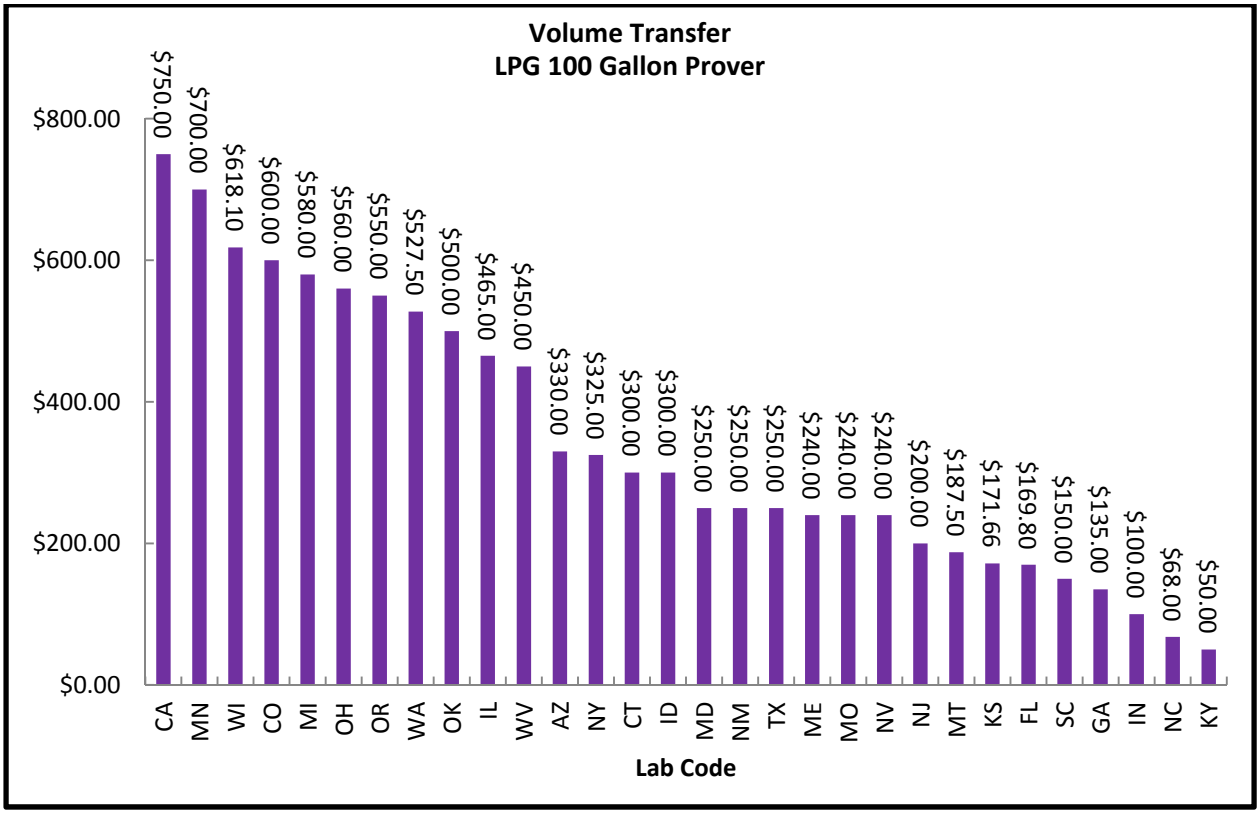


Figure 38: Fees charged for testing a 100 gallon LPG prover.

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 35

Lab ID	Fee
ID	$100.00

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

Comparison of Previous Surveys

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

Table 36: Average fee charged for testing a SVP via volume transfer from 2006 through 2010.

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

Description

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

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

Table 37: Fees charged for testing a SVP gravimetrically.

Comparison of Previous Surveys

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

Table 38: Average fee charged for testing a SVP gravimetrically from 2006 through 2010.

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 39: Metrologist position titles and salary ranges.

Lab ID	Position Title	Min Salary	Max Salary	Category
AK	State Metrologist I	$3,813.00	$5,473.00	Metrology/Calibration Technician
AK	State Metrologist II	$4,391.00	$6,253.00	Laboratory Supervisor
AL	Consumer W&M Protection Specialist: Lab	$2,376.40	$3,979.80	Metrology/Calibration Technician
AL	Laboratory Supervisor	$2,690.60	$4,077.00	Laboratory Supervisor
AL	Graduate Engineer	$3,438.20	$6,057.20	Metrology/Calibration Engineer
AR	Metrologist	$2,416.00	$2,416.00	Metrology/Calibration Technician
AR	Metrologist	$2,602.00	$2,602.00	Metrology/Calibration Technician
AR	Moisture Meter Inspector	$2,717.00	$2,717.00	Support Staff
AR	Moisture Technician	$2,967.00	$2,967.00	Support Staff
AR	Laboratory Supervisor	$3,216.00	$3,216.00	Laboratory Supervisor
AZ	Admin Services Officer ll	$3,882.80	$6,618.70	Laboratory Supervisor
CA	Measurement Standards Specialist II	$3,192.00	$3,834.00	Metrology/Calibration Technician
CA	Measurement Standards Specialist III	$3,837.00	$4,663.00	Metrology/Calibration Technician
CA	Principal State Metrologist	$5,899.00	$6,504.00	Laboratory Supervisor
CO	Metrologist I	$2,885.00	$4,952.00	Metrology/Calibration Engineer
CO	Metrologist II	$3,779.00	$5,423.00	Metrology/Calibration Engineer
CO	Metrologist III	$4,165.00	$5,979.00	Laboratory Supervisor
CT	Metrologist	$4,176.25	$5,624.50	Metrology/Calibration Engineer
CT	Weights and Measures Inspector	$4,692.25	$5,925.67	Metrology/Calibration Engineer
DA	Industrial Specialist	$5,200.00	$8,100.00	Laboratory Supervisor
DA	Program Manager	$7,400.00	$9,600.00	Manager
FL	Laboratory Technician IV	$2,125.81	$3,308.32	Support Staff
FL	Metrologist	$2,350.39	$3,717.22	Metrology/Calibration Technician
FL	Senior Metrologist	$2,763.49	$4,617.01	Laboratory Supervisor
GA	Metrologist	$1,839.83	$3,221.82	Metrology/Calibration Technician
GA	Metrologist 2	$2,026.83	$3,553.67	Metrology/Calibration Engineer
GA	Assistant State Metrologist	$2,701.53	$4,727.02	Technical Manager
GA	State Metrologist	$2,964.11	$5,191.82	Laboratory Supervisor
HI	Metrologist 1	$3,249.00	$4,809.00	Metrology/Calibration Technician
HI	Metrologist 2	$3,511.00	$5,202.00	Metrology/Calibration Engineer
HI	Metrologist 3	$3,798.00	$5,624.00	Laboratory Supervisor
IA	Metrologist	$5,000.00	$5,183.00	Metrology/Calibration Engineer
ID	Section Manager/Metrologist	$4,394.00	$8,082.50	Laboratory Supervisor
IL	Products & Standards Inspector	$3,758.00	$4,923.00	Calibration Engineer
IL	Public Service Administrator - Option 8Z	$4,400.00	$6,253.00	Calibration Technician
IN	Metrologist V	$1,980.00	$3,446.00	Metrology/Calibration Technician
IN	Inspector I	$2,052.00	$2,790.00	Wts & Meas Field Inspector
KS	AGRICULTURAL INSPECTOR III / METROLOGIST	$3,066.00	$4,317.00	Metrology/Calibration Technician
KS	STATE METROLOGIST	$3,221.00	$4,530.00	Laboratory Supervisor
KY	Agricultural Inspector I	$1,823.90	$3,008.54	Metrology/Calibration Technician
KY	Metrology Lab Technician I	$2,006.08	$3,309.32	Metrology/Calibration Technician
KY	Metrology Lab Technician II	$2,427.44	$4,004.00	Metrology/Calibration Engineer
KY	Program Coordinator	$2,670.20	$4,439.20	Laboratory Supervisor
KY	Metrology Lab Supervisor	$3,230.84	$5,329.36	Laboratory Supervisor
LA	Metrologist	$2,851.00	$5,520.00	
LA	Asst. Division Director	$4,277.00	$8,285.00	

