

RULE 4623 STORAGE OF ORGANIC LIQUIDS (Adopted April 11, 1991; Amended September 19, 1991; Amended December 17, 1992; Amended December 20, 2001; Amended May 19, 2005; Amended June 15, 2023)

1.0 Purpose

The purpose of this rule is to limit Volatile Organic Compound (VOC) emissions from the storage of organic liquids.

2.0 Applicability

This rule applies to any tank with a capacity of 1,100 gallons or greater in which any organic liquid is placed, held, or stored, and any tank used in crude oil or natural gas production operations with a potential to emit six (6) tons of VOC or greater per year.

3.0 Definitions

3.1 APCO-approved VOC Control System: either an external floating-roof tank complying with Section 5.3 provisions, internal floating-roof tank complying with Section 5.4 provisions, a vapor recovery system complying with Section 5.6 provisions, or pressure vessel as defined in Section 3.32.

3.2 Capacity: the volume of a tank, as shown in the Permit to Operate (PTO), or the tank manufacturer's specifications if a tank does not have a PTO, or as determined by District measurements.

3.3 Clean Produced Water: as defined in Rule 1020 (Definitions).

3.4 Component: includes, but is not limited to, any valve, fitting, threaded connection, pump, compressor, pressure-vacuum relief valve, pressure relief device, pipe, flange, process drain, sealing mechanism, hatch, sight-glass, meter, or seal fluid system in VOC service. This definition includes tanks and separators.

3.5 Compressor: a device used to compress gases or vapors or a combination of gases and vapors by the addition of energy, and includes all associated components used for connecting and sealing purposes. The phrase "all associated components used for connecting and sealing purposes" means the first VOC leak points (first components) connected on the body of the compressor. For example, a valve that is connected to a threaded hole on body of the compressor, the first VOC leak point is the threaded connection on the body side of the compressor, but the valve itself is not a "first VOC leak point". Similarly, a compressor shaft seal is considered as a first "VOC leak point".

3.6 Compressor Part: for the purpose of Section 5.9.4.9, a compressor part refers to the "first VOC leak point" as explained in Section 3.5.

- 3.7 Contact Floating Roof: a roof, located inside an internal floating roof tank, that floats on the liquid surface.
- 3.8 Crude Oil: petroleum extracted from the earth and which has not been processed in a refining operation.
- 3.9 Deck Fitting: a functional or operational device on a tank floating roof that substantially closes or seals a penetration in the deck of a floating roof.
- 3.10 Degassing: the process of removing organic vapors from a storage tank.
- 3.11 Emergency Standby Tank: a tank that does not receive or store an organic liquid for more than 60 cumulative days during any 12-month period.
- 3.12 External Floating Roof: a tank cover in an open top tank consisting of a pan type, pontoon type, or double-deck type cover that rests upon and is supported by the organic liquid being contained. An external floating roof is equipped with closure seals to close the space between the roof edge and tank shell.
- 3.13 Fixed Roof Tank: a tank with a roof that is permanently affixed to the shell of the tank.
- 3.14 Gas Leak: a reading in excess of the values specified in Table 1 or Table 2 as parts per million by volume (ppmv), as methane, above background on a portable hydrocarbon detection instrument that is calibrated with methane in accordance with the test method in Section 6.4.8.

Table 1 Gas Leak (Until June 30, 2024)	
	Gas Leak
Components	Greater than 10,000

Table 2 Gas Leak (After June 30, 2024)		
	Minor Gas Leak	Major Gas Leak
Components	500 to 10,000	Greater than 10,000

- 3.15 Gasoline: any petroleum distillate, petroleum distillate/alcohol blend, or alcohol, having a Reid vapor pressure of four (4) psia or greater which is used as motor fuel which is commonly or commercially known or sold as gasoline.
- 3.16 Gauge Float: a device to indicate the level of the liquid within a tank. The float rests on the liquid surface inside a gauge well in the tank.
- 3.17 Gauge Hatch/Sample Well (Ports): consists of a pipe sleeve equipped with a self-closing gasketed cover (to reduce evaporative losses) and allows hand-gauging or sampling of the stored liquid. The gauge hatch/sample port is usually located

beneath the gauger's platform, which is mounted on top of the tank shell. A cord may be attached to the self-closing gasketed cover so that the cover can be opened from the platform.

- 3.18 **Guidepole:** an anti-rotation device that is fixed to the top and bottom of a tank, passing through a well in a floating roof. A guidepole may be solid or be equipped with slots or holes for gauging purposes provided the guidepole is equipped with an appropriate sealing device that prevents openings that expose the stored liquid to the atmosphere.
- 3.19 **Inaccessible Component:** a component that is located over 15 feet above ground when access is required from the ground; or a component that is located over six (6) feet away from a platform when access is required from the platform, or a component in a location that would require the elevation of monitoring personnel higher than six (6) feet above permanent support surfaces.
- 3.20 **Internal Floating Roof:** a pan type, pontoon type, or double-deck type cover located inside a fixed roof tank that rests upon and is supported by the organic liquid being contained. An internal floating roof is equipped with closure seals to close the space between the roof edge and tank shell.
- 3.21 **Leak-Free:** a condition without a gas leak or a liquid leak.
- 3.22 **Leak Minimization:** reducing a leak to the lowest achievable level without damaging the component using best modern practices which include, but are not limited to, adding sealing material to the component, tightening the component, or adjusting the component without shutdown of the process that the component serves and that can be safely accommodated.
- 3.23 **Liquid Leak:** the dripping of organic liquid at a rate of more than 3 drops per minute.
- 3.24 **Maximum Operating Level:** the highest achievable level of fluid within a tank, as determined by the structural design of the tank. In the absence of tank specific design information, the maximum operating level is equal to tank capacity.
- 3.25 **Metallic-Shoe Type (Mechanical Shoe) Seal:** a metallic sheet (the shoe) that is held vertically against the vertical tank wall. The shoe is connected by braces to the floating roof and is held tightly against the wall by springs or weighted levers. A flexible coated fabric (envelope) is suspended from the shoe seal to the floating roof to form a vapor barrier over the annular space between the roof and the primary seal.
- 3.26 **Non-contact Floating Roof:** a roof that is located inside an internal floating roof tank that is supported on pontoons several inches above the liquid surface.

- 3.27 Organic Liquid: any liquid which contains volatile organic compounds (VOCs) including, but not limited to, crude oils and petroleum distillates.
- 3.28 Optical Gas Imaging (OGI): an instrument that makes emissions visible that may otherwise be invisible to the naked eye.
- 3.29 Petroleum Distillate: the product of a crude oil distillation or condensation process obtained by condensing the vapors for the purpose of purification, fractionation, or the formation of new substances.
- 3.30 Process Drain: any open portion of a non-continuous piping system, including open origination portion(s) of such a system used for collection and transport of liquids discharged from process vessels, spills, or other sources.
- 3.31 Pressure Vessel: a tank, reservoir, or container that is capable of maintaining working pressures sufficient to prevent organic liquid loss or VOC loss to the atmosphere at all times.
- 3.32 Pressure Relief Device (PRD): a pressure relief valve, a rupture disk, or an automatic pressure-relieving device associated with a process vessel or piping system that is activated by pressure upstream of the device and relieves to the atmosphere.
- 3.33 Pump: a device used to transport fluids by the addition of energy, and includes all associated components used for connecting or sealing purposes. The phrase "all associated components used for connecting and sealing purposes" means the first VOC leak points (first components) on the body of the pump. For example, a valve that is connected to a threaded hole on body of the pump, the first VOC leak point is the threaded connection on the body side of the pump, but the valve itself is not a "first VOC leak point." Similarly, a pump shaft seal is considered as a first "VOC leak point."
- 3.34 Pump Part: for the purpose of Section 5.9.4.9, a pump part refers to the "first VOC leak point" as explained in Section 3.33.
- 3.35 Resilient-Toroid-Type seal: a core of open-cell foam encapsulated in a coated fabric that is attached to a mounting on the deck perimeter and is continuous around the floating roof circumference.
- 3.36 Rim Vent: a vent used on tanks equipped with a seal design, such as a mechanical shoe seal, that creates a vapor pocket in the seal and rim area. The vent is used to release excess pressure or vacuum that is present in the vapor space bounded by the primary-seal shoe, the floating roof rim, the primary seal fabric, and the liquid level. A rim vent usually consists of a weighted pallet that rests on a gasketed cover.

