(Adopted February 13, 1998)(Amended November 4, 2005)
(Proposed Amended Rule July 2017)

PROPOSED AMENDED RULE 1118. CONTROL OF EMISSIONS FROM REFINERY FLARES

(a) Purpose and Applicability

The purpose of Rule 1118 is to monitor and record data on refinery and related flaring operations, and to control and minimize flaring and flare related emissions. The provisions of this rule are not intended to preempt any petroleum refinery, sulfur recovery plant and hydrogen production plant operations and practices with regard to safety. This rule applies to all flares used at petroleum refineries, sulfur recovery plants and hydrogen production plants.

(b) Definitions

For the purpose of this rule, the following definitions shall apply:

~~(1) CLEAN SERVICE FLARE is a flare that is designed and configured by installation to combust only natural gas, hydrogen gas and/or liquefied petroleum gas, or any other gas(es) with a fixed composition vented from specific equipment which has been determined to be equivalent and approved in writing by the Executive Officer.~~

CLEAN SERVICE STREAM is a gas stream such as natural gas, hydrogen gas and/or liquefied petroleum gas. Other gases with a fixed composition that inherently have a low sulfur content and are vented from specific equipment may be classified as clean service streams if determined to be equivalent and approved in writing by the Executive Officer.

~~(2)~~(1)

~~(3)~~(2) EMERGENCY is a condition beyond the reasonable control of the owner or operator of a flare requiring immediate corrective action to restore normal and safe operation, which is caused by a sudden, infrequent and not reasonably preventable equipment failure, upset condition, equipment malfunction or breakdown, electrical power failure, steam failure, cooling air or water failure, instrument air failure, reflux failure, heat exchanger tube failure, loss of heat, excess heat, fire and explosion, natural disaster, act of war or terrorism or external power curtailment, excluding power

curtailment due to an interruptible power service agreement from a utility. For the purpose of this rule, a ~~repetitive~~ flare event ~~from the same equipment~~ caused by poor maintenance, or a condition caused by operator error that results in a flare event shall not be deemed an emergency.

~~(4) EMERGENCY SERVICE FLARE is a flare other than clean service flare that is designed and configured by installation to combust only vent gases as a result of any situation arising from sudden and unforeseeable events beyond the reasonable control of the owner or operator of the gas flare which require immediate corrective action to restore normal and safe operation including emergency process upset condition, equipment malfunction or breakdown, electrical power failure, steam failure, cooling air or water failure, instrument air failure, reflux failure, heat exchanger tube failure, loss of heat, excess heat, fire and explosion.~~

~~(5)~~(3) ESSENTIAL OPERATIONAL NEED is an activity other than resulting from poor maintenance or operator error, determined by the Executive Officer to meet one of the following:

(A) Temporary fuel gas system imbalance due to:

(i) Inability to accept gas compliant with Rule 431.1 by an electric generation unit at the facility that produces electricity to be used in a state grid system, or

(ii) Inability to accept gas compliant with Rule 431.1 by a third party that has a contractual gas purchase agreement with the facility, or

(iii) The sudden shutdown of a refinery fuel gas combustion device;

~~(B) Relief valve leakage due to malfunction;~~

~~(C)~~(B) Venting of streams that cannot be recovered due to incompatibility with recovery system equipment or with refinery fuel gas systems, including supplemental natural gas or other gas compliant with Rule 431.1 that is used for the purpose of maintaining the higher heating value of the vent gas above 300 British Thermal Units per standard cubic foot. Such streams include inert gases, oxygen, gases with low or high molecular weights outside the design operating range of the recovery system equipment and gases with low or high higher heating values that could render refinery fuel gas systems and/or combustion devices unsafe;

~~(D)~~(C) Venting of clean service streams to a clean service flare or a general service flare;

~~(E) Intermittent minor venting from:~~

~~( ) Sight glasses;~~

~~( ) Compressor bottles;~~

~~( ) Sampling systems; or~~

~~( ) Pump or compressor systems; or~~

~~(J)~~(D) An emergency situation in the process operation resulting from the vessel operating pressure rising above pressure relief devices' set points, or maximum vessel operating temperature set point.

(4) FLARE is a combustion device that uses an open flame to burn combustible gases with combustion air provided by uncontrolled ambient air around the flame. When used as a verb means the combustion of vent gases in a flare device. Based on their use, flares are classified as:

~~(K)~~(A) CLEAN SERVICE FLARE is a flare that is designed and configured by installation to combust only clean service streams.

~~(L)~~(B) GENERAL SERVICE FLARE is a flare that is not a Clean Service Flare.

~~(6)~~(5) FLARE EVENT is any intentional or unintentional combustion of vent gas in a flare. ~~The flare event ends when the flow velocity drops below 0.12 feet per second,~~ The start is determined by the vent gas flow velocity exceeding 0.12 feet per second and the end is determined when the vent gas flow velocity drops below 0.12 feet per second, or when the owner or operator can demonstrate that no more vent gas was combusted based upon the monitoring records of the flare water seal level and/or other parameters as approved by the Executive Officer in the Flare Monitoring and Recording Plan as described in subdivision (f). For flare events that can be attributed to the same process unit(s) or equipment and has more than one start and end within a 24 hour period, it shall be considered a continuation of the same event, and not a separate or unique event. For a flare event that continues for more than 24 hours, each calendar day of venting of gases shall constitute a flare event.

~~(7)~~(6) FLARE GAS RECOVERY SYSTEM is a system comprised of compressors, pumps, heat exchangers, knock-out pots and water seals, installed to prevent or minimize the combustion of vent gas in a flare.

~~(8)~~(7) FLARE MINIMIZATION PLAN is a document intended to meet the requirements of subdivision (e).

~~(9)~~(8) FLARE MONITORING SYSTEM is the monitoring and recording equipment used for the determination of flare operating parameters, including higher heating value, net heating value, total sulfur concentration, combustion efficiency, standard volumetric flow rate and/or on/off flow indication.

(9) FLARE TIP VELOCITY is the velocity of flare gases exiting a flare tip averaged over 15 minutes and calculated as the volumetric flow divided by the area of the flare tip.

~~(10) GENERAL SERVICE FLARE is a flare that is not defined in paragraphs (b)(1) or (b)(3) that is designed and configured by installation to combust vent gases as a result of any situation including, but not limited to, relief of excess operating pressures, tank vapor displacement, start-ups, shutdowns, process unit turnarounds and blowdowns, and scheduled and unscheduled maintenance and clean up.~~

~~(11)~~(10) HYDROGEN PRODUCTION PLANT is a facility that produces hydrogen by steam hydrocarbon reforming, partial oxidation of hydrocarbons, or other processes, using refinery fuel gas, process gas or natural gas, and which supplies hydrogen for petroleum refinery operations.

~~(12)~~(11) NATURAL GAS is a mixture of gaseous hydrocarbons, with at least 80 percent methane (by volume), and of pipeline quality, such as the gas sold or distributed by any utility company regulated by the California Public Utilities Commission.

~~(13)~~(12) NOTICE OF SULFUR DIOXIDE EXCEEDANCE is a notice issued by the Executive Officer to the owner or operator when the petroleum refinery has exceeded a performance target of this rule.

~~(14)~~(13) PETROLEUM REFINERY is a facility that processes petroleum, as defined in the North American Industry Classification System (NAICS) as Industry No. 324110, Petroleum Refineries. For the purpose of this rule, all portions of the petroleum refining operation, including those at non-contiguous locations operating flares, shall be considered as one petroleum refinery.

~~(15)~~(14) PILOT is an auxiliary burner used to ignite the vent gas routed to a flare.

(15) PLANNED FLARE EVENT is any flaring as a result from process unit(s) or equipment startup, shutdown, turnaround, maintenance, and non-emergency flaring. Flaring from the startup of a process unit or equipment that is more than 24 hours after an unplanned shutdown of that same process unit shall be considered a Planned Flare Event.

(16) PURGE GAS is a continuous gas stream introduced into a flare header, flare stack and/or flare tip for the purpose of maintaining a positive flow that prevents the formation of an explosive mixture due to ambient air ingress.

(17) REPRESENTATIVE SAMPLE is a sample of vent gas collected from the location as approved in the Flare Monitoring and Recording Plan and analyzed utilizing test methods specified in subdivision (j).

(18) SAMPLING FLARE EVENT is any flare event of a clean service stream for a specific flare exceeding either a flow rate of 330 standard cubic feet per minute continuously for a period greater than 15 minutes, or any other flare event, as requested by the petroleum refinery and approved in writing by the Executive Officer. Sampling flare events that occur within 15 minutes of each other are considered a single event if the facility can demonstrate to the satisfaction of the Executive Officer that the events had a common cause and the release of vent gas originated from the same process unit.

