

BAY AREA AIR QUALITY MANAGEMENT DISTRICT

**RULE 12-11 – MISCELLANEOUS STANDARDS OF PERFORMANCE, FLARE  
MONITORING AT PETROLEUM REFINERIES**

*(Adopted June 4, 2003)*

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**REGULATION 12**  
**MISCELLANEOUS STANDARDS OF PERFORMANCE**  
**RULE 11**  
**FLARE MONITORING AT PETROLEUM REFINERIES**

(Adopted June 4, 2003)

**12-11-100 GENERAL**

- 12-11-101 Description:** The purpose of this rule is to require monitoring and recording of emission data for flares at petroleum refineries.
- 12-11-110 Exemption, Organic Liquid Storage and Distribution:** The provisions of this rule shall not apply to flares or thermal oxidizers used to control emissions exclusively from organic liquid storage vessels subject to Regulation 8, Rule 5 or exclusively from loading racks subject to Regulation 8 Rules 6, 33, or 39.
- 12-11-111 Exemption, Marine Vessel Loading Terminals:** The provisions of this rule shall not apply to flares or thermal oxidizers used to control emissions exclusively from marine vessel loading terminals subject to Regulation 8, Rule 44.
- 12-11-112 Exemption, Wastewater Treatment Systems:** The provisions of this rule shall not apply to thermal oxidizers used to control emissions exclusively from wastewater treatment systems subject to Regulation 8, Rule 8.
- 12-11-113 Exemption, Pumps:** The provisions of this rule shall not apply to thermal oxidizers used to control emissions exclusively from pump seals subject to Regulation 8, Rule 18. This exemption does not apply when emissions from a pump are routed to a flare header.
- 12-11-114 Limited Exemption, Total Hydrocarbon and Methane Composition Monitoring and Reporting:** The provisions of Sections 12-11-401.2, 401.3, 401.5, 502.2 and 502.3 that require monitoring and reporting of total hydrocarbon and methane composition shall not apply to a flare that exclusively burns flexicoker gas with or without supplemental natural gas, provided that the owner or operator demonstrates by weekly sampling and analysis, verified by the APCO, that the methane content and the non-methane content of the vent gas flared are less than 2 percent and 1 percent by volume, respectively.

**12-11-200 DEFINITIONS**

- 12-11-201 Flare:** A combustion device that uses an open flame to burn combustible gases with combustion air provided by uncontrolled ambient air around the flame. Flares may be either continuous or intermittent and are not equipped with devices for fuel-air mix control or for temperature control. This term includes both ground and elevated flares.
- 12-11-202 Flare Monitoring System:** All sample systems, transducers, transmitters, data acquisition equipment, data recording equipment, video monitoring equipment, and video recording equipment involved in flare monitoring.
- 12-11-203 Flaring:** A high-temperature combustion process used to burn vent gases.
- 12-11-204 Gas:** The state of matter that has neither independent shape nor volume, but tends to expand indefinitely. For the purposes of this rule, "gas" includes aerosols and the terms "gas" and "gases" are interchangeable.
- 12-11-205 Petroleum Refinery:** A facility that processes petroleum, as defined in the North American Industrial Classification Standard No. 32411, and including any associated sulfur recovery plant.
- 12-11-206 Pilot Gas:** The gas used to maintain the presence of a flame for ignition of vent gases.
- 12-11-207 Purge Gas:** The gas used to prevent air backflow in the flare system when there is no vent gas.

- 12-11-208 Sulfur Recovery Plant:** A process unit that processes sulfur and ammonia containing material and produces a final product of elemental sulfur.
- 12-11-209 Thermal Oxidizer:** An enclosed or partially enclosed combustion device that is used to oxidize combustible gases, that generally comes equipped with controls for combustion chamber temperature and often with controls for air/fuel mixture, and that exhausts all combustion products through a vent, duct, or stack so that emissions can be measured directly.
- 12-11-210 Vent Gas:** Any gas directed to a flare excluding assisting air or steam, flare pilot gas, and any continuous purge gases.