- 3.37 Roof Drain: a drain that permits the removal of rainwater from the surface of external floating roofs. A roof drain may be a closed drainage system that carries rainwater from the surface of the floating roof to the outside of the tank, or an open drainage system consisting of an open pipe that extends a short distance below the bottom of the deck allowing rainwater to drain from the surface of the floating roof into the organic liquid contents of the tank.
- 3.38 Roof Leg: an adjustable or fixed leg that is attached to the floating roof deck to support or hold the floating roof deck at a predetermined distance off the tank bottom to prevent damage to the fittings located underneath the deck and to allow for tank cleaning or repair. For adjustable legs, the load-carrying element passes through a well or sleeve in the deck.
- 3.39 Small Producer: an operator in the business of crude oil production who:
- 3.39.1 Produces an average of less than 6000 barrels per day of crude oil from all operations within the county; and
  - 3.39.2 Does not engage in refining, transportation, or marketing of refined petroleum products.
- 3.40 Tank: any stationary container, reservoir, or vessel, in which an organic liquid is placed, held, or stored. This definition includes components connected to the body of the tank. For example, a valve that is connected to a threaded hole on the body of the tank, the first VOC leak point is the threaded connection on the body side of the tank, but the valve itself is a separate component from the tank.
- 3.41 Tank Battery: for crude oil production facilities, a tank battery is an aggregation of two or more tanks where the tanks are located so that no one tank is more than 150 feet from another tank as measured from the closest tank edges, and the tanks are located in the same crude oil production field. For non-crude oil production facilities, a tank battery is an aggregation of two or more tanks located within the same facility, regardless of the distance of the tanks from each other.
- 3.42 True Vapor Pressure (TVP): the equilibrium partial vapor pressure exerted by an organic liquid at actual storage temperature.
- 3.43 Uncontrolled Fixed Roof Tank: a fixed roof tank that is not connected to an APCO-approved vapor recovery system operated as specified in Section 5.6.
- 3.44 Unsafe-to-Monitor Component: a component installed at a location that would prevent the safe inspection or repair of a component as defined by OSHA standards or in provisions for worker safety stated in 29 CFR 1910.
- 3.45 Vacuum Breaker: a device that equalizes the pressure of the vapor space across the floating roof deck as the deck is either being landed on or off its legs. A vacuum breaker consists of a well with a cover. Attached to the underside of the cover is a

guided leg long enough to contact the tank bottom as the floating deck approaches. When in contact with the tank bottom, the guide leg mechanically opens the breaker by lifting the cover off the well; otherwise the cover closes the well. Because the purpose of the vacuum breaker is to allow for the free exchange of air and/or vapor, the well does not extend appreciably below the deck.

- 3.46 Visible Gap: an opening that exceeds 0.060 inch.
- 3.47 Volatile Organic Compound (VOC): as defined in Rule 1020 (Definitions).
- 3.48 Zero Gap: no gap between the tank shell and the seal shall exceed 0.06 inch. The cumulative length of all gaps exceeding 0.02 inch shall not be more than five (5) percent of the circumference of the tank, excluding gaps less than 1.79 inches from vertical seams.
- 3.49 Zero Gap Pole Wiper Seal: a seal with no gap exceeding 0.06 inches between outer surface of the guidepole or gauge well and pole wiper seal.

#### 4.0 Exemptions

- 4.1 The provisions of this rule shall not apply to:
  - 4.1.1 Pressure vessels.
  - 4.1.2 Gasoline storage tanks with a capacity of less than 19,800 gallons that are subject to the requirements of Rule 4621 (Gasoline Transfer Into Stationary Storage Containers, Delivery Vessels, and Bulk Plants).
  - 4.1.3 Tanks that are used for storage/processing of clean produced water, or other water that meets the VOC standard specified in the definition of “clean produced water” in Rule 1020 (Definitions) unless the tank has a potential to emit six (6) tons of VOC emissions or greater per year and is used in crude oil and natural gas production operations.
  - 4.1.4 Tanks used in wine fermentation and for storage of resulting products, by-products, and spirits.
- 4.2 Except for complying with Sections 6.3.2, 6.3.3, and 7.1, the requirements of this rule shall not apply to:
  - 4.2.1 Emergency standby tanks, in existence prior to May 1, 1979, which exclusively store petroleum distillates or crude oil. Prior to return to Emergency Standby status, the contents of each tank shall be drained to the maximum extent feasible. After a tank has been used (filled or partially filled) and draining of the tank has begun, any further filling of the tank shall constitute a separate use of the tank, and the number of days the tank is used

shall be counted towards the 60 cumulative days limit specified in the definition of an emergency standby tank in Section 3.11. Fixed roof emergency standby tanks shall be equipped with a pressure-vacuum relief valve that meets the requirements of Section 5.2.

4.2.2 Temporary tanks, with capacities of 21,000 gallons (500 barrels) or less, left on site for six months or less.

4.3 Except for complying with Sections 6.3.4 and 7.1, a small producer's tank with a throughput of 50 barrels of crude oil per day or less is exempt from the requirements of this rule. All other small producer tanks that do not qualify for exemption under Section 4.4 shall comply with all the requirements of this rule.

4.4 Until June 30 2024, tanks exclusively receiving and/or storing an organic liquid with a TVP less than 0.5 psia are exempt from all other requirements of the rule except for complying with the following provisions:

After June 30, 2024, tanks exclusively receiving and/or storing an organic liquid with a TVP less than 0.1 psia are exempt from all other requirements of the rule except for complying with the following provisions:

4.4.1 TVP and API Gravity Testing provisions pursuant to Section 6.2,

4.4.2 Recordkeeping provisions pursuant to Section 6.3.6,

4.4.3 Test Methods provisions pursuant to Section 6.4, and

4.4.4 Compliance schedules pursuant to Section 7.0.

4.4.5 After June 30, 2024, operators shall follow the storage tank degassing and interior cleaning requirements pursuant to Section 5.7.5 for notification, recordkeeping, tank degassing, tank cleaning, and sludge removal.

The requirements of Section 4.4 shall not apply to tanks that are exempt pursuant to Sections 4.1 through 4.3.

## 5.0 Requirements

### 5.1 VOC Control System Requirements

#### 5.1.1 General VOC Control System Requirements

Except for small producers who are required to comply with the VOC control system requirements in Section 5.1.2, an operator shall not place, hold, or store organic liquid in any tank unless such tank is equipped with a VOC

control system identified in Table 3 or Table 4. The specifications for the VOC control system are described in Sections 5.2, 5.3, 5.4, 5.5, and 5.6.

Table 3 – General VOC Control System Requirements until June 30, 2024

Tank Capacity (Gallons)	True Vapor Pressure (TVP) of Organic Liquid		
	0.5 psia to <1.5 psia	1.5 psia to <11 psia	≥11.0 psia
(Group A) 1,100 to 19,800	Pressure-vacuum relief valve, or internal floating roof, or external floating roof, or vapor recovery system	Pressure-vacuum relief valve, or internal floating roof, or external floating roof, or vapor recovery system	Pressure vessel or vapor recovery system
(Group B) >19,800 to 39,600	Pressure-vacuum relief valve, or internal floating roof, or external floating roof, or vapor recovery system	Internal floating roof, or external floating roof, or vapor recovery system	Pressure vessel or vapor recovery system
(Group C) >39,600	Internal floating roof, or external floating roof, or vapor recovery system	Internal floating roof, or external floating roof, or vapor recovery system	Pressure vessel or vapor recovery system



Table 4 – General VOC Control System Requirements after June 30, 2024

Tank Capacity (Gallons)	True Vapor Pressure (TVP) of Organic Liquid			
	0.1 psia to <0.5 psia	0.5 psia to <1.5 psia	1.5 psia to <11 psia	≥11.0 psia
(Group A) 1,100 to 19,800	Pressure-vacuum relief valve, or internal floating roof, or external floating roof, or vapor recovery system	Pressure-vacuum relief valve, or internal floating roof, or external floating roof, or vapor recovery system	Pressure-vacuum relief valve, or internal floating roof, or external floating roof, or vapor recovery system	Pressure vessel or vapor recovery system
(Group B) >19,800 to 39,600	Pressure-vacuum relief valve, or internal floating roof, or external floating roof, or vapor recovery system	Pressure-vacuum relief valve, or internal floating roof, or external floating roof, or vapor recovery system	Internal floating roof, or external floating roof, or vapor recovery system	Pressure vessel or vapor recovery system
(Group C) >39,600	Pressure-vacuum relief valve, or internal floating roof, or external floating roof, or vapor recovery system	Internal floating roof, or external floating roof, or vapor recovery system	Internal floating roof, or external floating roof, or vapor recovery system	Pressure vessel or vapor recovery system

5.1.1.1 If a tank has the Potential to Emit greater than or equal to six (6) tons per year of VOC and actual emissions are greater than or equal to four (4) tons per year using a generally accepted model or calculation methodology, operator must install a vapor control system meeting the specifications described in Sections 5.3, 5.4, 5.5 or 5.6.

5.1.2 Small Producer VOC Control System Requirements

A small producer shall not place, hold, or store crude oil in any tank unless such tank is equipped with a VOC control system identified in Table 5 or Table 6. For storage of any organic liquid except crude oil, a small producer shall comply with the requirements of Section 5.1.1. The specifications for the VOC control system are described in Sections 5.2, 5.3, 5.4, 5.5, and 5.6.