~~(18)~~(19) SHUTDOWN is the procedure by which the operation of a process unit or piece of equipment is stopped due to the end of a production run, or for the purpose of performing maintenance, repair and replacement of equipment. Stoppage caused by frequent breakdown due to poor maintenance or operator error shall not be deemed a shutdown.

(20) SMOKELESS CAPACITY is the maximum vent gas flow rate or mass rate that a flare is designed to operate without visible emissions.

~~(19)~~(21) SPECIFIC CAUSE ANALYSIS is a process used by a facility subject to this rule to investigate the cause of a flare event, identify corrective measures and prevent recurrence of a similar event.

~~(20)~~(22) STARTUP is the procedure by which a process unit or piece of equipment achieves normal operational status, as indicated by such parameters as temperature, pressure, feed rate and product quality.

~~(21)~~(23) SULFUR RECOVERY PLANT is a facility that recovers elemental sulfur or sulfur compounds from sour gases and/or sour water generated by petroleum refineries.

(24) TURNAROUND is a planned activity involving shutdown and startup of one or several process units for the purpose of performing periodic maintenance, repair and replacement of equipment or installation of new equipment.

~~(22)~~(25) VENT GAS is any gas generated at a facility subject to this rule that is routed to a flare, excluding assisting air or steam, which are injected in the flare combustion zone or flare stack via separate lines.

~~(23)~~(26) VOLATILE ORGANIC COMPOUNDS (VOC) is as defined in Rule 102.

(c) Requirements

The owner or operator of a petroleum refinery, sulfur recovery plant or hydrogen production plant subject to this rule shall:

(1) ~~Effective January 1, 2006:~~Maintain a pilot flame present at all times a flare is operational.

(2) Operate all flares in a smokeless manner with no visible emissions except for periods not to exceed a total of five minutes during two consecutive hours, as determined by the test method in paragraph (j)(2~~3~~).

(3) Except for flare events that exceed the smokeless capacity of the flare, operate all flares at petroleum refineries such that the flare tip velocity averaged over 15 minutes is less than 60 feet per second, or the lesser of 400 feet per second or V_{Max}, where:

$$Log_{10}(V_{Max}) = \frac{Net\ Heating\ Value_{Vent\ Gas} + 1{,}212}{850}$$

and the Net Heating $Value_{Vent\ Gas}$ in British Thermal Units per standard cubic foot is determined pursuant to monitoring required in subparagraph (g)(9)(B).

(4) Effective the earlier of January 30, 2019, or six months after the approval of a facility's Flare Monitoring Plan required pursuant to paragraph (f)(1), flares at petroleum refineries shall maintain the net heating value of the flare combustion zone gas (NHV_{cz}) at or above 270 British Thermal Units per standard cubic feet, averaged over a 15-minute period. The owner or operator shall calculate NHV_{cz} as specified in subparagraph (g)(9)(C).

~~(3)~~(5) Conduct an annual acoustical or temperature leak survey of all pressure relief devices connected directly to a flare and repair leaking pressure relief devices no later than the next turnaround. The survey shall be conducted no earlier than 90 days prior to the scheduled process unit turnaround.

~~(4)~~(6) Conduct a Specific Cause Analysis for any flare event, excluding planned shutdown, planned startup and turnarounds, and for any flare event resulting from non-standard operating procedure during a planned shutdown, planned startup or turnaround, when either:

(A) Emissions exceed 100 pounds of VOC; or

(B) Emissions exceed 500 pounds of sulfur dioxide; or

(C) More than 500,000 standard cubic feet of vent gas are combusted~~.~~;

(7) Effective January 30, 2019, conduct a Specific Cause Analysis for any flare event at a petroleum refinery when the smokeless capacity of the flare is exceeded and either:

(A) The visible emission limits in paragraph (c)(2) or Rule 401 are exceeded; or

~~(C)~~(B) The flare tip velocity limits in paragraph (c)(3) is exceeded.

(8) Submit all Specific Cause Analyses as required by paragraphs (c)(6) or (c)(7) to the Executive Officer within 30 days, identifying the cause and duration of the flare event, and any mitigation and corrective actions taken or to be taken to prevent recurrence of a similar event. The owner or operator may request the Executive Officer to grant an extension of up to 15 days to submit the Specific Cause Analysis.

(9) All corrective actions identified in a Specific Cause Analysis required under paragraph (c)(6) or (c)(7) shall be implemented within 45 days of the flare event for which the Specific Cause Analysis was required or as soon thereafter as practicable.

(10) Effective January 30, 2019, no flare event at a petroleum refinery shall occur above the smokeless capacity of the flare under the following conditions:

(A) When the limits in clause (c)(10)(D)(i) or (ii) are exceeded and the flare event is due to operator error or poor maintenance.

(B) Two times in any consecutive three year period, if the flare events exceed the limits in clause (c)(10)(D)(i) or (ii) and a Specific Cause

Analysis shows the same cause for both flare events from the same equipment.

(C) Three times in any consecutive three year period, if the flare events exceed the limits in clause (c)(10)(D)(i) or (ii), and the flare events are due to any cause.

(D) Pursuant to paragraph (c)(10)(A) through (C), flare events shall not exceed:

(i) The visibility limits in paragraph (c)(2) or Rule 401; or

(ii) The velocity limits in paragraph (c)(3).

~~(5)~~(11) Conduct an analysis and determine the relative cause of any other flare events where more than 5,000 standard cubic feet of vent gas are combusted. When it is not feasible to determine relative cause, state the reason why it was not feasible to make the determination.

~~(6)~~(12) ~~Effective September 1, 2006, submit the following information to the Executive Officer:~~ Maintain the following information and submit to the Executive Officer upon request:

(A) Detailed process flow diagrams of all upstream equipment and process units venting to each flare and a complete description and technical specifications for each flare system components such as flares, associated knock-out pots, surge drums, water seals and flare gas recovery systems, and an audit of the vent gas recovery capacity of each flare system, the available storage for excess vent gases and the scrubbing capacity available for vent gases, including any limitations associated with scrubbing vent gases for use as a fuel; and

(B) A description of the equipment, processes and procedures installed or implemented within the last five years to reduce flaring; and

(C) A descriptions of any equipment, processes or procedures the owner or operator plans to install or implement to eliminate or reduce flaring. The description shall specify the scheduled year of installation or implementation.

~~(7)~~(13) ~~Effective January 1, 2007, submit to the Executive Officer an evaluation of options to reduce flaring during planned shutdowns, startups and turnarounds, including, but not limited to slower vessel depressurization, storing vent gases~~Submit to the Executive Officer by February 1, 2018 a

Scoping Document to minimize flaring emissions that includes the following components:

(A) The Scoping Document shall describe how a facility operator or owner can reduce emissions from all planned flare events to performance targets specified in subparagraph (c)(13)(B). The Scoping Document shall describe two alternatives for each performance target, and shall include an analysis of the following:

(i) proposed physical controls and/or operating practices,

(ii) technical feasibility constraints,

(iii) approximate cost (initial capital and ongoing),

(iv) time constraints,

(B) The Scoping Document shall analyze how each of the following annual performance targets for planned flare events can be achieved by January 1, 2021:

(i) 0.1 tons of sulfur oxides per million barrels of a facility's 2004 calendar year crude processing capacity,

(ii) 0.05 tons of sulfur oxides per million barrels of a facility's 2004 calendar year crude processing capacity, and

~~(i)~~(iii) 0.0 tons of sulfur oxides per million barrels of a facility's 2004 calendar year crude processing capacity.

(C) The Scoping Document shall describe how a facility operator or owner can reduce emissions from all flare events caused by an emergency with the exception of flare events caused by natural disasters or acts of war or terrorism. The Scoping Document shall include an analysis of:

(i) Three alternatives to flaring that can be available by January 1, 2021 to avoid flare events caused by an emergency, with the exception of flare events caused by natural disasters or acts of war or terrorism. Existing alternatives to avoid emergency flare events may count towards the three alternatives requirement.

(ii) The criteria described in clauses (c)(13)(A)(i) through (iv).

