

# NIST Handbook 143, Recognition Process, & Possible Accreditation

## What is NIST Recognition?

The National Institute of Standards and Technology (NIST) [Office of Weights and Measures \(OWM\)](#) has developed performance standards and formalized procedures for the voluntary recognition of state legal metrology laboratories. When a state laboratory is recognized, it receives a *Certificates of Metrological Traceability* detailing the scope of measurement and period of formal recognition (typically 1-year). After which, the laboratory must reapply to continue its formal recognition from NIST OWM.

The [NIST OWM Recognition Program](#) requires a high degree of technical and professional competence in calibration activities from approved signatory metrologists, and a comprehensive quality management system from recognized laboratories.

## Why is NIST Recognition useful?

Any state may operate a metrology laboratory but without NIST Recognition the work from that laboratory may not be accepted beyond the borders of that jurisdiction. Most state metrology and weights & measures (W&M) programs will accept work done in other jurisdictions if the laboratory completing the work is recognized by NIST OWM. This process is known as reciprocity (see [NIST Handbook 143](#) Section 2.12.7).

Nearly all states' W&M programs require registered service agents (RSA) to have their equipment calibrated and verified by recognized or accredited metrology laboratories periodically (usually annual or semi-annually). Without calibration from a recognized laboratory, RSAs will not be able to use their equipment in neighboring jurisdictions.

NIST Recognition also provides assurance to the enforcement work of any W&M Program because the equipment they use is verified in a laboratory with trained and recognized staff and the laboratory has a *Certificates of Metrological Traceability*. In states that adopt [NIST Handbook 130, Uniform Laws and Regulations in the Areas of Legal Metrology and Engine Fuel Quality](#), model weights and measures laws, or similar laws, require W&M programs to ensure metrological traceability to NIST and/or the International System of Units (SI).

## What is the difference between NIST Recognition and Accreditation?

Laboratory Accreditation differs from NIST Recognition in that the organizations providing accreditation are typically members of the [International Laboratory Accreditation Cooperation \(ILAC\)](#). For example, NIST operates a [National Voluntary Laboratory Accreditation Program \(NVLAP\)](#) which provides accreditation services that are established based on requests and demonstrated need. Accreditation is typically a longer and more rigorous process than recognition by NIST OWM.

Although the NIST OWM Recognition program is operated independently from the NVLAP, the general (ISO/IEC 17025:2017) and technical criteria (Annexes) used in both programs are nearly identical. OWM does not provide formal accreditation according to International Organization for Standardization (ISO) standards.

## Which is better for your laboratory?

The answer to this question depends on the needs of laboratory's customers. Some customers are required to have their calibration completed by an accredited laboratory while others (typically in legal metrology and W&M) are perfectly happy with using NIST recognized metrology laboratories.

## What is NIST Handbook 143?

[NIST Handbook 143](#) describes the performance standards and formalized procedures for the voluntary recognition of state legal metrology laboratories from NIST OWM.

### Important Sections form People New to the Process

#### 2.1 Purpose

#### 2.12.6 Management System Requirements

#### 3 Recognition Process

#### 3.3.2 Annual Submission Period

#### 3.6.2 Recognition Approval

#### 4.3 Approved Signatory

#### Appendix A. NIST OWM Services

## What does the NIST Recognition process look like?

The NIST recognition process begins when NIST published their Recognition Solicitation Memo in June or July of each year. This memo lays out what needs to be submitted to NIST OWM if a laboratory would like recognition for the following year in a table like Table 1 in [NIST Handbook 143](#). These requirements are largely the same for laboratories which are currently not recognized and for those that are.

Once the Recognition Solicitation Memo is published laboratory staff are responsible for completing the necessary components prior to the November 1<sup>st</sup> deadline to submit applications. It is advisable not to leave all the components for the last minute as many of these items take an extended time to complete, especially the first time around.

NIST formally accepts applications for recognition between October 1<sup>st</sup> and November 1<sup>st</sup> each year. They may make exceptions for labs that are not currently recognized if they have all the necessary documents prepared in advance, but it is prudent to plan to submit in the designated timeframe.

Once the application window has closed on November 1<sup>st</sup>, OWM staff begin the lengthy process of reviewing all the applications. This process typically takes 2 months. If a laboratory's submission application is incomplete NIST OWM will reach out requesting any additional documentation. Typically, laboratories will be given around ten business days to supply the requested information after which an application may be considered incomplete. Recognition by NIST OWM is not given to laboratories with incomplete applications.

In typical years, labs will begin receiving their renewed recognition, feedback letters, and certificates of metrological traceability around February 1<sup>st</sup>. Usually, labs will receive these documents electronically first, before the official version arrives by mail a few weeks later.

