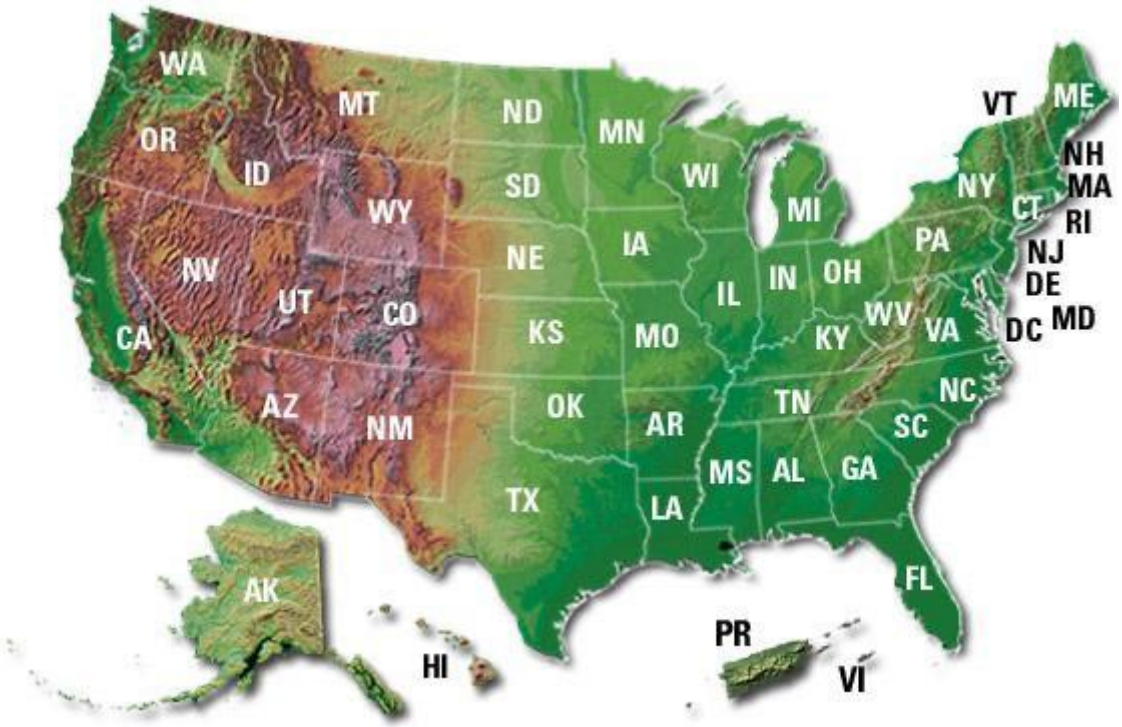
2024

State Laboratory Program Workload Survey



Published by the NCSL International Legal Metrology Committee

Foreword

As the new Chair of the NCSLI 156 Legal Metrology Committee, I'm excited to share this year's Legal Metrology Workload Survey. This survey, conducted every two years, is a cornerstone for capturing the current state of legal metrology laboratory operations across the country. Your input helps us track trends, advocate for resources, and better understand the evolving needs of our community.

With new leadership comes a fresh perspective—and possibly a few changes to the format or approach. We appreciate your patience and continued participation as we work thoughtfully to maintain the integrity and usefulness of the survey while adapting to ensure it continues to serve you as well.

I want to extend my deepest thanks to Steve Harrington, who has faithfully led this survey effort for well over a decade. His commitment to gathering, analyzing, and reporting the data has provided our community with clarity, consistency, and credibility. Steve not only developed the detailed reports that many of you have relied on, but also provided tremendous mentorship to both myself and our new Vice Chair, Andrew Shopes, during this transition. We are so grateful for the strong foundation he's built.

A huge thank-you to Andrew as well, who jumped right into data analysis with remarkable speed and precision, and whose support has already made a big impact. He's worked so hard on this survey; be sure and thank him when you see him! And a big shout out to Robert Rogers, our committee Secretary, for his steady contributions and behind-the-scenes work. Both Andrew and Robert have helped me step into this role with confidence and clarity, and I'm truly thankful to have them as part of the leadership team.

We know your time is valuable, and your input plays a vital role in shaping our understanding of legal metrology trends. Thank you for completing the survey—and for all the work you do every day to support accuracy, consistency, and public trust in measurement. Thanks also go to the staff of the National Institute of Standards and Technology, Office of Weights and Measures who have provided considerable support in collecting data and preparing and publishing this report.

Again, thanks for your continued participation and commitment to good measurements!

Best,

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Acknowledgements

This report was prepared with the support of the members of the NCSL International Committee 156 - Legal Metrology Committee. Special thanks go to the dedicated metrology professionals working in the State Laboratory Program who generously contributed their time and effort to complete the 2024 State Program Workload Survey. Their input provides the critical data that makes this report possible. We'd also like to extend our appreciation to the staff of the National Institute of Technology Office of Weights and Measures, whose continued support in providing data is instrumental.

It is our sincere hope that this biannual report continues to be a valuable resource to the State Laboratory Program laboratories and to the broader measurement community that depends on our services.

Objectives and History

Historically there has been inconsistency between survey titles and the year which data represents. Starting in 2008 the survey team adopted a convention of naming the report based upon the year which the data represents rather than the year the report was published. For example, the report titled "2008 State Laboratory Program Workload Survey" represents data collected during the 2008 calendar year. Table 1 correlates historical workload surveys to the year(s) during which the data was collected.

Survey Title	Year represented
1996 State Laboratory Program Workload Survey	1996
1999 State Laboratory Program Workload Survey	1998
2000 State Laboratory Program Workload Survey	1999
2001 State Laboratory Program Workload Survey	2000
2003 State Laboratory Program Workload Survey	2002
2005 State Laboratory Program Workload Survey	2004
2005 & 2006 State Laboratory Program Workload Survey	2005&2006
2008 State Laboratory Program Workload Survey	2008
2010 State Laboratory Program Workload Survey	2010
2012 State Laboratory Program Workload Survey	2012
2014 State Laboratory Program Workload Survey	2014
2016 State Laboratory Program Workload Survey	2016
2018 State Laboratory Program Workload Survey	2018
2020 State Laboratory Program Workload Survey	2020
2022 State Laboratory Program Workload Survey	2022
2024 State Laboratory Program Workload Survey	2024

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

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

Survey data is 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 interlaboratory comparisons are designed to meet the real needs of the workload. Ultimately, the survey information increases the efficiency of the entire SLP and maximizes 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.

Collection, Presentation, and Analysis of Data:

SLP laboratories submitted their data using standardized Microsoft Excel spreadsheets.

The data was copied from each completed survey form into a master workbook for analysis. The copy process is automated using Excel macros to expedite the process and to minimize the potential for random data transcription errors.

The overall survey is presented in the following order;

1. The NIST Office of Weights and Measures (OWM) provides an initial report of workload data from the NIST Measurement Services Division summarizing calibration work done for State laboratories covering a range of measurements including mass, volume, temperature, pressure, etc. This report generally presents the leveraging effect that the SLP provides for the NIST Measurement Services Division. The NIST report begins on page 15.
2. The NIST OWM provides an overview of the SLP which;
    - details program metrics NIST OWM uses to track member laboratories,
    - reports on the accreditation status of each of the member laboratories,
    - reports on training provided by NIST OWM for the member laboratories,
    - reports on proficiency testing conducted within the SLP,
    - reports on documentary standards used by the SLP,
    - details each member laboratory's measurement scope as recognized by NIST OWM.
3. Individual laboratories participating in the survey are identified by name location, age, size, and number of customers served beginning on page 31. Current contact information for the individual SLP laboratories and their NIST OWM Certificate of Measurement Traceability can be found on the NIST Office of Weights and Measures website: https://www.nist.gov/pml/owm
4. Each laboratory's prior survey participation in previous surveys is reported beginning on page 33.
5. The SLP workload portion of the survey is broken down into four broad measurement categories: mass, length, volume, and other. Each category is further subdivided into three sub-categories identifying the type of customer for whom measurements are performed: laboratory, weights and measures enforcement, and external.
   The data is presented in the form of both 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 member laboratory. Summary pie graphs are included to report totals across the entire SLP by customer type.
   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 37, Length on page 51, Volume on page 56, and all other tests on page 73.

6. A report on fees charged for the various services provided by each member lab begins on page 86. Fee estimates for a range of routine measurement services are presented using bar graphs detailing individual laboratory fee estimates. Historical averages are included for each measurement service where the data is available.
7. A report on laboratory staffing begins on page 119. This report includes;
    - Position titles;
    - Salary ranges; and
    - Detailed list of metrologists employed in the SLP at the time of the survey. The data includes specific calibration authorizations, experience in years, and the approximate dates each person is eligible for full retirement.
8. Each laboratory is asked to identify from whom they will accept calibration certificates on page 133. Member laboratories often have a regulatory duty with respect to service personnel who are normally required to submit measurement equipment for calibration on a regular basis. The acceptance matrix identifies from whom a service company can purchase a calibration certificate which will then be given legal recognition within that member laboratory's jurisdiction.
9. Each year the survey team prepares a section of supplementary questions which, unlike the previous sections, changes significantly from year to year. This section begins on page 136.
10. A reprint of the 2024 survey at end.

160. Additional Comments:

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. 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 analyze the change in the workload of individual laboratories due to the cyclic nature of the work. For example, a member laboratory may measure their volumetric glassware on a two-year calibration interval with the majority of these standards calibrated in sync with each other. The consequence being that few are tested in the following twelve-month period. This does not indicate that the workload is decreasing, it is just a reflection of the calibration interval assigned to those standards.

Impact and Leveraging of NIST Calibrations
(Information provided by NIST/OWM)

Calibration records for State laboratories were obtained from the NIST Measurement Services from 2000 through 2024. 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.

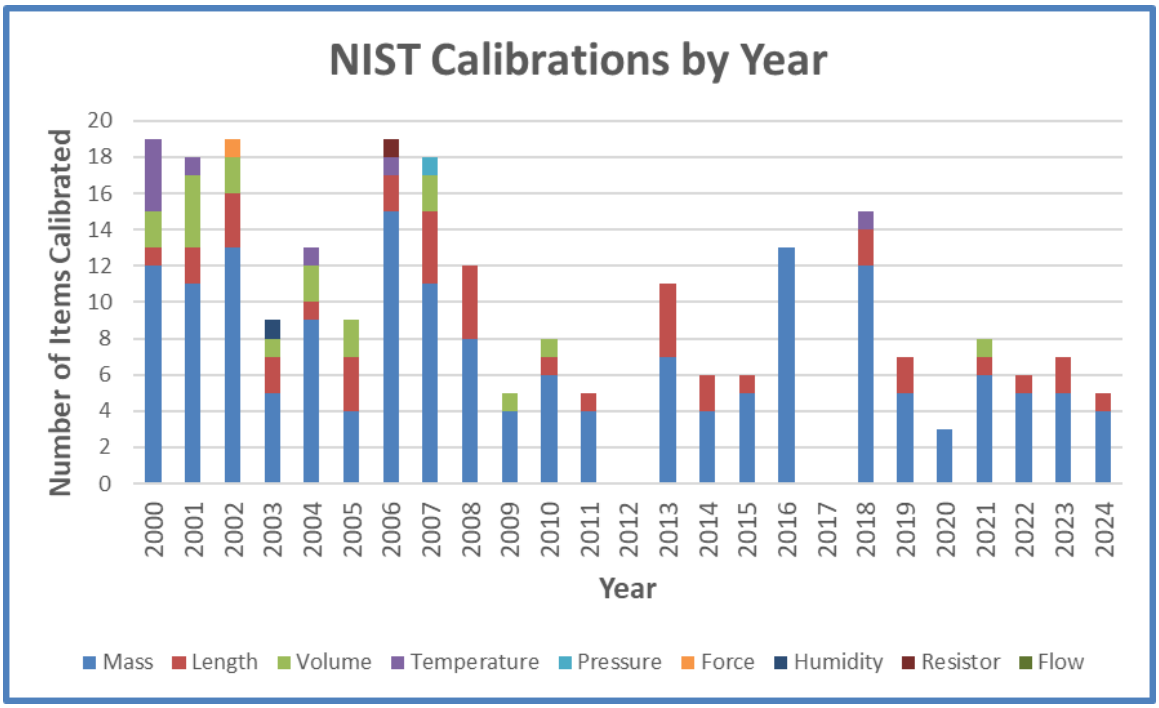


Figure 1. NIST total calibrations of State laboratories artifacts by year

Data in Figure 1 includes measurements and calibrations performed at NIST in traditional and non-traditional measurement areas (i.e., those outside of mass, length, and volume).

State weights and measures laboratories account for a small portion of NIST's annual calibrations. Given data obtained in the Laboratory Program surveys in the 1990's, typically 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 a National Metrology Institute (NMI) such as NIST.

Economic statistics indicate that weights and measures enforcement, supported by these leveraged State weights and measures laboratory calibrations, affect more than half of the $12 trillion (2024) U.S. Gross Domestic Product (GDP). Since over half of the State weights and measures laboratory workload affects 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.

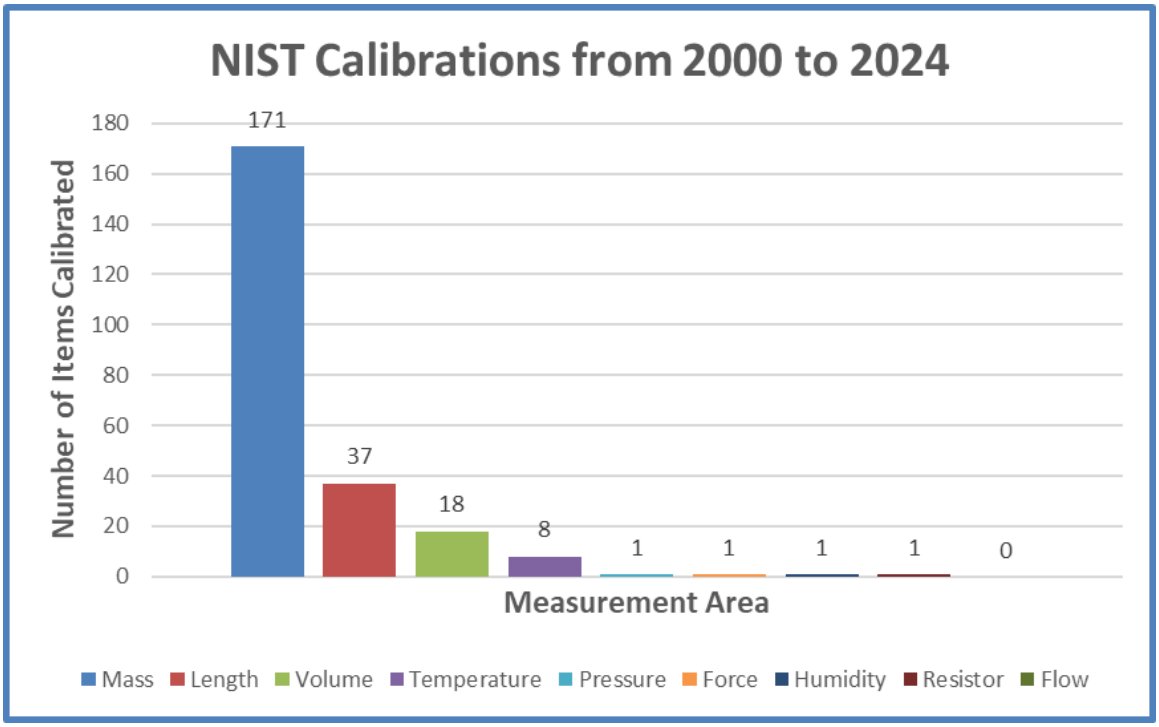


Figure 2. NIST calibration of State laboratories artifacts by parameter

One question that might be asked in looking at Figure 2 of leveraging data is "are enough calibrations being obtained from NIST by the States?" One responsibility of the NIST Office of Weights and Measures (OWM) is to coordinate the Laboratory Metrology Program. Each state laboratory that is recognized by OWM or accredited by NVLAP is required to have calibrations from acceptable sources, which are most often from NIST or other accredited laboratories. OWM Recognition or NVLAP Accreditation ensures that enough calibrations are obtained from NIST by the State weights and measures laboratories and that the State metrologists are trained adequately. Furthermore, metrologists must prove their competency/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 Proficiency Tests (Interlaboratory Comparisons) is that of obtaining updated calibrations for laboratory reference standards. It is estimated that better than 96 % of the laboratory standards are calibrated in a timely manner according to established calibration intervals.

Metrological traceability and its assessment are required to comply with seven essential elements to ensure traceability to the International System of Units (SI) – typically, though not always, through NIST calibration services. The seven essential elements are 1) defining the measurand and realization of the measurements to the International System of Units (SI), 2) a documented unbroken chain of comparisons (calibrations), 3) documented and up to date calibration program, 4) documented and suitable measurement uncertainties, 5) use of documented and validated procedures, 6) demonstrated technical competence/proficiency, and 7) an acceptable measurement assurance system to ensure the validity of the measurement results. In addition, State laboratories are required to comply with State laws regarding traceability to the SI and through the adoption of NIST publications like NIST Handbook 44: Specifications, Tolerances, and Other Technical Requirements for Weighing and Measuring Devices - Current Edition, and NIST Handbook 130: Uniform Laws and Regulations in the Areas of Legal Metrology and Engine Fuel Quality - Current Edition, they also must ensure compliance of measurement standards to appropriate/suitable specifications and tolerances for use in legal metrology.

Handbook 130 uniform laws allow for obtaining calibrations from suitable suppliers, as an alternative to direct NIST calibrations, when there is acceptable evidence of recognition and/or accreditation, suitable calibration and measurement capabilities (measurement, range, uncertainties) to ensure compliance with technical requirements of metrological traceability.

NIST Office of Weights and Measures (OWM)
Laboratory Metrology Program Overview

One of NIST's primary responsibilities is to ensure that uniform standards are available to support the nation's measurement infrastructure. As documented in the last edition of the workload survey, State laboratories provide the foundation for over 306,000 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 and the U.S. economy depend on the accuracy, traceability, and defensibility of these measurement results for State programs to enforce and ensure fair trade.

Four Interrelated Service Areas

There are four key areas of responsibility in the OWM Laboratory Metrology Program in support of ensuring the capability of laboratories to provide traceable measurement results: Laboratory Recognition, Proficiency Testing, Training, and Documentary Standards for Field Standards and Measurement Processes (Figure 1). Each functional area has a set of guiding documents as well as international documentary standards used for benchmarking to enhance program recognition and credibility.

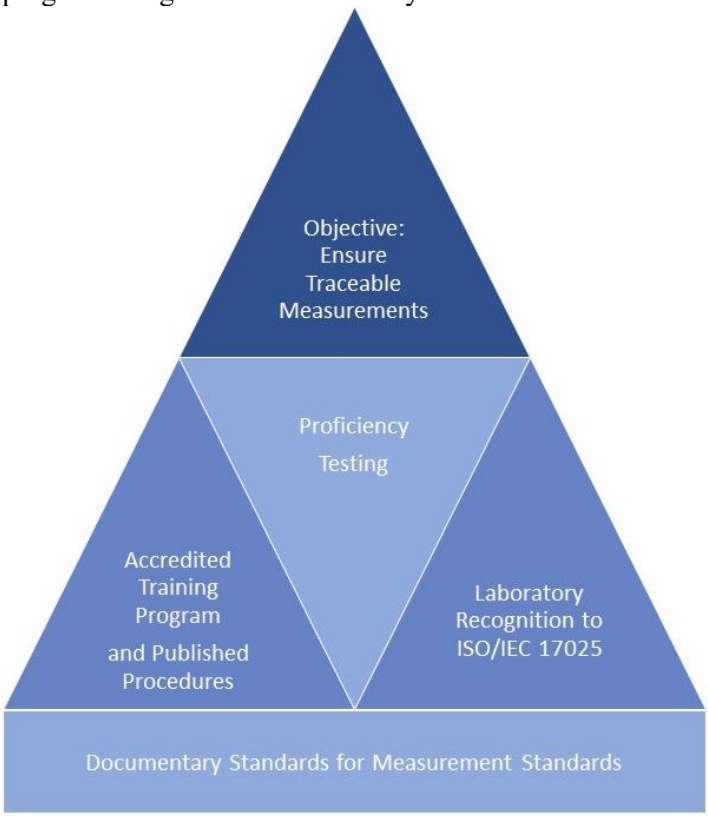


Figure 3. Laboratory Metrology Program Areas.

All areas are interrelated with the other areas. For example, laboratories that are recognized often support the weights and measures program requirements to ensure that measurement results have demonstrated metrological traceability while the Handbook 105-series documentary standards are often required by the weights and measures program for enforcement applications. The laboratory recognition area is very narrow in scope and only supports weights and measures laboratories in the U.S. To be recognized, the laboratory must successfully complete both training and proficiency testing requirements, in addition to all other published requirements that follow the ISO/IEC 17025 standard for calibration laboratories as outlined in NIST Handbook 143. Training on both proficiency testing and laboratory recognition requirements is

available. Proficiency testing is used not only to assess laboratory competency for recognition and accreditation but also the level of impact and application of training concepts.

Program Measures:

Program measures for the four service areas include the following items to assess ongoing program improvement needs. Graphic examples are included in each section to present the association measures.

1. Number of laboratories recognized by the Weights and Measures Division complying with NIST Handbook 143.
2. Laboratory Scoring Model measures changes in the national system over time with a quality index value according to elements of the NIST Handbook 143.
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.
5. Percentage of acceptable/passing proficiency test results and percentage of effective follow up actions (improvement, preventive, and corrective).
6. Updated publications.

Program Service Area Descriptions

Laboratory Recognition

Laboratory recognition is provided for the weights and measures laboratories to help demonstrate evidence of metrological traceability that is required in the States and local jurisdictions. Handbook 130, model weights and measures laws, as adopted in the jurisdictions, states that weights and measures programs are required to ensure metrological traceability to the International System of Units (SI) normally through NIST's calibration services. The latest model law indicates that laboratory recognition or accreditation provides the demonstrated evidence of metrological traceability. Some value-added impacts of the OWM laboratory recognition over accreditation alone is that OWM can target specific technical areas each year when and where problems have been identified, as well as conduct national-level analysis to assess and consider system-wide needs. Annual assessments are conducted for all laboratories and periodic resources are posted on the NIST website related to annual assessments. Example technical assessments that have provided national level assessments in the past few years include facility assessments, software verification and validation, measurement assurance, uncertainties, and metrological traceability. Identified problems provide input into the training area. Figure 2 provides a depiction of States with OWM laboratory recognition.

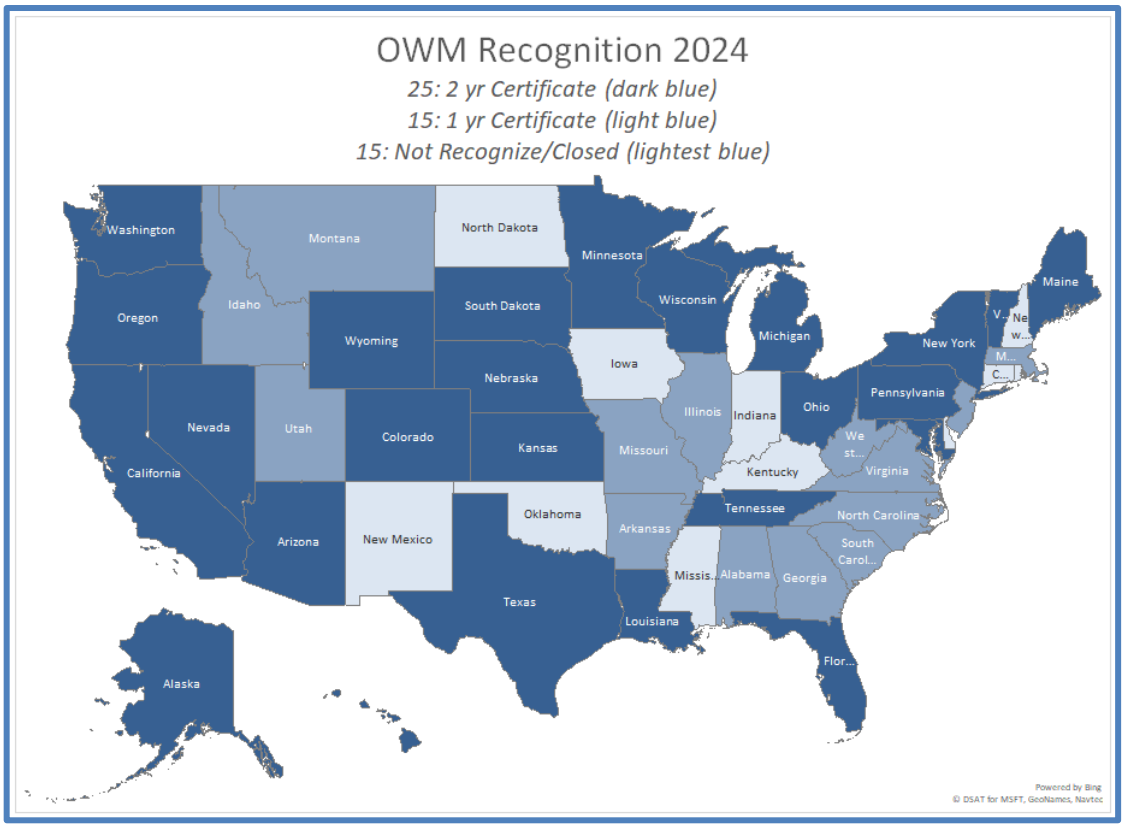


Figure 4. Laboratory Recognition by OWM (2024 December).

Laboratory Scoring Model

A laboratory scoring model was developed in 2006 and is based on assigning numerical values to each laboratory in several categories that correspond to NIST Handbook 143. Points are awarded in the following categories to each laboratory:

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

The model is intended to provide a quality index to the overall laboratory program. The scoring model was updated in 2008 based on laboratory feedback and the first two years of use. The scoring model is used internally at NIST to identify where resources and efforts will be allocated. The current “top score” possible (success goal) is 275. Laboratories that are fully successful with OWM 2-year Recognition generally score between 140 and 220. Figure 3 provides a chart of scoring results updated through 2024.

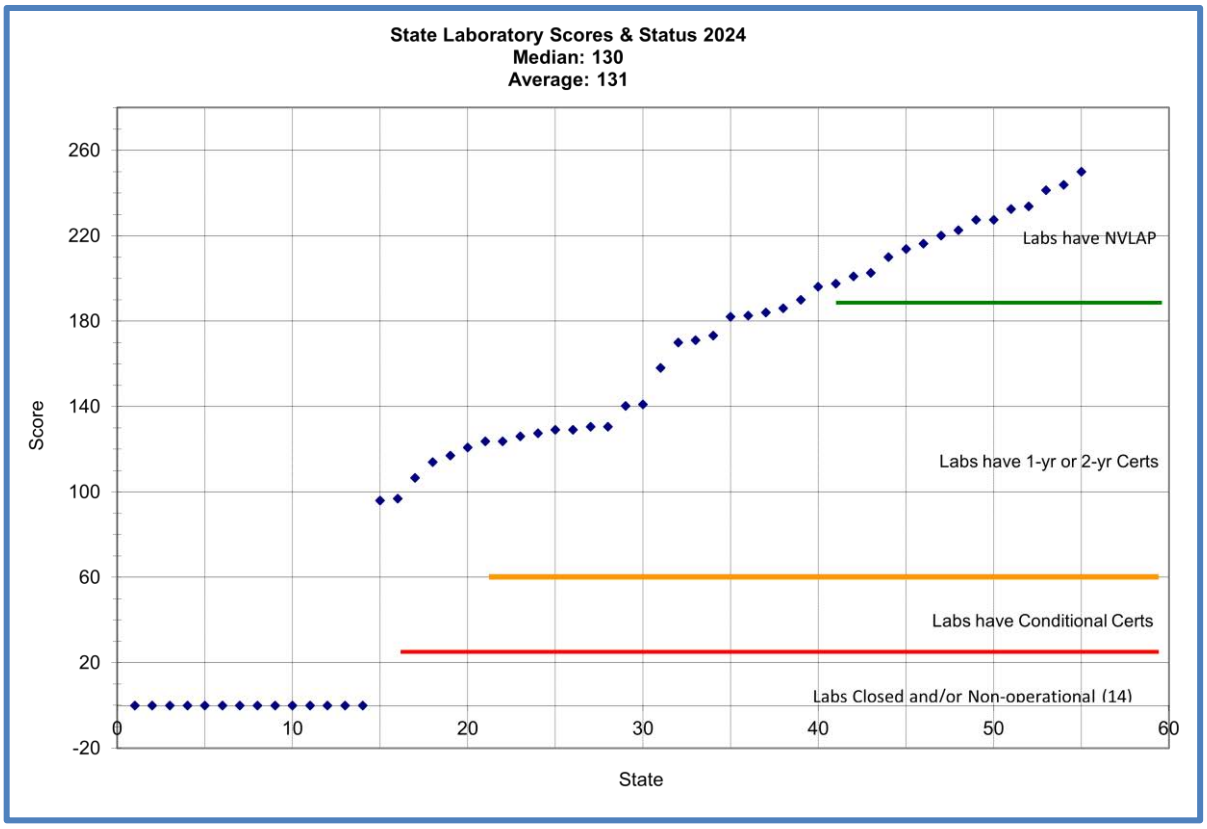


Figure 5. Laboratory Scoring Model

Scoring Model Trends

The OWM goal is to see the laboratory scores increase (or at least remain stable). Note: At this time, specific coding is not provided for identifying laboratories. In the latest assessment, we noted that several laboratories that were previously recognized and/or accredited have lost staff and did not have adequate succession planning in place to keep laboratory recognition and/or accreditation in place or in place at the levels prior to staff changes. Some laboratories are still recovering from the effects of the COVID-19 pandemic, especially where experienced staff are not locally available to support new staff. Table 1 provides Median and Mean scores since 2006. Training on the 2017 version of the ISO/IEC 17025 standard has been provided since 2016 and is ongoing. All laboratories are required to demonstrate continued compliance with the standard. OWM hopes to see average scores as high as they were before 2017 in the not too distant future.

Year	Median	Mean
Successful Goals	140 to 220	140 to 220
Accreditation Goals	220+	220+
2006	97.5	130
2007	140	140
2008	172	156
2009	172	156
2010	168	154
2012	168	156
2014 (end)	143	149
2016	186	169
2018[a]	126	131
2020	138	139
2022	131	137
2024	130	131
[a] Major adjustment due to use of 1-year interval for all laboratories with transition to ISO/IEC 17025:2017.		

Table 2. Laboratory Scoring Model Trends.

Laboratory Accreditation

The last measure of assessment in the recognition area that is presented here is the laboratory accreditation status through the NIST National Voluntary Laboratory Accreditation Program (NVLAP). Figure 4 provides a depiction of State Weights and Measures laboratories that are accredited. The OWM Laboratory Metrology Program interfaces with NVLAP for those state laboratories that are accredited.

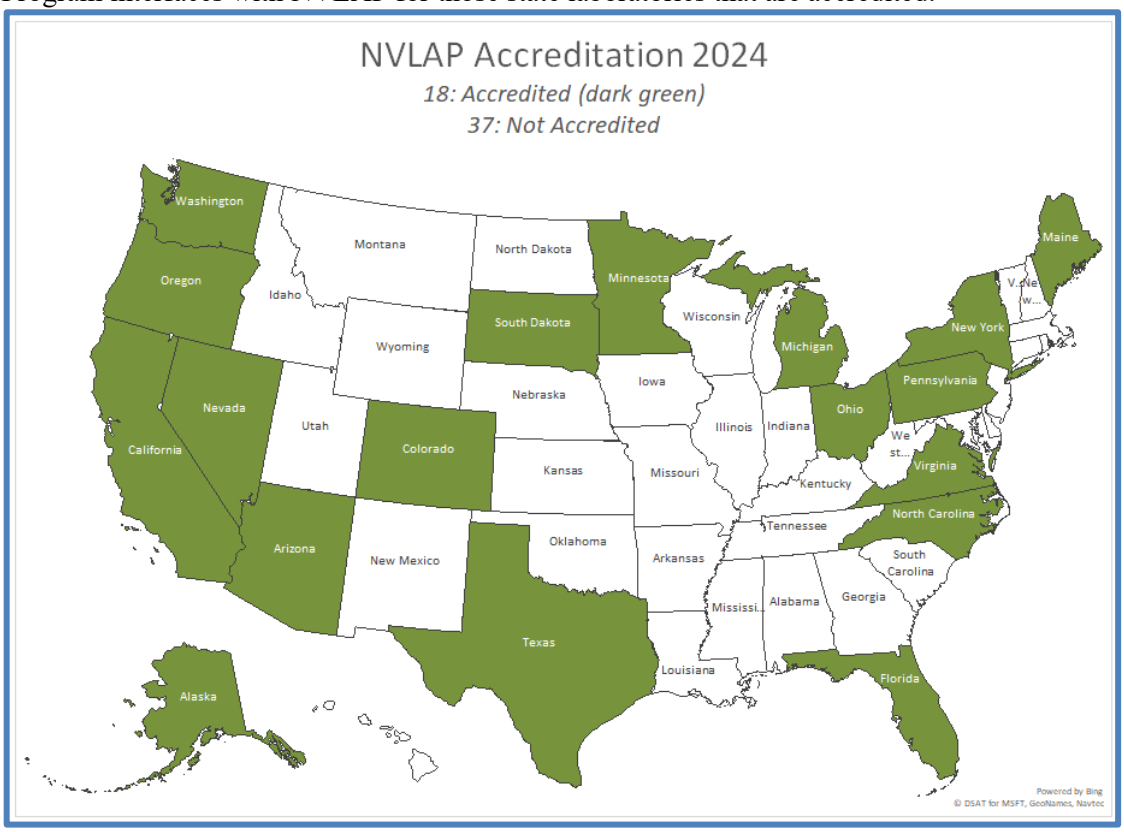


Figure 6. NVLAP Accreditation of State W&M Laboratories

The primary contact in NVLAP for state laboratories is Robert Knake. The primary contact in OWM for OWM accreditation and recognition is Micheal Hicks.

Training

Training includes courses that are taught at NIST in the OWM Training Laboratory, regionally at the Regional Measurement Assurance Program (RMAP) annual training sessions (Figure 5), and online as a webinar, workshop, and info-hours.

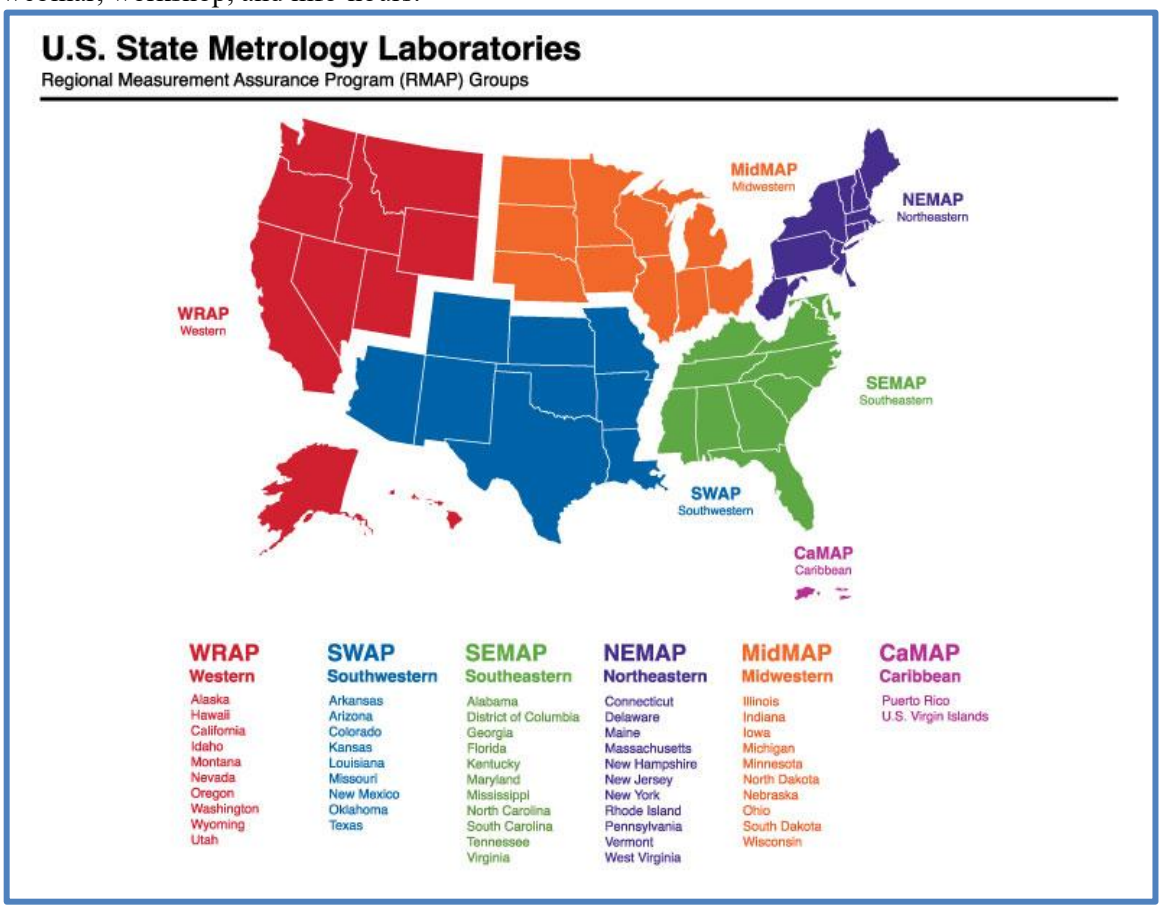


Figure 7. Regional Measurement Assurance Program (RMAP) Groups.

The core laboratory metrology courses/seminars that are offered by OWM at NIST include: Fundamentals of Metrology, Mass Metrology, Volume Metrology, and Advanced Mass Metrology. These courses were developed and updated as a part of a training redesign project to ensure that all training requirements needed by the laboratories are covered as well as to integrate more activities and adult learning concepts into the courses as a part of the goal of maintaining an accredited training service. Previous courses (Basic Metrology for States, Intermediate Metrology) are no longer available and have evolved into the current courses. In addition to the traditional hands-on training courses, the OWM Laboratory Metrology Program has developed a series of 2-hour webinars on a variety of high interest topics. The seminar and webinar tuition are funded by the OWM for U.S. weights and measures laboratory metrologists to enhance legal metrology uniformity. Specific training and personnel competency requirements to support laboratory recognition are published in NIST Handbook 143 with interim updates published on the NIST OWM website. Training at the RMAP sessions is selected each year based on training needs assessments with input gathered through laboratory requests and inquiries, assessments of annual submissions from the laboratories, and proficiency testing performance results.

The COVID-19 pandemic resulted in NIST OWM canceling all in-person training starting March 2020 through February 2022. RMAP training delivery was modified to an online method for 2020 and 2021. The online holdings of the courses were not as effective without the hands-on application. The in-person offering

of NIST courses, including RMAP training, has resumed since 2022 with affected laboratories recovering from the suspension and regaining their full scope capabilities. Laboratories with new metrologists and a lack of mentors are recovering the slowest as a result of the unplanned disturbance. OWM is looking at ways to support those laboratories to regain their full scope capabilities.
OWM Laboratory Metrology Program has had staff changes since the 2022 State Laboratory Workload Survey. The program currently consists of a staff of three. The program utilizes NIST associates to meet the training demand of the state laboratory program.
Numerous supplementary courses are taught throughout the year as webinars covering topics related to implementing content from NIST Handbook 143 or to address training needs between other seminars that are scheduled. Registration for all courses is done through the NIST OWM Contact Management System database with transcripts readily available to students. The primary contact and administrator of this system is Yvonne Branden.

Training courses (seminars and webinars) for 2012 through 2024 in metrology are summarized in Figures 6 and 7. In 2016 the Lab Metrology Program added "Laboratory Metrology Info Hour" (LMIH) webinars. This is a short, 1-hour session with no pre-work, post-work, and resulting certificates to provide training and updated news. In 2024, OWM added another version of "Info Hours" training events that is applicable to all metrologists of the legal metrology community.

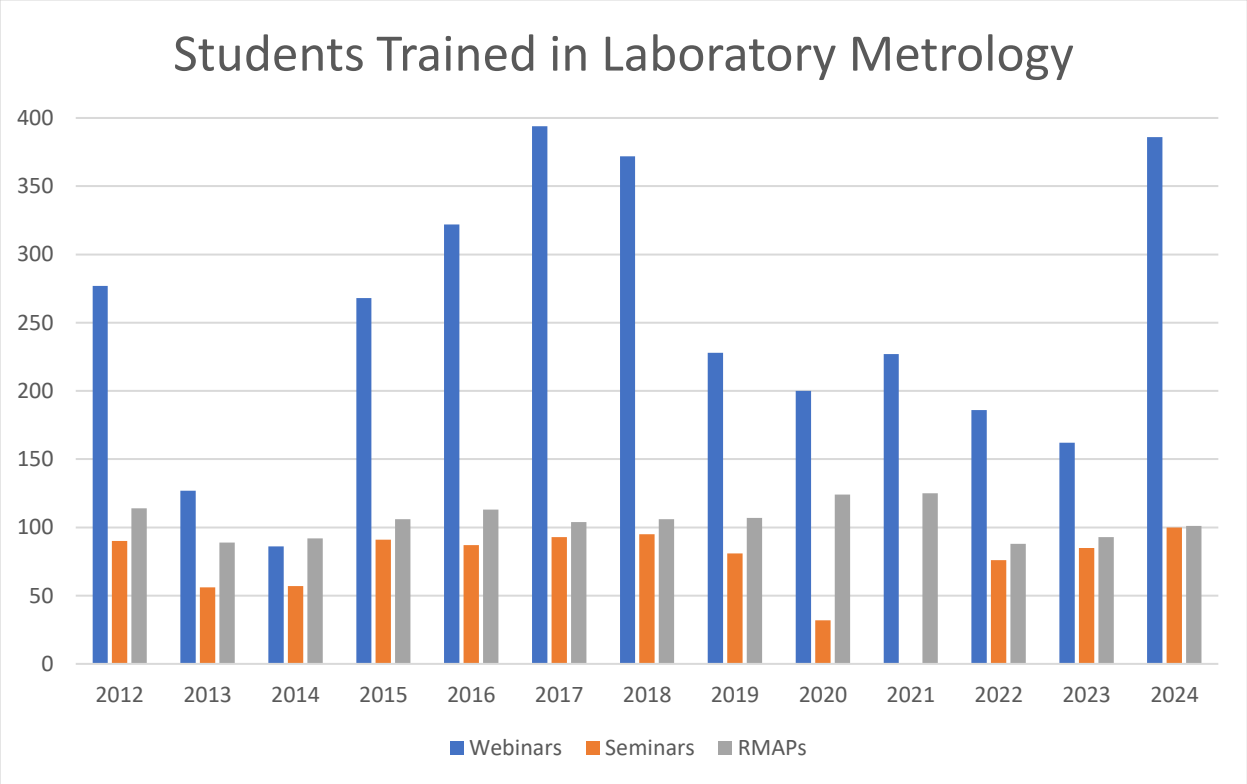


Figure 8. Laboratory Metrology Students Trained for 2012 through 2024.

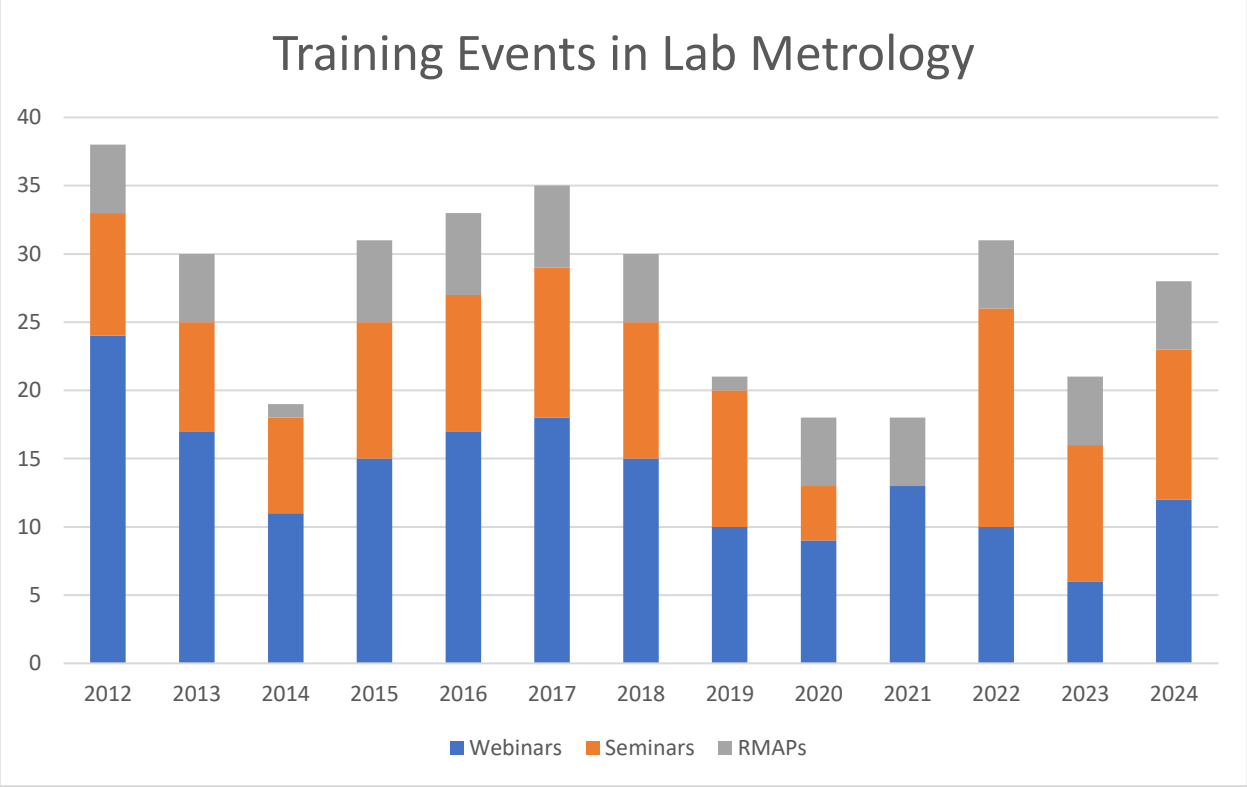


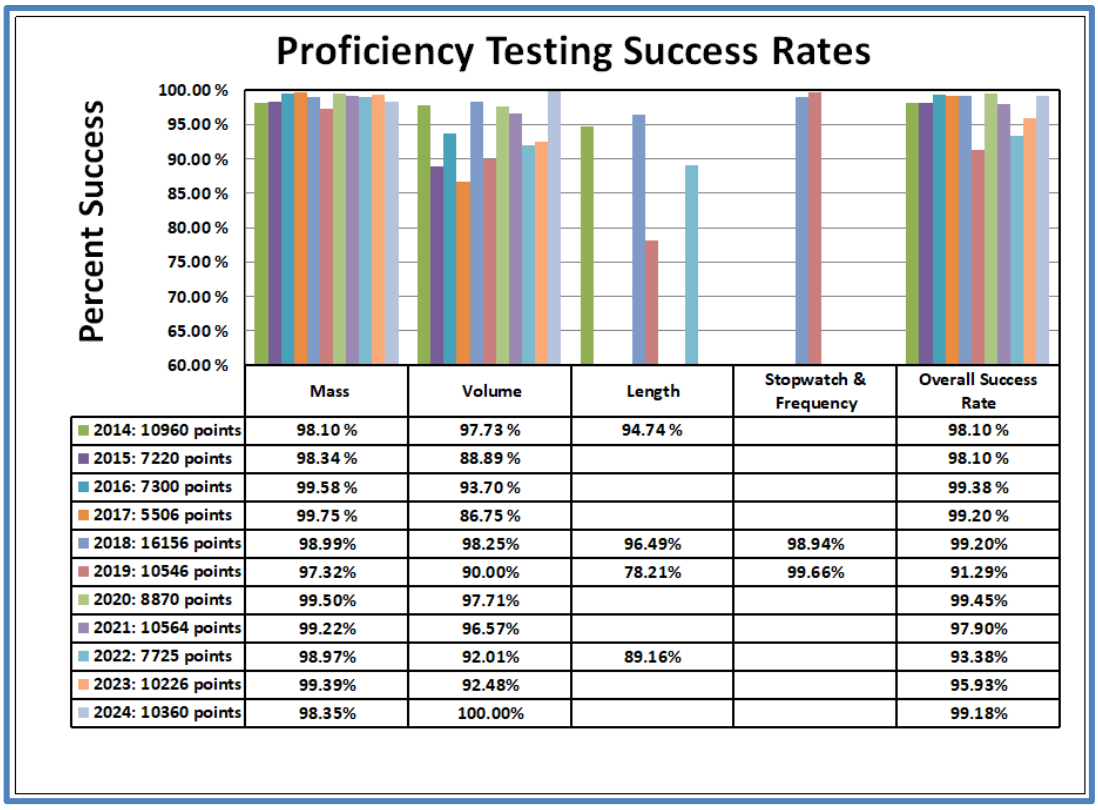
Figure 9. Laboratory Metrology Training Events for 2012 through 2024.

Proficiency Testing

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

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. Over 150,000 status points have been collected since pass/fail data has been collected. NIST began capturing pass/fail statistics for all PT/ILC results and compiling them by measurement parameter as in Figure 8. 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.

Overall, based on the 10-year of PT assessments in Figure 8, over 100,000 evaluation points of normalized error (E_n) and normalized precision (P_n) have been assessed in the listed measurement areas. Laboratories are making good progress towards reaching the success goal of 100 % passing rate and 100 % completed follow-up corrective actions when needed. Program planning, analysis and reporting tools used in the PT service area are used by many other laboratories outside the program and outside the United States.



	Mass	Volume	Length	Stopwatch & Frequency	Overall Success Rate
2014: 10960 points	98.10 %	97.73 %	94.74 %		98.10 %
2015: 7220 points	98.34 %	88.89 %			98.10 %
2016: 7300 points	99.58 %	93.70 %			99.38 %
2017: 5506 points	99.75 %	86.75 %			99.20 %
2018: 16156 points	98.99%	98.25%	96.49%	98.94%	99.20%
2019: 10546 points	97.32%	90.00%	78.21%	99.66%	91.29%
2020: 8870 points	99.50%	97.71%			99.45%
2021: 10564 points	99.22%	96.57%			97.90%
2022: 7725 points	98.97%	92.01%	89.16%		93.38%
2023: 10226 points	99.39%	92.48%			95.93%
2024: 10360 points	98.35%	100.00%			99.18%

Figure 10. Proficiency Testing Success Rates (2014 to 2024).

Documentary Standards

Ideally, documentary standards would be reviewed at least every five years and updated as appropriate. This area of the program receives the least overall attention due to limited resources, but standards are selected for updates when issues arise indicating a need. Currently, an update to NISTIR 7214 and NISTIR 7082 for the program's proficiency testing services are underway. A new revision of NIST Handbook 105-2 for volumetric glassware was published in 2022. NIST Handbook 105-1 for field standard weights and NIST Handbook 105-8 for weight carts were both updated in 2019. NIST Handbook 105-4 for LPG provers was updated in 2016. The program also participates in ASTM, USP, and OIML standards development.

Program References

An intentional effort has been made by the OWM Laboratory Metrology Program – at least since the 1980's – to adopt and use international standards and references to gain program credibility. For example, when NIST Handbook 143 was first published in 1986, it referenced ISO Guide 25 and Handbook 145 procedures referenced Mil-Std-45662A. Both ISO Guide 25 and Mil-Std-45662A were the internationally and nationally accepted standards at that time. Yet, full implementation of these and their current standard counterparts has taken time. The first documented guidance in the proficiency testing area followed ISO Guide 43, which has since become a formal standard rather than a guide with compliance to ISO/IEC 17043. New revisions of the program's proficiency testing guidance documents will be released in 2025 to comply with the 2023 edition of ISO/IEC 17043. Also, A new revision of NIST Handbook 143 was released in 2023 and continues to adopt ISO/IEC 17025.

