



Module: 8.6

LPG and Anhydrous Ammonia Liquid Metering Systems (Registered Service Agents)

Overview and Scope

This module outlines the learning objectives registered servicepersons must understand and apply to successfully perform their duties in placing in service, testing, repairing, and calibrating LPG and Anhydrous Ammonia Metering Systems. The module covers specific concepts related to device technology, operations, and specific inspection requirements, test procedures and, application of tolerances for these devices found in NIST Handbook 44 General Code, the LPG and Anhydrous Ammonia Liquid-Measuring Devices Code, and Appendices A, B, C, and, D, and NIST EPO 26 (Liquefied Petroleum Gas (LPG) Liquid-Measuring Systems), and NTEP Certificates of Conformance.

Suggested Prerequisite

Module 8.1 - NIST Handbook 44 and NIST Handbook 130 – Basic (Registered Service Agents)

Learning Objectives

1 Technologies Used in LPG and Anhydrous Ammonia Liquid Metering Devices

A registered serviceperson should understand the technologies used in a typical LPG or Anhydrous Ammonia Metering System. To demonstrate this the serviceperson can:

- 1.1 Define common terms for LPG or Anhydrous Ammonia metering systems.
- 1.2 Describe the important physical and chemical characteristics of LPG liquid and Anhydrous Ammonia and identify important physical and chemical hazards involved in handling these products.
- 1.3 Describe the major components of an LPG or Anhydrous Ammonia measuring system from the storage tank(s) to the discharge nozzle.
- 1.4 Recognize typical measurement technologies used in LPG or Anhydrous Ammonia systems, such as positive displacement meters.
- 1.5 Recognize typical registration technologies used in LPG or Anhydrous Ammonia systems, such as mechanical registers and electronic registers.
- 1.6 Identify the metrological components of a measuring system (indicating element, recording element, operator controls and printer).
- 1.7 Describe built in safety components in an LPG or Anhydrous Ammonia measuring system.
- 1.8 Restate that the systems may be made up of indicating elements/modules and

recording elements/modules.

- 1.9 Recognize that system performance will vary with the rate of flow, product composition and flow properties, influences such as temperature, supply voltage, etc., and disturbances such as product vaporization, EMI/RFI, and test prover capacities.

2 System Markings and Operations

A registered serviceperson should understand the various marking requirements applicable to an LPG or Anhydrous Ammonia measuring system and demonstrate the ability to operate a measuring system. To demonstrate this the serviceperson can:

- 2.1 Recognize and interpret required identification markings on an LPG or Anhydrous Ammonia measuring element.
- 2.2 Recognize and interpret required markings on the controls, indications and features of an LPG or Anhydrous Ammonia measuring system.
- 2.3 Describe the following functions/operations on a measuring system.
 - 2.3.1 Zero reset.
 - 2.3.2 Activation controls to start flow.
 - 2.3.3 Flow control valves (in line, at nozzle or outlet).
 - 2.3.4 Activation/deactivation of automatic temperature compensator for mechanical systems, or alternatively, use of system controls to obtain both net and gross volume indications for electronic systems.
- 2.4 Recognize and interpret the measurement information displayed on a mechanical register.
- 2.5 Recognize and interpret the measurement information displayed on an electronic register.
- 2.6 Demonstrate ability to estimate the actual flow rate of a system using the system indications.

3 Technical Requirements

A registered serviceperson should understand the various technical requirements applicable to an LPG or Anhydrous Ammonia measuring system. To demonstrate this the serviceperson can:

- 3.1 Apply the rules regarding the following measuring system features/indications and be able to find the rule in NIST Handbook 44.
 - 3.1.1 Marking Requirements.
 - 3.1.2 Value of minimum increment of volume and price indications.
 - 3.1.3 Return to proper zero indication on reset.
 - 3.1.4 Maximum and minimum flow rates for the system.
 - 3.1.5 Flow control and check valves.
 - 3.1.6 Discharge lines and valves.
 - 3.1.7 Maximum and minimum indications of delivery.

- 3.1.8 Agreement of indications within a system, both mechanical and electronic.
- 3.1.9 Mathematical agreement on computing devices - mechanical or electronic.
- 3.1.10 Unit price display and changes to unit price.
- 3.1.11 Vapor elimination devices.
- 3.1.12 Categories of sealing, appropriate seals and audit trails.

4 User Requirements

A registered serviceperson should understand the NIST Handbook 44, User Requirements found in the General Code and the Liquefied Petroleum Gas and Anhydrous Ammonia Liquid-Measuring Devices Code. To demonstrate this the serviceperson can:

- 4.1 Assess whether a device is installed correctly.
- 4.2 Assess whether a device is being used correctly including use of temperature compensation, recorded representation, ticket printing and receipt printing requirements.
- 4.3 Assess whether the device is being properly maintained.

5 Basic Test Procedures

A registered serviceperson should be able to apply the appropriate performance tests to an LPG or Anhydrous Ammonia measuring system, manually calculate delivery errors and evaluate compliance with the applicable tolerances and performance standards. To demonstrate this the serviceperson can:

- 5.1 Determine the appropriate accuracy class for the LPG or Anhydrous Ammonia measuring system.
- 5.2 Determine minimum test drafts required for testing an LPG or Anhydrous Ammonia measuring system.
- 5.3 Select appropriate test measures to conduct tests, use them correctly, and care for them when not in use. Use includes making connections of all hoses to the system under test correctly to ensure tests are conducted accurately.
- 5.4 Explain the difference between normal and special tests, or other performance tests and be able to apply the appropriate tolerance for each test.
- 5.5 Select appropriate test drafts for normal tests of a given measuring system, perform the appropriate normal tests, and evaluate the test results for compliance with applicable tolerances.
- 5.6 Select appropriate test drafts for special tests for a given measuring system, perform the appropriate special tests, and evaluate the test results for compliance with applicable tolerances.
- 5.7 Select appropriate test drafts and flow rates for a Repeatability Test for a given measuring system, perform the test, and evaluate the test results for compliance with applicable tolerances and agreement requirements.
- 5.8 Conduct appropriate performance tests to evaluate whether regulated devices within the system are working correctly and are functioning within tolerance (check valves,

prepay purchases, zero reset, mathematical agreement, etc.).

- 5.9 Apply the information found in an NTEP Certificate of Conformance.
- 5.10 Recognize and apply procedures in EPO 26 including safety notes and reminders.

Contributors:

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