

**RULE 426. LANDFILL GAS EMISSIONS**  
(Adopted 7/26/95)

- A. APPLICABILITY. The provisions of this Rule shall apply to all existing solid waste disposal sites that have received more than 500,000 tons of solid waste and all new solid waste disposal sites constructed after July 26, 1995.
- B. DEFINITIONS. For the purpose of this Rule, the following definitions shall apply:
1. "Active Landfill": Any solid waste disposal site which received waste at any time during the six months prior to any status determination under this Rule.
  2. "Baseline Condition": That state when leaks do not exist at:
    - a. Any location on the surface of the landfill covered by final cover; and
    - b. Any location on the surface of the landfill which has been covered by intermediate cover for over six months; and
    - c. Any location along the gas transfer path of the gas collection system.
  3. "Condensate": Any liquid in the landfill gas collection system resulting from the condensation of moisture in landfill gas.
  4. "Control Device": Any device that disposes of the collected gas by one or more of the following means: combustion; combustion for energy recovery; gas treatment and subsequent sale; sale and processing offsite; other equivalent methods.
  5. "Daily Cover": The material applied to the working faces of a landfill cell at the end of an operating day.
  6. "Destruction/Treatment Efficiency": A measure of the ability of the control device to combust, transform, or otherwise prevent the emissions to the atmosphere of volatile organic compounds in landfill gas.
  7. "Energy Recovery Equipment": Any equipment that uses landfill gas to produce useful energy.
  8. "Excavation": Any movement of landfill cover that triggers the notification requirements of any government agency.
  9. "Final Cover": Cover material that is applied on areas where additional cells are not to be constructed, and therefore, is highly resistant to erosion.
  10. "Gas Collection System": A series of collectors, wellheads, and associated piping and equipment which provides a gas transfer path to the control device.

11. "Inactive Landfill": Any solid waste disposal site which has not received waste in the six (6) months prior to any status determination under this Rule, or has begun or finished postclosure requirements in accordance with California Code of Regulations Title 14, Chapter 3, Article 7.8.
12. "Intermediate Cover": Cover material that is applied on areas where additional cells are not to be constructed for at least six (6) months, or on areas that are awaiting application of final cover, and therefore, must resist erosion for a longer period of time than daily cover.
13. "Landfill": Any location within a solid waste disposal site used for the permanent disposal of waste where the organic portion of the waste is subject to natural processes of aerobic and anaerobic decomposition.
14. "Landfilling": The process by which solid waste is placed in a landfill.
15. "Landfill Cells": That portion of solid wastes in a landfill that is enclosed by natural soil or cover material during a designated operating period, usually one day.
16. "Landfill Gas": Any untreated, raw gas derived through the decomposition of organic waste deposited in a solid waste disposal site, from the evolution of volatile species in the waste, or from chemical reactions of substances in the waste.
17. "Leak": Any point where the concentration of total organic compounds measured as methane exceeds 1000 ppmv except non-repeatable, momentary readings.
18. "Leak-free": The absence of the evidence of a "Leak".
19. "Non-decomposable, Inert Solid Waste": Materials which do not degrade biologically to form landfill gas. Examples include, but are not limited to, earth, rock, concrete, clay products, inert tailings, plaster board, glass, inert slag, asbestos, and demolition materials containing less than ten (10) percent by volume wood and metals.
20. "Non-repeatable, Momentary Readings": Indications of the presence of organic gases using a detector meeting the apparatus requirements of United States Environmental Protection Agency (EPA) Method 21 which persist for less than five (5) seconds and do not recur when the sampling probe is placed in the same location for at least twice the response time of the instrument.
21. "Offsite Gas Migration": Underground landfill gases detected, at any point on the perimeter or beyond, at a concentration greater than that allowed by state and federal regulations.
22. "Owner": The fee owner of a solid waste disposal site or the person who, through lease or other arrangement with the fee owner, is responsible for complying with

all applicable federal, state, and local requirements for landfill gas emissions. Where specific requirements of this Rule apply to equipment at the solid waste disposal site that is owned or operated by a second party other than the fee owner, the second party shall be deemed the owner for the purpose of such rule requirements as they relate to such equipment.

23. "Overdraw": The state at which oxygen from beyond the perimeter is drawn into the gas collection system.
24. "Oxygen Intrusion": The effect of overdraw.
25. "Perimeter": The outer boundary of the solid waste disposal site property.
26. "Quarter": The months that define a "quarter" are: January, February, and March (1st quarter ends on March 31); April, May, and June (2nd quarter ends on June 30); July, August, and September (3rd quarter ends on September 30); October, November, and December (4th quarter ends on December 31).
27. "Solid Waste": All putrescible and non-putrescible solid, semisolid, and liquid wastes, including garbage, trash, refuse, paper, rubbish, ashes, industrial waste, manure, vegetable or animal solid and semisolid wastes, sludge, and other discarded solid and semisolid wastes.
28. "Solid Waste Disposal Site": Includes the place, location, tract of land, area, or premises in use, intended to be used, or which has been used for the landfill disposal of wastes, and/or the evaporation of liquid chemical waste.
29. "Target Volume": The volume of landfill gas that can be collected from the landfill for a given quarter based on baseline gas collection flowrates.
30. "Upset Conditions": Unforeseeable and/or unexpected operating conditions that disrupt the normal and routine operation of either the landfill gas collection system or a control device.
31. "Waste-In-Place": The cumulative mass of all solid waste disposed in a landfill since commencement of landfilling.

