

RULE 414 STORAGE OF REACTIVE ORGANIC COMPOUND LIQUIDS  
(Adopted 12/11/79; Revised 9/14/99; 5/18/2004)

A. Applicability

A.1 Provisions of this Rule shall apply to any storage tank with a capacity equal to or greater than 1,500 gallons used to store Reactive Organic Compound (ROC) liquids with a true vapor pressure equal to or greater than 0.50 pounds per square inch absolute (psia).

A.2 Terms used in this Rule are defined in Rule 101 - Definitions.

A.3 Exemptions

A.3.a Gasoline storage tanks are exempt from this Rule and are regulated under Rule 415, "Transfer and Storage of Gasoline."

A.3.b The provisions of Subsections B.2 and B.4 shall not apply to emergency standby tanks not equipped with a vapor loss control device when:

A.3.b.1 the primary tank, while not in operation, is drained of reactive organic compound liquids, or

A.3.b.2 a breakdown, as defined by Rule 101, of the primary tank occurs and the requirements of Rule 111, Equipment Breakdown, sections C. thru G. are met and

A.3.b.3 shall be equipped with applicable and properly functioning relief valves.

A.3.c The provisions of Sections C, D, E, and F, shall not apply to out-of-service or empty storage tanks while they are undergoing cleaning, stock change, tank and roof repairs, or removal of contaminated stock, provided that the following provisions are implemented:

A.3.c.1 Written notice is received by the APCO at least 72 hours prior to such work being done (verbal notices are acceptable only in cases of emergency and if they are followed by a written notice);

A.3.c.2 For floating roof tanks, when the floating roof is resting on the leg supports, the process of emptying and refilling shall be accomplished as rapidly as

possible. Emissions shall be minimized during the process of filling, emptying, and refilling;

- A.3.c.3 Vapor Recovery Systems are operated on tanks so equipped, during filling, flushing, and emptying procedures prior to opening tanks for clean out;
  - A.3.c.4 Deleted
  - A.3.c.5 the tank is in compliance with this Rule prior to notification;
  - A.3.c.6 the APCO is notified when returning a tank to service after the above listed work is completed
- A.3.d The provisions of Sections C, D, E and F, shall not apply to in-service tanks undergoing preventive maintenance, including, but not limited to primary seal inspection, removal or installation of a secondary seal, repairs of regulators, fittings, deck components, hatches, valves, roofs, flame arrestors, or compressors, provided that the following conditions are met:
- A.3.d.1 Written notice is received by the APCO at least 72 hours prior to such work being done (verbal notices are acceptable only in cases of emergency and if they are followed by a written notice);
  - A.3.d.2 the tank is in compliance with this Rule prior to notification;
  - A.3.d.3 no product moves in or out of the storage tank and emissions are minimized through the use of vapor recovery devices;
  - A.3.d.4 an Authority to Construct is obtained prior to commencing work, if required under District Rules;
  - A.3.d.5 The APCO is notified when work is completed;
  - A.3.d.6 a report is submitted to the APCO no later than 30 days after returning to normal operation, demonstrating compliance with Section A.3.d.
  - A.3.d.7 The time of exemption allowed under this section shall not exceed 72 hours.

**B. Requirements**

- B.1 A person shall not store Reactive Organic Compound liquids in any storage tank with a capacity less than 40,000 gallons with a true vapor pressure equal to or greater than 0.50 pounds per square inch absolute (psia) unless such tank is equipped with at least one of the following:
- B.1.a a Submerged Fill Pipe, or
  - B.1.b one of the vapor loss control devices listed in Section C.
- B.2 A person shall not store organic liquids containing Reactive Organic Compounds with a true vapor pressure equal to or greater than 0.50 psia in any storage tanks with a capacity of 40,000 gallons or more, without using one of the vapor loss control devices listed in Section C.
- B.3 A person shall not store organic liquids containing Reactive Organic Compounds with a true vapor pressure equal to or greater than 1.50 psia in any above ground storage tank with a capacity of 10,000 gallons or more, and less than 20,000 gallons, unless the tank is equipped with one of the following:
- B.3.1 a pressure-vacuum relief valve set to within ten (10) percent of the maximum allowable working pressure of the tank or in accordance with appropriate recommendations of the American Petroleum Institute (API) or the American Society of Mechanical Engineers (ASME). The pressure vacuum relief valve shall be properly installed, maintained in good operating order, and shall remain in a leak-free condition except when the operating pressure exceeds the valve set pressure; or
  - B.3.2 one of the vapor loss control devices in Section C.
- B.4 A person shall not store organic liquids containing Reactive Organic Compounds with a true vapor pressure equal to or greater than 1.50 psia in any storage tank with a capacity of 20,000 gallons or more and less than 40,000 gallons, without using one of the vapor loss control devices listed in Section C.
- B.5 A person shall not store Reactive Organic Compound liquids with a true vapor pressure equal to or greater than 11.0 psia in any tank unless the tank is a Pressure Tank maintaining working pressures sufficient at all times to prevent organic vapor loss to the atmosphere, or designed and equipped with a vapor loss control device listed in Section C.
- B.6 A person shall not use an external floating roof tank or an internal floating