#### **12-11-400 ADMINISTRATIVE REQUIREMENTS**

- 12-11-401 Flare Data Reporting Requirements:** The owner or operator of a flare shall submit a monthly report to the APCO on or before 30 days after the end of each month for each flare subject to this rule. Only one report is required for a staged or cascading flare system if all flares in the system serve the same header or headers. The report shall be in an electronic format approved by the APCO. Each monthly report shall include all of the following:
- 401.1 The total volumetric flow of vent gas in standard cubic feet for each day and for the month, and, effective for the first full month after the commencement of the monitoring required by Section 12-11-501, for each hour of the month.
  - 401.2 If vent gas composition is monitored using sampling or integrated sampling, total hydrocarbon content as propane by volume, methane content by volume, and, hydrogen sulfide content by volume, for each sample or integrated sample required by Section 12-11-502. If the content of any additional compound or compounds is determined by the analysis of a sample or integrated sample, the content by volume of each additional compound.
  - 401.3 If vent gas composition is monitored by a continuous analyzer or analyzers pursuant to Section 12-11-502, average total hydrocarbon content as propane by volume, average methane content by volume, and, depending upon the analytical method used pursuant to Section 12-11-601, total reduced sulfur content by volume or hydrogen sulfide content by volume of vent gas flared for each hour of the month. If the content of any additional compound or compounds is determined by the continuous analyzer or analyzers, the average content by volume for each additional compound for each hour of the month.
  - 401.4 If the flow monitor installed pursuant to Section 12-11-501 measures molecular weight, the average molecular weight for each hour of the month.
  - 401.5 For any pilot and purge gas used, the type of gas used, the volumetric flow for each day and for the month, and the means used to determine flow.
  - 401.6 For any 24-hour period during which more than 1 million standard cubic feet of vent gas was flared, a description of the flaring including the cause, time of occurrence and duration, the source or equipment from which the vent gas originated, and any measures taken to reduce or eliminate flaring.
  - 401.7 Flare monitoring system downtime periods, including dates and times.
  - 401.8 The archive of images recorded for the month pursuant to Section 12-11-507.
  - 401.9 For each day and for the month provide calculated methane, non-methane and sulfur dioxide emissions. For the purposes of emission calculations only, a flare control efficiency of 98 percent shall be used for hydrocarbon flares, and a flare control efficiency of 93 percent shall be used for flexi-gas flares or if, based on the composition analysis specified in Section 12-11-502, the calculated lower heating value of the vent gas is less than 300 British Thermal Units/Standard Cubic Foot (BTU/SCF).

**12-11-402 Flow Verification Report:** Effective twelve months after adoption of this rule and every six months thereafter, the owner or operator of a flare shall submit a flow verification report to the APCO for each flare subject to the rule. The flow verification report shall be included in the corresponding monthly report required by Section 12-11-401. Only one report is required for a staged or cascading flare system if all flares in the system serve the same header or headers. The report shall compare flow as measured by the flow monitoring equipment required by Section 12-11-501 and a flow verification pursuant to Section 12-11-602 for the same period or periods of time. The owner or operator shall demonstrate that the flow verification was performed using good engineering practices. If there are no flaring events as described in Section 12-11-401.6 during the preceding six-month period, a flow verification report is not required for that period.

## **12-11-500 MONITORING AND RECORDS**

**12-11-501 Vent Gas Flow Monitoring:** Effective 180 days after adoption of this rule, the owner or operator of a petroleum refinery shall not operate a flare unless vent gas to the flare is continuously monitored for volumetric flow by a device that meets the following requirements:

- 501.1 The minimum detectable velocity shall be 0.1 foot per second.
- 501.2 The device shall continuously measure the range of flow rates corresponding to velocities from 0.5 to 275 feet per second in the header in which the device is installed.
- 501.3 The device shall have a manufacturer's specified accuracy of  $\pm 5\%$  over the range of 1 to 275 feet per second.
- 501.4 The device shall be installed at a location where measured volumetric flow is representative of flow to the flare or to the flare system in the case of a staged or cascading flare system consisting of more than one flare.
- 501.5 Effective 180 days after adoption of this rule, the owner or operator shall provide access for the APCO to verify proper installation and operation of the flare monitoring system.
- 501.6 Effective 18 months after adoption of this rule, the flow monitoring system shall be maintained to be accurate to within  $\pm 20\%$  as demonstrated by the flow verification report specified in Section 12-11-402.