Lab ID	Position Title	Min Salary	Max Salary	Category
LAC	ACWM Associate Inspector	$3,223.83	$3,223.83	Metrology/Calibration Technician
LAC	ACWM Inspector I	$3,478.00	$4,313.00	Metrology/Calibration Technician
LAC	ACWM Inspector II	$3,573.00	$4,679.00	Metrology/Calibration Engineer
LAC	ACWM Inspector III	$3,977.00	$5,216.00	Laboratory Supervisor
LAC	Metrologist	$4,036.45	$5,294.00	Metrology/Calibration Engineer
LAC	Senior Metrologist	$4,260.73	$5,588.36	Laboratory Supervisor
MD	Metrologist Trainee	$2,206.42	$3,418.25	Metrology Technician
MD	Metrologist I	$2,810.25	$4,409.58	Metrology Technician
MD	Metrologist II	$2,988.75	$4,705.75	Metrology Technician
MD	Laboratory Supervisor	$3,357.58	$5,359.75	Lab Supervisor
ME	Metrologist Assistant	$2,609.00	$3,515.00	Metrology/Calibration Technician
ME	Consumer Protection Inspector	$2,609.00	$3,515.00	Metrology/Calibration Technician
ME	Metrologist	$3,526.00	$4,787.50	Laboratory Supervisor
MI	Metrologist -9	$3,102.67	$4,425.20	Metrology/Calibration Technician
MI	Metrologist -10	$3,208.40	$4,524.00	Metrology/Calibration Technician
MI	Metrologist -P11	$3,714.53	$5,229.47	Metrology/Calibration Engineer
MI	Metrologist -12	$3,900.00	$5,685.33	Metrology/Calibration Engineer
MI	Metrology Specialist -13	$4,232.80	$6,212.27	Metrology/Calibration Engineer
MI	Metrologist Manager -14	$4,425.20	$6,512.13	Lab Supervisor
MN	State Program Administrator, Technical Specialist	$2,802.00	$3,945.00	Metrology/Calibration Technician
MN	State Program Administrator, Principle	$3,859.00	$5,688.00	Metrology/Calibration Engineer
MN	Assistant Director (Lab Manager)	$4,895.00	$7,035.00	Laboratory Supervisor
MO	Metrology Specialist	$2,625.00	$3,706.00	Metrology/Calibration Technician
MO	Metrologist	$3,040.00	$4,945.00	Laboratory Supervisor
MS	Assistant State Metrologist	$2,229.00	$3,901.00	Metrology/Calibration Technician
MS	State Metrologist	$2,472.00	$4,325.00	Laboratory Supervisor
MT	Field Inspector	$2,500.00	$3,300.00	Support Staff
MT	State Metrologist	$3,083.00	$3,750.00	Laboratory Supervisor
NC	Processing Assistant III	$2,007.67	$2,998.33	Support Staff
NC	Metrologist I	$2,733.00	$4,287.17	Metrology/Calibration Technician
NC	Quality Manager	$2,944.75	$4,694.17	Metrology/Calibration Engineer
NC	Grain Moisture Supervisor	$2,944.75	$4,694.17	Metrology/Calibration Engineer
NC	Lab Manager	$3,569.42	$5,875.00	Laboratory Supervisor
NH	Weights & Measures Metrologist	$2,795.00	$3,711.50	
NJ	Inspector III/Metrologist	$3,831.00	$5,557.00	Metrology/Calibration Technician
NJ	Inspector II/Metrologist	$4,435.00	$6,432.00	Metrology/Calibration Engineer
NJ	Inspector I/Metrologist	$5,135.00	$7,447.00	Metrology/Calibration Engineer
NJ	Supervisor of Licensing/Metrology	$5,659.00	$8,208.00	Laboratory Supervisor
NV	Chief State Metrologist	$3,403.00	$5,562.00	Laboratory Supervisor
NY	Specialist I (Metrologist)	$3,244.00	$5,433.00	Metrologist
NY	Assistant Director (Lab Manager)	$5,417.00	$7,048.00	Lab Manager
OH	Weights & Measure Inspector 2	$2,755.00	$3,455.00	Support Staff
OH	Weights & Measures Technologist	$2,938.00	$3,819.00	Metrology/Calibration Technician
OK	Metrologist I	$2,144.17	$3,573.67	Metrology/Calibration Technician
OK	Metrologist II	$2,576.67	$4,294.50	Metrology/Calibration Technician
OK	Metrologist III	$3,146.00	$5,243.33	Metrology/Calibration Engineer
OR	Metrologist	$3,547.00	$5,187.00	Metrology/Calibration Technician
OR	Lead Metrologist	$4,286.00	$6,277.00	Metrology/Calibration Technician
PA	Metrologist	$3,908.75	$5,564.83	Metrology/Calibration Technician
PA	Laboratory Supervisor	$3,939.75	$5,983.75	Laboratory Supervisor
PA	Metrologist (with NIST Basic Training)	$4,088.00	$5,564.83	Metrology/Calibration Engineer
PA	Metrolgogist (with NIST Intermediate Training)	$4,269.00	$5,564.83	Metrology/Calibration Engineer
SC	Program Coordinator I	$2,522.83	$4,667.92	Laboratory Supervisor

Lab ID	Position Title	Min Salary	Max Salary	Category
SC	Lab Technician II	$2,522.83	$4,667.92	Metrology/Calibration Technician
SD	State Inspector	$2,411.07	$3,993.60	Laboratory Supervisor
TX	Laboratory Technician I	$2,069.33	$2,827.42	Metrology/Calibration Technician
TX	Inspector II	$2,094.33	$2,945.00	Metrology/Calibration Engineer
TX	Inspector IV	$2,717.58	$3,855.00	Metrology/Calibration Engineer
TX	Program Supervisor IV	$3,687.83	$5,605.83	Lab Supervisor
UT	State Metrologist	$3,650.00	$5,791.00	Metrology/Calibration Technician
VA	Metrologist	$2,917.00	$4,000.00	Metrologist
VA	Lab Manager/Program Manager	$4,167.00	$5,000.00	Laboratory Supervisor
VT	Weights and Measure Specialist	$3,700.00	$5,300.00	Metrology/Calibration Technician
WA	State Metrologist	$2,994.00	$3,918.00	Laboratory Supervisor
WI	Metrologist	$3,818.00	$8,780.00	
WY	Senior Inspection Specialist	$3,945.00	$5,323.00	Laboratory Supervisor

2010 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.

Note

The SLP has lost several of its senior metrologists between 2008 and 2010. Some 27% of the metrologists listed in this survey will be eligible for full retirement by 2014. Some have already retired. In Table 40 we've highlighted those metrologists who have retired since the completion of this survey.

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

Laboratory ID	Name	Email	Mass I	Mass II	Mass III	Vol Trans	Vol Grav	Length	Time/Frequency	Temperature	Grain Moisture	What Year Eligible for Retirement?	State Lab Metrology	Other Metrology	Total Experience
AK	ROGER HOLLAND	ROGER.HOLLAND@ALASKA.GOV	N	P	F	F	P	N	F	N	N	2022	1	0	1
AK	GARRET BROWN	GARRET.BROWN@ALASKA.GOV	N	P	F	F	P	N	F	N	N	2023	6	8	14
AL	DAVID MORSE	DAVID.MORSE@AGI.ALABAMA.GOV	N	N	F	F	N	N	N	N	N	2011	9	0	9
AL	MICHAEL BRIDGES	MICHAEL.BRIDGES@AGI.ALABAMA.GOV	N	N	P	P	N	N	N	N	N	2012	1	0	1
AL	WES SEALS	WES.SEALS@AGI.ALABAMA.GOV	N	N	F	F	N	N	N	N	N	2015	5	0	5
AR	CHARLES HAWKINS	CHARLES.HAWKINS@ASPB.AR.GOV	N	N	F	F	N	N	N	N	N	2031	2	0	2
AR	CLINTON PHIFER	CLINTON.PHIFER@ASPB.AR.GOV	N	N	F	F	N	N	N	N	N	2036	3	0	3
AR	RAY CURTIS	RAY.CURTIS@ASPB.AR.GOV	N	F	F	F	N	N	N	N	N		13	0	13
AZ	BRIAN SELLERS	BSELLERS@AZDWM.GOV	N	F	F	F	F	N	N	N	N	2024	6.5	0	6.5
CA	GREG BOERS	GBOERS@CDFA.CA.GOV	N	F	F	F	F	F	F	F	N	2016	14	3	17
CA	ANTHONY GRUNEISEN	AGRUNEISEN@CDFA.CA.GOV	N	F	F	F	F	F	F	F	N	2023	7	0	7
CO	DIANE C. WISE	DIANE.WISE@AG.STATE.CO.US	P	F	F	F	F	F	F	N	F	2013	18	0	18
CO	JENNIFER A. OZNOFF	JENNIFER.OZNOFF@AG.STATE.CO.US	P	F	F	F	F	F	F	N	F	2030	10	0	10
CT	ION DAHA	ION.DAHA@CT.GOV	N	N	F	F	N	N	N	N	N	2031	1	0	1
CT	ANA MARIA FELICIANO	ANA.FELICIANO@CT.GOV	N	F	F	F	N	F	N	N	N	2039	0.5	0	0.5
DA	AL RUPERT	AL.L.RUPERT@USDA.GOV	N	N	F	N	N	N	N	N	N	2014	0	12	12
DA	MARCUS HARWITZ	MARCUS.HARWITZ@USDA.GOV	N	N	F	N	N	N	N	N	N	2020	9	1.5	10.5
FL	MIKE COOK	MICHEAL.COOK@FRESHFROMFLORIDA.COM	N	F	F	F	F	F	N	F	F	2001	25	0	25
FL	DAVIS TERRY	DAVIS.TERRY@FRESHFROMFLORIDA.COM	N	F	F	F	F	F	N	N	F	2019	11	0	11
GA	BRIAN GRACE	BGRACE@AGR.STATE.GA.US	N	N	F	F	F	F	N	N	F		4	0	4
GA	DALE GANN	DGANN@AGR.STATE.GA.US	N	F	F	F	F	F	N	N	F		12	0	12
GA	KONTZ BENNETT	KBENNETT@AGR.STATE.GA.US	N	F	F	F	F	F	N	N	N		11	0	11
HI	MICHAEL TANG	MICHAEL.TANG@HAWAII.GOV	F	F	F	F	F	F	F	N	N	2019	11	0	11
IA	ANDREW BLACKBURN	ANDREW.BLACKBURN@IAVALLEY.EDU	N	N	F	F	N	N	N	N	N		5	17	22
ID	KEVIN MERRITT	KEVIN.MERRITT@AGRI.IDAHO.GOV	N	F	F	F	F	N	N	N	N	2013	15	0	15
IL	MATT WILLIAMS	MATT.WILLIAMS@ILLINOIS.GOV	N	N	F	F	N	N	N	N	N	2012	10	0	10
IL	MIKE ROCKFORD	MIKE.ROCKFORD@ILLINOIS.GOV	F	F	F	F	N	N	N	N	N	2014	22	0	22
IL	KARL CUNNINGHAM	KARL.CUNNINGHAM@ILLINOIS.GOV	N	N	F	F	N	N	N	N	F	2027	6	0	6
IN	TERRELL SHARLOW		N	P	P	P	N	N	N	N	N	2005	10	0	10
IN	JERRY L. CLINGAMAN, JR.	JCLINGAM@ISDH.IN.GOV	F	F	F	F	F	F	F	F	N	2012	19	13	32
IN	DOUG STEVENS		N	P	P	P	N	N	N	N	N	2017	2	0	2
IN	KRIS WINNINGHAM	KWINNINGHAM@ISDH.IN.GOV	N	P	F	P	N	P	P	P	N	2035	2	0	2
KS	KARL HERKEN	KARL.HERKEN@KDA.KS.GOV	F	F	F	F	F	N	N	P	N		20	12	32
KS	KEVIN NUTTER	KEVIN.NUTTER@KDA.KS.GOV	N	F	F	F	F	N	N	P	N		16	10	26
KY	JASON GLASS	JASON.GLASS@KY.GOV	N	N	F	F	N	N	N	N	N	2029	7	0	7
KY	CHESTER WATSON	CHESTER.WATSON@KY.GOV	N	N	F	F	N	N	N	N	N	2034	3.5	0	3.5