Table 5 – Small Producer VOC Control System Requirements for Crude Oil Storage Tanks until June 30, 2024

Tank Capacity (gallons)	TVP and Crude Oil Throughput		
	0.5 psia to <11 psia and a tank throughput of >50 to <150 barrels of crude oil per day	0.5 psia to <11 psia and a tank throughput ≥150 barrels of crude oil per day	≥11 psia and regardless of crude oil tank throughput
(Group A) 1,100 to 39,600	Pressure-vacuum relief valve, or internal floating roof, or external floating roof, or vapor recovery system	Pressure-vacuum relief valve, or internal floating roof, or external floating roof, or vapor recovery system	Pressure vessel or vapor recovery system
(Group B) >39,600	Pressure-vacuum relief valve, or internal floating roof, or external floating roof, or vapor recovery system	Internal floating roof, or external floating roof, or vapor recovery system	Pressure vessel or vapor recovery system

Table 6 – Small Producer VOC Control System Requirements for Crude Oil Storage Tanks after June, 30, 2024

Tank Capacity (gallons)	TVP and Crude Oil Throughput			
	0.1 psia to <11 psia and a tank throughput of >50 to <150 barrels of crude oil per day	0.1 psia to <0.5psia and a tank throughput ≥150 barrels of crude oil per day	0.5 psia to <11 psia and a tank throughput ≥150 barrels of crude oil per day	≥11 psia and regardless of crude oil tank throughput
(Group A) 1,100 to 39,600	Pressure-vacuum relief valve, or internal floating roof, or external floating roof, or vapor recovery system	Pressure-vacuum relief valve, or internal floating roof, or external floating roof, or vapor recovery system	Pressure-vacuum relief valve, or internal floating roof, or external floating roof, or vapor recovery system	Pressure vessel or vapor recovery system
(Group B) >39,600	Pressure-vacuum relief valve, or internal floating roof, or external floating roof, or vapor recovery system	Pressure-vacuum relief valve, or internal floating roof, or external floating roof, or vapor recovery system	Internal floating roof, or external floating roof, or vapor recovery system	Pressure vessel or vapor recovery system

5.1.2.1 If tank VOC emissions have the Potential to Emit greater than or equal to six (6) tons per year of VOC and actual emissions are greater than or equal to four (4) tons per year using a generally accepted model or calculation methodology, install a vapor control system meeting the specifications described in Sections 5.3, 5.4, 5.5 or 5.6.

5.1.3 All tanks subject to the control requirements of this rule shall be maintained in a leak-free condition, except for the following components and as allowed by Section 5.2 and applicable provisions of Table 5 through Table 7, and Section 5.7.5.4:

5.1.3.1 Primary seals and secondary seals of external floating roof tanks that are in compliance with the applicable requirements specified in Sections 5.3.2.1, 5.3.2.2, and 5.3.2.3.

5.1.3.2 Primary seals and secondary seals of internal floating roof tanks that are in compliance with the applicable requirements specified in Section 5.4.1.

5.1.3.3 Floating roof deck fittings that are in compliance with the applicable requirements specified in Sections 5.5.2.1.5, 5.5.2.2.5, 5.5.2.3.3, 5.5.2.4.2, and 5.5.2.4.3.

5.1.3.4 Floating roof automatic bleeder vents that are in compliance with requirements specified in Sections 5.5.2.1.3 and 5.5.2.2.3 during product change provided product change is accomplished as expeditiously as practicable.

## 5.2 Specifications for Pressure-Vacuum Relief Valve

The pressure-vacuum relief valve shall be set to within ten (10) percent of the maximum allowable working pressure of the tank. The pressure-vacuum relief valve shall be permanently labeled with the operating pressure settings. The pressure-vacuum relief valve shall be properly installed and maintained in good operating order in accordance with the manufacturer's instructions, and shall remain in a leak-free condition except when the operating pressure exceeds the valve set pressure.

## 5.3 Specifications for External Floating Roof Tanks

5.3.1 An external floating roof tank shall be:

5.3.1.1 Equipped with a floating roof consisting of a pan type that is installed before December 20, 2001, pontoon-type, or double-deck type cover, that rests on the surface of the liquid contents; and

5.3.1.2 Equipped with a closure device between the tank shell and roof edge consisting of 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.

- 5.3.1.3 The floating roof shall be floating on the surface of the stored liquid at all times (i.e., off the roof leg supports) except during the initial fill until the roof is lifted off the leg supports and when the tank is completely emptied and subsequently refilled. When the roof is resting on the leg supports the processes of filling or emptying and refilling the tank shall be continuous and shall be accomplished as rapidly as possible. Whenever the operator intends to land the roof on its legs, an operator shall notify the APCO in writing at least three calendar days prior to performing the work. The tank must be in compliance with this rule before the operator may land the roof on its legs. The required information to be included in the written notification as well as the recordkeeping requirements is specified in Section 6.3.7.
- 5.3.2 Seal designs shall be submitted to the APCO and shall not be installed or used unless they are approved by the APCO as meeting the criteria set forth in Sections 5.3.2.1 through 5.3.2.3 as applicable. Seal designs other than set forth in Sections 5.3.2.1 through 5.3.2.3 may be approved provided that a notice allowing the use of such design has been published in the Federal Register pursuant to CFR 40 Part 60: Subpart Kb paragraph 60.114b.
- 5.3.2.1 Welded Tanks with Primary Metallic-Shoe Type Seal
- 5.3.2.1.1 No gap between the tank shell and the primary seal shall exceed one and one half (1-1/2) inches. The cumulative length of all gaps between the tank shell and the primary seal greater than one-half (1/2) inch shall not exceed ten (10) percent of the circumference of the tank. The cumulative length of all primary seal gaps greater than one-eighth (1/8) inch shall not exceed 30 percent of the tank circumference. No continuous gap greater than one-eighth (1/8) inch shall exceed ten (10) percent of the tank circumference.
- 5.3.2.1.2 No gap between the tank shell and the secondary seal shall exceed one-half (1/2) inch. The cumulative length of all gaps between the tank shell and the secondary seal, greater than one-eighth (1/8) inch shall not exceed five (5) percent of the tank circumference.
- 5.3.2.1.3 Metallic-shoe-type seals shall be installed so that one end of the shoe extends into the stored liquid and the other end extends a minimum vertical distance of 24 inches above the stored liquid surface.

- 5.3.2.1.4 The geometry of the metallic-shoe type seal shall be such that the maximum gap between the shoe and the tank shell is no greater than double the gap allowed by the seal gap criteria specified in Section 5.3.2.1.1 for a length of at least 18 inches in the vertical plane above the liquid surface.
- 5.3.2.1.5 There shall be no holes, tears, or openings in the secondary seal or in the primary seal envelope that surrounds the annular vapor space enclosed by the roof edge, seal fabric, and secondary seal.
- 5.3.2.1.6 The secondary seal shall allow easy insertion of probes up to one and one-half (1-1/2) inches in width in order to measure gaps in the primary seal.
- 5.3.2.1.7 The secondary seal shall extend from the roof to the tank shell and shall not be attached to the primary seal.

#### 5.3.2.2 Riveted Tank with Primary Metallic-Shoe Type Seal

- 5.3.2.2.1 No gap between the tank shell and the primary seal shall exceed two and one-half (2-1/2) inches. The cumulative length of all primary seal gaps greater than one and one-half (1-1/2) inches shall be not exceed ten (10) percent of the circumference of the tank. The cumulative length of all gaps between the tank shell and the primary seal greater than one-eighth (1/8) inch shall not exceed 30 percent of the circumference of the tank. No continuous gap greater than one-eighth (1/8) inch shall exceed ten (10) percent of the tank circumference.
- 5.3.2.2.2 No gap between the tank shell and the secondary seal shall exceed one-half (1/2) inch. The cumulative length of all gaps between the tank shell and the secondary seal greater than one-eighth (1/8) inch shall not exceed five (5) percent of the tank circumference.
- 5.3.2.2.3 Metallic shoe-type seals shall be installed so that one end of the shoe extends into the stored liquid and the other end extends a minimum vertical distance of 24 inches above the stored liquid surface. The geometry of the metallic-shoe type seal shall be such that the maximum gap between the shoe and the tank shell is no greater than double the gap allowed by the seal gap criteria specified

in Section 5.3.2.2.1 for a length of at least 18 inches in the vertical plane

5.3.2.2.4 There shall be no holes, tears, or openings in the secondary seal or in the primary seal envelope that surrounds the annular vapor space enclosed by the roof edge, seal fabric, and secondary seal.

5.3.2.2.5 The secondary seal shall allow easy insertion of probes up to two and one-half (2-1/2) inches in width in order to measure gaps in the primary seal.

5.3.2.2.6 The secondary seal shall extend from the roof to the tank shell and shall not be attached to the primary seal.

### 5.3.2.3 Tanks with Primary Resilient Toroid Seal:

5.3.2.3.1 The primary resilient toroid seal shall be mounted on the perimeter of the roof such that it is in contact with the tank's liquid contents at all times while the roof is floating.

5.3.2.3.2 No gap between the tank shell and the primary seal shall exceed one-half (1/2) inch. The cumulative length of all primary seal gaps greater than one-eighth (1/8) inch shall not exceed five (5) percent of the tank circumference. No continuous gap greater than one-eighth (1/8) inch shall exceed ten (10) percent of the tank circumference.

5.3.2.3.3 No gap between the tank shell and the secondary seal shall exceed one-half (1/2) inch. The cumulative length of all gaps between the tank shell and the secondary seal, greater than one-eighth (1/8) inch shall not exceed five (5) percent of the tank circumference.

5.3.2.3.4 There shall be no holes, tears, or openings in the secondary seal or in the primary seal envelope that surrounds the annular vapor space enclosed by the roof edge, seal fabric, and secondary seal.

5.3.2.3.5 The secondary seal shall allow easy insertion of probes up to one-half (1/2) inch in width in order to measure gaps in the primary seal.