**12-11-502 Vent Gas Composition Monitoring:** The owner or operator of a petroleum refinery shall not operate a flare unless the following requirements are met:

- 502.1 Requirements applicable to all vent gas composition monitoring:
  - 1.1 Vent gas monitored for composition, whether by sampling, integrated sampling or continuous monitoring, shall be taken from a location at which samples are representative of vent gas composition. If flares share a common header, a sample from the header will be deemed representative of vent gas composition for all flares served by the header.
  - 1.2 Effective 90 days after the adoption of this rule, the monitoring system shall provide access for the APCO to collect vent gas samples to verify the analyses required by Section 12-11-502.
- 502.2 Effective 90 days after adoption of this rule and until the requirements of Section 12-11-502.3 are met, the owner or operator shall monitor vent gas composition through sampling that meets the following requirements:
  - 2.1 For each day on which flaring occurs, one sample shall be taken within 30 minutes of the commencement of flaring.
  - 2.2 Samples may be taken from the flare header or from an alternate location at which samples are representative of vent gas composition.
  - 2.3 Samples shall be analyzed pursuant to Section 12-11-601.
- 502.3 Effective 270 days after adoption of this rule, the owner or operator shall monitor vent gas composition using one of the following four methods:

- 3.1 Sampling that meets the following requirements:
  - a. If the flow rate of vent gas flared in any consecutive 15-minute period continuously exceeds 330 standard cubic feet per minute (SCFM), a sample shall be taken within 15 minutes, except that, for flares exclusively serving sulfur or ammonia plants, a sample shall be taken within 1 hour or composition data representing worst-case conditions shall be provided by the owner or operator and verified by the APCO. The sampling frequency thereafter shall be one sample every three hours and shall continue until the flow rate of vent gas flared in any consecutive 15-minute period is continuously 330 SCFM or less. In no case shall a sample be required more frequently than once every 3 hours.
  - b. Samples shall be analyzed pursuant to Section 12-11-601.
- 3.2 Integrated sampling that meets the following requirements:
  - a. If the flow rate of vent gas flared in any consecutive 15 minute period continuously exceeds 330 standard cubic feet per minute (SCFM), integrated sampling shall begin within 15 minutes and shall continue until the flow rate of vent gas flared in any consecutive 15 minute period is continuously 330 SCFM or less.
  - b. Integrated sampling shall consist of a minimum of one aliquot for each 15-minute period until the sample container is full. If sampling is still required pursuant to Section 12-11-502.3.2a, a new sample container shall be placed in service within one hour after the previous container was filled. A sample container shall not be used for a sampling period that exceeds 24 hours.
  - c. Samples shall be analyzed pursuant to Section 12-11-601.
- 3.3 Continuous analyzers that meet the following requirements:
  - a. The analyzers shall continuously monitor for total hydrocarbon, methane, and, depending upon the analytical method used pursuant to Section 12-11-601, hydrogen sulfide or total reduced sulfur.
  - b. The hydrocarbon analyzer shall have a full-scale range of 100% total hydrocarbon.
  - c. Each analyzer shall be maintained to be accurate to within 20% when compared to any field accuracy tests or to within 5% of full scale.
- 3.4 A continuous analyzer employing gas chromatography that meets the following requirements:
  - a. The gas chromatography system shall monitor for total hydrocarbon, methane, and hydrogen sulfide.
  - b. The gas chromatography system shall be maintained to be accurate to within 5% of full scale.

**12-11-503 Pilot Monitoring:** Any flare subject to this rule must be equipped and operated with an automatic igniter or a continuous burning pilot, which must be maintained in good working order. If a pilot flame is employed, the flame shall be monitored with a device to detect the presence of the pilot flame. If an electric arc ignition system is employed, the system shall pulse on detection of loss of pilot flame and until the pilot flame is reestablished.

**12-11-504 Pilot and Purge Gas Monitoring:** The owner or operator of a petroleum refinery shall not operate a flare unless (1) volumetric flows of purge and pilot gases are monitored by flow measuring devices, or (2) other parameters are monitored so that volumetric flows of pilot and purge gas may be calculated based on pilot design and the parameters monitored.

**12-11-505 Recordkeeping Requirements:** Except as provided in Section 12-11-507, the owner or operator of a flare shall maintain records for all the information required to

be monitored for a period of five years and make such records available to the APCO upon request.