Laboratory ID	Name	Email	Mass I	Mass II	Mass III	Vol Trans	Vol Grav	Length	Time/Frequency	Temperature	Grain Moisture	What Year Eligible for Retirement?	State Lab Metrology	Other Metrology	Total Experience
KY	WILLIAM BAKER	BILL.BAKER@KY.GOV	N	N	F	F	N	N	N	N	N	2035	3.5	0	3.5
LA	RICHERT WILLIAMS	RICHER_@LDAF.STATE.LA.US	N	N	N	F	F	N	N	N	N	2000	11	0	11
LA	CARL DECKER	CDECKER@LDAF.STATE.LA.US	N	N	N	F	F	N	N	N	N	2005	19	0	19
LAC	KC CHOW	KCHOW@ACWM.LACOUNTY.GOV	P	F	F	F	F	N	N	N	N	2011	11	0	11
LAC	DONALD FRANKS	DFRANKS@ACWM.LACOUNTY.GOV	P	F	F	F	F	N	N	N	N	2028	5	0	5
LAC	LINA NG	LNG@ACWM.LACOUNTY.GOV	N	F	F	F	F	N	N	N	N	2030	3	0	3
MD	STEPHEN BARRY	BARRYSA@MDA.STATE.MD.US	F	F	F	F	F	F	N	F	N	2018	22	0	22
MD	ZENON WACLAWIW	WACLAWZM@MDA.STATE.MD.US	F	F	F	F	F	P	N	N	N	2028	12	0	12
MD	REGINALD KENNION	KENNIORE@MDA.STATE.MD.US	N	N	F	P	P	N	F	N	N	2039	3	0	3
ME	DANNY NEWCOMBE	DANNY.NEWCOMBE@MAINE.GOV	F	F	F	F	F	F	F	F	N	2010	22	0	22
ME	DONALD LANGLEY	DONALD.LANGLEY@MAINE.GOV	N	N	P	N	N	N	N	N	N	2010	5	0	5
ME	GEORGE O'CONNOR	GEORGE.OCONNOR@MAINE.GOV	P	P	F	P	P	F	N	P	N	2015	5	4	9
MI	CRAIG VANBUREN	VANBURENC9@MICHIGAN.GOV	F	F	F	F	F	F	N	F	N	2030	11	0	11
MI	SCOTT FERGUSON	FERGUSONS@MICHIGAN.GOV	N	N	P	P	N	N	N	N	N	2032	1	0	1
MI	RYANNE HARTMAN	HARTMANR9@MICHIGAN.GOV	N	P	F	F	F	P	N	P	N	2035	1	0	1
MI	NICK SANTINI	SANTININ@MICHIGAN.GOV	N	N	P	P	N	N	N	N	N	2041	0	0	0
MI	NEIL JONES	JONESN@MICHIGAN.GOV	F	F	F	F	F	F	N	F	N	Now	11	0	11
MN	BRUCE ADAMS	BRUCE.ADAMS@STATE.MN.US	F	F	F	F	F	F	N	F	N	2014	20	0	20
MN	HEIDI JONES	HEIDI.JONES@STATE.MN.US	N	N	P	N	N	N	N	N	N	2023	11	0	11
MN	MARK ZASADNY	MARK.ZASADNY@STATE.MN.US	F	F	F	F	F	F	N	F	N	2038	10	0	10
MN	NILS FLEMING	NILS.FLEMING@STATE.MN.US	F	F	F	F	F	F	N	F	N	2014	4.5	0	4.5
MN	STEVEN HARRINGTON	STEVEN.HARRINGTON@STATE.MN.US	F	F	F	F	F	F	N	F	N	2035	5.5	0	5.5
MO	ROBERT WITTENBERGER	BOB.WITTENBERGER@MDA.MO.GOV	N	F	F	F	P	F	N	N	N	2007	35	0	35
MO	KEVIN HANSON	KEVIN.HANSON@MDA.MO.GOV	N	F	F	F	P	F	N	N	N	2021	11	4	15
MO	TOM HUGHES	TOM.HUGHES@MDA.MO.GOV	N	F	F	F	P	F	N	N	F	2022	12	0	12
MS	JOHN L. SULLIVAN	JOHNS1@MDAC.STATE.MS.US	N	N	F	F	N	N	N	N	N	2026	10	0	10
MS	WILLIAM BELL		N	N	F	F	N	N	N	N	N	2030	6	0	6
MS	MEL IASIGI		N	N	F	F	N	N	N	N	N		10	0	10
MT	KEITH REIMUND	KREIMUND@MT.GOV	N	P	F	F	P	N	N	N	N	2028	10	5	15
NC	CHERYL TEW	CHERYL.TEW@NCAGR.GOV	N	N	N	N	N	N	N	N	F	2010	30	0	30
NC	CLIFF MURRAY	CLIFF.MURRAY@NCAGR.GOV	F	F	F	F	F	F	N	F	N	2011	9	20	29
NC	SHARON WOODARD	SHARON.WOODARD@NCAGR.GOV	F	F	F	F	F	F	N	F	P	2022	19	0	19
NC	SPURGEON VAN HYDER	VAN.HYDER@NCAGR.GOV	F	F	F	F	F	F	N	N	N	2024	17	0	17
NC	HAROLD TAL ANDERSON III	TAL.ANDERSON@NCAGR.GOV	F	F	F	F	F	F	N	F	N	2029	12	0	12
NC	GERALD PRICE	GERALD.PRICE@NCAGR.GOV	N	P	F	F	F	F	N	N	N	2030	3	0	3
NH	TIM OSMER	TOSMER@AGR.STATE.NH.US	F	F	F	F	F	N	N	N	N	2041	5.5	0	5.5