(D) For each flare operated at the facility, the Scoping Document shall contain a description of:

(i) The smokeless capacity, and documentation for how the smokeless capacity was determined;

(ii) The maximum vent gas flow rate;

(iii) The maximum supplemental gas flow rate;

~~(ii)~~(iv) For flares with assist steam and/or air, the minimum and maximum total steam and/or air rate;

~~(iii)~~(v) Process flow diagram which shows all gas lines that are associated with the flare (e.g., waste, purge, supplemental gases, assist steam);

~~(iv)~~ Detailed process flow diagrams of all associated upstream equipment and process units venting to each flare, with a general description of components, identifying the type and location of each flare and all associated control equipment including but not limited to knockout drums, flare headers, assist, and ignition systems;

~~(v)~~(vi) ~~Effective January 1, 2007, o~~Operate all flares in such a manner that minimizes all flaring and that no vent gas is combusted except during emergencies, shutdowns, startups, turnarounds or essential operational needs. ~~Notwithstanding the effective date above, for the owner or operator of a facility subject to this rule that must install flare gas recovery and treatment system(s) to comply with the requirements of this paragraph, the effective date for a flare directly associated with the proposed flare gas recovery and treatment system shall be January 1, 2009, provided the owner or operator submits a complete application to construct and operate a flare gas recovery and treatment system(s) by July 1, 2006. For a facility installing flare gas treatment and recovery system(s) for more than two flares, the owner or operator may request an extension of the compliance date specified in this paragraph for the flare gas recovery and treatment system serving the additional flares to no later than January 1, 2010. The Executive Officer may grant an extension provided that the owner or operator submits a request in writing to the Executive Officer prior to January 1, 2007, and the facility demonstrates that an extension is necessary due to operational needs.~~

~~(8)~~(14) ~~Effective January 1, 2009, p~~Prevent the combustion in any flare of vent gas with a hydrogen sulfide concentration in excess of 160 ppm, averaged over three hours, excluding any vent gas resulting from an emergency, shutdown, startup, process upset or relief valve leakage. ~~Notwithstanding the effective date above, for the owner or operator of a facility installing flare gas treatment and recovery system(s) for more than two flares to comply with the requirements of paragraph (c)(4), the owner or operator may request an extension of the compliance date specified in this paragraph for the flare gas recovery and treatment system serving the additional flares to no later than January 1, 2010. The Executive Officer may grant an extension provided that the owner or operator submits a request in writing to the Executive Officer prior to January 1, 2007, and the facility demonstrates that an extension is necessary due to operational needs.~~

(d) Performance Targets

~~(1)~~ The owner or operator of a petroleum refinery subject to this rule shall ~~minimize flare emissions and meet the following performance targets:~~

~~( ) Beginning with calendar year 2006, minimize sulfur dioxide emissions from flares to less than 10.35 tons per million barrels of crude processing capacity, calculated as an average over one calendar year;~~

~~( ) Beginning with calendar year 2008, minimize sulfur dioxide emissions from flares to less than 1 ton per million barrels of crude processing capacity, calculated as an average over one calendar year;~~

~~( ) Beginning with calendar year 2010, minimize sulfur dioxide emissions from flares to less than 0.7 tons per million barrels of crude processing capacity, calculated as an average over one calendar year;~~

~~( ) Beginning with calendar year 2012,~~ minimize sulfur dioxide emissions from flares to less than 0.5 tons per million barrels of crude processing capacity, calculated as an average over one calendar year.

~~(6)~~(1) Compliance with this~~e~~ performance target~~s above~~ shall be determined at the end of each calendar year based on the facility's annual flare sulfur dioxide emissions normalized over the crude oil processing capacity in calendar year 2004.

~~(7)~~(2) In the event the petroleum refinery specific performance target~~s~~ of paragraph (d)(1) is exceeded for any calendar year, the Executive Officer may issue a Notice of Sulfur Dioxide Exceedance that shall become a part of the refinery compliance record.

~~(8)~~(3) In the event the petroleum refinery specific performance target of paragraph (d)(1) is exceeded for any calendar year, the owner or operator of the petroleum refinery shall:

(A) Submit a Flare Minimization Plan pursuant to subdivision (e), and

(B) Pay the District mitigation fees, within 90 days following the end of a calendar year for which the performance target was exceeded, according to the following schedule:

(i) If excess emissions are no more than ten percent of the petroleum refinery specific performance target, $25,000 per ton for all sulfur dioxide emission(s) in excess of the applicable performance target, or

(ii) If excess emissions are greater than ten percent but no more than twenty percent of the petroleum refinery specific performance target, $50,000 per ton of all sulfur dioxide emission(s) in excess of the applicable performance target, or

(iii) If excess emissions are greater than twenty percent of the petroleum refinery specific performance target, $100,000 per ton of all sulfur dioxide emission(s) in excess of the applicable performance target.

(iv) ~~Notwithstanding the mitigation fee schedule of this subparagraph, the mitigation fee for a petroleum refinery for a calendar year will not exceed $4,000,000.~~

(e) Flare Minimization Plan

(1) The owner or operator of a petroleum refinery exceeding the performance target~~s~~ in paragraph (d)(1) shall submit, no later than 90 days ~~from~~ after the end of a calendar year with emissions exceeding the annual performance target, a complete Flare Minimization Plan for approval by the Executive Officer. This plan shall constitute a plan pursuant to Rule 221 and fees shall be assessed pursuant to Rule 306. The plan application shall list all actions to be taken by the petroleum refinery to meet the performance target~~s~~ in

~~subdivision~~ paragraph (d)(1), and shall include ~~including~~ the following information:

(A) A complete description and technical specifications for each flare and associated knock-out pots, surge drums, water seals and flare gas recovery systems;

~~(B) Detailed process flow diagrams of all upstream equipment and process units venting to each flare, identifying the type and location of all control equipment;~~

~~(C)~~(B) Refinery policies and procedures to be implemented and any equipment improvements to minimize flaring and flare emissions and comply with the performance target~~s~~ of paragraph (d)(1) for:

(i) Planned turnarounds and other scheduled maintenance, based on an evaluation of these activities during the previous five years;

(ii) Essential operational needs and the technical reason for which the vent gas cannot be prevented from being flared during each specific situation, based on supporting documentation on flare gas recovery systems, excess gas storage and gas treating capacity available for each flare; and

(iii) Emergencies, including procedures that will be used to prevent recurring equipment breakdowns and process upset<u>s</u>, based on an evaluation of the adequacy of maintenance schedules for equipment, process and control instrumentation.

~~(D)~~(C) Any flare gas recovery equipment and treatment system(s) to be installed to comply with the performance targets of paragraph (d)(1).

(2) The Executive Officer will make the Flare Minimization Plans available for public review for a period of 60 days and respond to comments received prior to plan approval. The Executive Officer will approve a plan upon determining that it meets the requirements of subdivision (e), or notify the owner or operator in writing that the plan is deficient and specify the required corrective action. If the owner or operator fails to submit an amendment within 45 days to correct the deficiency, the Executive Officer will deny the Flare Minimization Plan. The facility ~~will~~ shall be deemed in violation of this rule upon the Executive Officer's denial of the Flare Minimization Plan.

(3) The owner or operator of a petroleum refinery having an existing approved Flare Minimization Plan shall, no later than 90 days from the end of a calendar year, submit for the approval of the Executive Officer a revised Flare Minimization Plan, subject to the provisions of paragraphs (e)(1) and (e)(2), in the event the annual performance target for that calendar year is exceeded.

(4) The owner and operator of a petroleum refinery shall comply with all provisions of an approved Flare Minimization Plan. Violation of any of the terms of the plan is a violation of this rule.

(f) Flare Monitoring and Recording Plan Requirements

~~(1)~~ The owner or operator of an existing petroleum refinery, ~~sulfur recovery plant or hydrogen production plant,~~ as of ~~November 4, 2005~~February 1, 2018, shall~~:~~

~~(2)~~(1) ~~On or before June 30, 2006,~~ submit a Revised Flare Monitoring and Recording Plan, complete with an application and appropriate fees, for each facility to the Executive Officer for approval. This plan shall constitute a plan pursuant to Rule 221 and fees shall be assessed pursuant to Rule 306. Each Flare Monitoring and Recording Plan shall contain the information described in paragraph (f)(3) of this rule.

(2) The owner or operator of an existing petroleum refinery, sulfur recovery plant or hydrogen production plant shall:

(A) Comply with the most current Flare Monitoring and Recording Plan approved by the Executive Officer. ~~and in effect prior to November 4, 2005. The Executive Officer will amend the plan to include Rule 1118 as adopted on February 13, 1998, to become part of the plan and will issue the amended plan within 30 days of November 4, 2005.~~ The ~~amended~~ current plan shall remain in effect until ~~the~~ any Revised Flare Monitoring and Recording Plan, submitted pursuant to ~~sub~~paragraph (f)(1)~~(A)~~ is approved by the Executive Officer.

(B) The owner or operator of a petroleum refinery, sulfur plant or hydrogen plant shall comply with all provisions of an approved Flare Monitoring and Recording Plan. Violation of any of the terms of the plan is a violation of this rule.

