

Spacing and Dikes for Storage Vessels and Tanks

GP 09-01-01

Scope

- 1) [I] This Global Practice (GP) covers the layout, spacing, and design of dikes of:
 - a) Aboveground pressurized storage vessels designed for 2.5 psig (17 kPa) or greater containing flammable liquids (mounded storage vessels are not included).
 - b) Atmospheric storage tanks designed for 2.5 psig (17 kPa) or less and containing flammable or combustible liquids.
 - c) Refrigerated storage tanks and vessels designed for 15 psig (103 kPa) or less, storing flammable materials including anhydrous ammonia which have a Reid Vapor Pressure (RVP) above 20 psia (138 kPa).
 - 2) The requirements of this Practice are applicable only for the tank types listed above located in facilities provided with firewater systems per [GP 03-02-03](#) and with foam systems that meet the requirements of [GP 03-02-02](#) installed on all atmospheric storage tanks. For storage facilities that do not meet these requirements, the Owner's Central Engineering Safety and Risk Section should be consulted.
 - 3) [I] An asterisk (*) indicates that additional information is required. If a job is contracted, this additional information is furnished in the Job Specification.
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1. Required References

* [I] This Section lists Practices and Standards that are generically referenced and assumed to be a part of this document. Use the latest edition unless otherwise specified herein.

1.1. Global Practices–ExxonMobil Engineering Practices

GP 03-02-01	Sewer Systems
GP 03-02-02	Foam Systems for Storage Tanks
GP 03-02-03	Firewater Systems
GP 04-09-01	Site Preparation and Earthwork

1.2. API–American Petroleum Institute

API STD 2510	Design and Construction of LPG Installations
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1.3. NFPA–National Fire Protection Association

NFPA 30	Flammable and Combustible Liquids Code (National Fire Codes, vol. 1)
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2. Additional Requirements

2.1. Local Regulations

[I] Where local regulations cover the spacing and diking requirements for storage vessels or tanks, the more stringent requirements of the location regulations or this Practice shall be used.

2.2. CFR–U.S. Code of Federal Regulations

* [I] The following Code shall be used with this Practice as specified by the Owner.

40 CFR 112	Oil Pollution Prevention
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2.3. Reactive or Unstable Liquids

- * [S], [I] Location and spacing of tanks for storing liquids that are chemically reactive or unstable, or that have special safety or fire protection requirements, shall be approved by Owner's Engineer before final tankage layout is established. (Examples of such liquids are tetra-methyl lead (TML), tetra-ethyl lead (TEL), cetane improver additive, triethyl aluminum (TEA), organic peroxides, carbon disulfide, acrylic acid, vinyl acetate, styrene, and butadiene.

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- 2) [S] The EMRE Safety and Risk Engineering Section shall be consulted for location, spacing, and diking requirements for tanks storing liquefied oxygen or hydrogen or for tanks storing peroxide.

3. Definitions

Term	[I] Description
Combustible liquids	High flash liquids [closed-cup flash points 100°F (38°C) or higher] when handled at temperatures more than 15°F (8°C) below flash point. This category includes high flash stocks such as kerosene, some jet fuels, heating oils, heavy fuel oils, lubricating oils, transformer oils, and some asphalts.
Critical area	As used herein, includes process units, utility plants, manifolds, and loading areas located on marine piers, main line railroads, and public waterways.
Crude oils	Hydrocarbon mixtures which have not been processed in a refinery. This category also includes other wide boiling range stocks that may boil-over during a tankage fire.
Dike	An earth or concrete wall providing a specified liquid retention capacity.
Diversion wall	An earth or concrete wall which directs spills to a safe and environmentally acceptable disposal area.
Double containment vessel (in reference only to refrigerated storage)	A vessel consisting of two shells, each designed for containment of the full head of stored product at minimum temperature.
Double walled vessel	A vessel consisting of two shells, the outer of which may or may not be designed for containment of the full head of stored product at minimum temperature.
Flammable liquids	Low flash liquids [closed-cup flash point below 100°F (38°C)] and high flash liquids [closed cup flash point 100°F (38°C) or higher] when handled at temperatures above or within 15°F (8°C) of their flash points. This category includes low flash stocks such as gasoline, some jet fuels, and oils stored at temperatures above or within 15°F (8°C) of their flash points. Crude oils are not included.
Freeboard	The distance between the top of the contained liquid and the top of the dike or toe wall.

