

 EXXON ENGINEERING	SAFETY IN PLANT DESIGN LOADING RACKS AND LPG STORAGE FACILITIES PROPRIETARY INFORMATION - For Authorized Company Use Only	DESIGN PRACTICES	
		Section XV-J	Page 1 of 7
		Date December, 1998	

Changes shown by ↕

CONTENTS

Section	Page
SCOPE	2
REFERENCES	2
DESIGN PRACTICES	2
INTERNATIONAL PRACTICES	2
ER&E REPORTS	2
INDUSTRY STANDARDS	3
DEFINITIONS	3
TANK TRUCK AND RAIL LOADING AND UNLOADING	3
LOADING AND UNLOADING CONNECTIONS FOR LOW FLASH AND HIGH FLASH FUELS	3
LOADING AND UNLOADING CONNECTIONS FOR LIQUEFIED PETROLEUM GAS (LPG)	3
OVERFILL PROTECTION	4
CONTROL OF VAPOR EMISSIONS DURING LOADING	4
EMERGENCY ISOLATION	4
WEIGH SCALES	4
ROOFING AND PLATFORMS	5
CONTROL OF IGNITION SOURCES	5
LAYOUT AND SPACING	5
FIREFIGHTING FACILITIES	5
SPECIAL REQUIREMENTS FOR ASPHALT	5
SPECIAL REQUIREMENTS FOR CHEMICALS	5
STORAGE OF LPG AND SIMILAR MATERIALS	5

Revision Memo

12/98	Previous Pgs. 3-5 All references to "Docks" have been removed from this practice. They are now included in Section XXXI-I .
Page 2	Various references were removed, added or updated, as appropriate.
Page 3&4	Added definition for Liquefied Petroleum Gas (LPG). Created two new sub-sections on loading and unloading - one for fuels and one for LPG connections: Clarified use of all-metal loading arms for LPG (Item 2); Mentioned acceptable types of vapor return lines (Item 3); Updated spray loading guidelines (Item 4); Clarified vapor return line recommendation (Item 5); Incorporated previous Item 7 into new Item 2.
Page 4	Added "level" in two locations where "vehicle ... gauge" was mentioned. Added note on avoiding internal probes made of conductive materials. Added references to Section XV-F for EBVs and to remote valve actuators.
Page 5	Added EE.2M.98 reference. Removed reference to Section A of API RP 500. Clarified flash point to be "Pensky-Martens Closed Cup" and deleted reference to Section XVII for hazardous chemicals' properties..
Page 6	Added reference to API 2510 and API 2510A. Referenced Section II for critical exposure temperature (CET). Clarified situations where a high-high level cutoff should be provided (Items a, b, and c). Added reference to EE.5DL.88. Added Item 11 on remote emergency isolation of LPG storage facilities.
Page 7	Changed Item No. from 11 to 12 and updated references, as appropriate.

DESIGN PRACTICES		SAFETY IN PLANT DESIGN LOADING RACKS AND LPG STORAGE FACILITIES PROPRIETARY INFORMATION - For Authorized Company Use Only	EXXON EXXON ENGINEERING
Section	Page		
XV-J	2 of 7		
Date December, 1998			

SCOPE

This section covers safety aspects of the design of two offsite areas which do not conveniently fall into other sections: tank truck and rail loading and unloading facilities, and offsite storage of Liquefied Petroleum Gas (LPG) and similar materials. Safety considerations for Docks, which were previously covered in this practice, are now covered in [Section XXXI-I](#). Additional information on safe design and operations of LPG facilities may be found in the two volumes published by Exxon Company, International (ECI) titled *Safety in Plant Design* and *LPG Safe Operations*.

REFERENCES

DESIGN PRACTICES

Section II	Design Temperature, Design Pressure and Flange Rating
Section XV	Safety in Plant Design
Section XVII	Plant Environmental Considerations
Section XVIII	Air Pollution Control, Industrial Hygiene, and Noise Control
Section XXII	Storage Facilities/Systems
Section XXIII	Product Loading Facilities/Systems
Section XXIV	Product Blending Facilities
Section XXXI	(Section I) Safety Considerations for the Design of Marine Terminals

INTERNATIONAL PRACTICES

IP 3-2-3,	Firewater Systems
IP 3-2-4,	Pressure Relieving Systems
IP 3-5-1,	Fill and Discharge Lines, and Auxiliary Piping for Storage Tanks and Vessels
IP 3-7-1,	Piping Layout, Supports, and Flexibility
IP 3-16-1,	Flanged Joints, Gaskets, and Bolting
IP 4-2-1,	Auxiliary Structures for Operation and Maintenance
IP 5-1-1,	Pressure Vessels
IP 9-1-1,	Spacing and Dikes for Storage Vessels and Tanks
IP 9-2-1,	Additional Requirements for Pressure Storage Spheres
IP 9-6-1,	Refrigerated Storage Tanks
IP 14-3-1,	Fireproofing
IP 15-1-3,	Instruments for Storage Tanks and Vessels
IP 15-9-2,	Electric Motor Operators for Valves
IP 16-1-1,	Area Classification and Related Electrical Design for Flammable Liquids, Gases or Vapors
IP 19-5-1,	Cathodic Protection