Table 3. Program Area Reference Documents.

Topic	Publication Type and Number	Title	Latest Revision Date
Recognition	Handbook 143	State Weights and Measures Laboratories Program Handbook	2023
Accreditation	Handbook 150-2[i]	NVLAP Calibration Laboratories	2024
Accreditation	Handbook 150-2, Annex A	Annex A: ANSI/NCSL Z540-1-1994, Part I (normative)	2024
Accreditation	Handbook 150-2, Annex B	Annex B: Dimensional measurements (normative)	2024
Accreditation	Handbook 150-2, Annex C	Annex C: Time and frequency measurements (normative)	2024
Accreditation	Handbook 150-2, Annex D1	Annex D: Mechanical measurements (normative), D1 Force Calibrations	2024
Accreditation	Handbook 150-2, Annex D2	Annex D: Mechanical measurements (normative), D2 Mass calibrations	2024
Accreditation	Handbook 150-2, Annex D3	Annex D: Mechanical measurements (normative), D3 Volume calibrations	2024
Accreditation	Handbook 150-2, Annex E	Annex E: Requirements for NVLAP-accredited legal metrology laboratories	2024
Mass Calibration Lab Procedures	NISTIR 5672	Advanced Mass Calibrations and Measurements Assurance Program for the State Calibration Laboratories	2019
Mass Calibration Lab Procedures	NISTIR 6969	Selected Laboratory and Measurement Practices, and Procedures to Support Basic Mass Calibrations	2019
Volume Calibration Lab Procedures	NISTIR 7383	Selected Procedures for Volumetric Calibrations	2019
Length Calibration Lab Procedures	NISTIR 8028	Selected Laboratory and Measurement Practices and Procedures for Length Calibrations	2014
Weights and Measures Lab Procedures	NISTIR 8250[1]	Calibration Procedures for Weights and Measures Laboratories	2019
Proficiency Testing	NISTIR 7082	Proficiency Test Policy Plan	2018
Proficiency Testing	NISTIR 7214[2]	Weights and Measures Division Quality Manual for Proficiency Testing and Interlaboratory Comparisons	2005

Topic	Publication Type and Number	Title	Latest Revision Date
Field Standards	Handbook 105-1	Specifications and Tolerances for Field Standard Weights, (NIST Class F) (available for Historical purposes)	1990
Field Standards	Handbook 105-1	Specifications and Tolerances for Field Standard Weights, (Ref OIML R111 and ASTM E617)	2019
Field Standards	Handbook 105-2[3]	Specifications and Tolerances for Field Standard Measuring Flasks	2022
Field Standards	Handbook 105-3	Specifications and Tolerances for Graduated Neck Type Volumetric Field Standards	2010
Field Standards	Handbook 105-4	Specifications and Tolerances for Liquefied Petroleum Gas and Anhydrous Ammonia Liquid Volumetric Provers	2016
Field Standards	Handbook 105-5	Specifications and Tolerances for Field Standard Stopwatches	1997
Field Standards	Handbook 105-6	Specifications and Tolerances for Thermometers	1997
Field Standards	Handbook 105-7[4]	Specifications and Tolerances for Dynamic Small Volume Provers	1997
Field Standards	Handbook 105-8[5]	Specifications and Tolerances for Field Standard Weight Carts	2019
Notes	[i] NVLAP Handbook 150-2 for Calibration Laboratories and all Annexes are referenced in Handbook 143 as requirements for Weights and Measures Laboratories. Technical criteria were published as duplicates in the 2023 version of NIST Handbook 143. Associated checklists are applicable for internal auditing and assessor evaluations as well. OWM staff contributed to the technical and editorial reviews of the applicable NVLAP annexes. [ii] Additional procedures available in draft form to be formatted, validated, and published as part of this NISTIR in the future. See the table of contents for works to be completed in the future. [iii] Updates expected to ensure compliance with ISO/IEC 17043 upon next revision (to ensure compliance and consistency with ISO/IEC 17025.) [iv] Decision rule criteria are updated in this publication. Currently specifies uncertainty to be less than the tolerances (maximum applicable error) only. [v] Comments received to update this publication. Updates are pending work of national working group analysis and efforts related to metering and meter calibrations. [vi] Updates expected to correct tolerance tables for correct rounding formatting.		

Internal Processes and Strategic Assessments

Each OWM Laboratory Metrology Program area has documented internal processes that are followed to ensure consistency on an ongoing basis. At a high level, OWM conducts annual strategic planning and selects specific strategic and operational objectives. The Laboratory Metrology Program conducts an annual SWOT analysis (identifying strengths, weaknesses, threats, and opportunities) within each program area. This

method has also been used to gather input from metrologists at the annual RMAP training sessions to ensure customer input is considered and that program efforts are responsive to current and emerging national needs.

Measuring Results

As noted throughout this section, specific concepts are used to measure results in each Laboratory Metrology Program area. At one time, most of the measures were output measures. These included a count of how many laboratories were recognized, how many students attended training and how many courses were held, how many proficiency tests were conducted and in what measurement areas, along with the status of how many 105-series handbooks were published or in the process of being updated. Gradually, these measures have moved to include outcome measures where improvements are tracked, especially quality and impact. For example, the maps show how many laboratories are recognized by OWM and accredited by NVLAP. In addition, the scoring model shows the big picture assessment of all the laboratories against standardized criteria to track whether improvements (or declines) are seen from year to year in the overall national quality of the laboratories. In the training area, OWM obtained IACET Accreditation in 2013, renewed in 2018 and 2023, and includes formal Kirkpatrick-type course evaluations to assess satisfaction with a training experience, learning, application, and impact. In the proficiency testing area, pass-fail statistics are tracked as well as a periodic evaluation of the resulting follow-up corrective actions made by the laboratories. In the documentary standards area, the level of application and adoption within the weights and measures programs is considered.

If you have questions or comments about any of these program areas or the OWM Laboratory Metrology Program, please feel free to contact Micheal Hicks (micheal.hicks@nist.gov).

Participants

The SLP comprises of 55 metrology laboratories. There are 50 state laboratories and 5 other government laboratories (Puerto Rico, Washington DC, Los Angeles County, USDA-GIPSA, and U.S.-Virgin Islands). Of these 55 laboratories, 11 are not operational. Connecticut, Delaware, Indiana, Iowa, Los Angeles County, Mississippi, North Dakota, New Hampshire, New Mexico, Puerto Rico, Rhode Island, Washington D.C., and the U.S. Virgin Islands,

Notes and Comments:

- 42 metrology laboratories provided data.
- Figure 11 provides basic information summarizing the ages and sizes of the facilities in which the SLP conducts its work. It also summarizes the number of customers typically served by each laboratory.
- Office space is the overall size of the space in the laboratory devoted to administrative work. This includes space for workstations, filing, etc. In general, this category may include all of the space devoted to the laboratory, not specifically dedicated to measurement work.
- Laboratory space is that space in the laboratory devoted to measurement work. This may include space where measurements are performed, space devoted to storing measurement standards and equipment, space used for material handling, space used for shipping and receiving of customer equipment, etc.
- Customers is a count of all distinct customers who received measurement services from the laboratory regardless of the reason or application.

	Age[1]	Office Space	Lab Space	Customers	Non Service Agent customers
Average	27	706	3721	195	77
Median	24	520	2950	142	44
Maximum	62	2500	12200	1221	807

Figure 11: Aggregate age, size, and customer information of all SLP labs

Table 4: (beginning next page) Listing of the SLP laboratories including location, age[1], size, and total number of customers served as of the 2024 calendar year.

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

Laboratory	Address	Contact	Website	Age	Office Space	Lab Space	Customers	Non Service Agent customers
State of Alaska Metrology Laboratory	12050 Industry Way Bldg. O-6 Anchorage, AK 99515	Phone: (907) 365-1222 Fax: N/A	https://dot.alaska.gov/mscve/pages/metrology.shtml	11	350	1740	88	80
Alabama Department of Agriculture	1445 Federal Dr Montgomery, AL 36107	Phone: 334-240-3729 Fax: 334-240-7175	www.alabama.gov	51	314	588	260	0
Arkansas State Standards Laboratory	4608 West 61st Street Little Rock, AR, 72209	Phone: 501-570-1153 Fax: none	https://agriculture.arkansas.gov/laboratory-services/metrology-laboratory/	50	1079	1042	190	9
Arizona Dept of Agriculture Weights and Measures Metrology Lab	4425 W Olive Ave Ste 134 Glendale, AZ 85302	Phone: 602-771-4938 Fax: n/a	https:agriculture.az.gov/	25	500	5500	205	78
California State Metrology Laboratory	6790 Florin Perkins Road, Suite 100 Sacramento, CA 95828	Phone: (916) 229-4858 Fax:	https://www.cdfa.ca.gov/dms/programs/metrology/metrology.html	21	296	3747	111	4
Colorado Metrology Lab	300 S. Technology Ct. Broomfield, CO, 80021	Phone: 303-869-9272 Fax: N/A	https://ag.colorado.gov/labs/metrology-laboratory	6	500	2900	227	67
Florida Metrology Laboratory	3125 Conner Blvd Lab 2 Tallahassee, FL 32399	Phone: 850-410-3667 Fax: n/a	www.fdacs.gov	55	620	3500	201	17
Georgia Department of Agriculture	3150 U.S. Highway 41 South Tifton, GA 31794	Phone: 229-386-4120 Fax: 229-386-3665	agr.georgia.gov/laboratories	15	994	6818	192	59
Hawaii Measurement Standards Laboratory	1851 Auiki Steet Honolulu, HI 96819	Phone: (808) 832-0682 Fax: (808) 832-0683	hdoa.hawaii.gov/qad/measurement-standards	23	443	2853	57	37
ISDA Metrology Laboratory	2216 Kellogg Lane Boise, Idaho 83712	Phone: 208-332-8691 Fax:	agri.idaho.gov	56	720	1900	77	49
State of Illinois Metrology Laboratory	801 E. Sangamon Ave. Springfield, IL 62702	Phone: (217)785-8480 Fax: N/A	https://agr.illinois.gov/consumers/weightsmeasures/metrology-lab.html	48	1200	3220	201	35
Kansas Metrology Lab	2004 Research Park Circle Manhattan, KS, 66502	Phone: 785-564-7477 Fax: 785-564-6777	https://www.agriculture.ks.gov/divisions-programs/agricultural-laboratory/metrology-laboratory	5	237	3751	112	51
Kentucky Department of Agriculture	107 Corporate Dr Frankfort, KY, 40601	Phone: 502-782-9215 Fax: 502-573-0303	www.kyagr.com	24	40	2395	1	0
Louisiana State Metrology Laboratory	5825 Florida Blvd Baton Rouge, LA 70806	Phone: (225) 922-1379 Fax: (225) 923-4877	ldaf.la.gov/business/weights-measures	43	540	1522	154	82
Massachusetts Division of Standards Metrology Laboratory	250 Elliot Street ~ Suite 10-D Ashland, MA 01721	Phone: 508-532-1200 Fax: Not Applicable	https://www.mass.gov/orgs/division-of-standards	3	324	4676	277	7
Maryland Dept of Agriculture, Weights & Measures Laboratory	50 Harry S Truman Pkwy Annapolis, MD 20850	Phone: 410-841-5790 Fax: 410-841-2765	www.mda.maryland.gov	34	930	4870	22	1
Maine Metrology Laboratory	333 Cony Rd Augusta, ME 04330	Phone: 207-287-7587 Fax: n/a	https://www.maine.gov/dacf/qar/weights_and_measures/metrology.shtml	59	432	2600	46	9
Michigan Department of Agriculture and Rural Development	940 Venture Lane Williamston, MI 48895	Phone: 517-281-5363 Fax: 517-655-8303	https://www.michigan.gov/mdard/lab	28	2000	12200	147	76
State of MN Metrology	14305 Southcross Drive W Suite 150 Burnsville, MN 55306	Phone: 651-539-1567 Fax: 952-356-4040	https://mn.gov/commerce/business/weights-measures/scales-meters/metrology.jsp	18	1120	4706	167	55
Missouri Metrology Laboratory	1616 Missouri Blvd. Jefferson City, MO 65109	Phone: 573-751-3440 Fax:	agriculture.mo.gov	32	385	2433	70	1

Montana Weights and Measures Laboratory	3806 US HWY 12/287 East Helena, MT, 59635	Phone: (406)461-4168 Fax: None	https://bsd.dli.mt.gov/weights-and-measures/	5	1000	3000	48	1
North Carolina Metrology Laboratory	4400 Reedy Creek Road Raleigh, NC 27607	Phone: 984-236-4800 Fax: 919-831-1303	www.ncagr.gov/standard	3	2483	6902	239	3
Nebraska Standards Laboratory	3721 West Cuming St. Lincoln, NE 68524	Phone: 402-471-2087 Fax:	https://nda.nebraska.gov/fscp/wam/standard_lab.html	46	580	1800	159	70
New Hampshire Metrology Lab	25 Capitol Street Concord, NH 03301	Phone: 603-271-0894 Fax: N/A	https://www.agriculture.nh.gov/divisions/weights-measures/metrology-lab.htm	53	0	708	0	0
State of NJ, Office of Weights and Measures	1261 Routes 1 & 9 South Avenel, NJ 07001	Phone: (732)621-2554 Fax: (732)382-5298	njconsumeraffairs.gov/OWM	35	200	2700	843	807
Nevada Metrology Lab	2150 Frazer Avenue Sparks, NV 89431	Phone: (775) 353-3794 Fax: (775) 353-3798	https://agri.nv.gov/Protection/Weights_and_Measures/Metrology_Lab/	51	170	10044	48	22
New York State Metrology Laboratory	10B Airline Dr Albany, NY 12235	Phone: 518-457-4781 Fax: 518-457-2552	www.agriculture.ny.gov	12	975	4240	113	43
Ohio Department of Agriculture	8995 East Main St Bldg #5 Reynoldsburg, OH 43068	Phone: (614) 728-6290 Fax: (614) 728-6424	http://agri.ohio.gov/divisions/weights-and-measures	55	2500	3047	287	101
Oklahoma Bureau of Standards	2800 N. Lincoln Blvd. Oklahoma City, OK 73105	Phone: 405-522-5462 Fax: N/A	https://ag.ok.gov	16	650	6200	37	17
Oregon Department of Agriculture	635 Capitol St NE, Suite 100 Salem, OR 97301	Phone: 503-986-4669 Fax: 503-986-4784	https://www.oregon.gov/oda/market-access/pages/metrology.aspx	26	367	2038	109	44
Pennsylvania Standards Laboratory	2221 Forster Street, Room G-44A Harrisburg, PA 17125	Phone: 717-787-4707 Fax: 717-705-0882	https://www.pa.gov/agencies/dgs/programs-and-services/pennsylvania-standards-laboratory.html	27	1568	3780	587	294
South Carolina Department of Agriculture	129 Ballard Court West Columbia, SC 29172	Phone: (803) 253-4052 Fax: N/A	https://agriculture.sc.gov/	7	835	8000	282	0
South Dakota Metrology Laboratory	100 Otter Rd, Building D Sturgis, SD, 57785	Phone: 605-280-4572 Fax:	https://dps.sd.gov/inspections/weights-measures/metrology-lab	4	300	2800	88	84
Julius Johnson Metrology Lab	5203 Marchant Dr. Nashville, TN, 37211	Phone: 6158375159 Fax:	https://www.tn.gov/agriculture/consumers/standards/metrology.html	7	0	0	76	0
Texas Department of Agriculture - Metrology Laboratory	PO Box 1518, 1258 CR 226 Giddings, TX 78942	Phone: 979.542.3231 Fax: 877.205.7741	https://www.texasagriculture.gov/RegulatoryPrograms/WeightsandMeasures/MetrologyLab.aspx	22	1200	11077	202	0
Utah Metrology Lab	4315 S 2700 W, TSOB South Bldg Taylorsville, UT 84129	Phone: 801-982-2267 Fax:	ag.utah.gov	2	80	1892	64	44
VDACS	600 North 5th Street Richmond, VA 23219	Phone: 804-786-0479 Fax: 804-371-0206	https://www.vdacs.virginia.gov/index.shtml	22	0	3637	135	56
Vermont State Metrology Laboratory	163 Admin Drive Randolph Center, VT 05061	Phone: 802-522-5415 Fax: Don't	agriculture.vermont.gov/weights-measures/metrology-lab	5	500	1500	137	70
WSDA Weights & Measures Metrology Laboratory	2747 29th Ave SW, Ste B Tumwater, WA 98512	Phone: 360 764 0199 Fax: N/A	https://agr.wa.gov/departments/laboratories/metrology-lab	47	230	2734	296	78
Wisconsin Weights and Measures Laboratory	3601 Galleon Run Madison, WI, 53718	Phone: (608) 224-4913 Fax: (608) 224-4912	https://datcp.wi.gov/Pages/Programs_Services/MetrologyLab.aspx	18	550	3700	400	93
West Virginia Weights & Measures Metrology Laboratory	570 MacCorkle Ave SW St. Albans, WV 25177	Phone: 304-380-9260 Fax: 304-722-0605	labor.wv.gov	62	1780	1855	1221	665
Wyoming Department of Agriculture	6607 Campstool Rd Cheyenne, WY 82007	Phone: 307-777-7556 Fax: 307-777-1943	agriculture.wy.gov	13	650	1660	30	6

Laboratory Survey Participation

Lab ID																	
Lab Code/Year	1996	1998	1999	2000	2002	2004	2005	2006	2008	2010	2012	2014	2016	2018	2020	2022	2024
AK	Yes		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
AL	Yes				Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
AR	Yes	Yes	Yes	Yes	Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
AZ	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
CA	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
CO	Yes		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
CT	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
DE	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**
FL	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
GA	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
HI	Yes	Yes	Yes	**	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
IA	Yes	Yes	Yes		**	Yes	Yes	Yes	Yes	Yes	Yes	**	**	**	**	**	**
ID	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	
IL	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
IN	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes		Yes	Yes	Yes	Yes		**
KS	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
KY	Yes	Yes	Yes	Yes	Yes	**	**	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
LA	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
MA	Yes		Yes	Yes	Yes	Yes	Yes	Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes	Yes
MD	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
ME	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
MI	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
MN	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
MO	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
MS	Yes	Yes		**	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	**	**
MT	Yes	Yes	Yes	Yes	Yes	Yes			Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes
NC	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
ND	Yes	Yes	Yes	Yes	Yes	**	Yes	Yes	Yes		**	**	**	**	**	**	**
NE	Yes	Yes			Yes	Yes	Yes	Yes			Yes	Yes	Yes	Yes	Yes	Yes	Yes
NH	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	**	**	**
NJ	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
NM	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	**
NV	Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
NY	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
OH	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
OK	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes		Yes
OR	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
PA	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
RI	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**
SC	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Lab Code/Year	1996	1998	1999	2000	2002	2004	2005	2006	2008	2010	2012	2014	2016	2018	2020	2022	2024
SD	Yes	Yes			**	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
TN	Yes	Yes	Yes	Yes	Yes	**	Yes	Yes	Yes		Yes	Yes	Yes	No	Yes	Yes	Yes
TX	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
UT	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
VA	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
VT	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
WA	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
WI	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
WV	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
WY	Yes	Yes	Yes	Yes	Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
USDA-GIPSA	Yes					Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	**
Wash. DC	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**
Virgin Islands	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**
Puerto Rico	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	**	**	**
LA County	Yes	Yes	Yes	Yes	Yes	**	**	**	Yes	Yes	Yes	Yes	Yes	Yes	No	**	**
TOTAL	51	46	45	44	48	47	46	49	50	47	48	49	49	45	47	42	42

Table 5: Listing of SLP member laboratories and their participation status in previous surveys (blanks indicate non-participation). ** indicates an inactive lab, empty cells indicate no response to the survey.

Grand Total

In order to give a very high-level overview of the measurement work performed by the SLP program the survey team added the number of measurements reported by all of the laboratories for each measurement procedure surveyed to come up with a grand total. This total does not factor in time or effort required in performing individual measurements. The reader is referred to the supplementary section of the 2014 edition of the SLP Workload Survey for data on the time required to complete individual measurements.

Survey	Labs	Total Devices	Lab Average
1996	51	322,472	6,323
1998	46	320,931	6,977
1999	45	352,274	7,828
2000	45	361,600	8,036
2002	48	375,411	7,821
2004	47	355,986	7,574
2005	46	361,054	7,849
2006	49	365,004	7,449
2008	50	367,336	7,347
2010	47	368,333	7,837
2012	47	305,728[2]	6,505
2014	49	336,858	6,875
2016	49	400,911[3]	8,182
2018	45	326,219[4]	7,244
2020	44	306,860[5]	7,064
2022	42	306,660	7,301
2024	42	318,052	7,573

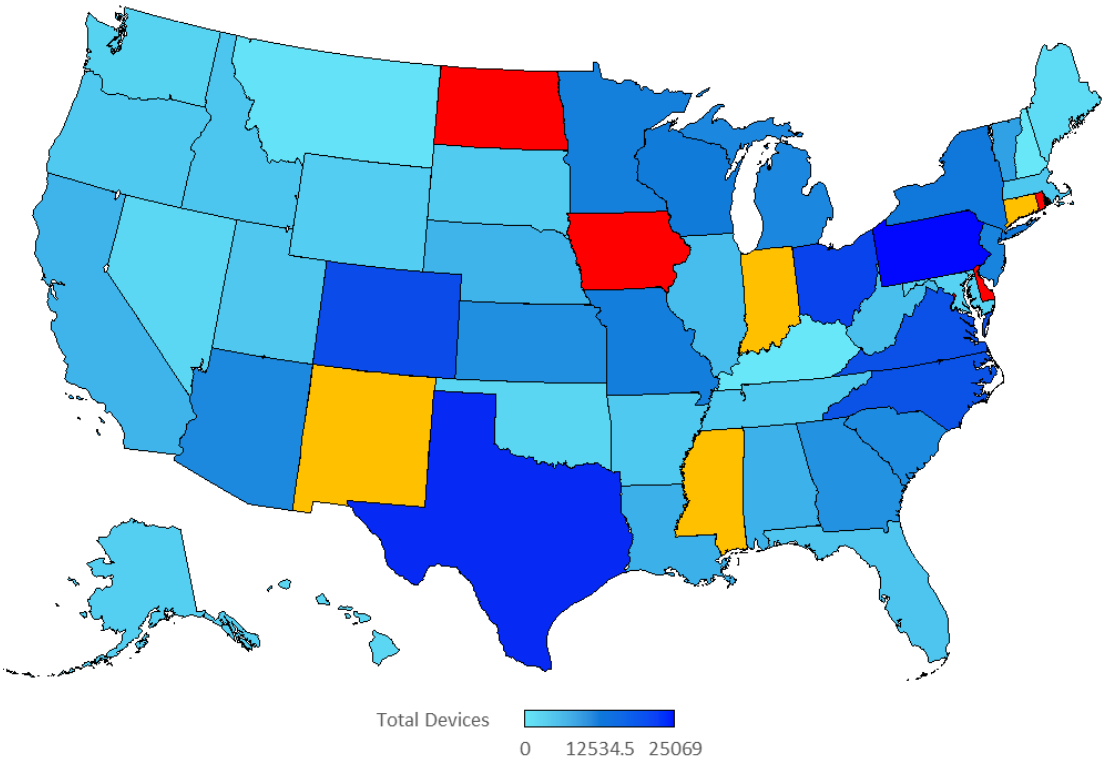
Table 6: Summary of all measurements reported on prior surveys.

[2] The dip in SLP measurement production reported in 2012 is attributed in large part to the absence of a survey response from Puerto Rico. Puerto Rico routinely reports testing approximately 30,000 lottery balls

[3] In 2016 the metrology laboratory in Puerto Rico reported testing 69,800 lottery balls. This number is a little over double what has been historically reported by this laboratory. This accounts for a large portion of the increase in measurement production reported by the SLP this year.

[4] The dip in SLP measurement production reported in 2018 is attributed in large part to the absence of a survey response from Puerto Rico. Puerto Rico routinely reports testing approximately 30,000 lottery balls

[5] In 2020 COVID-19 and the associated efforts to control the impact of the disease on hospitals nationwide significantly affected the U.S. economy.



PA	25069	OR	3495
TX	21349	TN	3470
OH	18578	AR	3431
CO	17747	SD	3221
VA	17129	WY	3033
NC	16867	AK	2784
NY	12742	MD	2405
WI	12373	WA	2355
MO	12051	OK	2008
MN	11801	HI	1846
NJ	11442	NV	1814
MI	10995	ME	1237
AZ	10835	MT	599
SC	10631	KY	48
KS	10151	NH	0
GA	9828	CT	No Data
VT	8000	IN	No Data
LA	6357	MS	No Data
AL	6194	NM	No Data
NE	5916	DE	Closed
CA	5850	IA	Closed
IL	4833	LA County	Closed
WV	4603	ND	Closed
FL	3882	PR	Closed
ID	3844	RI	Closed
UT	3629		
MA	3610		

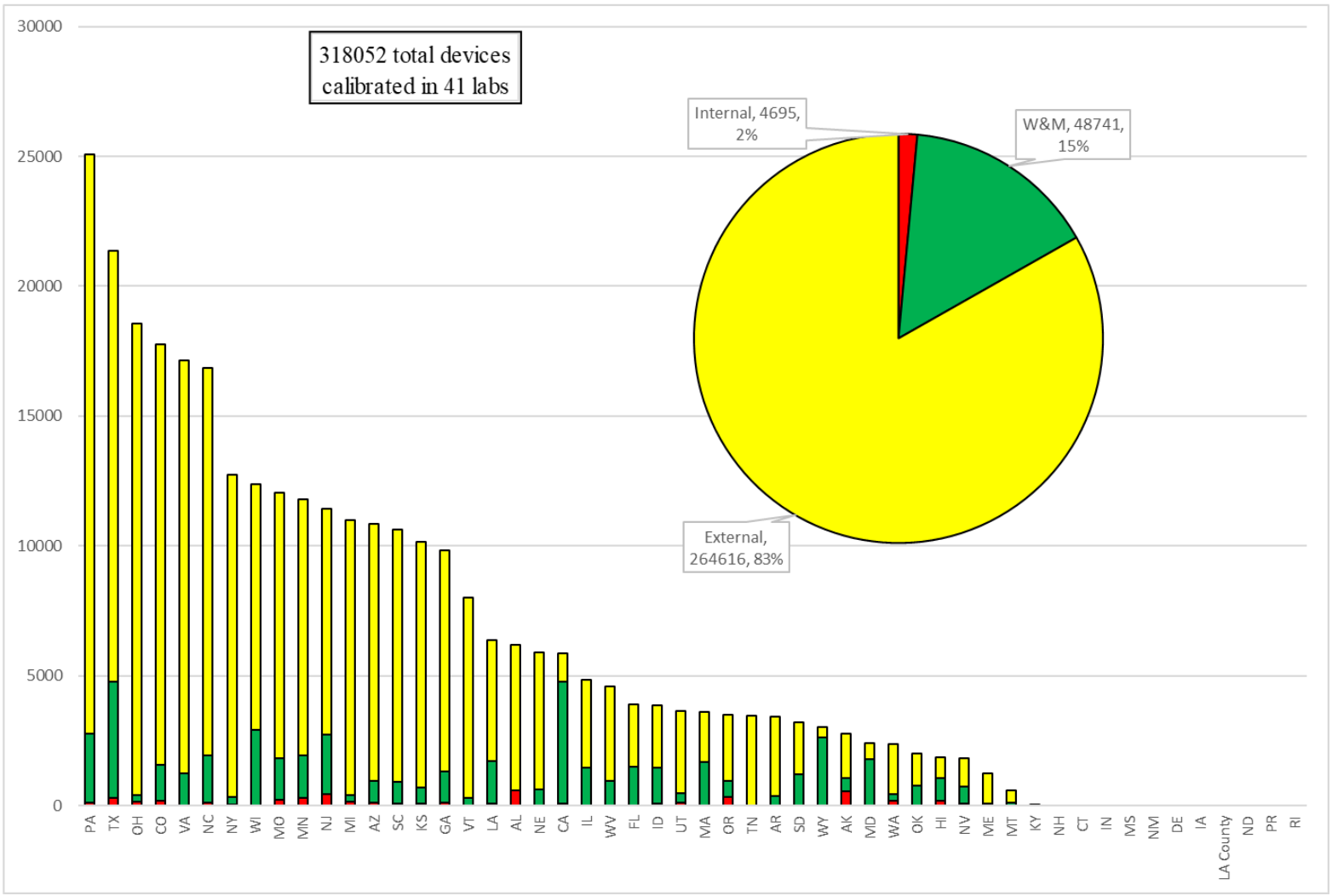


Figure 12: Total of all measurements reported.

Mass

Mass weighing procedures are broken into several categories based on measurement procedures and the category of mass standard measured for the purpose of this report.

Echelon I weighing procedures are those mass calibrations which use calibration designs, such as those detailed in the NIST SEMATECH Engineering Statistics Handbook and NIST Technical Note 952, that are solved using numerical least squares approximations and correct for air buoyancy when inter-comparing weights of unequal volume. These calibrations are typically associated with, but are not limited to, high precision weight standards such as those specified in ASTM E617 Class 0 or OIML E1. Masscode is the industry standard software used to analyze data collected for an echelon I calibration. Any calibration for which a laboratory used Masscode to analyze the primary data is considered to be an echelon I calibration for this survey.

Echelon II weighing procedures are typically used when high tolerance class calibrations are requested. These typically involve many redundant measurements in order to reduce the overall measurement uncertainty to an acceptable level. Unlike Echelon I, conventional mass corrections of the laboratory standards are typically used in lieu of performing air buoyancy corrections. Examples of echelon II mass calibration procedures may be found in NIST Internal Report 6969 (Harris, NIST IR 6969, "Selected Laboratory and Measurement Practices, and Procedures, to Support Basic Mass Calibrations", 2019), SOP 4 and SOP 7 (Harris, NIST IR 6969, "Selected Laboratory and Measurement Practices, and Procedures, to Support Basic Mass Calibrations", 2019).

Echelon III weighing procedures are essentially everything else with the exception of measurements performed on weight carts, railroad test cars, and railroad specific weight carts. A typical echelon III procedure is SOP 8 found in NIST Internal Report 6969 (Harris, NIST IR 6969, "Selected Laboratory and Measurement Practices, and Procedures, to Support Basic Mass Calibrations", 2019). Most mass standards tested in SLP metrology lab fall into this category (91%)[6]

Weight Carts are motorized carts used to transport a load of field test weights to facilitate the field testing of larger capacity scales. Weight carts are often subject to the specifications and tolerances found in NIST Handbook 105-8 (NIST Handbook 105-8 "Specifications and Tolerances for Field Standard Weight Carts", 2019) are typically tested using echelon III procedures. They are, nevertheless, treated separately herein as they are distinct from field test weights.

Railroad Test Cars are certified mass standards built for AAR interchange service used to facilitate the testing of railroad track scales. Specifications for these field standards are published by The Association of American Railroads (AAR Scale Handbook 2013 Edition, 2013). Certification of these mass standards is typically done using a master scale facility certified by the USDA Grain Inspection, Packers and Stockyard Association (GIPSA).

Railroad Specific Weight Carts are certified mass standards used to facilitate testing of railroad track scales. Unlike railroad test cars these devices by themselves are not suitable for AAR

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

interchange service. Unlike traditional weight carts these devices are designed to transport 80,000 lb or more of test weight short distances on rail. Certification of these mass standards is typically done using a master scale facility certified by the USDA Grain Inspection, Packers and Stockyard Association (GIPSA) as these carts can weigh 10,000 lb or more. Additional weights loaded onto the cart are standard cast iron field test weights and are covered under Echelon III weighing procedures.

Mass Echelon I

Description

The graphs on the following page represent the total number of Mass Echelon I standards evaluated by the 42 reporting laboratories. The map graph illustrates a geographical distribution of the measurements. 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.

Comparison of previous surveys

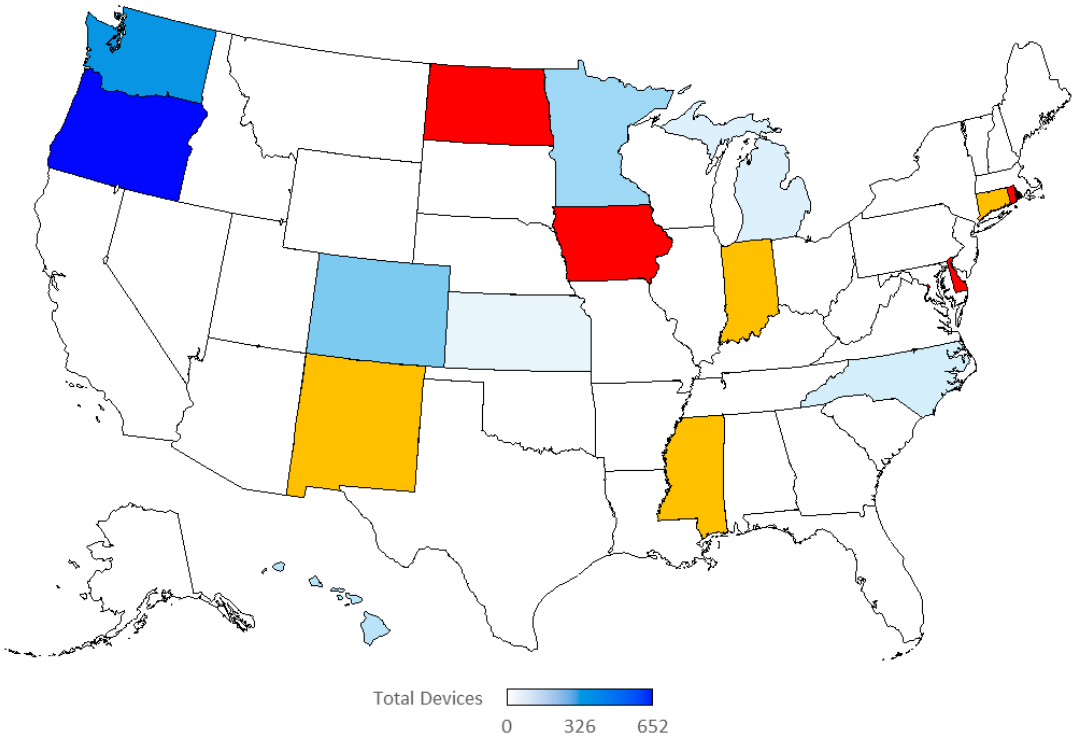
Year	# Labs	Total Devices
1998	10	2,667
1999	15	5,985
2000	16	5,227
2002	15	5,288
2004	14	3,707
2005	14	3,103
2006	14	3,025
2008	17	2,216
2010	19	2,309
2012	12	2,493
2014	13	2,980
2016	11	1,845
2018	11	2,485
2018	11	2,485
2022	9	1,421
2024	8	1,508

Table 7: 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

- 51 % of all Mass I standards were calibrated for internal use by the laboratory.
- 0 % of all Mass I standards were calibrated for the weight and measures program.
- 49 % of all Mass I standards were calibrated for external customers.



OR	652	NV	0
WA	337	NY	0
CO	172	OH	0
MN	126	OK	0
HI	89	PA	0
NC	56	SC	0
MI	46	SD	0
KS	30	TN	0
AK	0	TX	0
AL	0	UT	0
AR	0	VA	0
AZ	0	VT	0
CA	0	WI	0
FL	0	WV	0
GA	0	WY	0
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IL	0	IN	No Data
KY	0	MS	No Data
LA	0	NM	No Data
MA	0	DE	Closed
MD	0	IA	Closed
ME	0	LA County	Closed
MO	0	ND	Closed
MT	0	PR	Closed
NE	0	RI	Closed
NH	0		
NJ	0		

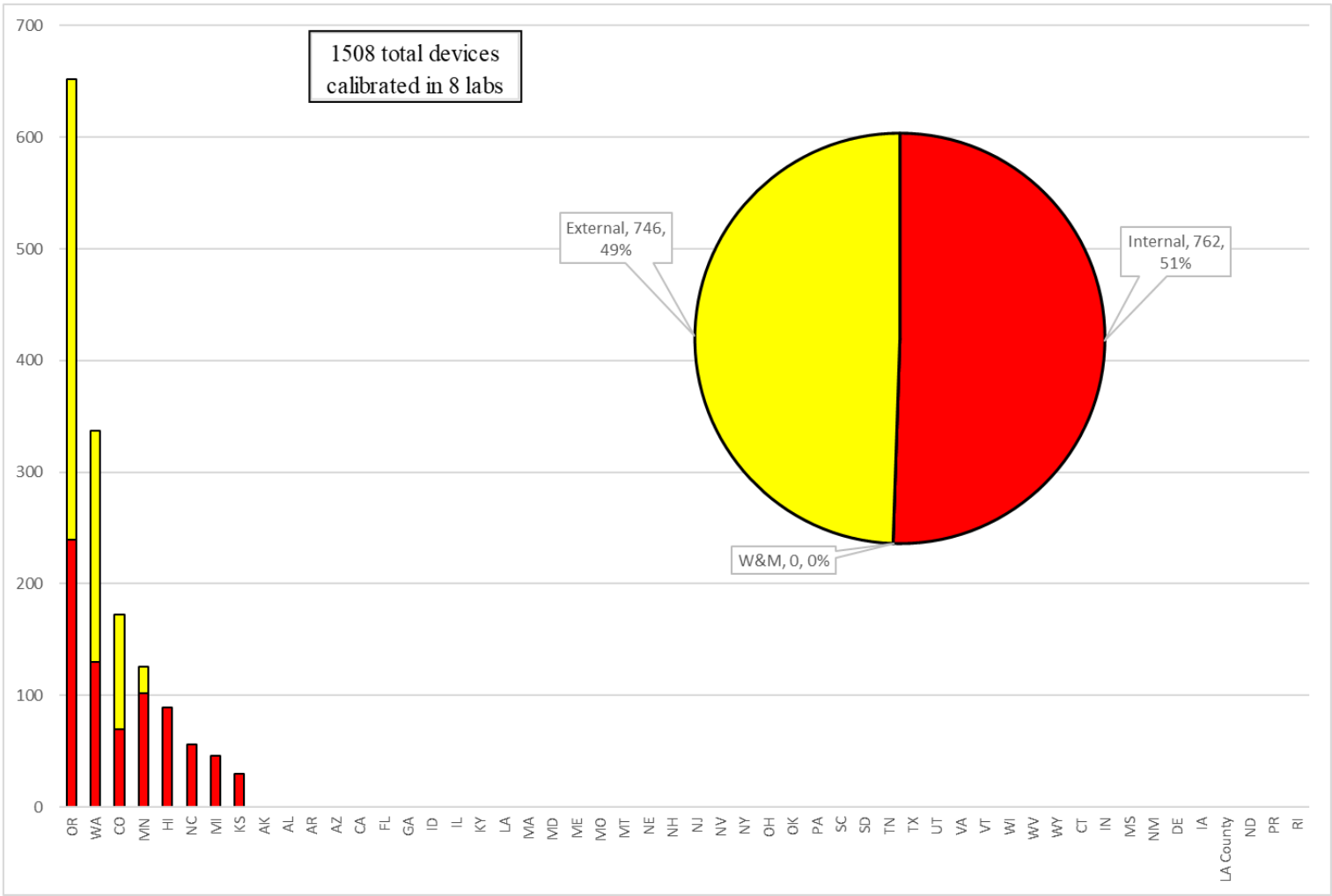


Figure 13: Mass Echelon I tests.

Mass Echelon II

Description

The graphs on the following page represent the total number of Mass Echelon II standards evaluated by the 42 reporting laboratories. The map graph illustrates a geographical distribution of the measurements. 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.

Comparison of previous surveys

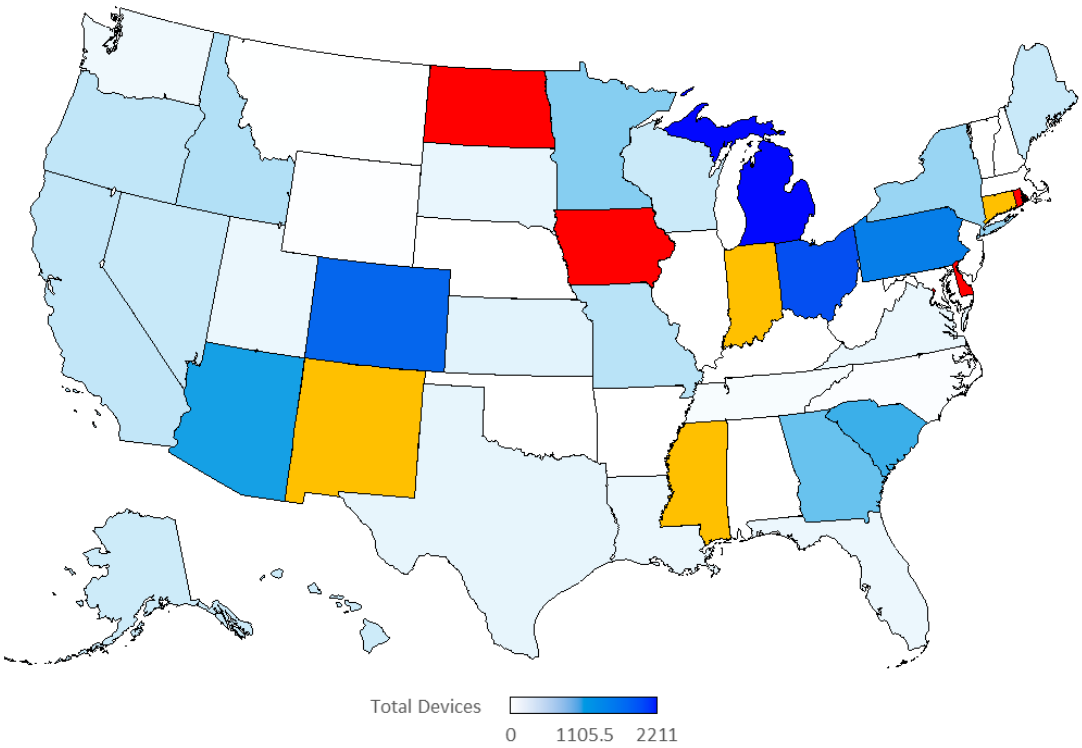
Year	# Labs	Total Devices
1996	38	37,662
1998	36	24,926
1999	35	25,807
2000	38	26,428
2002	37	25,847
2004	32	21,714
2005	32	20,541
2006	33	22,352
2008	32	25,371
2010	34	23,316
2012	30	18,222
2014	26	16,832
2016	27	11,723
2018	27	14,456
2020	26	12,083
2022	26	13,096
2024	30	13,460

Table 8: Echelon II tests reported on previous surveys.

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

Notes and Comments

- 12 % of all Mass II standards were calibrated for internal use by the laboratory.
- 15 % of all Mass II standards were calibrated for the weight and measures program.
- 73 % of all Mass II standards were calibrated for external customers.



MI	2211	NC	17
OH	1671	WY	8
CO	1496	MT	4
PA	1320	AL	0
AZ	1045	AR	0
SC	873	IL	0
GA	673	KY	0
MN	538	MA	0
NY	455	MD	0
ID	343	NE	0
MO	310	NH	0
OR	275	NJ	0
CA	271	OK	0
NV	244	VT	0
ME	240	WV	0
WI	230	CT	No Data
AK	224	IN	No Data
HI	223	MS	No Data
KS	130	NM	No Data
TX	105	DE	Closed
SD	97	IA	Closed
LA	90	LA County	Closed
UT	90	ND	Closed
VA	89	PR	Closed
FL	85	RI	Closed
WA	68		
TN	35		

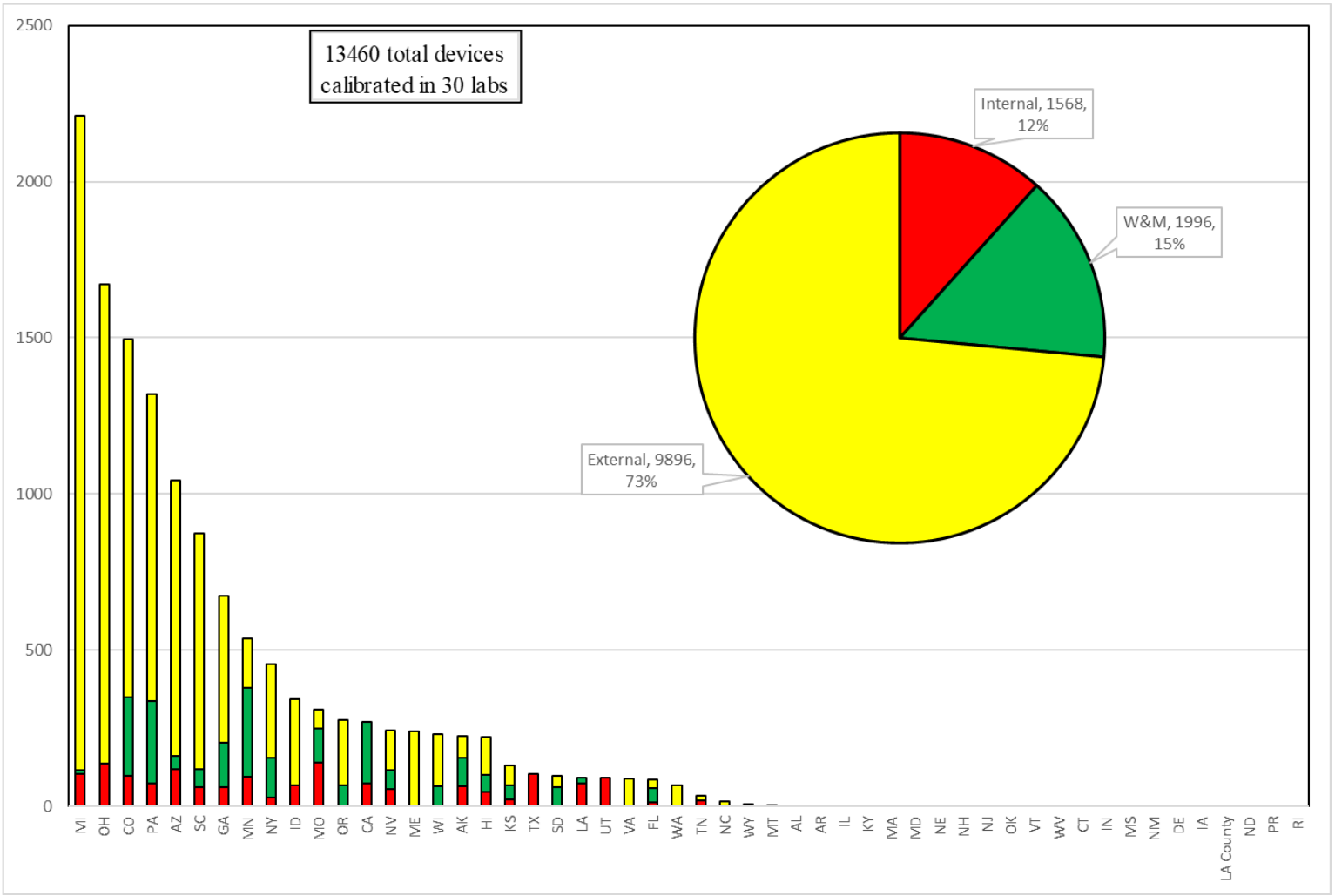


Figure 14: Mass Echelon II tests.

Mass Echelon III

Description

The graphs on the following page represent the total number of Mass Echelon III standards evaluated by the 42 reporting laboratories. The map graph illustrates a geographical distribution of the measurements. 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.

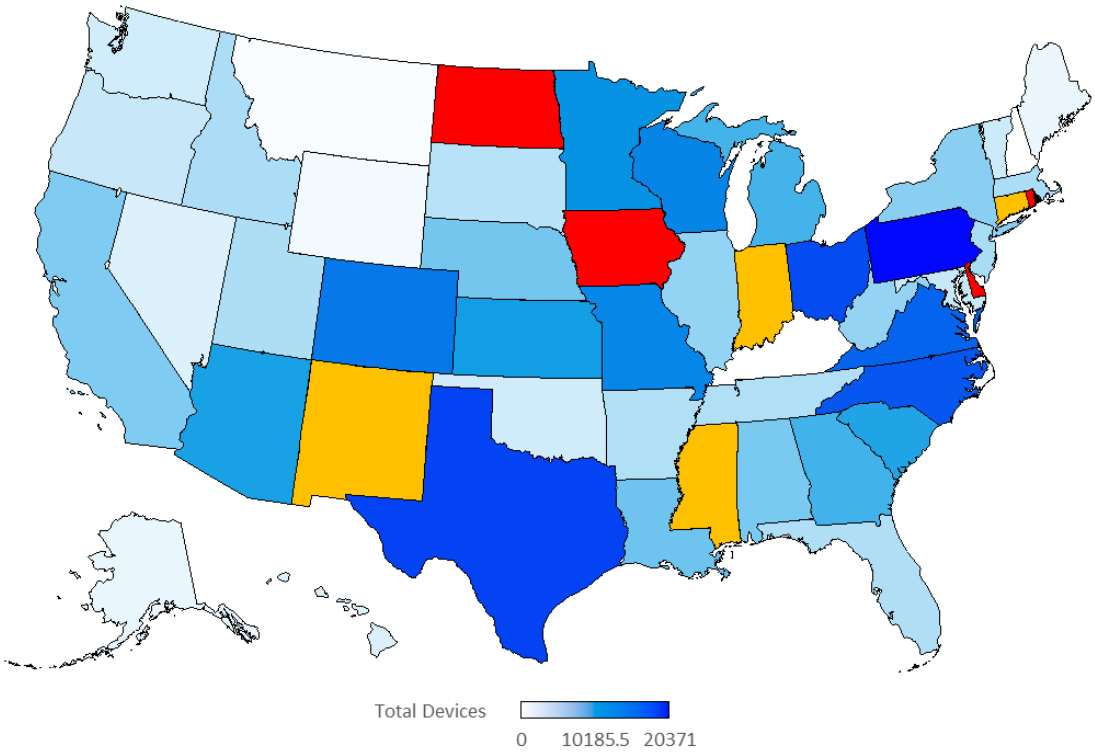
Comparison of previous surveys

Year	# Labs	Total Devices
1996	51	259,713
1998	46	259,166
1999	45	257,938
2000	45	260,072
2002	47	267,240
2004	47	248,117
2005	46	248,650
2006	49	256,844
2008	50	254,221
2010	47	256,094
2012	47	256,094
2014	47	244,985
2016	48	261,823
2018	45	258,852
2020	44	245,846
2022	41	232,017
2024	40	249,588

Table 9: Echelon III tests reported on previous surveys.

Notes and Comments

- <1 % of all Mass III standards were calibrated for internal use by the laboratory.
- 17 % of all Mass III standards were calibrated for the weight and measures program.
- 83 % of all Mass III standards were calibrated for external customers.



