

**RULE 326. STORAGE OF REACTIVE ORGANIC COMPOUND LIQUIDS. (Adopted 12/14/1993, revised 1/18/2001)**

**A. Applicability**

This rule applies to equipment used to store reactive organic compound (ROC) liquids with a vapor pressure greater than 0.5 pounds per square inch absolute.

**B. Exemptions**

1. The provisions of this rule shall not apply to:
  - a. Any storage tank having a capacity of less than or equal to 5,000 gallons.
  - b. Any storage tank containing a reactive organic compound liquid having a vapor pressure less than 0.5 pounds per square inch absolute. Any person claiming exemption for a storage tank pursuant to this section must maintain adequate records demonstrating that the vapor pressure of all products stored in that tank is less than 0.5 pounds per square inch absolute. If a substance listed in Attachment A constitutes the entire contents of a tank, see Sections J.1.a and K.1 of this rule.
  - c. Crude oil storage tanks subject to Rule 325, Crude Oil Production and Separation.
  - d. Gasoline storage tanks with equal to or less than 40,000 gallons capacity which are subject to Rule 316, Storage and Transfer of Gasoline.
2. The provisions of Sections D.3 and D.4 shall not apply to an emergency standby tank not equipped with a vapor loss control device when:
  - a. The tank is drained of reactive organic compound liquids, or
  - b. A breakdown, as defined by Rule 505, occurs to the primary tank and the requirements of Rule 505 are met.
3. The provisions of Sections E, F, G and H shall not apply to out-of-service or empty storage tanks when undergoing cleaning, stock change, tank and roof repairs or removal of contaminated stock provided that:
  - a. The requirements of Sections D, E & F of Rule 343 (Petroleum Storage Tank Degassing) are met, or
  - b. The following are accomplished:
    - 1) At least 72 hours prior to such work being done, written notice is received by the APCO.
    - 2) The tank is in compliance with these rules prior to notification.
    - 3) For floating roof tanks, when the floating roof is resting on the leg supports, the process of filling, emptying, and refilling shall be continuous and shall be accomplished as rapidly as possible. Emissions shall be minimized during the process of filling, emptying, and refilling.

- 4) Vapor recovery shall be used on tanks so equipped during filling or flushing and emptying procedures prior to opening tanks for cleanout.
  - 5) District is notified when returning a tank to service after the above listed work has been completed.
4. The provisions of Sections E, F, G and H shall not apply to in-service floating roof tanks undergoing preventive maintenance, including but not limited to roof repair, primary seal inspection, or removal and installation of a secondary seal, provided that the following conditions are met:
  - a. At least 72 hours prior to such work being done, written notice is received by the APCO.
  - b. The tank is in compliance with these rules prior to notification.
  - c. Product shall move neither in nor out of the storage tank and emissions shall be minimized.
  - d. If an Authority to Construct is required, in accordance with Rule 201, then one shall be obtained prior to commencing work.
  - e. The time of exemption allowed under this section shall not exceed 72 hours.
5. The provisions of Section E.3 shall not apply to in-service tanks undergoing preventive maintenance, including but not limited to repair of regulators, fittings, deck components, hatches, valves, flame arrestors, or compressors, provided that the following conditions are met:
  - a. At least 72 hours prior to such work being done, written notice is received by the APCO.
  - b. The tank is in compliance with these rules prior to notification.
  - c. District is notified when preventive maintenance work is completed.
  - d. Emissions are minimized during maintenance operations.
  - e. The time of exemption allowed under this section shall not exceed 24 hours.
6. This rule shall not apply to components, as that term is defined in Rule 331 (Fugitive Emissions Inspection and Maintenance), which are subject to inspection and maintenance under Rule 331.
7. This rule shall not apply to pressure vessels.

### C. Definitions

See Rule 102 for definitions not restricted to interpretation of this rule.

**"Alternate test method"**: A new method for testing that is not referenced in this rule or which involves major changes to a referenced test method.

**"Appropriate analyzer"**: A hydrocarbon analyzer that meets the requirements of United States Environmental Protection Agency Reference Method 21 and is calibrated with methane.

**"Automatic Bleeder Vent"**: A floating roof vent that automatically vents air only during initial filling operations and during subsequent landings of the roof.

**"Emergency Standby Tank"**: A tank which is not used (filled or partially filled) more than twice in any 12 (twelve) month period and for which such use is reported to the Control Officer within 24 hours of the start of such use.