Laboratory ID	Name	Email	Mass I	Mass II	Mass III	Vol Trans	Vol Grav	Length	Time/Frequency	Temperature	Grain Moisture	What Year Eligible for Retirement?	State Lab Metrology	Other Metrology	Total Experience
NJ	MICHAEL CECERE	MICHAEL.CECERE@LPS.STATE.NJ.US	N	F	F	F	F	F	F	N	N	2022	5	0	5
NJ	RAYMOND SZPOND	RAYMOND. SZPOND@LPS.STATE.NJ.US	N	F	F	F	F	F	F	N	N	2022	12	0	12
NJ	W. CRAIG GERHARTZ	GERHARTZC@LPS.STATE.NJ.US	N	N	F	F	N	F	F	N	N	2034	7	0	7
NM	STEVE SUMNER	SSUMNER@NMDA.NMSU.EDU	F	F	F	F	F	N	N	N	N	2012	13	20	33
NM	CLAY IVEY	CIVEY@NMDA.NMSU.EDU	N	N	F	F	P	N	N	N	N		1	0	1
NV	STEVE SCHULTZ	BOXCAR53@AGRI.STATE.NV.US	N	F	F	F	F	N	N	N	N	2015	7	6	13
NV	DAVE WALCH	DWALCH@AGRI.STATE.NV.US	N	N	P	P	N	N	N	N	N	2018	11	0	11
NY	ED SZESNAT	EDWARD.SZESNAT@AGMKT.STATE.NY.US	F	F	F	F	F	F	F	F	N	2009	18	0	18
NY	ROBERT ACHESON	ROBERT.ACHESON@AGMKT.STATE.NY.US	N	F	F	F	F	F	F	F	N	2009	8	0	8
NY	MIKE SIKULA	MIKE.SIKULA@AGMKT.STATE.NY.US	N	F	F	F	F	F	F	F	N	2019	11	0	11
OH	STEVE SMITH	SSMITH@AGRI.STATE.GOV	N	N	N	P	N	N	N	N	N	2014	0	0	0
OH	EARL MATTHEWS	MATTHEWS@AGRI.STATE.GOV	N	P	P	P	P	P	P	N	N	2015	9	0	9
OH	KEN JOHNSON	JOJNSON@AGRI.STATE.GOV	N	F	F	F	F	F	F	N	N	2020	21	0	21
OK	RICHARD GONZALES	RICHARD.GONZALES@ODA.STATE.OK.US	F	F	F	F	F	F	N	N	N	2012	24	0	24
OK	ROBERT WHITNEY	ROBERT.WHITNEY@ODA.STATE.OK.US	N	N	P	P	N	N	N	N	N	2026	3	0	3
OK	JAMES WILLSON	JAMES.WILLSON@ODA.STATE.OK.US	N	N	P	P	N	N	N	N	N	2031	1	0	1
OK	JEREMY NADING	JEREMY.NADING@ODA.STATE.OK.US	N	P	F	F	F	F	N	N	N	2037	5	0	5
OK	HEATHER SCHMIDT	HEATHER.SCHMIDT@ODA.STATE.OK.US	N	N	P	N	N	N	N	N	N	2040	1	0	1
OR	RAY NEKUDA	RNEKUDA@ODA.STATE.OR.US	N	F	F	F	F	N	N	N	N	2037	3	0	3
OR	AARON AYDELOTTE	AAYDELOTTE@ODA.STATE.OR.US	F	F	F	F	F	N	N	F	N	2044	10	0	10
PA	TERRANCE M. SHINGARA	TESHINGARA@STATE.PA.US	N	F	F	F	F	F	F	N	N	2006	6	0	6
PA	PAUL D. SPROUT	PSPROUT@STATE.PA.US	N	F	F	F	F	F	F	N	N	2010	7	16	23
PA	RICHARD M. RADEL, JR.	RIRADEL@STATE.PA.US	N	F	F	F	F	F	F	N	N	2025	2.5	0	2.5
PA	JAMES P. GOWNLEY	JGOWNLEY@STATE.PA.US	N	F	F	F	F	F	F	N	N	2030	9	0	9
PA	CHRISTOPHER J. DRUPP	CDRUPP@STATE.PA.US	N	F	F	F	F	F	F	N	N	2034	3	0	3
PR	JOSÉ TORRES	JATORRES@NIST.GOV	F	F	F	F	F	F	N	N	N	2018	23	0	23
PR	ABNER RODRÍGUEZ	OLAS_50@YAHOO.COM	N	F	F	F	F	F	N	N	N	2041	7	0	7
SC	ROBERT L. MCGEE	RMCGEE@SCDA.SC.GOV	F	F	F	F	F	F	N	N	F	2023	16	0	16
SC	ED MENDENHALL	EMENDEN@SCDA.SC.GOV	N	F	F	F	F	F	N	N	P	2031	7	0	7
SC	BILLY KENNINGTON	BKENNING@SCDA.SC.GOV	N	F	F	F	F	F	N	N	F		32	0	32
SD	BRAD STOVER	BRAD.STOVER@STATE.SD.US	N	N	F	F	N	N	N	N	N	2026	8	0	8
TX	HARVEY FISCHER	HARVEY.FISCHER@TEXASAGRICULTURE.GOV	N	P	F	F	F	N	N	N	N	2009	5	27	32
TX	PRESTON ADACHI	PRESTON.ADACHI@TEXASAGRICULTURE.GOV	N	F	F	F	F	N	N	N	N	2015	5	30	35
TX	DANIEL GIBBONS	DANIEL.GIBBONS@TEXASAGRICULTURE.GOV	N	F	F	F	F	N	N	N	N	2024	7	0	7
TX	PHILIP WRIGHT	PHILIP.WRIGHT@TEXASAGRICULTURE.GOV	N	F	F	F	F	N	N	N	N	2029	3	0	3
TX	LISA CORN	LISA.CORN@TEXASAGRICULTURE.GOV	N	P	F	F	F	N	N	N	N	2035	3	0	3

Laboratory ID	Name	Email	Mass I	Mass II	Mass III	Vol Trans	Vol Grav	Length	Time/Frequency	Temperature	Grain Moisture	What Year Eligible for Retirement?	State Lab Metrology	Other Metrology	Total Experience
TX	PATRICK SANDERS	PATRICK.SANDERS@TEXASAGRICULTURE.GOV	N	N	P	P	P	N	N	N	N	2035	1	0	1
UT	BILL RIGBY	BRIGBY@UTAH.GOV	N	N	F	F	N	P	N	N	N	2029	6	0	6
VA	DALE L. SAUNDERS	DALE.SAUNDERS@VDACS.VIRGINIA.GOV	N	N	P	P	N	N	P	N	N	2014	4	0	4
VA	WILLIAM H. LOVING	WILLIAM.LOVING@VDACS.VIRGINIA.GOV	N	F	F	F	N	N	F	N	N	2021	10	0	10
VT	RAY CIOFFI	RAY.CIOFFI@STATE.VT.US	N	N	F	F	N	N	N	F	N	2011	32	0	32
VT	MARC PAQUETTE	MARC.PAQUETTET@STATE.VT.US	N	N	P	F	N	N	N	N	N	2025	1	0	1
WA	DAN WRIGHT	DWRIGHT@AGR.WA.GOV	F	F	F	F	F	F	F	N	N	2014	16	16	32
WI	ALAN PORTER	ALAN.PORTER@WI.GOV	N	N	F	F	N	N	N	N	N	2002	24	0	24
WI	JEFF HOUSER	JEFF.HOUSER@WI.GOV	N	N	F	F	N	N	N	N	N	2018	4	0	4
WI	RICH MCCANN	RICHARD.MCCANN@WI.GOV	N	N	F	F	N	N	N	N	N	2025	7	5	12
WV	ANTHONY O'BRIEN	TONY.P.OBRIEN@WV.GOV	N	N	F	F	N	N	N	N	N	2025	12	0	12
WV	DAN MACE	DAN.J.MACE@WV.GOV	N	N	F	F	N	N	N	N	N	2026	14	0	14
WY	ROBERT WEIDLER	RWEIDL@STATE.WY.US	N	N	F	F	N	N	N	N	N	2029	3	0	3

Table 40: Listing of SLP metrologists as of 2010. 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.

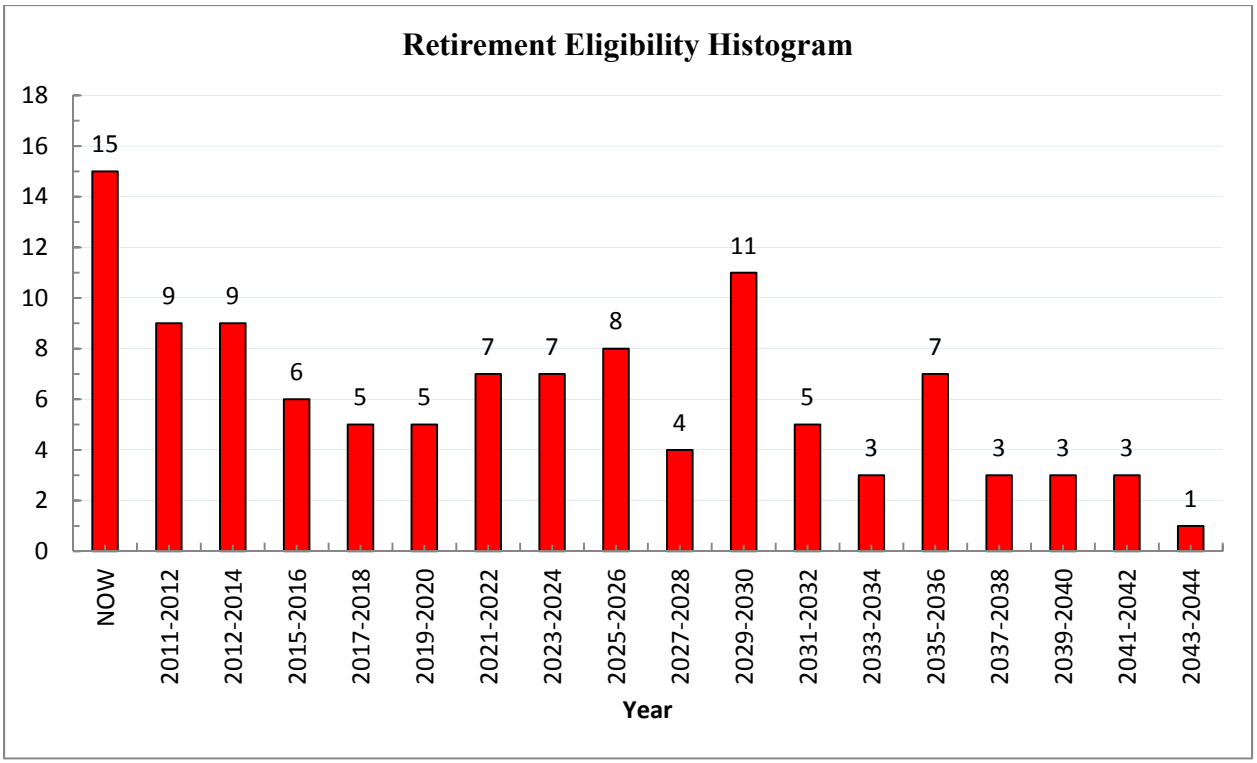


Figure 39: Retirement Eligibility Histogram, 111 metrologists reporting. Metrologists were asked to provide the year which they are eligible for "full" retirement. This may not reflect when any one person actually plans to leave the SLP.