PA	20371	TN	3206
TX	16277	SD	2913
OH	15633	MD	2293
NC	14876	OR	2279
VA	13958	VT	2105
CO	12556	OK	1918
WI	11670	WA	1909
MO	11543	HI	1490
MN	10692	NV	1428
KS	9738	AK	902
AZ	9453	ME	778
SC	9151	WY	507
GA	7762	MT	276
MI	7698	KY	0
LA	5961	NH	0
NE	5724	CT	No Data
AL	5466	IN	No Data
CA	5204	MS	No Data
NY	4818	NM	No Data
IL	4455	DE	Closed
WV	4409	IA	Closed
NJ	3540	LA County	Closed
MA	3408	ND	Closed
ID	3403	PR	Closed
UT	3309	RI	Closed
FL	3281		
AR	3228		

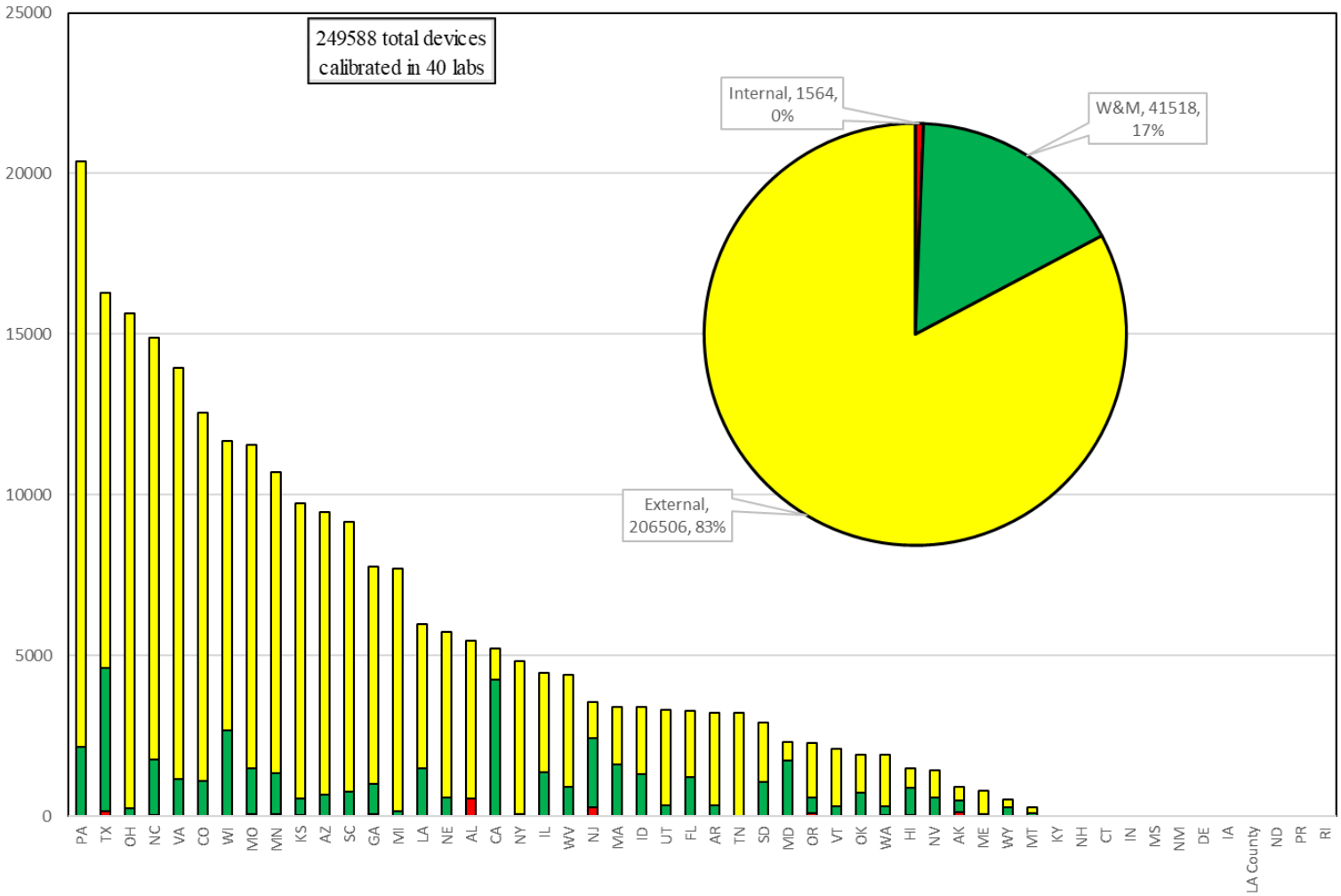


Figure 15: Mass Echelon III tests.

Weight Carts

Description

The graphs on the following page represent the total number of weight carts evaluated by the 42 reporting laboratories. The map graph illustrates a geographical distribution of the measurements. 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.

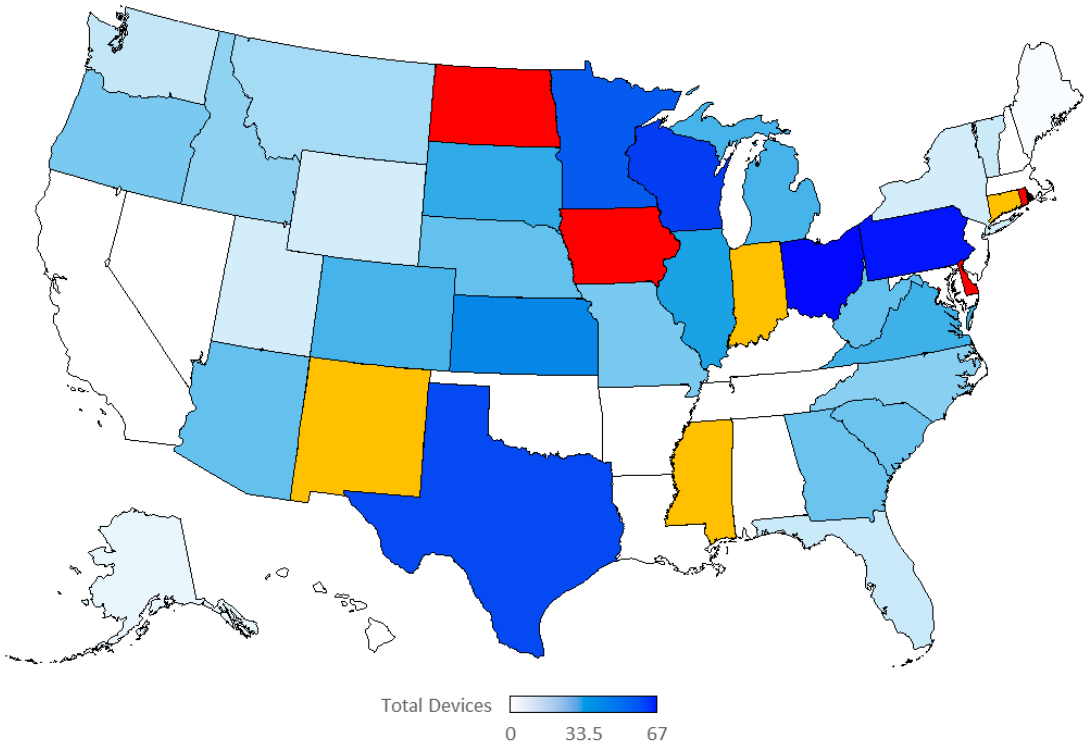
Comparison of previous surveys

Year	# Labs	Total Devices
1998	30	297
2000	27	344
2002	29	388
2004	33	365
2005	30	410
2006	31	388
2008	32	445
2010	35	468
2012	31	433
2014	30	517
2016	31	572
2018	30	585
2020	29	587
2022	29	646
2024	29	685

Table 10: Weight Cart tests reported on previous surveys.

Notes and Comments

- 0 % of all weight carts were calibrated for internal use by the laboratory.
- 17 % of all weight carts were calibrated for the weight and measures program.
- 83 % of all Mass III standards were calibrated for external customers.



OH	67	AK	3
PA	64	ME	1
WI	55	AL	0
TX	52	AR	0
MN	48	CA	0
KS	38	HI	0
IL	31	KY	0
SD	28	LA	0
VA	26	MA	0
CO	25	MD	0
MI	25	NH	0
AZ	21	NJ	0
NE	21	NV	0
WV	21	OK	0
GA	20	TN	0
SC	20	CT	No Data
MO	18	IN	No Data
OR	18	MS	No Data
NC	16	NM	No Data
ID	15	DE	Closed
MT	12	IA	Closed
WA	8	LA County	Closed
FL	7	ND	Closed
VT	7	PR	Closed
NY	6	RI	Closed
UT	6		
WY	6		

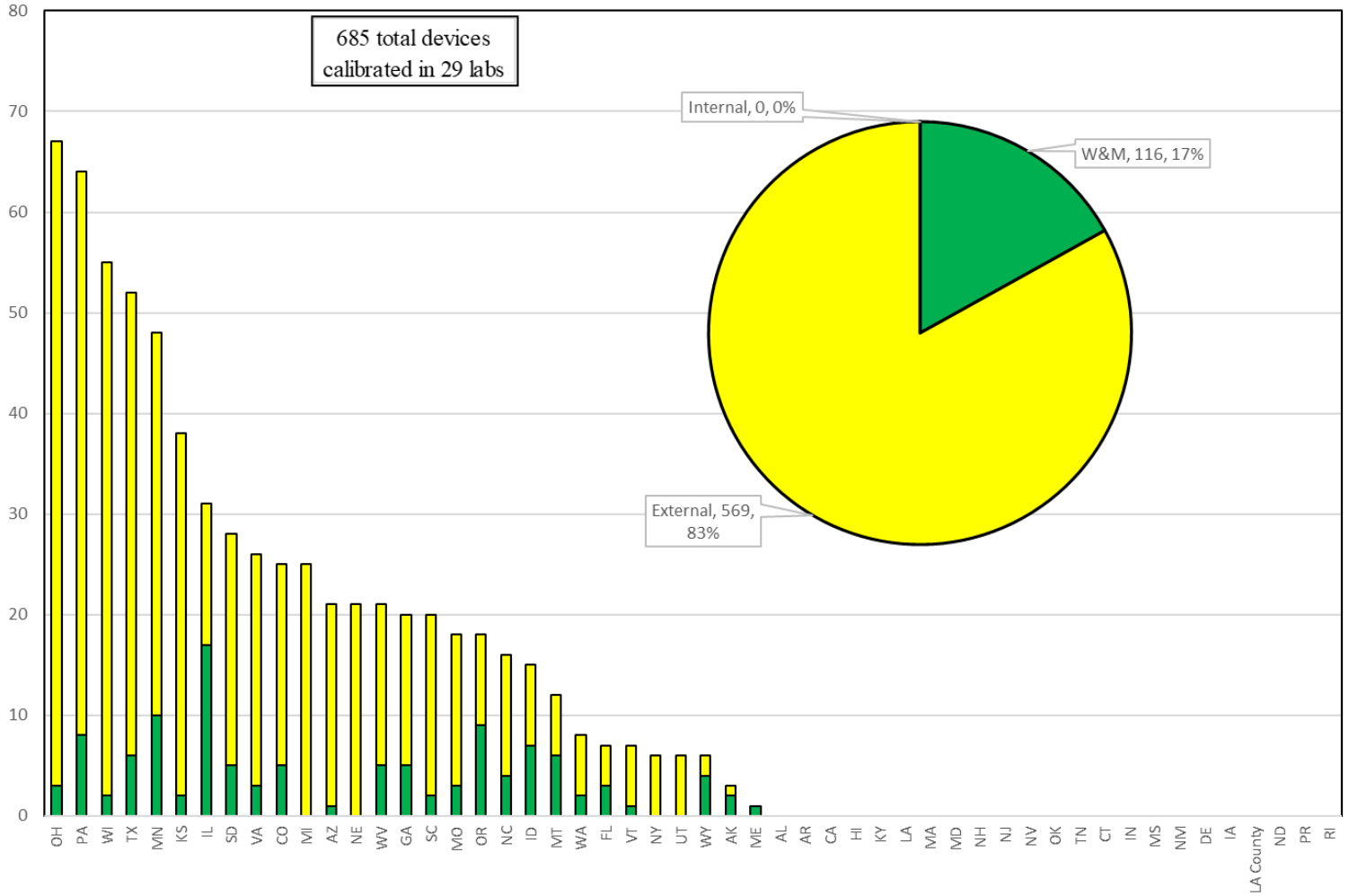


Figure 16: Weight Cart tests.

Railroad Test Cars

Description

The graphs on the following page represent the total number of railroad test cars evaluated by the 42 reporting laboratories. The map graph illustrates a geographical distribution of the measurements. 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.

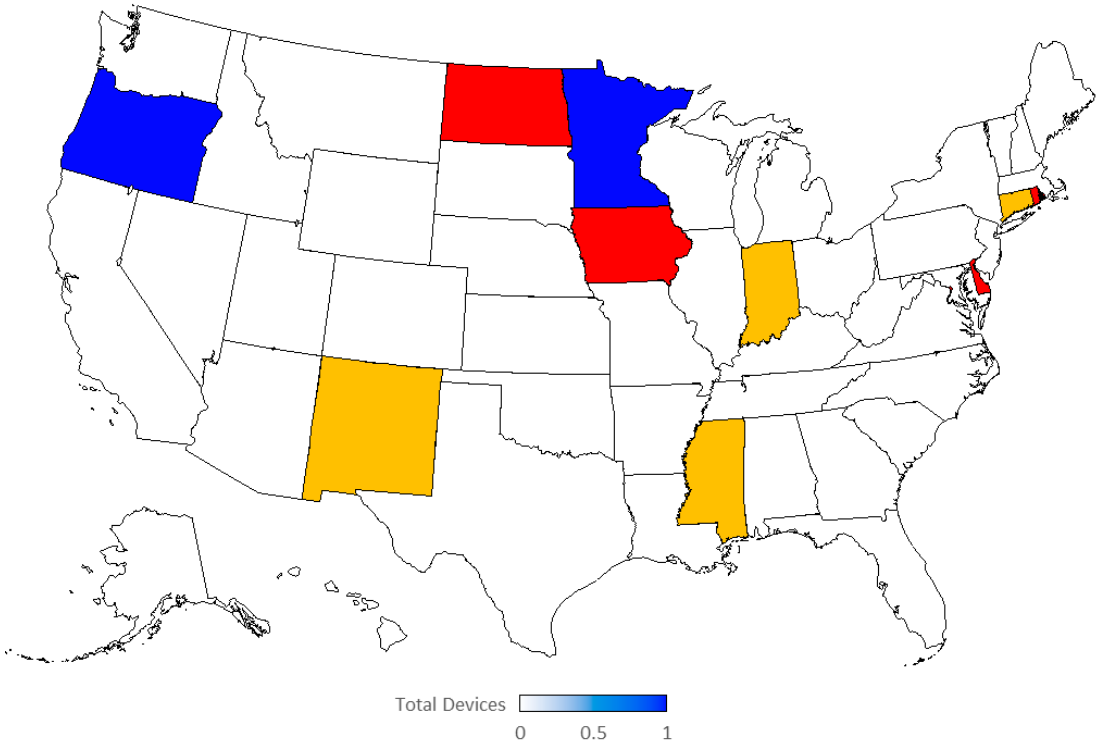
Comparison of previous surveys

Year	# Labs	Total Devices
2016	5	43
2018	3	16
2020	3	30
2022	3	8
2024	2	2

Table 11: Railroad Test Car tests reported on previous surveys.

Notes and Comments

- 0 % of all railroad test cars were calibrated for internal use by the laboratory.
- 50% of all railroad test cars were calibrated for the weight and measures program.
- 50 % of all railroad test cars were calibrated for external customers.



MN	1	NY	0
OR	1	OH	0
AK	0	OK	0
AL	0	PA	0
AR	0	SC	0
AZ	0	SD	0
CA	0	T N	0
CO	0	T X	0
FL	0	UT	0
GA	0	VA	0
HI	0	VT	0
ID	0	WA	0
IL	0	WI	0
KS	0	WV	0
KY	0	WY	0
LA	0	CT	No Data
MA	0	IN	No Data
MD	0	MS	No Data
ME	0	NM	No Data
MI	0	DE	Closed
MO	0	IA	Closed
MT	0	LA County	Closed
NC	0	ND	Closed
NE	0	PR	Closed
NH	0	RI	Closed
NJ	0		
NV	0		

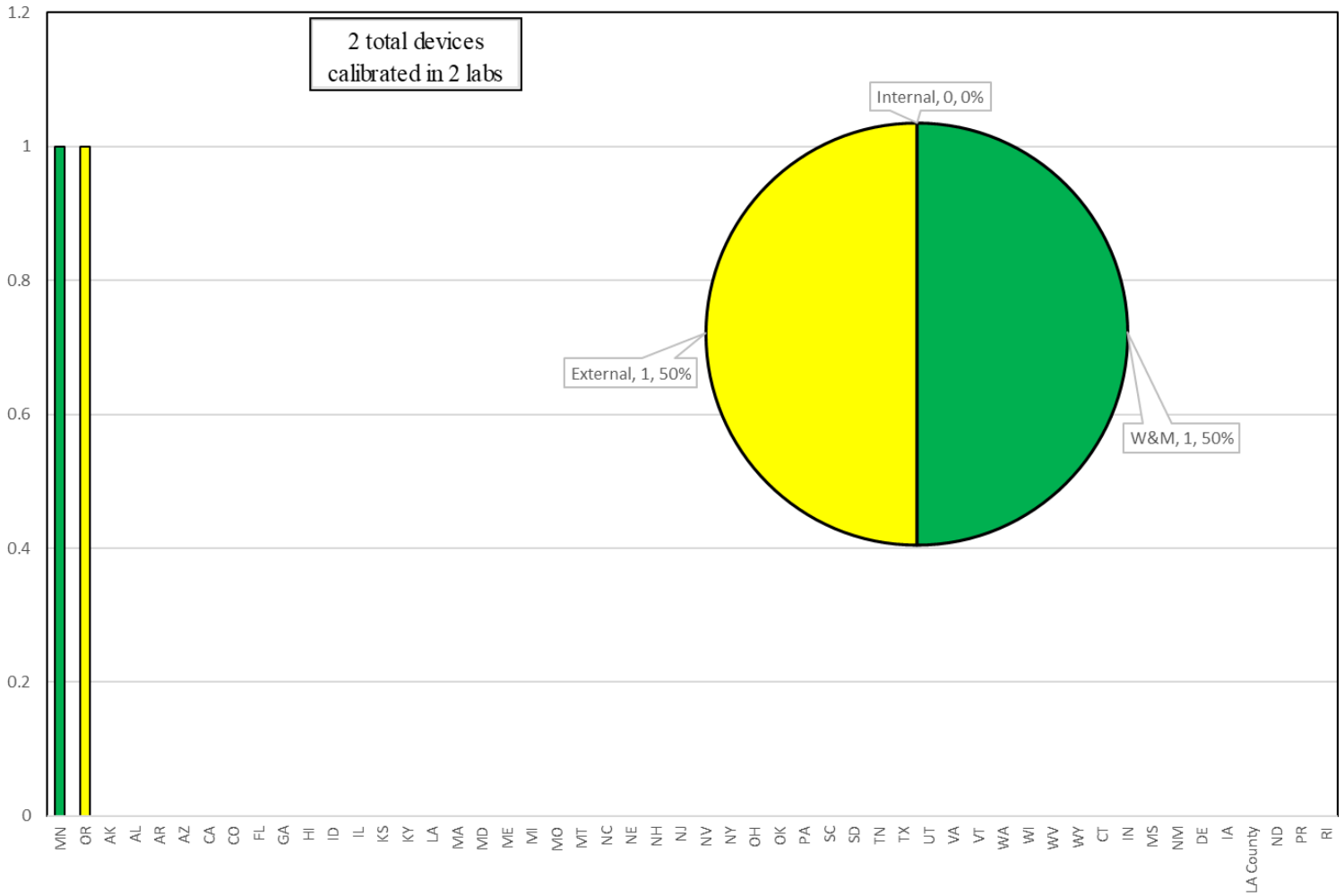


Figure 17: Railroad Test Car tests.

Railroad Specific Weight Carts

Description

The graphs on the following page represent the total number of railroad specific weight carts evaluated by the 42 reporting laboratories. The map graph illustrates a geographical distribution of the measurements. 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.

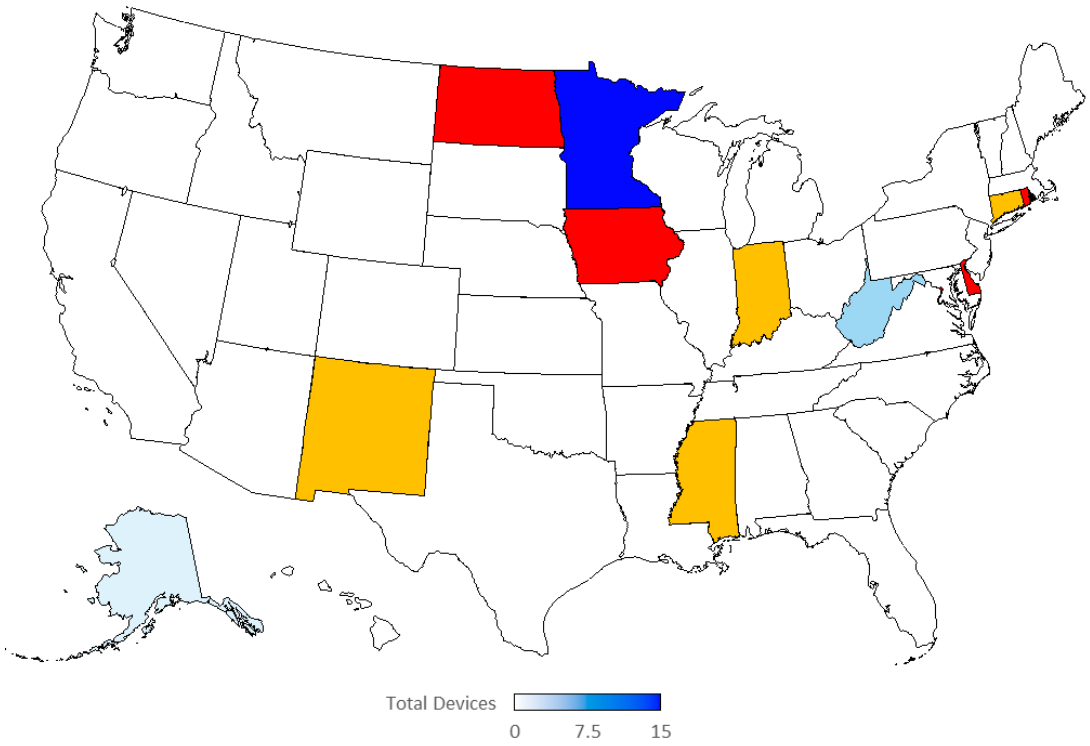
Comparison of previous surveys

Year	# Labs	Total Devices
2016	5	13
2018	7	33
2020	3	8
2022	3	21
2024	3	19

Table 12: Railroad Specific Weight Carts tests reported on previous surveys.

Notes and Comments

- 0 % of all weight carts were calibrated for internal use by the laboratory.
- 5 % of all weight carts were calibrated for the weight and measures program.
- 95 % of all weight carts were calibrated for external customers.



MN	15	NY	0
WV	3	OH	0
AK	1	OK	0
AL	0	OR	0
AR	0	PA	0
AZ	0	SC	0
CA	0	SD	0
CO	0	T N	0
FL	0	T X	0
GA	0	UT	0
HI	0	VA	0
ID	0	VT	0
IL	0	WA	0
KS	0	WI	0
KY	0	WY	0
LA	0	CT	No Data
MA	0	IN	No Data
MD	0	MS	No Data
ME	0	NM	No Data
MI	0	DE	Closed
MO	0	IA	Closed
MT	0	LA County	Closed
NC	0	ND	Closed
NE	0	PR	Closed
NH	0	RI	Closed
NJ	0		
NV	0		

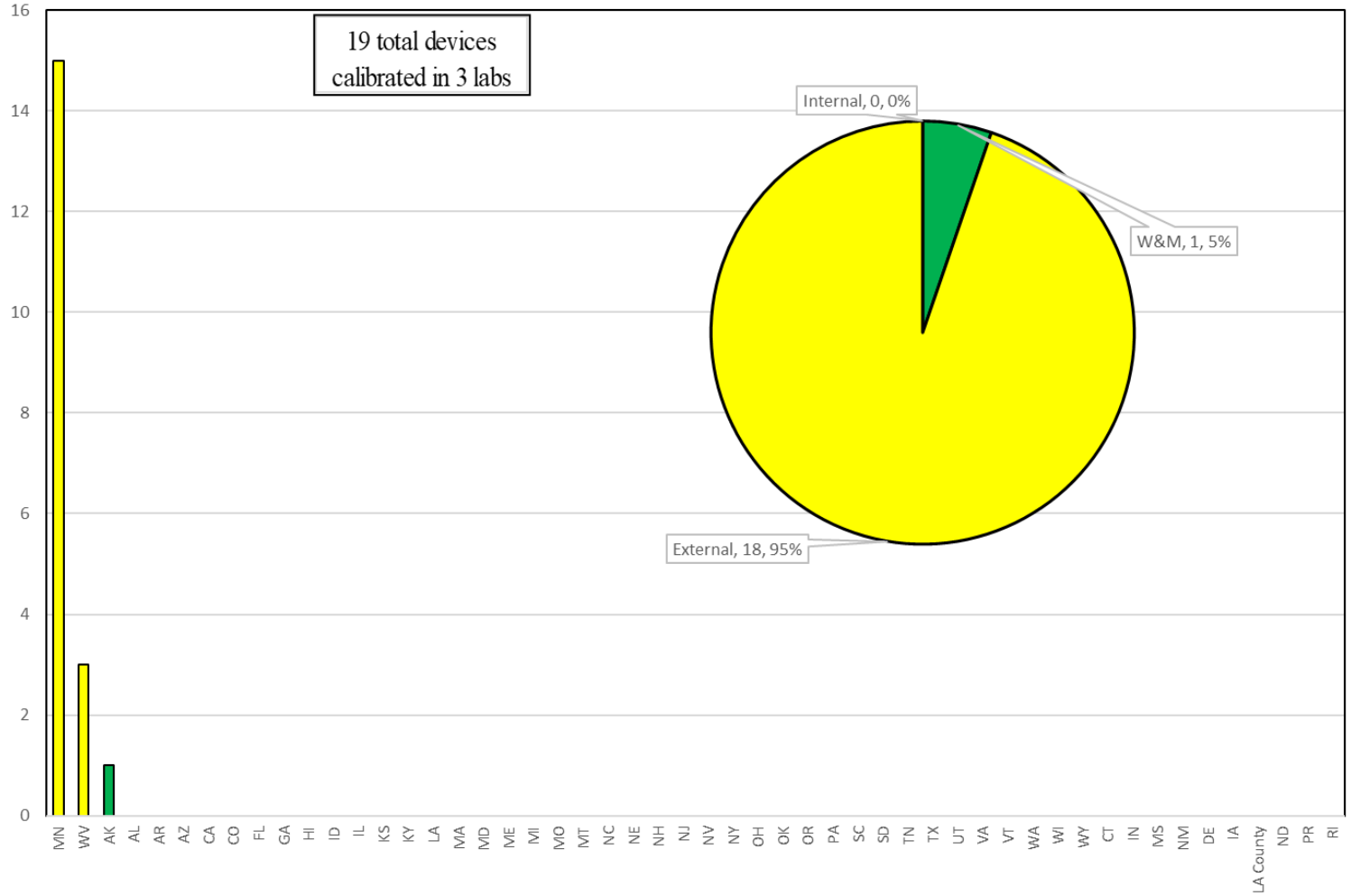


Figure 18: Railroad Specific Weight Cart tests.

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 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 the other a direct comparison of a surveyor tape to a fixed length bench calibrated at 1 ft intervals out to 16 ft. Measurement procedures may be found in NISTIR 8028, 2014, *Selected Laboratory and Measurement Practices and Procedures for Length Calibrations, Jose A. Torres, Georgia L. Harris.*

Steel Tape Measures

Description

The graphs on the following page represent the total number of tape measures evaluated by the 42 reporting laboratories. The map graph illustrates a geographical distribution of the measurements. 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.

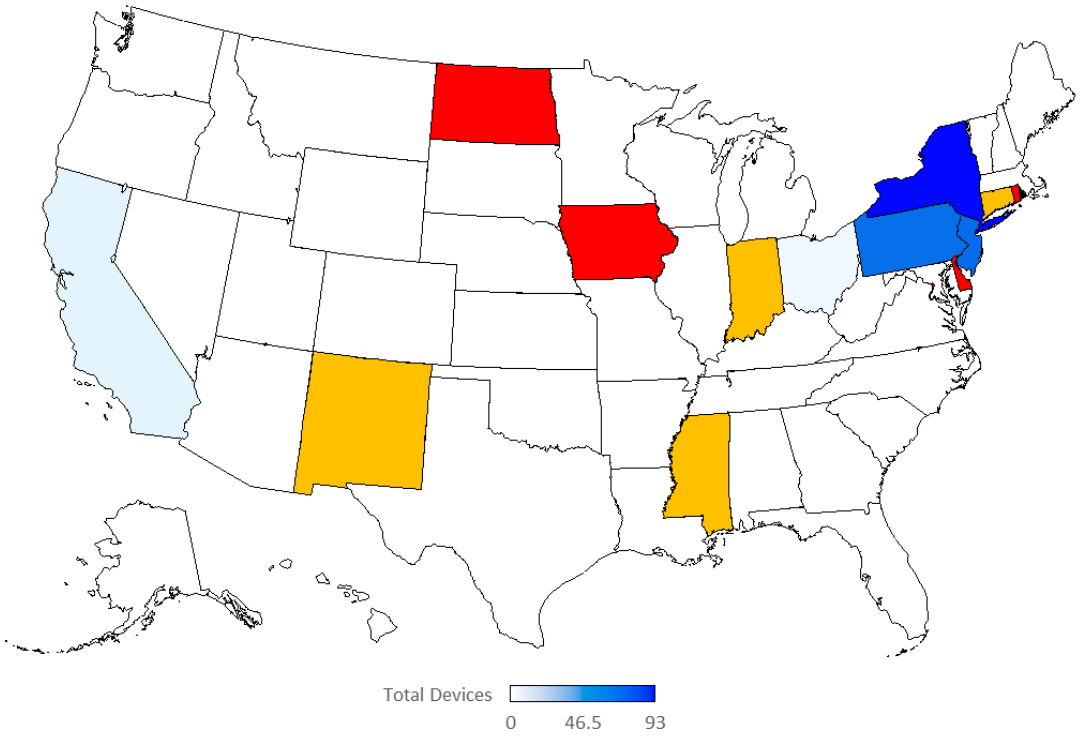
Comparison of previous surveys

Year	# Labs	Total Devices
1996	27	707
1998	29	537
1999	21	566
2000	22	487
2002	21	584
2004	21	319
2005	19	304
2006	18	339
2008	17	425
2010	15	310
2012	12	353
2014	9	323
2016	7	319
2018	5	213
2020	5	226
2022	5	196
2024	5	222

Table 13: Tape measure tests reported on previous surveys.

Notes and Comments

- 2 % of all tape measures were tested for internal use by the laboratory.
- 26 % of all tape measures were tested for the weight and measures program.
- 72 % of all tape measures were tested for external customers.



NY	93	NH	0
NJ	61	NV	0
PA	60	OK	0
CA	5	OR	0
OH	3	SC	0
AK	0	SD	0
AL	0	T N	0
AR	0	T X	0
AZ	0	UT	0
CO	0	VA	0
FL	0	VT	0
GA	0	WA	0
HI	0	WI	0
ID	0	WV	0
IL	0	WY	0
KS	0	CT	No Data
KY	0	IN	No Data
LA	0	MS	No Data
MA	0	NM	No Data
MD	0	DE	Closed
ME	0	IA	Closed
MI	0	LA County	Closed
MN	0	ND	Closed
MO	0	PR	Closed
MT	0	RI	Closed
NC	0		
NE	0		

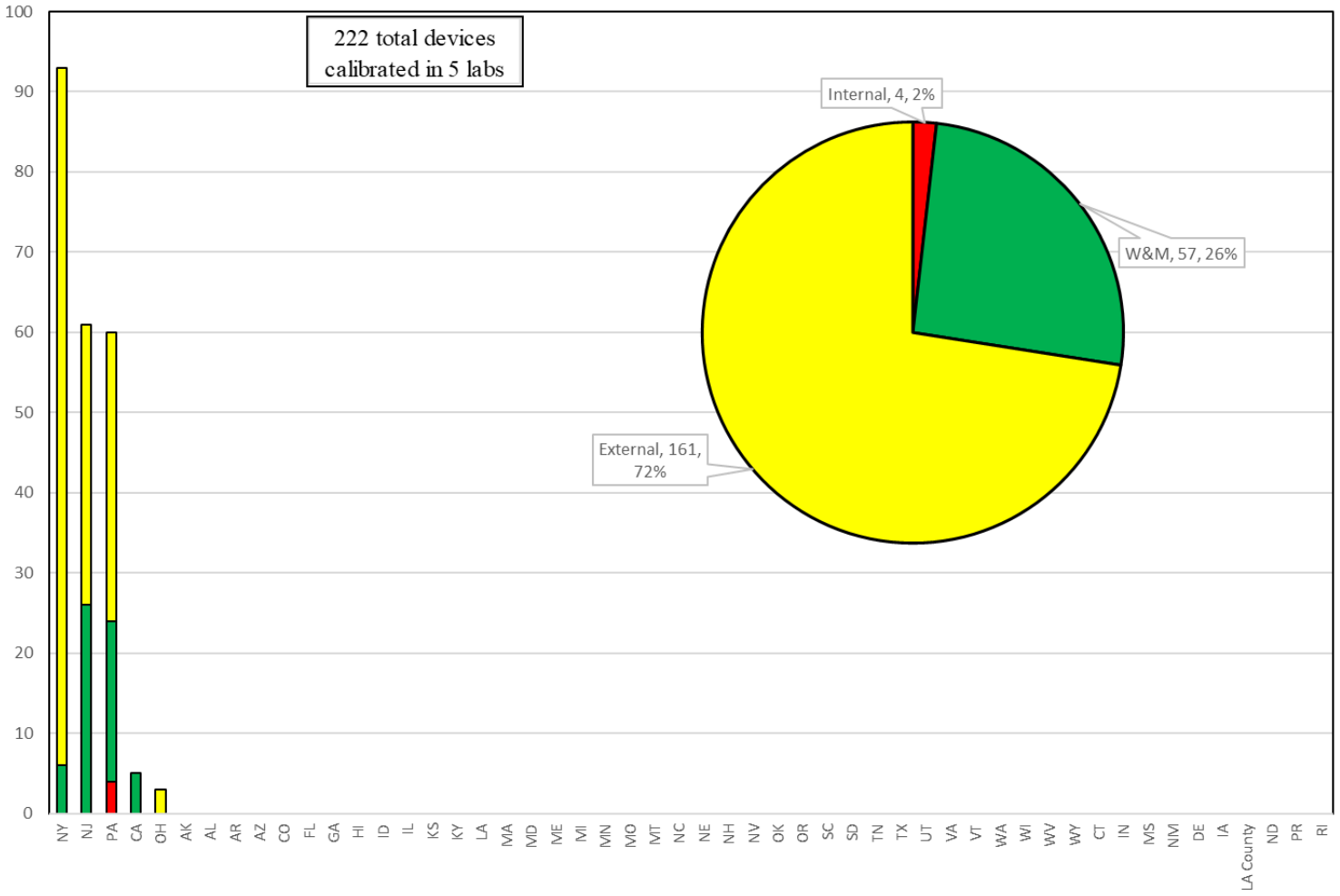


Figure 19: Tape Measure tests.

Rigid Rules

Description

The graphs on the following page represent the total number of rigid rules evaluated by the 42 reporting laboratories. The map graph illustrates a geographical distribution of the measurements. 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.

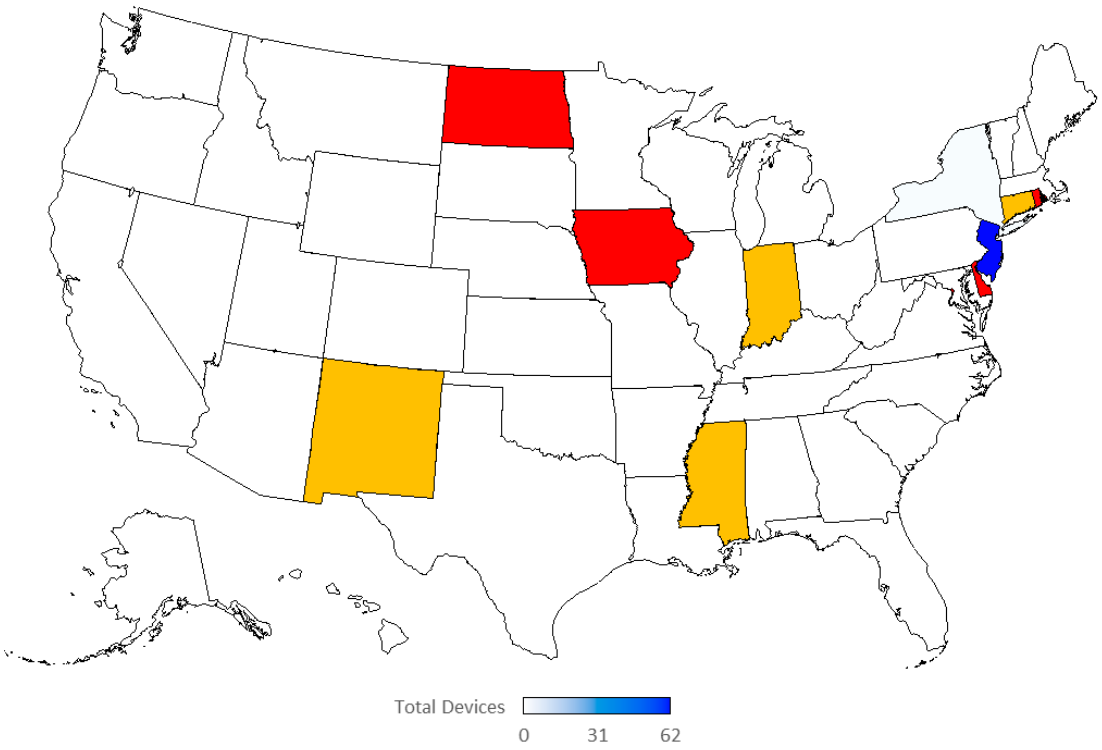
Comparison of previous surveys

Year	# Labs	Total Devices
1996	26	582
1998	29	269
1999	20	413
2000	16	169
2002	14	138
2004	12	98
2005	11	85
2006	11	122
2008	11	88
2010	8	89
2012	3	85
2014	3	54
2016	2	36
2018	4	184
2020	3	30
2022	1	37
2024	2	63

Table 14: Rigid rule tests reported in previous surveys.

Notes and Comments

- 2 % of all rigid rules were tested for internal use by the laboratory.
- 0 % of all rigid rules were tested for the weight and measures program.
- 98 % of all rigid rules were tested for external customers.



NJ	62	OH	0
NY	1	OK	0
AK	0	OR	0
AL	0	PA	0
AR	0	SC	0
AZ	0	SD	0
CA	0	TN	0
CO	0	TX	0
FL	0	UT	0
GA	0	VA	0
HI	0	VT	0
ID	0	WA	0
IL	0	WI	0
KS	0	WV	0
KY	0	WY	0
LA	0	CT	No Data
MA	0	IN	No Data
MD	0	MS	No Data
ME	0	NM	No Data
MI	0	DE	Closed
MN	0	IA	Closed
MO	0	LA County	Closed
MT	0	ND	Closed
NC	0	PR	Closed
NE	0	RI	Closed
NH	0		
NV	0		

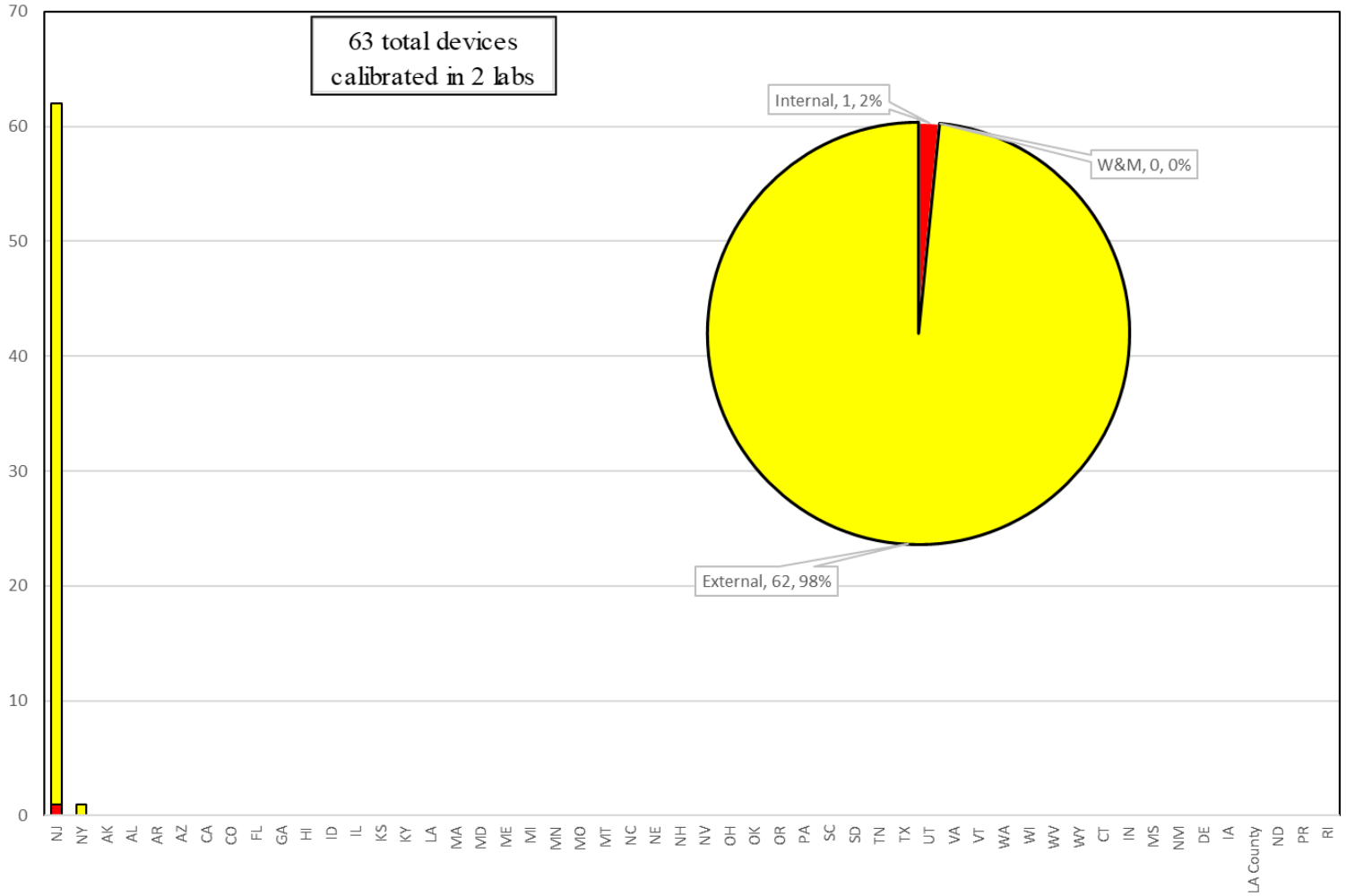


Figure 20: Rigid rule tests.

Volume

Volume measurement service are the 2nd most commonly performed by the SLP laboratories next to mass measurement. Volume measurement is broken down into distinct categories based upon the type of volumetric standard tested. The categories are glassware, volume test measures (≤ 5 gallons), medium volume provers (>5 gallons and ≤ 100 gallons), and large volume provers (> 100 gallons).

Examples of Volumetric Standards include but may not be limited to the following;

- laboratory glassware (see for example ASTM E288) and field measuring flasks (see NIST Handbook 105-2).
- steel graduated neck test measures as described in NIST Handbook 105-3 and in American Petroleum Institute's Manual of Petroleum Measurement Standards (Chapter 4). These include the steel 5 gallon capacity test measures commonly used by weights and measures officials to test retail motor fuel dispensers.
- pressurized Liquefied Petroleum Gas (LPG) Provers as described in NIST Handbook 105-4.
- slicker plate standards. These devices are similar to volumetric provers with the exception that they 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.

Volume measurements are further subdivided into two measurement categories. Volume standards are calibrated either by;

- transferring a known quantity of liquid (usually clean water) into them (See SOP's 16, 18, and 19 of NIST Internal Report 7383) −Volumetric Calibration−, or
- by filling it with a well characterized liquid (typically distilled water) and weighing it (See SOP 14 of NIST Internal Report 7383) −Gravimetric Calibration−.

Glassware

Description

The graphs on the next two pages represent the total number of volume measurements performed on glassware by the 42 reporting laboratories. Each map graph illustrates the geographical distribution of these measurements. The pie graphs located on each map for each individual lab and a larger pie graph that reflects the totals. The bar graph at the bottom of the page shows the same customer 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.

Comparison of previous surveys

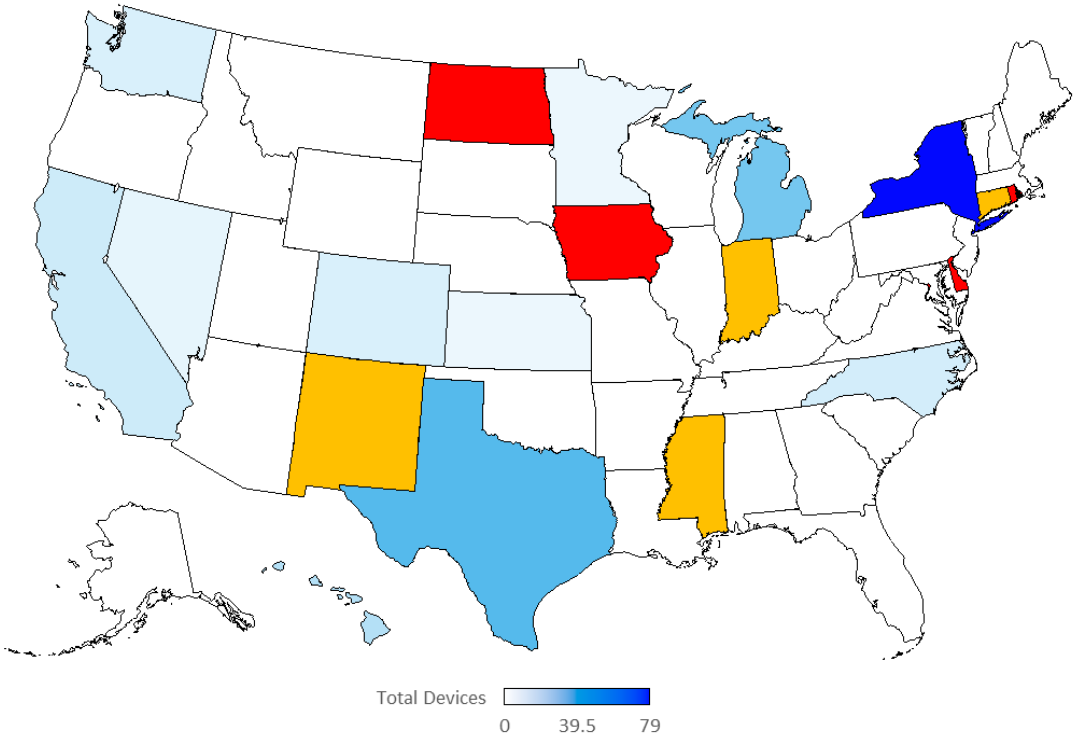
Year	# Labs	Volume Transfer	Gravimetric	Total
1996	29			1,205
1998	24			844
1999	25			853
2000	27			668
2002	24			555
2004	17			332
2005	20	69	140	209
2006	18	82	172	254
2008	18	42	183	225
2010	16	43	288	331
2010	16	43	288	331
2012	8	170	78	248
2014	9	124	119	243
2016	10	6	75	81
2018	9	0	104	104
2020	9	0	189	189
2022	6	2	100	102
2024	11	0	177	177

Table 15: Glassware calibrations from previous surveys.

Notes and Comments

- 39 % of all glassware standards were tested for the laboratory
- 49 % of all glassware standards were tested for Weights and Measures enforcement programs.
- 12 % of all glassware standards were tested for external customers.

Gravimetric



NY	79	NH	0
TX	27	NJ	0
MI	22	OH	0
HI	12	OK	0
CA	8	OR	0
NC	7	PA	0
CO	6	SC	0
WA	6	SD	0
NV	4	TN	0
KS	3	UT	0
MN	3	VA	0
AK	0	VT	0
AL	0	WI	0
AR	0	WV	0
AZ	0	WY	0
FL	0	CT	No Data
GA	0	IN	No Data
ID	0	MS	No Data
IL	0	NM	No Data
KY	0	DE	Closed
LA	0	IA	Closed
MA	0	LA County	Closed
MD	0	ND	Closed
ME	0	PR	Closed
MO	0	RI	Closed
MT	0		
NE	0		

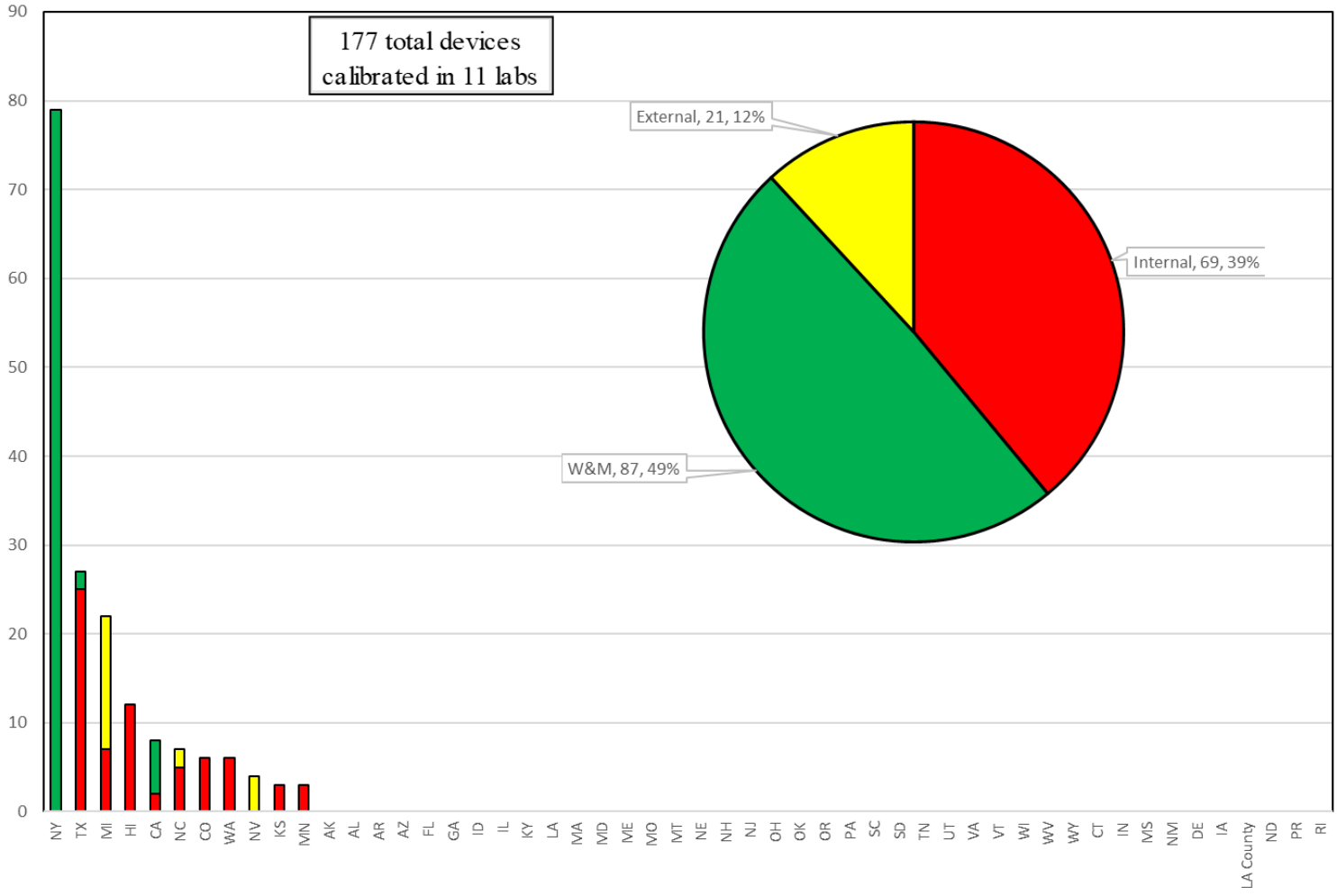


Figure 22: Glassware calibrations, gravimetric method.