**"Heavy Oil"**: Crude oil with American Petroleum Institute gravity less than twenty degrees.

**"HOST Test Method"**: The "Test Method for Vapor Pressure of Reactive Organic Compounds in Heavy Crude Oil Using Gas Chromatography", approved by the United States Environmental Protection Agency and any subsequent updates approved by the United States Environmental Protection Agency.

**"Leak"**:

- a. A leak exists when a reading in excess of 10,000 ppm, as methane, above background, is obtained using an appropriate portable hydrocarbon analyzer and when sampling is performed according to the procedures specified in United States Environmental Protection Agency Method 21 - Appendix A, 40 CFR Section 3.2.1., or
- b. A leak exists when the dripping of liquid containing reactive organic compounds at a rate of more than three (3) drops per minute is observed.

A "leak" is not a gaseous emission from pressure relief devices on tanks or delivery vessels when the process pressure exceeds the limit specified for the device.

**"Light Oil"**: Crude oil with American Petroleum Institute gravity greater than or equal to twenty degrees.

**"Out of Service"**: means that no liquid is present in the tank, it is configured to allow easy verification of such emptiness by inspection, and no concentrations of gaseous organic compounds greater than 1000 (one thousand) ppmv can be detected outside the tank using United States Environmental Protection Agency Reference Method 21.

**"Pressure vessel"**: Vessels rated, as indicated by an ASME pressure rating stamp, and operated to contain normal working pressures of at least 15 psig without vapor loss to the atmosphere.

**"Preventive Maintenance"**: means a regularly scheduled course of procedure designed to prevent equipment failure or decline in function.

**"Submerged fill pipe"**: Any fill pipe or discharge nozzle which meets any of the following conditions:

- a. The discharge opening is entirely submerged when the liquid level is six (6) inches above the bottom of the container.
- b. When applied to a container which is loaded from the side, the discharge opening is entirely submerged when the liquid level is 18 inches above the bottom of the container.
- c. When applied to a container which is loaded from the bottom, the discharge opening is entirely submerged when the liquid level is six (6) inches above the bottom of the container.

**"Tank"**: A container, constructed primarily of nonearthen materials, used for the purpose of storing or holding any organic liquid.

**"Vapor pressure"**: The vapor pressure measured as described in Section K.1 of this rule.

**"Vapor recovery system"**: Any reactive organic compound vapor control system which is designed to prevent the release or venting of reactive organic compound gases to the atmosphere under normal operating conditions.

**D. Requirements - Emission Reduction**

1. A person shall not store crude oil or other reactive organic compound liquids in any storage tank with a capacity less than, or equal to 40,000 gallons unless such tank is equipped with at least one of the following:
  - a. A submerged fill pipe, or
  - b. One of the vapor loss control devices listed in Section E.
2. A person shall not store crude oil or reactive organic compound liquids with a vapor pressure equal to or greater than 1.5 pounds per square inch absolute in any above ground storage tank with a capacity equal to or greater than 10,000 gallons, and less than 20,000 gallons, unless such tank is equipped with one of the following:
  - a. A pressure-vacuum relief valve with verifiable pressure and vacuum settings in accordance with appropriate recommendations of the American Petroleum Institute. The pressure-vacuum relief valve shall be properly installed, properly maintained, and in good operating order; or
  - b. One of the vapor loss control devices in Section E.
3. A person shall not store crude oil or reactive organic compound liquids with a vapor pressure equal to or greater than 1.5 pounds per square inch absolute in any storage tank with a capacity of 20,000 gallons or greater but less than 40,000 gallons without using one of the vapor control devices in Section E.
4. A person shall not store crude oil or reactive organic compound liquids with a vapor pressure equal to or greater than 0.5 pounds per square inch absolute in any storage tanks with a capacity equal to or greater than 40,000 gallons without using one of the vapor control devices in Section E.
5. A person shall not store organic liquids with a vapor pressure greater than 11 pounds per square inch absolute in any tank unless such tank is:
  - a. A pressure vessel, or
  - b. Designed and equipped with a vapor loss control device in Section E.3 or E.4.

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 pounds per square inch absolute or greater.

**E. Requirements for Vapor Loss Control Devices**

The following are the vapor loss control devices that satisfy the storage tank requirements of Section D.

