

Bottom Loading and Vapor Recovery for MC-306 & DOT-406 Tank Motor Vehicles

API RECOMMENDED PRACTICE 1004
EIGHTH EDITION, JANUARY 2003

REAFFIRMED, FEBRUARY 2011



AMERICAN PETROLEUM INSTITUTE

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Downstream Segment

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FOREWORD

This Recommended Practice is intended to provide guidelines for the design and operation of bottom loading and vapor-recovery systems of MC-306 & DOT-406 tank motor vehicles.

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CONTENTS

	Page
1 GENERAL.....	1
1.1 Background	1
1.2 Purpose.....	1
2 SCOPE.....	1
3 REFERENCES	1
4 BOTTOM LOADING FOR TANK MOTOR VEHICLES.....	2
4.1 Adapter Used for Bottom Loading	2
4.2 Tank Vehicles Used for Bottom Loading	5
5 SECONDARY SHUTOFF CONTROL SYSTEM	6
5.1 Liquid Flow Control	6
5.2 Secondary Control Systems.....	6
5.3 Types of Secondary Control Systems	6
5.4 Required Features	9
5.5 Recommended Features.....	11
6 VAPOR RECOVERY FOR TANK MOTOR VEHICLES.....	15
6.1 When Vehicles are Bottom Loaded and Vapor Recovery Is Required	15
6.3 When Vehicles Are Top Loaded and Vapor Recovery Is Required.....	16
6.4 When Vehicles Are Unloaded and Vapor Recovery is Required	16
6.5 When Vehicles Equipped for Vapor Recovery Are Unloaded and Vapor Recovery Is Not Required.....	16
6.6 Required Feature	16
7 LOADING ISLANDS EQUIPPED FOR BOTTOM LOADING.....	17
7.1 Required Features	17
7.2 Recommended Features.....	18
Figures	
1 Standard Tank Vehicle Adapter for Bottom Loading and Unloading	3
2 Standard Interlock Control for Bottom Loading Adapter	4
3 Horizontal and Vertical Spacing of Adapters	5
4A Functional Lane Shutdown Diagram	7
4B Functional Rack Shutdown Diagram	8
5A Side View of Trailer Showing Need for Different Sensor Depths.....	9
5B End View of Trailer Showing Various Levels and Two Methods of Mounting Sensor.....	10
6A Construction Details for Thermistor Receptacle (Green).....	12
6B Construction Details for Thermistor Plug (Green).....	12
7A Construction Details for Optical Receptacle (Blue).....	13
7B Construction Details for Optical Plug (Blue).....	13
8 Wiring Schematic for Thermistor System	14
9 Wiring Schematic for Optical System	14
10 Coaxial Product Vapor Hose Connections	17
11 Separate Product and Vapor Hose Connections with Manifold Vents	18
12 Separate Product and Vapor Hose Connections	19

CONTENTS

	Page
13 Location of Pressure Gauge	20
14 Typical Loading Rack Arm Configuration	21
Tables	
1 Conversion of Customary Units in Figure 1 and 2 to SI Units	2
2 Color Coding for Thermistor System Wiring	15
3 Color Coding for Optic System Wiring	15

Bottom Loading and Vapor Recovery for MC-306 & DOT-406 Tank Motor Vehicles

1 General

1.1 BACKGROUND

In 1960, the API Transportation Department studied bottom loading and prepared a report that pointed out the need for uniform standards for tank vehicle bottom loading equipment. The API Marketing Department expressed interest in the project, and in 1961, a joint committee was formed to begin work on standardization.

By 1965, the joint committee reached a consensus on standardization procedures. To ensure interchangeability, a tank vehicle adapter had to be developed that would be available to all manufacturers and users. With the cooperation of all known interested manufacturers, recommended criteria for the adapter were established.

In October 1967, the first edition of API RP 1004 was published. In 1971, changes in the 1967 edition were necessary, and another joint committee was formed to produce a second edition, which was published in June 1972. Again, all known interested manufacturers cooperated in writing the revised standard.

The increasing requirements for vapor-recovery systems dictated a revision of API RP 1004 to expand the material on tank vehicle recovery systems, to provide additional guidance, and to promote the compatibility of equipment. In addition, a requirement for a standard electrical connection between the vehicle and the loading island became necessary to tie the systems together. To disseminate this new material, Change 1 to the second edition was prepared by the joint committee and was distributed in January 1974.

The joint committee was discharged after distribution of Change 1. It was soon apparent that a continual update of the bottom loading and vapor-recovery information would be required. Task groups were set up within the Transportation Department to prepare the third and subsequent editions. These task groups work closely with the Marketing Department, all known interested manufacturers of bottom loading equipment and tank vehicles, and other users of tank vehicles.

1.2 PURPOSE

The purpose of this Recommended Practice (RP) is to provide guidance to users and manufacturers in the design and operation of bottom loading and vapor-recovery systems to provide greater reliability and interchangeability with safe features.