Test Measures (≤5 gallon)

Description

The graphs on the next two pages represent the total number of volume measurements performed on test measures by the 42 reporting laboratories. Each map graph illustrates the geographical distribution of these measurements. The pie graphs located on each map for each individual lab and a larger pie graph that reflects the totals. The bar graph at the bottom of the page shows the same customer 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.

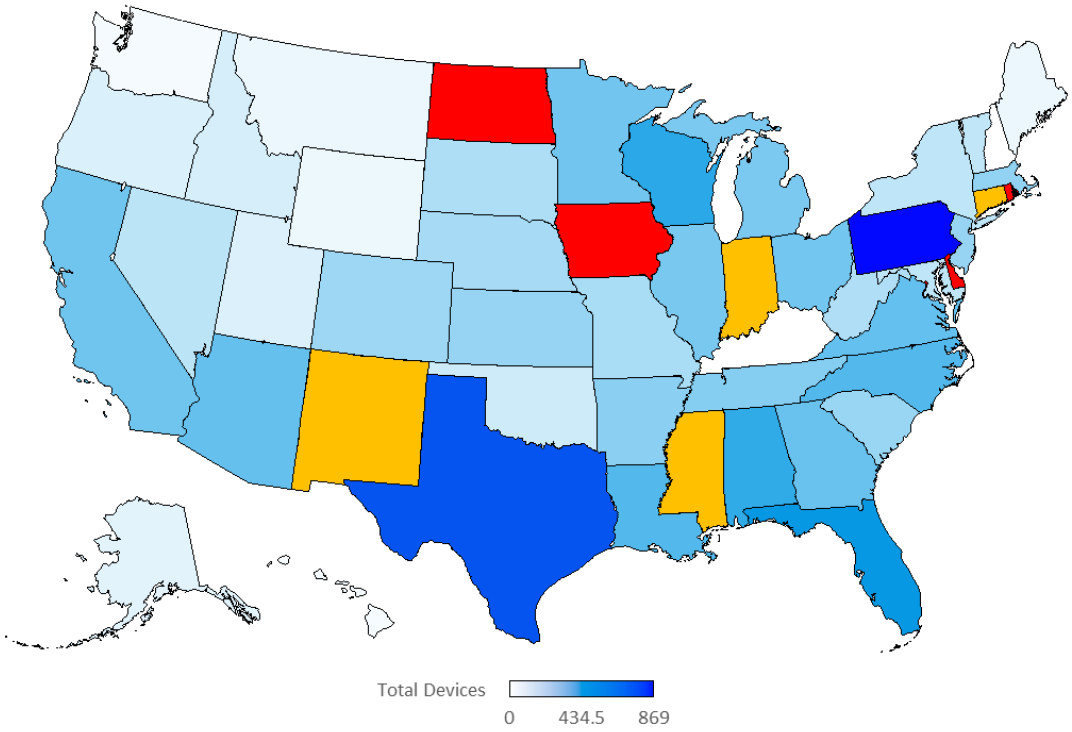
Comparison of previous surveys

Year	# Labs	Volume Transfer	Gravimetric	Total
1996	48	8,290		8,290
1998	46	6,861		6,861
1999	45	6,986		6,986
2000	45	7,368		7,368
2002	48	6,966		6,966
2004	46	6,400		6,400
2005	42	6,925	75	7,000
2006	46	7,532	77	7,609
2008	49	7,321	69	7,390
2010	45	8,216	73	8,289
2012	46	7,533	93	7,626
2014	46	7,863	128	7,991
2016	46	7,926	84	8,010
2018	44	8,308	74	8,341
2020	43	7,265	53	7,318
2022	41	7,834	53	7,887
2024	40	8137	77	8,214

Table 16: Test Measure (5 ≤ gal.) volume tests from previous surveys.

Notes and Comments

- 1 % of all test measures were tested for the laboratory.
- 26 % of all test measures were tested for Weights and Measures enforcement programs.
- 73 % of all test measures were tested for external customers.



PA	869	MD	112
TX	642	NY	112
FL	439	VT	108
WI	373	OK	87
AL	363	ID	73
LA	302	OR	65
NC	301	UT	63
VA	271	AK	50
AZ	269	ME	34
GA	262	MT	34
CA	250	WY	31
MN	248	WA	20
OH	247	HI	17
IL	236	KY	0
MI	231	NH	0
TN	213	CT	No Data
AR	203	IN	No Data
MA	191	MS	No Data
KS	183	NM	No Data
NJ	183	DE	Closed
SC	178	IA	Closed
CO	172	LA County	Closed
NE	154	ND	Closed
MO	151	PR	Closed
SD	142	RI	Closed
WV	141		
NV	117		

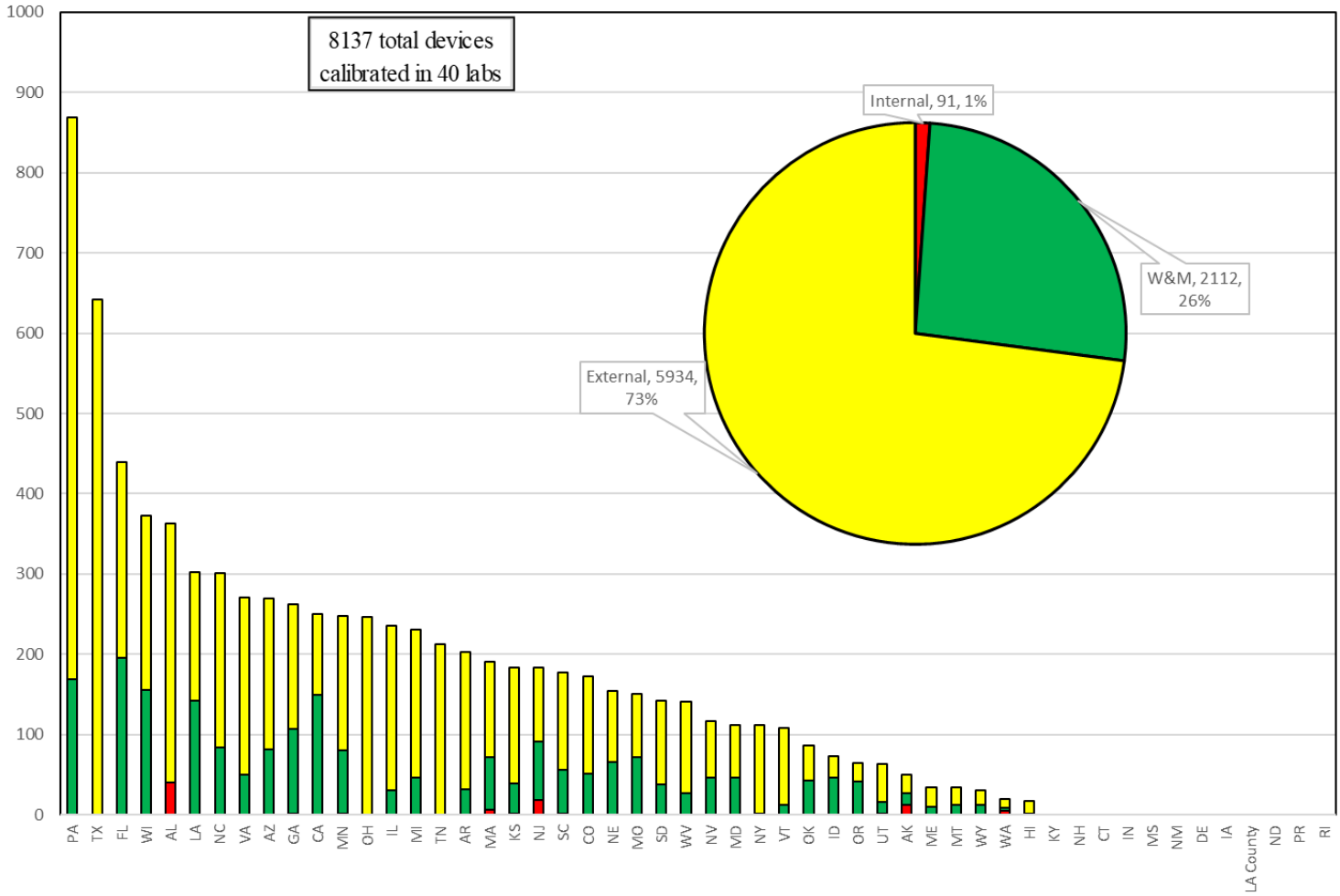
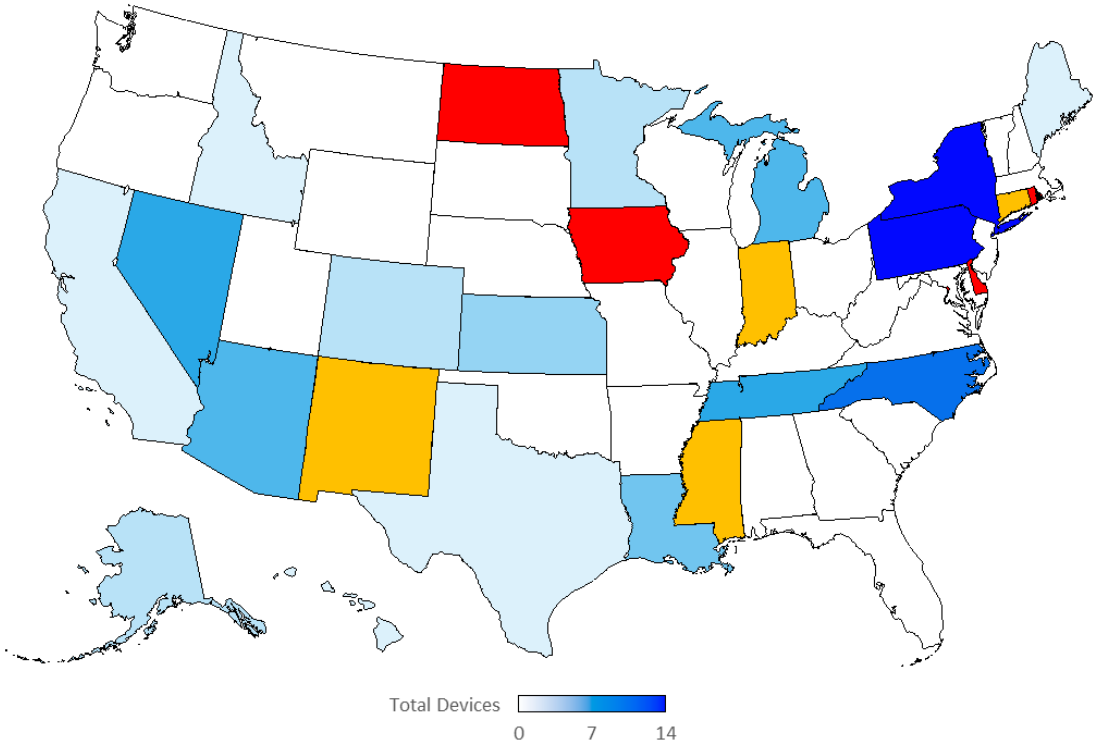


Figure 23: Test Measure tests (≤5 gallon), volume transfer.



	14	NE	0
	14	NH	0
	9	NJ	0
	6	OH	0
	6	OK	0
	5	OR	0
	5	SC	0
	4	SD	0
	3	UT	0
	2	VA	0
	2	VT	0
	2	WA	0
	1	WI	0
	1	WV	0
	1	WY	0
	1	CT	No Data
	1	IN	No Data
	0	MS	No Data
	0	NM	No Data
	0	DE	Closed
	0	IA	Closed
	0	LA County	Closed
	0	ND	Closed
	0	PR	Closed
	0	RI	Closed
	0		
	0		

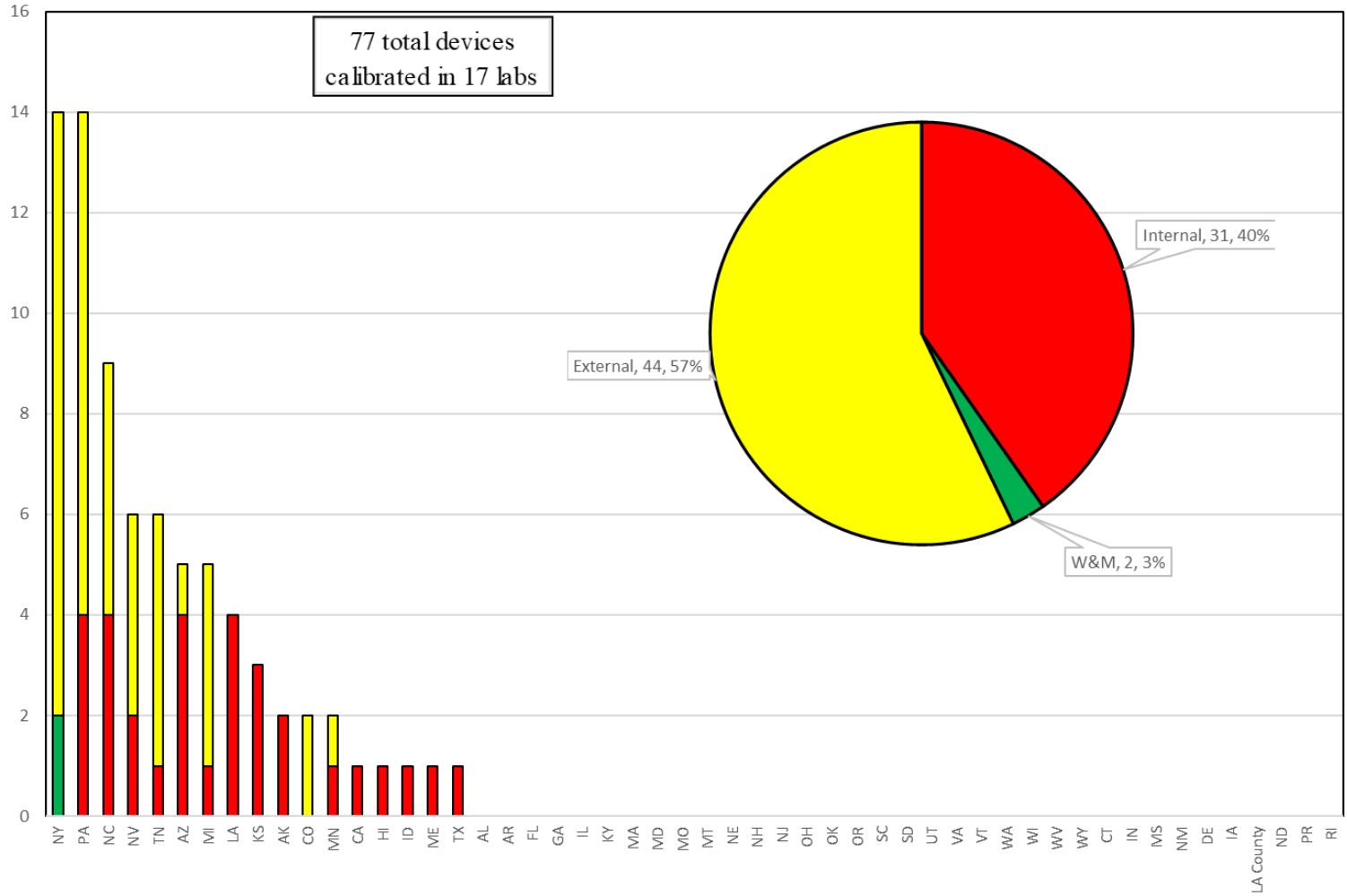


Figure 24: Test Measure tests (≤5 gallon), gravimetric.

Provers (> 5 gallon and ≤ 100 gallon)

Description

The graphs on the next two pages represent the total number of volume measurements performed on volumetric provers by the 42 reporting laboratories. Each map graph illustrates the geographical distribution of these measurements. The pie graphs located on each map for each individual lab and a larger pie graph that reflects the totals. The bar graph at the bottom of the page shows the same customer 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.

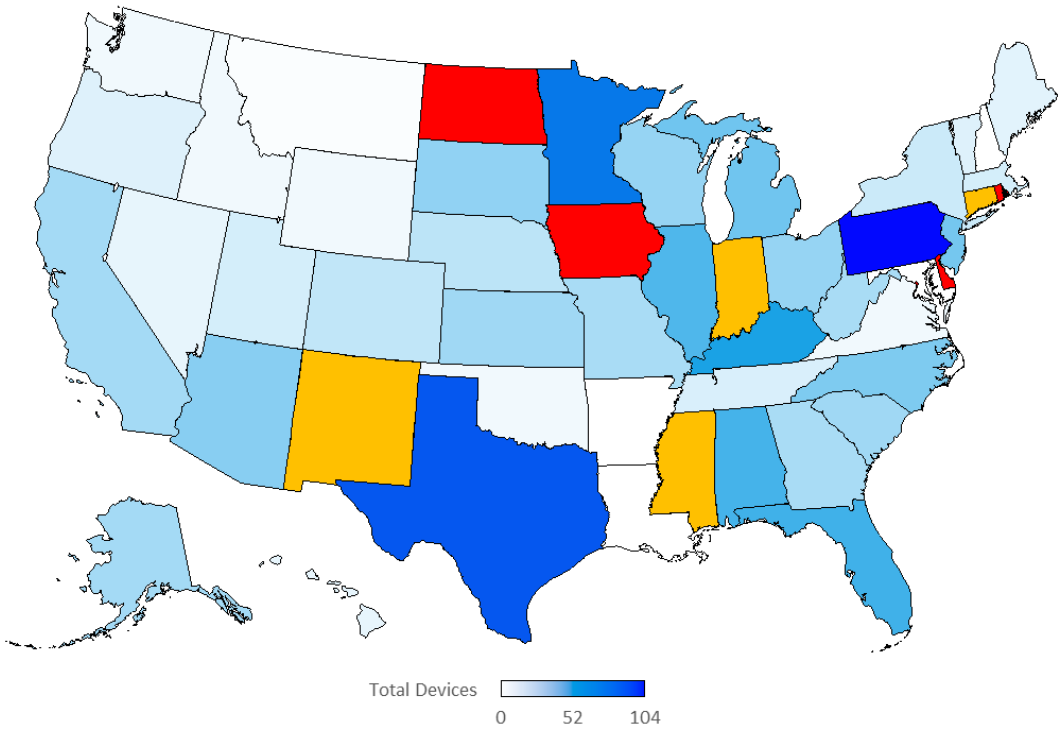
Comparison of previous surveys

Year	# Labs	Volume Transfer	Gravimetric	Total
2005		726	47	773
2006		760	81	841
2008		737	46	783
2010	41	711	49	760
2012	39	713	31	744
2014	37	828	57	885
2016	39	745	58	803
2018	38	841	61	902
2020	37	757	33	790
2022	37	785	76	861
2024	38	828	44	872

Table 17: Provers (>5 gal. and ≤ 100 gal.) volume tests from previous surveys.

Notes and Comments

- 5 % of all provers (> 5 gal. and ≤ 100 gal.) were tested for the laboratory
- 23 % of all provers (> 5 gal. and ≤ 100 gal.) were tested for Weights and Measures enforcement programs.
- 72 % of all provers (> 5 gal. and ≤ 100 gal.) were tested for external customers.



PA	104	OR	7
TX	76	VT	7
MN	64	ME	6
KY	48	HI	5
FL	40	NV	5
AL	39	ID	3
IL	37	OK	3
MI	30	VA	3
NJ	29	WA	3
NC	27	WY	3
AZ	25	MT	1
SD	23	AR	0
OH	22	LA	0
WI	22	MD	0
KS	20	NH	0
SC	20	CT	No Data
AK	19	IN	No Data
CA	19	MS	No Data
GA	18	NM	No Data
MO	18	DE	Closed
WV	18	IA	Closed
NE	14	LA County	Closed
CO	13	ND	Closed
NY	11	PR	Closed
MA	9	RI	Closed
UT	9		
TN	8		

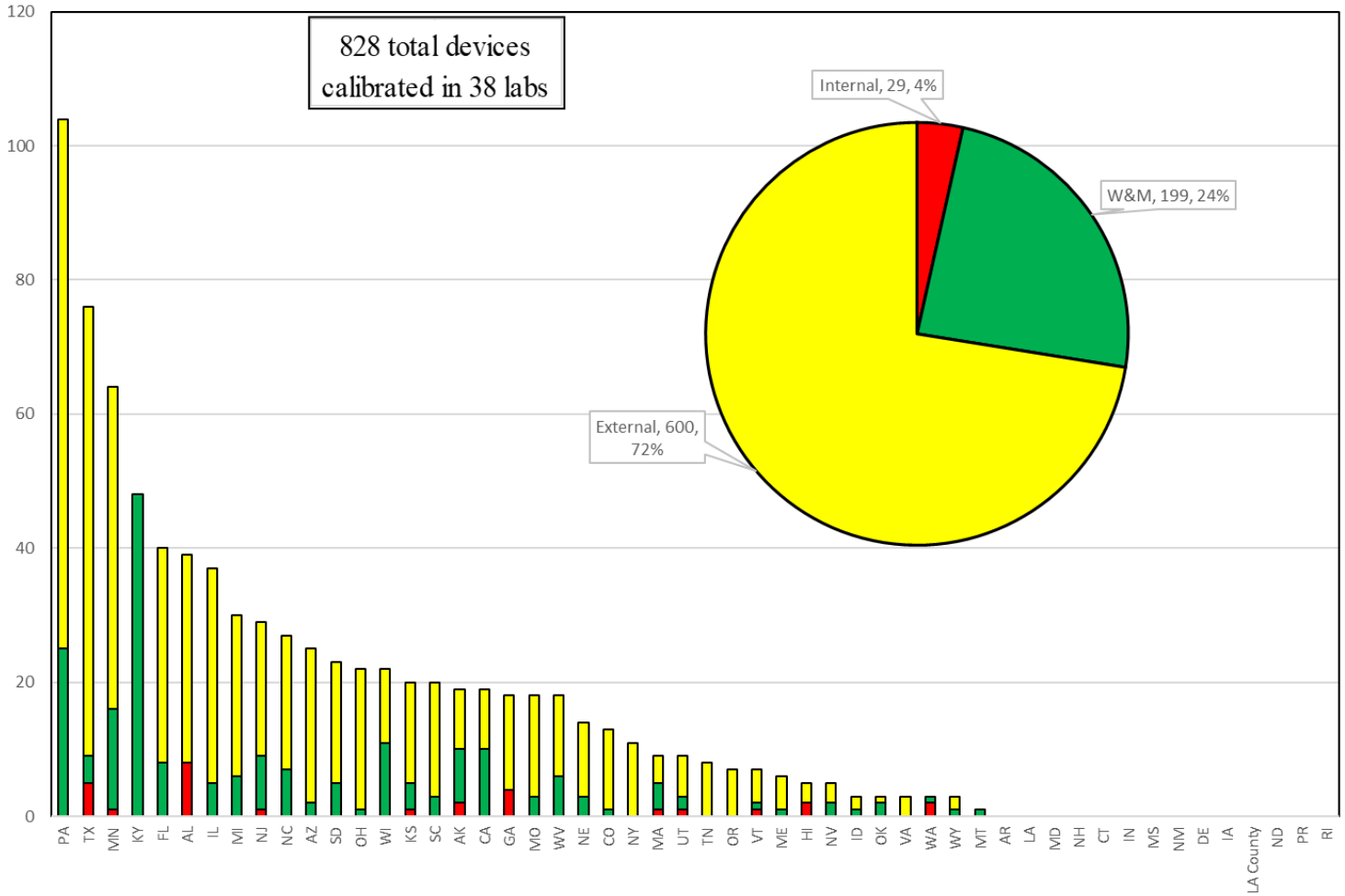
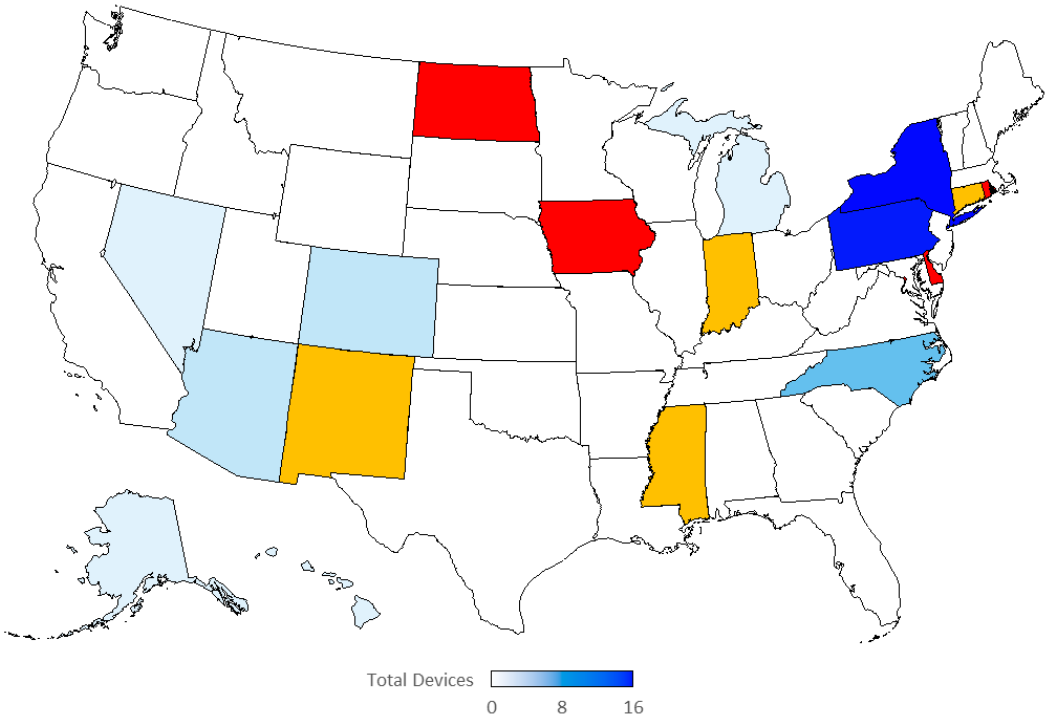


Figure 25: Prover (≥5 gal. and < 100 gal.) tests, volume transfer.



NY	16	NJ	0
PA	15	OH	0
NC	5	OK	0
AZ	2	OR	0
CO	2	SC	0
AK	1	SD	0
HI	1	T N	0
MI	1	T X	0
NV	1	UT	0
AL	0	VA	0
AR	0	VT	0
CA	0	WA	0
FL	0	WI	0
GA	0	WV	0
ID	0	WY	0
IL	0	CT	No Data
KS	0	IN	No Data
KY	0	MS	No Data
LA	0	NM	No Data
MA	0	DE	Closed
MD	0	IA	Closed
ME	0	LA County	Closed
MN	0	ND	Closed
MO	0	PR	Closed
MT	0	RI	Closed
NE	0		
NH	0		

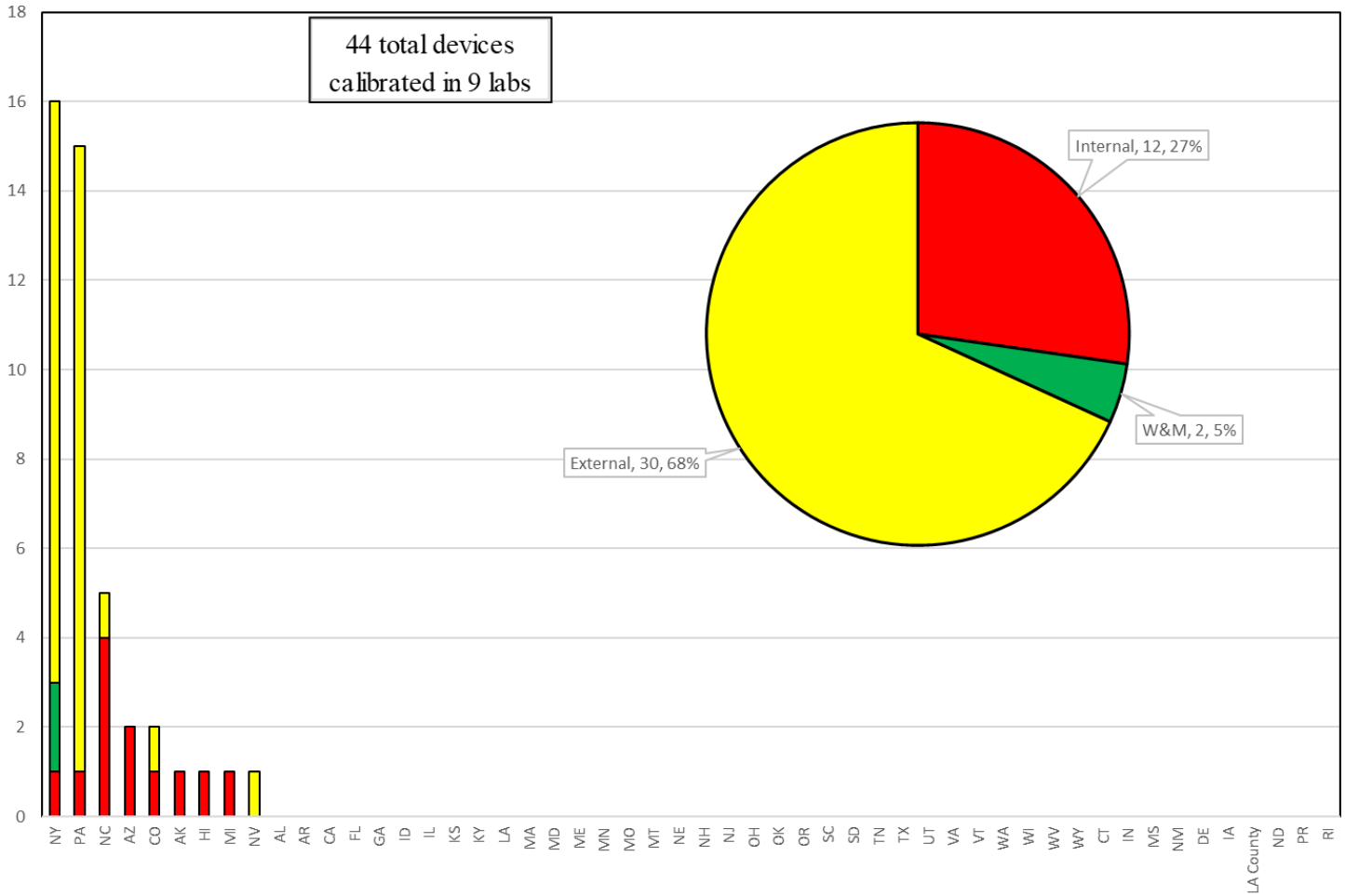


Figure 26: Prover (≥5 gal. and < 100 gal.) tests, gravimetric.

Provers (> 100 gallon)

Description

The graphs on the next two pages represent the total number of volume measurements performed on volumetric provers by the 42 reporting laboratories. Each map graph illustrates the geographical distribution of these measurements. The pie graphs located on each map for each individual lab and a larger pie graph that reflects the totals. The bar graph at the bottom of the page shows the same customer 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.

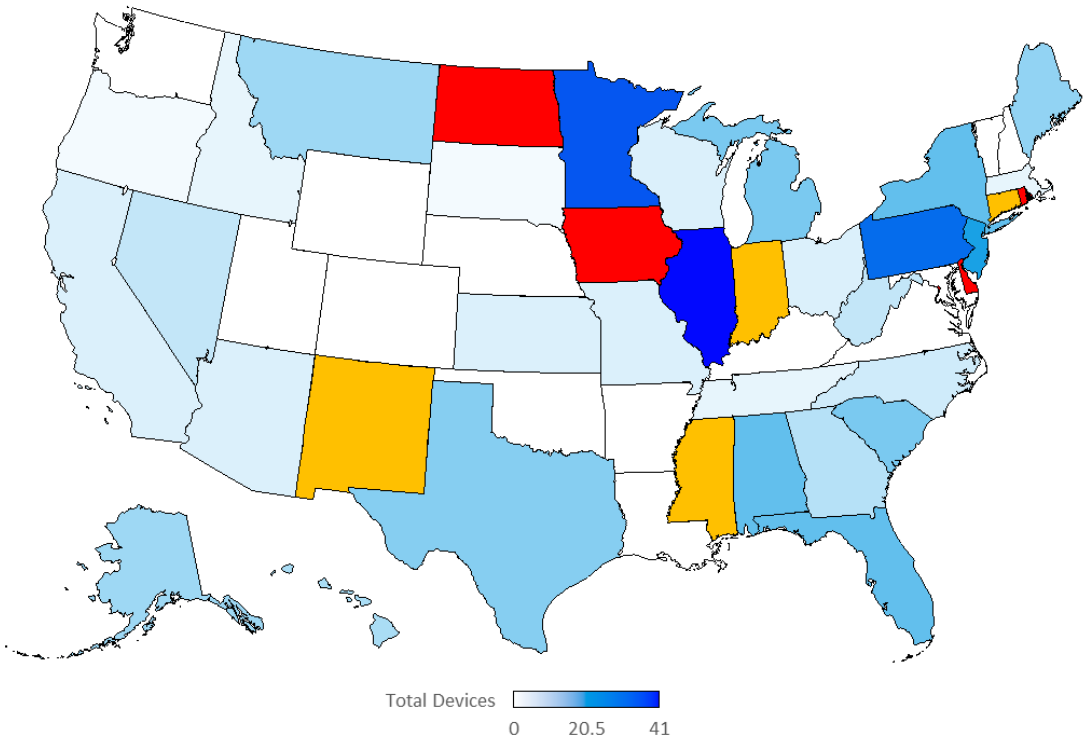
Comparison of previous surveys

Year	# Labs	Volume Transfer	Gravimetric	Total
2005		201	1	202
2006		202	0	202
2008	34	284	0	284
2010	33	287	0	287
2012	30	237	1	238
2014	30	239	1	240
2016	30	275	3	278
2018	28	259	1	260
2020	29	284	0	284
2022	28	280	0	280
2024	29	266	0	266

Table 18: Provers (> 100 gal.) tests from previous surveys.

Notes and Comments

- 2 % of all provers (> 100 gal.) were tested for the laboratory.
- 15 % of all provers (> 100 gal.) were tested for Weights and Measures enforcement programs.
- 83 % of all provers (> 100 gal.) were tested for external customers.



IL	41	OR	1
MN	30	SD	1
PA	27	AR	0
NJ	19	CO	0
AL	13	KY	0
FL	13	LA	0
NY	13	MD	0
MI	11	NE	0
SC	11	NH	0
TX	10	OK	0
ME	9	UT	0
AK	8	VA	0
MT	8	VT	0
HI	7	WA	0
GA	6	WY	0
NV	5	CT	No Data
WV	5	IN	No Data
NC	4	MS	No Data
AZ	3	NM	No Data
CA	3	DE	Closed
KS	3	IA	Closed
MO	3	LA County	Closed
OH	3	ND	Closed
WI	3	PR	Closed
ID	2	RI	Closed
MA	2		
TN	2		

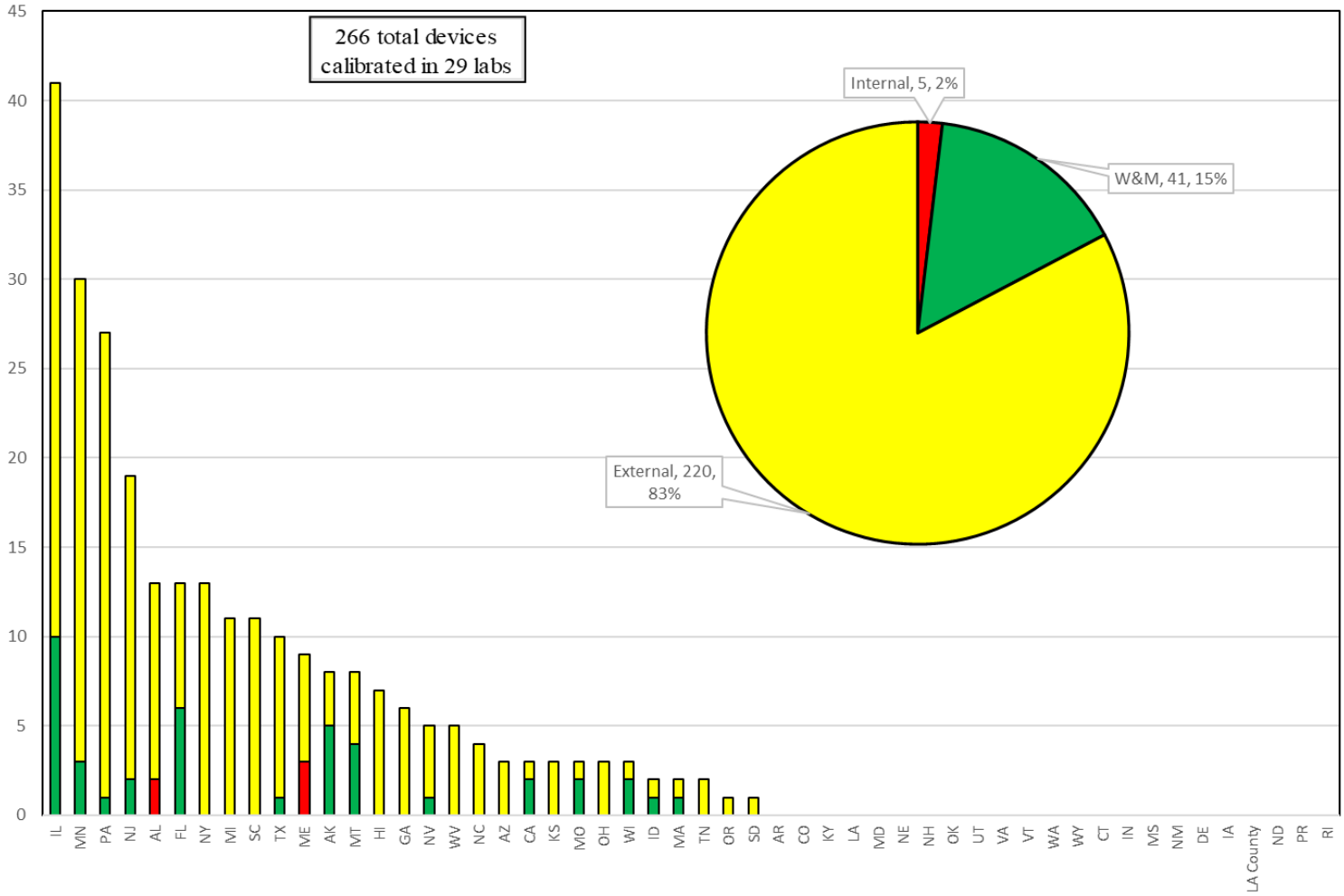


Figure 27: Prover (>100 gal.) tests, volume transfer

No Gravimetric Volume Tests to Report

Figure 28: Prover (>100 gal.) tests, gravimetric

Liquefied Petroleum Gas (LPG) Provers

Description

The graphs on the next two pages represent the total number of measurements performed on LPG provers by the 42 reporting laboratories. Each map graph illustrates the geographical distribution of these measurements. The pie graphs located on each map for each individual lab and a larger pie graph that reflects the totals. The bar graph at the bottom of the page shows the same customer 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.

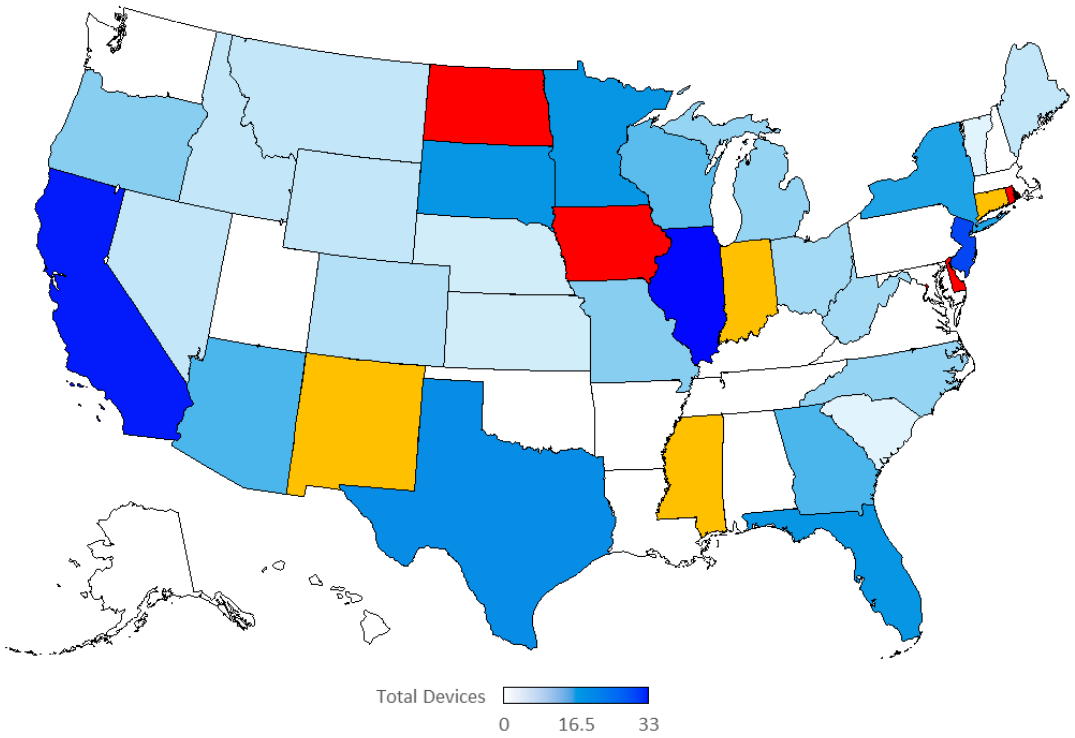
Comparison of previous surveys

Year	# Labs	Volume Transfer
2005		226
2006		239
2008	27	249
2010	33	304
2012	24	228
2014	25	231
2016	25	253
2018	29	292
2020	23	259
2022	28	305
2024	27	286

Table 19: 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.



IL	33	AK	0
CA	31	AL	0
NJ	26	AR	0
TX	18	HI	0
FL	17	KY	0
MN	17	LA	0
SD	17	MA	0
NY	15	MD	0
AZ	12	NH	0
GA	12	OK	0
WI	11	PA	0
MO	8	TN	0
OR	8	UT	0
MI	7	VA	0
NC	7	WA	0
OH	6	CT	No Data
WV	6	IN	No Data
CO	5	MS	No Data
ID	4	NM	No Data
ME	4	DE	Closed
MT	4	IA	Closed
NV	4	LA County	Closed
WY	4	ND	Closed
KS	3	PR	Closed
NE	3	RI	Closed
SC	2		
VT	2		

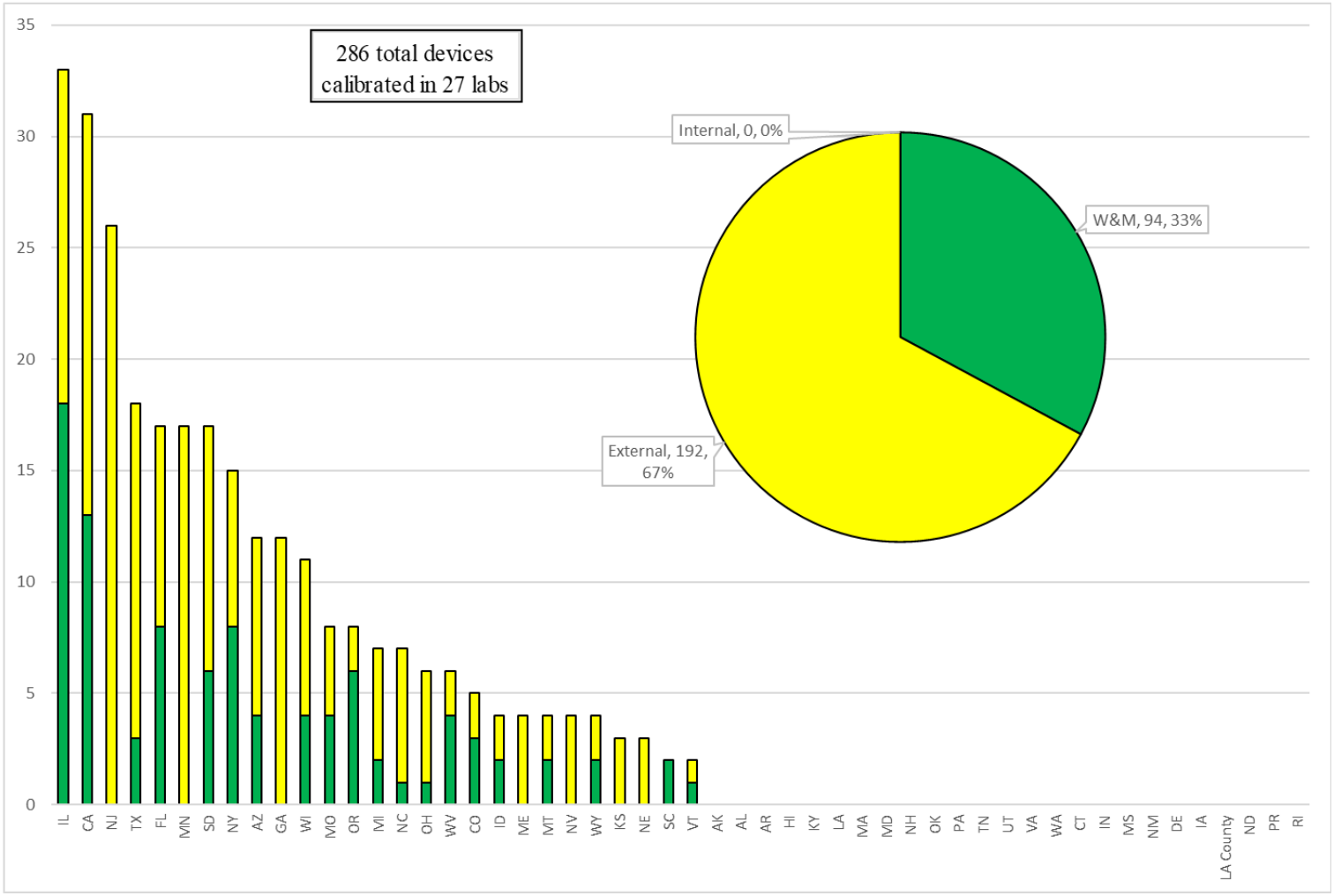


Figure 29: LPG Prover tests, volume transfer

Findings

(This section was deprecated in 2018 however prior history data has been retained in this report for convenience. See the new section titled “Small Volume Provers, Compact Displacement Provers, and Closed Loop Provers”)

Year	# Labs	Gravimetric	Volume Transfer	Total
2005		11	0	11
2006		20	0	20
2008	3	16	11	27 [MI,NC,VT]
2010	2	30	0	30 [MI,NC]
2012	3	57	0	57
2014	4	32	3	35
2016	3	31	0	31[AZ,MI,NC]

Table 20: SVP tests from previous surveys.

Small Volume Provers, Compact Displacement Provers, and Closed Loop Provers

Description

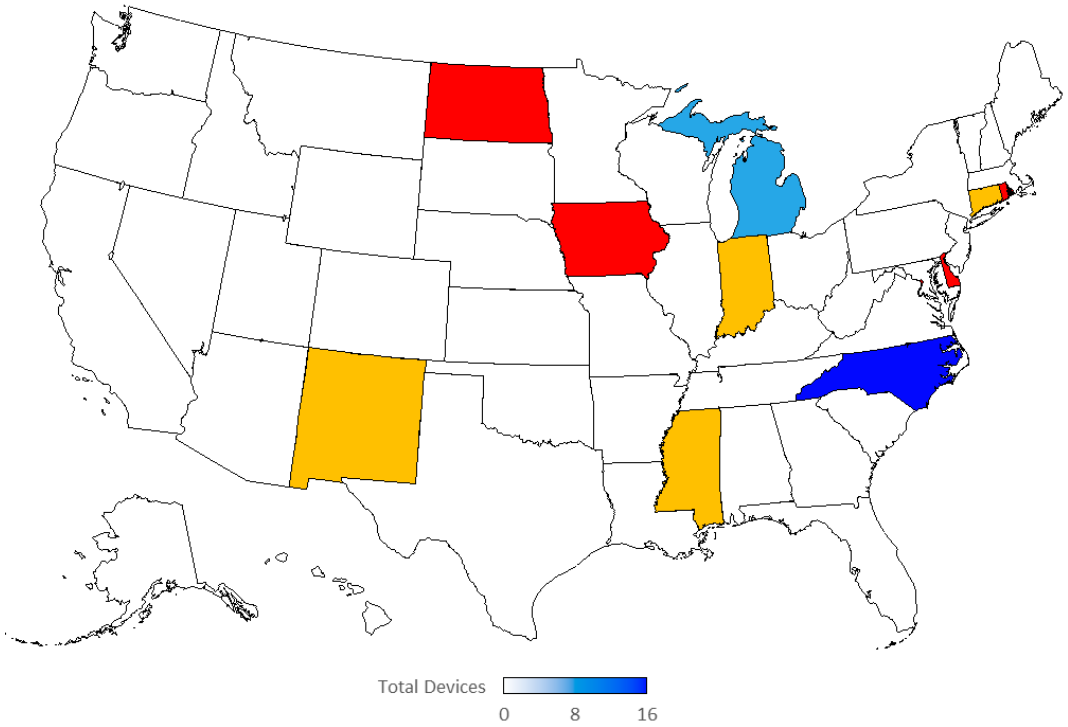
The graphs on the next two pages represent the total number of measurements performed on small volume provers, compact displacement provers, and closed loop provers by the 42 reporting laboratories. Each map graph illustrates the geographical distribution of these measurements. The pie graphs located on each map for each individual lab and a larger pie graph that reflects the totals. The bar graph at the bottom of the page shows the same customer 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.

Comparison of previous surveys

Year	# Labs	Total Devices
2018	2	28
2020	2	24
2022	2	19
2024	2	23

Table 21: Small Volume, Compact Displacement, and Closed Loop prover tests.