1. External Floating Roof: A floating roof, consisting of a pontoon-type or double-deck-type cover that rests on the surface of the liquid contents and is properly installed, properly maintained and in good operating order. External floating roof seals shall comply with the criteria specified in Sections F and G.
2. Internal Floating Roof: A fixed roof tank with an internal-floating-type cover consisting of a pan, pontoon, or double-deck that rests on the liquid surface and is properly installed, properly maintained and in good operating order. Internal floating roof seals shall comply with the criteria specified in Sections F and H.

3. Vapor Recovery System: A leak-free vapor recovery system, consisting of a system capable of collecting all reactive organic compound vapors and gases, and one of the following: a vapor return system handling natural gas for fuel, sale, or underground injection or a disposal system capable of processing such vapors and gases, so as to prevent their emission to the atmosphere at a vapor removal efficiency of at least 95% by weight.

Vapor recovery systems shall comply with the following requirements:

- a. 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.
- b. 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 such as to minimize the release of reactive organic compound vapors.
- c. Pressure vacuum valves on above ground tanks 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 the operating pressure exceeds the valve set pressure.

Where a tank is equipped with both an operational vapor recovery system and an internal floating roof, the operator shall meet the requirements of Section E.3 of this rule and shall not be required to comply with Sections F, H and I.1.

4. Other Vapor Loss Control Device: Any other equipment having a vapor removal efficiency of at least 95% by weight, of reactive organic compound vapors, provided
  - a. said equipment consists of an enclosure or intake designed to collect and deliver all emissions and a control device to remove reactive organic compounds from the delivered emissions, and
  - b. an application for installation of such equipment and a testing protocol to show 95% vapor removal efficiency are submitted to and approved by the Air Pollution Control Officer, the California Air Resources Board and the United States Environmental Protection Agency.

#### **F. Requirements for All Closure Devices**

The closure device on any external floating roof tank or any internal floating roof tank shall meet the following criteria:

1. Secondary seals shall extend from the roof to the tank shell, shall not be attached to primary seals, and shall not be shoe-mounted.
2. All openings in the roof, except pressure vacuum valves and automatic bleeder vents, shall provide a projection at least two (2) inches below the liquid surface to prevent belching of liquid and to reduce escaping vapors. All openings and fittings shall be covered and shall have gaskets at all times with no visible gap, except when in use. For inaccessible openings on internal floating roof tanks, there shall be no visible gaps as viewed from the fixed roof manway, except when the opening is in use.
3. 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.

4. Solid sampling or gauging wells, and similar fixed projections through a floating roof such as an anti-rotational pipe, shall meet the following conditions:
  - a. The well shall provide a projection at least two (2) inches below the liquid surface.
  - b. The well shall be equipped with a cover, seal or lid, which shall at all times be in a closed position with no gap exceeding 1/8 inch, except when the well is in use.
  - c. The gap between the well and the roof shall be added to the gaps measured to determine compliance of the secondary seal and in no case shall exceed 1/2 inch.
5. Slotted sampling or gauging wells shall meet the following conditions:
  - a. The well shall provide a projection at least two (2) inches below the liquid surface.
  - b. The well shall have an internal float designed to minimize the gap between the float and the well, provided that the gap in no case exceeds 1/2 inch.
  - c. The gap between the well and the roof shall be added to the gaps measured to determine compliance of the secondary seal and in no case shall exceed 1/2 inch.
6. 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% of the area of the opening.
7. Any metallic shoe-type seal for which an Authority to Construct was granted on or after October 4, 1989 shall meet the following conditions:
  - 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.
  - 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.
8. Any external or internal floating roof for which an Authority to Construct was granted on or after October 4, 1989 shall have at least four (4) ninety degree radial vapor barriers to minimize wind effects. An alternative device may be approved in writing by the APCO provided such device is demonstrated to be equivalent in minimizing wind effects.