roof tank to store organic liquids with a vapor pressure of 11 psia or greater.

C. Vapor Loss Control Devices

C.1 Vapor loss control devices that satisfy the storage tank requirements referred to in Section B are as follows:

C.1.a an external floating roof tank consisting of a pontoon-type or double deck-type cover resting on the surface of the liquid contents and properly installed, maintained, and in good operating order. External floating roofs shall have both a primary and a secondary seal, one above the other. Primary and secondary seals shall comply with the criteria specified in Sections D and E.

C.1.b an internal floating roof tank consisting of a pan, pontoon, or double-deck that rests on the liquid surface and is properly installed, and maintained in good operating order. Internal floating roof seals shall comply with the criteria specified in Sections D and F.

C.1.c a closed-type Vapor Recovery System, with a vapor loss control efficiency of at least 95 percent by weight, capable of collecting all Reactive Organic Compounds.

C.1.d other equipment, approved by the APCO, that has a capture and control efficiency of at least 95% by weight.

D. Requirements for All Closure Devices

D.1 The closure device on any external floating roof tank or any internal floating roof tank shall meet the following requirements:

D.1.a any secondary seals shall extend from the roof to the tank shell. Secondary seals shall not be attached to primary seals and shall not be shoe-mounted;

D.1.b All openings in any floating roof or Floating Cover, except pressure/vacuum valves and hatches on manhole covers, shall provide projections below the liquid surface. The projections shall be designed to prevent belching of liquid and to prevent entrained or foamed volatile organic compounds from escaping from the liquid contents of the tank and shall be equipped with a cover, seal, or lid which shall be gas tight at all times, except when the device or appurtenance is in use. Hatches on

manhole covers shall also be gas tight except during sampling, inspection or maintenance.

- D.1.c Pressure-vacuum valves shall be set in accordance with appropriate recommendations of the American Petroleum Institute, shall be properly installed, properly maintained, and in good operating order, and shall remain in a leak-free condition except when operating pressure exceeds the valve set pressure.
- D.2 Solid sampling or gauging wells, and similar fixed projections through a floating roof, such as an anti-rotational pipe, shall meet the following requirements:
- D.2.a the sampling or gauging well shall provide a projection of at least two (2) inches below the liquid surface;
  - D.2.b the sampling or gauging well shall be equipped with a cover, seal or lid, which shall be in a closed position with no gap exceeding 1/8 inch, except when the sampling or gauging well is in use;
  - D.2.c in no case shall the gap between the sampling or gauging well and the roof exceed ½ inch. The length of the gap between the sampling or gauging well and the roof shall be added to the cumulative length of the gaps measured to determine compliance of the secondary seal as specified in Subsections E.2.c, E.3.a, E.4.b.
- D.3 Slotted sampling or gauging wells shall meet the following requirements:
- D.3.a the sampling or gauging well shall provide a projection of at least two (2) inches below the liquid surface.
  - D.3.b the sampling or gauging well shall have an internal float designed to minimize the gap between the float and the sampling or gauging well, provided that the gap in no case exceeds ½ inch;
  - D.3.c in no case shall the gap between the sampling or gauging well and the roof exceed ½ inch. The length of the gap between the sampling or gauging well and the roof shall be added to the cumulative length of the gaps measured to determine compliance of the secondary seal as specified in Subsections E.2.c, E.3.a, E.4.b.

D.3.d Any emergency roof drain that drains back to the stored liquid shall be provided with a slotted membrane fabric cover, or equivalent, that covers at least 90 percent of the area of the opening;

D.4 Any metallic shoe-type seal shall meet the following requirements:

D.4.a one end of the shoe shall extend at least two (2) inches into the stored liquid and the other end shall extend a minimum vertical distance of 24 inches above the liquid surface;

D.4.b the gap between the shoe and tank wall shall not exceed three (3) inches for a welded tank or five (5) inches for a riveted tank at any point from the liquid surface to 18 inches above it.