NC	16	OH	0
MI	7	OK	0
AK	0	OR	0
AL	0	PA	0
AR	0	SC	0
AZ	0	SD	0
CA	0	TN	0
CO	0	TX	0
FL	0	UT	0
GA	0	VA	0
HI	0	VT	0
ID	0	WA	0
IL	0	WI	0
KS	0	WV	0
KY	0	WY	0
LA	0	CT	No Data
MA	0	IN	No Data
MD	0	MS	No Data
ME	0	NM	No Data
MN	0	DE	Closed
MO	0	IA	Closed
MT	0	LA County	Closed
NE	0	ND	Closed
NH	0	PR	Closed
NJ	0	RI	Closed
NV	0		
NY	0		

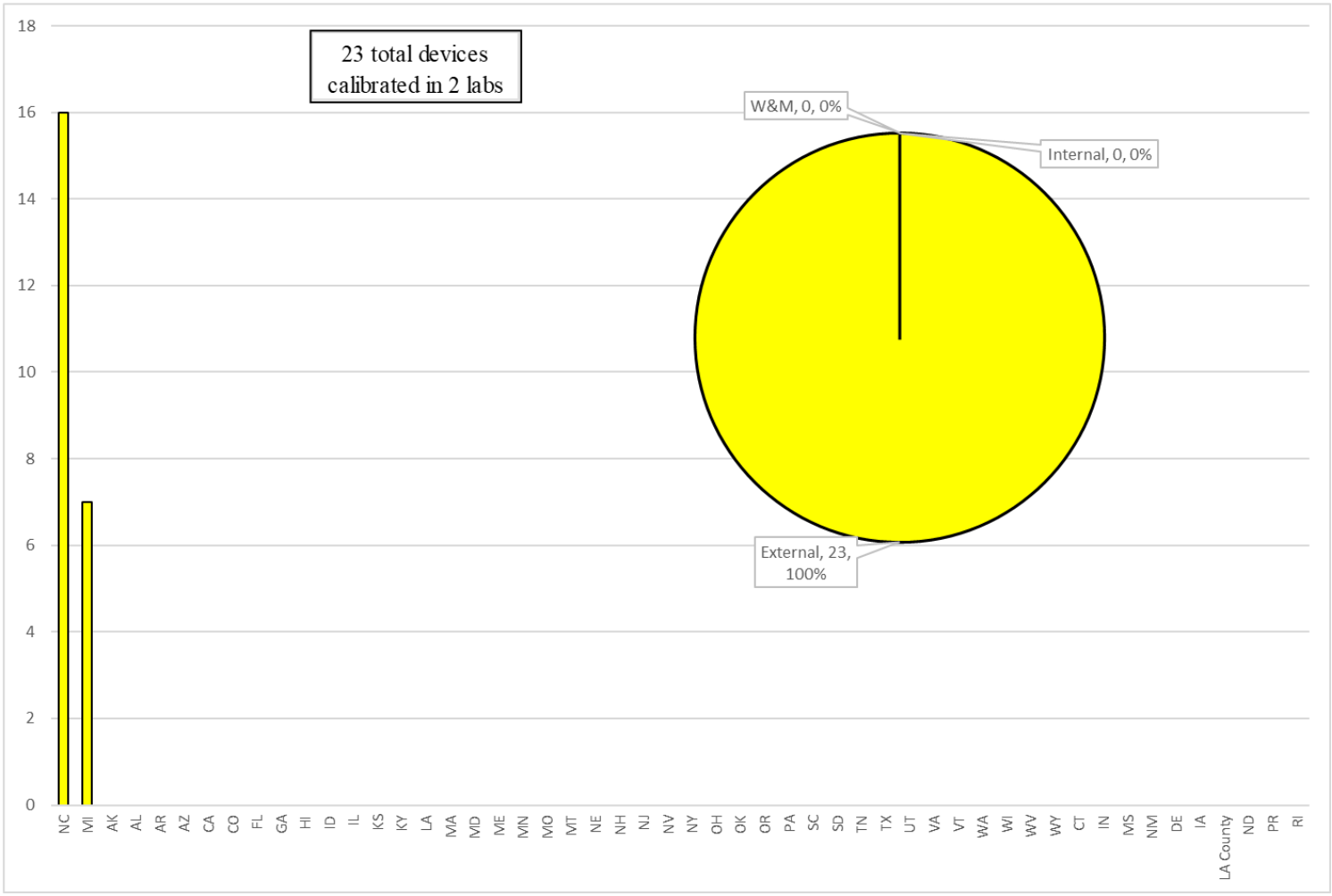


Figure 30: Small Volume, Compact Displacement, and Closed Loop prover tests

Temperature

Description

The graphs on the next page represent the total number of measurements performed on temperature sensing devices by the 42 reporting laboratories. Each map graph illustrates the geographical distribution of these measurements. The pie graphs located on each map for each individual lab and a larger pie graph that reflects the totals. The bar graph at the bottom of the page shows the same customer 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.

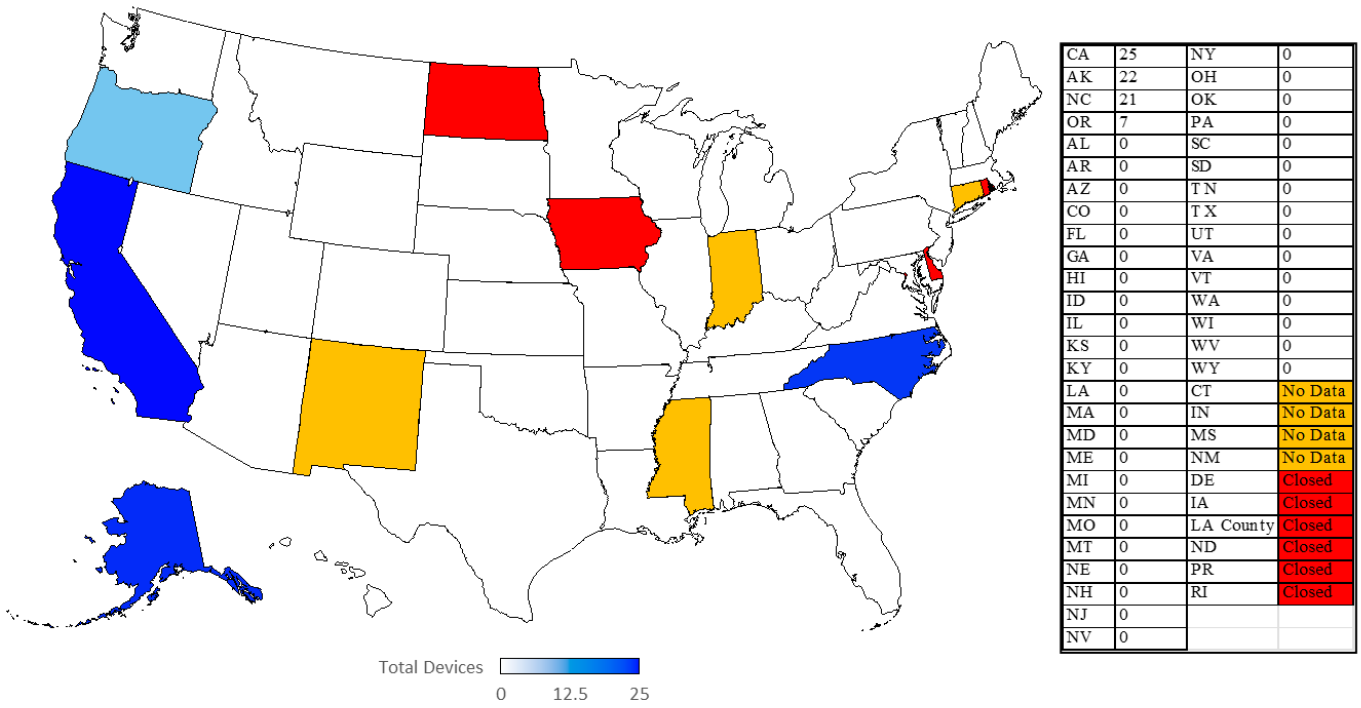
Comparison of previous surveys

Year	# Labs	Total Devices
1996	20	447
1998	11	378
1999	12	514
2000	16	460
2002	13	456
2004	12	315
2005	15	418
2006	12	281
2008	13	498
2010	11	465
2012	7	191
2014	6	192
2016	6	242
2018	5	216
2020	5	262
2022	5	314
2024	4	75

Table 22: Temperature standard tests from previous surveys.

Notes and Comments

- 16 % of all temperature standards were tested for internal use by the laboratory.
- 77 % of all temperature standards were tested for the weight and measures program.
- 7 % of all temperature standards were tested for external customers.



CA	25	NY	0
AK	22	OH	0
NC	21	OK	0
OR	7	PA	0
AL	0	SC	0
AR	0	SD	0
AZ	0	TN	0
CO	0	TX	0
FL	0	UT	0
GA	0	VA	0
HI	0	VT	0
ID	0	WA	0
IL	0	WI	0
KS	0	WV	0
KY	0	WY	0
LA	0	CT	No Data
MA	0	IN	No Data
MD	0	MS	No Data
ME	0	NM	No Data
MI	0	DE	Closed
MN	0	IA	Closed
MO	0	LA County	Closed
MT	0	ND	Closed
NE	0	PR	Closed
NH	0	RI	Closed
NJ	0		
NV	0		

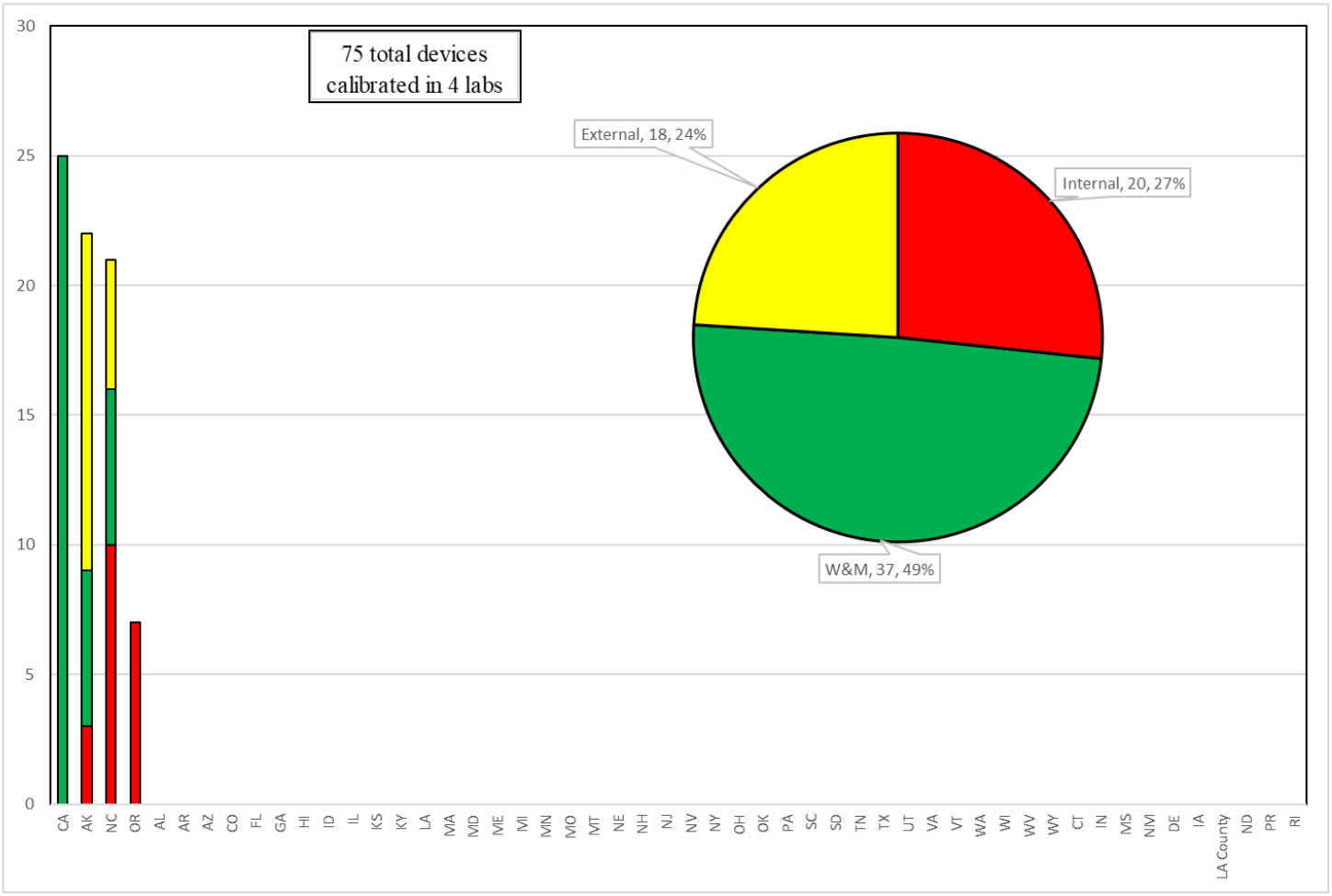


Figure 31: Temperature standard tests.

Frequency

Description

The graphs on the next page represent the total number of measurements performed on frequency standards by the 42 reporting laboratories. Each map graph illustrates the geographical distribution of these measurements. The pie graphs located on each map for each individual lab and a larger pie graph that reflects the totals. The bar graph at the bottom of the page shows the same customer 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.

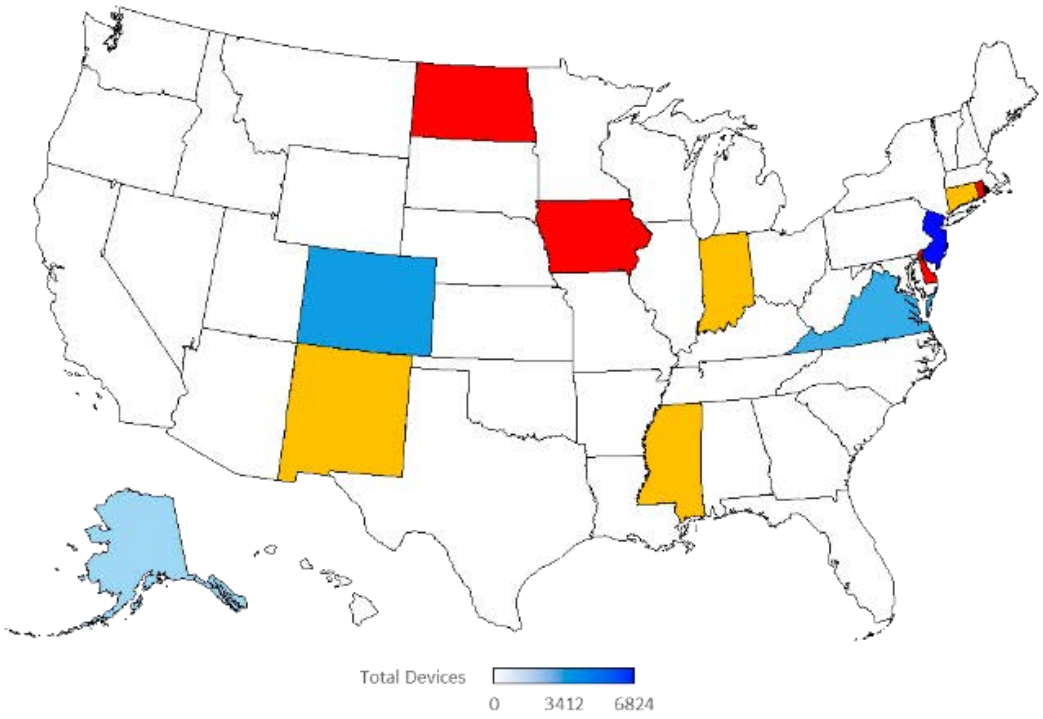
Comparison of previous surveys

Year	# Labs	Total Devices
1996	6	12,518
1998	4	11,561
1999	5	13,518
2000	7	14,670
2002	6	13,785
2004	3	14,772
2005	4	15,162
2006	4	14,832
2008	4	15,058
2010	4	17,580
2012	4	14,177
2014	4	13,282
2016	4	14,501
2018	3	10,054
2020	4	12,083
2022	4	13,220
2024	4	14,253

Table 23: Frequency standard tests from previous surveys.

Notes and Comments

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



NJ	6824	NY	0
CO	3298	OH	0
VA	2782	OK	0
AK	1349	OR	0
AL	0	PA	0
AR	0	SC	0
AZ	0	SD	0
CA	0	TN	0
FL	0	TX	0
GA	0	UT	0
HI	0	VT	0
ID	0	WA	0
IL	0	WI	0
KS	0	WV	0
KY	0	WY	0
LA	0	CT	No Data
MA	0	IN	No Data
MD	0	MS	No Data
ME	0	NM	No Data
MI	0	DE	Closed
MN	0	IA	Closed
MO	0	LA County	Closed
MT	0	ND	Closed
NC	0	PR	Closed
NE	0	RI	Closed
NH	0		
NV	0		

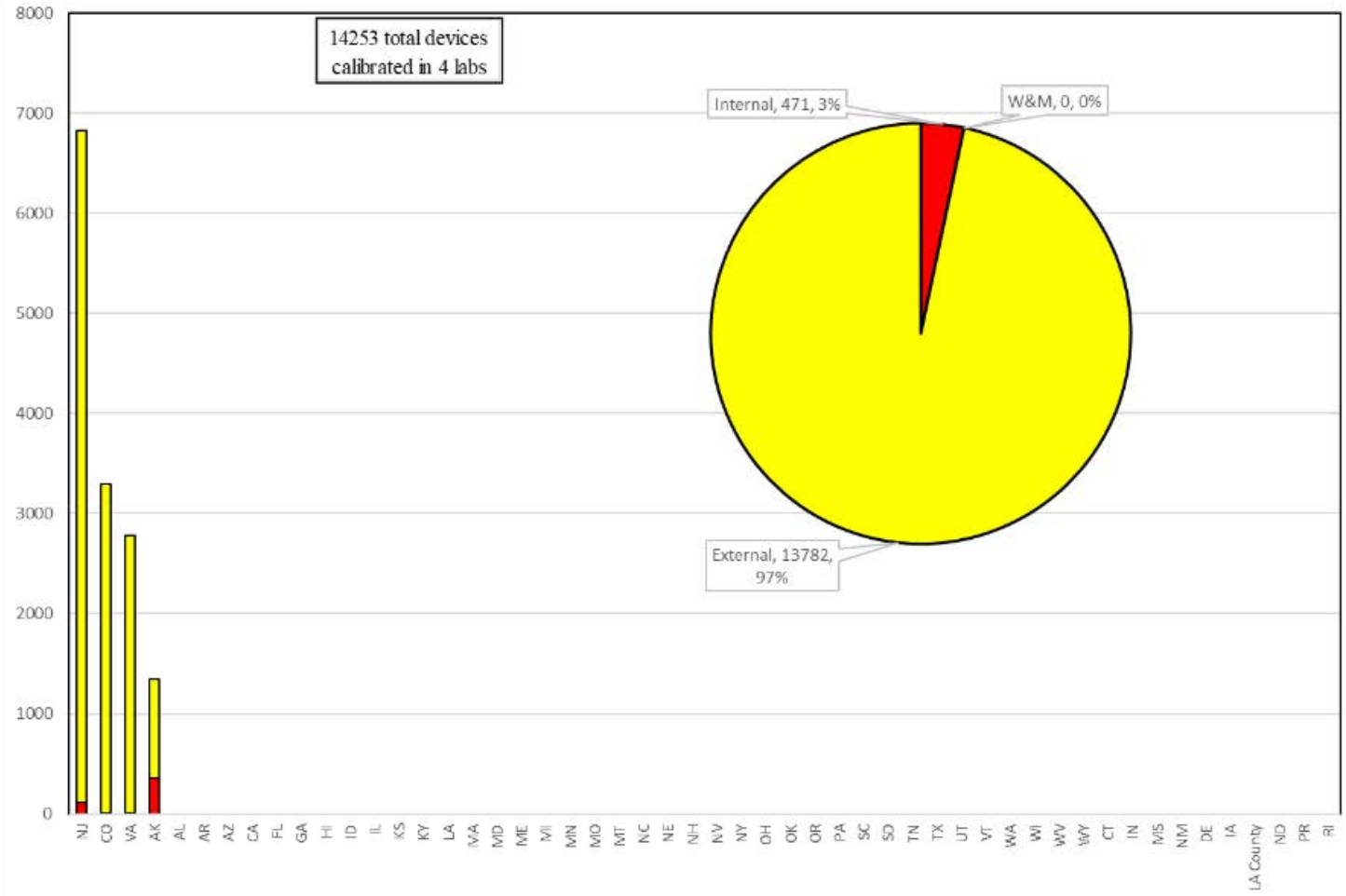


Figure 32: Frequency standard tests

Timing Devices

Description

The graphs on the next page represent the total number of measurements performed on timing devices by the 42 reporting laboratories. Each map graph illustrates the geographical distribution of these measurements. The pie graphs located on each map for each individual lab and a larger pie graph that reflects the totals. The bar graph at the bottom of the page shows the same customer 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.

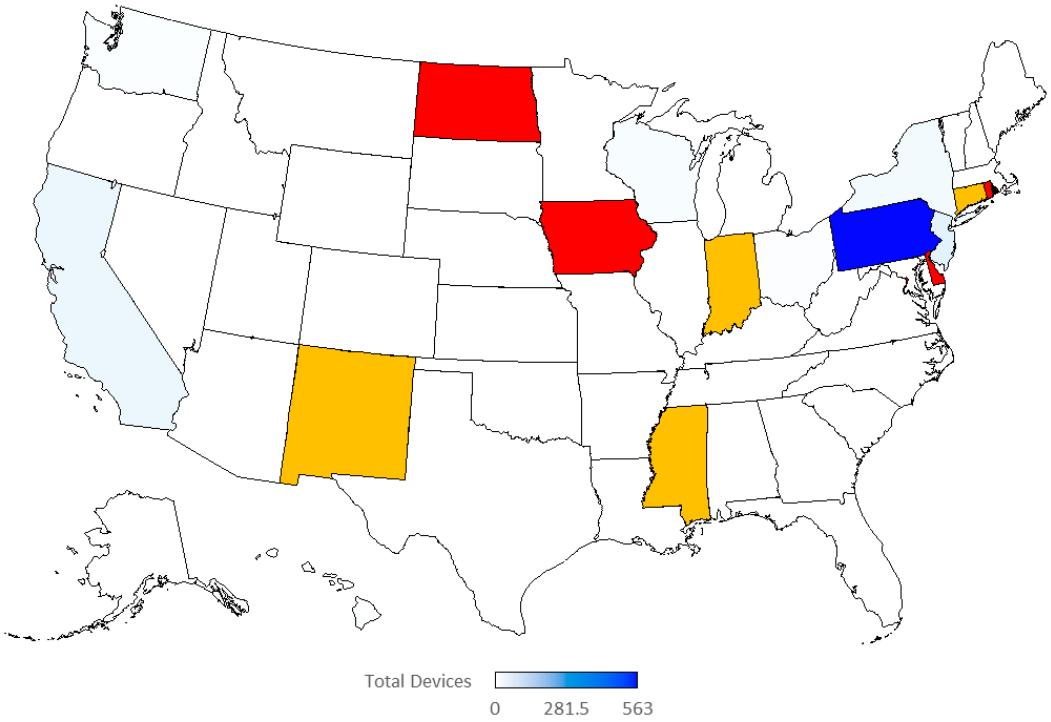
Comparison of previous surveys

Year	# Labs	Total Devices
1996	13	161
1998	11	380
1999	14	451
2000	13	554
2002	11	479
2004	9	951
2005	8	387
2006	11	365
2008	11	401
2010	9	339
2012	10	577
2014	7	600
2016	8	506
2018	9	4306
2020	9	572
2022	7	642
2024	8	651

Table 24: Timing devices tests from previous surveys

Notes and Comments

- 3 % of all timing devices were tested for internal use by the laboratory.
- 17 % of all timing devices were tested for the weight and measures program.
- 80 % of all timing devices were tested for external customers.



PA	563	NC	0
NJ	33	NE	0
CA	21	NH	0
NY	15	NV	0
WI	9	OK	0
OH	5	OR	0
WA	4	SC	0
HI	1	SD	0
AK	0	TN	0
AL	0	TX	0
AR	0	UT	0
AZ	0	VA	0
CO	0	VT	0
FL	0	WV	0
GA	0	WY	0
ID	0	CT	No Data
IL	0	IN	No Data
KS	0	MS	No Data
KY	0	NM	No Data
LA	0	DE	Closed
MA	0	IA	Closed
MD	0	LA County	Closed
ME	0	ND	Closed
MI	0	PR	Closed
MN	0	RI	Closed
MO	0		
MT	0		

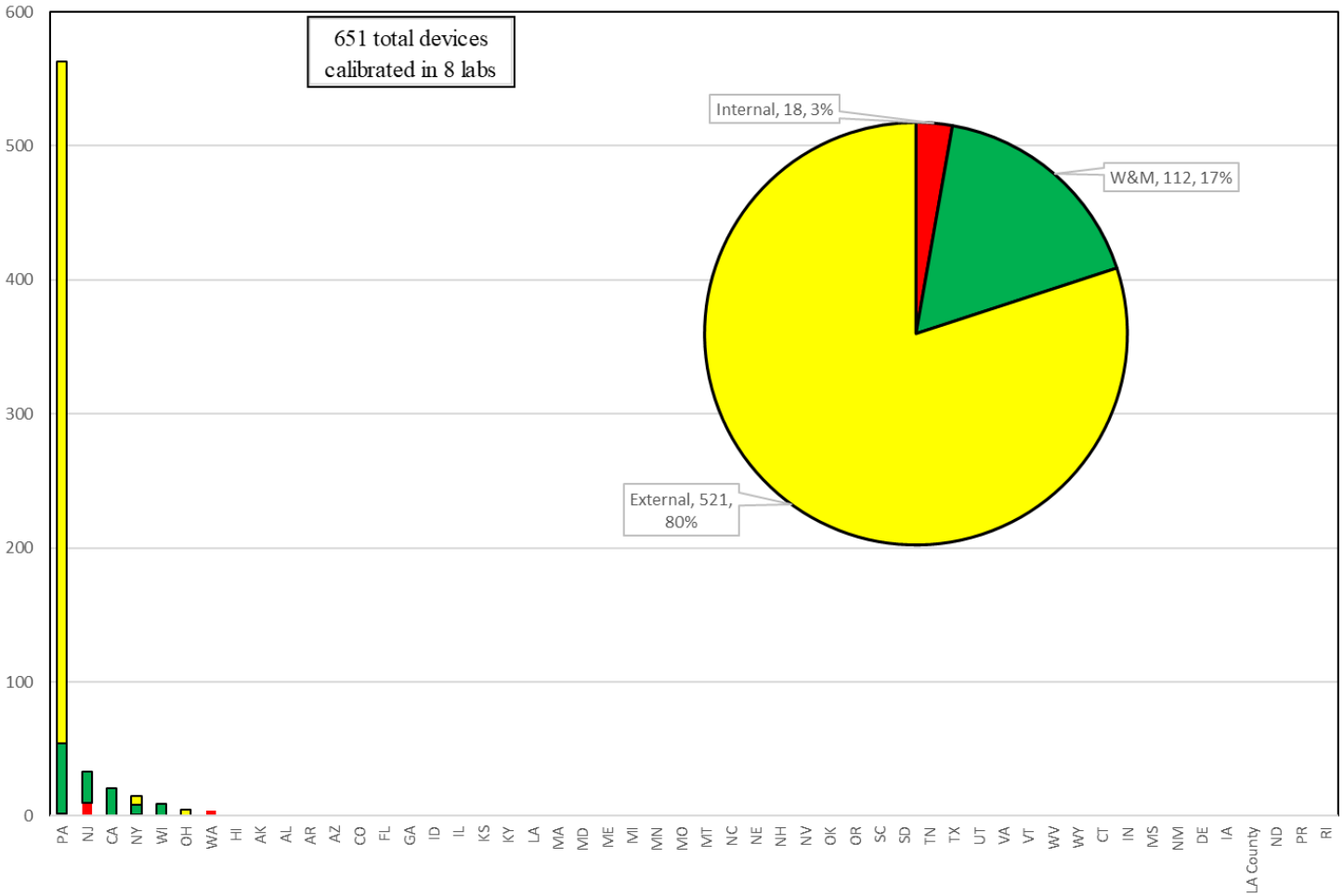


Figure 33: Timing device tests

Wheel Load Weighers

Description

The graphs on the next page represent the total number of measurements performed on wheel load weighers by the 42 reporting laboratories. Each map graph illustrates the geographical distribution of these measurements. The pie graphs located on each map for each individual lab and a larger pie graph that reflects the totals. The bar graph at the bottom of the page shows the same customer 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.

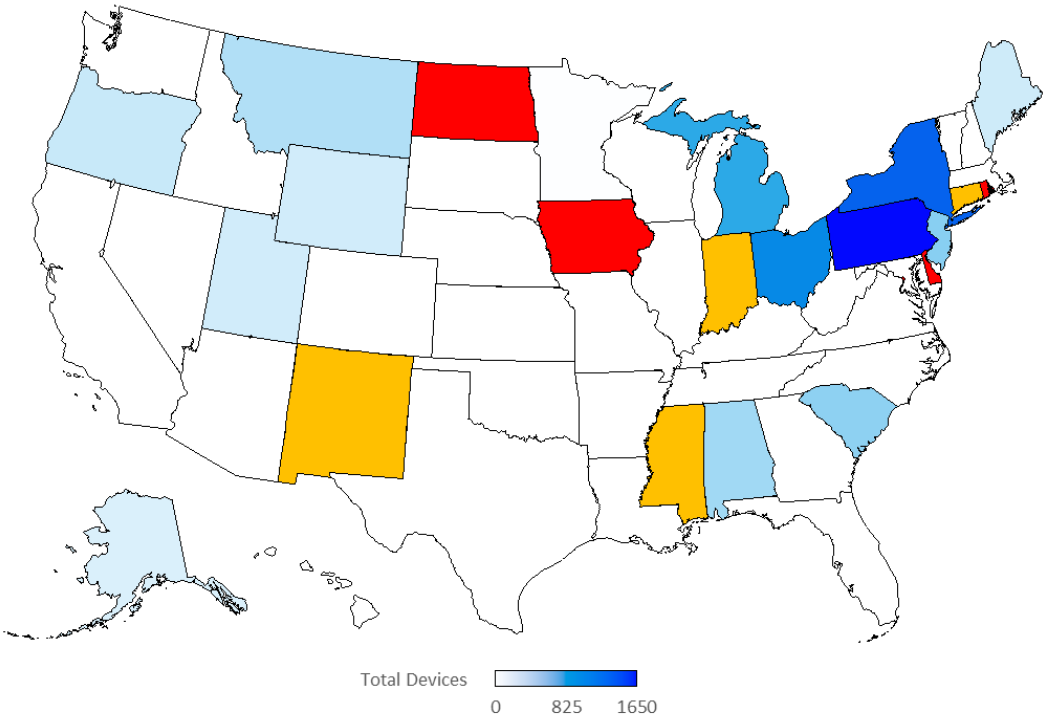
Comparison of previous surveys

Year	# Labs	Total Devices
1998	19	12,178
1999	20	12,781
2000	22	13,699
2002	23	10,350
2004	21	10,884
2005	19	9,748
2006	20	10,567
2008	22	10,191
2010	20	10,815
2012	17	7,050
2014	16	6,515
2016	14	6,541
2018	15	6,476
2020	15	5,934
2022	12	5,759
2024	14	6,539

Table 25: Wheel load weigher tests from previous surveys

Notes and Comments

- 1 % of all wheel load weighers were tested for internal use by the laboratory.
- 0 % of all wheel load weighers were tested for the weight and measures program.
- 99 % of all wheel load weighers were tested for external customers.



PA	1650	MD	0
NY	1142	MO	0
OH	921	NC	0
MI	701	NE	0
NJ	396	NH	0
SC	376	NV	0
AL	313	OK	0
MT	260	SD	0
OR	182	TN	0
ME	164	TX	0
WY	154	VA	0
UT	152	VT	0
AK	122	WA	0
MN	6	WI	0
AR	0	WV	0
AZ	0	CT	No Data
CA	0	IN	No Data
CO	0	MS	No Data
FL	0	NM	No Data
GA	0	DE	Closed
HI	0	IA	Closed
ID	0	LA County	Closed
IL	0	ND	Closed
KS	0	PR	Closed
KY	0	RI	Closed
LA	0		
MA	0		

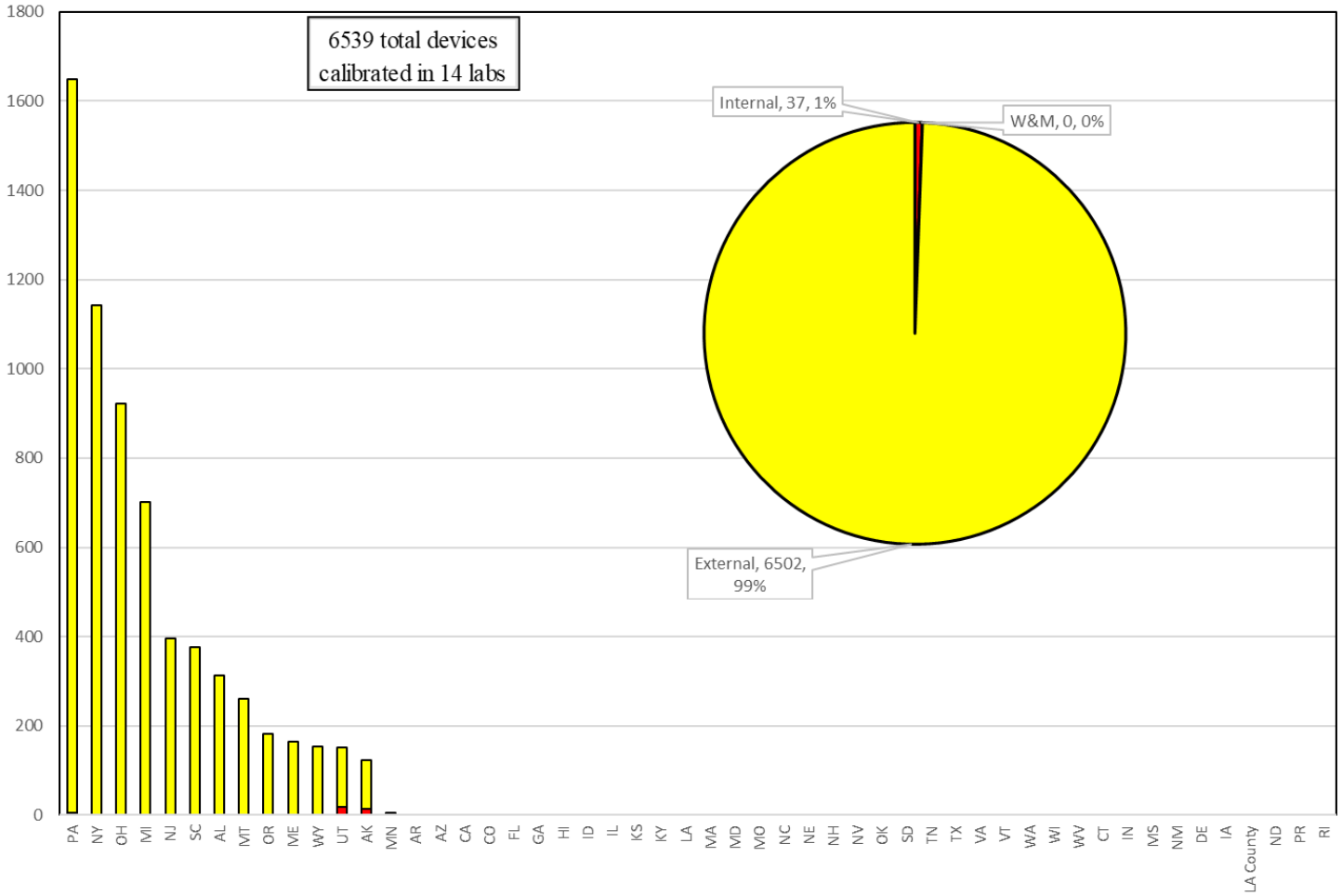


Figure 34: Wheel load weigher test

Electric Watt-hour Meters (NEW 2022)

Description

The graphs on the next page represent the total number of measurements performed on watt-hour meters used to support the testing of electric vehicle charging stations by the 42 reporting laboratories. Each map graph illustrates the geographical distribution of these measurements. The pie graphs located on each map for each individual lab and a larger pie graph that reflects the totals. The bar graph at the bottom of the page shows the same customer 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.

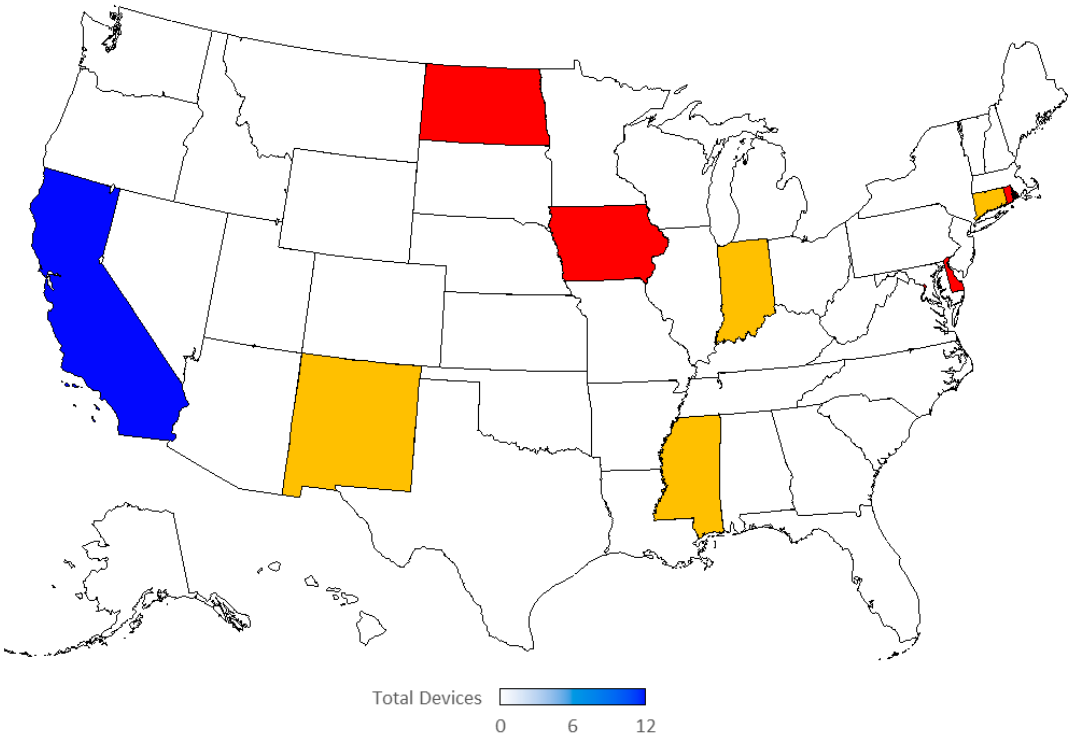
Comparison of previous surveys

Year	# Labs	Total Devices
2022	1	22
2024	1	12

Table 26: Timing devices tests from previous surveys

Notes and Comments

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



CA	12	OH	0
AK	0	OK	0
AL	0	OR	0
AR	0	PA	0
AZ	0	SC	0
CO	0	SD	0
FL	0	T N	0
GA	0	T X	0
HI	0	UT	0
ID	0	VA	0
IL	0	VT	0
KS	0	WA	0
KY	0	WI	0
LA	0	WV	0
MA	0	WY	0
MD	0	CT	No Data
ME	0	IN	No Data
MI	0	MS	No Data
MN	0	NM	No Data
MO	0	DE	Closed
MT	0	IA	Closed
NC	0	LA County	Closed
NE	0	ND	Closed
NH	0	PR	Closed
NJ	0	RI	Closed
NV	0		
NY	0		

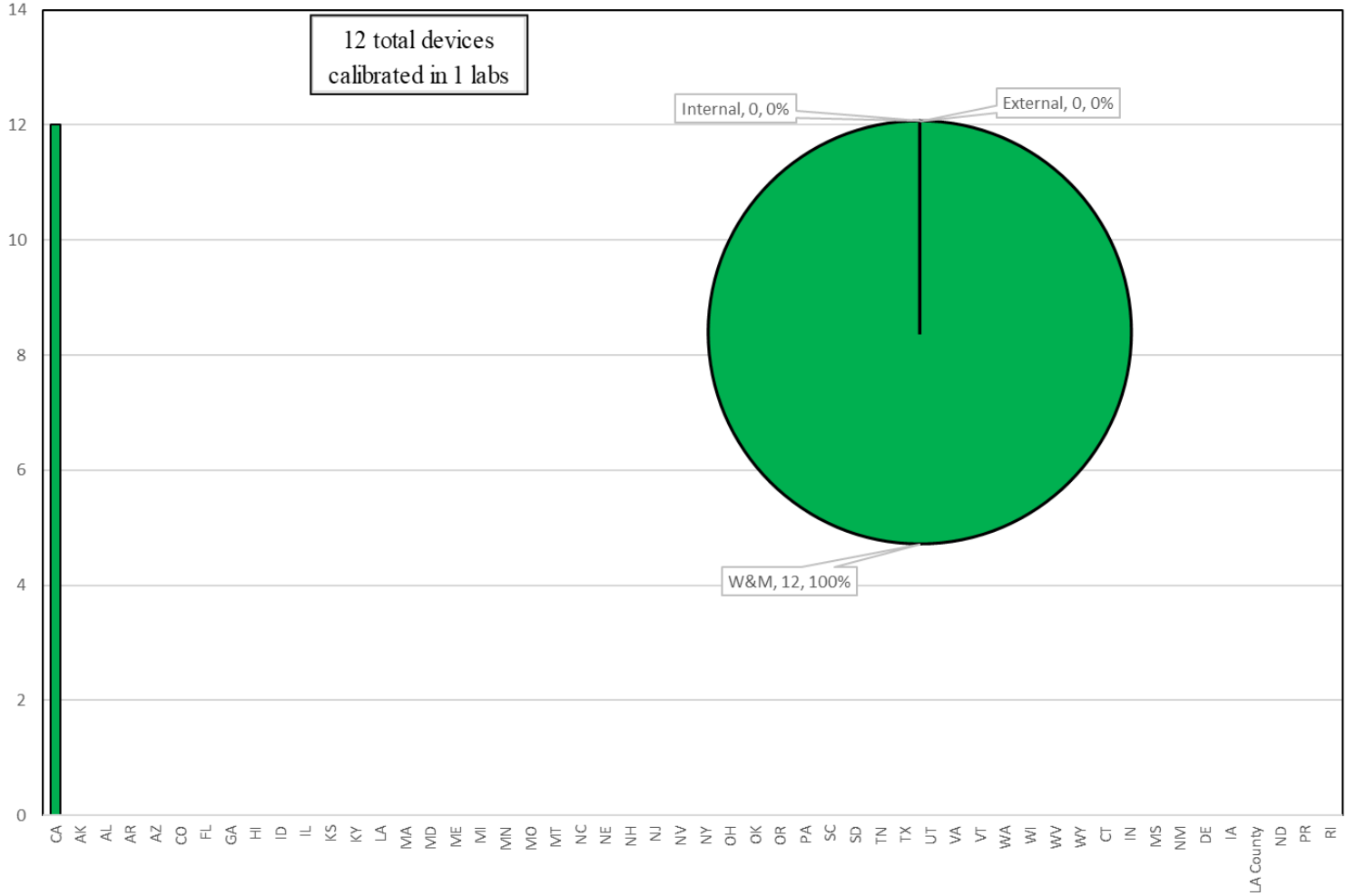


Figure 35: Electric Watt-hour Meters

Lottery Balls

Description

The graphs on the next page represent the total number of measurements performed on lottery balls by the 42 reporting laboratories. Each map graph illustrates the geographical distribution of these measurements. The pie graphs located on each map for each individual lab and a larger pie graph that reflects the totals. The bar graph at the bottom of the page shows the same customer 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.

Comparison of previous surveys

Year	# Labs	Total Devices
1999	9	19,982
2000	13	24,702
2002	11	35,818
2004	11	40,939
2005	9	47,920
2006	9	41,068
2008	10	42,553
2010	8	46,515
2012	7	13,924[7]
2014	8	40,899
2016	6	80,946[8]
2018	4	11,087[9]
2020	5	9,600
2022	5	12,653
2024	4	12,551

Table 27: Lottery balls tests from previous surveys

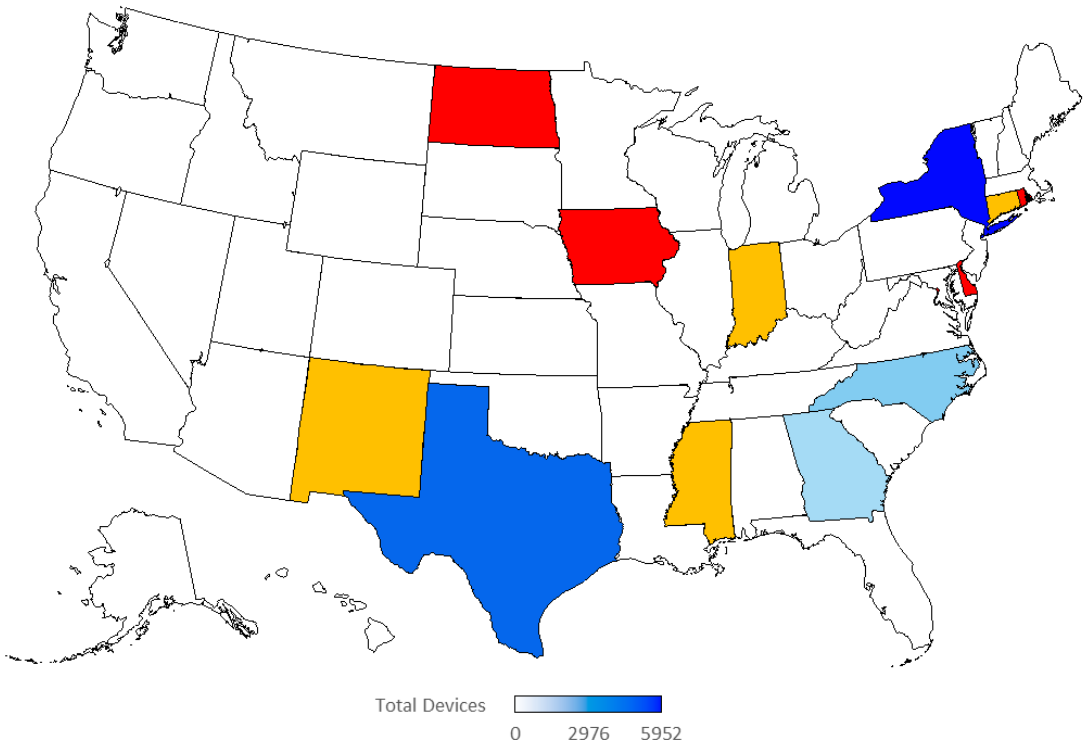
Notes and Comments

- 100 % of all lottery balls were tested for external customers.

[7] The metrology laboratory in Puerto Rico, which normally performs approximately 30,000 of the total number of lottery balls tests, did not submit survey responses in 2012.

[8] The metrology laboratory in Puerto Rico, which performs approximately 30,000 of the total number of lottery balls tests, reported 69,800 in 2016.

[9] The metrology laboratory in Puerto Rico, which normally performs approximately 30,000 of the total number of lottery balls tests, did not submit survey responses in 2018.



NY	5952	NV	0
TX	4019	OH	0
NC	1505	OK	0
GA	1075	OR	0
AK	0	PA	0
AL	0	SC	0
AR	0	SD	0
AZ	0	TN	0
CA	0	UT	0
CO	0	VA	0
FL	0	VT	0
HI	0	WA	0
ID	0	WI	0
IL	0	WV	0
KS	0	WY	0
KY	0	CT	No Data
LA	0	IN	No Data
MA	0	MS	No Data
MD	0	NM	No Data
ME	0	DE	Closed
MI	0	IA	Closed
MN	0	LA County	Closed
MO	0	ND	Closed
MT	0	PR	Closed
NE	0	RI	Closed
NH	0		
NJ	0		

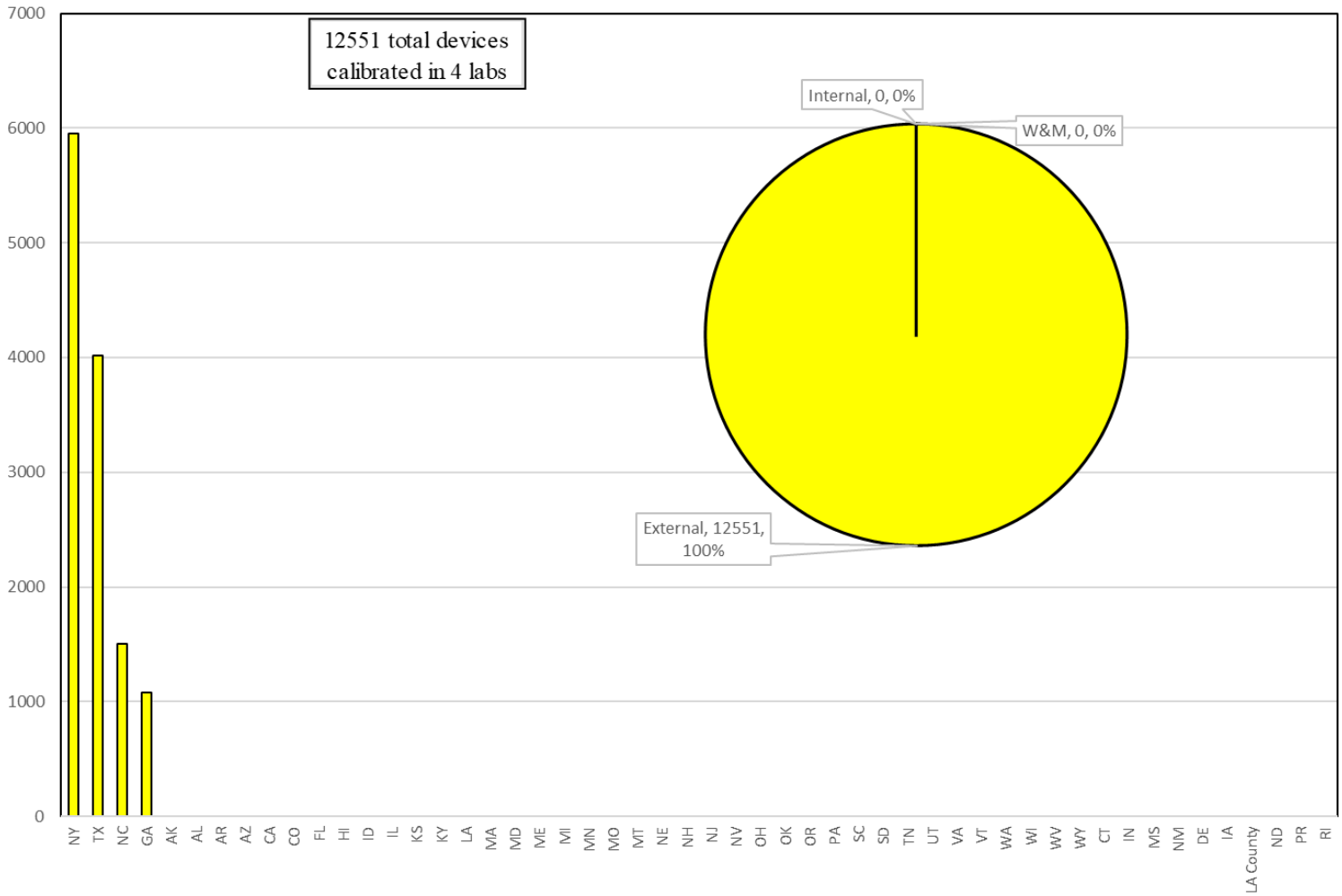


Figure 36 Lottery Ball tests

Summary Other Tests

The category of "Other Tests" is included to give each of the SLP laboratories an opportunity to report calibration work done on devices that did not fit into any of the other categories in the survey. This should not be considered to be an exhaustive list as it was up to each laboratory to determine which tests were worth including in the workload survey and survey allowed for only 3 additional responses per laboratory surveyed.

State	Description	Lab	Weights and Measures	External	Total
Alaska	Witness testing of residential Watt-Hour Meter	0	0	1	1
Alaska	Distance testing LIDAR units for law enforcement	0	0	80	80
California	Watt-Hour Standards used to test AC Submeters	0	12	0	12
Minnesota	Internal Compairison of environmental monitoring devices	4	0	0	4
Minnesota	Datalogger - internal only	7	0	0	7
New Jersey	Scales < 1000 lb capacity	0	34	130	164
New Jersey	Laser Devices	0	0	46	46
New Jersey	Water Meter Bench Provers	2	0	57	59
Pennsylvania	Force Gauges ≤ 30 lbf	0	0	12	12
Texas	Neck Calibrations	0	0	122	122
Vermont	Hydrometers	0	0	5771	5771
Wyoming	Gas Pump Inspection - lab staff are also assigned field inspection duties	0	1725	0	1725
Wyoming	Large Capacity Scale Inspection - lab staff are also assigned field inspection duties	0	285	0	285
Wyoming	Small scale inspections - lab staff are also assigned field inspection duties	0	310	0	310

Table 28: Other tests reported by the participating laboratories

Laboratory Fees

Description

This information is provided as guidance for SLP member laboratories evaluating the fees they charge for measurement services as well as potential clients whom use their services.

The SLP laboratories charge fees for the calibration work they perform; when reviewing the fee estimates in this section consider;

- laboratories may provide an hourly rate and bill real time for all work done,
- laboratories may provide an hourly rate and bill based on the typical time to complete a calibration,
- laboratories may charge a fixed fee for routine calibration work,
- laboratories may charge additional fees for cleaning, repair, adjusting, packaging, etc. which are outside of that which is normally required to prepare measurement standards for calibration.