(3) The owner or operator of a new or an existing non-operating petroleum refinery, sulfur recovery plant or hydrogen production plant starting or

restarting operations on or after [Date of amendment] ~~February 13, 1998~~ shall:

(A) Provide the Executive Officer a written notice of the date of start-up no later than seven (7) days prior to starting or commencing operations.

(B) No later than 180 days prior to the initial startup or resumption of operations, submit a complete application and appropriate fees for a Flare Monitoring and Recording Plan to the Executive Officer for approval. This plan shall constitute a plan pursuant to Rule 221 and fees shall be assessed pursuant to Rule 306. Each Flare Monitoring and Recording Plan shall contain the information described in paragraph (f)(~~3~~4) of this rule.

(4) Each Flare Monitoring and Recording Plan or Revised Flare Monitoring and Recording Plan shall include, at a minimum, the following:

(A) A facility plot plan showing the location of each flare in relation to the general plant layout.

(B) Type of flare service, as defined in ~~subdivision~~ paragraph (b)(4), and information regarding design capacity, operation and maintenance for each flare.

(C) The following information regarding pilot and purge gas, and assist steam and/or air for each flare:

(i) Type(s) of gas used;

(ii) Actual set operating flow rate in standard cubic feet per minute;

(iii) Maximum total sulfur concentration expected for each type of gas used; and

(iv) Average higher (gross) heating value expected for each type of gas used.

~~(iv)~~(v) Minimum and maximum flow rate, pressure, and temperature of steam and/or air

(D) Drawing(s), preferably to scale with dimensions, and an as built process flow diagram of the flare(s) identifying major components, such as flare header, flare stack, flare tip(s) or burner(s), purge gas system, pilot gas system, ignition system, assist system, water seal, knockout drum and molecular seal.

(E) A representative flow diagram showing the interconnections of the flare system(s) with vapor recovery system(s), process units and other equipment as applicable.

(F) A complete description of the assist system process control, flame detection system and pilot ignition system.

(G) A complete description of the gas flaring process for an integrated gas flaring system which describes the method of operation of the flares (e.g. sequential, etc.).

(H) A complete description of the flare gas recovery system and vapor recovery system(s) which have interconnection to a flare, such as compressor description(s), design capacities of each compressor and the vapor recovery system, and the method currently used to determine and record the amount of vapors recovered.

(I) Drawing(s) with dimensions, preferably to scale, showing the following information for proposed vent gas:

(i) Sampling locations; and,

(ii) Flow meter device(s), on/off flow indicators, higher heating value analyzer, and total sulfur analyzer, and steam and/or air meter locations and the method used to determine the location.

(J) A detailed description of manufacturer's specifications, including but not limited to, make, model, type, range, precision, accuracy, calibration, maintenance, a quality assurance procedure and any other specifications and information referenced in Attachment A for all existing and proposed flow metering devices, on/off flow indicating devices, higher heating value and total sulfur analyzers for vent gas, and steam and/or air assist meters.

(K) A complete description and the data used to determine and to set the actuating and de-actuating and the method to be used for verification of each setting for each on/off flow indicator.

(L) A complete description of proposed analytical and sampling methods or estimation methods, if applicable, for determining higher (gross) heating value, and total sulfur concentration of the flare vent gas, and levels of steam or air assist to the flare tip.

(M) A complete description of the proposed data recording, collection and management and any other specifications and information referenced in Attachment A for each flare monitoring system.

(N) A complete description of proposed method to determine, monitor and record total volume, higher heating value, and total sulfur concentration of gases vented to a flare for each flare event pursuant to the requirements of this rule.

(O) For new or existing non-operating petroleum refinery, sulfur recovery plant or hydrogen production plant starting or restarting operations on or after (Date of Amendment), Aa schedule for the installation and operation of each flare monitoring system.

(P) A complete description of any proposed alternative criteria to determine a sampling flare event for each specific flare, if any, and detailed information used for the basis of establishing such criteria.

~~(I) A request to use the alternative sampling program pursuant to subparagraph (g)(4)(C), if applicable, with a complete description of proposed Quality Assurance/Quality Control procedures to be used in a test program to determine the correlation between the results from the alternative sampling program and the testing and monitoring methods specified in subdivision (j).~~

~~(h)~~(g) Operation, Monitoring and Recording Requirements

The owner or operator of a flare subject to this rule shall comply with the following:

(1) On or before six (6) months after approval of the Flare Monitoring and Recording Plan or Revised Flare Monitoring and Recording Plan, start monitoring and recording in accordance with subdivision (g) and the provisions in the approved Flare Monitoring and Recording Plan or Revised Flare Monitoring and Recording Plan.

(2) Notwithstanding the provisions in Rule 430 - Breakdown Provisions and Rule 2004 - Requirements, the Operation Monitoring and Recording Requirements of this rule shall be applicable during all periods including breakdowns except as specified in paragraph (g)(5)(A).

(3) Perform monitoring and recording of the operating parameters, as applicable, according to the monitoring and recording requirements and frequency shown in Table 1 (including footnotes) below, except as specified in paragraph (g)(4) and (g)(5).

~~**TABLE 1**~~

~~**Effective until June 30, 2007**~~

~~TYPE OF FLARE~~	~~OPERATING PARAMETER~~	~~MONITORING AND RECORDING~~
~~Clean Service~~	~~Vent Gas Flow[1]~~	~~Measured and Recorded[2] Continuously with Flow Meter(s) and/or On/Off Flow Indicator(s)~~
	~~Vent Gas Higher Heating Value[3]~~	~~Calculated[5]~~
	~~Vent Gas Total Sulfur Concentration[4]~~	~~Calculated[5]~~
~~General Service~~	~~Vent Gas Flow[1]~~	~~Measured and Recorded[2] Continuously with Flow Meter(s) and/or On/Off Flow Indicator(s)~~
	~~Vent Gas Higher Heating Value[3]~~	~~Continuously Measured and Recorded with a Higher Heating Value Analyzer~~
	~~Vent Gas Total Sulfur Concentration[4]~~	~~Semi-Continuously Measured and Recorded with a Total Sulfur Analyzer~~

~~1. Standard Cubic Feet per Minute.~~

~~2. All flow meters, flow indicators and recorders shall meet or exceed the minimum specifications in Attachment A.~~

~~3. Higher (Gross) Heating Value in British Thermal Units per Standard Cubic Foot.~~

~~4. Total Sulfur as SO_2, ppm.5.Based on the default emission factors in attachment B1 or alternative emission factors as approved by the Executive Officer as part of a Flare Monitoring and Recording Plan~~

TABLE 1

~~**Effective July 1, 2007**~~

TYPE OF FLARE	OPERATING PARAMETER	MONITORING AND RECORDING
Clean Service	Gas Flow[1]	Measured and Recorded[2] Continuously with Flow Meter(s) and/or On/Off Flow Indicator(s)
	Gas Higher Heating Value [3]	Calculated or Representative Sample for Each Flare Event
	Total Sulfur Concentration[4]	Calculated or Representative Sample for Each Flare Event
~~Emergency Service~~	~~Gas Flow[1]~~	~~Measured and Recorded[2] Continuously with Flow Meter(s) and/or On/Off Flow Indicator(s)~~
	~~Gas Higher Heating Value [3]~~	~~Continuously Measured and Recorded with a Higher Heating Value Analyzer~~
	~~Total Sulfur Concentration[4]~~	~~Semi-Continuously Measured and Recorded with a Total Sulfur Analyzer~~
General Service	Gas Flow[1]	Measured and Recorded[2] Continuously with Flow Meter(s) with or without on/off flow indicator(s)
	Gas Higher Heating Value [3]	Continuously Measured and Recorded with a Higher Heating Value Analyzer
	Total Sulfur Concentration[4]	Semi-Continuously Measured and Recorded with a Total Sulfur Analyzer

1. Standard Cubic Feet per Minute.
2. All flow meters, flow indicators and recorders shall meet or exceed the minimum specifications in Attachment A.
3. Higher (Gross) Heating Value in British Thermal Units per Standard Cubic Foot.
4. Total Sulfur as SO_2, ppm.

Effective No Later Than January 30, 2019

General Service and Clean Service, if applicable	Assist Steam and/or Air Flow	Continuously Measured and Recorded with a Flow Meter[1]

1. Meter shall be capable of determining steam flow at standard conditions.

(4) Alternative Flare Vent Gas Sampling

(A) In cases where sampling of vent gas is exempted pursuant to paragraph (k)(1), the owner or operator of a gas flare shall identify for each flare event, the cause of event, the process system(s) involved, date and time event started and duration and any other information related to the type of vent gas (e.g. total sulfur concentration) which is necessary to calculate flare emissions using the guidelines in Appendix B for substituted data. The estimated emissions, subject to approval by the Executive Officer as representative of emissions from that flare event, shall be reported and submitted with the quarterly report as specified in paragraph (i)(4).