## How do you become a NIST OWM Approved Signatory? Why is this important?

For a laboratory to be Recognized by NIST OWM they must have at least one approved signatory for a mass echelon 3 and volume echelon 2. The requirements to become an Approved Signatory are spelled out in Table 2 of [NIST Handbook 143](#), but can be simplified to successfully complete the following list of courses, activities, and problems:

1. Fundamentals of Metrology course (one week)
2. Mass Metrology course (two weeks)
3. Volume Metrology course (one week)
4. Participate in the laboratory's Regional Measurements Assurance Program (RMAP)
5. Participate and Pass a Proficiency Test
  - a. At least one test must be complete for each scope of measurement a laboratory performs
6. Complete the Laboratory Auditing Problems (LAPs)

For laboratories of higher echelons there are further requirements which can be found in Table 2 of [NIST Handbook 143](#).

### What are Laboratory Auditing Problems (LAPs)?

LAPs are exactly what the name suggests. They are a set of questions developed by NIST OWM that prompt a new metrologist to audit parts of a laboratory's quality system. The LAPs can be found on the [NIST OWM website](#).

### What is a Regional Measurement Assurance Program (RMAP)?

NIST OWM had divided the country into 5 regions to aid in the coordination and logistics of ongoing metrology training. To see which region your laboratory belongs, see Figure 2 in [NIST Handbook 143](#). Each region has a defined time each year where NIST OWM staff come to provide ongoing training. At least one member of the staff of a recognized metrology laboratory must attend the regional training every year.

### What is a Proficiency Testing?

A proficiency test is a comparison of a calibration on specific artifacts by a group of different metrologists and typically includes metrologists from multiple laboratories. Proficiency tests are usually performed annually within each measurement assurance region of the country.

### Tips from metrologists around the country

- Take the time to prepare for the courses on campus at NIST in Gaithersburg.
- Make sure to keep up with the homework when taking NIST courses, leaving everything to the last minute will lead to poor results and the student will retain less from the course.

## What are laboratory Echelons?

Laboratory echelons refer to the level of calibration a laboratory performs. Mass calibration laboratories are classified as Echelon I, II, or III while volume calibration laboratories are classified as Echelon I, or II. The key thing to know about echelons is that the lower the number, the higher the level of calibration that can be completed. For example, Mass Echelon I laboratories can perform calibration of very high accuracy and precision, while Mass Echelon III laboratories perform calibration of lower precision. Typically, laboratories who perform echelon I calibration also perform calibration at echelon II and III.

## What is a Laboratory's Scope?

A laboratory's scope is the range of measurement and level of uncertainty at which it can perform work. For example, one laboratory may be able to perform calibration from 1000 lb to 0.001 lb at an echelon III level while another might be able to perform calibrations from 50 lb to 0.001 lb at both an echelon II and III level. Scopes of measurement are defined in all areas of measurement, including but not limited to mass, volume, length, and frequency.

## What does training look like?

Metrology training comes in many forms just like learning anything else, but the types of training can largely be grouped into Formal, On-the-Job Training, and Mentoring. No matter what form training takes, it must be documented as it is important to prove accredited technical competency.

### What is formal metrology training?

Formal metrology training takes the form of NIST Courses, both in-person and online. A list of the most common in-person courses is below and a list of NIST online offerings can be found through the [NIST OWM Contact System](#).

1. Fundamentals of Metrology course (one week)
2. Mass Metrology course (two weeks)
3. Volume Metrology course (one week)
4. Advanced Mass Metrology course (two weeks)
5. Regional Measurement Assurance Program (RMAP) (3 to 4 days annually)

### On-the-Job Training (OJT)

OJT occurs outside of a formal classroom setting and typically occurs within the normal operation of a laboratory. For example, a metrologist can demonstrate a procedure to a new hire and have them complete the same procedure under supervision, or a new hire could read a standard operating procedure (SOP) before watching an experienced staff member demonstrate the SOP.

OJT is the broadest type of training since it can take almost any form and occurs informally in many instances. This makes it the most difficult and important type of training to document, so a laboratory will need to develop a method to record OJT.

#### Tips from metrologists around the country

- Have the trainee document what was covered in the OJT and have the trainer review the document. This way the trainer will have a better idea of what the trainee understood and what needs more reinforcement.
- Document OJT on the training log just as the laboratory documents formal training.

### Mentoring

Mentoring, like OJT, can be both a formal and informal process. Mentoring typically takes the form of an experienced metrologist working with one less experienced but can also occur in a peer-to-peer setting as well, when one metrologist has additional insight into an area of expertise.

#### Tips from metrologists around the country

- When starting something new, don't hesitate to reach out to other labs in the region.

- When looking to expand the laboratory's scope, contact other laboratories in the region to get advice from people who are already doing it.

## Additional Resources

[NIST Handbook 143](#)

[NIST OWM Laboratory Metrology](#)