5.3.2.3.6 The secondary seal shall extend from the roof of the tank to the shell and not be attached to the primary seal.

5.3.2.4 The following seal designs have been found to be equivalent to seals meeting the criteria set forth in Sections 5.3.2.1 through 5.3.2.3:

5.3.2.4.1 When installed and maintained with zero gap:

MANUFACTURER	MODEL
Republic Fabricators	WeatherGuard Seal

5.3.2.4.2 When installed and maintained to meet the gap criteria for primary and secondary seals set forth in Sections 5.3.2.1 through 5.3.2.3:

MANUFACTURER	MODEL
"HMT"	Dual/Multi Blade Wiper Seals

#### 5.4 Specifications for Internal Floating Roof Tanks

5.4.1 Internal floating roof tanks shall be equipped with seals that meet the criteria set forth in Section 5.3, except for complying with the requirement specified in Section 5.3.2.1.3. For internal floating roof, the metallic-shoe type seals shall be installed so that one end of the shoe extends into the stored liquid and the other end extends a minimum vertical distance of 6 inches above the stored liquid surface.

5.4.2 The following seal designs have been found to be equivalent to seals meeting the criteria set forth in Section 5.3:

5.4.2.1 When installed and maintained with zero gap:

MANUFACTURER	MODEL
Ultraflote	Single Ultraseal

5.4.2.2 When installed and maintained to meet the gap criteria for primary and secondary seals set forth in Sections 5.3.2.1 through 5.3.2.3:

MANUFACTURER	MODEL
Ultraflote	Dual Ultraseal
Altech	Double Wiper Seal

5.4.3 The operator shall comply with the floating roof landing requirements specified in Section 5.3.1.3.

## 5.5 Floating Roof Deck Fitting Requirements

5.5.1 All openings in the roof used for sampling or gauging, except for pressure-vacuum relief valves complying with Section 5.2, shall provide a projection below the liquid surface to prevent belching of liquid and to prevent entrained or formed organic vapor from escaping from the liquid contents of the tank and shall be equipped with a cover, seal, or lid. The cover, seal, or lid shall at all times be in a closed position, with no visible gaps and leak-free, except when the device or appurtenance is in use for sampling or gauging.

5.5.2 Tanks shall meet the requirements of Sections 5.1.3, 5.5.1, and Sections 5.5.2.1 through 5.5.2.4.

### 5.5.2.1 Requirements for Internal Floating Roof Deck Fittings

5.5.2.1.1 Each opening in a non-contact internal floating roof except for automatic bleeder vents (vacuum breaker vents) and rim space vents shall provide a projection below the liquid surface.

5.5.2.1.2 Each opening in the internal floating roof except for leg sleeves, automatic bleeder vents, rim space vents, column wells, ladder wells, sample wells, combination manway/vacuum breakers, and stub drains shall be equipped with a cover, or a lid shall be maintained in a closed position at all times (i.e., no visible gap) except when the device is in use. The cover or lid shall be equipped with a gasket. Covers on each access hatch and automatic gauge float well shall be bolted in place except when they are in use.

5.5.2.1.3 Automatic bleeder vents shall be equipped with a gasket and shall be closed at all times when the roof is floating except when the roof is being floated off or is being landed on the leg roof supports.

5.5.2.1.4 Rim vents shall be equipped with a gasket and shall be set to open only when the internal floating roof is not floating or set to open at the manufacturer's recommended setting.



5.5.2.1.5 Each penetration of the internal floating roof for the purpose of sampling shall be a sample well. The well shall have a slit fabric cover that covers at least 90 percent of the opening. The fabric cover must be impermeable.

5.5.2.1.6 Each penetration of the internal floating roof that allows for passage of a column supporting the fixed roof shall have a flexible fabric sleeve seal or a gasketed sliding cover. The fabric sleeve must be impermeable.

#### 5.5.2.2 Requirements for External Floating Roof Deck Fittings

5.5.2.2.1 Except for automatic bleeder vents and rim vents and pressure-vacuum relief valves, each opening in a non-contact external floating roof shall provide a projection below the liquid surface.

5.5.2.2.2 Except for automatic bleeder vents and rim vents, roof drains, and leg sleeves, each opening in the roof shall be equipped with a gasketed cover, seal, or lid that shall be maintained in a closed position at all times (i.e., no visible gap) except when in actual use.

5.5.2.2.3 Automatic bleeder vents shall be equipped with a gasket and shall be closed at all times when the roof is floating except when the roof is being floated off or is being landed on the roof leg supports.

5.5.2.2.4 Rim vents shall be equipped with a gasket and shall be set to open when the roof is being floated off the roof leg supports or at the manufacturer's recommended setting.

5.5.2.2.5 Each emergency roof drain shall be provided with a slotted membrane fabric cover that covers at least 90 percent of the area of the opening. The fabric cover must be impermeable if the liquid is drained into the contents of the tanks.

5.5.2.2.6 External floating roof legs shall be equipped with vapor socks or vapor barriers in order to maintain a leak-free condition so as to prevent VOC emissions from escaping through the roof leg opening.

### 5.5.2.3 Solid Guidepole

Solid sampling or gauging wells, and similar fixed projections through a floating roof such as an anti-rotational pipe, shall meet the following requirements:

5.5.2.3.1 The well shall provide a projection below the liquid surface.

5.5.2.3.2 The well shall be equipped with a pole wiper and a gasketed cover, seal or lid which shall be in a closed position at all times (i.e., no visible gap) except when the well is in use.

5.5.2.3.3 The gap between the pole wiper and the guidepole shall be added to the gaps measured to determine compliance with the secondary seal requirement, and in no case shall exceed one-half (1/2) inch.

### 5.5.2.4 Slotted Guidepole

Slotted sampling or gauging wells shall meet the following requirements:

5.5.2.4.1 The well shall provide a projection below the liquid surface.

5.5.2.4.2 The well on external floating roof shall be equipped with the following: a sliding cover, a well gasket, a pole sleeve, a pole wiper, and an internal float and float wiper designed to minimize the gap between the float and the well, and provided the gap shall not exceed one-eighth (1/8) inch; or shall be equipped with a well gasket, a zero gap pole wiper seal and a pole sleeve that projects below the liquid surface.

5.5.2.4.3 The gap between the pole wiper and the guidepole shall be added to the gaps measured to determine compliance with the secondary seal requirement, and in no case shall exceed one-eighth (1/8) inch.

## 5.6 Specifications for Vapor Recovery Systems

5.6.1 Fixed roof tanks shall be fully enclosed and shall be maintained in a leak-free condition. An APCO-approved vapor recovery system shall consist of a closed system that collects all VOCs from the storage tank, and a VOC control device.

The vapor recovery system shall be maintained in a leak-free condition. The VOC control device shall be one of the following:

5.6.1.1 A condensation or vapor return system that connects to one of the following: a gas processing plant, a field gas pipeline, a pipeline distributing Public Utility Commission quality gas for sale, an injection well for disposal of vapors as approved by the California Geologic Energy Management Division (CalGEM).

5.6.1.2 A VOC control device that reduces the inlet VOC emissions by at least 95 percent by weight as determined by the test method specified in Section 6.4.6.

5.6.2 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.

5.6.3 All piping, valves, and fittings shall be constructed and maintained in a leak-free condition.

#### 5.7 Voluntary Tank Preventive Inspection and Maintenance, and Tank Interior Cleaning Program

Until June 30, 2024, operators who elect to participate in the voluntary tank preventive inspection and maintenance, and tank interior cleaning program (program) shall be allowed to use the provisions specified in Tables 5 to 7 and Section 5.7.5. When using Tables 5 to 7 and Section 5.7.5 provisions, operators shall perform the procedures as expeditiously as practicable and minimize emissions to the maximum extent practicable. To participate in this program, the operator shall comply with the requirements of Sections 5.7.1 through 5.7.4.

5.7.1 Submit a letter to the APCO prior to conducting tank inspection, maintenance, and cleaning activities. The letter shall contain a list of each tank that will be subject to this program. The list shall include the tank identification number and location, and/or PTO numbers.

5.7.2 Keep in their facility at all times a copy of the letter sent to the APCO and maintain the records of annual tank inspection, maintenance and cleaning activities, to document their participation in the program.

5.7.3 The absence of a copy of the letter and/or failure to maintain appropriate records shall be deemed as non-participation in the program, and therefore the operator will not be eligible to use the provisions specified in Tables 5 to 7 and Section 5.7.5. Those who have not voluntarily participated in the program but are found to be using the provisions of Tables 5 to 7, and Section 5.7.5 shall be deemed to be in violation of this rule.

5.7.4 Operators who elect to participate in this program but who fail to comply with all of the requirements specified in Tables 3 and 4 and Section 5.7.5 shall be deemed to be a violation of the provisions of this rule.

#### 5.7.5 Storage Tank Degassing and Interior Cleaning Requirements

After June 30, 2024, operators of Fixed and Floating Roof Tanks shall comply with the provisions of Section 5.7.5. Operators may disconnect from vapor recovery provided that the procedures are performed as expeditiously as practicable and emissions are minimized to the maximum extent practicable.