(B) The owner or operator of a flare may comply with the vent gas sampling requirements of paragraph (g)(3) based on alternative criteria for determining a sampling flare event for each specific flare, provided that such alternative criteria are submitted as part of the Flare Monitoring and Recording Plan in subparagraph (f)(~~3~~4)(P), and are approved in writing by the Executive Officer.

~~(B) During the interim period, which is after the approval of the Flare Monitoring and Recording Plan or Revised Flare Monitoring and Recording Plan and until in compliance with paragraph (g)(1), an alternative sampling program for sampling flare events for each flare may be used provided the following requirements are met:~~

~~( ) A request to use an alternative sampling program has been submitted by the flare owner or operator as part of the Flare Monitoring and Recording Plan pursuant to subparagraph (f)(3)(Q) and approved as equivalent by the Executive Officer. The Executive Officer must make a finding, in the case of an existing facility, that compliance with subparagraph (f)(1)(B) is not feasible.~~

~~( ) The vent gas(es) to each flare shall be sampled and analyzed, if applicable, for total sulfur and higher (gross) heating value in accordance with methods specified in subdivision (j),~~

~~once a day. If there is a sampling flare event in any day, the sampling and analysis shall also be conducted during such event in addition to the daily sampling requirement.~~

~~( ) In addition to the samples collected and analyzed pursuant to the requirements in clause (g)(4)(C)(ii), the vent gas(es) to each flare shall be sampled and analyzed in accordance with Table 1, as follows:~~

~~( ) Once a day during each sampling flare event other than the flare event specified in clause (g)(4)(C)(ii), if such a sampling event occurs during that day.~~

~~( ) For all sampling flare events that are the result of any process unit shutdown.~~

~~(iii) The vent gas(es) to each flare shall be sampled and analyzed for all other sampling flare events to measure hydrogen sulfide concentrations in the vent gas using a colorimetric method or other methods as specified in the Flare Monitoring and Recording Plan pursuant to subparagraph (f)(3)(Q) and as approved in writing by the Executive Officer.~~

~~(C) After the interim period of monitoring and recording pursuant to subparagraph (g)(4)(C), the owner or operator of a flare may, based on the monitoring data, request a change in the vent gas sampling requirement of paragraph (g)(3) and/or propose an equivalent alternative criteria for determining a sampling flare event for each specific flare, provided that the owner or operator of the flare submits an application for the modification to the Flare Monitoring and Recording Plan and can demonstrate, and obtain written approval of the Executive Officer that an alternative vent gas sampling and/or an alternative criteria for determining a sampling flare event for each specific flare is equivalent to the sampling requirement of paragraph (g)(3) and is adequate to determine the quality of vent gas(es) and to calculate emissions from all such flare events.~~

~~(C) After the interim period of monitoring and recording pursuant to subparagraph(g)(4)(C), the Executive Officer may revise any alternative criteria for determining a sampling flare event for each~~

~~specific flare or any alternative vent gas sampling which have been previously proposed by the owner or operator of a flare and approved by the Executive Officer, if the Executive Officer determines that the alternative(s) is not adequate based on the monitoring data or other information to determine the quality of vent gas(es) and to calculate emissions from all such flare events. The owner or operator of the flare shall use the revised criteria for determining a sampling flare event or vent gas sampling to monitor and record flare events no later than 30 days after written notification by the Executive Officer.~~

~~(14)~~(5) Flare Monitoring System

(A) Maintain any flare monitoring system, used to ensure compliance with paragraph (g)(3) of this rule, in good operating condition at all times when the flare that it serves is operational, except when out of service due to:

(i) Breakdowns and unplanned system maintenance, which shall not exceed 96 hours, cumulatively, per quarter for each reporting period; or,

(ii) Planned maintenance, which shall not exceed 14 days per 18 month period commencing the start of flare monitoring and recording, provided that a written notification detailing the reason for maintenance and methods that will be used during the maintenance period to determine emissions associated with flare events is provided to the Executive Officer prior to, or within 24 hours of, removal of the monitoring system from service.

(B) A flare monitoring system may be used to measure and record the operating parameters required in paragraph (g)(3) of this rule for more than one flare provided that:

(i) All the gases being measured and recorded are delivered to the flare(s) for combustion; and,

(ii) ~~Effective July 1, 2007, i~~If the flare monitoring system is used to measure and record the operating parameters for ~~emergency service flares, as well as~~ general service flares, the flare monitoring system shall consist of a continuous vent gas flow meter, a continuous higher heating value

analyzer, a total sulfur analyzer and recorder, and a steam and/or air flow meter that meet the requirements specified in Attachment A.

(6) Monitor the presence of a pilot flame using a thermocouple or any other equivalent device approved by the Executive Officer to detect the presence of a flame.

~~(7) Effective July 1, 2006, m~~Monitor all flares for visible emissions using color video monitors with date and time stamp, capable of recording a digital image of the flare and flame, and at a reasonable resolution, distance, and angle above the flare flame that is suitable for visible emissions observations, at a rate of no less than one frame per ~~minute~~ second.

(7)

~~(8) Effective January 1, 2007, for all emergency and~~ All general service flares~~:~~

(8) ~~Install each~~ shall:

(A) Have a flow meter installed in a manner and at a location that would allow for accurate measurements of the total volume of vent gas to each flare. If the flow meter cannot be placed in the location that would allow for accurate measurement due to physical constraints, the operator shall retrofit or equip the existing flow meters with totalizing capability to indicate the true net volume of gas flow to each flare.

(B) ~~Install~~ Maintain an automated sample collection system at each flare, capable to alert personnel that a sample is being collected following the start of a sampling flare event, unless total sulfur is monitored with a certified analyzer approved by the Executive Officer.

(C) Monitor and record the pilot gas and purge gas flow to each flare using a flow meter or equivalent device approved by the Executive Officer.

(9) No later than January 30, 2019, for all general service flares:

(A) The owner or operator shall install, operate, calibrate, and maintain a monitoring system capable of continuously measuring, calculating, and recording the volumetric flow rate in the flare header or headers that feed the flare and also record the pilot gas, purge gas, and assist steam and/or air flow to each flare using a flow meter or equivalent device approved by the Executive Officer.

(B) The owner or operator shall install, operate, calibrate, and maintain a calorimeter capable of continuously measuring, calculating, and recording the Net Heating Value of flare vent gas at standard conditions.

(C) The owner or operator shall determine the Net Heating Value of the combustion zone gas (NHV_{CZ}) in 15 minute block averages using the following equation:

$$NHV_{CZ} = \frac{Q_{VG} \times NHV_{VG}}{Q_{VG} + Q_{Steam} + Q_{Air}}$$

Where:

Q_{VG} is the cumulative vent gas flow over a 15 minute period
Q_{Steam} is the cumulative flow of assist steam over a 15 minute period
Q_{Air} is the cumulative flow of assist air over a 15 minute period
NHV_{VG} is the Net Heating Value of vent gas over a 15 minute period as determined by monitoring required in paragraph (g)(9)(B).

(h) Recordkeeping Requirements

The owner or operator of a flare shall maintain records in a manner approved by the Executive Officer for a period of five (5) years for all the information required to be monitored under paragraphs (g)(3), (g)(4), (g)(5), (g)(6), (g)(7), (g)(9), and subparagraph (g)(8)(C) as applicable and make such records available to the Executive Officer upon request:

~~(0) For a period of 90 days for the information required under paragraph (g)(7); and~~

~~(0) For a period of five (5) years for all the information required under paragraphs (g)(3), (g)(4), (g)(5), (g)(6) and (g)(7), as applicable.~~

~~(k)~~(i) Notification and Reporting Requirements

~~Effective January 1, 2006, t~~The owner or operator of a flare shall:

(1) Provide a 24 hour telephone service for access by the public for inquiries about flare events. The owner or operator shall provide the Executive Officer in writing the name and number of the initial contact and any contact update.

(2) Notify the Executive Officer ~~by telephone~~ via the web-based Refinery Flare Event Notification System within one hour from the start of any ~~unplanned~~

flare event defined in subparagraphs (b)(3)(A), (B), or (D), or flare event caused by an emergency and indicate whether ~~with~~ emissions exceed~~ing~~ either 100 pounds of VOC or 500 pounds of sulfur dioxide, or exceed~~ing~~ 500,000 standard cubic feet of flared vent gas, and

~~(3) Submit a Specific Cause Analysis as required by subparagraph (c)(1)(D) to the Executive Officer within 30 days, identifying the cause and duration of the unplanned flare event, and any mitigation and corrective actions taken. The owner or operator may request the Executive Officer to grant an extension of up to 30 days to submit the Specific Cause Analysis.~~

~~(4)~~(3) Notify the Executive Officer via the web-based Refinery Flare Event Notification System at least 24 hours prior to the start of a planned flare event, or within 4 hours prior to the restart of a process unit after an unplanned shutdown of that unit in the previous 48 hours with emissions exceeding either 100 pounds of VOC or 500 pounds of sulfur dioxide, or 500,000 standard cubic feet of combusted vent gas**.** Within one hour of the start of a planned flare event, submit a notification via the web-based Refinery Flare Event Notification System, referencing the notification number assigned to the planned flare event at the time of the original ~~telephone~~ notification.