The time it takes for any one laboratory to calibrate a particular item will vary significantly between laboratories because of differences in the staffing level, staff experience, the facility, the available weight handling equipment, and the available measurement equipment.

Laboratories were asked to quote the typical fee that they would charge for the various routine measurements instead of providing 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[10].

Additional Notes:

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

[10] Actual fees may differ from those indicated for a variety of reasons including but not limited to the number of required adjustments and the general condition of the equipment as delivered to the laboratory.

Fees for Out of State Customers

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;

Georgia
Kansas
North Carolina
Oklahoma
Vermont
Wyoming

Details on labs charging higher rates for out-of-state customers may be found in the comments for sections 8-32 published in this report beginning on page 158.

Fees for Local Government Weights and Measures Programs

Labs were asked if they charge local government for the calibration of W&M field test equipment used for regulatory purposes. The following labs indicated that they charge for calibrating city, county, township (political jurisdiction W&M) equipment and standards:

Alaska
Arizona
California
Colorado
Florida
Idaho
Kansas
Kentucky
Louisiana
Maryland
Michigan
Minnesota
Missouri
North Carolina
Nebraska
New Hampshire
Nevada
New York
Oregon
South Dakota
Utah
Virginia
Vermont
Washington
West Virginia

NOTE: Labs may not charge because they provide the service pro bono or because there is an absence of W&M programs operated at the county, city, or township level in the region.

Fees for in State Registered Service Companies

Labs were asked if they charge for the calibration of field test equipment used by registered placed in service agents where the agent is registered within the lab's jurisdiction. The following labs indicated that they charge for calibrating registered service company equipment and standards:

Alaska
Alabama
Arkansas
Arizona
California
Colorado
Florida
Georgia
Hawaii
Idaho
Illinois
Kansas
Kentucky
Louisiana
Massachusetts
Maryland
Maine
Michigan
Minnesota
Missouri
Montana
North Carolina
Nebraska
New Hampshire
New Jersey
Nevada
New York
Ohio
Oklahoma
Oregon
Pennsylvania
South Carolina
South Dakota
Tennessee
Texas
Utah
Virginia
Vermont
Washington
Wisconsin
West Virginia
Wyoming

NOTE: Not all states operate a service agent registration program.

Fees for “in Jurisdiction” Weights and Measures Programs

Labs were asked if they charge for the calibration of W&M field test equipment used by the W&M program within the lab’s jurisdiction. Normally this question addresses W&M programs operated at the state government level. The following labs indicated that they charge for calibrating W&M field equipment and standards:

Colorado
South Dakota
Washington

Laboratory Fee Data Presentation

Fee data are plotted as box and whisker charts showing distribution of reported fees into quartiles delineated by boxes, the mean value, and whiskers are intended to highlight both the mean and outliers.

Fees are also tabulated in order from highest to lowest. Each fee table includes the fee estimate provided by each responding laboratory, the estimated calibration time, and indicators which are meant to show whether the laboratory figures packing, equipment setup, certificate preparation, and maintenance of statistical controls explicitly as part of the calibration time estimate.

Historical average fees are reported with each section.

Minimum Laboratory Fees

Description

Labs may enforce a minimum charge to cover all the basic costs associated with performing small calibration jobs. Each laboratory was asked if a minimum calibration fee is assessed and the responses are provided in Figure 37 on page 91. Fees are omitted if the reporting lab is not recognized or accredited in the calibration

Lab	Minimum Fee	Adjustment Fee	Handling Fee	Certificate Fee
NV	$190.00	+		
IL	$155.00	+	+	+
OR	$149.00	+	+	+
WI	$146.40	+	+	+
MO	$125.00			
AK	$85.00			
NE	$80.00	+	+	+
MT	$75.00			
VT	$75.00			
MI	$72.50			
ID	$60.00			
GA	$55.00			
WA	$52.75			
AZ	$50.00			
KS	$50.00		+	
OH	$50.00	+	+	
MA	$45.00	+		+
SC	$45.00			
CO	$40.00			
ME	$40.00			
FL	$25.00			
NC	$25.00			
UT	$25.00			
HI	$20.00			
AL				
AR				
CA				
KY				
LA				
MD				
MN				
NH				
NJ				
NY				
OK				
PA				
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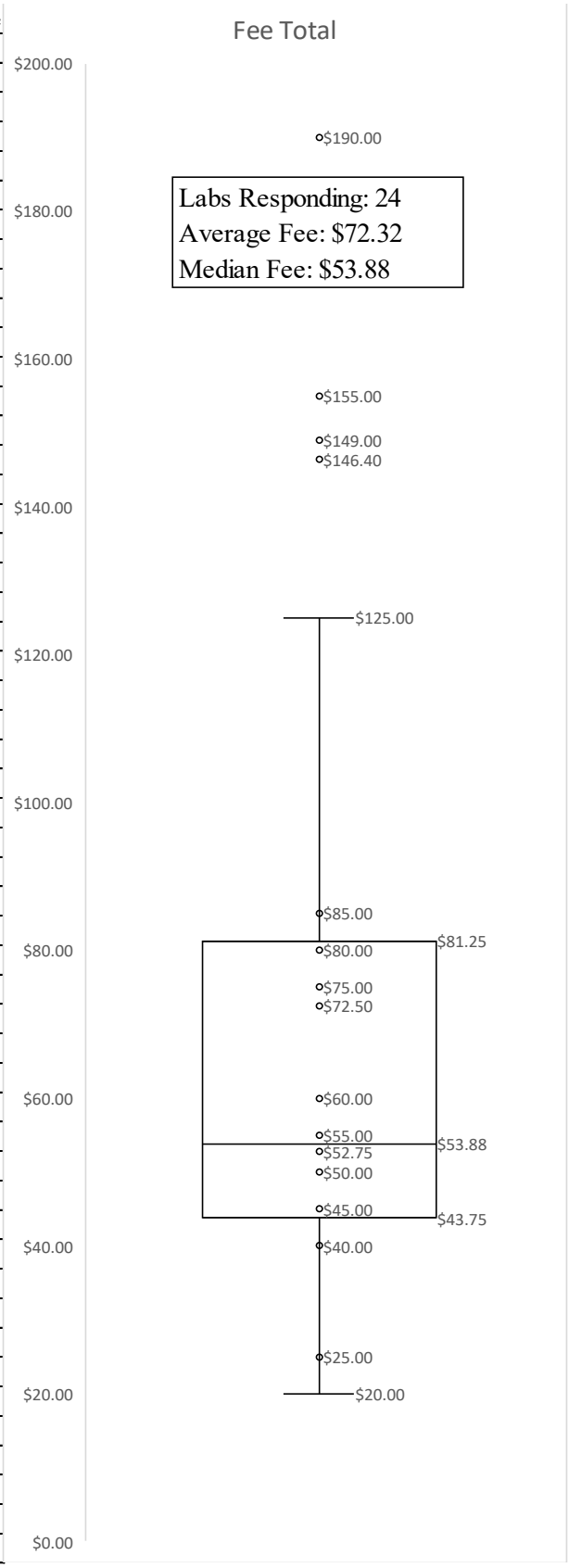

Figure 37: Minimum laboratory fees charged.

Mass Echelon I

Description

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

Comparison of Previous Surveys

Survey	Labs Reporting	Average Fee
2004	15	$617.87
2006	16	$758.75
2008	14	$700.07
2010	15	$780.83
2012	14	$820.18
2014	15	$870.90
2016	13	$922.23
2018	10	$933.07
2020	9	$1,028.00
2022	9	$1,264.25
2024	8	$1,145.15

Table 29: Average fee charged for Echelon I mass testing.

Lab	Calibration Fee	Price Per Weight	Per Weight Adjustment Fee	Handling Fee	Certificate Fee
MI	$1,812.50	$86.31			
OR	$1,788.00	$85.14	Yes	Hourly rate	Hourly rate
MN	$1,146.60	$54.60	$91.00		$54.60
CO	$1,120.00	$53.33			
WA	$945.12	$45.01			
KS	$840.00	$40.00	$40.00	$20.00	
HI	$819.00	$39.00			
NC	$690.00	$32.86			
AK					
AL					
AR					
AZ					
CA					
FL					
GA					
ID					
IL					
KY					
LA					
MA					
MD					
ME					
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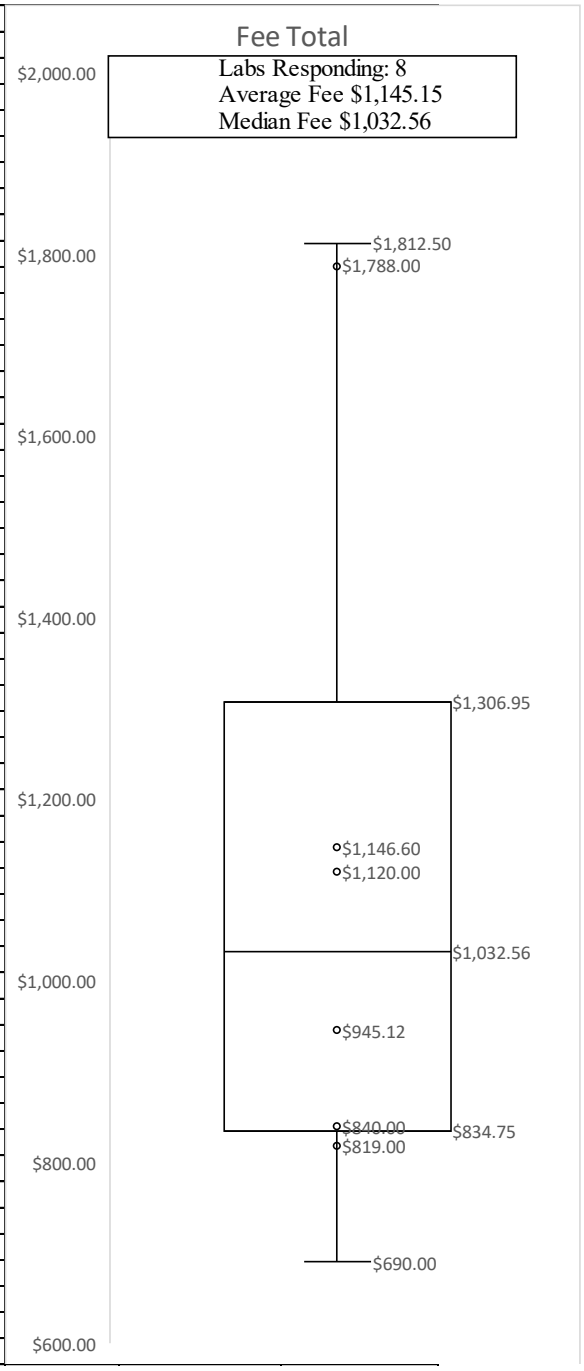

Figure 38: Fees charge for calibrating a precision weight kit containing 21 individual weights ranging from 100 g to 1 mg to ASTM Class 0 tolerances using Echelon I testing techniques.

Mass Echelon II

Description

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

Comparison of Previous Surveys

Survey	Labs Reporting	Average Fee
2000	33	$334.00
2002	39	$414.32
2004	30	$431.43
2006	31	$482.87
2008	29	$496.18
2010	29	$522.09
2012	25	$636.25
2014	27	$601.17
2016	26	$671.85
2018	23	$594.27
2020	22	$620.09
2022	24	$687.98
2024	29	$754.15

Table 30: Average fee charged for Echelon II mass testing.

Lab	Calibration Fee	Price Per Weight	Per Weight Adjustment Fee	Handling Fee	Certificate Fee
OR	$1,788.00	$85.14	Yes	Hourly rate	Hourly rate
TX	$1,470.00	$70.00	$10.00		
PA	$1,365.00	$65.00			
CA	$1,200.00	$57.14			
NY	$1,050.00	$50.00			$210.00
ID	$945.00	$45.00			
MI	$913.50	$43.50	$29.00		
AK	$850.00	$40.48			
FL	$840.00	$40.00			
NV	$760.00	$36.19	Charged per hour		
MO	$750.00	$35.71			
WA	$747.23	$35.58			
MN	$709.80	$33.80	$18.20		$36.40
NC	$690.00	$32.86			
GA	$630.00	$30.00			
HI	$630.00	$30.00			
VA	$588.00	$28.00			
LA	$525.00	$25.00	$25/weight		
TN	$525.00	$25.00			
WI	$504.00	$24.00	$24.00		$40.00
OH	$500.00	$23.81	$30.00	$10.00	
ME	$480.00	$22.86			
AZ	$440.00	$20.95			
CO	$440.00	$20.95	$20.00		
KS	$420.00	$20.00	$40.00	$20.00	
SC	$409.50	$19.50	2x the price per weight		
SD	$192.00	$9.14			
AL					
AR					
IL					
KY					
MA					
MD					
MT					
NE					
NH					
NJ					
OK					
UT					
VT					
WV					
WY					
CT					
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LA County					
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RI					

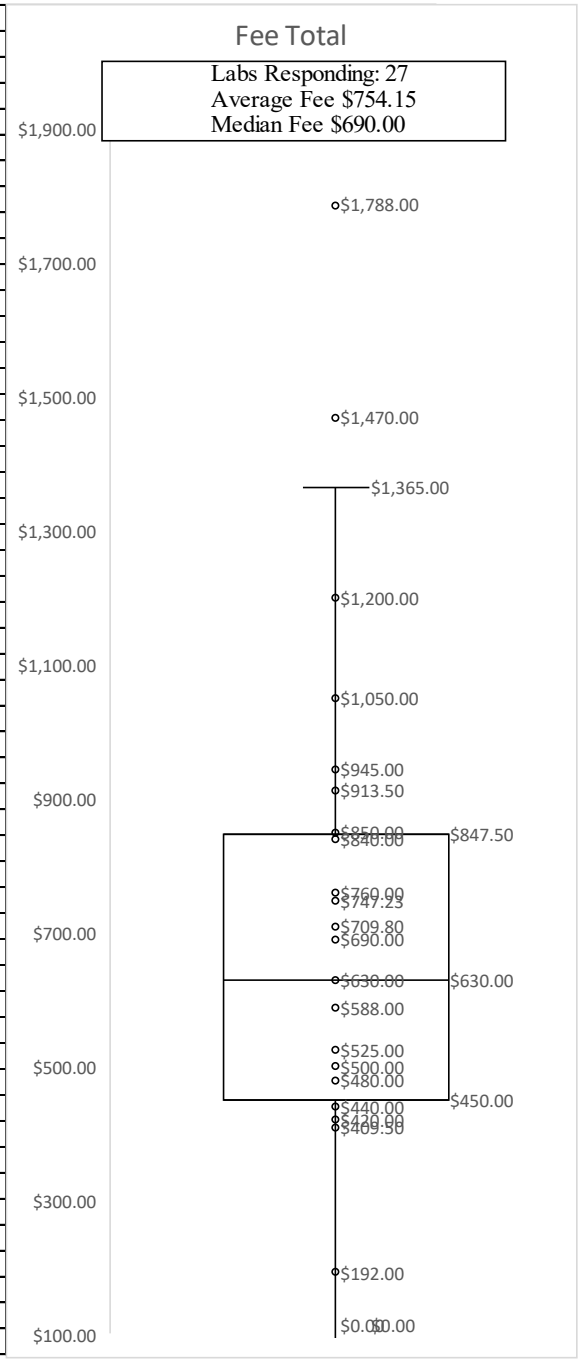

Figure 39: Fees charge for calibrating a precision weight kit containing 21 individual weights ranging from 100 g to 1 mg to ASTM Class 2 tolerances using Echelon II testing techniques.

Mass Echelon III (31 lb kits)

Description

Each laboratory was asked to estimate the fee charged for testing a 31 lb weight kit containing 22 pieces to NIST Class F tolerances using Echelon III procedures (NIST Handbook 105-1 "Specifications for Field Standard Test Weights (NIST Class F)", 1990).

Comparison of Previous Surveys

Survey	Labs Reporting	Average Fee
2000	36	$77.00
2002	41	$94.99
2004	38	$121.13
2006	42	$135.64
2008	44	$156.93
2010	41	$179.30
2012	43	$186.93
2014	46	$187.56
2016	47	$203.97
2018	43	$201.28
2020	43	$185.99
2022	40	$202.52
2024	42	$198.40

Table 31: Average fee charged for Echelon III mass testing.

Lab	Calibration Fee	~Price Per Weight	Per Weight Adjustment Fee	Handling Fee	Certificate Fee
HI	$440.00	$20.00			
NJ	$440.00	$20.00			
PA	$440.00	$20.00	2x the price per weight		
TX	$440.00	$20.00	$10.00		
OR	$372.50	$16.93	Yes	Hourly rate	Hourly rate
WA	$330.90	$15.04			
CA	$330.00	$15.00			
MI	$319.00	$14.50	$14.50		
IL	$310.00	$14.09	Per hour	Per hour	Per hour
AK	$300.00	$13.64			
NV	$285.00	$12.95	Charged per hour		
NY	$250.00	$11.36			$50.00
ID	$242.00	$11.00			
ME	$200.00	$9.09			
OH	$200.00	$9.09	$30.00	$10.00	
OK	$198.00	$9.00	3x the price per weight		
WI	$176.00	$8.00	$24.00		$40.00
AZ	$165.00	$7.50			
MA	$165.00	$7.50			$25.00
TN	$165.00	$7.50	2x the price per weight		
MN	$163.80	$7.45	$9.10		$36.40
AR	$154.00	$7.00	$14.00		
LA	$154.00	$7.00	$7/weight		
NH	$152.00	$6.91	Yes		
MT	$150.00	$6.82			
UT	$150.00	$6.82			
FL	$142.00	$6.45			
NE	$140.00	$6.36	$80h		
MO	$125.00	$5.68			
CO	$124.00	$5.64	$4.00		
GA	$121.00	$5.50			
SC	$115.50	$5.25	2x the price per weight		
AL	$110.00	$5.00	$2.00		
KY	$110.00	$5.00	$2.50		
NC	$110.00	$5.00			
WV	$110.00	$5.00	$10.00		
SD	$96.00	$4.36			
VT	$95.00	$4.32	Based on Time		
MD	$80.00	$3.64	$9.00		
VA	$77.00	$3.50			
WY	$50.00	$2.27			
KS	$35.00	$1.59	$5.00	$20.00	
CT					
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LA County					
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NM					
PR					
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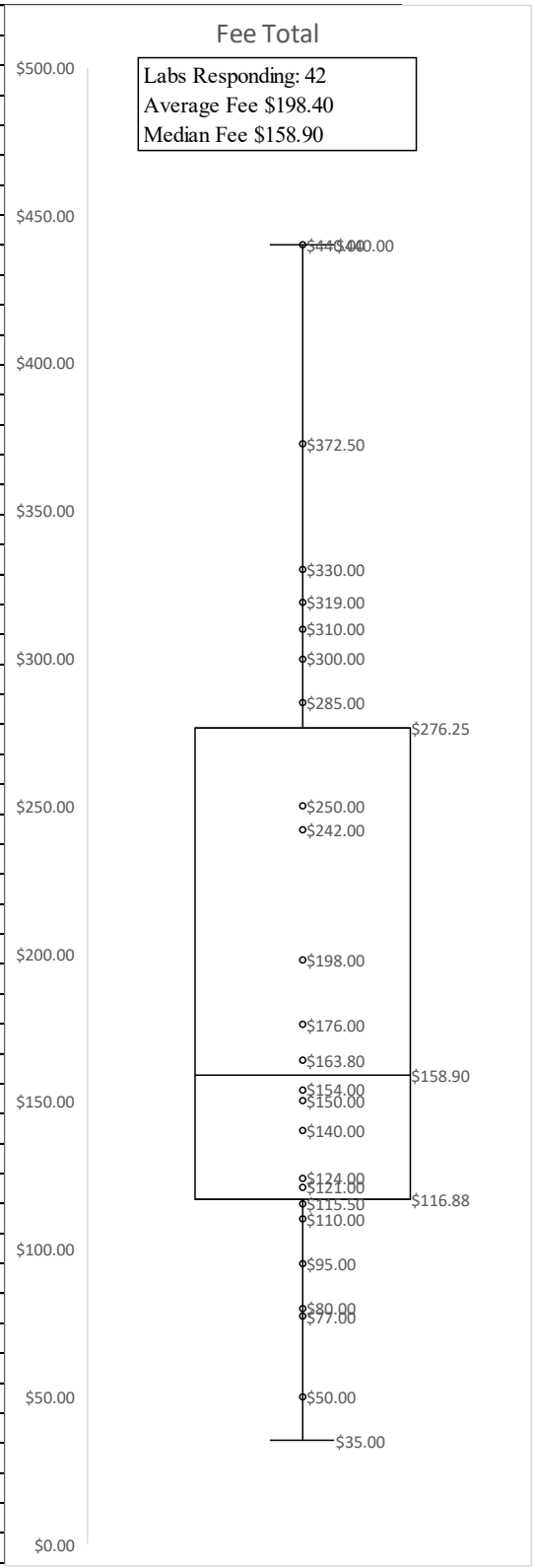

Figure 40: Fees charged for testing a 31 lb weight kit containing 22 pieces to NIST HB 105-1 Class F tolerances using mass echelon III procedure

Mass Echelon III (50 lb Test Weights)

Description

Each laboratory was asked to estimate the fee charged for testing a set of 20 50 lb cast iron pipe- handle style test weights to NIST Class F tolerances or ASTM E617 Classes 4 – 7 using echelon III procedures (NIST Handbook 105-1 "Specifications for Field Standard Test Weights (NIST Class F)", 1990).

Comparison of Previous Surveys

Survey	Labs Reporting	Average Fee
2014	47	$294.67
2016	47	$351.98
2018	44	$336.72
2020	43	$365.41
2022	40	$363.34
2024[1]	42	$347.35

Table 32: Average fee charged for testing 20 50 lb cast iron pipe-handle test weights.

[1]: Previous averages included 5 adjustments, price now reflects calibration without adjustments, and price per adjustment by state can now be found in the figure below.

Lab	Calibration Fee	~Price Per Weight	Per Weight Adjustment Fee	Handling Fee	Certificate Fee
NY	$1,500.00	$75.00			$300.00
AK	$1,000.00	$50.00			
NJ	$800.00	$40.00			
CA	$600.00	$30.00			
TX	$600.00	$30.00	$10.00		
HI	$580.00	$29.00			
NV	$475.00	$23.75	Charged per hour		
IL	$465.00	$23.25	Per hour	Per hour	Per hour
OR	$447.00	$22.35	Yes	Hourly rate	Hourly rate
NH	$420.00	$21.00	Yes		
KY	$400.00	$20.00	$5.00		
PA	$400.00	$20.00	2x price per weight		
WA	$361.13	$18.06			
MA	$350.00	$17.50	$15.00		$25.00
MN	$345.80	$17.29	$9.10	$45.50	$36.40
AZ	$330.00	$16.50			
MT	$300.00	$15.00			
OK	$300.00	$15.00	3x the price per weight		
WY	$300.00	$15.00			
MI	$290.00	$14.50	$14.50		
ID	$280.00	$14.00			
WI	$268.80	$13.44	$19.20	$48.00	$40.00
GA	$250.00	$12.50			
NC	$250.00	$12.50			
AR	$240.00	$12.00	$24.00		
FL	$240.00	$12.00			
LA	$240.00	$12.00	$12/weight		
ME	$240.00	$12.00	$10.00		
MD	$220.00	$11.00	$9.00		
OH	$200.00	$10.00	$10.00		
UT	$200.00	$10.00			
WV	$200.00	$10.00	$20.00		
CO	$192.00	$9.60	$8.00		
NE	$170.00	$8.50	$8.00		
SC	$165.00	$8.25	2x price per weight		
AL	$160.00	$8.00	$6.00		
VA	$160.00	$8.00	2x price per weight		
TN	$150.00	$7.50	2x price per weight		
VT	$150.00	$7.50	$4.75		
SD	$144.00	$7.20	$4.80		
MO	$125.00	$6.25			
KS	$80.00	$4.00	$5.00	$30.00	
CT					
DE					
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LA County					
MS					
ND					
NM					
PR					
RI					

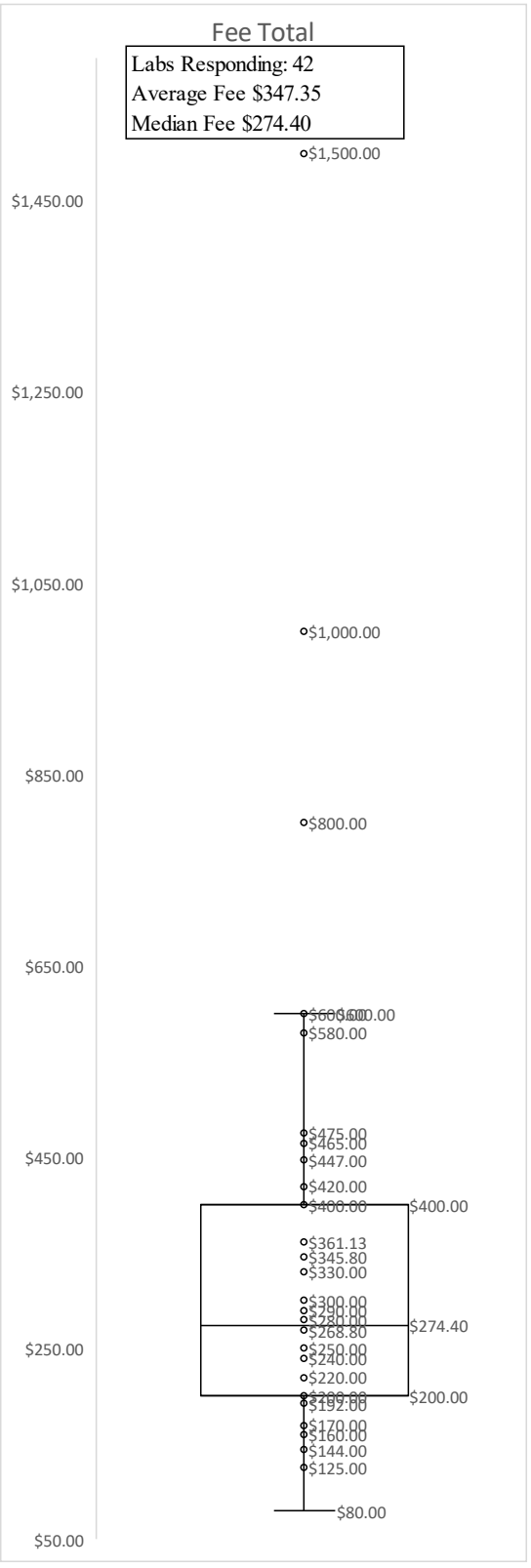

Figure 41: Fees charged for testing a set of 20 50 lb cast iron pipe-handle style test weights to NIST HB 105-1 Class F tolerances using mass echelon III procedures.

Mass Echelon III (1000 lb Test Weights)

Description

Each laboratory was asked to estimate the fee charged for testing a set of 24 1,000 lb cast iron test weights according to NIST Class F or ASTM E617 Classes 4 – 7 tolerances using Echelon III procedures (NIST Handbook 105-1 "Specifications for Field Standard Test Weights (NIST Class F)", 1990).

Comparison of Previous Surveys

Survey	Labs Reporting	Average Fee
2014	46	$1,058.00
2016	47	$820.06
2018	44	$857.66
2020	43	$798.32
2022	39	$798.77
2024[1]	40	$750.84

Table 33: Average fee charged for testing 24 1,000 lb cast iron test weights

[1]: Previous averages included 5 adjustments, price now reflects calibration without adjustments, and price per adjustment by state can now be found in the figure below.

Lab	Calibration Fee	~Price Per Weight	Per Weight Adjustment Fee	Handling Fee	Certificate Fee
AK	$1,800.00	$75.00			
CA	$1,800.00	$75.00			
NY	$1,800.00	$75.00			$360.00
HI	$1,416.00	$59.00			
ID	$1,200.00	$50.00			
KY	$1,200.00	$50.00	$20.00		
OR	$1,192.00	$49.67	Yes	Hourly rate	Hourly rate
TX	$1,140.00	$47.50	$20.00		
PA	$1,080.00	$45.00	$25.00		
NJ	$960.00	$40.00			
NV	$950.00	$39.58	Charged per hour		
IL	$930.00	$38.75	Per hour	Per hour	Per hour
MT	$900.00	$37.50			
MI	$870.00	$36.25	$14.50		
MN	$855.40	$35.64	$36.40	$127.40	$36.40
WA	$731.12	$30.46			
FL	$720.00	$30.00			
WV	$720.00	$30.00	$20.00		
WI	$680.00	$28.33	$40.80	$172.80	$40.00
LA	$600.00	$25.00	$25.00		
WY	$600.00	$25.00			
NC	$580.00	$24.17			
NE	$564.00	$23.50	$20.00		
MA	$540.00	$22.50	$20.00		$25.00
OK	$528.00	$22.00	3x the price per weight		
VA	$528.00	$22.00	2x price per weight		
UT	$500.00	$20.83			
ME	$480.00	$20.00	$20.00		
OH	$480.00	$20.00	$20.00		
VT	$475.00	$19.79	Based on Time		
AR	$432.00	$18.00	$36.00		
SC	$414.00	$17.25	2x price per weight		
CO	$408.00	$17.00	$10.00		
GA	$396.00	$16.50			
AL	$360.00	$15.00	$8.00		
AZ	$330.00	$13.75			
MO	$250.00	$10.42			
TN	$240.00	$10.00	$4.58		
KS	$192.00	$8.00	$5.00	$20.00	
SD	$192.00	$8.00	$4.00		
MD					
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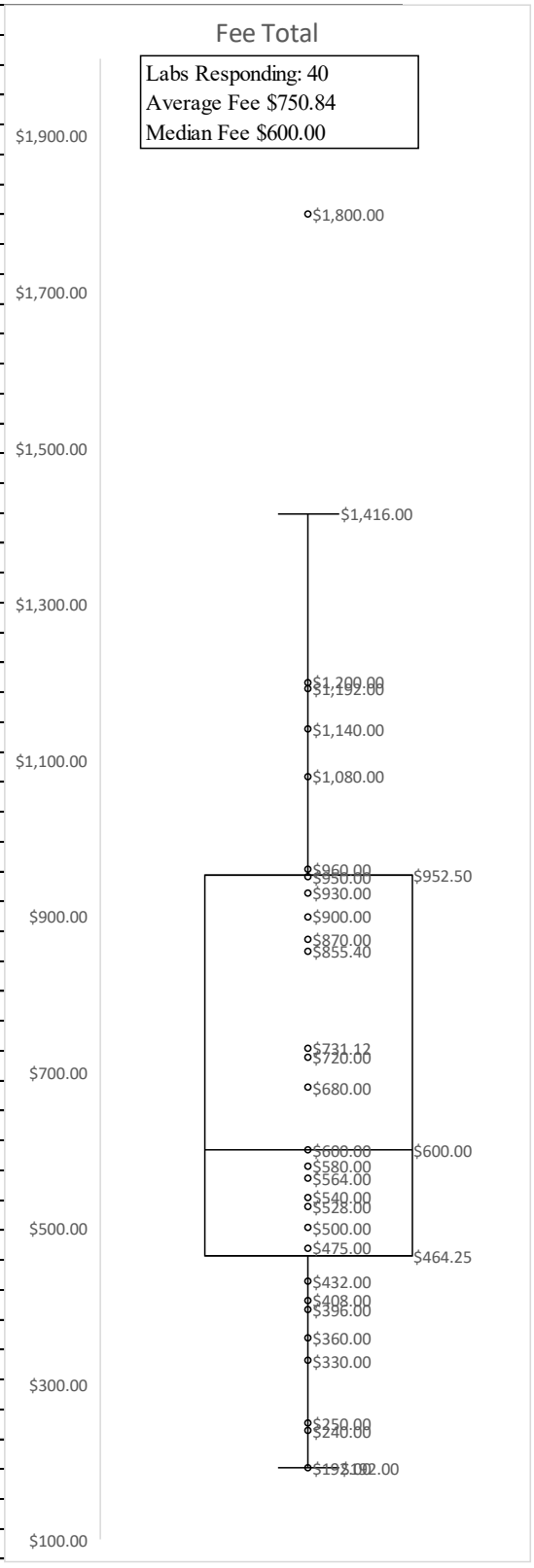

Figure 42: Fees charged for testing a set of 24 1,000 lb cast iron test weights to NIST HB 105-1 Class F tolerances using mass Echelon III procedures.

5,000 lb Weight Cart

Description

Each laboratory was asked to estimate the fee charged for testing a 5,000 lb weight cart according to NIST HB 105-8 tolerances using Echelon III procedures (NIST Handbook 105-8 "Specifications and Tolerances for Field Standard Weight Carts", 2019).

Comparison of Previous Surveys

Survey	Labs Reporting	Average Fee
2004	28	$163.27
2006	31	$205.74
2008	31	$185.80
2010	34	$225.09
2012	30	$201.65
2014	31	$203.97
2016	32	$205.01
2018	31	$208.60
2020	31	$233.00
2022	29	$251.06
2024	30	$248.56

Table 34: Average fee charged for a 5,000 lb weight cart testing.

Lab	Calibration Fee	Per Weight Adjustment Fee	Handling Fee	Certificate Fee
ME	$560.00			
AK	$510.00			
MT	$450.00			
NY	$450.00			$90.00
WA	$443.36			
MI	$406.00			
WI	$360.00	$80.00		$40.00
PA	$315.00			
IL	$310.00	Per hour	Per hour	Per hour
VT	$300.00	$25.00		
MN	$273.00	$91.00	$127.40	$36.40
SC	$265.50			
MO	$250.00			
OK	$250.00			
OR	$242.00	Yes	Hourly rate	Hourly rate
NE	$200.00	$80h		
OH	$200.00			
UT	$200.00			
WV	$200.00	$20.00		
ID	$190.00			
VA	$131.00	$92.00		
NC	$125.00			
CO	$120.00			
AZ	$110.00			
GA	$110.00			
TX	$110.00	$40.00		
FL	$100.00			
WY	$100.00			
SD	$96.00	$24.00		
KS	$80.00	$25.00	$100.00	
AL				
AR				
CA				
HI				
KY				
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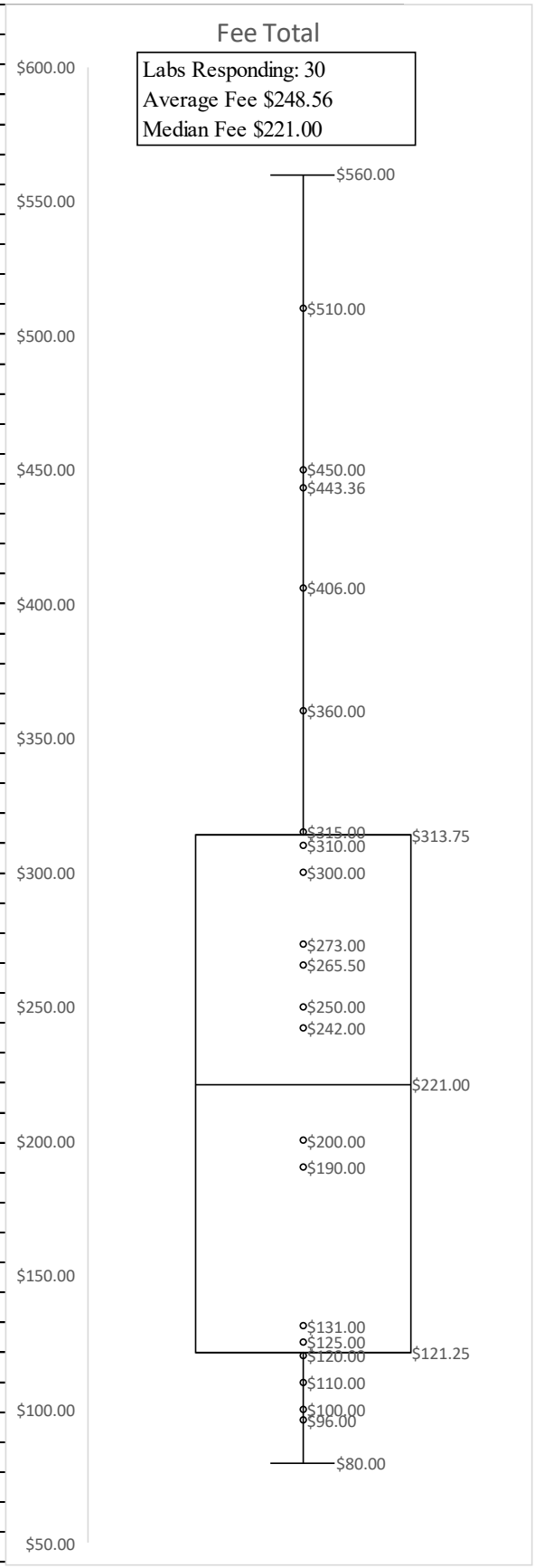

Figure 43: Fees charged for testing a 5,000 lb weight cart according to NIST HB 105-8 tolerances using mass Echelon III

procedures.

Scale Truck Calibration Class F

Description

Each laboratory was asked to estimate the fee charged for testing the measurement equipment contained in a single scale truck. The truck was assumed to carry 24 1,000 lb cast cube weights, 20 50 lb pipe-handle weights, 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	Average Fee
2004	39	$1,050.56
2006	43	$1,060.77
2008	42	$1,300.30
2010	44	$1,455.69
2012	42	$1,520.41
2014	45	$1,472.13
2016	47	$1,529.57
2018	44	$1,562.19
2020	43	$1,521.59
2022	40	$1,522.55
2024[1]	42	$1,669.43

Table 35: Average fee charged for typical scale truck testing.
[1]: Average of estimate includes only states that calibrate every section of the truck

Lab	Calibration Fee	Weight Cart	1000 lb weights	50 lb weights
NY	$4,250.00	Yes	Yes	Yes
AK	$3,910.00	Yes	Yes	Yes
CA	$3,060.00		Yes	Yes
HI	$2,876.00		Yes	Yes
TX	$2,730.00	Yes	Yes	Yes
PA	$2,675.00	Yes	Yes	Yes
NJ	$2,640.00		Yes	Yes
OR	$2,447.20	Yes	Yes	Yes
IL	$2,325.00	Yes	Yes	Yes
MI	$2,204.00	Yes	Yes	Yes
ID	$2,154.00	Yes	Yes	Yes
MT	$2,100.00	Yes	Yes	Yes
WA	$2,028.73	Yes	Yes	Yes
NV	$1,805.00		Yes	Yes
MN	$1,783.60	Yes	Yes	Yes
KY	$1,710.00		Yes	Yes
ME	$1,680.00	Yes	Yes	Yes
WI	$1,660.80	Yes	Yes	Yes
OK	$1,474.00	Yes	Yes	Yes
FL	$1,344.00	Yes	Yes	Yes
WV	$1,340.00	Yes	Yes	Yes
UT	$1,300.00	Yes	Yes	Yes
OH	$1,280.00	Yes	Yes	Yes
MA	$1,220.00		Yes	Yes
NE	$1,214.00	Yes	Yes	Yes
NC	$1,175.00	Yes	Yes	Yes
LA	$1,148.00		Yes	Yes
AZ	$1,100.00	Yes	Yes	Yes
WY	$1,100.00	Yes	Yes	Yes
SC	$1,075.50	Yes	Yes	Yes
VT	$1,045.00	Yes	Yes	Yes
GA	$998.00	Yes	Yes	Yes
AR	$980.00		Yes	Yes
VA	$973.00	Yes	Yes	Yes
CO	$968.00	Yes	Yes	Yes
MO	$750.00	Yes	Yes	Yes
AL	$740.00		Yes	Yes
NH	$724.00			Yes
TN	$720.00		Yes	Yes
SD	$576.00	Yes	Yes	Yes
KS	$422.00	Yes	Yes	Yes
MD	$380.00			Yes
CT				
DE				
IA				
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LA County				
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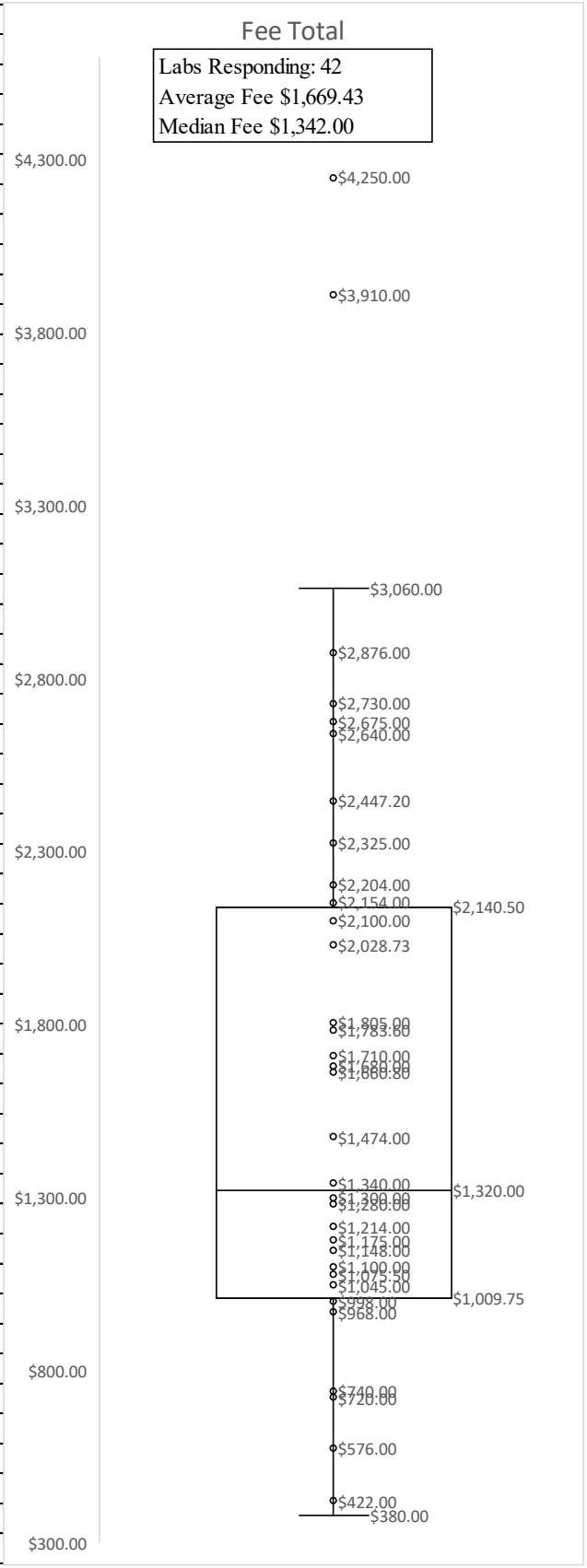

Figure 44: Fees charged for testing a typical scale truck according to mass Echelon III procedures.

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	Average Fee
2000	33	$133.00
2002	36	$173.03
2004	22	$250.89
2006	22	$261.23
2008	18	$244.86
2010	16	$234.16
2012	10	$246.00
2014	9	$198.56
2016	7	$200.71
2018	5	$195.50
2020	6	$262.92
2022	5	$390.15
2024	4	$421.25

Table 36: Average fee charged for typical 19 point testing of a 100 ft steel tape.

Lab	Calibration Fee	Adjustment Fee	Handling Fee	Certificate Fee
PA	$760.00			
CA	$600.00			
NY	$185.00			$37.00
NJ	$140.00			
AK				
AL				
AR				
AZ				
CO				
FL				
GA				
HI				
ID				
IL				
KS				
KY				
LA				
MA				
MD				
ME				
MI				
MN				
MO				
MT				
NC				
NE				
NH				
NV				
OH				
OK				
OR				
SC				
SD				
TN				
TX				
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LA County				
MS				
ND				
NM				
PR				
RI				

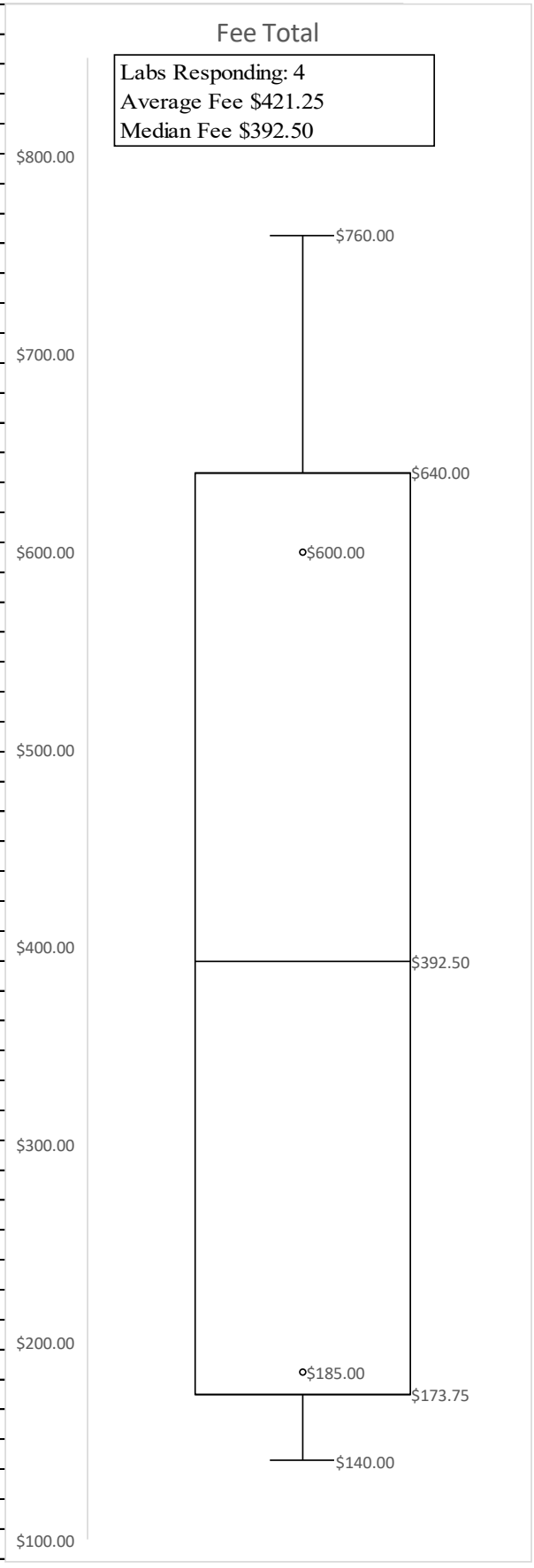

Figure 45: Fees charged for testing a steel 100 ft tape.

5 gallon test measures – Volume Transfer

Description

Each laboratory was asked to estimate the fee charged for testing a single 5 gallon field test measure according to NIST HB 105-3 (NIST Handbook 105-3, "Specifications and Tolerance Graduated Neck Type Volumetric Field Standards", 2010) tolerances using a volume transfer calibration.

Comparison of Previous Surveys

Survey	Labs Reporting	Average Fee
2000	35	$35.00
2002	41	$41.46
2004	39	$42.06
2006	43	$43.93
2008	43	$56.89
2010	44	$64.44
2012	44	$63.61
2014	46	$62.52
2016	48	$67.07
2018	44	$70.24
2020	43	$65.57
2022	40	$66.51
2024	42	$70.87

Table 37: Average fee charged for testing of a 5 gallon field test measure via volume transfer.

Lab	Calibration Fee	Adjustment Fee	Handling Fee	Certificate Fee
OR	$223.50	Yes	Hourly rate	Hourly rate
NV	$190.00	Charged per hour		
IL	$155.00	Per hour	Per hour	Per hour
CA	$150.00			
MN	$145.60	$36.40		$36.40
WA	$131.82			
MO	$125.00			
PA	$120.00			
MI	$101.50			
OH	$100.00	$50.00	$10.00	
HI	$92.00			
ME	$80.00			
WI	$80.00			$40.00
SD	$77.00	$24.00		
AK	$75.00			
MT	$75.00			
NY	$75.00			$15.00
ID	$60.00			
OK	$60.00			
VT	$60.00			
TX	$55.00			
NE	$51.00	$80/h		
AZ	$50.00			
KS	$50.00	$10.00	$20.00	
UT	$50.00			
MA	$45.00			
NH	$45.00			
AR	$40.00			
CO	$40.00			
LA	$40.00			
SC	$37.25			
FL	$35.00			
AL	$30.00			
GA	$30.00			
MD	$30.00			
NC	$30.00			
NJ	$30.00			
WV	$30.00			
WY	$25.00			
VA	$22.00	$44.00		
KY	$20.00	$5.00		
TN	$15.00			
CT				
DE				
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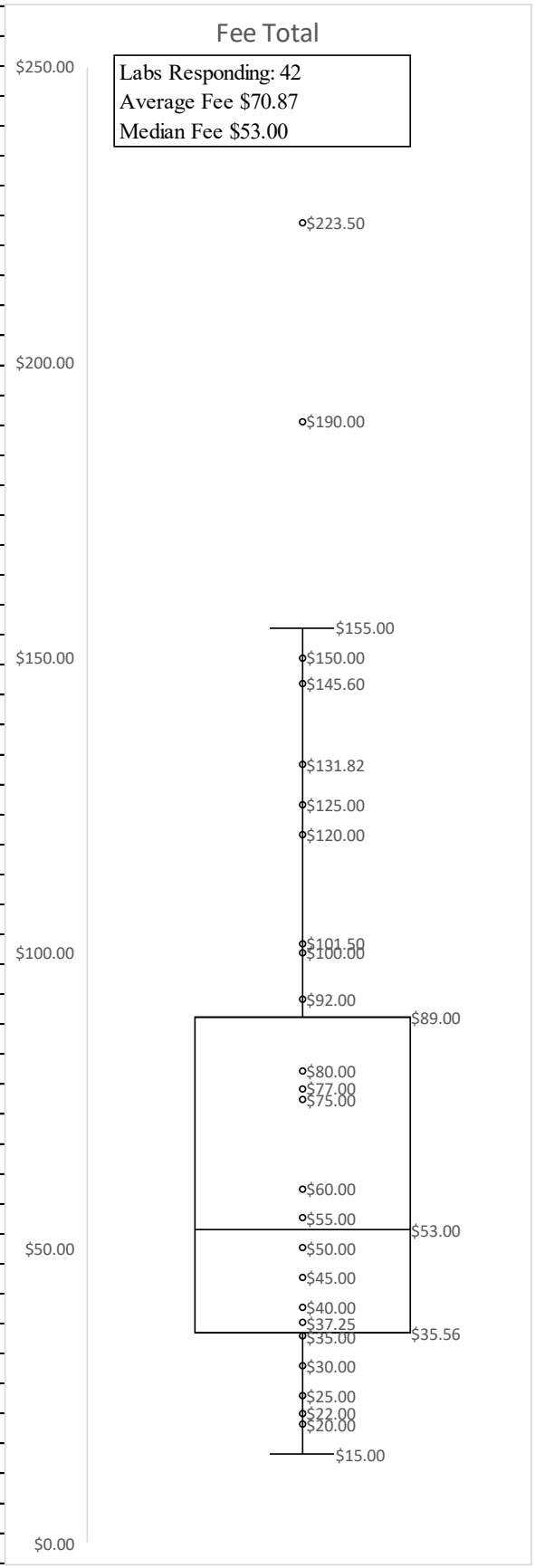

Figure 46: Fees charged for testing a 5 gallon test measure via volume transfer technique.

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 (NIST Handbook 105-3, "Specifications and Tolerance Graduated Neck Type Volumetric Field Standards", 2010) using a gravimetric measurement technique.

Comparison of Previous Surveys

Survey	Labs Reporting	Average Fee
2006	20	$177.95
2008	17	$173.65
2010	21	$209.25
2012	18	$215.24
2014	22	$200.95
2016	19	$241.26
2018	18	$218.05
2020	16	$216.62
2022	15	$257.75
2024	20	$259.08

Table 38: Average fee charged for testing of a 5 gallon field test measure via gravimetric method.