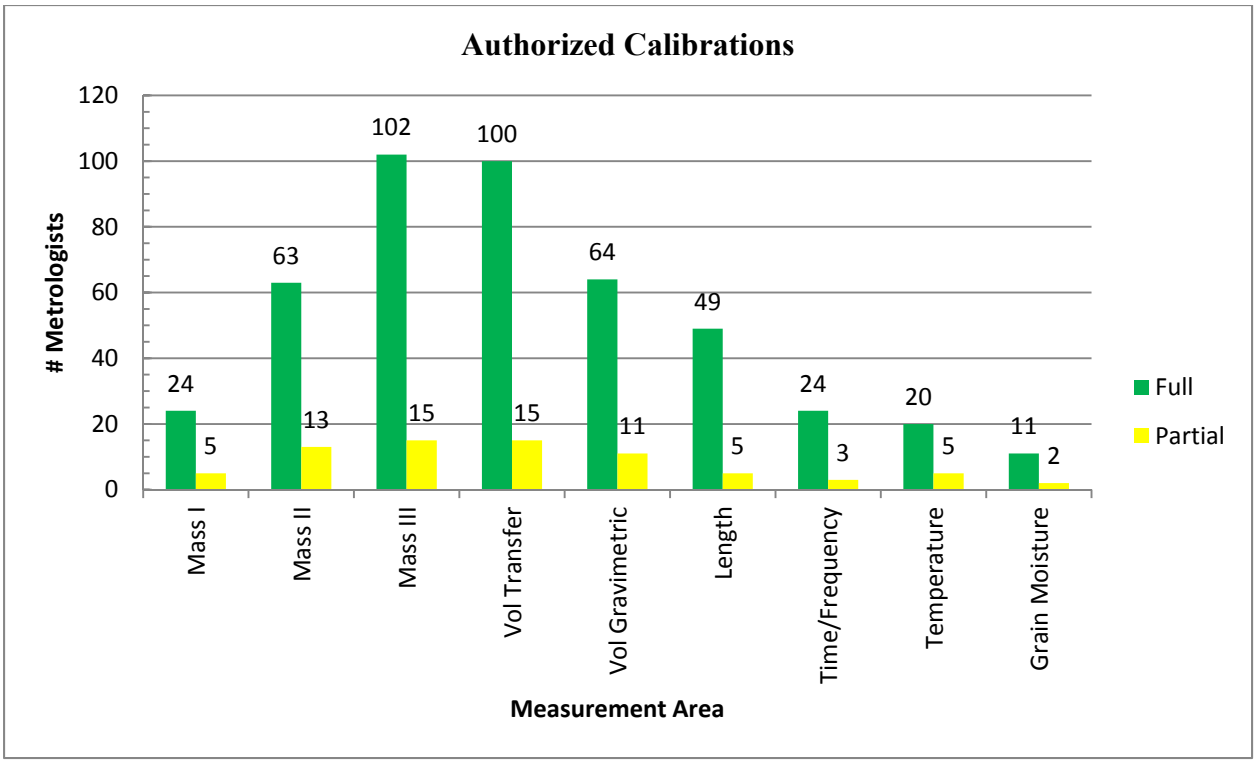


Figure 40: 121 Metrologists reporting. Metrologists were asked to indicate which type of calibrations they are authorized to perform on behalf of their laboratories.

State Laboratory Program/Metrology Experience

Description

Total Metrology Experience:

Each metrologist was asked to disclose 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 40 ranks the SLP metrologists by total metrology experience.

Comparison of previous surveys

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

Table 41: Comparison matrix summarizing metrology experience reported by metrologists from 2000 to 2010.

Comments:

- Data was collected for 121 metrologist in the SLP from 47 laboratories.
- Each metrologist reports an average of 9.5 years the SLP experience each.
- Each metrologist reports an average of 1.9 years "other" experience each.
- Each of the 19 metrologist reporting "other" experience reports an average of 12 years other experience.
- Each metrologists report an average of 11.4 years total experience each.

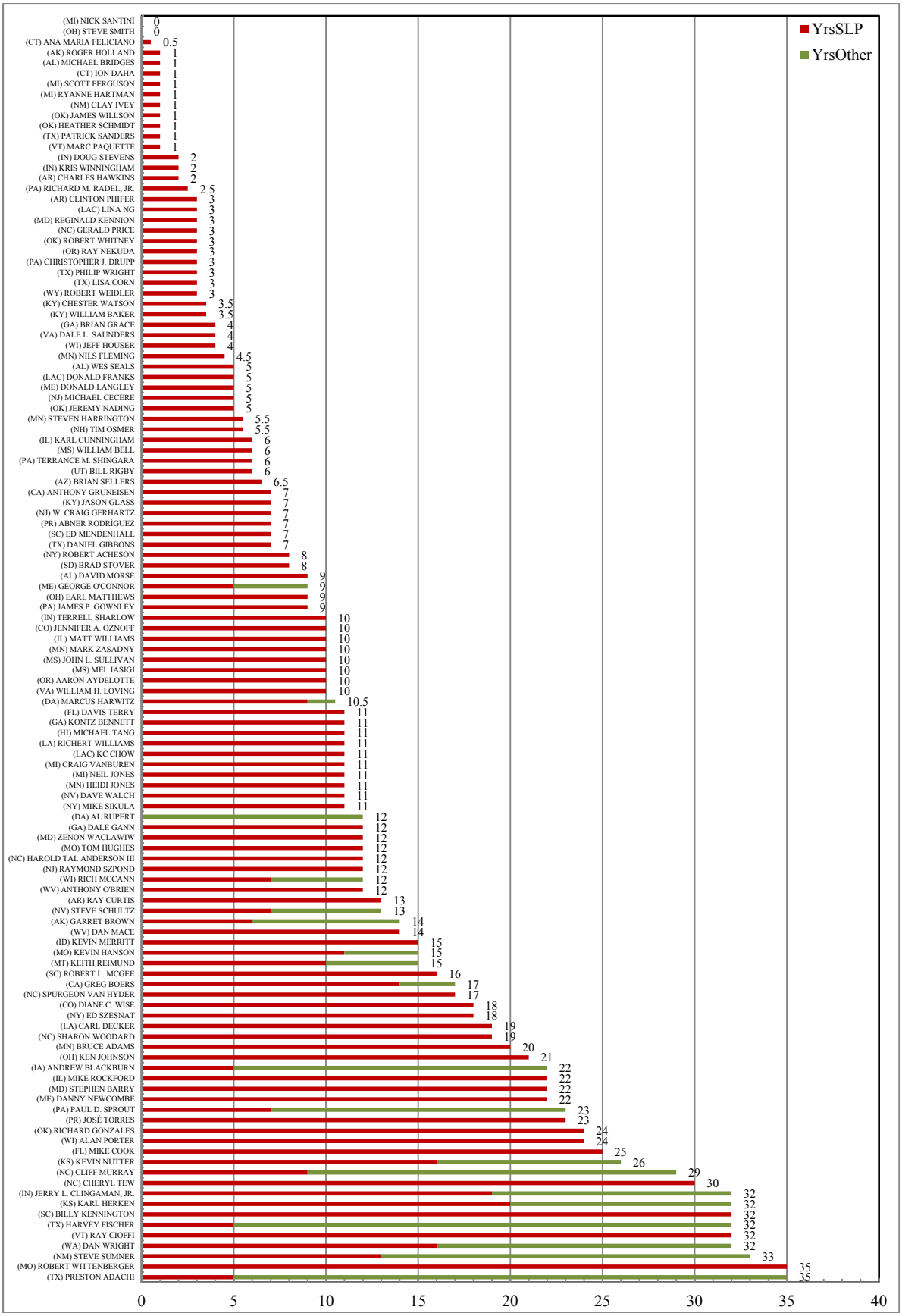


Figure 41: SLP metrologists ranked by years of experience. Red indicates experience in the SLP, green indicates other metrology experience.

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 (17) recognition (18).
- Any NVLAP Accredited Lab (19).
- Any Weight Manufacturer regardless of accreditation status.
- Any laboratory accredited by an accreditation body that is an ILAC (20) signatory.

Table 42: Calibration Certificate acceptance matrix.

