

Safe Operation of Vacuum Trucks in Petroleum Service

API RECOMMENDED PRACTICE 2219
THIRD EDITION, NOVEMBER 2005

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Downstream Segment

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FOREWORD

This third edition of *Safe Operation of Vacuum Trucks in Petroleum Service* provides information concerning the safe operation of vacuum trucks engaged in all aspects of handling flammable and combustible liquids, associated waste water, produced water, sour water, basic sediment and water (BS&W), caustics, spent acids, or other fluids stemming from petroleum operations. This publication discusses the types of vacuum pumps and cargo tanks associated with vacuum truck operations, the common hazards associated with those vacuum truck operations and representative safe work practices and precautions to help prevent accidents and injuries. Appendix G provides brief descriptions of a variety of incidents involving vacuum trucks, including offloading into open areas. These may be useful in reviewing specific operating procedures or developing materials for safety meetings or pre-job briefings.

Vacuum truck personnel working in petroleum facilities shall be trained in the safe operation of the vacuum equipment, familiar with the hazards of the products being handled and aware of relevant facility permit requirements, safety procedures and emergency response requirements. It is the responsibility of the vacuum truck owner and operator to comply with (1) applicable federal, state and local regulations; (2) this recommended practice and (3) facility requirements regarding the safe operation of vacuum trucks; including, but not limited to, the following items:

- * Construction, inspection, maintenance and certification of the vacuum tank.
- * Selection and safe operation of the vacuum truck, vacuum pump, hoses and accessories.
- * Regulatory requirements for safe highway operation of the truck.
- * Proper transportation, handling and disposal of hazardous materials.
- * Safe vacuum truck loading, unloading and transport operations within the facility.
- * Training and qualification of operators and other assigned vacuum truck personnel.

Although the material contained in this document is intended to be consistent with regulatory requirements, API RP 2219 is not a compliance document. Each user or operator must ensure compliance with all applicable laws and regulations. The United States Department of Transportation (DOT) *Code of Federal Regulations*, 49 *CFR*, specifies the minimum requirements for the design, construction, maintenance, testing and operation of vehicles used for handling and transporting hazardous materials within the United States. Criteria for minimum training and qualifications of drivers and operators are also found in 49 *CFR*. The Department of Labor, Occupational Safety and Health Administration's (OSHA) requirements for safety, health and hazard awareness applicable to operators and other personnel working with vacuum truck operations are found in the Code of Federal Regulations, 29 *CFR* 1910. U. S. Coast Guard regulations in 33 *CFR* 154 for bulk transfer of hazardous materials to and from vessels at marine facilities could include certain vacuum truck transfer operations.

The procedures contained herein are intended to apply to vacuum trucks, skids and trailers used in flammable and combustible liquid service. These requirements include, but are not limited to, 49 *CFR* parts 178.345 - 178.348 as well as DOT 407 and DOT 412 (formerly designated MC307 and MC312) cargo tank trailers used in vacuum and transfer operations for handling and transporting flammable and combustible liquids and corrosive materials.

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Suggested revisions are invited and should be submitted to the Standards and Publications Department, API, 1220 L Street, NW, Washington, DC 20005, standards@api.org.

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Safe Operation Of Vacuum Trucks In Petroleum Service

1 General

1.1 INTRODUCTION

Vacuum trucks are used in all segments of the petroleum industry with varied applications. Appropriate safe operating practices may vary because of different hazards associated with the materials to be moved and the facilities serviced. This recommended practice seeks to assist vacuum truck owners and operators in the development and implementation of practical and safe operating practices that will help identify hazards and reduce risks.

1.2 SCOPE

The scope of this recommended practice includes the use of vacuum/pressure trucks, skids, portable tanks and trailers (herein referred to as vacuum trucks) to remove flammable and combustible liquids from tanks and equipment and to clean up liquid hydrocarbon spills. The scope includes movement of liquid mixtures (such as “produced water”, BS&W or tank bottoms) that may contain sufficient hydrocarbon material to present comparable hazards.

These safe practices also apply to the operation of portable vacuum tanks, skids and trailers typically used in emergency flammable and combustible liquid spill cleanup activities. While not included in the specific scope of this standard, Appendix F presents information related to pneumatic (air moving) trucks and hoppers, typically used in the petroleum industry for removal of non-combustible dry materials such as catalysts, dusts, powders or, residue.

1.3 BASIC VACUUM OPERATIONS

The two basic types of vacuum truck operations are:

1. Vacuum loading and off-loading operations that eliminate or minimize the introduction of air into the system by:
 - a. Completely submerging the suction nozzle into the liquid during the transfer process and
 - b. Directly connecting the transfer hose to the source or receiving tank, vessel or container, below the surface level of the liquid contained therein.
2. Vacuum truck operations that introduce air into the system during the transfer process, including:
 - a. Air conveying operations (Appendix F) involving the incidental removal of solid materials when the suction hose is either partially submerged or not submerged (or if submerged, when air is entrained or entrapped in the material) or the intentional removal of solids when used in a vacuum excavation system,
 - b. Liquid transfer operations where the end of the hose is not directly connected to the source or receiving tank, container or vessel or the nozzle is not submerged into the liquid within the tank, container or vessel, and
 - c. Vacuum truck operations involving spill cleanup of liquids where air enters the transfer hose as liquids are skimmed off the surface (water or land).