##### 5.7.5.1 Notification

Operators of storage tanks subject to the requirements of Section 5.7 shall notify the APCO in writing at least three (3) days prior to performing tank degassing and interior tank cleaning activities. Written notification shall include the following information:

5.7.5.1.1 The PTO number and physical location of the tank being degassed,

5.7.5.1.2 The date and time that tank degassing and cleaning activities will begin,

5.7.5.1.3 The degassing method, as allowed pursuant to Section 5.7.5.4, to be used,

5.7.5.1.4 The method to be used to clean the tank, including any solvents to be used, and

5.7.5.1.5 The method to be used to dispose of the removed sludge, including methods that will be used to control emissions from the receiving vessel and emissions during transport.

##### 5.7.5.2 Records

Operators shall maintain records of tank cleaning activities for a period of 5 years and present said records to the APCO upon request. Records should include the final details of the planned activities submitted pursuant to Section 5.7.5.1.

##### 5.7.5.3 Fixed-Roof Tanks Operating Only a Pressure-Vacuum Relief Valve

5.7.5.3.1 Except for complying with Section 5.7.5.3.2 requirements, fixed-roof tanks allowed, pursuant to

Tables 3, 4, 5, and 6 of this rule, to operate with a pressure-vacuum relief valve are not subject to the degassing requirements specified in Section 5.7.5.4.

5.7.5.3.2 Operators shall comply with the requirements of Section 5.2 during the process of draining, and refilling the tank with an organic liquid having a TVP of 0.5 psia or greater until June 30, 2024, or TVP of 0.1 psia or greater after June 30, 2024.

5.7.5.3.3 The requirements specified in Sections 5.1 and 5.2 shall not apply to the tank during interior cleaning or maintenance activities.

#### 5.7.5.4 Tank Degassing Requirements

Except for tanks satisfying Section 5.7.5.3 provisions, the process of tank degassing shall be accomplished by emptying the tank of organic liquid having a TVP of 0.5 psia until June 30, 2024, or TVP of less than 0.1 psia after June 30, 2024, or greater, and minimizing organic vapors in the tank vapor space by one of the following methods:

5.7.5.4.1 Exhaust VOCs contained in the tank vapor space to an APCO-approved vapor recovery system until the organic vapor concentration is 5,000 ppmv or less, or is 10 percent or less of the lower explosion limit (LEL), whichever is less; or

5.7.5.4.2 Displace VOCs contained in the tank vapor space to an APCO-approved vapor recovery system by filling the tank with a suitable liquid until 90 percent or more of the maximum operating level of the tank is filled. Suitable liquids are organic liquids having a TVP of less than 0.5 psia until June 30, 2024, or TVP of less than 0.1 psia after June 30, 2024, water, clean produced water, or produced water derived from crude oil having a TVP less than 0.5 psia; or

5.7.5.4.3 Displace VOCs contained in the tank vapor space to an APCO-approved vapor recovery system by filling the tank with a suitable gas. Degassing shall continue until the operator has achieved a vapor displacement equivalent to at least 2.3 times the tank capacity. Suitable gases are air, nitrogen, carbon dioxide, or

natural gas containing less than 10 percent VOC by weight; or

- 5.7.5.4.4 For free-water knockout tanks, the operator may degas the tank vapor space by restricting the outflow of water and floating off the oilpad, such that at least 90 percent of the tank volume is displaced.
- 5.7.5.4.5 During degassing, the operator shall discharge or displace organic vapors contained in the tank vapor space to an APCO-approved vapor recovery system that is leak-free and meets the requirements of Section 5.6.1.1 or Section 5.6.1.2.
- 5.7.5.4.6 To facilitate connection to an external APCO-approved vapor recovery system a suitable tank fitting, such as a manway, may be temporarily removed for a period of time not to exceed 1 hour.
- 5.7.5.4.7 Except as provided for in Section 5.7.5.4.9, the tank shall be in compliance with the applicable requirements specified in Section 5.1 through Section 5.6 during draining, degassing, and refilling the tank with an organic liquid having a TVP of 0.5 psia or greater until June 30, 2024, or TVP of less than 0.1 psia after June 30, 2024, or greater.
- 5.7.5.4.8 Draining and refilling of floating roof tanks shall occur as a continuous process and shall proceed as rapidly as practicable while the roof is not floating on the surface of the stored liquid.
- 5.7.5.4.9 For floating-roof tanks, the gap seal requirements specified in Sections 5.3.2 and 5.4.2 shall not apply while the roof is resting on its legs, and during the processes of draining, degassing, or refilling the tank. The leak-free condition specified in Section 5.1.3 shall not apply during refilling the tank, if the operator complies with Section 5.7.5.4.8 requirements.
- 5.7.5.4.10 After a tank has been degassed pursuant to the provisions of Section 5.7.5 the requirements specified in Section 5.1 through Section 5.6 shall not apply until an organic liquid having a TVP of 0.5 psia or greater until June 30, 2024, or TVP of less than 0.1 psia after June 30, 2024, or greater is placed, held, or stored in the tank.

#### 5.7.5.5 Tank Cleaning

5.7.5.5.1 While performing tank cleaning activities, operators may use the following cleaning agents: diesel, solvents with an initial boiling point of greater than 302°F, solvents with a vapor pressure of less than 0.5 psia, or solvents with 50 grams per liter VOC content or less.

5.7.5.5.2 Steam cleaning shall be allowed at locations where wastewater treatment facilities are limited or during the months of December through March.

#### 5.7.5.6 Removed Sludge

Operators of tanks containing an organic liquid with a TVP of 1.5 psia or greater shall control emissions from the removed sludge by complying with all of the following provisions:

5.7.5.6.1 During sludge removal the operator shall control emissions from the receiving vessel by operating an APCO-approved vapor control device that reduces emissions of organic vapors by at least 95 percent.

5.7.5.6.2 Operators shall transport removed sludge in closed, liquid leak-free containers.

5.7.5.6.3 Notwithstanding Section 5.7.5.6.2, operators shall store removed sludge, until final disposal, in leak-free containers, or tanks complying with Section 5.1 requirements. Sludge that is to be used to manufacture roadmix, as defined in Rule 2020 (Exemptions), is exempt from this requirement. Roadmix manufacturing operations exempt pursuant to Rule 2020, shall maintain documentation of their compliance with Rule 2020, and promptly make said documentation available to the APCO upon request.

**Table 5: Fixed Roof Tank Preventive Inspection and Maintenance until June 30, 2024**  
**Emission Minimization for Components Serving Organic Liquid Storage Tanks**

Components	Maintenance Schedule	Emission Minimization	Additional Requirements
<ol style="list-style-type: none"> <li>1. Hatch</li> <li>2. Tank seals and seams</li> <li>3. Cable Seals</li> <li>4. Piping components directly affixed to the tank and within five feet of the tank, including but not limited to:                -Valves                -Flanges                -Connectors</li> </ol>	<ol style="list-style-type: none"> <li>1. Conduct annual inspections with maintenance and repair of components.</li> <li>2. Conduct visual inspections and inspections using a portable hydrocarbon detection instrument conducted in accordance with EPA Method 21.</li> <li>3. Visually or ultrasonically inspect as appropriate, the external shells and roofs of un-insulated tanks for integrity annually.</li> </ol>	<ol style="list-style-type: none"> <li>1. Liquid Leak                Repair leaking components that have a liquid leak rate of <math>\geq 30</math> drops per minute, within 8 hours after detection. Repair leaking components that have a liquid leak rate of <math>\geq 3</math> to <math>&lt; 30</math> drops per minute within 24 hours after detection.</li> <li>2. Gas leak                Comply with the following requirements to repair leaking components that have a gas leak <math>&gt; 10,000</math> ppmv (measured in accordance with EPA Method 21 by a portable hydrocarbon detection instrument that is calibrated with methane):               <ol style="list-style-type: none"> <li>a. Eliminate the leak within 8 hours after detection; or</li> <li>b. If the leak cannot be eliminated, then minimize the leak to the lowest possible level within 8 hours after detection by using best maintenance practices; and</li> <li>c. Eliminate the leak within 48 hours after minimization; and</li> <li>d. In no event that the total time to minimize and eliminate the leak shall exceed 56 hours after detection.</li> </ol> </li> <li>3. If a component type for a given tank is found to leak during an annual inspection, then conduct quarterly inspections of that component type on the tank or tank system for four consecutive quarters. If a component type is found to have no leak after four consecutive quarterly inspections, then revert to annual inspections.</li> </ol>	<ol style="list-style-type: none"> <li>1. For leaking components, immediately affix a tag and maintain records of liquid leak and gas leak detection readings, date/time leak was discovered, and date/time the component was repaired to a leak-free condition.</li> <li>2. Leaking components that have been discovered by the operator that have been immediately tagged and repaired within the deadlines specified in the Emissions Minimization requirements, shall not constitute a violation of this rule. However, leaking components discovered during inspections by District staff that were not previously identified and/or tagged by the operator, and/or any leaks that were not repaired within deadlines specified in the Emissions Minimization requirements, shall constitute a violation of this rule.</li> <li>3. Any component found to be leaking on two consecutive annual inspections is in violation of this rule, even if it is under the voluntary inspection and maintenance program.</li> </ol>



Table 6: External Floating Roof Tank Preventive Inspection and Maintenance until June 30, 2024