ER&E REPORTS

1. EE.49E.79, Additional Design Considerations for Refrigerated Liquefied Gas Facilities
2. CE IE 82, Rail and Truck Loading Guide for Pressurized/Refrigerated Products
3. EE.42E.83, Rollover Protection Guidelines for Refrigerated Liquefied Gas Storage Tanks
4. EE.85E.83, Safe Storage and Handling of Asphalt
5. EE.25E.84, Guidelines for the Safe Installation of Mounded LPG Drums
6. EE.1M.85, Truck Loading Rack Design Guide for Clean Products
7. EE.80E.86, Damage Estimates from BLEVEs, UVCEs and Spill Fires
8. EE.5DL.88, Safety and Fire Protection Newsletter 88-5; Remote Actuation of Sphere Deluge System
9. EE.50E.88, Fireproofing of Spheres



 EXXON ENGINEERING	SAFETY IN PLANT DESIGN LOADING RACKS AND LPG STORAGE FACILITIES PROPRIETARY INFORMATION - For Authorized Company Use Only	DESIGN PRACTICES	
		Section XV-J	Page 3 of 7
		Date December, 1998	

REFERENCES (Cont)

10. EE.1DL.89, Static Electricity and Bottom Loading
11. EE.21E.89, Piping Vibration Evaluation Guide
12. EE.94E.90, Impact of API 2510/2510A Revisions on Exxon LPG Standards
13. EE.44E.94, Possible Risk Reduction Design Items for Above Ground LPG Storage
14. EE.101E.94, Planning and Selection Guide for Oil Spill Response Equipment
15. EE.2M.98, Updated Guidelines for Prevention of Electrostatic Ignitions
16. 97 ECS3 20, SOC Communication 97-01, Remote Operation of Manual Valves

INDUSTRY STANDARDS

1. API RP 500, Classification of Locations for Electrical Installations at Petroleum Facilities (2nd Edition)
2. API RP 1004, Bottom Loading and Vapor Recovery for MC-306 Tank Motor Vehicles (1995)
3. API RP 2003, Protection Against Ignitions Arising Out of Static, Lightning, and Stray Currents (6th Edition, 9/98)
4. API Std. 2510, Design and Construction of Liquefied Petroleum Gas (LPG) Installations (5/95)
5. API Pub. 2510A, Fire Protection Considerations for the Design and Operation of LPG Storage Facilities (2nd Edition)

DEFINITIONS

Liquefied Petroleum Gas (LPG)

Light hydrocarbon material, gaseous at atmospheric temperature and pressure, held in the liquid state by pressure to facilitate storage, transport and handling. Commercial liquefied gas consists essentially of C₃'s and C₄'s.

S TANK TRUCK AND RAIL LOADING AND UNLOADING

Loading and unloading racks present a potential fire risk because of the possibility of hose or loading arm failure, overfilling, venting to atmosphere during loading, and vehicular traffic close to piping and equipment. Designs must therefore minimize uncontrolled releases and ignition sources and provide adequate fire protection.

The following safety features should be included in the design of truck and rail loading and unloading facilities:

LOADING AND UNLOADING CONNECTIONS FOR LOW FLASH AND HIGH FLASH FUELS

1. Bottom and top loading are equally acceptable if properly designed to recognized codes.
2. Bottom loading requires compatible dry-break connections for the vehicle and loading arm or hose. The connections should comply with API RP 1004, which also accommodates vapor recovery, or a comparable code. Metal loading arms are recommended; properly specified hose is also acceptable.
3. All-metal loading arms are required for top loading through an open hatch. Vapor recovery with top loading requires special fittings and connections.

LOADING AND UNLOADING CONNECTIONS FOR LIQUEFIED PETROLEUM GAS (LPG)

1. Liquid loading and spray loading for LPG are equally acceptable if properly designed to recognized codes.
2. Liquid loading and spray loading for LPG should be accomplished by using hard (all-metal) arms. Existing facilities may continue to load through hoses if risk assessment indicates that the risk from a potential hose failure is acceptably low. It is suggested to use dry break couplings in order to minimize LPG release during uncoupling. Hose connections for bulk transfer should be designed such that they can be emptied of liquid after loading. They may be left in the vapor phase. Hard arms may be left under liquid, however, they need thermal expansion protection.
3. A vapor return will facilitate the loading process in making it shorter. Vapor connections may be through hard arm or hose. The combination liquid as hard arm and vapor as hose is also allowable.