Lab	Calibration Fee	Adjustment Fee	Handling Fee	Certificate Fee
PA	$825.00			
MO	$500.00			
AZ	$440.00			
NV	$380.00	Charged per hour		
MN	$327.60			$36.40
CO	$320.00			
OR	$298.00	Yes	Hourly rate	Hourly rate
HI	$276.00			
AK	$255.00			
NY	$225.00			$45.00
NH	$220.00			
MI	$217.50			
OK	$200.00			
KS	$180.00	$180.00	$20.00	
ME	$160.00			
LA	$120.00			
SC	$67.50			
ID	$60.00			
NC	$60.00			
TN	$50.00			
AL				
AR				
CA				
FL				
GA				
IL				
KY				
MA				
MD				
MT				
NE				
NJ				
OH				
SD				
TX				
UT				
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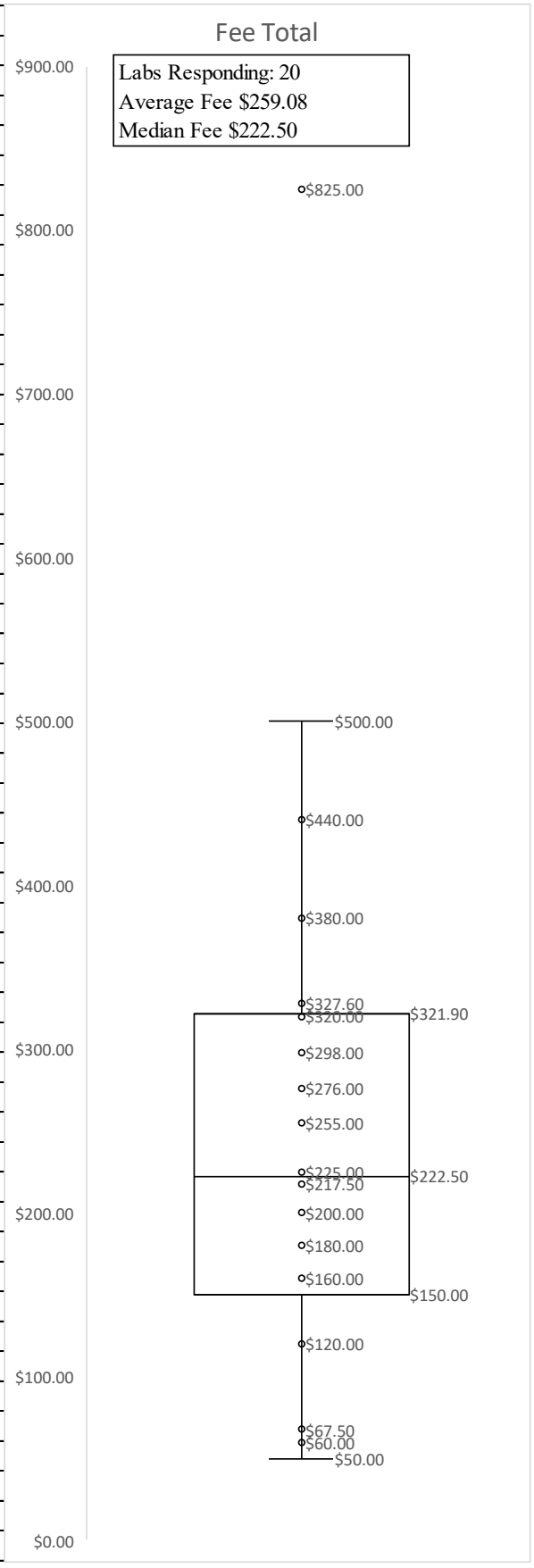

Figure 47 Fees charged for gravimetrically testing a 5 gallon test measure.

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 (NIST Handbook 105-3, "Specifications and Tolerance Graduated Neck Type Volumetric Field Standards", 2010) using a volume transfer calibration technique.

Comparison of Previous Surveys

Survey	Labs Reporting	Average Fee
2000	35	$108.00
2002	40	$125.19
2004	35	$138.73
2006	37	$145.32
2008	36	$191.83
2010	38	$219.76
2012	38	$206.35
2014	40	$217.01
2016	42	$224.16
2018	38	$214.57
2020	39	$217.73
2022	35	$237.14
2024	37	$245.84

Table 39: Average fee charged for testing of a 100 gallon field standard prover via volume transfer.

Lab	Calibration Fee	Adjustment Fee	Handling Fee	Certificate Fee
IL	$465.00	Per hour	Per hour	Per hour
CA	$450.00			
MT	$450.00			
ID	$448.00			
PA	$440.00			
OR	$432.10	Yes	Hourly rate	Hourly rate
NY	$400.00			$80.00
NV	$380.00	Charged per hour		
HI	$368.00			
MI	$362.50			
MA	$360.00			$25.00
WA	$342.29			
VT	$300.00			
MO	$250.00			
OH	$250.00	$100.00		
OK	$250.00			
ME	$240.00	$40.00		
AZ	$220.00			
WI	$216.00			$40.00
AK	$200.00			
NJ	$200.00			
WV	$200.00			
WY	$200.00			
SD	$192.00	$48.00		
MN	$182.00	$36.40		$36.40
NE	$160.00	$80h		
TX	$160.00			
UT	$150.00			
SC	$139.00			
CO	$120.00			
TN	$110.00			
FL	$106.25			
KS	$85.00	$25.00	$100.00	
AL	$75.00			
KY	$70.00	$25.00		
NC	$68.00			
GA	$55.00			
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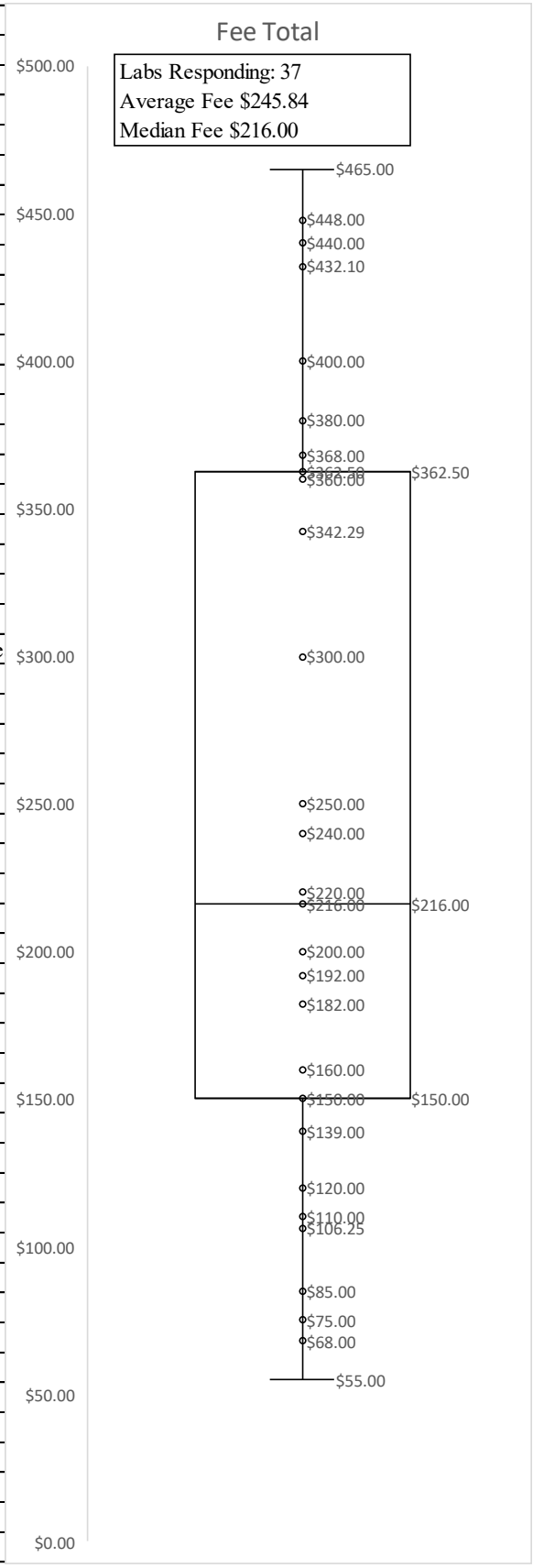

Figure 48: Fees charged for testing a 100 gallon field standard prover via volume transfer technique.

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 (NIST Handbook 105-3, "Specifications and Tolerance Graduated Neck Type Volumetric Field Standards", 2010) using a gravimetric calibration technique.

Comparison of Previous Surveys

Survey	Labs Reporting	Average Fee
2006	4	$265.00
2008	7	$434.29
2010	7	$597.14
2012	7	$447.14
2014	8	$670.63
2016	7	$854.29
2018	7	$702.29
2020	7	$702.29
2022	6	$805.17
2024	9	$793.29

Table 40: Average fee charged for testing of a 100 gallon field test standard prover via gravimetric method.

Lab	Calibration Fee	Adjustment Fee	Handling Fee	Certificate Fee
PA	$1,640.00			
MN	$1,419.60			$36.40
CO	$920.00			
AZ	$660.00			
NY	$600.00			$120.00
OK	$600.00			
NV	$570.00	Charged per hour		
ME	$480.00	$40.00		
NC	$250.00			
AK				
AL				
AR				
CA				
FL				
GA				
HI				
ID				
IL				
KS				
KY				
LA				
MA				
MD				
MI				
MO				
MT				
NE				
NH				
NJ				
OH				
OR				
SC				
SD				
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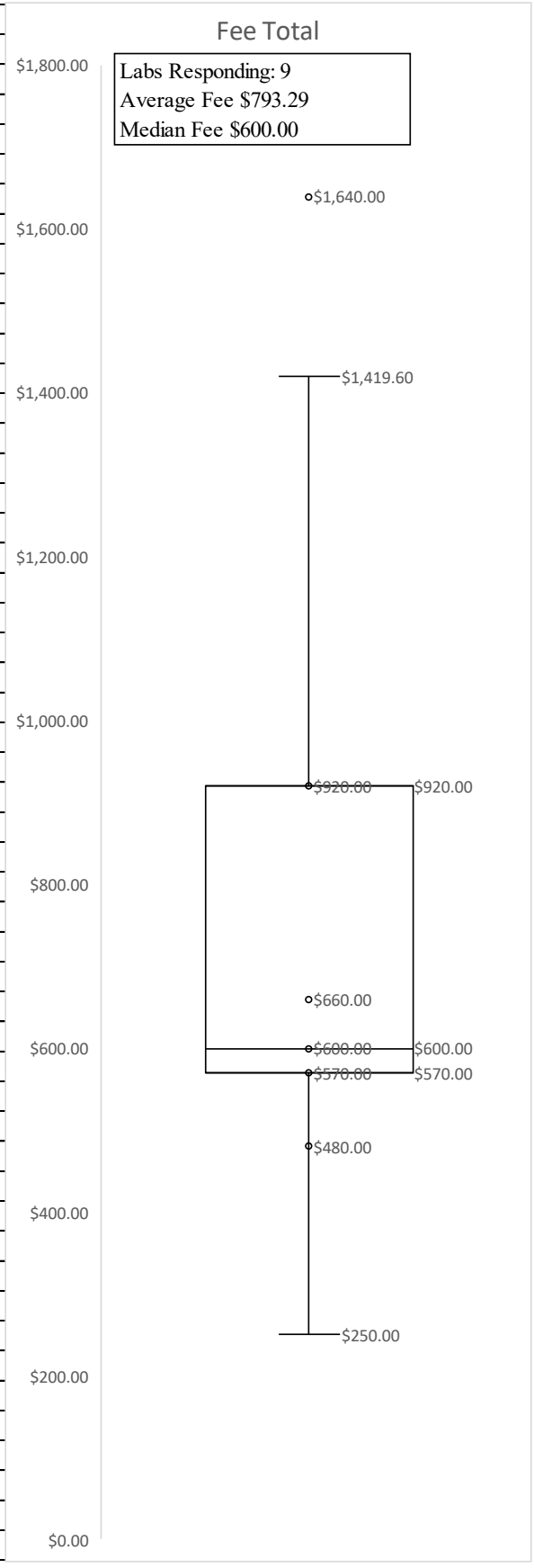

Figure 49: Fees charged for gravimetrically testing a 100 gallon field standard steel prover.

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 (NIST Handbook 105-4, "Specifications and Tolerances for Liquified Petroleum Gas and Anhydrous Ammonia Liquid Volumetric Provers", 2016) using a volume transfer calibration technique.

Comparison of Previous Surveys

Survey	Labs Reporting	Average Fee
2006	32	$255.78
2008	31	$295.39
2010	38	$219.75
2012	29	$348.05
2014	31	$347.05
2016	30	$372.44
2018	29	$389.74
2020	28	$394.65
2022	30	$413.30
2024	29	$432.48

Table 41: Average fees charged for the testing of a 100 gallon LPG prover from via volume transfer.

Lab	Calibration Fee	Adjustment Fee	Handling Fee	Certificate Fee
OR	$908.90			
CA	$750.00			
MN	$691.60	$36.40		$36.40
ID	$672.00			
NY	$650.00			$130.00
WI	$640.00			$40.00
MT	$600.00			
OH	$600.00			
MI	$580.00			
NV	$570.00	Charged per hour		
AR	$500.00			
OK	$500.00			
WV	$500.00			
ME	$480.00	$40.00		
VT	$450.00			
AZ	$440.00			
AK	$400.00			
MO	$375.00			
SD	$336.00	$48.00		
TX	$325.00			
NE	$240.00	$80h		
SC	$200.50			
FL	$200.00			
NJ	$200.00			
WY	$200.00			
KS	$170.00	$50.00	$100.00	
CO	$160.00			
GA	$135.00			
NC	$68.00			
AL				
HI				
IL				
KY				
LA				
MA				
MD				
NH				
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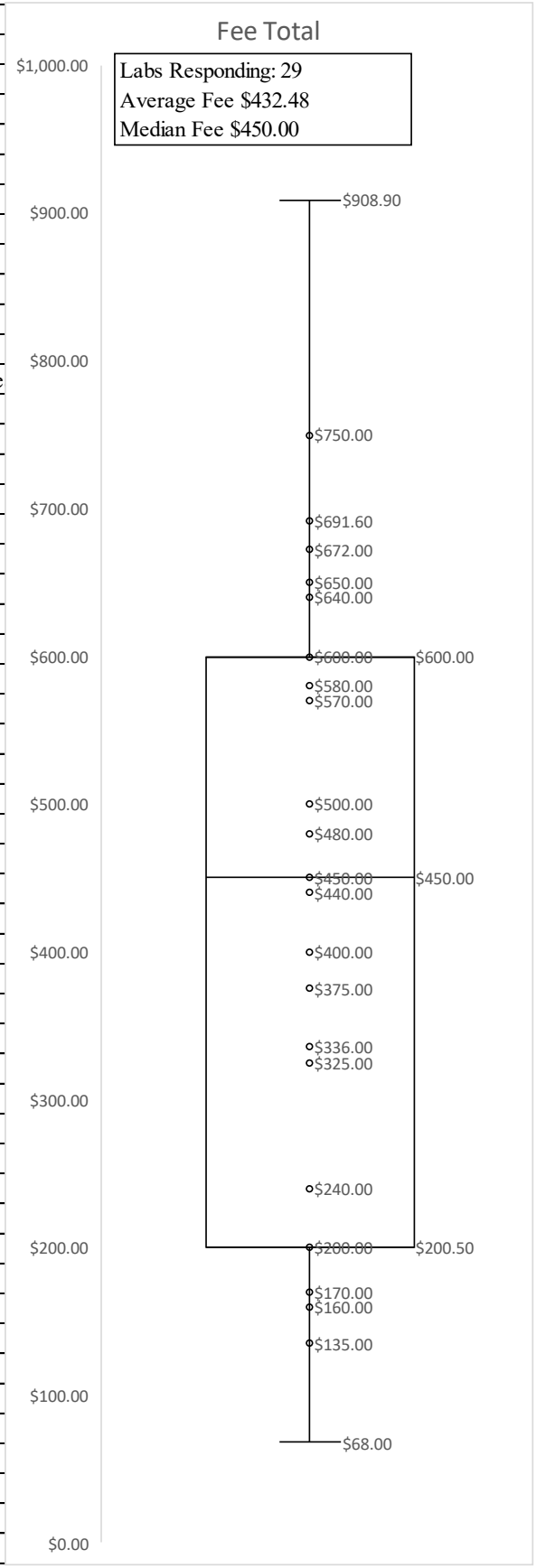


Figure 50: Fees charged for testing a 100 gallon LPG prover.

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

Description

In previous surveys each lab was asked to estimate the fee for calibrating a 20 gallon SVP according to NIST HB 105- 7 tolerances (NIST Handbook 105-7, "Specifications and Tolerances for Dynamic Small Volume Provers", 1997). The question was deprecated in 2016 because only a very few labs calibrate these devices. The results are reprinted in this survey for convenient reference.

Comparison of Previous Surveys

Survey	Labs Reporting	Average Fee
2006	3	$113.33
2008	2	$123.75
2010	1	$100.00
2012	2	$200.00
2014	4	$220.00

Table 42: Average fee charged for testing a SVP via volume transfer from 2006 through 2014.

Metrology Positions/Title and Salaries

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

Lab ID	Job Title	Standardized Title	Min Salary	Max Salary
NY	Director	Laboratory Supervisor	$111,924.96	$141,438.96
CO	Physical Scientist V (supervises multiple labs)	Laboratory Supervisor	$110,232.00	$162,828.00
CA	Principal State Metrologist	Laboratory Supervisor	$109,404.00	$135,096.00
NJ	Supervisor of Licensing, W&M	Laboratory Supervisor	$99,249.24	$141,840.48
MN	Lab Manager: SPA Manager Senior	Laboratory Supervisor	$90,576.00	$130,308.00
OR	Lead Metrologist	Laboratory Supervisor	$86,472.00	$132,780.00
NJ	Weights and Measures Inspector 3	Laboratory Supervisor	$84,433.20	$125,543.16
NY	Specialist II	Laboratory Supervisor	$84,156.00	$106,454.04
IL	Public Service Adminstrator (Chief Metrologist)	Laboratory Supervisor	$77,496.00	$111,996.00
VT	Weights & Measures Section Chief	Laboratory Supervisor	$74,484.84	$117,457.56
MI	Metrologist Manager - 14	Laboratory Supervisor	$74,297.64	$109,283.16
FL	Laboratory Manager	Laboratory Supervisor	$72,258.48	$108,387.72
ID	Section Manager / Metrologist	Laboratory Supervisor	$70,080.00	$131,539.20
NV	Metrologist III	Laboratory Supervisor	$67,296.24	$100,098.72
ME	Metrologist / W&M Program Manager	Laboratory Supervisor	$66,351.96	$93,891.24
PA	Laboratory Supervisor	Laboratory Supervisor	$66,249.96	$100,635.96
VT	Weights & Measures Specialist	Laboratory Supervisor	$66,060.84	$103,542.36
VA	Laboratory Manager	Laboratory Supervisor	$64,999.92	$84,999.96
HI	Metrologist 3	Laboratory Supervisor	$63,096.00	$89,016.00
MT	Metrologist	Laboratory Supervisor	$62,745.60	$64,934.40
AR	Chief of Quality Systems	Laboratory Supervisor	$62,520.00	$99,732.00
AK	State Metrologist 2	Laboratory Supervisor	$61,650.00	$98,298.00
LA	Agriculture Program Manager - Metrology	Laboratory Supervisor	$61,256.04	$110,282.04
WY	Inspection Supervisor	Laboratory Supervisor	$59,172.00	$88,764.00
OH	Laboratory Supervisor	Laboratory Supervisor	$58,406.40	$72,945.60
WA	State Metrologist	Laboratory Supervisor	$54,204.00	$72,924.00
UT	State Metrologist	Laboratory Supervisor	$54,120.00	$85,836.00
SC	Lab Director	Laboratory Supervisor	$54,000.00	$90,000.00
KS	Agricultural Inspector/State Metrologist	Laboratory Supervisor	$53,400.00	$59,400.00
NC	Metrology Laboratory Manager	Laboratory Supervisor	$53,247.96	$88,715.04
WV	Labor Programs Manager	Laboratory Supervisor	$52,487.04	$92,679.96
TX	Manager for Metrology Laboratory	Laboratory Supervisor	$51,612.00	$84,480.00
WI	Laboratory Director	Laboratory Supervisor	$51,590.40	$85,113.60
AR	Metrology Lab Manager	Laboratory Supervisor	$50,220.00	$80,100.00
AZ	State Metrologist	Laboratory Supervisor	$46,593.60	$79,424.40
MO	Metrology Lab Manager	Laboratory Supervisor	$46,464.00	$99,000.00
NE	Scientist II	Laboratory Supervisor	$43,200.00	$66,000.00
WV	Labor Program Specialist	Laboratory Supervisor	$39,461.04	$68,581.92
GA	State Metrologist	Laboratory Supervisor	$39,038.04	$71,523.00
KY	Metrology Lab Supervisor	Laboratory Supervisor	$38,770.08	$63,952.32
AL	Laboratory Supervisior	Laboratory Supervisor	$32,287.20	$48,924.00
NY	Director	Laboratory Supervisor	$111,924.96	$141,438.96

Lab ID	Job Title	Standardized Title	Min Salary	Max Salary
MA	Adminstrator V	Metrology/Calibration Engineer	$90,000.00	$120,000.00
CO	Physical Scientist III	Metrology/Calibration Engineer	$86,376.00	$127,584.00
CO	Physical Scientist II	Metrology/Calibration Engineer	$74,604.00	$110,196.00
MI	Metrology Specialist - 13	Metrology/Calibration Engineer	$68,910.36	$101,212.80
PA	Metrologist (PSL Intermediate Requirements)	Metrology/Calibration Engineer	$67,677.96	$88,235.04
MN	Technical Manager/Quality Manager/ Lab Administrator: SPA Principal	Metrology/Calibration Engineer	$66,648.00	$98,244.00
PA	Metrologist (PSL Basic Requirements)	Metrology/Calibration Engineer	$64,860.96	$88,235.04
IL	Metrologist Associate	Metrology/Calibration Engineer	$63,912.00	$89,724.00
MI	Metrologist - 12	Metrology/Calibration Engineer	$63,523.20	$92,601.60
NV	Metrologist II	Metrology/Calibration Engineer	$61,721.28	$91,496.16
MI	Metrologist - P11	Metrology/Calibration Engineer	$60,507.24	$85,176.00
HI	Metrologist 2	Metrology/Calibration Engineer	$58,296.00	$83,064.00
SD	Metrologist	Metrology/Calibration Engineer	$57,399.12	$86,092.44
ID	Ag Program Specialist / Metrologist	Metrology/Calibration Engineer	$57,120.00	$114,240.00
TN	Metrologist	Metrology/Calibration Engineer	$54,204.00	$81,096.00
MI	Metrologist - 10	Metrology/Calibration Engineer	$52,228.80	$73,652.76
CA	Environmental Scientist	Metrology/Calibration Engineer	$51,228.00	$106,524.00
NC	Quality Assurance Manager	Metrology/Calibration Engineer	$50,940.00	$84,690.96
MI	Metrologist - 9	Metrology/Calibration Engineer	$50,544.00	$72,134.40
TX	Program Specialist IV	Metrology/Calibration Engineer	$42,240.00	$68,952.00
LA	Agricultural Laboratory Scientist	Metrology/Calibration Engineer	$40,830.00	$90,021.96
NH	Weights & Measures Specialist	Metrology/Calibration Engineer	$40,500.00	$56,034.00
AR	Agriculture Program Coordinator	Metrology/Calibration Engineer	$40,332.00	$64,332.00
TX	Inspector V	Metrology/Calibration Engineer	$36,972.00	$58,392.00
AR	Metrologist	Metrology/Calibration Engineer	$36,144.00	$57,660.00
WV	Labor Inspector II	Metrology/Calibration Engineer	$34,247.04	$58,935.96
AL	Consumer W & M Protection Specialist	Metrology/Calibration Engineer	$28,516.80	$47,757.60
KY	Metrology Lab Technician I	Metrology/Calibration Engineer	$24,072.96	$39,711.84
OR	Metrologist	Metrology/Calibration Technician	$78,588.00	$120,792.00
NJ	Weights and Measures Inspector 2	Metrology/Calibration Technician	$69,615.96	$106,615.80
NY	Specialist I	Metrology/Calibration Technician	$65,001.00	$82,656.00
PA	Metrologist	Metrology/Calibration Technician	$61,947.00	$88,235.04
NJ	Weights and Measures Inspector 1	Metrology/Calibration Technician	$60,135.84	$92,113.92
MA	Compliance Officer II	Metrology/Calibration Technician	$60,000.00	$90,000.00
MN	Metrologist: SPA Senior	Metrology/Calibration Technician	$58,128.00	$85,236.00
FL	Sr. Metrologist	Metrology/Calibration Technician	$57,230.88	$85,754.04
NV	Metrologist I	Metrology/Calibration Technician	$56,689.20	$83,666.16
VA	State Metrologist	Metrology/Calibration Technician	$54,999.96	$64,999.92
HI	Metrologist 1	Metrology/Calibration Technician	$53,940.00	$76,764.00
MD	Metrologist II	Metrology/Calibration Technician	$53,808.00	$86,322.00
AK	State Metrologist 1	Metrology/Calibration Technician	$53,508.00	$86,004.00
CA	Measurement Standards Specialist II	Metrology/Calibration Technician	$52,992.00	$65,556.00
FL	Metrologist	Metrology/Calibration Technician	$52,153.92	$78,230.88
NJ	Weights and Measures Apprentice	Metrology/Calibration Technician	$51,950.88	$78,552.84
WI	Metrologist	Metrology/Calibration Technician	$51,590.40	$85,113.60
OH	Weights and Measures Technologist	Metrology/Calibration Technician	$51,292.80	$66,726.36
MD	Metrologist I	Metrology/Calibration Technician	$50,565.00	$80,883.96
CO	Calibration Technician	Metrology/Calibration Technician	$49,848.00	$79,776.00

Lab ID	Job Title	Standardized Title	Min Salary	Max Salary
SC	Lab Technologist III	Metrology/Calibration Technician	$46,656.00	$86,316.00
KS	Agricultural Inspector/Metrologist	Metrology/Calibration Technician	$42,540.00	$48,540.00
MD	Metrologist Trainee	Metrology/Calibration Technician	$42,056.04	$66,759.00
WY	Inspection Specialist	Metrology/Calibration Technician	$41,448.00	$62,184.00
SC	Lab Technologist II	Metrology/Calibration Technician	$38,988.00	$72,132.00
NC	Metrologist I	Metrology/Calibration Technician	$38,174.04	$61,632.00
AZ	Assistant State Metrologist	Metrology/Calibration Technician	$36,168.00	$67,982.40
MO	Metrology Specialist	Metrology/Calibration Technician	$34,992.00	$77,784.00
WV	Labor Inspector I	Metrology/Calibration Technician	$32,862.00	$56,373.00
GA	Metrologist	Metrology/Calibration Technician	$30,000.00	$78,000.00
KY	Metrology Lab Technician II	Metrology/Calibration Technician	$29,129.28	$48,048.00
FL	QA/QC Coordinator	Support Staff	$72,258.48	$108,387.72
IL	Products & Standards Inspector	Support Staff	$59,304.00	$77,604.00
NJ	Agency Service Representative 4	Support Staff	$54,351.12	$76,649.88
CO	Admin Assistant III (supports entire division)	Support Staff	$49,848.00	$69,792.00
VT	Consumer Protection Specialist	Support Staff	$49,420.80	$97,427.16
FL	Laboratory Techinician IV	Support Staff	$40,615.44	$60,923.16
PA	Laboratory Adminstrative Assistant	Support Staff	$39,785.04	$59,384.04
TX	Program Specialist II	Support Staff	$32,976.00	$52,008.00
SC	Office Manager	Support Staff	$32,688.00	$60,468.00
NC	Administrative Specialist I	Support Staff	$31,622.04	$49,290.00

Table 43: Metrologist position titles and salary ranges.

SLP Metrology Salaries – Standardized Title Comparison

A comparison of salary ranging reported across the SLP is made here using the standardized titled reported for each job title;

- Laboratory Supervisor
- Metrology/Calibration Engineer
- Metrology/Calibration Technician
- Support Staff

Annual salaries for each position identified are plotted on a range from minimum to maximum and sorted on the highest possible compensation from high to low. Summary information for the entire program is provided showing minimum, maximum, and average values for the minimum salaries, maximum salaries, and salary ranges.

No adjustments have been made to these data for cost of living variations across the nation.

Laboratory Supervisor

	Minimum	Maximum	Average	Median
Minimum Salary	$32,287.20	$48,924.00	$65,013.77	$62,520.00
Maximum Salary	$111,924.96	$162,828.00	$97,530.41	$93,891.24
Salary Difference	$79,637.76	$113,904.00	$32,516.64	$31,371.24

Metrologist/Calibration Engineer

	Minimum	Maximum	Average	Median
Minimum Salary	$24,072.96	$24,072.96	$54,448.42	$55,662.00
Maximum Salary	$127,584.00	$127,584.00	$83,428.45	$85,634.22
Salary Difference	$103,511.04	$103,511.04	$28,980.03	$29,972.22

Metrologist/Calibration Technician

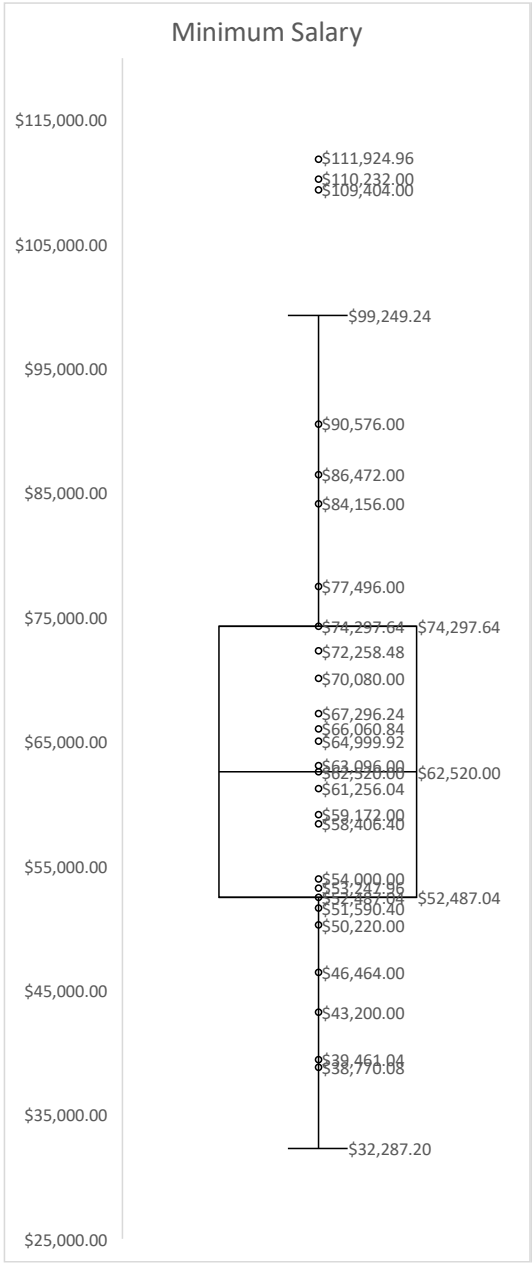
	Minimum	Maximum	Average	Median
Minimum Salary	$29,129.28	$48,048.00	$50,225.75	$51,950.88
Maximum Salary	$120,792.00	$120,792.00	$77,733.84	$78,552.84
Salary Difference	$91,662.72	$72,744.00	$27,508.09	$26,601.96

Support Staff

	Minimum	Maximum	Average	Median
Minimum Salary	$31,622.04	$49,290.00	$46,286.89	$45,018.12
Maximum Salary	$72,258.48	$108,387.72	$71,193.40	$65,357.58
Salary Difference	$40,636.44	$59,097.72	$24,906.50	$20,339.46

Table 44: SLP metrologist compensation summary by standardized job titles.

Supervisor Lab ID	Min Salary	Max Salary
NY	$111,924.96	$141,438.96
CO	$110,232.00	$162,828.00
CA	$109,404.00	$135,096.00
NJ	$99,249.24	$141,840.48
MN	$90,576.00	$130,308.00
OR	$86,472.00	$132,780.00
NJ	$84,433.20	$125,543.16
NY	$84,156.00	$106,454.04
IL	$77,496.00	$111,996.00
VT	$74,484.84	$117,457.56
MI	$74,297.64	$109,283.16
FL	$72,258.48	$108,387.72
ID	$70,080.00	$131,539.20
NV	$67,296.24	$100,098.72
ME	$66,351.96	$93,891.24
PA	$66,249.96	$100,635.96
VT	$66,060.84	$103,542.36
VA	$64,999.92	$84,999.96
HI	$63,096.00	$89,016.00
MT	$62,745.60	$64,934.40
AR	$62,520.00	$99,732.00
AK	$61,650.00	$98,298.00
LA	$61,256.04	$110,282.04
WY	$59,172.00	$88,764.00
OH	$58,406.40	$72,945.60
WA	$54,204.00	$72,924.00
UT	$54,120.00	$85,836.00
SC	$54,000.00	$90,000.00
KS	$53,400.00	$59,400.00
NC	$53,247.96	$88,715.04
WV	$52,487.04	$92,679.96
TX	$51,612.00	$84,480.00
WI	$51,590.40	$85,113.60
AR	$50,220.00	$80,100.00
AZ	$46,593.60	$79,424.40
MO	$46,464.00	$99,000.00
NE	$43,200.00	$66,000.00
WV	$39,461.04	$68,581.92
GA	$39,038.04	$71,523.00
KY	$38,770.08	$63,952.32
AL	$32,287.20	$48,924.00



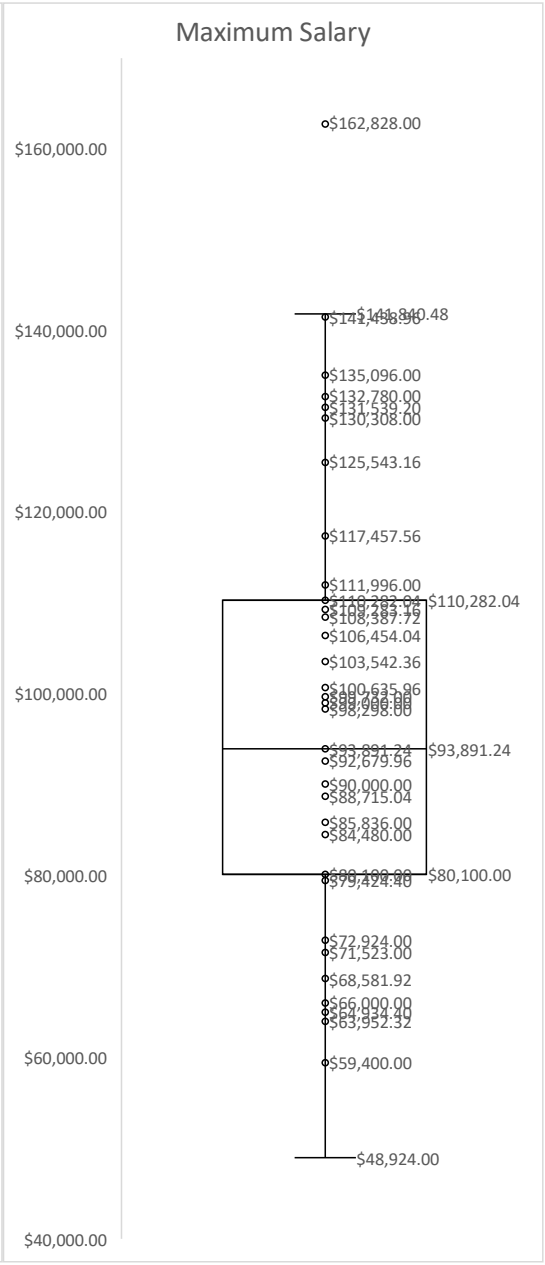


Figure 51: Salaries for Laboratory Supervisors

Metrologist/Calibration Engineer		
Lab ID	**Min Salary**	**Max Salary**
MA	$90,000.00	$120,000.00
CO	$86,376.00	$127,584.00
CO	$74,604.00	$110,196.00
MI	$68,910.36	$101,212.80
PA	$67,677.96	$88,235.04
MN	$66,648.00	$98,244.00
PA	$64,860.96	$88,235.04
IL	$63,912.00	$89,724.00
MI	$63,523.20	$92,601.60
NV	$61,721.28	$91,496.16
MI	$60,507.24	$85,176.00
HI	$58,296.00	$83,064.00
SD	$57,399.12	$86,092.44
ID	$57,120.00	$114,240.00
TN	$54,204.00	$81,096.00
MI	$52,228.80	$73,652.76
CA	$51,228.00	$106,524.00
NC	$50,940.00	$84,690.96
MI	$50,544.00	$72,134.40
TX	$42,240.00	$68,952.00
LA	$40,830.00	$90,021.96
NH	$40,500.00	$56,034.00
AR	$40,332.00	$64,332.00
TX	$36,972.00	$58,392.00
AR	$36,144.00	$57,660.00
WV	$34,247.04	$58,935.96
AL	$28,516.80	$47,757.60
KY	$24,072.96	$39,711.84

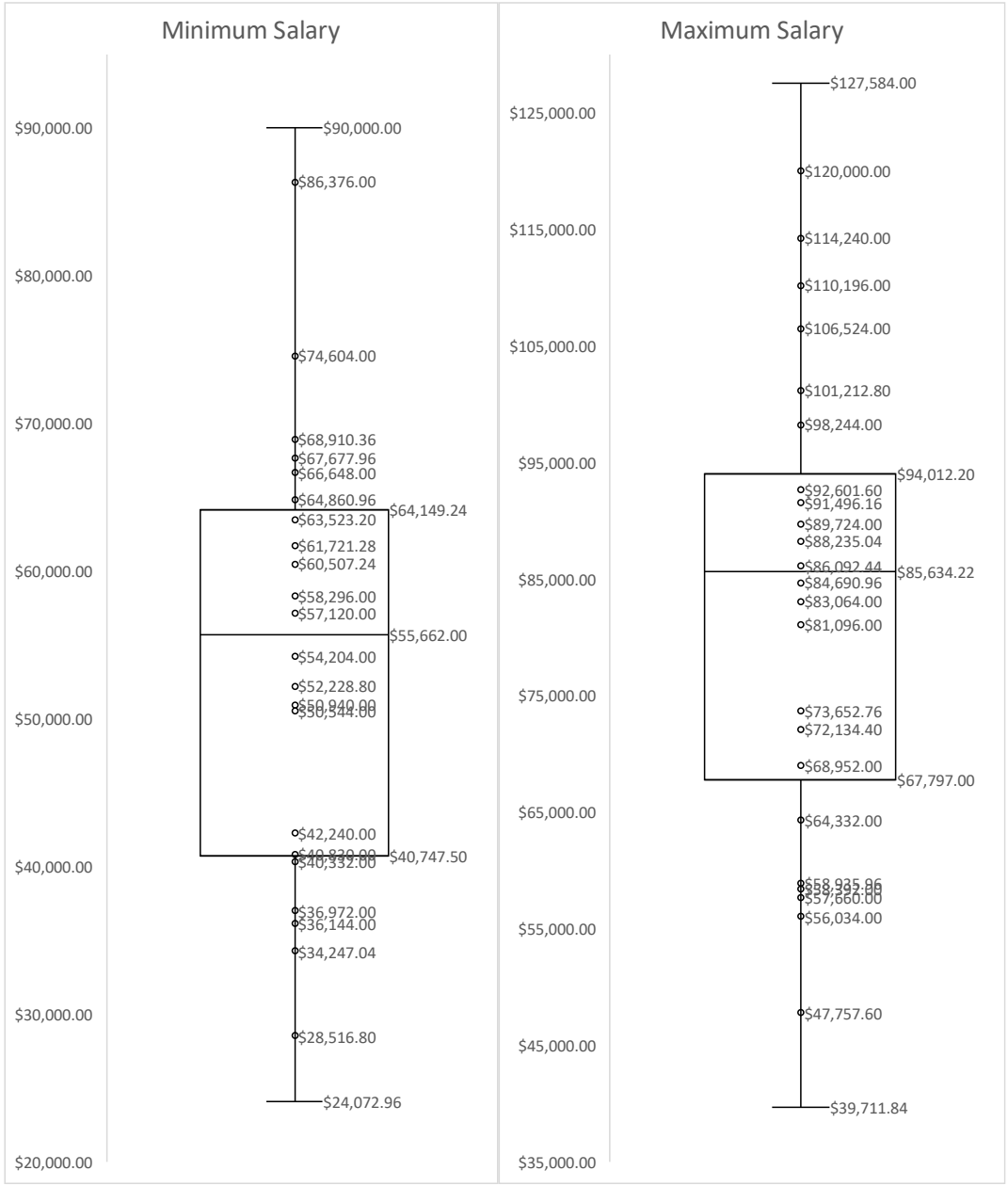


Figure 52: Salary ranges for Metrology/Calibration Engineers

Metrologist/Calibration Technician		
Lab ID	**Min Salary**	**Max Salary**
OR	$78,588.00	$120,792.00
NJ	$69,615.96	$106,615.80
NY	$65,001.00	$82,656.00
PA	$61,947.00	$88,235.04
NJ	$60,135.84	$92,113.92
MA	$60,000.00	$90,000.00
MN	$58,128.00	$85,236.00
FL	$57,230.88	$85,754.04
NV	$56,689.20	$83,666.16
VA	$54,999.96	$64,999.92
HI	$53,940.00	$76,764.00
MD	$53,808.00	$86,322.00
AK	$53,508.00	$86,004.00
CA	$52,992.00	$65,556.00
FL	$52,153.92	$78,230.88
NJ	$51,950.88	$78,552.84
WI	$51,590.40	$85,113.60
OH	$51,292.80	$66,726.36
MD	$50,565.00	$80,883.96
CO	$49,848.00	$79,776.00
SC	$46,656.00	$86,316.00
KS	$42,540.00	$48,540.00
MD	$42,056.04	$66,759.00
WY	$41,448.00	$62,184.00
SC	$38,988.00	$72,132.00
NC	$38,174.04	$61,632.00
AZ	$36,168.00	$67,982.40
MO	$34,992.00	$77,784.00
WV	$32,862.00	$56,373.00
GA	$30,000.00	$78,000.00
KY	$29,129.28	$48,048.00

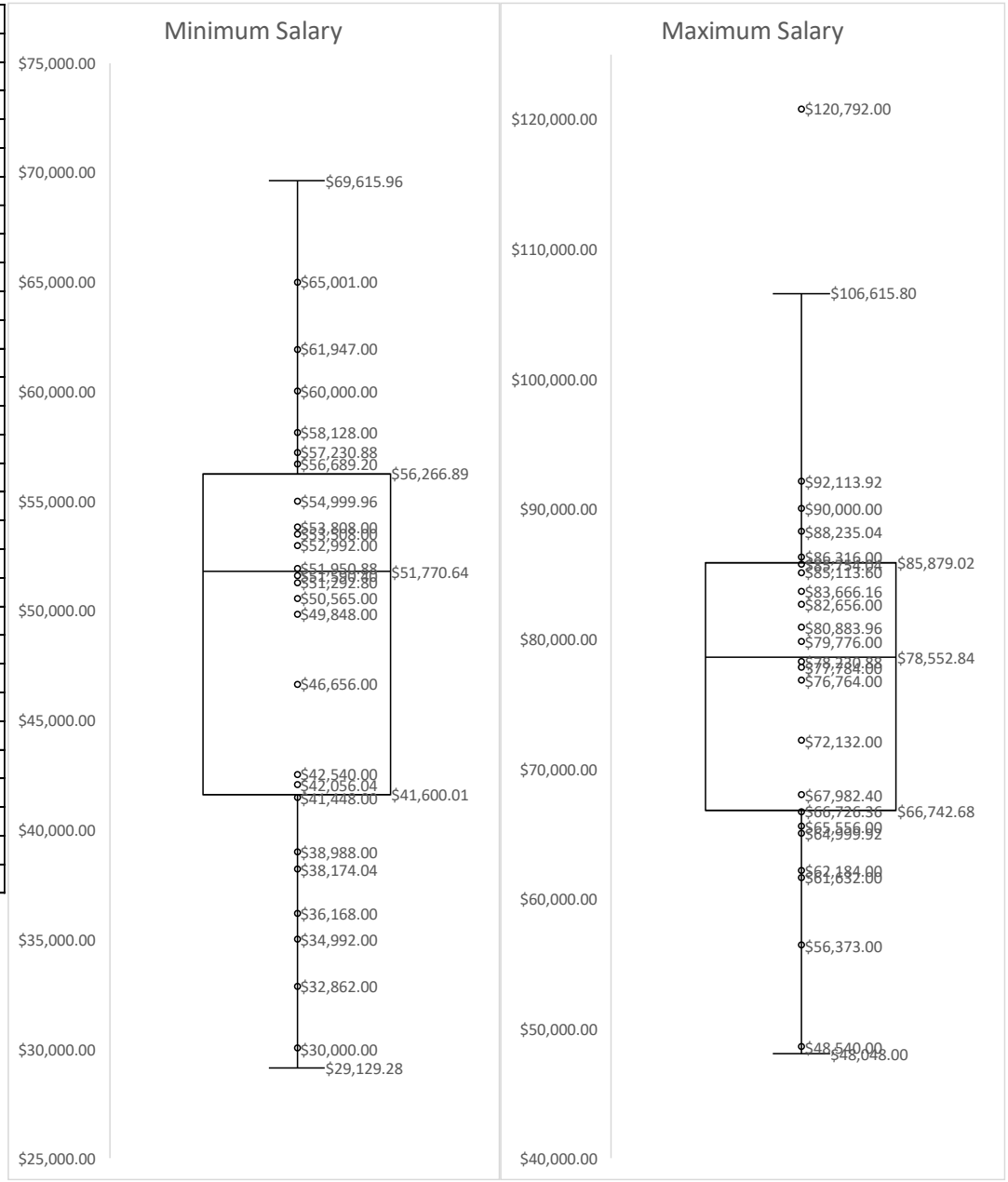


Figure 53: Salary ranges for Metrology/Calibration Technicians

Support Staff		
Lab ID	**Min Salary**	**Max Salary**
IL	$59,304.00	$77,604.00
VT	$49,420.80	$97,427.16
FL	$40,615.44	$60,923.16
NC	$31,622.04	$49,290.00
SC	$32,688.00	$60,468.00
TX	$32,976.00	$52,008.00
CO	$49,848.00	$69,792.00
FL	$72,258.48	$108,387.72
PA	$39,785.04	$59,384.04
NJ	$54,351.12	$76,649.88

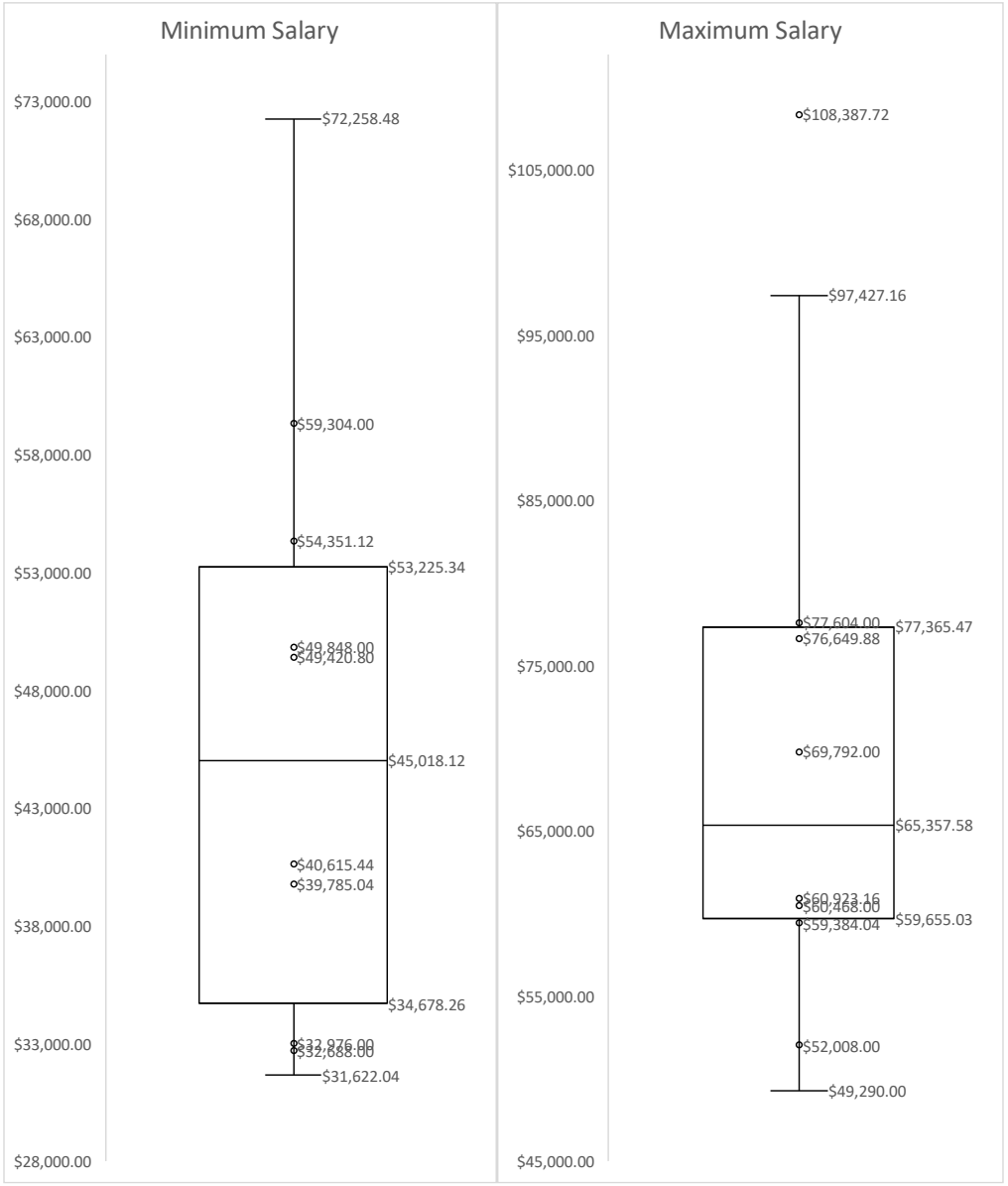


Figure 54: Salary ranges for Support Staff

State Laboratory Program Metrologists

The survey requested specific data on each metrologists on staff in the SLP. These data include details on what measurements the metrologist is authorized to perform, their experience (in years) both in the SLP and outside of it, and the calendar year when they will be eligible for full retirement.