Emission Minimization for Components Serving Organic Liquid Storage Tanks			
Components	Maintenance Schedule	Emission Minimization	Additional Requirements
<p>1. Piping Components (valves, flanges, and connectors) directly affixed to the tank and within five feet of the tank.</p>	<p>1. Conduct annual inspections with maintenance and repair of components.</p> <p>2. Conduct visual inspections and inspections using a portable hydrocarbon detection instrument conducted in accordance with EPA Method 21.</p> <p>3. Visually or ultrasonically inspect as appropriate, the external shells and roofs of uninsulated tanks for integrity annually.</p>	<p>1. Liquid Leak Repair leaking components that have a liquid leak rate of <math>\geq 30</math> drops per minute within 8 hours after detection. Repair leaking components that have a liquid leak rate of <math>\geq 3</math> to <math>&lt; 30</math> drops per minute within 24 hours after detection.</p> <p>2. Gas leak Comply with the following requirements to repair leaking components that have a gas leak <math>&gt; 10,000</math> ppmv (measured in accordance with EPA Method 21 by a portable hydrocarbon detection instrument that is calibrated with methane):</p> <ul style="list-style-type: none"> <li>a. Eliminate the leak within 8 hours after detection; or</li> <li>b. If the leak cannot be eliminated, then minimize the leak to the lowest possible level within 8 hours after detection by using best maintenance practices; and</li> <li>c. Eliminate the leak within 48 hours after minimization; and</li> <li>d. In no event that the total time to minimize and eliminate the leak shall exceed 56 hours after detection.</li> </ul> <p>3. If a component type for a given tank is found to leak during annual inspection, then conduct quarterly inspections on the tank or tank system for four consecutive quarters. If a component type is found to have no leak after four consecutive quarterly inspections, then revert to annual inspections.</p>	<p>1. For leaking components, immediately affix a tag and maintain records of liquid leak and gas leak detection readings, date/time leak was discovered, and date/time the component was repaired to a leak-free condition.</p> <p>2. Leaking components that have been discovered by the operator that have been immediately tagged and repaired within the deadlines specified in the Emissions Minimization requirements, shall not constitute a violation of this rule. However, leaking components discovered during inspections by District staff that were not previously identified and/or tagged by the operator, and/or any leaks that were not repaired within deadlines specified in the Emissions Minimization requirements, shall constitute a violation of this rule.</p> <p>3. Any component found to be leaking on two consecutive annual inspections is in violation of this rule, even if it is under the voluntary inspection and maintenance program.</p>

Table 7: Internal Floating Roof Preventive Inspection Maintenance until June 30, 2024

Emission Minimization for Components Serving Organic Liquid Storage Tanks			
Components	Maintenance Schedule	Emission Minimization	Additional Requirements
<p>1. Piping Components (valves, flanges, and connectors) directly affixed to the tank and within five feet of the tank.</p>	<p>1. Conduct annual inspections with maintenance and repair of components.</p> <p>2. Conduct visual inspections and inspections using a portable hydrocarbon detection instrument conducted in accordance with EPA Method 21.</p> <p>3. Externally inspect un-insulated tanks, tank shells, and roofs for integrity annually.</p>	<p>1. Liquid Leak Repair leaking components that have a liquid leak rate of <math>\geq 30</math> drops per minute, within 8 hours after detection. Repair leaking components that have a liquid leak rate of <math>\geq 3</math> to <math>&lt; 30</math> drops per minute within 24 hours after detection.</p> <p>2. Gas leak Comply with the following requirements to repair leaking components that have a gas leak <math>&gt; 10,000</math> ppmv (measured in accordance with EPA Method 21 by a portable hydrocarbon detection instrument that is calibrated with methane):</p> <ul style="list-style-type: none"> <li>a. Eliminate the leak within 8 hours after detection; or</li> <li>b. If the leak cannot be eliminated, then minimize the leak to the lowest possible level within 8 hours after detection by using best maintenance practices; and</li> <li>c. Eliminate the leak within 48 hours after minimization; and</li> <li>d. In no event that the total time to minimize and eliminate the leak shall exceed 56 hours after detection.</li> </ul> <p>3. If a component type for a given tank is found to leak during annual inspection, then conduct quarterly inspections on the tank or tank system for four consecutive quarters. If a component type is found to have no leak after four consecutive quarterly inspections, then revert to annual inspections.</p>	<p>1. For leaking components, immediately affix a tag and maintain records of liquid leak and gas leak detection readings, date/time leak was discovered, and date/time the component was repaired to a leak-free condition.</p> <p>2. Leaking components that have been discovered by the operator that have been immediately tagged and repaired within the deadlines specified in the Emissions Minimization requirements, shall not constitute a violation of this rule. However, leaking components discovered during inspections by District staff that were not previously identified and/or tagged by the operator, and/or any leaks that were not repaired within deadlines specified in the Emissions Minimization requirements, shall constitute a violation of this rule.</p> <p>3. Any component found to be leaking on two consecutive annual inspections is in violation of this rule, even if it is under the voluntary inspection and maintenance program.</p>

5.8 Preventive Maintenance and Interior Cleaning Requirements for Fixed Roof Tanks (Effective after June 30, 2024)

5.8.1 Conduct maintenance and cleaning activities pursuant to Section 5.7.5.

5.9 Inspection and Re-Inspection Requirements (Effective after June 30, 2024)

5.9.1 Determination of Compliance with the Leak Standards during District Inspection

For the purpose of this rule, a facility shall be considered in violation if one or more of the conditions specified in Sections 5.9.1.1 through 5.9.1.4 exist at the facility.

5.9.1.1 The discovery of a major gas leak greater than 10,000 ppmv.

5.9.1.2 The discovery of a liquid leak as defined in Section 3.23.

5.9.1.3 Exceeding the allowable number of minor leaks defined in Table 8.

Table 8 – Allowable Leaks		
Leak Threshold	200 or Less Components Inspected*	More than 200 Components Inspected*
500-10,000ppmv	5	2% of total inspected

\*The maximum number of leaks in Table 8 shall be rounded upwards to the nearest integer, where required. The maximum allowable percent of leaks is calculated from the total number of components inspected during the specified inspection period. Leaks counted toward the allowable leak threshold in Table 8 are still subject to the maintenance and repair requirements of Section 5.9.3 through 5.9.4.

5.9.1.4 Failure to repair leaks within the timeframes specified in Table 9.

5.9.2 Determination of Compliance with the Leak Standards during Operator Inspection

For the purpose of this rule a facility shall be considered in violation if the following condition specified in Section 5.9.2.1 exists at the facility.

5.9.2.1 Failure to repair leaks within the timeframes specified in Table 9.

5.9.3 A leak discovered during Operator and District Inspection(s) above the leak threshold defined in Section 3.14 and in Table 2 shall be repaired within the timeframes of Table 9.

Table 9 – Repair Time Periods	
Leak Threshold	Repair Time Period
Minor Leak	14 Calendar Days
Major Leak	2 Calendar Days
Liquid Leak	2 Calendar Days

- 5.9.4 At least once each calendar quarter all components shall be tested for leaks, except for inaccessible components, unsafe to monitor components and floating roof tanks including their deck fittings and components.

External floating roof tanks shall be inspected once every 12 months as required by Section 6.1.3.

Internal floating roof tanks shall be inspected once every 60 months as required by Section 6.1.4.

Inspections shall be performed as allowed by the following:

- 5.9.4.1 All components shall be tested for leaks of total hydrocarbons in units of parts per million volume (ppmv) in accordance with US EPA Reference Method 21 as specified in Section 6.4.8.
- 5.9.4.2 Inaccessible components and unsafe-to-monitor components shall be inspected once every 12 months per US EPA Reference Method 21.
- 5.9.4.3 Except for inaccessible components, unsafe to monitor components, and floating roof tanks including deck fittings and components, owners or operators shall audio-visually inspect (by hearing and by sight) all hatches, pressure-vacuum relief valves, pressure relief devices, and pump seals for leaks or indications of leaks at least once every 24 hours for facilities that are visited daily, or at least once per calendar week for facilities that are not visited at least once every 24 hours.
- 5.9.4.4 Any audio-visual inspection specified in Section 5.9.4.3 that indicates a leak shall be tested using US EPA Reference Method 21 within 24 hours, and the leak shall be repaired in accordance with the repair timeframes specified in Table 9.
- 5.9.4.5 An operator shall inspect all new, replaced, or repaired fittings, flanges, and threaded connections within 72 hours of placing the component in service.

5.9.4.6 A District inspection in no way fulfills any of the mandatory inspection requirements that are placed upon operators and cannot be used or counted as an inspection required of an operator.

5.9.4.7 Upon detection of a component with a leak concentration measured above the standards specified, the owner or operator shall affix to that component a weatherproof readily visible tag that identifies the date and time of leak detection measurement and the measured leak concentration. The tag shall remain affixed to the leaking component until it has been successfully repaired or replaced, after which the tag shall be removed.

5.9.4.7.1 Successful repair shall be confirmed by re-measuring the components using US EPA Reference Method 21 to determine that the component is below the minimum leak threshold after repair or replacement.