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			
AZ			Yes	Yes		Yes
CA			Yes	Yes		Yes
CO			Yes	Yes		
CT	Yes		Yes			
HI			Yes	Yes		Yes
IA			Yes	Yes		Yes
ID			Yes	Yes		
IL			Yes	Yes		
IN			Yes			
KS			Yes	Yes		
KY			Yes	Yes		Yes
LA		Yes	Yes	Yes		
LAC			Yes	Yes		
MD			Yes			
ME			Yes	Yes		Yes
MI			Yes	Yes		
MN			Yes			
MO			Yes	Yes		Yes
MS			Yes			
MT			Yes	Yes		Yes
NC	Yes		Yes	Yes		Yes
NH			Yes	Yes		Yes
NJ	Yes		Yes			
NM			Yes			Yes
NV			Yes	Yes	Yes	Yes
NY			Yes	Yes		Yes
OH			Yes	Yes		
OK			Yes	Yes		Yes
OR			Yes	Yes		Yes
PA			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 Accreditation Body that is an ILAC Signatory
PR	Yes					
SC			Yes	Yes		Yes
SD			Yes	Yes		Yes
TX			Yes	Yes		
UT			Yes			
VT		Yes				
WI			Yes	Yes		
WV			Yes	Yes		Yes
WY			Yes	Yes		Yes

Supplementary Survey Questions

Each of the SLP laboratories was presented a list of standards published by NIST (National Institute of Standards and Technology), by ASTM (formerly the American Society of Testing and Materials), and by OIML (International Organization of Legal Metrology) and asked if they referenced each standard within the framework of their program. They were asked if they used the standard as an enforcement tool, if they recommended the standard, or if the standard was simply not used.

"Enforce" means the laboratory used the standard as a basis for rejecting measurement equipment from service. SLP metrology laboratories are often charged with approving measurement equipment for use in legal metrology and have the authority to condemn and confiscate equipment which does not meet the requirements of the standard.

"Recommend" means the laboratory will recommend this standard when specifications are needed for the measurement equipment in question. For example: Purchasing specifications.

"Not Used" Is self explanatory. The laboratory does not use this standard in any way, shape, or form.

The column titled "Weights and Measures" indicates the number of laboratories indicating that they used the standard as a guideline or requirement for evaluating measurement equipment in support of a government operated weights and measures enforcement program.

The column titled "Service Technicians" indicates the number of laboratories indicating that they used the standard as a guideline or requirement for evaluating measurement equipment for licensed or otherwise regulated calibration and repair technicians.

Note: Not all laboratories provided responses for all of the standards asked about. This may simply reflect confusion as to what the standard is or it may reflect caution if there is doubt as to whether the standard is actually used or not. We have only counted responses which are definitive yes or no answers. Questions which were not answered were not counted.

NIST Handbook 105 Series Standards (21)

The NIST Handbook 105 series provides specifications and tolerances for reference standards and field standard weights and measures.

- Handbook 105-1 Specifications and Tolerances for Field Standard Weights (NIST Class F)
- Handbook 105-2 Specifications and Tolerances for Field Standard Measuring Flasks
- Handbook 105-3 Specifications and Tolerances for Graduated Neck Type Volumetric Field Standards
- Handbook 105-4 Specifications and Tolerances for Liquefied Petroleum Gas and Anhydrous Ammonia Liquid Volumetric Provers
- Handbook 105-5 Specifications and Tolerances for Field Standard Stopwatches
- Handbook 105-6 Specifications and Tolerances for Thermometers
- Handbook 105-7 Specifications and Tolerances for Dynamic Small Volume Provers
- Handbook 105-8 Specifications and Tolerances for Field Standard Weight Carts

NIST Handbook 105 Series Publication		Weights and Measures	Service Technicians
105-1	Enforce	36	32
	Recommend	6	7
	Not Used	0	1
105-2	Enforce	9	5
	Recommend	10	8
	Not Used	6	9
105-3	Enforce	34	33
	Recommend	5	5
	Not Used	2	1
105-4	Enforce	24	25
	Recommend	9	8
	Not Used	2	3
105-5	Enforce	7	3
	Recommend	7	8
	Not Used	9	10
105-6	Enforce	6	2
	Recommend	7	7
	Not Used	12	13
105-7	Enforce	1	4
	Recommend	4	7
	Not Used	11	9
105-8	Enforce	25	23
	Recommend	7	7
	Not Used	6	6

Table 43: Numbers of laboratories reporting usage of each of the named NIST HB105 series standards

ASTM Standards (22)

ASTM publishes standards for materials, measurement and test equipment, petroleum based fuels, safety equipment, paints and coatings, textiles, construction, etc.

- ASTM E617 Standard Specification for Laboratory Weights And Precision Mass Standards
- ASTM E74 Standard Practice of Calibration of Force-Measuring Instruments for Verifying the Force Indication of Testing Machines
- ASTM E100 Standard Specification for ASTM Hydrometers
- ASTM E288 Standard Specification for Laboratory Glass Volumetric Flasks
- ASTM E1 Standard Specification for ASTM Liquid-in-Glass Thermometers
- ASTM E2251 Standard Specification for Liquid-in-Glass ASTM Thermometers with Low-Hazard Precision Liquids

ASTM Standard		Weights and Measures	Service Technicians
E617	Enforce	11	9
	Recommend	8	9
	Not Used	4	3
E74	Enforce	5	4
	Recommend	3	3
	Not Used	8	7
E100	Enforce	0	0
	Recommend	0	0
	Not Used	14	14
E288	Enforce	3	1
	Recommend	1	2
	Not Used	12	12
E1	Enforce	0	0
	Recommend	1	1
	Not Used	13	13
E2251	Enforce	1	0
	Recommend	1	2
	Not Used	13	13

Table 44: Numbers of laboratories reporting usage of each of the identified ASTM standards

OIML Publications (23)

The OIML develops model regulations, International Recommendations, which provide Members with an internationally agreed upon basis for the establishment of national legislation on various categories of measuring instruments.

- R 7 Clinical thermometers, mercury-in-glass with maximum device
- R 43 Standard graduated glass flasks for verification officers
- R 59 Moisture meters for cereal grains and oilseeds
- R 84 Platinum, copper, and nickel resistance thermometers (for industrial and commercial use)
- R 91 Radar equipment for the measurement of the speed of vehicles
- R 111-1 Weights of classes E1, E2, F1, F2, M1, M1-2, M2, M2-3 and M3. Part 1: Metrological and technical requirements
- R 111-2 Weights of classes E1, E2, F1, F2, M1, M1-2, M2, M2-3 and M3. Part 2: Test report format
- R 114 Clinical electrical thermometers for continuous measurement
- R 115 Clinical electrical thermometers with maximum device
- R 119 Pipe provers for testing of measuring systems for liquids other than water
- R 120 Standard capacity measures for testing measuring systems for liquids other than water
- R 129 Multi-dimensional measuring instruments
- R 133 Liquid-in-glass thermometers

OIML Standard		Weights and Measures	Service Technicians
R7	Enforce	0	0
	Recommend	0	0
	Not Used	13	13
R43	Enforce	1	0
	Recommend	1	1
	Not Used	11	12
R59	Enforce	3	3
	Recommend	0	0
	Not Used	13	13
R84	Enforce	0	0
	Recommend	0	0
	Not Used	13	13
R91	Enforce	2	2
	Recommend	2	0
	Not Used	11	11
R111-1	Enforce	6	5
	Recommend	7	7
	Not Used	6	6
R111-2	Enforce	4	3
	Recommend	4	4
	Not Used	8	9
R114	Enforce	0	0
	Recommend	2	1
	Not Used	11	12
R115	Enforce	0	1
	Recommend	1	1
	Not Used	12	12
R119	Enforce	0	0
	Recommend	0	0
	Not Used	13	13
R120	Enforce	2	1
	Recommend	0	0
	Not Used	11	12

OIML Standard		Weights and Measures	Service Technicians
R129	Enforce	0	0
	Recommend	0	0
	Not Used	13	13
R133	Enforce	0	0
	Recommend	1	0
	Not Used	13	13

Table 45: Numbers of laboratories reporting usage of each of the identified OIML publications.

Workload Survey Instructions

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2010 Workload Survey
State Metrology Laboratories
for
Jan 1, 2010 – Dec 31, 2010

December 2, 2010

To: State Metrology Laboratories

DUE by April 1, 2011

Instructions

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

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

952-435-4040 Attn: Steven

or mail it to

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

Frequently Asked Questions & General Guidance

Laboratory Data – Sections 1-6:

Contact Information for Person Completing this Survey:

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

Laboratory Information:

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

Laboratory Age & Size:

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

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

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

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

Examples

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

Number of Laboratory Customers served during the reporting period

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

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

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

Staff Data - Section 7:

Staff information:

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

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

Workload Sections 8-29:

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

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

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

External Customers – All other standards calibrated by the laboratory.

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

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

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

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

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

Workload Categories:

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

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

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

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

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

Calibration Fees:

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

Supplementary Questions:

Additional information is often requested regarding the SLP in conjunction with this survey. These requests are kept separate from the main survey to maintain a consistent presentation from year to year in a document titled "Supplementary Survey Questions". The supplementary survey instructions are included here in order to minimize the impact on the main survey instructions in order to maintain a more consistent document.

This year we are requesting some basic information as to whether or not your program utilizes various national and international standards from 1) the 105 Handbook series, 2) ASTM Standards, 3) OIML Standards, and 4) American Petroleum Institute (API) Standards.