**12-11-506 General Monitoring Requirements:** Persons responsible for monitoring subject to this rule shall comply with the following:

- 506.1 Periods of flare monitoring system inoperation greater than 24 continuous hours shall be reported by the following working day, followed by notification of resumption of monitoring. Adequate proof of expeditious repair shall be furnished to the APCO for downtime in excess of fifteen consecutive days. Periods of inoperation of the vent gas flow monitoring required by Section 12-11-501 shall not exceed 30 days per calendar year. Periods of inoperation of vent gas composition monitoring specified in Sections 12-11-502.3.2 (integrated sampling) and 12-11-502.3.4 (gas chromatography) shall not exceed 30 days per calendar year. Effective 450 days after the adoption of this rule, periods of inoperation of the vent gas composition monitoring specified in Section 12-11-502.3.3 (continuous analyzers) shall not exceed 30 days per calendar year per analyzer. Periods of inoperation of video monitoring specified in Section 12-11-507 shall not exceed 30 days per calendar year.
- 506.2 During periods of inoperation of continuous analyzers or auto-samplers installed pursuant to Section 12-11-502, persons responsible for monitoring shall take samples as required by Section 12-11-502.2.1. During periods of inoperation of flow monitors required by Section 12-11-501, flow shall be calculated using good engineering practices.
- 506.3 The person(s) responsible for monitors subject to this rule shall maintain and calibrate all required monitors and recording devices in accordance with the applicable manufacturer's specifications. In order to claim that a manufacturer's specification is not applicable, the person responsible for emissions must have, and follow, a written maintenance policy that was developed for the device in question. The written policy must explain and justify the difference between the written procedure and the manufacturer's procedure.
- 506.4 Data Recording System: All in-line continuous analyzer and flow monitoring data must be continuously recorded by an electronic data acquisition system capable of one-minute averages. Flow monitoring data shall be recorded as one-minute averages.

**12-11-507 Video Monitoring:** For each flare equipped with video monitoring capability as of January 1, 2003, the owner or operator of a flare subject to this rule shall, effective 180 days after adoption of this rule, install and maintain equipment that records a real-time digital image of the flare and flame at a frame rate of no less than 1 frame per minute. The recorded image of the flare shall be of sufficient size, contrast, and resolution to be readily apparent in the overall image or frame. The image shall include an embedded date and time stamp. The equipment shall archive the images for each 24-hour period. Effective 180 days after adoption of this rule, for any flare for which the report required by Section 12-11-401 shows that more than 1 million standard cubic feet of vent gas was flared in any 24-hour period, the owner or operator of the flare shall, within 90 days after the end of the month covered by the report, meet the same requirements as those imposed by this Section for flares with existing video monitoring capability.

**12-11-600 MANUAL OF PROCEDURES**

**12-11-601 Testing, Sampling, and Analytical Methods:**

- 601.1 Samples and integrated samples shall be analyzed using the following test methods, or latest revision, where applicable:

- 1.1 Total hydrocarbon content and methane content of vent gas shall be determined using ASTM Method D1945-96, ASTM Method UOP 539-97, or EPA Method 18.
  - 1.2 Hydrogen sulfide content of vent gas shall be determined using ASTM Method D1945-96 or ASTM Method UOP 539-97.
  - 1.3 Any alternative method to the above methods if approved by the APCO and EPA.
- 601.2 Except as provided in Section 12-11-601.3, if vent gas composition is monitored using continuous analyzers, the analyzers shall employ the following methods, or latest revision, where applicable:
- 2.1 Total hydrocarbon content and methane content of vent gas shall be determined using EPA Method 25A or 25B.
  - 2.2 Total reduced sulfur content of vent gas shall be determined using ASTM Method D4468-85.
  - 2.3 Hydrogen sulfide content shall be determined using ASTM Method D4084-94.
  - 2.4 Any alternative method to the above methods if approved by the APCO and EPA.
- 601.3 If vent gas composition is monitored with a continuous analyzer employing gas chromatography, the following requirements shall be met:
- 3.1 ASTM Method D1945-96 or latest revision, or ASTM Method UOP 539-97 or latest revision shall be used.
  - 3.2 The system shall analyze samples for total hydrocarbon content, methane content, and hydrogen sulfide content.
  - 3.3 The minimum sampling frequency shall be one sample every 30 minutes.
  - 3.4 Any alternative method to the above methods if approved by the APCO and EPA.

**12-11-602 Flow Verification Test Methods:** For purposes of the semi-annual verification required by Section 12-11-402, vent gas flow shall be determined using one or more of the following methods:

- 602.1 District Manual of Procedures, Volume IV, ST-17 and ST-18;
- 602.2 EPA Methods 1 and 2;
- 602.3 Other flow monitoring devices or process monitors.
- 602.4 Any verification method recommended by the manufacturer of the flow monitoring equipment installed pursuant to Section 12-11-501.
- 602.5 Tracer gas dilution or velocity.
- 602.6 Any alternative method approved by the APCO and EPA.