**G. Requirements for External Floating Roofs**

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

1. There shall be no holes or tears in, or openings in the seal or seal fabric which allow the emission of reactive organic compound vapors through the secondary seal or in the primary seal envelope surrounding the annular vapor space enclosed by the roof edge, seal fabric and secondary seal.
2. Welded Tanks with Primary Metallic Shoe Seals:

- a. The cumulative length of all gaps between the primary seal and the tank shell exceeding 1/2 inch shall not be more than 10%, and exceeding 1/8 inch shall not be more than 40% of the tank circumference.
  - b. No gap between the tank shell and the primary seal shall exceed 1-1/2 inches; no continuous gap greater than 1/8 inch shall exceed 10% of the circumference of the tank.
  - c. The cumulative length of all gaps between the secondary seal and the tank shell exceeding 1/8 inch shall not be more than 5% of the tank circumference.
  - d. No gap between the tank shell and the secondary seal shall exceed 1/2 inch.
  - 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.
3. Tanks with Primary Resilient-Toroid Seals:
- 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 5% of the circumference of the tank.
  - b. No gap between the tank shell and the primary or secondary seal shall exceed 1/2 inch.
  - 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.
  - d. The primary resilient toroid seal shall be liquid-mounted.
4. Riveted Tanks with Primary Metallic Shoe Seals:
- 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 10% of the circumference of the tank.
  - b. The secondary seal shall consist of at least two sealing surfaces, such 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 6 inches. No gap between the tank shell and the secondary seal shall exceed 1/2 inch. The cumulative length of all secondary seal gaps exceeding 1/8 inch shall be not more than five (5) percent of the circumference.
  - c. 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.
5. Welded Tanks with Zero Gap Secondary Seals: Any secondary seal where installation or retrofit on a welded tank for which an Authority to Construct was granted on or after October 4, 1989 shall be a zero gap secondary seal. A secondary seal shall be considered to be retrofitted if at least a cumulative fifty percent of the circumference of the seal is replaced on or after October 4, 1989. A zero gap secondary seal shall meet the following conditions:
- a. No gap between the tank shell and the primary seal shall exceed 1-1/2 inches. No continuous gap in the primary seal greater than 1/8 inch shall exceed 10% of the circumference of the tank. The cumulative length of all primary seal gaps exceeding 1/2 inch shall be not more than 10% of the circumference and the cumulative length of all primary seal gaps exceeding 1/8 inch shall be not more than 40% of the circumference.

- 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.
6. Primary Seal Inspection for External Floating Roof Tanks (Selected Locations): The primary seal envelope shall be made available for unobstructed inspection by the APCO on an annual basis at a minimum of four locations selected along its circumference at random by the APCO. In the case of riveted tanks with toroid-type seals, at least eight (8) such locations shall be made available; in all other cases, a minimum of four (4) such locations shall be made available, except 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.
7. Primary Seal Inspection for External Floating Roof Tanks (Full Circumference): 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:
  - a. Prior to installation of the secondary seal.
  - b. At least every five (5) years, or every ten (10) years if the seal is a zero gap secondary seal which is installed pursuant to Section G.5.
  - 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 no less than 72 hours prior to voluntary removal of the secondary seal.

#### **H. Requirements for Internal Floating Roofs**

Internal floating roofs shall meet the following conditions in addition to the closure device requirements in Section F. However, where a tank is equipped with both an operational vapor recovery system and an internal floating roof, the operator shall meet the requirements of Section E.3 of this rule and shall not be required to comply with Sections F, H and I.1.

1. For any fixed roof tank with a new or replaced internal floating type cover for which an Authority to Construct was granted on or after October 4, 1989, the closure device shall consist of one of the following:
  - 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
  - b. Two seals, one above the other, the one below shall be referred to as the primary seal and the one above shall be referred to as the secondary seal.
2. There shall be no holes or tears in, or other openings which allow the emission of reactive organic compound vapors through the primary or secondary seals.
3. For any fixed roof tank using an internal floating-type cover, the internal floating-type cover shall be made available for inspection each time the tank is emptied and gas freed. Visual inspections through the manholes or roof hatches on the fixed roof shall be made available 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 gas freeing.



## **I. Requirements for Inspection and Reporting**

1. 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. If the secondary seal is a "zero gap seal" as per Section G.5, then actual gap measurements of the primary seal shall be recorded at least once every 10 years. For all secondary seals, actual gap measurements shall be recorded on an annual basis.
2. The results of each inspection shall be reported to the APCO within 30 calendar days after the inspection date.
3. The owner or operator of any storage tank subject to this rule shall submit the following information to the APCO for each storage tank subject to this rule:
  - a. The location of the storage tank and District Permit to Operate number for the storage tank.
  - b. The product and vapor pressure of the product typically stored.
  - c. The current compliance status of the storage tank with respect to the requirements of this rule.
  - d. For storage tanks with external floating roofs or internal floating roofs, the type of tank (welded or riveted), and the type of roof seals (primary and secondary).