Example:

105-1 Class F Weights and Mass Standards	For state regulatory investigators?	Actively Enforced	☐
		Actively Recommended	☐
		Not actively Recommended or Enforced	☐
	For industry service technicians?	Actively Enforced	☐
		Actively Recommended	☐
		Not actively Recommended or Enforced	☐

State Regulatory Investigators refers to those individuals who are charged with inspecting legal for trade devices for compliance with state and local regulations. These individuals typically have the authority to remove devices from service and may be government employees or they may be private contractors working on the government's behalf.

Industry Service Technicians refers to those individuals who are authorized to place legal for trade devices into commercial service. These individuals may be authorized by the state or local jurisdiction through a formal permitting process, however, the term is simply used in this survey to identify anyone who is potentially allowed to install and service legal for trade devices under state and local law regardless of whether a formal process exists or not.

Actively Enforced indicates that the standard is enforced. This essentially means the measurement and test equipment used in conjunction with installing and repairing legal for trade devices may be condemned based upon the standard identified.

Actively Recommended indicates that the standard is used merely as a guideline for selection of measure and test equipment to be used in conjunction with the installation and repair of legal for trade devices.

Not Actively Recommended or Enforced indicates that the standard is not referenced at all. You may use an alternative standard (i.e. OIML R111 instead of HB 105-1) or you may simply not have an opinion regarding to the measurement and test equipment described by the standard identified (i.e. it is not widely used or regulated).

In addition to the sample shown in these instructions there are two more columns associated with each standard.

In the column titled "Other Usage (purchasing specifications, calibration tolerance definitions, etc)" please indicate if you use the standard for any other reason.

Example: you may not enforce ASTM E617 specifications for weights but you may use the tolerance tables within to establish adjustment criteria for the calibration of test weights.

In the column titled, "Enforced/Recommended Calibration Interval

(please specify in months)" please indicate the calibration interval required for the measure and test equipment described by the standard. If it doesn't apply, simply mark the field as "N/A".

Example: Service providers are often required to have their HB105-1 compliant test weights calibrated annually. If this is true, enter "12" in this field.

If you have a situation which is not covered sufficiently by the supplementary questionnaire or you are unsure how to answer. Please contact me. See below.

ASSISTANCE/QUESTIONS??

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

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

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

Workload Survey Form

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2010 State Laboratory Program Survey
DUE by April 1, 2011

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

1. Contact Information for Person Completing this Survey

Name: _____

Phone: _____

Fax: _____

2. Laboratory Information

Laboratory: _____

Mail Address: _____

City, State, Zip: _____

Web Site: Address _____

3. Laboratory Age & Size

Age of Lab: _____ yrs

Office Space: _____ sq ft

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

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

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

5. Number of Laboratory Customers served during the reporting period

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

Laboratory Customers _____

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

- ☐ Your State Lab ONLY
- ☐ Any State Lab regardless of status
- ☐ Any NIST/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	Vol Trans	Vol Grav	Length	Time/Frequency	Temperature	Grain Moisture		State Lab Metrology	Other Metrology	Total Metrology Experience

2010 Workload Information

NOTE: The following information should be based on a 12 month period, preferably Jan 1, 2010 through Dec 31, 2010 or the most recent fiscal year. Reported data should not be estimates. If unable to quote actual data, please attach your comments to the end of this survey.

Actual Period of Time Covered: From _____ To _____

8. Mass Echelon I

Number of mass standards calibrated using Advanced Weighing Designs and Mass Code Data Reduction.
Regardless of Class.

Lab (Internal)	
W&M Program	
External Customers	
Total	

9. Mass Echelon II

Number of mass standards.
ASTM Class 1, 2, 3
OIML Class E2, F1

Lab (Internal)	
W&M Program	
External Customers	
Total	

10. Mass Echelon III

Number of mass standards (except weight carts).
ASTM Class 4, 5, 6, 7
OIML Class F2, M1, M2, M3
NIST Class F

Lab (Internal)	
W&M Program	
External Customers	
Total	

11. Weight Carts

Number of weight carts calibrated.

Lab (Internal)	
W&M Program	
External Customers	
Total	

12. Volume – Glassware

Number of individual pieces of volumetric glassware calibrated.
Note: Indicate number of Volume Transfer (V-T) and/or Gravimetric test methods.

	Vol-Transfer	Gravimetric
Lab (Internal)		
W&M Program		
External Customers		
Total		

13. Volume – SVP (Small Volume Provers) (NOT 5 gallon test measures)

Number of small volume provers calibrated.
Note: Indicate number of Volume Transfer (V-T) and/or Gravimetric test methods. If you don't know what a SVP is, your answer is probably zero.

	Vol-Transfer	Gravimetric
Lab (Internal)		
W&M Program		
External Customers		
Total		

14. Volume – LPG

Number of individual LPG provers calibrated.
Note: Indicate number of Volume Transfer (V-T) and/or Gravimetric test methods.

	Vol-Transfer	Gravimetric
Lab (Internal)		
W&M Program		
External Customers		
Total		

15. Volume – Non-Pressurized Small Metal Standards (≤ 5 gallon)

Number of metal volumetric standards (20 liter / 5 gallon and smaller).
Note: Indicate number of Volume Transfer (V-T) and/or Gravimetric test methods.

	Vol-Transfer	Gravimetric
Lab (Internal)		
W&M Program		
External Customers		
Total		

16. Volume – Non-Pressurized Medium Metal Standards (> 5 gallon and ≤ 100 gallon)

Number of metal volumetric standards (larger than 20 liter / 5 gallon and less than or equal to 400 liter / 100 gallon).
Note: Indicate number of Volume Transfer (V-T) and/or Gravimetric test methods.

	Vol-Transfer	Gravimetric
Lab (Internal)		
W&M Program		
External Customers		
Total		

17. Volume – Non-pressurized Large Metal Standards (> 100 gallon)

Number of metal volumetric standards (greater than 400 liter / 100 gallon).
Note: Indicate number of Volume Transfer (V-T) and/or Gravimetric test methods.

	Vol-Transfer	Gravimetric
Lab (Internal)		
W&M Program		
External Customers		
Total		

18. Length - Tapes

Number of individual tapes (metal, fiberglass, woven fiberglass, cloth, etc.). Please enter #devices tested, NOT number of points tested.

Lab (Internal)	
W&M Program	
External Customers	
Total	

19. Length - Rigid Rules

Number of rigid rules calibrated.

Lab (Internal)	
W&M Program	
External Customers	
Total	

20. Thermometry

Number of thermometers tested (mechanical, liquid-in-glass, thermocouples, thermistors, PRTs, SPRTs).

Lab (Internal)	
W&M Program	
External Customers	
Total	

21. Frequency

Number of frequency standards tested (includes tuning forks).

Lab (Internal)	
W&M Program	
External Customers	
Total	

22. Timing Devices

Number of timing devices tested (stopwatches).

Lab (Internal)	
W&M Program	
External Customers	
Total	

23. Wheel Load Weighers

Number of wheel load weighers tested :

Lab (Internal)	
W&M Program	
External Customers	
Total	

24. Lottery Balls		
Number of lottery balls tested : Characteristic Tested: ❑ Mass ❑ Diameter ❑ Other *Describe Other*_____	Lab (Internal)	
	W&M Program	
	External Customers	
	Total	

25. (A) Other Types of Measurements not covered in this survey		
Describe type of measurement:	Lab (Internal)	
	W&M Program	
	External Customers	
	Total	

26. (B) Other Types of Measurements not covered in this survey		
Describe type of measurement:	Lab (Internal)	
	W&M Program	
	External Customers	
	Total	

27. (C) Other Types of Measurements not covered in this survey		
Describe type of measurement:	Lab (Internal)	
	W&M Program	
	External Customers	
	Total	

28. Laboratory Fees

In this section please estimate the typical fees charged for each of the described examples.

Does your laboratory charge fees for external customers? YES ❑ NO ❑

	Do you have a minimum fee?	$
	[Mass Echelon I] ASTM Class 0 Precision mass set 100 g to 1 mg (21 weights)	$
	[Mass Echelon II] ASTM Class 2 Precision mass set 100 g to 1 mg (21 weights)	$
	One – 31 lb Class F weight set (22 weights)	$
	5,000 lb weight cart	$
Scale test truck:	24-1000 lb weights (5 adjusted)	$
	20 - 50 lb weights (5 adjusted)	$
	2 -31 lb weight sets (22 weights each)	$
	TOTAL	$
	One – 5 gallon test measure using volume transfer method:	$
	One – 5 gallon test measure using gravimetric method:	$
	One – 100 gallon prover using volume transfer method:	$
	One – 100 gallon prover using gravimetric method:	$
	One – 100 gallon LPG prover:	$
	One – 20 gallon SVP (small volume prover) using volume transfer method:	$
	One – 20 gallon SVP (small volume prover) using gravimetric method:	$
	One- 100 foot tape with 19 points tested:	$

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

29. Comments on Survey

Additional Survey Questions

Jurisdiction: | Name:

For each of the following recommended standards please indicate if your jurisdiction actively enforces, recommends, or does not utilize the standard. Please indicate if your jurisdiction utilizes the indicated standard for purchasing specifications, measurement tolerances, etc. Please indicate the calibration interval recommended or enforced by your jurisdiction for the device covered by each standard if appropriate. Indicate N/A as is appropriate for your jurisdiction.