~~(5)~~(4) Submit a quarterly report in an electronic format approved by the Executive Officer within 30 days after the end of each quarter. Each quarterly report shall be certified for accuracy in writing by the responsible facility official and shall include the following:

(A) The information required to be monitored under paragraphs (g)(3), (g)(4), (g)(5), (g)(6), and (g)(9), and subparagraph (g)(8)(C) of this rule. Notwithstanding the January 30, 2019 compliance date in paragraph (g)(9), data collected pursuant to paragraphs (g)(9) shall be made available in the first quarterly report after the applicable monitors have been installed.

(B) The total daily and quarterly emissions of criteria pollutants from each flare and each flare event along with all information used to calculate the emissions, which includes standard volumes, higher heating values and total sulfur concentration of the vent gases, event duration and emission factors. Identify each reported value of flow rate, higher heating values or sulfur concentration reported using Data Substitution Procedures in Attachment B, and identify the data

substitution method used and the date the method was approved by the Executive Officer, if applicable.

(i) Emissions from flares shall be calculated using the Emissions Calculation Procedures outlined in Attachment B: Guidelines for Emissions Calculations.

(ii) During all down time periods of the monitoring system, emissions shall be calculated using the Missing Data Substitution Procedures outlined in Attachment B: Guidelines for Emissions Calculations.

(C) The description of the cause of each flare event as analyzed pursuant to ~~sub~~paragraphs (c)(~~1~~6),~~(D) and~~ (c)(~~1~~7)~~(E)~~ and the category of flare event such as emergency, shutdown, startup or essential operational need or other specific cause(s), and the associated emissions.

(D) Records of annual acoustical or temperature leak survey conducted pursuant to ~~sub~~paragraph (c)(~~1~~5)~~(C)~~. The record shall include identification of all valves inspected, date of inspections, and the name of the person(s) conducting the inspections.

(E) Flare monitoring system downtime periods, including dates and times and explanation for each period

(F) A copy of written notices for all reportable air releases related to any flare event, as required by 40 CFR, Part 302 - Designation, Reportable Quantities, and Notification and 40 CFR, Part 355 - Emergency Planning and Notification, if applicable.

(j) Testing and Monitoring Methods

(1) For the purpose of this rule, the test methods listed below shall be used:

(A) The higher (gross) heating value of vent gases shall be determined by:

(i) ASTM Method D~~-2382-88~~4809-13, ASTM Method D ~~3588-91~~ 3588-98(2011),~~or~~ ASTM Method D~~-4891-89~~4891-13, or other ASTM standard as approved by the Executive Officer, and

(ii) ~~Effective July 1, 2007, w~~With a higher heating value analyzer that meets or exceeds the specifications in Attachment A.

(B) The total sulfur concentration, expressed as sulfur dioxide, shall be determined by:

(i) District Method 307-91 or ASTM Method D ~~5504-01~~5504-12, or other ASTM standard as approved by the Executive Officer, and

(ii) ~~Effective July 1, 2007, w~~With a total sulfur analyzer that meets or exceeds the specifications in Attachment A.

(C) The vent gas flow shall be determined by a flow measuring device that meets or exceeds the specifications described in Attachment A, as applicable. The accuracy of all flow meters shall be verified every twelve months according to the manufacturers' procedures and the results shall be submitted to the Executive Officer within 30 days after the reports are issued.

~~(2) Until the continuous and semi-continuous analyzers are certified by the Executive Officer and operational, analyses for higher (gross) heating value and total sulfur concentration shall be:~~

~~( ) Conducted by a District approved lab; or~~

~~( ) Conducted by the owner or operator of a gas flare if the District has provided prior written approval of QA/QC and standard operating procedures. All analytical reports shall be signed by the facility official responsible for analytical equipment to certify the accuracy of the reports.~~

~~(5)~~(2) Visible emissions pursuant to paragraph (c)(~~1~~2)~~(B)~~ shall be determined by US EPA Method 22, 40 CFR Part 60 Appendix A.

~~(6)~~(3) Notwithstanding subparagraph~~s~~ (j)(1)~~ and (j)(2)~~, continuous monitoring systems certified under Rule 2011 - Requirements for Monitoring, Reporting and Recordkeeping of Oxides of Sulfur (SOx) Emissions and Rule 2012 - Requirements for Monitoring, Reporting and Recordkeeping of Oxides of Nitrogen (NOx) Emissions, may be used for the monitoring of vent gases.

(k) Exemption

(1) Notwithstanding a flare monitoring system, consisting of a flow meter, higher heating value analyzer and total sulfur analyzer that is in operation, sampling and analyses of representative samples for higher heating values and total sulfur concentration pursuant to paragraph (g)(3) may not be required for any flare event that:

(A) Is a result of a catastrophic event including a major fire or an explosion at the facility such that collecting a sample is infeasible or constitutes a safety hazard, or

(B) Constitutes a safety hazard to the sampling personnel at the sampling location approved in the Flare Monitoring and Recording Plan during the entire flare event, provided that a sample is collected at an alternative location where it is safe as determined by the facility owner or operator. The owner or operator shall demonstrate to the Executive Officer that the sample collected at an alternative location is representative of the flare event.

(2) Any sulfur dioxide emissions from flare~~ing~~ events caused by external power curtailment beyond the operator's control~~,~~ (excluding interruptible service agreements), natural disasters or acts of war or terrorism shall not count towards either:

(A) ~~t~~The performance targets specified in subdivision (d) upon submittal of documentation proving the existence of such events and certified in writing by the petroleum refinery official responsible for emission reporting; or

~~(C)~~(B) The prohibitions listed in paragraph (c)(10).

ATTACHMENT A

FLARE MONITORING SYSTEM REQUIREMENTS

The components of each flare monitoring system must meet or exceed the minimum specifications listed below. Components with other specifications may be used provided the owner or operator of a gas flare can demonstrate that the specifications are equivalent and has been approved by the Executive Officer.

1. Continuous Flow Measuring Device

The monitor must be sensitive to rapid flow changes, and have the capability of reporting both instantaneous velocity and totalized flow. Materials exposed to the flare gas shall be corrosion resistant. If required by the petroleum refinery or the hydrogen production plant, the manufacturer must provide an enclosure with an area classification rating of Class 1, Division 2, Groups A, B, C, D, and is FM and CSA approved. The monitor shall (i) feature automated daily calibrations at low and high ranges, and (ii) shall signal alarms if the calibration error or drift is exceeded, provided that the monitor is equipped with such capability. The volumetric flow measuring device may consist of one or more flow meters, and, as combined, shall meet the following specifications.

Velocity Range:	0.1-250 ft/sec
Repeatability:	± 1% of reading over the velocity range
Accuracy:	± 20% of reading over the velocity range of 0.1-1 ft/s and ± 5% of reading over the velocity range of 1-250 ft/s
Installation:	Applicable AGA, ANSI, API, or equivalent standard; hot tap capability. If applicable, the manufacturer must specify the straight-run pipe requirements in terms of the minimum upstream and downstream distances from the nearest flow disturbances to the device
Flow Rate Determination:	Must be corrected to one atmosphere pressure and 68^0 F and recorded as one-minute averages
Data Records	Measured continuously and recorded over one-minute averages. The instrument shall be capable of storing or transferring all data for later retrieval
QA/QC	Shall comply with the flow QA/QC requirements of District Rule 218.1. An annual verification of accuracy is required, and shall be specified by the manufacturer. Note: A flow RATA is generally infeasible due to safety concerns

2. On/Off Flow Indicator

The on/off flow indicator is a device which is used to demonstrate the flow of vent gas during a flare event, and shall meet or exceed specifications as approved by the Executive Officer. The on/off flow indicator setting shall be verifiable.

3. Data Recording System

All data as generated by the above flow meters and the on/off flow indicators must be continuously recorded by strip chart recorders or computers. The strip chart must have a minimum chart width of 10 inches, a readability of 0.5% of the span, and a minimum of 100 chart divisions. The computer must have the capability to generate one-minute average data from that which is continuously generated by the flow meters and the on/off limit switch.