## **J. Requirements - Recordkeeping**

1. The operator of any tank subject to this rule shall maintain the following records:
  - a. Type of liquid stored in each tank. The vapor pressure ranges of such liquids are required if records immediately available do not establish that the liquid is a substance listed in Attachment A and kept below the temperature listed therein for that substance.
  - b. The inspections reports required by Section I. Such records shall contain, at a minimum, the following information:
    - 1) Date of inspection and initials of inspector.
    - 2) Actual gap measurements between the tank shell and seals.
    - 3) Data, supported by calculations as necessary, to demonstrate compliance with the requirements of this rule.
    - 4) Any corrective actions or repairs taken to comply with the requirements of this rule and the date these actions were taken.
  - c. The maintenance records where excess emissions occur during operations exempted by Sections B.3, B.4, and B.5. These records contain, at a minimum, the following:
    - 1) Permit number, tank identification, type of vapor controls, and initials of personnel performing maintenance.
    - 2) Description of specific maintenance procedure performed.

- 3) Estimate of excess emissions caused by maintenance procedure and how determined.
    - 4) Start and finish times and dates of maintenance procedure.
  - d. The breakdown records where excess emissions occur during use of emergency standby tanks allowed by Section B.2.b. These records shall contain, at a minimum, date, time and duration of breakdown and calculation of excess emissions resulting from the breakdown.
2. Records 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.

#### **K. Requirements for Test Methods**

1. Vapor pressure of tank contents shall be determined as follows:
  - a. If the American Petroleum Institute 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.
    - 1) Reid vapor pressure shall be measured using Test Method for Vapor Pressure for Petroleum Products, American Society for Testing and Materials Method D 323-82.
    - 2) Conversion shall be done using either the American Petroleum Institute nomograph attached hereto as Attachment B or conversion shall be done using the conversion calculation specified in the oil and gas section of the California Air Resources Board document entitled "Technical Guidance Document to the Criteria and Guidelines Regulation for AB 2588" dated August 1989 and attached hereto as Attachment C. If the American Petroleum Institute nomograph scales do not encompass the values necessary for its use, conversion shall be done using Attachment B.
  - b. If the American Petroleum Institute gravity of the oil is below 20 degrees, then the vapor pressure shall be determined using the HOST Test Method. For purposes of this rule, vapor pressure shall include the vapor pressure of all hydrocarbon compounds, i.e., hydrocarbon compounds containing from one to ten carbon atoms, present in the oil sample as determined by gas chromatography.
  - c. The American Petroleum Institute gravity shall be determined according to American Society for Testing and Materials Method D 287-82.
  - d. Separate samples shall be taken for American Petroleum Institute gravity and vapor pressure determinations. Sampling for American Petroleum Institute gravity shall be according to American Society for Testing and Materials Method D 4057-88.
  - e. An alternative test method may be used if it provides the same result for a given sample and is approved in advance as a source-specific SIP revision by the United States Environmental Protection Agency and the California Air Resources Board for the purpose of determining vapor pressure of liquids of the type subject to this rule.

- f. An organic liquid listed in Attachment A shall be deemed to be in compliance with the appropriate vapor pressure limits for the tank in which it is stored provided the actual storage temperature does not exceed the corresponding maximum temperature listed.
2. The test methods used for measuring the vapor removal efficiency in Sections E.3 and E.4 shall be the California Air Resources Board Methods TP 202.1 and TP 203.1. The applicability of Methods TP 202.1 and TP 203.1 shall be determined as follows:
  - a. California Air Resources Board Method TP 202.1 applies to tanks receiving organic liquid by truck.
  - b. California Air Resources Board Method TP 203.1 applies to tanks receiving organic liquid other than by truck.
3. The test method used for detecting and measuring leaks is United States Environmental Protection Agency Reference Method 21. The analyzer shall be calibrated with methane.