Standard	Compliance Enforcement			Other Usage (purchasing specifications, calibration tolerance definitions, etc)	Enforced/Recommended Calibration Interval (please specify in months)
NIST HB 105 Series					
105-1 Class F Weights and Mass Standards	For state regulatory investigators?	Actively Enforced	☐		
		Actively Recommended	☐		
		Not actively Recommended or Enforced	☐		
	For industry service technicians?	Actively Enforced	☐		
		Actively Recommended	☐		
		Not actively Recommended or Enforced	☐		
105-2 Glass Flasks	For state regulatory investigators?	Actively Enforced	☐		
		Actively Recommended	☐		
		Not actively Recommended or Enforced	☐		
	For industry service technicians?	Actively Enforced	☐		
		Actively Recommended	☐		
		Not actively Recommended or Enforced	☐		
105-3 Graduated Neck-Type Volumetric Test Measures and Provers	For state regulatory investigators?	Actively Enforced	☐		
		Actively Recommended	☐		
		Not actively Recommended or Enforced	☐		
	For industry service technicians?	Actively Enforced	☐		
		Actively Recommended	☐		
		Not actively Recommended or Enforced	☐		

105-4 Liquefied Petroleum Gas Type Provers	For state regulatory investigators?	Actively Enforced	☐		
		Actively Recommended	☐		
		Not actively Recommended or Enforced	☐		
	For industry service technicians?	Actively Enforced	☐		
		Actively Recommended	☐		
		Not actively Recommended or Enforced	☐		
105-5 Stopwatches	For state regulatory investigators?	Actively Enforced	☐		
		Actively Recommended	☐		
		Not actively Recommended or Enforced	☐		
	For industry service technicians?	Actively Enforced	☐		
		Actively Recommended	☐		
		Not actively Recommended or Enforced	☐		
105-6 Thermometers	For state regulatory investigators?	Actively Enforced	☐		
		Actively Recommended	☐		
		Not actively Recommended or Enforced	☐		
	For industry service technicians?	Actively Enforced	☐		
		Actively Recommended	☐		
		Not actively Recommended or Enforced	☐		
105-7 Dynamic Small Volume Provers	For state regulatory investigators?	Actively Enforced	☐		
		Actively Recommended	☐		
		Not actively Recommended or Enforced	☐		
	For industry service technicians?	Actively Enforced	☐		
		Actively Recommended	☐		
		Not actively Recommended or Enforced	☐		

105-8 Field Standard Weight Carts	For state regulatory investigators?	Actively Enforced	☐		
		Actively Recommended	☐		
		Not actively Recommended or Enforced	☐		
	For industry service technicians?	Actively Enforced	☐		
		Actively Recommended	☐		
		Not actively Recommended or Enforced	☐		
ASTM Standards					
ASTM E617 (mass)	For state regulatory investigators?	Actively Enforced	☐		
		Actively Recommended	☐		
		Not actively Recommended or Enforced	☐		
	For industry service technicians?	Actively Enforced	☐		
		Actively Recommended	☐		
		Not actively Recommended or Enforced	☐		
ASTM E74 (load cells/proving rings calibration)	For state regulatory investigators?	Actively Enforced	☐		
		Actively Recommended	☐		
		Not actively Recommended or Enforced	☐		
	For industry service technicians?	Actively Enforced	☐		
		Actively Recommended	☐		
		Not actively Recommended or Enforced	☐		
ASTM E100 (hydrometers)	For state regulatory investigators?	Actively Enforced	☐		
		Actively Recommended	☐		
		Not actively Recommended or Enforced	☐		
	For industry service technicians?	Actively Enforced	☐		
		Actively Recommended	☐		
		Not actively Recommended or Enforced	☐		

ASTM E288 (glassware)	For state regulatory investigators?	Actively Enforced	☐		
		Actively Recommended	☐		
		Not actively Recommended or Enforced	☐		
	For industry service technicians?	Actively Enforced	☐		
		Actively Recommended	☐		
		Not actively Recommended or Enforced	☐		
ASTM E1 (LIG Thermometers, mercury)	For state regulatory investigators?	Actively Enforced	☐		
		Actively Recommended	☐		
		Not actively Recommended or Enforced	☐		
	For industry service technicians?	Actively Enforced	☐		
		Actively Recommended	☐		
		Not actively Recommended or Enforced	☐		
ASTM E2251 (LIG Thermometers, other)	For state regulatory investigators?	Actively Enforced	☐		
		Actively Recommended	☐		
		Not actively Recommended or Enforced	☐		
	For industry service technicians?	Actively Enforced	☐		
		Actively Recommended	☐		
		Not actively Recommended or Enforced	☐		
OIML Standards					
R7 Clinical thermometers, mercury-in-glass with maximum device	For state regulatory investigators?	Actively Enforced	☐		
		Actively Recommended	☐		
		Not actively Recommended or Enforced	☐		
	For industry service technicians?	Actively Enforced	☐		
		Actively Recommended	☐		
		Not actively Recommended or Enforced	☐		

R43 Standard graduated glass flasks for verification officers	For state regulatory investigators?	Actively Enforced	☐		
		Actively Recommended	☐		
		Not actively Recommended or Enforced	☐		
	For industry service technicians?	Actively Enforced	☐		
		Actively Recommended	☐		
		Not actively Recommended or Enforced	☐		
R59 Moisture meters for cereal grains and oilseeds	For state regulatory investigators?	Actively Enforced	☐		
		Actively Recommended	☐		
		Not actively Recommended or Enforced	☐		
	For industry service technicians?	Actively Enforced	☐		
		Actively Recommended	☐		
		Not actively Recommended or Enforced	☐		
R84 Platinum, copper, and nickel resistance thermometers (for industrial and commercial use)	For state regulatory investigators?	Actively Enforced	☐		
		Actively Recommended	☐		
		Not actively Recommended or Enforced	☐		
	For industry service technicians?	Actively Enforced	☐		
		Actively Recommended	☐		
		Not actively Recommended or Enforced	☐		
R91 Radar equipment for the measurement of the speed of vehicles	For state regulatory investigators?	Actively Enforced	☐		
		Actively Recommended	☐		
		Not actively Recommended or Enforced	☐		
	For industry service technicians?	Actively Enforced	☐		
		Actively Recommended	☐		
		Not actively Recommended or Enforced	☐		

R111-1 Weights of classes E1, E2, F1, F2, M1, M1-2, M2, M2-3 and M3. Part 1: Metrological and technical requirements	For state regulatory investigators?	Actively Enforced	☐		
		Actively Recommended	☐		
		Not actively Recommended or Enforced	☐		
	For industry service technicians?	Actively Enforced	☐		
		Actively Recommended	☐		
		Not actively Recommended or Enforced	☐		
R111-2 Weights of classes E1, E2, F1, F2, M1, M1-2, M2, M2-3 and M3. Part 2: Test report format	For state regulatory investigators?	Actively Enforced	☐		
		Actively Recommended	☐		
		Not actively Recommended or Enforced	☐		
	For industry service technicians?	Actively Enforced	☐		
		Actively Recommended	☐		
		Not actively Recommended or Enforced	☐		
R114 Clinical electrical thermometers for continuous measurement	For state regulatory investigators?	Actively Enforced	☐		
		Actively Recommended	☐		
		Not actively Recommended or Enforced	☐		
	For industry service technicians?	Actively Enforced	☐		
		Actively Recommended	☐		
		Not actively Recommended or Enforced	☐		
R115 Clinical electrical thermometers with maximum device	For state regulatory investigators?	Actively Enforced	☐		
		Actively Recommended	☐		
		Not actively Recommended or Enforced	☐		
	For industry service technicians?	Actively Enforced	☐		
		Actively Recommended	☐		
		Not actively Recommended or Enforced	☐		

R119 Pipe provers for testing of measuring systems for liquids other than water	For state regulatory investigators?	Actively Enforced	☐		
		Actively Recommended	☐		
		Not actively Recommended or Enforced	☐		
	For industry service technicians?	Actively Enforced	☐		
		Actively Recommended	☐		
		Not actively Recommended or Enforced	☐		
R120 Standard capacity measures for testing measuring systems for liquids other than water	For state regulatory investigators?	Actively Enforced	☐		
		Actively Recommended	☐		
		Not actively Recommended or Enforced	☐		
	For industry service technicians?	Actively Enforced	☐		
		Actively Recommended	☐		
		Not actively Recommended or Enforced	☐		
R129 Multi-dimensional measuring instruments	For state regulatory investigators?	Actively Enforced	☐		
		Actively Recommended	☐		
		Not actively Recommended or Enforced	☐		
	For industry service technicians?	Actively Enforced	☐		
		Actively Recommended	☐		
		Not actively Recommended or Enforced	☐		
R133 Liquid-in-glass thermometers	For state regulatory investigators?	Actively Enforced	☐		
		Actively Recommended	☐		
		Not actively Recommended or Enforced	☐		
	For industry service technicians?	Actively Enforced	☐		
		Actively Recommended	☐		
		Not actively Recommended or Enforced	☐		

Other Standards					
API Standards (any, please specify in comments)	For state regulatory investigators?	Actively Enforced	☐		
		Actively Recommended	☐		
		Not actively Recommended or Enforced	☐		
	For industry service technicians?	Actively Enforced	☐		
		Actively Recommended	☐		
		Not actively Recommended or Enforced	☐		

Comments

MAIL OR FAX COMPLETED SURVEY TO:

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