5.9.4.8 Excluding tanks, components or component parts which incur five (5) repair actions within a rolling 12-month period shall be replaced with a compliant component in working order and must be re-measured using US EPA Reference Method 21, to determine that the component is below the minimum leak threshold. A record of the replacement must be maintained in a log at the facility, and shall be made available upon request by the APCO.

Failure to comply with all of the Maintenance Requirements of Section 5.9.4.1 through 5.9.4.8 shall constitute a violation of this rule.

5.9.4.9 An operator shall attempt to minimize all component leaks immediately to the extent possible, but no later than one (1) hour after detection of leak in order to stop or reduce leakage to the atmosphere.

5.9.4.10 If the leak has been minimized but the leak still exceeds the applicable leak standards of this rule, an operator shall comply with at least one of the requirements of Sections 5.9.4.10.3, 5.9.4.10.4 or 5.9.4.10.5 as soon as practicable but not later than the time period specified in Table 9.

5.9.4.10.1 The leak rate measured, after leak minimization has been performed, shall be the leak rate used to determine the repair period specified in Table 9.

5.9.4.10.2 The start of the repair period shall be the time of the initial leak detection.

5.9.4.10.3 Repair or replace the leaking component; or

5.9.4.10.4 Vent the leaking component to a VOC control system as defined in Section 3.1.

5.9.4.10.5 Remove the leaking component from operation.

## 6.0 Administrative Requirements

### 6.1 Inspection of Floating Roof Tanks

6.1.1 The operator of external floating roof tanks shall make the primary seal envelope available for unobstructed inspection by the APCO on an annual basis at locations selected along its circumference at random by the APCO. In the case of riveted tanks with toroid-type seals, a minimum of eight (8) locations shall be made available; in all other cases, a minimum of four (4) locations shall be made available. If the APCO suspects a violation may exist 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.

6.1.2 Operators of floating roof tanks shall submit a tank inspection plan to the APCO for approval. The plan shall include an inventory of the tanks subject to this rule and a tank inspection schedule. A copy of the operator's tank safety procedures shall be made available to the APCO upon request. The tank inventory shall include tank's identification number, PTO number, maximum tank capacity, dimensions of tank (height and diameter), organic liquid stored, type of primary and secondary seal, type of floating roof (internal or external floating roof), construction date of tank, and location of tank. Any revision to a previously approved tank inspection schedule shall be submitted to the APCO for approval prior to conducting an inspection.

#### 6.1.3 External Floating Roof Tank Inspection

6.1.3.1 Inspect all floating roof tanks at least once every 12 months to determine compliance with the requirements of this rule. The actual gap measurements of the floating roof primary and secondary seals shall be recorded. The inspection results shall be submitted to the APCO as specified in Section 6.3.5.

6.1.3.2 Inspect the primary and secondary seals for compliance with the requirements of this rule every time a tank is emptied or degassed. Actual gap measurements shall be performed when the liquid level is static but not more than 48 hours after the tank roof is re-floated.

#### 6.1.4 Internal Floating Roof Tank Inspection

- 6.1.4.1 For newly constructed, repaired, or rebuilt internal floating roof tanks, visually inspect the internal floating roof and its appurtenant parts, fittings, etc., and measure the gaps of the primary seal and/or secondary seal prior to filling the tank. If there are holes, tears, or other openings in the primary seal, the secondary seal, or the seal fabric or defects in the internal floating roof or its appurtenant parts, components, fittings, etc., the operator shall repair the defects before filling the tank.
- 6.1.4.2 Visually inspect, through the manholes, roof hatches, or other openings on the fixed roof, the internal floating roof and its appurtenant parts, fittings, etc., and the primary seal and/or secondary seal at least once every 12 months after the tank is initially filled with an organic liquid. There should be no visible organic liquid on the roof, tank walls, or anywhere. Other than the gap criteria specified by this rule, no holes, tears, or other openings are allowed that would permit the escape of hydrocarbon vapors. Any defects found are violations of this rule.
- 6.1.4.3 Conduct actual gap measurements of the primary seal and/or secondary seal at least once every 60 months. Other than the gap criteria specified by this rule, no holes, tears, or other openings are allowed that would permit the escape of hydrocarbon vapors. Any defects found shall constitute a violation of this rule. The inspection results shall be submitted to the APCO as specified in Section 6.3.5.

#### 6.2 TVP and API Gravity Testing of Stored Organic Liquid in Uncontrolled Fixed Roof Tanks

Sections 6.2.1 and 6.2.2 shall not apply to tanks that exclusively store organic liquids listed in Appendix A, provided the storage temperature indicated in Appendix A is not exceeded at any time. An operator shall comply with Section 6.3.6 if the information in Appendix A is used to demonstrate the TVP and/or API gravity of the stored liquid.

##### 6.2.1 TVP and API Gravity Testing

- 6.2.1.1 An operator shall conduct TVP and API testing upstream of each separator and fixed roof tank not controlled by a vapor control system per Sections 5.3, 5.4, 5.5, or 5.6 using test methods in Section 6.4 and the procedures below:
  - 6.2.1.1.1 In lieu of testing upstream of each fixed roof tank not meeting the control systems of Sections 5.3, 5.4, 5.5, and 5.6 an operator may conduct TVP testing of a

representative fixed roof tank. The selection of a representative, uncontrolled fixed roof tank is submitted in writing to the APCO, and written approval is granted by the APCO prior to conducting the test.

- 6.2.1.1.2 One fixed roof tank not meeting the control systems of Sections 5.3, 5.4, 5.5, and 5.6 represents some or all of the tanks in a tank battery (defined in Section 3.41).
- 6.2.1.1.3 For crude oil production facilities, the representative uncontrolled fixed roof tank shall be the front line tank (or tanks) in a tank battery that is first receiving the produced fluids (mixture of oil, water, and gases) from the crude oil production wells.
- 6.2.1.1.4 The stored organic liquid in each of the represented tank is the same and came from the same source.
- 6.2.1.1.5 The TVP and storage temperature of the stored organic liquid of the representative tank to be tested are the same or higher than those of the tanks it is to represent.
- 6.2.1.1.6 An operator must maintain a sketch or diagram of the separator and tank system depicting the sampling location.
- 6.2.1.1.7 The TVP testing shall be conducted during the months of June through September using the actual storage temperature of the organic liquid in the tank.
- 6.2.1.1.8 Testing shall occur whenever there is a change in the source or type of organic liquid stored in each tank. The operator shall submit the records of TVP and/or API gravity testing to the APCO as specified in Section 6.3.6.
- 6.2.1.1.9 An operator shall conduct a TVP and API testing of each fixed roof tank not controlled by a vapor control system per Sections 5.3, 5.4, 5.5, or 5.6 at least once every 24 months following the procedures in Section 6.2.1.

### 6.3 Recordkeeping

An operator shall retain accurate records required by this rule for a period of five years. Records shall be made available to the APCO upon request, except for certain records that need to be submitted as specified in the respective sections below.



- 6.3.1 An operator whose tanks are subject to the requirements of this rule shall keep an accurate record of each organic liquid stored in each tank, including its storage temperature, TVP, and API gravity. The requirement of 6.3.1 shall not apply to fixed roof tanks equipped with a vapor recovery system, external floating roof tanks, or internal floating roof tanks that meet the requirements of this rule.
- 6.3.2 An operator whose emergency standby tanks are required to comply with Section 4.2.1 shall maintain records showing date(s) the organic liquid is first introduced into each tank, and date(s) each tank is fully drained. Such records shall be submitted to the APCO 60 days prior to permit renewal.
- 6.3.3 An operator whose temporary tanks are required to comply with Section 4.2.2 shall maintain records showing the tank capacity and duration of time that the tank is used.
- 6.3.4 Small producers shall maintain monthly records of average daily crude oil production to determine compliance with Section 3.39. The monthly crude oil production records required by the California Geologic Energy Management Division (CalGEM) may be used to comply with the above requirement. Small producers shall also maintain monthly records of the average daily crude oil throughput of each tank to demonstrate compliance with Sections 4.3, and/or 5.1.2. Operators shall submit the required monthly records upon the request of the APCO.
- 6.3.5 An operator shall submit the reports of the floating roof tank inspections conducted in accordance with the requirements of Section 6.1 to the APCO within five calendar days after the completion of the inspection only for those tanks that failed to meet the applicable requirements of Sections 5.2 through 5.5. The inspection report for tanks that have been determined to be in compliance with the requirements of Sections 5.2 through 5.5 need not be submitted to the APCO, but the inspection report shall be kept on-site and shall be made available upon request by the APCO. The inspection report shall contain all information necessary to demonstrate compliance with the provisions of this rule, including the following:
  - 6.3.5.1 Date of inspection and names and titles of company personnel doing the inspection.
  - 6.3.5.2 Tank identification numbers and PTO number.
  - 6.3.5.3 Measurements of the gaps between the tank shell and primary and secondary seals.
  - 6.3.5.4 Leak-free status of tanks and floating roof deck fittings. Records of leak-free status shall include the vapor concentration values

measured in ppmv in accordance with the Test Method in Section 6.4.8.