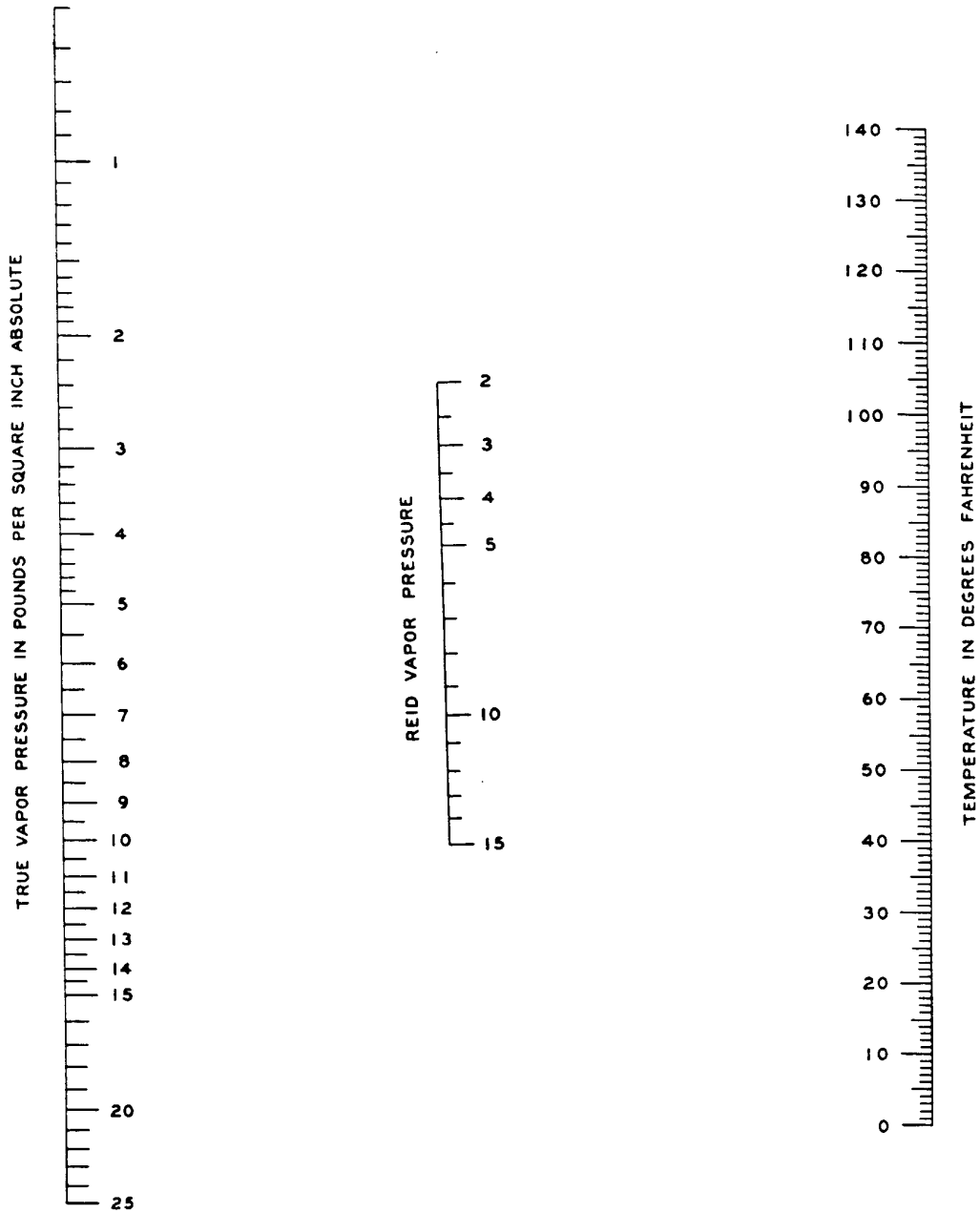
**L. Compliance Schedule**

1. Any person required to modify or replace an existing heavy oil storage tank to comply with this rule shall:
  - a. Sample for true vapor pressure in accordance with the test methods in Section K.1.b. of this rule and submit the results to the District no later than April 18, 2001.
  - b. If true vapor pressure results do not qualify for an exemption pursuant to Section B. of this rule, submit a complete Authority to Construct (ATC) application to the APCO no later than April 18, 2001.
  - c. Submit to the APCO an application for a Permit to Operate and demonstrate final compliance no later than April 18, 2002.
2.
  - a. No later than June 14, 1994 the owner or operator of any light oil storage tank subject to this rule shall submit the information required by Section I.3.
  - b. No later than April 18, 2002, the owner or operator of any heavy oil storage tank subject to this rule shall submit the information required by Section I.3.