Lab 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 Metrology Experience
AK	Travis Garding	travis.garding@alaska.gov	N	Y	Y	Y	Y	N	Y	Y	N	2050	5	9	14
AK	Roger Holland	roger.holland@alaska.gov	N	Y	Y	Y	Y	N	Y	Y	N	2025	13		13
AL	Michael Bridges	michael.bridges@agi.alabama.gov			Y	Y						2027	15		15
AL	James Little	james.little@agi.alabama.gov			N	N						2049	1		1
AR	Jill Franke	Jill.Franke@agriculture.arkansas.gov	N	N	Y	Y	N	N	N	N	N	2042	10		10
AR	Brian Terry	Brian.Terry@agriculture.arkansas.gov	N	N	N	N	N	N	N	N	N	2042	0.8		0.8
AR	Kayla Hankins	Kayla.Hankins@agriculture.arkansas.gov	N	N	N	N	N	N	N	N	N	2050	2.75		2.75
AR	Kyla Williams	kyla.williams@agriculture.arkansas.gov	N	N	N	N	N	N	N	N	N	2051	1.25		1.25
AZ	Brian Sellers	bsellers@azda.gov	N	Y	Y	Y	Y	N	N	N	N	2024	20.5		20.5
AZ	Mauro Nieves	mnieves@azda.gov	N	N	Y	Y	N	N	N	N	N	2036	5		5
CA	Tony Gruneisen	Anthony.Gruneisen@cdfa.ca.gov	N	Y	Y	Y	Y	Y	Y	Y	N	2032	24		24
CA	Toni Bulai	Toni.Bulai@cdfa.ca.gov	N	Y	Y	Y	Y	Y	Y	Y	N	2040	8.6	9	17.6
CA	Demi Noll	Demielle.Noll-Tennin@cdfa.ca.gov	N	N	N	N	N	N	N	N	N		3		3
CO	Tiffany Brigner	tiffany.brigner@state.co.us	N	N	N	N	N		N			2028	5		5
CO	Aaron Nowotny	aaron.nowotny@state.co.us	N	N	N	N	N		N				2		2
CO	Andrew Shopes	andrew.shopes@state.co.us	Y	Y	Y	Y	Y		Y			2051	4		4
CO	Kate Smetana	kate.smetana@state.co.us	Y	Y	Y	Y	Y		Y			2040	12		12
FL	Megan Money	Megan.Money@fdacs.gov	N	Y	Y	Y	N	N	N	N	N	2042	12		12
FL	Mike Kruse	Mike.Kruse@fdacs.gov	N	Y	Y	Y	N	N	N	N	N	2043	10		10
FL	Amy Smith	Amy.Smith@fdacs.gov	N	Y	Y	Y	N	N	N	N	N	2036	12		12
GA	Stan Diffie	stan.diffie@agr.georgia.gov	N	Y	Y	Y	N	N	N	N	N	2026	6		6
GA	John Plourde	john.plourde@agr.georgia.gov	N	N	N	N	N	N	N	N	N	2024	0.5		0.5
HI	Michael Tang	michael.tang@hawaii.gov	Y	Y	Y	Y	Y	N	Y	N	Y	2019	24		24
ID	Stacie Ybarra	stacie.ybarra@agri.idaho.gov	N	Y	Y	Y	Y	N	N	N	N	2032	15		15
ID	David Bennett	david.bennett@agri.idaho.gov	N	Y	Y	Y	Y	N	N	N	N	2034	2		2
IL	Karl Cunningham	karl.cunningham@illinois.gov		N	Y	Y					Y	2025	22		22
IL	John Satterlee	john.satterlee@illinois.gov		N	Y	Y					Y	2046	8		8
IL	Austin Boyett	austin.boyett@illinois.gov		N	Y							2052	3		3
IL	Stephanie Somers	Stephanie.Somers@Illinois.gov		N	Y						Y	2052	3		3
IL	Evan Johnson (Starts 3/16/2025)	Clarenceevan.Johnson@illinois.gov		N	Y	Y						2055	7		7
KS	Kevin Uphoff	Kevin.uphoff@ks.gov	Y	Y	Y	Y	Y	N	N	Y	N	2036	14		14
KS	Evan Johnson	ClarenceEvan.Johnson@ks.gov	N	Y	Y	Y	Y	N	N	N	N	2050	5		5
KY	Sharon Webb	SHARON.WEBB@KY.GOV	N	N	N	N	N	N	N	N	N	2040			

Lab 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 Metrology Experience
KY	Jason Glass	JASON.GLASS@KY.GOV	N	N	Y	Y	N	N	N	N	N	2025	22		22
KY	Chester Watson	CHESTER.WATSON@KY.GOV	N	N	Y	Y	N	N	N	N	N	2031	17		17
LA	Whitney Corley	wcorley@ldaf.la.gov		Y	Y	Y	Y					2055	6		6
LA	Jennifer Adair	jadair@ldaf.la.gov		Y	Y	Y	Y					2056	5		5
LA	Tyler Holmes	tholmes@ldaf.la.gov										2059	2		2
MA	Ray Costa	ray.costa@mass.gov	N	N	Y	Y	N	N	N	N	N	2015	16	35	51
MA	Hain "Will" Setow	hain.setow@mass.gov	N	N	N	N	N	N	N	N	N	2050	3		3
MD	Tong Hsu	tong.hsu@maryland.gov	N	N	Y	Y	N	N	N	N	N	2050	8		8
MD	Emily Hoyt	emily.hoyt1@maryland.gov	N	N	Y	Y	N	N	N	N	N	2058	1		1
ME	Bradford Bachelder	bradford.bachelder@maine.gov	N	Y	Y	Y	Y	Y	N	N	N	2052	12	1	13
MI	Craig VanBuren	vanburenc9@michigan.gov	N	N	N	N	N						25		25
MI	Neil Jones	jonesn@michigan.gov	Y	Y	Y	Y	Y						25		25
MI	Nick Santini	santinin@michigan.gov	Y	Y	Y	Y	Y						14		14
MI	Ryanne Hartman	hartmanr9@michigan.gov	N	Y	Y	Y	Y						14		14
MI	Scott Ferguson	fergusons9@michigan.gov	N	Y	Y	Y	Y						14		14
MI	Christopher Wellman	wellmanc1@michigan.gov	N	N	N	N	N						1		1
MI	Craig DeWaele	dewaelec@michigan.gov	N	N	N	N	N						1		1
MN	Benj FitzRysler	Benjamin.FitzRysler@state.mn.us	Y	Y	Y	Y	Y	N	N	N	N	2046	10	7	17
MN	Eric Johnson	Eric.E.Johnson@state.mn.us	N	Y	Y	Y	Y	N	N	N	N	2043	5	5	10
MN	Anna Pierce	Anna.Pierce@state.mn.us	N	Y	Y	Y	Y	N	N	N	N	2051	7	2	9
MN	Halie LaTourelle	Halie.LaTourelle@State.mn.us	N	N	N	N	N	N	N	N	N	2060	1.5	5	6.5
MN	Valare Falkner	Valare.Falkner@state.mn.us	N	N	N	N	N	N	N	N	N	2055	6		6
MN	Calvin Crouch	Calvin.Crouch@state.mn.us	N	N	N	N	N	N	N	N	N	2060	0.5	4	4.5
MO	Johnny Bell	johnny.bell@mda.mo.gov	N	Y	Y	Y	Y	N	N	N		2032	5		5
MO	Houston Naugher	houston.naugher@mda.mo.gov	N	Y	Y	Y	Y	N	N	N		2053	7		7
MT	David Fraser	dafraser@mt.gov	N	N	Y	Y	N	N	N	N	N	2030	12		12
NC	Sharon Woodard	sharon.woodard@ncagr.gov	Y	Y	Y	Y	Y	Y	N	Y	Y	2022	32		32
NC	Robert Rogers	robert.rogers@ncagr.gov	Y	Y	Y	Y	Y	Y	N	Y	N	2041	13	8	21
NC	Charles Edward Stevens, Jr	ed.stevens@ncagr.gov	N	N	N	N	N	N	N	N	N	2052	2.5		2.5
NC	Daniel Zhang	daniel.zhang@ncagr.gov	N	N	N	N	N	N	N	N	N	2053	1		1
NC	David McAllister	david.mcallister@ncagr.gov	N	N	N	N	N	N	N	N	N	2045	0.11		0.11
NC	Natalia Wilson	natalia.wilson@ncagr.gov	N	N	N	N	N	N	N	N	N	2055	0.1		0.1
NE	Joel P Lavicky	joel.lavicky@nebraska.gov			Y	Y						2040	9		9

Lab 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 Metrology Experience
NH	John Abasto	John.f.abasto@agr.nh.gov										2050	5		5
NH	Richard Cote	Richard.P.Cote@agr.nh.gov										2010	33		33
NJ	Michael J. Cecere	CecereM@dca.njoag.gov	N	N	Y	Y	N	Y	Y	N	N	2019	18		18
NJ	Federico Isaza	IsazaF@dca.njoag.gov	N	N	N	N	N	N	N	N	N	2058	1.5		1.5
NJ	Ethan Botelho	BotelhoE@dca.njoag.gov	N	N	N	N	N	N	N	N	N	2060			
NV	James Kellames	jkellames@agri.nv.gov	N	Y	Y	Y	Y	N	N	N	N	2043	8		8
NV	Kiara Saunders	kriske@agri.nv.gov	N	Y	Y	Y	Y	N	N	N	N	2048	5		5
NY	Jeremy Best	jeremy.best@agriculture.ny.gov		Y	Y	Y	Y	Y	Y			2049	6		6
NY	Jonathan Fox	jonathan.fox@agriculture.ny.gov		Y	Y	Y	Y	Y	Y			2039	10		10
NY	Michael Lejeune	michael.lejeune@agriculture.ny.gov		Y	Y	Y	Y	Y	Y			2035	10		10
OH	Ken Johnson	ken.johnson@agri.ohio.gov	N	Y	Y	Y	N	N	Y	N	N	2020	35		35
OH	Keith Crider	keith.crider@agri.ohio.gov	N	Y	Y	Y	N	N	Y	N	N	2027	3	37	40
OH	Daniel Walker	daniel.walker@agri.ohio.gov	N	Y	Y	Y	N	N	Y	N	N	2043	13	10	23
OH	Tom Buck	tom.buck@agri.ohio.gov	N	Y	Y	Y	N	N	Y	N	N	2032	11		11
OK	Will Krivanek	William.Krivanek@ag.ok.gov	N	N	N	N	N	N	N	N	N		2		2
OK	Termelia Hogg	Termelia.Hogg@ag.ok.gov	N	N	N	N	N	N	N	N	N		2		2
OR	Aaron Aydelotte	Aaron.AYDELOTTE@oda.oregon.gov	Y	Y	Y	Y	Y	N	N	Y	N	2029	24		24
OR	Ray Nekuda	Raymond.NEKUDA@oda.oregon.gov	Y	Y	Y	Y	Y	N	N	N	N	2037	17		17
PA	James P. Gownley	jgownley@pa.gov	N	Y	Y	Y	Y	Y	Y	N	N	2030	23		23
PA	Christopher J. Drupp	cdrupp@pa.gov	N	Y	Y	Y	Y	Y	Y	N	N	2034	17		17
PA	Richard M. Radel, Jr.	riradel@pa.gov	N	Y	Y	Y	Y	Y	Y	N	N	2025	16.5		16.5
PA	Dustin Claycomb	duclaycomb@pa.gov	N	Y	Y	Y	Y	Y	Y	N	N	2031	10.5	5	15.5
PA	Kenrick Singh	kensingh@pa.gov	N	N	Y	Y	N	N	Y	N	N	2046	2.25		2.25
SC	Tim Jones	tjones@scda.sc.gov	N	Y	Y	Y	Y	N	N	N	N	2044	10		10
SC	Kristin Sherrick	ksherrick@scda.sc.gov	N	Y	Y	Y	Y	N	N	N	N	2044	7		7
SC	Candice Zegilla	cmzegilla@scda.sc.gov	N	N	N	N	N	N	N	N	N	2052	2		2
SD	Ron Peterson	ron.peterson@state.sd.us	N	Y	Y	Y	N	N	N	N	N	2025	13		13
TN	Nicholas Andersen	Nicholas.andersen@tn.gov		Y	Y	Y	Y				Y		8		8
TN	Rong Zhang	Rong.Zhang@tn.gov		Y	Y	Y	Y				Y		6		6
TN	Luis Rendon	Luis.Rengon@tn.gov											1		1
TX	Lisa Corn	lisa.corn@texasagriculture.gov	N	Y	Y	Y	Y	N	N	N	N	2035	17		17
TX	Keri Schatte	keri.schatte@texasagricultre.gov	N	Y	Y	Y	Y	N	N	N	N	2038	8		8
TX	Heather Exner	heather.exner@texasagriculture.gov	N	N	N	N	N	N	N	N	N	2032	3		3

Lab 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 Metrology Experience
TX	Kirt Weyand	kirt.weyand@texasagriculture.gov	N	N	N	N	N	N	N	N	N	2050	2.5		2.5
UT	Bill Rigby	brigby@utah.gov		Y	Y	Y						2030	20		20
VA	William Scott	William.Scott@vdacs.virginia.gov		Y	Y	Y			Y			2035	10	5	15
VA	Obofoni Simire	Obofoni.Simire@vdacs.virginia.gov										2035	1	18	19
VA	Ameta Robinson	Armeta.Robinson@vdacs.virginia.gov										2025	3	19	22
VT	Marc Paquette	marc.paquette@vermont.gov	N	N	Y	Y	N	N	N	N	N	2021	18		18
VT	Scott Dolan	scott.dolan@vermont.gov	N	N	Y	Y	N	N	N	N	N	2041	12		12
WA	Leslie German	lgerman@agr.wa.gov	Y	Y	Y	Y	Y	N	Y	N	N	2029	8		8
WI	Justin Lien	justin.lien@wisconsin.gov	N	Y	Y	Y	N	N	Y	N	N	2044	11		11
WI	Paul Masterson	paul.masterson@wisconsin.gov	N	Y	Y	Y	N	N	Y	N	N	2045	10		10
WI	Ronald DePouw	ronald.depouw@wisconsin.gov	N	Y	Y	Y	N	N	Y	N	N	2047	8		8
WI	Bradley Wing	bradleya.wing@wisconsin.gov	N	N	N	N	N	N	N	N	N	2052	9		9
WV	Tory Brewer	Tory.D.Brewer@wv.gov	N	N	Y	Y	N	N	N	N	N	2038	12		12
WV	Jacob Woodrum	Jacob.L.Woodrum@wv.gov	N	N	N	N	N	N	N	N	N	2045			
WV	Adam Lopez	Adam.J.Lopez@wv.gov	N	N	N	N	N	N	N	N	N	2042	1		1
WY	Bob Weidler	robert.weidler@wyo.gov			Y	Y						2029	16		16
WY	Todd Stiles	todd.stiles@wyo.gov			Y							2032	9		9

Table 45: Listing of SLP metrologists as of 2024. Each metrologist was asked to indicate which of the listed calibrations they are authorized to perform, provide what year they are eligible for retirement, and to provide a measure of their metrology experience.

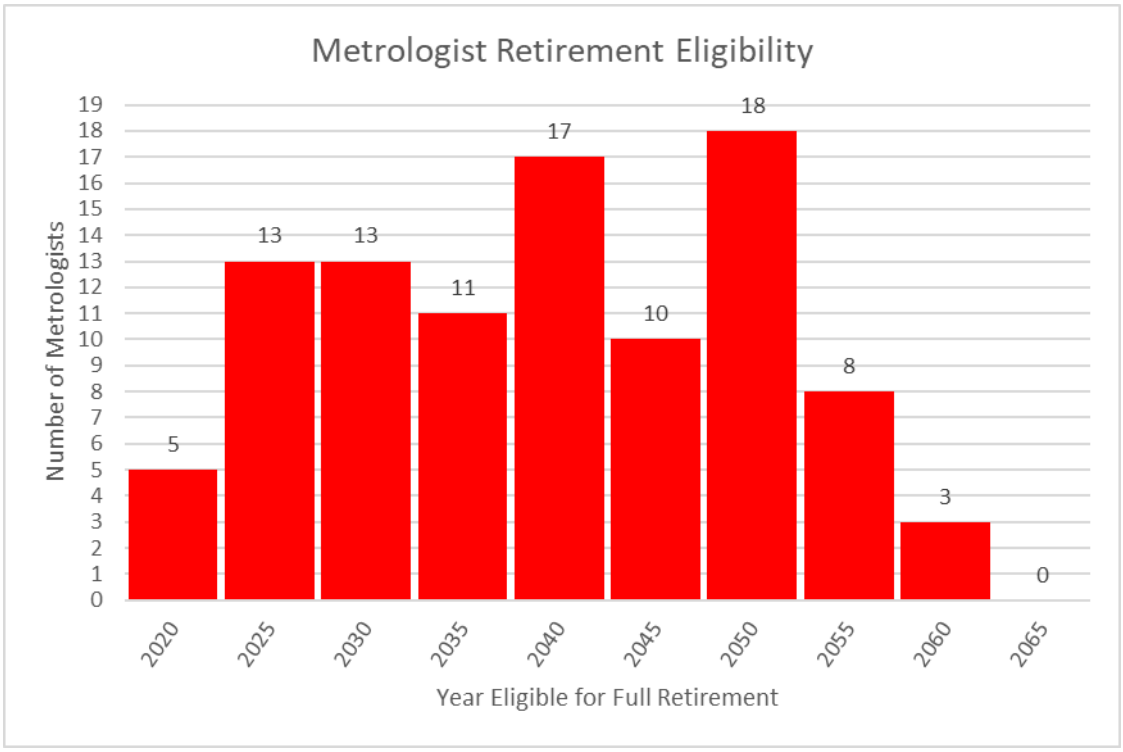


Figure 55: Retirement Eligibility Histogram. Of the 116 metrologists, 102 reported the year they would be eligible for full retirement. This may not reflect when any one person plans to leave the SLP.

Mass I	12
Mass II	58
Mass III	80
Vol Trans	77
Vol Grav	44
Length	13
Time/Frequency	25
Temperature	8
Grain Moisture	7

Table 46: 116 Metrologists reporting. Metrologists were asked to indicate which type of calibrations they are authorized to perform on behalf of their respective laboratories.

State Laboratory Program/Metrology Experience

Description

Total Metrology Experience:

Each metrologist was asked to report their metrology experience in years. The data was broken down into two categories, years of experience in the SLP, and years metrology experience outside the SLP.

Comparison of previous surveys

	Number of Metrologists	Average SLP Experience	Median SLP Experience	Average Other Experience	Median Other Experience	Average Total Experience	Median Total Experience
2000	111	8.7		2.4		11.0	
2002	113	9.1		2.1		11.2	
2004	111	8.1		2.6		10.8	
2006	112	8.3		3.1		11.4	
2008	125	9.2		2.4		11.6	
2010	121	9.5		1.9		11.4	
2012	110	8.7		2.1		10.8	
2014	118	9.2		1.7		10.9	
2016	116	8.8		2.8		10.3	
2018	119	9.3		1.4		10.7	
2020	122	8.5		1.3		9.8	
2022	110	8.8		2.6		10.4	
2024	116	9.5	8.0	11.2	7.5	11.1	9.0

Table 47: Comparison matrix summarizing metrology experience reported by metrologists.

Comments:

- Data was collected for 116 metrologist in the SLP from 42 laboratories.

NOTE: The survey team is aware some of the metrologists identified in this list are either full time weights and measures employees working part time in the laboratory due to promotions or transfers or are working as post retirement contractors to help maintain laboratory recognition or accreditation. These individuals tend to be more senior and thus skew the overall measures of experience and retirement

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[11].
- Any of the SLP member labs.
- Any SLP member lab having NIST/OWM Recognition.
- Any NVLAP Accredited Lab.
- Any Weight Manufacturer regardless of accreditation status.
- Any laboratory accredited by an accreditation body that is an ILAC signatory.

Lab ID	Your State Lab Only	Any State Lab Regardless of Status	Any NIST/OWM Recognized Lab	Any NVLAP Accredited Lab	Any Weight Manufacturer Regardless of Accreditation Status	Any Company or Lab that is Accredited by an Accreditation Body that is an ILAC Signatory
AK	No	No	Yes	Yes	No	Yes
AL	No	No	Yes	No	No	No
AR	No	No	Yes	Yes	No	Yes
AZ	No	No	Yes	Yes	No	Yes
CA	No	No	Yes	Yes	No	Yes
CO	No	No	Yes	Yes	No	No
FL	No	No	Yes	Yes	No	Yes
GA	No	No	Yes	Yes	No	No
HI	No	No	Yes	Yes	No	No
ID	No	No	Yes	No	No	Yes
IL	No	No	Yes	Yes	No	No
KS	No	No	Yes	Yes	No	No
KY	Yes	No	Yes	Yes	No	Yes
LA	No	No	Yes	Yes	No	Yes
MA	Yes	No	Yes	Yes	No	No
MD	No	No	Yes	Yes	No	Yes
ME	No	No	Yes	Yes	No	Yes
MI	No	No	Yes	Yes	No	Yes
MN	No	No	Yes	No	No	No
MO	Yes	No	Yes	Yes	No	Yes

[11] 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/OWM Recognized Lab	Any NVLAP Accredited Lab	Any Weight Manufacturer Regardless of Accreditation Status	Any Company or Lab that is Accredited by an Accreditation Body that is an ILAC Signatory
MT	Yes	Yes	Yes	Yes	No	Yes
NC	No	No	Yes	Yes	No	Yes
NE	No	No	Yes	Yes	No	No
NH	No	No	Yes	Yes	No	Yes
NJ	Yes	No	Yes	No	No	No
NV	No	No	Yes	Yes	No	Yes
NY	No	No	Yes	Yes	No	Yes
OH	No	No	Yes	Yes	No	Yes
OK	No	No	Yes	Yes	No	Yes
OR	No	No	Yes	Yes	No	Yes
PA	No	No	Yes	No	No	No
SC	No	No	Yes	Yes	No	Yes
SD	Yes	No	Yes	Yes	No	Yes
TN	No	No	Yes	No	No	No
TX	No	No	Yes	Yes	No	Yes
UT	No	No	Yes	Yes	No	Yes
VA	No	No	Yes	Yes	No	Yes
VT	No	No	Yes	Yes	No	Yes
WA	No	No	Yes	Yes	No	Yes
WI	No	No	Yes	Yes	No	Yes
WV	No	No	Yes	Yes	No	Yes
WY	Yes	No	Yes	Yes	No	Yes

Table 48: Calibration Certificate acceptance matrix.

NOTE: The question of calibration acceptance seems to be a bit vague. One could take it to mean acceptance of a calibration certificate from a service provider for the calibration of measure and testing equipment used by the laboratory to carry out its work. Another interpretation involves the acceptance of those calibration certificates submitted by service agents registered or licensed by the state or county weights and measures program. A third interpretation would look at any calibration certificate submitted to the laboratory regardless of reason. The survey team cannot infer how each respondent interpreted the question.

Supplementary Questions

Some biannual surveys include a section covering subjects of potential interest by NIST OWM and the SLP member laboratories. These supplementary questions are designed to require only a minimum of research time in order to answer and the answers themselves are generally limited to one word, multiple choice responses.

Historical Supplementary Questions

- 2003 – Miscellaneous questions
- 2010 – Use of national and international standards (HB 105 series, OIML, ASTM)
- 2014 – Who do you use for calibration services; Time to calibrate measure and test equipment.
- 2016 – Weight cleaning policy, Masscode revision in service, largest weight cart, relative metric workload, and service request tracking.
- 2018 – Acceptance criteria for MTE coming into the lab for calibration (cast iron and test measures). Calibration services requested by customers but not offered by the lab. What version of Excel are you using?
- 2020 – Questions related to COVID-19 impact on lab operations.
- 2022 – Questions related to remote work, laboratory renovations, program funding, and EV charging station support.
- 2024 – questions from 2022, as well as Questions related to staff retention, and calibrations needs

In 2018 a standardized format for including supplemental questions was introduced into the survey. Section 1 includes a bank of up to 10 yes or no questions. Section 2 includes a bank of up to 10 short answer questions.

Supplementary Questions Section 1

No.	Question	Yes	No
1	As of 31 December 2024, does your laboratory have a vacancy in a position described in Section 4?	7	33
2	Is your laboratory facility owned by the governing entity under which it operates? (i.e. state, county, municipality, federal district, tribe, territory, or commonwealth)	29	13
3	Is your laboratory facility rented or leased by the governing entity under which it operates? (answer No if you answered Yes to question 3)	13	29
4	Has your laboratory had any renovations since 1 January 2023?	5	37
5	Has your laboratory had any new construction since 1 January 2023?	1	41
6	Are there any renovations expected to start or continue in 2025?	6	32
7	Is new laboratory construction expected to begin in 2025? (if the project is adding to an existing laboratory answer No here, answer Yes to question 7)	1	38
8	Does your laboratory currently test watt-hour meters which are used to test electric vehicle charging stations?	0	42
9	Does your laboratory plan to test watt-hour meters which are used to test electric vehicle charging stations in 2025?	4	32
10	Does your laboratory currently test Mass flow meters?	1	41
	Does your laboratory plan to test Mass flow meters?	3	33
	Does your laboratory allow teleworking?	14	25
11	Identify the average 1-way commute completed by the metrology staff in your lab:		
12	0-10 miles	13	
	11-20 miles	13	
13	21-30 miles	16	
	31-40 miles	10	
	41-50 miles	2	
	> 50 miles	1	
14	Laboratory Funding, Is your laboratory funded by:		
	Fees (including calibration fees and service registration fees)	27	
	Weights and Measures program funds	23	
	General Fund Allocation	32	
	Other Funds	4	
15	Please indicate whether or not your lab uses the following software:		
	Qualtrax	3	
	IndySoft	1	
	MC Link	0	
	Balance Link	4	
	Q-Pluse	2	

Table 49: Summary of responses to supplementary questions in section 1.

	Count	Response
Q. 1		
Yes	7	AK, KS, MD, MN, NJ, SD, TX
No	33	AL, AR, AZ, CA, CO, FL, GA, ID, IL, KY, LA, MA, ME, MI, MO, MT, NC, NE, NV, NY, OH, OK, OR, PA, SC, TN, UT, VA, VT, WA, WI, WV, WY
Unsure	2	HI, NH
N/A	0	
Q. 2		
Yes	29	AK, AL, AR, CO, FL, GA, HI, ID, IL, LA, MD, ME, MI, NC, NH, NJ, NV, NY, OH, OK, OR, PA, SC, SD, TX, UT, VT, WV, WY
No	13	AZ, CA, KS, KY, MA, MN, MO, MT, NE, TN, VA, WA, WI
Unsure	0	
N/A	0	
Q. 3		
Yes	13	AK, AZ, CA, HI, KS, KY, MA, MN, MO, NE, VA, WA, WI
No	29	AL, AR, CO, FL, GA, ID, IL, LA, MD, ME, MI, MT, NC, NH, NJ, NV, NY, OH, OK, OR, PA, SC, SD, TN, TX, UT, VT, WV, WY
Unsure	0	
N/A	0	
Q. 4		
Yes	5	AK, CO, MN, TX, WI
No	37	AL, AR, AZ, CA, FL, GA, HI, ID, IL, KS, KY, LA, MA, MD, ME, MI, MO, MT, NC, NE, NH, NJ, NV, NY, OH, OK, OR, PA, SC, SD, TN, UT, VA, VT, WA, WV, WY
Unsure	0	
N/A	0	
Q. 5		
Yes	1	AL
No	41	AK, AR, AZ, CA, CO, FL, GA, HI, ID, IL, KS, KY, LA, MA, MD, ME, MI, MN, MO, MT, NC, NE, NH, NJ, NV, NY, OH, OK, OR, PA, SC, SD, TN, TX, UT, VA, VT, WA, WI, WV, WY
Unsure	0	
N/A	0	
Q. 6		
Yes	6	GA, ID, MI, MO, MT, NJ
No	32	AK, AL, AR, AZ, CA, HI, IL, KS, KY, LA, MA, MD, ME, MN, NC, NE, NH, NY, OH, OK, PA, SC, SD, TN, TX, UT, VA, VT, WA, WI, WV, WY
Unsure	4	CO, FL, NV, OR
N/A	0	

	Count	Response
Q. 7		
Yes	1	WI
No	38	AK, AL, AR, AZ, CA, CO, FL, GA, HI, ID, IL, KS, KY, LA, MA, MD, ME, MN, MO, MT, NC, NE, NH, NJ, NV, NY, OH, OR, PA, SC, SD, TN, TX, UT, VA, VT, WV, WY
Unsure	1	OK
N/A	2	MI, WA
Q. 8		
Yes	0	
No	42	AK, AL, AR, AZ, CA, CO, FL, GA, HI, ID, IL, KS, KY, LA, MA, MD, ME, MI, MN, MO, MT, NC, NE, NH, NJ, NV, NY, OH, OK, OR, PA, SC, SD, TN, TX, UT, VA, VT, WA, WI, WV, WY
Unsure	0	
N/A	0	
Q. 9		
Yes	4	CA, NV, VA, WI
No	32	AK, AL, AR, AZ, CO, FL, GA, ID, IL, KS, KY, LA, MA, MD, ME, MN, MT, NE, NH, NY, OH, OK, OR, PA, SC, SD, TN, UT, VT, WA, WV, WY
Unsure	6	HI, MI, MO, NC, NJ, TX
N/A	0	
Q. 10		
Yes	1	MT
No	41	AK, AL, AR, AZ, CA, CO, FL, GA, HI, ID, IL, KS, KY, LA, MA, MD, ME, MI, MN, MO, NC, NE, NH, NJ, NV, NY, OH, OK, OR, PA, SC, SD, TN, TX, UT, VA, VT, WA, WI, WV, WY
Unsure	0	
N/A	0	
Q. 11		
Yes	3	CO, MT, NE
No	33	AK, AL, AR, CA, FL, GA, ID, IL, KS, KY, LA, MA, MD, ME, MN, MO, NC, NH, NJ, NV, NY, OH, OK, PA, SC, SD, TX, UT, VA, VT, WA, WV, WY
Unsure	6	AZ, HI, MI, OR, TN, WI
N/A	0	
Q. 12		
Yes	14	AR, FL, GA, ID, IL, KY, ME, MI, MN, NC, NJ, NY, SD, WA
No	25	AK, AL, AZ, CA, CO, HI, LA, MA, MD, MO, MT, NE, NH, NV, OH, OK, OR, PA, SC, TN, TX, VA, WI, WV, WY
Unsure	1	UT
N/A	2	KS, VT

Q. 13		0-10 miles
Yes	13	AK, AZ, CA, HI, ID, IL, MO, NE, NV, TN, VA, WI, WV
		11-20 miles
Yes	13	AZ, CO, IL, KS, KY, MT, OK, OR, SC, SD, TX, WV, WY
		21-30 miles
Yes	16	FL, GA, MD, ME, MN, MO, NC, NJ, OH, PA, SC, UT, VT, WA, WI, WV
		31-40 miles
Yes	10	AL, AR, KY, LA, MI, MN, NH, NY, SC, WI
		41-50 miles
Yes	2	MA, VT
		> 50 miles
Yes	1	VT
Q. 14		Fees (including calibration fees and service registration fees)
Yes	27	AK, AL, CA, CO, FL, ID, IL, KY, LA, MD, ME, MI, MO, MT, NC, NE, NJ, NV, OH, OR, SC, TX, UT, VT, WA, WI, WV
		Weights and Measures program funds
Yes	23	AK, AR, AZ, CO, ID, IL, KS, LA, ME, MI, MN, MT, NE, NJ, NV, OH, OR, SC, TN, UT, VT, WA, WI
		General Fund Allocation
Yes	32	AK, AL, AR, CA, CO, FL, GA, HI, ID, IL, KS, KY, LA, MA, MD, ME, MI, MN, MO, NC, NE, NH, NY, OH, OK, PA, SD, VA, VT, WI, WV, WY
		Other Funds
Yes	4	MD, MN, MO, VT
Q. 15		Qualtrax
Yes	3	AR, KS, NC
		IndySoft
Yes	1	MN
		MC Link
Yes	0	
		Balance Link
Yes	4	HI, MI, NY, PA
		Q-Pluse
Yes	2	MI, TN
		Other
Yes	3	KS, MN, OH

Table 50: Summary of responses to supplementary questions in section 1.

Supplementary Questions Section 2

Questions 1 Identify some requests for calibration services that you are currently unable to provide.

AK	On-site analytical balance calibrations.
AL	Weight carts and 2500 lb weights
AR	Large Volume, LPG
CO	Mass flow meter
FL	Thermometry small volume gravimetric; 2500 lb Mass III
GA	6000 lb weight carts 2000 lb cast iron
HI	pressure temperature
ID	Volume Transfer - Provers above 750 gal
KS	Dynamic small volume provers thermometers Watt-Hour meters for EV gauge blocks mass standards less than 2500 lb but greater than 1250 lb
LA	Weight carts frequency
MA	Class 1 Weight Kits (1 to 2 per year at most)
MD	Large volume prover (100 to 150 gallon) Large mass (1000 pound)
ME	Mass echelon I (ASTM I)
MN	2000 lb grain platform - assigned value (platform is 20 feet long) 750 gallon LPG prover 250 lb EII (2023 request, 205 lb EII calibrations were added to our scope in 2024). Gravimetric of 5 gal slicker (required customer portal) 5500 lb Weight cart EI 2 kg to 5 kg
MO	Taximeter
NC	Electrical Port Chargers, Pressure Gauges, Gauge Blocks.
NE	EII 10kg to 1mg
NH	Requests simply wanted us to offer calibration services.
NJ	Calibrations of 1 and 2 gallon test measures, either gravimetric or volume transfer 2. Mass Echelon II calibrations
NV	Calipers, pipettes, tape measures

NY	Stopwatches that don't meet precision requirements, Ech I mass calibrations, gravimetric calibrations larger than 100 gal, small volume provers (SVP systems)
OH	ECH I calibrations
OK	Mass I, Mass II, and Volume Gravimetric
PA	Mass Echelon I, Thermometers, LPG Prover Calibrations
SD	1250, 1500, 2500 lb weights
TN	Weight Carts
UT	Mass I calibrations
VA	electronic tuning forks
VT	ASTM Class 4 Stainless Steel 10 kg & 20 kg, Glassware to 1 gil to 1/2 gallon, 50 mL to 2000 mL, 25' and 102' Steel Tape, Class 2 1 mg to 500 mg, 1 kg to 5 kg
WA	I do not provide outside gravimetric calibrations. There was one request for gravimetric calibrations (2 items).
WI	Hardly any, however, may receive 2-3 requests for an ASTM Class I calibration.
WV	Mass Echelon II Mass Echelon III >1,000 lb
WY	Length calibration for local law enforcement

Table 51: Responses to supplementary question 1

Question 2: Identify calibration needs of your lab that have been difficult or unable to procure

AK	Excessive enviromental sensor calibration costs.
AL	We are up to date on all our calibrations
CA	All calibrations are considered to be services provided by vendors, and as such they may only be procured through a contract process. The organization contract process is extremely inefficient, and is making obtaining coalibrations in a timely manner extremely difficult. We submitted a request to have a thermometer (thermistor) calibrated in September 2024, and are still waiting for an approval as of March 2025.
FL	gravimetric calibrations - water system
KS	Thermometry, large volume (gravimetric)
KY	Volumetric Glassware
LA	2500 lb MEIII lab standard calibration
MA	Our 100 gal Slicker Standard is on a stainless steel platform that is approximately 9' 6" high. This results in the spout being approximately 10' above the ground. Occasionally, we have to reject performing volume transfer to customers' truck mounted provers with neck openings at heights resulting in insufficient decline of the drain hose from the standard to the test prover.
ME	None needed (wanted)
NE	EI for furure EII lab calibrations
NH	Funding
NY	Calibration of balances by external providers, barometer calibration for precision mass measurements
OH	Water quality for gravimetric calibrations and environmental control for length measurements
OK	Recertification of some of our own physical standards
SC	Working to obtain Mass Echelon I to perform mass code. Acquisition of data has been slower than expected.
TN	Echelon I calibrations
TX	Echelon II calibrations of 2500 lb, 2000 lb
VA	Echelon I calibrations
VT	Hydrometry (We are good for now but will need an alternative supplier now that NIST is not doing them)
WA	Had the lab's 500 lb stainless pair standards calibrated at Rice Lake, CA in 2024 and it was difficult to find transport that had a state contract.
WI	Not applicable. We are very fortunate to be approved for nearly any lab need/request that is made.

Table 52: Calibrations that each lab has had difficulty, or been unable to, procure for their own programs

Question 3. Between January 2023 and 2025, How many staff have you hired?

AK	1
AL	1
AR	2
CO	1
FL	4
GA	2
ID	1
IL	4
KY	1
MD	1 hired at end of 2023
MI	2
MN	2 (Metrologist, Lab Administrator), and one postion being added in 2025.
MT	No Metrology staff. 6 W&M Inspectors
NC	3
NJ	We hired two Metrologist Trainees - A WM Inspector 1 and a WM Apprentice have been assigned to the lab.
OK	2
TN	1
TX	3
VA	1
WA	1 part time assistant, less than 20 hr/wk.
WI	Zero (0). Last hire was an employee that has been with the lab since 2016 as a LTE (limited term employee) and was recently moved to a permanent metrologist as of Augst 2022. Therefore, three (3) metrologists and a Lab Director.
WV	3
AK	1

Table 53: Number of staff hired between 2023 and 2025

Question 4. Between January 2023 and 2025, How many staff have you lost?

AK	1
AL	1
AR	1
CO	1
FL	2
GA	1
IL	1
KY	1
MD	1 lost at end of 2024, position change within W&M section, will only participate in PT
MI	1
MN	1 (Lab Administrator retired)
MT	No Metrology staff.
NC	1
NH	Richard is available on a part-time basis. He has made it known that he will be available only sporadically, at his convenience. The intent is to hire someone full time, but given the department's budget, that is unlikely to happen any time soon.
NJ	We lost one Metrologist/Authorized Signatory and one Customer Services Representative 1 (support staff)
OK	4
SD	1
TN	1
TX	1
VA	1
WI	Zero (0). Lab Staff are averaging 9 yrs of work experience as a metrologist.
WV	2

Table 54: Number of staff lost between 2023 and 2025

Question 5: If you answered Yes to Question 4 Section 33 (Supplementary Y/N questions) please describe the renovations completed.

AK	Enlarged freight access door to accommodate larger weight cart access into laboratory.
CO	continued renovations have occurred on HVAC system, most notably in January 2024 ductwork was re-rerouted to change amount of outside air coming into the system to reduce strain on humidification system.
MN	Lifting of granite table in Precision mass lab to replace aged vinyl mat with cork and lead (5/2024). Laboratory deep cleaning by Mavo for lead mitigation (12/2024)
TX	Humidifies lowered in labs and awnings extended over garage oors
WI	Expanded passageway from loading dock into the interior of the lab to accommodate all sizes of weight carts. Expansion required breaking concrete wall (height + width). Also, purchased three (3) new room humidifiers, one for each of the three rooms of the lab - Volume, Small Mass, Large Mass. New lab software and hardware controls to adjust and monitor facility HVAC system.

Table 55: Laboratory completed renovations.

Question 6: If you answered Yes to Question 5 Section 33 (Supplementary Y/N questions) please describe any improvements you realized over your existing laboratory facility.

AL	We are having our holding airlock area expanded so trucks and back in and drop weights under cover.

Table 56: Laboratory improvements

Question 7: If you answered Yes to Question 6 Section 33 (Supplementary Y/N questions) please describe the renovations planned.

GA	Sprinkler head in volume prover room will be moved to accommodate volume transfer station.
ID	New flooring, paint, bathroom upgrades, HVAC, large mass lab access doors, large volume lab scaffolfing, hoists.
MI	Upgrades to HVAC system and building security will be starting in Feburary 2025.
MO	The lab and its HVAC systems are not being renovated but the building the Missouri Metrology Lab is housed within is being renovated with a new HVAC system, bathrooms upgraded, new flooring, cubilcles, ceiling tiles, and lighting.
MT	Separating the Large and Small Volume transfer areas from the shop.
NJ	Renovations: A new HVAC system has been requested. Precision Environment in Ohio has already performed an engineering study and has provided us with a remediation proposal. That proposal has been submitted to the NJ OWM State Superintendent, the NJ Division of Consumer Affairs, and to Treasury for final approval.
NV	Updates to the current heating, ventilation, and air conditioning (HVAC) system, as well as the electrical system.
WI	no further renovations are being discussed at this time.

Table 57: Laboratory planned renovations.

Question 8. If you answered Yes to Question 7 Section 33 (Supplementary Y/N questions) please describe any improvements you expect to realize over your existing laboratory facility.

OK	New Super Thermometer (Mass II)
WV	Better environmental controls, more space, better workflow, spaces to expand to Echelon II

Table 58: Laboratory planned improvements.

2022 Workload Survey - Excel Version

The worksheets in this survey are protected to reduce the risk of unintentionally making changes to the survey layout. The survey team uses a group of templates to collect and analyze survey responses in order to expedite the report building process and to reduce the risk of transcription errors when copying your responses from this form. Please do not modify this survey as it will no longer work within the survey team's process if you do. The survey team welcomes your suggestions for improvement. Please add your comments to the comment block at the end of this survey. If you have mockups for an improved layout you may send it in with the completed survey for consideration.

Section 1

Loaded . . .

Name :	
Phone :	
Fax :	

Section 2

Laboratory Information

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

Section 3

Laboratory Information

Age of Lab :		yrs
Office Space :		sq ft
Active Lab Space :		sq ft

Section 4

List all Job Titles which perform metrology measurements or functions.

Job Title	Minimum Monthly Salary	Maximum Monthly Salary	Select the closest job description from the standardized list below

Section 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 with the same parent company, count each as a separate customer.

Laboratory Customers :		
Number of the above that are NOT W&M officials or Service Companies:		

Section 6

Which of the following best describes your State's policy on accepting calibration certificates for field standards from registered service agents/companies in lieu of performing required verification of their testing equipment. Your State will accept calibration certificates from:

(Select 'Yes' for all that apply)

Your State Lab ONLY :	
Any State Lab regardless of status :	
Any NIST/OWM Recognized Lab :	
Any NVLAP Accredited Lab :	
Any 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, ANAB (and L-A-B), LAB, IAS, Perry Johnson)	

Comments: Sections 1-6

Go To Next Sheet (Survey Section 7)

Section 7

1. Please list all current personnel who perform metrology measurements or functions in the laboratory (match with your Scope).

Name	Email	Check Approved Signatory Status (yes or no)									What 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

Comments: Sections 7 (include additional items on your scope which are not listed above.)

Go To Next Sheet (Survey Sections 8-32)

Go To Previous Sheet (Survey Sections 1 - 6)

Section 8	**Mass Echelon I** (Match with Handbook 143 and Lab Scope)		
	Number of mass standards calibrated using Advanced Weighing Designs and Mass Code Data Reduction. Regardless of Class. And, ASTM 1 or better, OIML E2 or better.	Lab (Internal)	
		W&M Program[1]	
		External Customers[2]	
	Actual Counts	TOTAL	0
Section 9	**Mass Echelon II** (Match with Handbook 143 and Lab Scope)		
	Number of mass standards. ASTM Class 2, 3 OIML Class F1, F2	Lab (Internal)	
		W&M Program[1]	
		External Customers[2]	
	Actual Counts	TOTAL	0
Section 10	**Mass Echelon III** (Match with Handbook 143 and Lab Scope)		
	Number of mass standards (except weight carts). ASTM Class 4, 5, 6, 7 OIML Class M1, M2, M3 NIST Class F	Lab (Internal)	
		W&M Program[1]	
		External Customers[2]	
	Actual Counts	TOTAL	0
Section 11	**Weight Carts**		
	Number of weight carts calibrated.	Lab (Internal)	
		W&M Program[1]	
		External Customers[2]	
	Actual Counts	TOTAL	0
Section 12	**Railroad Test Cars (Master Scale)**		
	Number of cars calibrated.	Lab (Internal)	
		W&M Program[1]	
		External Customers[2]	
	Actual Counts	TOTAL	0
Section 13	**Railroad Specific Weight Carts**		
	Number of weight carts calibrated.	Lab (Internal)	
		W&M Program[1]	
		External Customers[2]	
	Actual Counts	TOTAL	0

Footnotes: Section 8 - Section 29

1. Count State or Local Jurisdiction owned Weights and Measures Testing Equipment used by State Weights and Measures Program Staff only.

2. External customers includes registered service companies, industry, city/county standards, and standards that do not belong to State officials.

Section 14	**Volume - Glassware**			
	Number of individual pieces of volumetric glassware calibrated. Note: Indicate number of Volume Transfer and/or Gravimetric tests.		Vol-Transfer	Gravimetric
		Lab (Internal)		
		W&M Program[1]		
		External Customers[2]		
	Actual Counts	TOTAL	0	0
Section 15	**15.Volume - SVP (Dynamic Volumetric Systems)**			
	Number of small volume provers and closed loop provers calibrated.	Lab (Internal)		
		W&M Program[1]		
		External Customers[2]		
	Actual Counts	TOTAL	0	
Section 16	**Volume - LPG**			
	Number of individual LPG provers calibrated.	Lab (Internal)		
		W&M Program[1]		
		External Customers[2]		
	Actual Counts	TOTAL	0	
Section 17	**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 (Volume II) and/or Gravimetric (Volume I) tests.		Vol-Transfer	Gravimetric
		Lab (Internal)		
		W&M Program[1]		
		External Customers[2]		
	Actual Counts	TOTAL	0	0
Section 18	**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 (Volume II) and/or Gravimetric (Volume I) tests.		Vol-Transfer	Gravimetric
		Lab (Internal)		
		W&M Program[1]		
		External Customers[2]		
	Actual Counts	TOTAL	0	0
Section 19	**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 (Volume II) and/or Gravimetric (Volume I) tests.		Vol-Transfer	Gravimetric
		Lab (Internal)		
		W&M Program[1]		
		External Customers[2]		
	Actual Counts	TOTAL	0	0

Section 20	**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[1]	
		External Customers[2]	
	Actual Counts	TOTAL	0
Section 21	**Length - Rigid Rules**		
	Number of individual rigid rules tested. Please enter #devices tested, NOT number of points tested.	Lab (Internal)	
		W&M Program[1]	
		External Customers[2]	
	Actual Counts	TOTAL	0
Section 22	**Thermometry**		
	Number of thermometers tested (mechanical, liquid-in-glass, thermocouples, thermistors, PRT, and SPRT).	Lab (Internal)	
		W&M Program[1]	
		External Customers[2]	
	Actual Counts	TOTAL	0
Section 23	**Frequency**		
	Number of frequency standards tested (includes tuning forks).	Lab (Internal)	
		W&M Program[1]	
		External Customers[2]	
	Actual Counts	TOTAL	0
Section 24	**Timing Devices**		
	Number of timing devices tested (Such as stopwatches).	Lab (Internal)	
		W&M Program[1]	
		External Customers[2]	
	Actual Counts	TOTAL	0
Section 25	**Wheel Load Weighers**		
	Number of wheel load weighers tested.	Lab (Internal)	
		W&M Program[1]	
		External Customers[2]	
	Actual Counts	TOTAL	0
Section 26	**Lottery Balls**		
	Number of lottery balls tested.	Lab (Internal)	
		W&M Program[1]	
		External Customers[2]	
	Actual Counts	TOTAL	0
Section 27	**Watt-Hour Meters used to test EV Charging Stations**		
	Number of Watt-Hour meters tested.	Lab (Internal)	
		W&M Program[1]	
		External Customers[2]	
	Actual Counts	TOTAL	0
Section 28	**(A) Other Types of Measurements not covered in this survey**		
	Describe type of measurement:	Lab (Internal)	
		W&M Program[1]	
		External Customers[2]	
		TOTAL	0
Section 29	**(B) Other Types of Measurements not covered in this survey**		
	Describe type of measurement:	Lab (Internal)	
		W&M Program[1]	
		External Customers[2]	
		TOTAL	0
Section 30	**(C) Other Types of Measurements not covered in this survey**		
	Describe type of measurement:	Lab (Internal)	
		W&M Program[1]	
		External Customers[2]	
		TOTAL	0

Section 31 Instructions:

Calibration Fee: What you charge for calibrating the artifacts listed with no added adjustments or other fees
Adjustment Fee: What you charge to adjust a **single artifact** for examples listed
Handling fee: What you charge for packing/unpacking and any additional fees based on size of the artifact.
Certificate Fee: Any fee related to certificate creation for artifacts.

Section 31

In this section please estimate the typical fees charged for each of the described examples and enter the average time required for each item.		Calibration Fee with no cleaning or adjustments	Additional fee for Adjustment	Do you have a handling fee?	Fee	Do you have a certificate fee?	Fee	Do you have any additional fees? If yes, please provide the total additionals fee here and specify what they are for in the comments
If you have a minimum fee, what is it?								
[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) :								
[Mass Echelon III] One - 31 lb Class F weight kit (22 weights) :								
[Mass Echelon III] 5,000 lb weight cart :								
Mass Echelon III Large Scale Test Truck	24 - 1000 lb weights:							
	20 - 50 lb weights :							
	2 - 31 lb weight kits (22 weights each) :							
	Scale Test Truck 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 - 100 foot tape with 19 points tested :								

Section 32

Do you charge:	
Do you charge out of state customers higher fees than in state customers?	
Do you charge for calibrating W&M field equipment and standards?	
Do you charge for calibrating city, county, township (political jurisdiction W&M) equipment and standards?	
Do you charge for calibrating registered service company equipment and standards?	

	Section 33: *Supplementary Questions 1. (Yes/No)*	
1	As of 31 December 2024, does your laboratory have a vacancy in a position described in Section 4?	
2	Is your laboratory facility owned by the governing entity under which it operates? (i.e. state, county, municipality, federal district, tribe, territory, or commonwealth)	
3	Is your laboratory facility rented or leased by the governing entity under which it operates? *(answer No if you answered Yes to question 2)*	
4	Has your laboratory had any renovations since 1 January 2023?	
5	Has your laboratory had any new construction since 1 January 2023?	
6	Are there any renovations expected to start or continue in 2025?	
7	Is new laboratory construction expected to begin in 2025? (if the project is adding to an existing laboratory answer No here, answer Yes to question 6)	
8	Does your laboratory currently test watt-hour meters which are used to test electric vehicle charging stations?	
9	Does your laboratory plan to test watt-hour meters which are used to test electric vehicle charging stations in 2025?	
10	Does your laboratory currently test Mass flow meters?	
11	Does your laboratory plan to test Mass flow meters?	
12	Does your laboratory allow teleworking?	
13	**Identify the average 1-way commute completed by the metrology staff in your lab:**	
14	0-10 miles	
15	11-20 miles	
16	21-30 miles	
17	31-40 miles	
18	41-50 miles	
19	> 50 miles	
20	**Laboraty Funding, Is your laboratory funded by:**	
21	Fees (including calibration fees and service registration fees)	
22	Weights and Measures program funds	
23	General Fund Allocation	
24	Other Funds	
25	**Please indicate whether or not your lab uses the following software:**	
26	Qualtrax	
27	IndySoft	
28	MC Link	
29	Balance Link	
30	Q-Pluse	
31	Please list any other software in the comments below	

Renovations:
4- Answer Yes if any renovations were made to your facility since 2023. This includes any updates or additions to an existing laboratory. It does not include new MT&E including mass comparators.

7- New construction means construction of an entirely new laboratory facility which can include the buildout of a new leased space, new laboratory space added to an existing structure, or an entirely new structure.

6 and 7 are similar. In these answer yes if work is planned to start in 2025.

The question as posed is intended to help metrologists who may be facing either a remodel or planning a new lab identify labs which are or have recently done the same.
Follow up questions are included in the next section to describe additional details of the project(s).

For questions 13-19,
compute the average 1-way commute for all full time metrology staff in your lab (including support staff)

Questions 21-24,
Answer Yes for any portion of the fees you charge are returned to the laboratory fund to help cover laboratory operational costs.
Answer No if the fees charged are returned to the agency.

Answer Yes to Weights and Measures program funds if your laboratory is closely associated with and operates from a common cost center and funding as the Weights and Measures program.

Answer Yes to General Fund allocation if
your laboratory funds includes general fund money in any amount.

Answer Yes to "Other Funds" for all funding
not described in 21, 22, and 23.
Use the Comments Section below to provide any additional details you feel are important.

Comments, Supplementary Questions 1.

Go To Supplementary Questions 2.
Go To Previous (Sections 8 - 32)

Section 34: *Supplementary Questions 2. Short Answer*		
#	Question	(Give a brief description or list)
1	Identifiy requests for calibration services that you are currently unable to provide.	
3	Identifiy calibration needs of your lab that have been difficult or unable to procure	
4	Between January 2023 and 2025, How many staff have you hired?	
5	Between January 2023 and 2025, How many staff have you lost?	
6	If you answered Yes to Question 4 Section 33 (Supplementary Y/N questions) please describe the renovations completed.	
7	If you answered Yes to Question 5 Section 33 (Supplementary Y/N questions) please describe any improvements you realized over your existing laboratory facility.	
8	If you answered Yes to Question 6 Section 33 (Supplementary Y/N questions) please describe the renovations planned.	
9	If you answered Yes to Question 7 Section 33 (Supplementary Y/N questions) please describe any improvements you expect to realize over your existing laboratory facility.	
10		
11		
12		
13		
14		
15		
16		
17		
18		
19		
20		

Go To Survey Comments

Back To Supplementary Questions 1.

(End of Report)