#### E. External Floating Roof Requirements

External floating roofs shall meet the following conditions in addition to the closure device requirements in Section D.

E.1 There shall be no holes, tears, or other openings in the primary seal, the secondary seal, or the seal fabric which allow the emission of Reactive Organic Compounds to the atmosphere.

E.2 Welded Tanks with Primary Metallic Shoe Seals:

E.2.a The cumulative length of all gaps between the primary seal and the tank shell exceeding  $\frac{1}{2}$  inch shall not be more than ten (10) percent, and exceeding  $\frac{1}{8}$  inch shall not be more than 40 percent of the tank circumference.

E.2.b No gap between the tank shell and the primary seal shall exceed 1-1/2 inches; no continuous gap greater than  $\frac{1}{8}$  inch shall exceed ten (10) percent of the circumference of the tank.

E.2.c The cumulative length of all gaps between the secondary seal and the tank shell exceeding  $\frac{1}{8}$  inch shall not be more than five (5) percent of the tank circumference.

E.2.d No gap between the tank shell and the secondary seal shall exceed  $\frac{1}{2}$  inch.

E.2.e The secondary seal shall allow easy insertion of probes up to 1-1/2 inches in width in order to measure gaps in the primary seal.

E.3 Tanks with Primary Resilient-Toroid Seals:

- E.3.a The cumulative length of all gaps between the tank shell and the primary or secondary seal exceeding 1/8 inch shall not be more than five (5) percent of the circumference of the tank.
- E.3.b No gap between the tank shell and the primary or secondary seal shall exceed 1/2 inch
- E.3.c The secondary seal shall allow easy insertion of probes up to 1/2 inch in width in order to measure gaps in the primary seal.
- E.3.d The primary resilient toroid seal shall be liquid-mounted.

E.4 Riveted Tanks with Primary Metallic Shoe Seals:

- E.4.a Gaps between the tank shell and the primary seal shall not exceed 2-1/2 inches. The cumulative length of all primary seal gaps exceeding 1-1/2 inches shall be not more than ten (10) percent of the circumference of the tank.
- E.4.b The secondary seal shall consist of at least two sealing surfaces, so that the sealing surfaces prevent the emission of Reactive Organic Compounds around the rivets. Serrated sealing surfaces are allowable if the length of serration does not exceed six (6) inches. No gap between the tank shell and the secondary seal shall exceed 2 inch. The cumulative length of all secondary seal gaps exceeding 1/8 inch shall be not more than five (5) percent of the circumference.

E.5 Welded Tanks with "Zero Gap" Secondary Seals

Any secondary seal on a welded tank shall meet the following conditions:

- E.5.a The gap between the tank shell and the primary seal shall not exceed 1-1/2 inches. A continuous gap in the primary seal greater than 1/8 inch shall not exceed ten (10) percent of the circumference of the tank. The cumulative length of all primary seal gaps exceeding 2 inch shall be not more than ten (10) percent of the circumference. The cumulative length of all primary seal gaps exceeding 1/8 inch shall be not more than 40 percent of the circumference.
- E.5.b There shall be no visible or measurable gap between the tank shell and the secondary seal, excluding gaps less than two (2) inches from vertical weld seams.

F. Internal Floating Roof Requirements.

F.1 For any fixed roof tank with an internal floating-type cover, the closure device shall consist of one of the following in addition to the closure device requirements in Section D.

F.1.a A liquid mounted primary seal only, mounted in full contact with the liquid in the annular space between the tank shell and floating roof, or

F.1.b Both a primary and a secondary seal, where secondary seals are required, one above the other.

F.2 There shall be no holes, tears, or other openings in the seal or seal fabric which allow the emission of Reactive Organic Compound vapors through the primary or secondary seals.

G. Vapor Recovery System Requirements

Vapor Recovery Systems shall comply with the following requirements:

G.1 Any tank gauging or sampling device on a tank vented to the Vapor Recovery System shall be equipped with a leak-free cover which shall be closed at all times except during gauging or sampling.

G.2 All piping, valves and fittings shall be designed and constructed to operate in a leak-free condition, and shall be maintained and operated in a leak-free condition so as to minimize the release of Reactive Organic Compound vapors.

H. Inspection Requirements

H.1 The primary seal envelope shall be made available for unobstructed inspection by the APCO on an annual basis at four (4) locations selected along its circumference at random by the APCO. In the case of riveted tanks with toroid-type seals, eight (8) such locations shall be made available. In all other cases, a minimum of four (4) such locations shall be made available. If any violations are suspected, the APCO may require such further unobstructed inspection of the primary seal as may be necessary to determine the seal condition for its entire circumference.