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Term	[I] Description
Grouped tanks	Two or more tanks that are in the same diked area and conceivably could be lost in a single fire. The collective storage in these tanks may be viewed as being contained in a single tank. Section 6.1 describes how the grouping of tanks applies to the various materials stored.
Net capacity (of dike)	The actual retention capacity within the dike. The capacity of the diked area enclosing more than one tank shall be calculated after deducting the tank displacement of the other tanks below the height of the dike, assuming that the volume occupied by the largest tank is available for retention. Net capacity shall also exclude the volume of the tank ring wall/foundation that is below the dike height for all tanks within the diked area.
Paired tanks	Consist of two tanks, except where the "extension of pairing principle" applies, as described in Section 6.1.
Remote retention basin	A diked-in area that provides spill containment capacity for one or more storage vessel(s) and is located at a safe distance from the vessel(s). A remote retention facility includes the retention basin and any facilities necessary to drain liquid from the vessel(s) to the retention basin.
Single containment vessel (in reference only to refrigerated storage)	A vessel consisting of one or two shells, but having only one shell designed for containment of the full head of stored product at minimum temperature.
Tank diameter	Where tank spacing is expressed in terms of tank diameter, the following criteria govern: a) If tanks are in similar services (type of tank and stock), the diameter of the largest tank is used. b) If tanks are in different services, or different types of tanks are used, the diameter of the tank that requires the greater spacing is used.
Toe wall	A low earth, concrete, or masonry unit curb that has no capacity requirements and is intended to retain small leaks or spills.
Vessel	As used in this Practice refers to aboveground pressurized storage vessels, including spheres, and horizontal and vertical drums containing flammable liquid.
Vessel diameter	Where vessel spacing is expressed in terms of vessel diameter, the diameter of the largest vessel is used. For double walled vessels, the outside shell diameter is used.
Vessel spacing or tank spacing	The unobstructed distance between vessel or tank shells, or between vessel shells and the nearest edge of adjacent equipment, property lines, or buildings. For double walled vessels, the outside shell diameter is used.

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3.1. Floating and Fixed Roof Tanks

* [I] Floating and fixed roof tanks, and their equivalents for the purpose of tank spacing and dike retention capacities, as covered by this Practice, are defined as follows:

Type of Tankage	Equivalency
Floating Roof Tank	- Open top or fixed roof tank containing pontoon, double deck, or similar compartmented design floating roof approved by Owner's Engineer. - Fixed roof tank containing an internal floating cover of a type approved by Owner's Engineer, e.g.,: —metal cover using pontoons for flotation —aluminum honeycomb sandwich panel
Fixed Roof Tank	- Dome or cone roof tank. - Dome or cone roof tank containing a pan type (i.e., no bulkhead or pontoon for flotation) floating roof (see Note). - Dome or cone roof tank containing a non-metallic or a combination metallic/non-metallic internal floating cover - Open top tank containing pan type floating roof (see Note). Note: Relative to Items 2 and 3 above, pan type floating roofs are no longer specified (1) in new construction, or (2) as a new installation in an existing tank.

4. Design

- * [S] Diversion walls and sloping of the ground away from vessels to a remotely located retention basin is permitted, when approved by Owner's Engineer.
- [S], [E] Earth, concrete, masonry, or any combination of these materials are acceptable for dikes and toe walls unless prohibited by local regulations.
- [S], [E] All dikes, diversion walls, toe walls, and spill containment areas shall be suitable for the static hydraulic and temperature conditions which may be encountered, and shall be constructed to retain stored stocks and firewater or stormwater by resisting percolation of liquid. The dike wall and containment floor shall have a soil hydraulic conductivity of 10^{-7} cm/s or lower. Dike construction shall be in accordance with [GP 04-09-01](#). Dike design and construction shall include an analysis for structural integrity from seismic loading (if applicable), prevention of areas where channels in dike subject to loss of soil (soil piping) could occur, and prevention of dike sliding, overturning, slope failure, or significant settlement.
- [S] Piping within diked or toe walled areas shall be limited to that serving the vessels/tanks in that area. Piping manifolds shall not be located within diked areas. Piping located between roadways and dikes shall be provided with crosswalks to facilitate pedestrian traffic from the road to the tank dikes.

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