4. Continuous and Semi-continuous Gaseous Stream Higher Heating Value (HHV) Flare Monitoring Systems

The following is intended to ensure that verifiable, meaningful, and representative data are collected from continuous and semi-continuous gaseous stream HHV flare measurement monitoring devices systems. All procedures are subject to Executive Officer review and approval.

General Requirements:

a. The monitoring system must be capable of measuring HHV within the requirements of the rule.

b. The monitoring system must be capable of adjusting to rapid changes in HHV within a reasonable time meeting the definition of a continuous or semi-continuous monitoring system as defined in the applicable rule and as approved by the Executive Officer.

c. Monitoring system sampling interfaces and analyzers in contact with sample gas must be compatible with sample gases and able to resist flow temperatures and pressures.

d. The sampling inlet system interface must be heated as necessary so as to prevent condensation.

e. Sample gas must be conditioned such that the sample is free of particulate or liquid matter.

f. The sample must flow without impediment through the instrument sampling system sampling interface and analyzer.

g. Use an enclosure with an area classification rating of Class 1, Division 2, Groups A, B, C, D, and is FM or CSA approved. The enclosure must be able to maintain a stable analyzer temperature as required for analyzer performance.

h. The monitoring system must feature automated daily calibrations calibration checks, minimally at mid-range, and preferably at both applicable Federal minimum BTU requirements (low end) and 95% of full scale (high end) ranges at low and high ranges

i. The monitoring system analyzer must include an output compatible with a Data Acquisition System (DAS) or similar system that can process data generated by the analyzer and record the results. A data recorder compatible with analyzer output and capable of recording analyzer output must be supplied with the instrument.

j. Each monitoring system must have a written quality assurance/quality control (QA/QC) plan approved by the Executive Officer and available for District inspection.

k. Maintain a maintenance log for each monitoring system.

l. Perform routine maintenance and repair as recommended by the manufacturer or according to a standard operating procedure submitted and approved by the Executive Officer.

m. The placement and installation of monitoring systems is critical for collecting representative information on HHV gas content. Factors that should be considered in placement of a sampling interface include but are not limited to safety, ensuring the sample is representative of the source, ease of placement and access. Sampling interfaces, conditioning systems and enclosures may be shared with other instrumentation, if appropriate.

n. Perform at monitoring system start-up and on an annual basis a relative accuracy test audit (RATA) which is the ratio of the sum of the absolute mean difference between the monitoring system generated data and the value determined using ASTM D1945-03 and ASTM D3588-91, ASTM D 4891-89, or other ASTM standard as approved by the Executive Officer. See rule 218.1 (a)(23) for calculations.

o. Periodically perform a calibration curve or linearity verification error test according to permitting conditions and or on a schedule approved by the Executive Officer. Typically, this calibration curve will be prepared from standards representing a:
   i. 10-30 percent of the measurement range
   ii. 40-60 percent of the measurement range
   iii. 80-100 percent of the measurement range

p. Analyzers with auto calibration check capability should be checked daily unless a different calibration frequency is approved by the Executive Officer. For analyzers without auto calibration check capability, submit a calibration check frequency request including supporting documentation to the Executive Officer for comment and approval.

q. Periodically perform a zero drift test. Allowed zero drift should be consistent with a properly operating system. See rule 218.1 (a)(32) for calculations.

r. Retain records on the valid data return percentage.

s. Retain records on the availability or up-time of the monitoring system.

t. Retain records on the breakdown frequency and duration of the breakdown.

u. Retain records on excursions beyond quality control limits stated in the QA plan.

5. Continuous and Semi-continuous Gaseous Stream Total Sulfur Monitoring Systems

The following is intended to ensure that verifiable, meaningful, and representative data are collected from continuous and semi-continuous gaseous stream sulfur monitoring systems. All procedures are subject to Executive Officer review and approval.

General Requirements

a. The monitoring system must be capable of measuring total sulfur concentration within the requirements of the rule.

b. The monitoring system must be capable of adjusting to rapid changes in sulfur concentration within a reasonable time as defined in the applicable rule and as approved by the Executive Officer.

c. Monitoring system in contact with sample gas must be inert to sulfur gases and resistant to corrosion.

d. The sampling inlet system interface system must be heated as necessary so as to prevent condensation.

e. Sample gas must be conditioned such that the sample is free of particulate or liquid matter.

f. The sample must flow without impediment through the instrument sampling system sampling interface and analyzer.

g. Use an enclosure with an area classification rating of Class 1, Division 2, Groups A, B, C, D, and is FM or CSA approved. The enclosure must be able to maintain a stable analyzer temperature as required for analyzer performance.

h. The monitoring system must feature automated daily calibrations at low and high ranges, and shall signal alarms if the calibration error or drift is exceeded.

i. The monitoring system must include a Data Acquisition System (DAS) or similar system that can process data generated by the analyzer and record the results.

j. Each monitoring system must have a written quality assurance/quality control (QA/QC) plan approved by the Executive Officer and available for District inspection.

k. Maintain a maintenance log for each monitoring system.

l. Perform routine maintenance as recommended by the manufacturer or according to a standard operating procedure submitted and approved by the Executive Officer.

m. The placement and installation of monitoring systems is critical for collecting representative information on total sulfur gas concentration. Factors that should be considered in placement of a sampling interface include but are not limited to safety, ensuring the sample is representative of the source, ease of placement and access. Sampling interfaces,

conditioning systems and enclosures may be shared with other instrumentation, if appropriate.

n. Perform at monitoring system start-up and on an annual basis a relative accuracy test audit (RATA) which is the ratio of the sum of the absolute mean difference between the monitoring system generated data and the value determined using SCAQMD Laboratory Method 307-91, ASTM D5504-01 or other ASTM standard as approved by the Executive Officer. See rule 218.1(a)(23) for calculations.

Note: Facilities are reminded that there are many critical issues for the collection of representative and monitoring system comparable gas samples destined for Method 307-91 or ASTM D5504-01 analysis.

o. Facilities are strongly encouraged to use calibration gases prepared using a NIST hydrogen sulfide SRM, Nederlands Meetinstituut NMi or a NTRM standard as the primary reference.

p. Periodically perform a calibration curve or linearity verification performed according to permitting conditions and/or on a schedule approved by the Executive Officer. Typically, this calibration curve will be prepared from standards representing:

i. 10 to 30 percent of the measurement range
ii. 40 to 60 percent of the measurement range
iii. 80 to 100 percent of the measurement range

q. Analyzers with auto calibration capability shall be calibrated daily unless a different calibration frequency is approved by the Executive Officer. For analyzers without auto calibration capability, submit a calibration frequency request, including supporting documentation to the Executive Officer for comment and approval.

r. Seven Day Calibration Error Test shall be performed by evaluating the analyzer performance over seven consecutive days as necessary. The calibration drift should not exceed five percent of the full-scale range.

s. Analyze daily a control or drift test sample or standard. Adequate system analyzer performance is demonstrated by recoveries of 90 to 110 percent of the theoretical amounts for total reduced sulfur species in the test gas.

t. Periodically perform an analyzer blank test to evaluate the presence of analyzer leaks or wear on sample valves and related components. Replace components as necessary to restore the analyzer to nominal function. A blank should yield results below the monitoring plan approved lower measurement range.

u. Periodically perform a zero drift test. Allowed zero drift should be consistent with a properly operating system analyzer. See rule 218.1(a)(32) for calculations.

v. Retain records on the valid data return percentage.

w. Retain records on the availability or up-time of the monitoring system.

x. Retain records on the breakdown frequency and duration of the breakdown.

y. Retain records on excursions beyond quality control limits stated in the QA plan.

Gas Chromatograph (GC) Based System Analyzer Specific Requirements

a. The following performance tests specific to GC based sulfur analyzers are part of an overall QA program. This list is not all inclusive. The specific performance tests that are required under rule compliance will be based upon analyzer configuration, data requirements, practical concerns such as safety and are subject to approval by the Executive Officer.
   i. Whenever a calibration is performed and whenever a calibration drift test is performed, examine retention times for each calibration component. Compare the retention times against historically observed retention times. Retention time drift should be better than within five percent. Compare the retention times to analyzer and DAS parameters such as time gates to ensure compatibility. These parameters including the analysis time may need to be updated on occasion.
   ii. Verify daily that the analyzer response drift for individual sulfur species does not exceed ten percent of the control information.

Total Sulfur Analyzer System Requirements

a. The following performance tests specific to total sulfur based analyzers are part of an overall QA program. This list is not all inclusive. The specific performance tests that are required under rule compliance will be based upon instrument analyzer configuration, data requirements, practical concerns such as safety and are subject to approval by the Executive Officer.
   i. Verify daily that the analyzer response drift for the concentration of total sulfur, expressed as sulfur dioxide does not exceed ten percent of the control information.