H.2 For tanks with secondary seals, the primary seal envelope shall be made available for unobstructed inspection by the APCO for the full circumference at the following times:



- H.2.a Prior to installation of the secondary seal.
  - H.2.b At least once every five (5) years, or once every ten (10) years if the seal is a zero gap secondary seal.
  - H.2.c If the secondary seal is voluntarily removed by the Owner or Operator, it shall be made available for such inspection at that time. The Owner or Operator shall provide notification to the APCO at least 72 hours prior to voluntary removal of the secondary seal.
  - H.3 For all primary seals, actual gap measurements shall be recorded upon installation or replacement of primary seals, or prior to installation of secondary seals, and at least once every five (5) years thereafter.
  - H.4 If the secondary seal is a "zero gap seal" the actual gap measurements of the primary seal shall be recorded at least once every ten (10) years.
  - H.5 For all secondary seals, actual gap measurements shall be recorded on an annual basis. In all cases, those records shall be of sufficient detail to determine compliance with requirements of this Rule.
  - H.6 Any internal floating-type cover on a fixed roof tank shall be made available for inspection each time the tank is degassed and emptied. Visual inspections through the manholes or roof hatches on the fixed roof shall be conducted on an annual basis, provided such an inspection can be conducted safely. The APCO shall be notified at least 72 hours in advance of each degassing.
  - H.7 Each calendar month, pipes, valves and fittings shall be inspected for liquid and vapor leaks. For the purposes of this section, detection methods incorporating sight, sound, or smell are acceptable. Any leaks detected shall be recorded. Appropriate corrective action must be taken immediately to correct the leak. Any leak must be repaired within 15 days of detection.
- I. Record Keeping and Reporting Requirements
- I.1 The operator of any tank requesting an exemption according to the provisions of Sections A.1, A.2, and A.3 of this Rule, shall maintain records containing the following information:
    - I.1.a Permit number, tank identification, and type of vapor controls;
    - I.1.b Description of specific maintenance procedure performed;

- I.1.c Start and finish times and dates of procedure;
  - I.1.d Estimate of emissions caused by maintenance procedure and description of estimation method;
  - I.1.e Any additional information required by Sections A.3.c and A.3.d.
- I.2 The operator of any tank subject to this Rule shall maintain records of
- I.2.a the type of compound stored in each tank,
  - I.2.b the vapor pressure ranges of such compounds, unless the compound is a substance listed in Table 1 and kept below the temperature listed therein for that substance,
  - I.2.c the settings of any pressure-vacuum relief valve, and,
  - I.2.d the basis for the pressure-vacuum relief valve setting.
- I.3 Records of monthly leak inspections shall include the following information:
- I.3.a date of inspection;
  - I.3.b findings indicate if any leaks were discovered and the location, nature, and severity of each leak;
  - I.3.c leak determination method;
  - I.3.d corrective action (date each leak was repaired and the reasons for any repair interval in excess of 15 calendar days); and
  - I.3.e name and signature of the person performing the inspection.
- I.4 Reports shall be prepared after the inspection of seals from floating roof covers as required by Section I and shall contain, the following information:
- I.4.a Date of inspection and initials of inspector;
  - I.4.b For all floating roof tanks, actual gap measurements between the tank shell and seals;
  - I.4.c Data, supported by calculations as necessary, to demonstrate compliance

- I.4.d Any corrective actions or repairs taken to comply with the requirements of this Rule and the date these actions were taken.
- I.5 Records required by Section I of this Rule shall be maintained for a period of at least five (5) years from the date of each entry, and such records shall be made available to the APCO upon request.
- J. Test Methods
  - J.1 True vapor pressure of tank contents shall be determined as follows:
    - J.1.a For reactive organic liquids having the reference properties listed in Table 1, the true vapor pressure can be assumed to fall below the values listed in the Table, provided that the actual storage temperature does not exceed the corresponding maximum temperature specified in the Table and that the tank contains only one substance.
    - J.1.b The true vapor pressure of organic liquids that are not petroleum products shall be determined by ASTM Method D2879-97.
    - J.1.c If the API gravity of the oil is greater than or equal to 20 degrees, then the vapor pressure shall be determined by measuring the Reid vapor pressure and converting the result to true vapor pressure at the tank's maximum liquid storage temperature.
      - J1.c.1 For storage tanks operating above or below ambient temperatures, the maximum liquid storage temperature is the highest calendar-month average of the storage temperature.
      - J1.c.2 For storage tanks operating at ambient temperatures, the maximum liquid storage temperature is the maximum local monthly average ambient temperature as reported by the National Weather Service.
      - J1.c.3 True vapor pressure shall be measured using ASTM D-323-99a, Standard Test Method for Vapor Pressure of Petroleum Products.
      - J1.c.4 Conversion shall be done using the American Petroleum Institute Nomograph (API 2518 from API Publication 2517, Second Edition, February 1980).