2 Scope

2.1 This RP covers required and recommended features of the following aspects of bottom loading and vapor recovery:

a. The configuration and operation of 4-in. (101.6-mm) adapters for bottom loading.

b. Tank vehicles equipped for bottom loading or vapor recovery.

c. Secondary shutoff control systems.

d. Loading installations equipped for bottom loading or vapor recovery.

2.2 Since most petroleum terminals serve more than one tank truck carrier, guidelines are necessary to ensure that the equipment is compatible. Sections 4 through 7 describe means of attaining operating flexibility with vehicles equipped for bottom loading and vapor recovery. Where compatible equipment is required, certain features must be standardized; these items are listed as required features. Other features are desirable but are not essential to interchangeability; these are listed as recommended features.

2.3 For this edition of API RP 1004, all dimensions in customary units have been converted to the International System of Units (SI) and carried to decimal figures.

3 References

API

RP 1007 *Loading and Unloading of MC306/ DOT406 Cargo Tank Motor Vehicles*

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

NFPA¹

70 *National Electrical Code*

U.S. Military Specification²

CID-A-A-59326
Commercial Item Description Coupling Halves, Quick-Disconnect, Cam-Locking Type

EPA³

Standards of Performance for New Stationary Sources (40 Code of Federal Regulations Part 60.501. "Definitions:" and Part 60, Appendix A, Method 27, "Determination of Vapor Tightness of Gasoline Delivery Tank Using Pressure Vacuum Test")

Standards of Performance for Bulk Gasoline Terminals, (40 Code of Federal Regulations 60 Subpart XX, 60.500)

¹National Fire Protection Agency, 1 Batterymarch Park, Quincy, Massachusetts 02269-9101

²U.S. Army Tank-automotive and Armaments Command, ATIN: AMSTAR D/210, Warren, Michigan 48367

³U.S. Environmental Protection Agency, U.S. Government Printing Office, Washington, D.C. 20402

TTMA⁴

RP No. 54-97 *External Work on Cargo Tank Motor
Vehicles Which May Have Been in Service*

4 Bottom Loading for Tank Motor Vehicles

4.1 ADAPTER USED FOR BOTTOM LOADING

4.1.1 Required Features

4.1.1.1 Type

To mate with loading couplers, the tank vehicle adapter must have the basic configuration shown in Figure 1 (all tolerances are provided in the appropriate figure). In the open position, the adapter must have a clear, unobstructed opening 2 in. (50.8 mm) in depth, measured from the outer face or closure of the valve as shown in Figure 1. If a poppet device is used, the adapter poppet must have a travel of 2 in. (50.8 mm), measured from the sealing surface, as shown in Figure 1. The front face of the adapter poppet must be flat within 0.004 in. (0.102 mm), excluding the corner radius. No fastening device shall protrude above the general plane of the adapter face.

If an interlock control is installed on the adapter, its dimensions must conform to those shown in Figure 2. Table 1 provides equivalent SI values for the customary dimensions shown in Figures 1 and 2.

4.1.1.2 Actuation

The primary liquid control must be by means of the set stop meter on the loading island or a self-contained system on the tank vehicle. The coupler may be opened for loading by manual or automatic means.

4.1.1.3 Size of Product Opening

The adapter must have a product opening 4 in. (101.6 mm) in diameter at the exposed outer face or closure of the valve.

4.1.1.4 Pressure Rating

The adapter must be designed for a working pressure of 75 pounds per square in. (psi) (517 kilopascals) and shall not leak at 1.5 times working pressure.

4.1.1.5 Mounting

The mounting must be accomplished by using a Truck Trailer Manufacturers Association (TTMA) standard, light-weight, 8-hole, 4-in. (101.6-mm) flange.

⁴Tank Truck Manufacturers Association, 1020 Princess Street, Alexandria, Virginia 22314

Table 1—Conversion of Customary
Units in Figure 1 and 2 to SI Units

English Dimensions (in.)	SI Dimensions (mm)
0.002	0.051
0.005	0.127
0.015	0.381
0.0625	1.588
0.125	3.175
0.190	4.826
0.250	6.350
0.375	9.525
0.750	19.050
1.000	25.400
1.500	38.100
2.000	50.800
2.060	52.324
2.250	57.150
2.440	61.976
4.000	101.600
4.250	107.950
5.250	133.350
5.750	146.050
6.000	152.400
6.500	165.100
7.250	184.150

4.1.1.6 Mating Action

The mating action must be of the push type, with provision for locking without rotating the loading coupler body. The coupling range must permit mating of the coupler to the adapter in any position in a range of 360 degrees, without any coupler contacting an adjacent adapter spaced on 10-in. (254-mm) centers.

A safety interlock or two-step action must be provided on the coupler to prevent any liquid flow while coupling or uncoupling.

4.1.1.7 Sealing Surface

As shown in Figure 1, the sealing surface must have a circular finish of not more than 63 μ in. (see Table 1 for SI conversions of customary units).

4.1.2 RECOMMENDED FEATURES

4.1.2.1 Overall Size

The adapter should be as compact as is practicable for adequate design. The overall size of the adapter and the coupler, including the operation of any handles or controls, should permit adjacent adapters to be spaced on 10-in. (254-mm) centers. Adapters should be easy to operate with heavily gloved hands.