ATTACHMENT B

GUIDELINES FOR CALCULATING FLARE EMISSIONS

The following methods shall be used to calculate flare emissions. An alternative method may be used, provided it has been approved as equivalent in writing by the Executive Officer.

1. Emission Calculation Procedures

Petroleum refinery, sulfur recovery plant or hydrogen production facility operators shall use the following equations and emission factors to calculate emissions from vent gas, natural gas, propane and butane:

Effective January 30, 2019

Vent Gas

Air Pollutant	Equation	Emission Factor
ROG	E = V x ~~H~~NHV x EF	~~0.063~~ 0.66 lb/mmBTU
NOx	E = V x HHV x EF	0.068 lb/mmBTU
CO	E = V x ~~H~~NHV x EF	~~0.37~~0.31 lb/mmBTU
PM10	E = V x EF	21 lb/mmSCF
SOx	E = V x Cs x 0.1662	Note (1)

Effective Until January 30, 2019

Air Pollutant	Equation	Emission Factor
ROG	E = V x HHV x EF	0.063 lb/mmBTU
NOx	E = V x HHV x EF	0.068 lb/mmBTU
CO	E = V x HHV x EF	0.37 lb/mmBTU
PM10	E = V x EF	21 lb/mmSCF
SOx	E = V x Cs x 0.1662	Note (1)

Where:

E = Calculate vent gas emissions (lbs)

V= Volume flow of vent gas, as measured in million standard cubic foot at 14.7 psia and 68^0 Fahrenheit

HHV = Higher Heating Value, as measured in British Thermal Unit per standard cubic foot

NHV = Net Heating Value, as measured in British Thermal Units per standard cubic foot

EF = Emission Factor

Cs = The concentration of total sulfur in the vent gas, expressed as sulfur dioxide, as measured in part per million by volume using the methods specified in this rule.

Note (1) If an approved total sulfur analyzer is used in accordance with this rule, Cs is the concentration of total sulfur in the vent gas, averaged over 15 minutes or less, if the event duration is shorter than 15 minutes.

Note (2) For a flare event where a representative sample or other sampling method is not required pursuant to Table 1 of this rule, use HHV and/or Cs from any representative sample of a flare event on the same day. If no representative sample is taken that day, use HHV and/or Cs from the last representative sample taken prior to the flare event.

Natural Gas

Air Pollutant	Equation	Emission Factor (lb/mmSCF)
ROG	E = V x EF	7
NOx	E = V x EF	130
CO	E = V x EF	35
PM10	E = V x EF	7.5
SOx	E = V x EF	0.83

Propane and Butane

Air Pollutant	Equation	Emission Factor (lb/mmBTU)
ROG	E = V x 3500 x EF	0.003
NOx	E = V x 3500 x EF	0.13
CO	E = V x 3500 x EF	0.032
PM10	E = V x 3500 x EF	0.0014
SOx	E = V x 3500 x EF	0.047

Single On/Off Flow Indicator Switch

The flow rate setting of the on/off flow indicator switch if the switch is not actuated or the maximum design capacity of the flare for the flow rate for each flare event.

Multiple On/Off Flow Indicator Switch

a) The flow rate setting of the first stage on/off flow indicator switch if the switch is not actuated.
b) When an on/off switch is actuated assume the flow rate is the flow rate that would actuate the on/off switch set at the next highest flow rate.
c) Use the maximum design capacity of the flare for the flow rate when the on/off switch set for the highest flow rate is actuated.

Flow Meters Only

a) Use the recorded flow meter data until the maximum range is exceeded.
b) When the maximum range of the flow meter is exceeded, assume the flow rate is the maximum design capacity of the flare(s), unless the owner or operator demonstrates and the Executive Officer approves a calculated flow based upon operational parameters and process data that represent the flow during the period of time that the flow exceeded the maximum range of the flow meter.
c) When the flow rate is below the valid lower range of the flow meter, assume the flow rate is at the lower range.

Combination of Flow Meters and On/Off Flow Indicator Switches

a) Use the recorded flow meter data until the maximum range is exceeded.

b) When the maximum range of the flow meter is exceeded, assume the flow rate is the flow rate that would actuate the on/off switch set at the next highest flow rate.
c) Use the maximum design capacity of the flare for the flow rate when the on/off switch set for the highest flow rate is actuated.
d) When the flow rate is below the valid lower range of the flow meter, assume the flow rate is at the lower range.
e) When the flow rate is below the valid lower range of the flow meter and the set flow rate of an on/off switch, assume the flow rate is the flow rate that would actuate the on/off switch.

2. Data Substitution Procedures

For any time period for which the vent gas flow, the higher heating value or the total sulfur concentration, expressed as sulfur dioxide, are not measured, analyzed and recorded pursuant to the requirements of this rule, unless the owner or operator of a petroleum refinery, sulfur recovery plant or hydrogen production plant demonstrates using verifiable records of flare water seal level and/or other parameters as approved by the Executive Officer in the Flare Monitoring and Recording Plan or the Revised Flare Monitoring and Recording Plan that no flare event occurred during the period these parameters were not measured, analyzed or recorded, the operator shall substitute and report the following values:

a) If the flow rate is not measured or recorded for any flare event, the totalized flow shall be calculated from the methodology in section 2(a)(i) below, unless the Executive Officer approves the method specified in Section 2(a)(ii).

i) The totalized flow shall be calculated from the product of the flare event duration and the estimated flow rate. The flow rate shall be calculated using the following equation for the period of time the flow meter was out of service:

$$FR = Max.\ FR - 0.5(Max.\ FR - Avg.\ FR)$$

Where:

FR = Estimated Flow Rate (standard cubic feet per minute)

Max FR = Maximum flow rate that was measured and recorded for that flare during the previous 20 quarters preceding the flare event. This maximum value is based on the average flow rate during an individual flare event, not an instantaneous maximum value.

Avg FR = Average flow rate for all measured and recorded flow rates for all sampled flare events for that flare, during the previous 20 quarters preceding the subject flare event.

The duration of a flare event during periods when the flow meter is out of service shall be determined using an alternate method approved by the Executive Officer in the Flare Monitoring and Recording Plan or Revised Flare Monitoring and Recording Plan.

In the absence of an approved alternate method to determine the duration of the flare event during periods when the flow meter is out of service,

the operator shall report the flare to be venting for the entire time the flow meter is out of service.

ii) Alternate methods using recorded and verifiable operational parameters and/or process data, including reference to similar events that have previously occurred, approved by the Executive Officer to be representative of the volume of vent gas, may be used to determine the flow rate in lieu of the method specified above.

b) If the higher heating value is not measured or recorded for any flare event pursuant to the requirements of this rule, the higher heating value shall be calculated from the methodology in section 2(b)(i) below, unless the Executive Officer approves the method specified in Section 2(b)(ii).

i) The higher heating value shall be calculated using the following equation for the period of time this parameter was not measured or recorded:

HHV = Max HHV – 0.5(Max HHV – Avg HHV)

Where:

HHV = Estimated higher heating value (Btu/scf)

Max HHV = Maximum HHV measured and recorded for that flare during the previous 20 quarters preceding the flare event.

Avg HHV = Average value of all HHV measured and recorded for that flare for all sampled flare events during the previous 20 quarters preceding the flare event.

ii) Alternate methods using recorded and verifiable operational parameters, sampled data, and/ or process data, including reference to similar events that have previously occurred, approved by the Executive Officer to be representative of the HHV of the vent gas, may be used to determine the HHV in lieu of the method specified above.

c) If the total sulfur concentration, expressed as sulfur dioxide, is not measured or recorded for any flare event pursuant to the requirements of this rule, it shall be calculated from the methodology in section 2(c)(i) below, unless the Executive Officer approves the method specified in Section 2(c)(ii).

i) The total sulfur concentration expressed as sulfur dioxide shall be calculated using the following equation for the period of time this parameter was not measured or recorded:

SFE = Max SFE – 0.5(Max SFE – Avg SFE)

Where:

SFE = Estimated total sulfur concentration, expressed as sulfur dioxide (ppmv)

Max SFE = Maximum total sulfur concentration expressed as sulfur dioxide measured and recorded for that flare during the previous 20 quarters preceding the flare event.

Avg SFE = Average value of all total sulfur concentrations measured and recorded for that flare for all sampled flare events during the previous 20 quarters preceding the flare event.

ii) Alternate methods using recorded and verifiable operational parameters, sampled data, and/ or process data, including reference to similar events that have previously occurred, approved by the Executive Officer to be representative of the total sulfur concentration of the vent gas expressed as sulfur dioxide, may be used to determine the total sulfur concentration in lieu of the method specified above.