- J1.c.5 If the API nomograph scales do not encompass the quantities necessary for its use, conversion shall be done using the conversion calculation specified in the oil and gas section of the California Air Resources Board (ARB) document entitled "Technical Guidance Document to the Criteria and Guidelines Regulation for AB 2588" and dated August 1989.
- J.1.d If the API gravity of the oil is less than 20 degrees, then the vapor pressure shall be determined by using the latest version of the "Test Method for Vapor Pressure of Reactive Organic Compounds in Heavy Crude Oil Using Gas Chromatography," by the Lawrence Berkeley National Laboratory approved by the California Air Resources Board and the United States Environmental Protection Agency.
- J.1.e The API gravity shall be determined according to ASTM Method D-287-92e1.
- J.1.f Separate samples shall be taken for API gravity and vapor pressure determinations. Sampling for API gravity shall be according to ASTM Method D-4057-95.
- J.2 The test methods used for measuring the vapor loss control efficiency in Subsections C.1.c. and C.1.d. shall be conducted according to ARB Methods 202 and 203.
- J.3 EPA Reference Method 21 shall be used to measure liquid and vapor leaks. The analyzer shall be calibrated with methane.
- K. Violations

Any leak discovered by District personnel from equipment required to be leak-free shall constitute a violation of this Rule.
- L. Compliance Schedule
  - L.1 Any person required to modify or replace an existing storage tank to comply with this Rule shall submit a complete Authority to Construct application to the APCO no later than January 1, 1998, and shall demonstrate final compliance no later than January 1, 1999.

Table1 Maximum Allowable Temperature Versus True Vapor Pressure Maximum Temp.  
°F

Organic Compounds	Reference Properties			Not to Exceed	
	Density (lb/ga)	EAPI	IBP (EF)	0.5 psia (tvp)	1.5 psia (tvp)
Middle Distillates					
Kerosene	----	42.5	350	195	250
Diesel	----	36.4	372	230	290
Gas Oil	----	26.2	390	249	310
Stove Oil	----	23.0	421	275	340
Jet Fuels					
JP-1	----	43.1	330	165	230
JP-3	----	54.7	110	----	25
JP-4	----	51.5	150	20	68
JP-S	----	39.6	355	205	260
JP-7	---	44--50	360	205	260
JP-8	----	----	----	167	222
Fuel Oil					
No.1	----	42.5	350	195	250
No.2	----	36.4	372	230	290
No. 3	----	26.2	390	249	310
No. 4	----	23.0	421	275	340
No. 5	----	19.9	560	380	465
Residual	----	19-27	----	405	----
No.6	----	16.2	625	450	----
Asphalts					
60-100 pen.	----	----	----	490	550
120-150 pen.	----	----	----	450	500
200-300 pen.	----	----	----	360	420
Acetone	6.6	47.0	133	----	35
Acrylonitrile	6.8	41.8	173	30	62
Benzene	7.4	27.7	176	34	70
Carbon Disulfide	10.6	22.1	116	----	10
Carbon Tetrachloride	13.4	----	170	20	63
Chloroform	12.5	----	142	----	40
Cyclohexane	6.5	49.7	177	30	65
1,2 Dichloroethane	10.5	----	180	35	75
Ethyl Acetate	7.5	23.6	171	38	70
Ethyl Alcohol	6.6	47.0	173	55	85
Isopropyl Alcohol	6.6	47.0	181	62	95
Methyl Alcohol	6.6	47.0	148	30	62
Methyl Ethyl Ketone	6.7	44.3	175	30	70

Toluene	7.3	30.0	231	75	120
Vinyl Acetate	7.8	19.6	163	30	65

Note: To use Table 1, first determine the maximum temperature (per Section J of the Rule) for the organic compound being stored. If the temperature is below the value listed in the 1.5 psia column for that compound, the true vapor pressure is assumed to be less than 1.5 psia. Similarly, if the temperature is below the value listed in the 0.5 psia column for that compound, the true vapor pressure is assumed to be less than 0.5 psia.