- 6.3.5.5 Data, supported by calculations, demonstrating compliance with the requirements specified in Sections 5.3, 5.4, 5.5.2.3.3, 5.5.2.4.2, and 5.5.2.4.3 of this rule.
- 6.3.5.6 Any corrective actions or repairs performed on the tank in order to comply with this rule and the date such actions were taken.
- 6.3.6 An operator shall submit the records of TVP and API gravity testing conducted in accordance with the requirements of Section 6.2 to the APCO within 45 days after the date of testing. The record shall include the tank identification number, PTO number, type of stored organic liquid, TVP and API gravity of the stored organic liquid, test methods used, and a copy of the test results. An operator who uses the information in Appendix A to demonstrate the TVP and/or API gravity of the stored organic liquid shall submit information to the APCO within 45 days after the date that the type of organic liquid stored in the tank has been determined.
- 6.3.7 An operator shall maintain the records of the external floating roof or internal floating roof landing activities that are performed pursuant to Sections 5.3.1.3 and 5.4.3. The records shall include information on the TVP, API gravity, and type of organic liquid stored in the tank, the purpose of landing the roof on its legs, the date of roof landing, duration the roof was on its legs, the level or height at which the tank roof was set to land on its legs, and the lowest liquid level in the tank. The operator shall keep the records at the facility (or on-site) for a period of five years. The records shall be made available to the APCO upon request.
- 6.3.8 An operator who is demonstrating that their tank PTE emissions are below six (6) tons of VOC per year or actual emissions are below four (4) tons of VOC per year shall keep an accurate record of each organic liquid stored in each tank, including storage temperature, TVP, and monthly throughput.
- 6.3.9 Inspection Log

The operator shall maintain an inspection log containing, at a minimum, all of the following information:

- 6.3.9.1 Total number of components inspected, and total number and percentage of leaking components found during inspection.
- 6.3.9.2 Location, type, name or description of each leaking component and description of any unit where the leaking component is found.

- 6.3.9.3 Date of leak detection and method of leak detection.
- 6.3.9.4 For gas leaks, record the leak concentration in ppmv, and for liquid leaks record the volume.
- 6.3.9.5 Date of repair, replacement, or removal from operation of leaking components.
- 6.3.9.6 After the component is repaired or is replaced, the date of re-inspection and the leak concentration in ppmv.
- 6.3.9.7 Inspector's name, business mailing address, and business telephone number.
- 6.3.9.8 The facility operator responsible for the inspection and repair program shall sign and date the inspection log certifying the accuracy of the information recorded in the log.
- 6.3.9.9 Records of each calibration of the portable hydrocarbon detection instrument utilized for inspecting components, including a copy of current calibration gas certification from the vendor of said calibration gas cylinder, the date of calibration, concentration of calibration gas, instrument reading of calibration gas before adjustment, instrument reading of calibration gas after adjustment, calibration gas expiration date, and calibration gas cylinder pressure at the time of calibration.
- 6.3.9.10 Copies of all records required by Section 6.3 of this rule shall be retained for a minimum of five (5) years after the date of an entry, and the records shall be made available to the APCO, CARB, and US EPA upon request.

#### 6.4 Test and Inspection Methods

The following test methods shall be used unless otherwise approved by the APCO and the United States Environmental Protection Agency (US EPA).

- 6.4.1 Analysis of halogenated exempt compounds shall be conducted using California Air Resources Board (CARB) Method 432.
- 6.4.2 The API gravity of crude oil or petroleum distillate shall be determined by using ASTM Method D287-12b (reapproved 2019) e1 "Standard Test Method for API Gravity of Crude Petroleum and Petroleum Products (Hydrometer Method) or ASTM Method D4052-18a "Standard Test Method for Density, Relative Density and API Gravity of Liquids by Digital Density meter", Sampling for API gravity shall be performed in accordance with ASTM Method D 4057-95

“Standard Practices for Manual Sampling of Petroleum and Petroleum Products”.

- 6.4.3 Except for crude oil subject to Section 6.4.4, the TVP of any organic liquid shall be determined by measuring the Reid Vapor Pressure (RVP) using ASTM D 323-94 (Test Method for Vapor Pressure for Petroleum Products), and converting the RVP to TVP at the tank’s maximum organic liquid storage temperature. The conversion of RVP to TVP shall be done in accordance with the procedures in Appendix B. Appendix B is an excerpt from the oil and gas section of “ARB Technical Guidance Document to the Criteria and Guidelines Regulation for AB 2588”, dated August 1989. As an alternative to using ASTM D 323-94, the TVP of crude oil with an API gravity range of greater than 26° up to 30° may be determined by using other equivalent test methods approved by APCO, ARB and US EPA.
- 6.4.4 The latest version of the Lawrence Berkeley National Laboratory “Test Method for Vapor Pressure of Reactive Organic Compounds in Heavy Crude Oil Using Gas Chromatograph”, as approved by ARB and US EPA, shall be used to determine the TVP of crude oil with an API gravity of 26° or less, or for any API gravity that is specified in this test method.
- 6.4.5 An operator may use the information in Appendix A to determine the TVP of the stored organic liquid in a tank provided the storage temperature listed in Appendix A is not exceeded at any time.
- 6.4.6 The control efficiency of any VOC destruction device, measured and calculated as carbon, shall be determined by US EPA Method 25, except when the outlet concentration must be below 50 ppm in order to meet the standard, in which case US EPA Method 25a may be used. US EPA Method 18 may be used in lieu of US EPA Method 25 or US EPA Method 25A provided the identity and approximate concentrations of the analytes/compounds in the sample gas stream are known before analysis with the gas chromatograph and the gas chromatograph is calibrated for each of the known analytes/compounds to ensure that the VOC concentrations are neither under- or over-reported.
- 6.4.7 Analysis of halogenated exempt compounds shall be analyzed by ARB Method 422 “Exempt Halogenated VOCs in Gases September 12, 1990”.
- 6.4.8 Measurements of a gas-leak concentration shall be determined by US EPA Method 21.
  - 6.4.8.1 After June 30, 2024, All leaks detected with the use of an OGI instrument shall be measured using EPA Reference Method 21 within two (2) calendar days of initial OGI leak detection or within 14 calendar days of initial OGI leak detection of an inaccessible or

unsafe to monitor component to determine compliance with the leak thresholds and repair timeframes specified in Table 9.

7.0 Compliance Schedule

7.1 Any tank that is exempted under Section 4.0 that becomes subject to the VOC control system requirements of this rule through the loss of exemption status, shall be in full compliance with this rule on the date the exemption status is lost.

7.2 An operator shall comply with this rule in accordance with the schedule specified below:

Table 10 – Compliance Schedule		
	Authority to Construct	Full Compliance
Leak Standards (Table 2), Inspection and Re-Inspection Requirements in Section 5.9	N/A	July 1, 2024
Tanks required to comply with Sections 5.1.1.1, 5.1.2.1, or required to install a pressure-vacuum relief valve	March 31, 2024	12 months after issuance of ATC

**Appendix A**  
**STORAGE TEMPERATURE VERSUS VAPOR PRESSURE**

ORGANIC LIQUID	Reference Properties		Maximum Temp °F Not to Exceed	
	Gravity (°API)	Initial Boiling Point (°F)	0.5 (psia)	1.5 (psia)
Middle Distillates				
Kerosene	42.5	350	195	250
Diesel	36.4	372	230	290
Gas Oil	26.2	390	249	310
Stove Oil	23	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-5	39.6	355	205	260
JP-7	44-50	360	205	260
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	421	275	340
No. 5	19.9	560	380	465
Residual	19.27	---	405	---
No. 6	16.2	625	450	---
Asphalt				
60-100 pen.	---	---	490	550
120-150 pen.	---	---	450	500
200-300 pen.	---	---	360	420

Appendix A (Continued)  
STORAGE TEMPERATURE VERSUS VAPOR PRESSURE

Organic Liquid	Reference Properties			Maximum Temperature (°F) Not to Exceed	
	Density (lb/gal)	Gravity °API	Initial Boiling Point (°F)	0.5 psia	1.5 psia
Acetone	6.6	47	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	231	75	120
Styrene	7.5		293	128	167
Vinyl Acetate	7.8	19.6	163	30	65

## *Appendix B*

California Air Resources Board Technical Guidance  
to the Criteria and Guidelines Regulation for AB 2588  
(Partial Excerpt from pages 102, 103 and 104)

### True Vapor Pressure (TVP)

RVP is the absolute pressure of volatile crude oil and nonviscous petroleum liquids. Numerically, the relationship between TVP, RVP and temperature can be expressed by the following equation:

$$\text{TVP} = (\text{RVP}) e^{[C_o(\text{IRTEMP} - \text{ITEMP})]}$$

Where:  $C_o$  = Constant dependent upon the value of RVP  
 $\text{ITEMP} = (1/559.69^\circ\text{R})$   
 $\text{IRTEMP} = (1/(\text{T}_s + 459.69^\circ\text{R}))$   
 $\text{T}_s =$  Temperature of the stored fluid in °F

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

Values of  $C_o$  for different RVP numbers are tabulated in Table C-3. 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 calculated values of TVP in order to obtain reasonable TVP numbers. The relationship between the three values is given as follows:

$$\text{Corrected TVP} = \text{Calculated TVP} + C_F$$

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

If  $\text{RVP} < 3$ ,

$$C_F = (0.04) \times (\text{RVP}) + 0.1$$

If  $\text{RVP} > 3$ ,

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



Appendix B (Continued)

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

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