**Attachment A**  
 Maximum Allowable Storage Temperatures Versus Vapor Pressure

Organic Liquids/Compounds	Maximum Temp. °F Not to Exceed	
	0.5 psia	1.5 psia
Middle Distillates		
Kerosene	195	250
Diesel	230	290
Gas Oil	249	310
Stove Oil	275	340
Jet Fuels		
JP-1	165	230
JP-3	--	25
JP-4	20	68
JP-5	205	260
JP-7	205	260
JP-8	167	222
Fuel Oil		
No. 1	195	250
No. 2	230	290
No. 3	249	310
No. 4	275	340
No. 5	380	465
Residual	405	--
No. 6	450	--
Asphalts		
60-100 pen.	490	550
120-150 pen.	450	500
200-300 pen.	360	420
Acetone	--	35
Acrylonitrile	30	62
Benzene	34	70
Carbon Disulfide	--	10
Carbon Tetrachloride	20	63
Chloroform	--	40
Cyclohexane	30	65
1,2 Dichloroethane	35	75
Ethyl Acetate	38	70
Ethyl Alcohol	55	85
Isopropyl Alcohol	62	95
Methyl Alcohol	30	62
Methyl Ethyl Ketone	30	70
Toluene	75	120
Vinylacetate	30	65

**Attachment B**  
**American Petroleum Institute Nomograph**  
**(API 2518)**



**True Vapor Pressures (*P*) of Crude Oils (2 psi to 15 psi RVP)**

**Attachment C**  
**Technical Guidance Document to the Criteria and Guidelines Regulation for AB 2588**  
**(Excerpt from pages 102, 103, and 114)**

5. True Vapor Pressure (TVP)

True vapor pressure, the equilibrium partial pressure exerted by a volatile liquid, is perhaps the most difficult term in the breathing loss equation to calculate. A nomograph (included in Appendix E) relates TVP to both the Reid Vapor Pressure (RVP) and the storage temperature ( $T_s$ ). RVP is the absolute vapor pressure of volatile crude oil and nonviscous petroleum liquids. Numerically, the relationship between TVP, RVP, and temperature can be expressed by the following equation:

$$TVP = (RVP)e^{C_o(IRTEMP-ITEMP)} \quad (25)$$

Where:

$C_o$	=	Constant dependent upon the value of RVP
$ITEMP$	=	$(1/559.69 \text{ } ^\circ R)$
$IRTEMP$	=	$(1/(T_s + 459.69 \text{ } ^\circ R))$
$T_s$	=	Temperature of the stored fluid

The value of the constant term  $C_o$  depends on the given value of RVP.

Values of  $C_o$  for different RVP numbers are tabulated in Appendix C. It should be noted, however, that an error was discovered in the API nomograph calculated values of TVP so that the RVP was not equal to TVP at 100°F as was expected given the general definition of RVP. Using linear regression techniques, correction factors ( $C_F$ ) were developed and should be added to the calculation values of TVP in order to obtain reasonable TVP numbers. The relationship between the three values is given as follows:

$$\text{Corrected TVP} = \text{Calculated TVP} + C_F \quad (26)$$

The correction factor was found to be dependent upon RVP according to the following equations:

If  $RVP < 3$ ,

$$C_F = (0.04) \times (RVP) + 0.1 \quad (27)$$

If  $RVP > 3$ ,

$$C_F = e^{[(2.3452061 \log(RVP)) - 4.132622]} \quad (28)$$

**TABLE C-3 VALUES OF  $C_o$  FOR DIFFERENT RVP NUMBERS**

RVP	$C_o$
0<RVP<2	-6622.5
2<RVP<3	-6439.2
RVP = 3	-6255.9
3<RVP<4	- 6212.1
RVP = 4	-6169.2
4<RVP<5	- 6177.9
RVP = 5	-6186.5
5<RVP<6	- 6220.4
RVP = 6	-6254.3
6<RVP<7	-6182.1
RVP = 7	-6109.8
7<RVP<8	- 6238.9
RVP = 8	-6367.9
8<RVP<9	- 6477.5
RVP = 9	-6587.9
9<RVP<10	- 6910.5
RVP = 10	-7234.0
10<RVP<15	- 8178.0
RVP>15	- 9123.2