

Chapter 1

Introduction to the Course

Chapter Objectives

Upon completion of this chapter, you should be able to:

1. Explain the purpose and content of the NIST Training Program.
2. Identify the purpose and objectives of this course.
3. Describe the prerequisite knowledge and skills necessary to comprehend the content of the course.

The NIST Training Program

As a weights and measures official, you are responsible for enforcing the system of weights and measures in the United States. You are probably aware that enforcement is a function of State and local jurisdictions rather than the Federal Government. However, the National Institute of Standards and Technology (NIST) has a mandate to provide technical assistance and advice to promote measurement uniformity and traceability of standards. Historically, training has been part of NIST's approach to providing this technical assistance and advice. In addition, NIST provides significant support to the National Conference on Weights and Measures (NCWM) in partial implementation of its statutory responsibility for cooperation with the States in securing uniformity in weights and measures laws and methods of inspection among the State and local jurisdictions.

Technological advances, especially in the area of electronic devices, have increased the need for training weights and measures officials. In response to this need, the NIST Weights and Measures Division (WMD) maintains a training program to:

- promote inspection and regulatory uniformity, and
- provide weights and measures officials with the knowledge and skills they need to deal with and benefit from changing technologies.

NIST offers a variety of courses and formats to meet the specific training needs of individuals or groups. While some of the courses are designed primarily to provide structured and uniform training for new officials and service people, experienced officials and service people also benefit from continuing education and training. Included among the courses offered by NIST are a series of “functional courses,” which provide detailed instruction on specific functions of officials such as inspecting and testing different types of weighing and measuring equipment.

Other courses offered cover background, theory, and policy on weights and measures related subjects. Another course that covers topics that are related to specific aspects of this course and that may be especially useful either in preparation for your study of vehicle-tank meters or as a supplement is the “Introduction to NIST Handbook 44, Specifications, Tolerances and Technical Requirements for Weighing and Measuring Devices.” The NIST Handbook 44 course is a self-study course that provides an overview of NIST Handbook 44, including the history, organization, and format of the handbook; guidelines for use of the handbook; and a review of the basic principles on which the handbook is based.

Course Objectives

It is safe to say that the average American consumer gives relatively little thought to the subject of vehicle-tank meters. If he or she takes any notice of them at all, it is usually while stuck in traffic behind a tanker truck that is laboring up an incline on a one-lane road. At that, the exasperated motorist probably has at best a very limited understanding of the complicated looking contraption mounted on the back or the side of the truck, with its profusion of pipes, valves, levers, and indicators. This lack of knowledge – and interest – on the part of the consumer is at the same time easy to understand and somewhat paradoxical.

It is easy to understand because the average American (who does not live on a farm and works at home or in an office) has little direct contact with vehicle-tank meters or the jobs they perform. The only common retail application of these devices is in the delivery of home heating fuel. And when we see the delivery person dragging that long hose up to the side of the house on a blustery winter day, how many of us go out to stand by the truck and observe what's going on? The delivery person may drop off a ticket at the end of the delivery that shows us how much fuel we have purchased, but we are rarely present when the ticket is printed and really have no idea how it is produced. Even though we pay quite a bit of money for the fuel that keeps us warm in the winter, we are not overly anxious about whether or not we are actually getting what we pay for.

This truly is a paradox, especially in a consumer-oriented society like ours. And it is the more surprising when we stop to consider that those complicated looking contraptions are involved quite directly in bringing us so many of the products we buy or use. Nearly all liquid products – from gasoline to laundry detergent to milk – are transported during at least some part of their travel from their place of production to their place of final sale in tank trucks. And farms and factories depend upon tank truck deliveries of such liquid products as fertilizers, pesticides, lubricants, industrial chemicals, and others too numerous to mention, to produce the consumer goods that provide our abundant material way of life. Almost every time a tanker truck makes a delivery of product to a buyer, that complicated looking contraption is used as the basis for determining the price of the transaction. The sum of these transactions amounts to billions of dollars every year, dollars that ultimately come from consumers and taxpayers. Should we be anxious about whether or not we are actually receiving what we pay for?

The fact is that we are not, and that we have every reason to feel secure, but few of us realize that we owe our peace of mind, in this regard at least, to two things: the precision instrument that we think of – if we think of it at all – as that complicated looking contraption on the back of the truck, and the efforts of the weights and measures officials who periodically inspect and test

these devices to assure that they are operating at the high levels of accuracy and reliability for which they are designed.

As a weights and measures official, you serve both the purchasing public and the members of the commercial community who sell to them, by assuring equity in the marketplace, discouraging unfair competition, and promoting consumer confidence.

So your job is more important than many people may realize. It is challenging work, requiring knowledge, skill, and judgment. You must master the complexities of the exacting technical specifications, tolerances, and procedures that have been established by your jurisdiction. You must be able to use precision test equipment expertly. And, you must perform your tasks judiciously, in such a way as to assure the protection of the public and at the same time minimize the burden of inspections and tests to the users of weighing and measuring devices.

So it is not enough simply to master procedures, as important as they may be. You must also understand something of how the business and marketplace work. And it is not enough to learn specifications and tolerances. As you will see in the following chapters, you must also be able to recognize and distinguish between various types and classes of devices before you can decide which particular requirements apply in a given situation. And you must also, to do your job well, understand the entire vehicle-tank metering system, of which the measuring device is only a part.

Finally, you must keep up-to-date with a constantly changing and evolving technology. As you are probably aware, the "high-tech" electronic revolution, which in recent years has extended to every sector of our economy and has entered our schools and homes as well, has not passed over the meter industry. So you must be prepared to deal with frequent changes in already complex and highly sophisticated systems.

This course is intended to help prepare you to take on these challenges. You should understand, however, that the purpose and objectives of this course are limited. It is not intended to train you as a mechanical or electronic technician, repairperson, or troubleshooter. Its primary purpose is to help you perform the no less important job of a weights and measures official.

Upon completion of the module, you should have the knowledge and skills to:

- Identify and describe the types and classes of positive displacement vehicle-tank meters that are commonly encountered in the field. (milk meters and mass flow meters are not covered in this course)
- Identify and describe the design and operation of typical metering systems and their principal components, especially those involved in measuring, indicating, recording, and delivering product.
- Identify the appropriate test equipment used for testing vehicle-tank meters in the field and describe procedures for setup, operation, and maintenance of this equipment.

- Understand and describe safety procedures prescribed and recommended for inspectors conducting tests on vehicle-tank meters in the field.
- Describe procedures for inspecting and testing vehicle-tank metering systems to determine compliance with specifications and performance requirements set forth in NIST Handbook 44 and in accordance with NIST Handbook 112, “Examination Procedure Outlines for Weighing and Measuring Devices.”
- Describe post-examination tasks that must be performed upon completion of an official field examination, including documentation and recordkeeping.

Prerequisites

No previous knowledge of vehicle-tank metering systems is required. You, however, should be familiar with the introductory and general sections of the latest edition of NIST Handbook 44, "*Specifications, Tolerances, and Other Technical Requirements for Weighing and Measuring Devices*," before beginning this course.

Summary

This training course is part of NIST WMD’s training program for weights and measures officials and service personnel. It is intended to help you prepare to perform the important task of examining vehicle-tank metering systems in the field and to understand the NIST Handbook 44 requirements applicable to these systems.