1.4 CONCEPT OF HAZARD VS. RISK

Hazards are conditions or properties of materials with the inherent ability to cause harm. Risk involves the potential for exposure to hazards that will result in harm or damage. For example, a hot surface or material can cause thermal skin burns or a corrosive acid can cause chemical skin burns, but these injuries can occur only if there is contact exposure to skin. A person working at an elevated height has “stored energy” and a fall from a height can cause injury—but there is no risk unless a person is working at heights and is thus exposed to the hazard. There is no risk when there is no potential for exposure.

Determining the level of risk for any activity involves understanding hazards and estimating the probability and severity of exposure that could lead to harm or damage. The preceding examples relate the consequences of hazard exposure, severity and probability to determine risks to people. The same principles can be applied to property risk. For instance, hydrocarbon vapors in a flammable mixture with air can ignite if exposed to a source of ignition resulting in a fire which could damage property as well as cause injury.

The U.S. Department of Transportation and the United Nations provide specific definitions and classifications for “Hazardous Materials”. These more general performance-based concepts are significant in order to understand the potential risk associated with vacuum truck operations.

1.5 JOB HAZARD ANALYSIS

Those in charge of vacuum truck operations can implement the principles of Hazard vs. Risk by conducting a job hazard analysis (JHA) to assess hazards and risks associated with specific tasks. This review, sometimes also called a job safety analysis (JSA), helps identify hazards so that protective equipment, procedures and contingency plans can be put in place to mitigate risks associated with identified hazards.

Prior to engaging in jobsite vacuum truck operations, the relevant, written JHAs/JSAs can be reviewed by an entire crew, including third party workers, to help everyone become familiar with the hazards, risks and exposure protection safeguards. Such JHAs/JSAs should be periodically reviewed so they remain current and can help to prevent incidents. (See OSHA Publication 3071, Job Hazard Analysis, or other JHA/JSA-related material from OSHA's web site.).

2 References

The most recent editions of each of the following standards, codes, and publications are referenced in this recommended practice as useful sources of additional information. Further information may be available from the cited Internet World Wide Web sites or references included in the Appendix A Bibliography.

API

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

ACGIH¹

TLVs[®] and BEIs[®] Based on Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices

ASME²

ASME Boiler And Pressure Vessel Code Section VIII: Pressure Vessels—Division 1

ASME Boiler And Pressure Vessel Code Section XII: Rules for Construction and Continued Service of Transport Tanks

NFPA³

NFPA 30 *Flammable and Combustible Liquids Code*

NFPA 326 *Safeguarding of Tanks and Containers for Entry, Cleaning or Repair*

NFPA 650 *Pneumatic Conveying Systems for Handling Combustible Particulate Solids*

NTTC⁴

Hazardous Materials Transportation—The Tank Truck Driver's Guide

NIOSH⁵

NIOSH Pocket Guide to Chemical Hazards

Pratt, Thomas H. *Electrostatic Ignitions of Fires and Explosions* ISBN 0-8169-9948-1, AIChE CCPS

OSHA⁶

29 Code of Federal Regulations (CFR) Parts 1910

1910.1000 *Subpart Z, Toxic and Hazardous Substances*

1910.132 *Subpart I, Personal Protective Equipment*

1910.147 *Control of Hazardous Energy (Lockout/Tagout)*

1910.1200 *Hazard Communication*

EPA⁷

40 CFR *Protection of Environment*

¹American Conference of Governmental Industrial Hygienists, 1330 Kemper Meadow Drive, Cincinnati, Ohio, 45240, www.acgih.org.

²American Society of Mechanical Engineers International, Three Park Avenue, New York, New York, 10016, www.asme.org, ASME International [Publications], 22 Law Drive, Box 2900, Fairfield, New Jersey, 07007-2900.

³National Fire Protection Association, 1 Batterymarch Park, Quincy, Massachusetts, 02169, www.nfpa.org.

⁴The National Tank Truck Carriers, Inc., 2200 Mill Road, Alexandria, Virginia, 22314, www.tanktruck.net.

⁵National Institute for Occupational Safety and Health, 4676 Columbia Parkway, Cincinnati, Ohio, 45226, www.cdc.gov/niosh.

⁶U.S. Department of Labor, Occupational Safety and Health Administration, 200 Constitution Ave. N.W., Washington, D.C., 20210, www.osha.gov.

⁷U.S. Environmental Protection Agency, Ariel Rios Building, 1200 Pennsylvania Avenue, N.W., Washington, D.C., 20460, www.epa.gov.