Manual of Petroleum Measurement Standards Chapter 6—Metering Assemblies

Section 2—Loading Rack Metering Systems

THIRD EDITION, FEBRUARY 2004

REAFFIRMED, JULY 2016

AMERICAN PETROLEUM INSTITUTE

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Measurement Coordination

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FOREWORD

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Chapter 6—Metering Assemblies

Section 2—Loading Rack Metering Systems

1 Introduction

This standard serves as a guide in the selection, installation and operation of loading rack metering systems for petroleum products, including liquefied petroleum gas. This standard does not endorse or advocate the preferential use of any specific type of metering system or meter.

In general, metering system installations must meet certain fundamental requirements, including those that ensure proper meter type, size, installation and adequate protective and readout devices (such as presets, registers [counters], strainers, relief valves, pressure and flow control valves, and air eliminators, where required). Descriptions of these and other system components are covered elsewhere in this standard or other API standards. Also, to ensure compliance with state laws and regulations the latest editions of NIST Handbook 44, Handbook 12, as well as specific local weights and measures requirements, should be considered.

2 Scope of Application

This standard offers guidance on the design, selection, and operation of loading rack metering systems and associated equipment where liquid hydrocarbons are loaded into vehicle tanks.

3 Pertinent Publications

3.1 REFERENCED PUBLICATIONS

The most recent editions of the following standards, recommended practices, and handbooks are cited in this standard.

API

Manual of Petroleum Measurement Standards (*MPMS*)

Chapter 4.2, "Pipe Provers"
Chapter 4.4, "Tank Provers"
Chapter 4.5, "Master Meters"
Chapter 4.6, "Pulse Interpolation"
Chapter 4.7, "Field-Standard Test Measures"
Chapter 5.1, "General Considerations for Measurement by Meters"
Chapter 5.2, "Measurement of Liquid Hydrocarbons by Displacement Meter"
Chapter 5.3, "Measurement of Liquid Hydrocarbons by Turbine Meters"
Chapter 5.6, "Measurement of Liquid Hydrocarbons by Coriolis Force-Flow Meters"
Chapter 6.6, "Pipeline Metering Systems"
Chapter 7, "Temperature Determination"
Chapter 9, "Density Determination"
Chapter 11.1, "Physical Properties Data"
Chapter 11.2.1, "Compressibility Factors for Hydrocarbons: 0 – 90 API Gravity Range"
Chapter 11.2.2, "Compressibility Factors for Hydrocarbons: 0.350 – 0.637 Relative Density"
Chapter 12.2, "Calculation of Liquid Petroleum Quantities by Turbine or Displacement Meters

RP 1004 *Bottom Loading and Vapor Recovery for MC-306 Tank Motor Vehicles*

RP 2003 *Protection Against Ignitions Arising Out of Static, Lightning, and Stray Currents*

NIST[1]

Handbook 12 *Examination Procedure Outlines for Weighing and Measuring Devices*

Handbook 44 *Specifications, Tolerances, and Other Technical Requirements for Weighing and Measuring Devices*

4 Loading Rack Metering Systems

The loading rack metering systems described in this standard are those that apply to transport-type truck facilities. The rack may be of a single-product/single-meter, single-product/multi-meter, or multi-product/multi-meter design. The design of the rack should allow one meter to be proved without interfering with the other meters involved in the loading operations.

4.1 LOADING RACK METERING SYSTEM INSTALLATION

Loading rack metering systems are designed to deliver accurate quantities of products into transport trucks for the subsequent delivery to remote locations. The metering configurations may consist of single tally meters, single product meters, blend meters and additive meters. Since rack delivery meter volumes are considered in the terminal loss/gain determination, the design, installation and operation of the meters is extremely important. It must be noted that the loading rack is usually the final opportunity to measure accurately, i.e., after the product leaves the loading rack, measurement errors are difficult to correct.

Each meter must be proved under conditions as close to normal as possible. This would encompass the usual delivery

[1]National Institute of Standards and Technology, U.S. Department of Commerce, Gaithersburg, Maryland 20899.