### C. EXEMPTIONS

1. The Air Pollution Control Officer (APCO) may exempt solid waste disposal sites from the requirements of this Rule if the site:
  - a. Contains only non-decomposable, inert solid waste; or
  - b. Receives only hazardous waste.
2. Areas of an active landfill that are to remain active by the building of new landfill cells may be conditionally exempt from the gas collection requirements of Section E subject to approval by the APCO. In order for certain active areas to be exempt

from Section E, the owner shall submit an update to the operation and maintenance plan required by Subsection I.1.a.4 at least two (2) weeks prior to the landfilling of solid waste on those areas.

3. The APCO may exempt solid waste disposal sites from the requirements of this Rule if the owner can demonstrate that the concentration of total organic compounds measured at any point near the surface of the solid waste disposal site does not exceed 500 ppmv, as methane, other than non-repeatable, momentary readings. Testing shall be performed according to the procedures in Subsection G.1 of this Rule following written notification to the APCO.
  - a. If the owner of a solid waste disposal site equipped with an operating gas collection system intends to shut down the gas collection system, they shall notify the APCO of such action no less than fifteen (15) calendar days prior to shutdown and testing.
  - b. This exemption shall be reevaluated annually by the APCO until the owner completes postclosure requirements in accordance with California Code of Regulations Title 14, Chapter 3, Article 7.8.

D. EMISSIONS QUANTIFICATION PLAN. An owner of a solid waste disposal site may comply with the provisions of this Rule without performing emissions quantification by committing to the installation of a gas collection system that meets the requirements of Section E on or before the date the emission quantification plan is due. Failure to honor such a commitment shall be considered a violation of this Section.

1. The owner of any solid waste disposal site with more than 1,000,000 tons of waste-in-place on July 26, 1995, shall submit to the APCO an emissions quantification plan no later than October 24, 1995.
2. The owner of any solid waste disposal site with more than 500,000 but less than or equal to 1,000,000 tons of waste-in-place on July 26, 1995, shall submit to the APCO an emissions quantification plan no later than October 26, 1996.
3. The owner of any solid waste disposal site that surpasses 500,000 tons of waste-in-place after July 26, 1995, shall submit to the APCO an emissions quantification plan no later than 15 calendar months after surpassing 500,000 tons of waste-in-place.
4. An emissions quantification plan required by Subsection D.1, D.2, D.3, or I.3 shall contain at a minimum:
  - a. A detailed map showing locations of proposed sampling areas if sampling is to be performed.
  - b. A detailed description of any testing methods or modeling techniques to be used for the purpose of quantifying the uncontrolled emissions of volatile organic compounds (VOCs).

- c. Proposed test dates if source testing is to be performed.
  - d. An estimate of the current amount of waste-in-place (tons) and waste acceptance rate (tons per day).
5. The owner of any solid waste disposal site required by Subsection D.1, D.2, D.3, or I.3 to submit an emissions quantification plan shall execute that plan and submit their emission results no later than 90 days after the District's approval of that plan.
- a. If the estimated VOC emissions quantified under an emissions quantification plan are less than or equal to fifteen (15) tons per year, the owner shall update the emissions quantification plan and/or VOC emissions estimate at a future date as determined by the APCO. The APCO may require additional emissions testing or modeling.
- E. REQUIREMENTS - GAS COLLECTION SYSTEM. If the estimated VOC emissions quantified under an emissions quantification plan are greater than fifteen (15) tons per year, the owner shall install and operate a gas collection system on all landfill surface locations covered by intermediate or final cover. The following requirements shall only be applicable to the installation and operation of a gas collection system.
- 1. The gas collection system shall, at a minimum:
    - a. Collect each quarter, at least 90 percent of the target volume established for that quarter pursuant to Subsection E.5.a.
    - b. Be constructed to prevent off-site migration and oxygen intrusion or overdraw that can cause fires or damage to the collection system.
      - 1) Offsite migration shall be determined in accordance with existing state and federal regulations. Should any state or federal regulation conflict with this Rule, the more stringent regulation shall apply.
  - 2. The owner shall use the procedures in Subsections G.1 and G.3 to determine if a baseline condition exists. Each time that a baseline condition is re-established, the owner shall measure and record:
    - a. The baseline gas collection flowrate, in dry standard cubic feet per minute (dscfm), for the entire landfill.
    - b. The baseline oxygen concentration in the collected landfill gas stream, in percent by volume, at the inlet to the control device before adding combustion air.

The owner may re-establish the baseline gas collection flowrate and the baseline oxygen concentration at any time. The District shall be notified at least five (5)

days prior to each establishment so that District personnel may be onsite to confirm that a baseline condition exists.

3. The owner shall measure and record the oxygen concentration at the inlet to the control device using the procedures in Subsection G.3 on at least four (4) days each week. A single sampling run shall be sufficient for this purpose. Each sampling run shall establish the oxygen concentration to be used for all preceding hours retroactive to the hour of the previous measurement.
4. The owner shall monitor and record the total gas collection flowrate for the landfill at least once every day. A chart recorder shall be sufficient for recording this data.
5. The overall effectiveness of the gas collection system for each quarter shall be determined by the owner within two weeks after the end of the quarter.
  - a. The owner shall establish a quarterly target for the volume of landfill gas to be collected. The target volume shall be the summation of all baseline gas collection flowrates established pursuant to Subsection E.2 during the past quarter in dscfm multiplied by the number of minutes operated at that flowrate during the quarter.

$$V = \sum_{i=1}^n (f_i \times t_i)$$

where:

- $V$  = target volume for next quarter in cubic feet
- $f_i$  = baseline gas collection flowrate for the *ith* interval in dscfm
- $t_i$  = time operated at each flowrate for the *ith* interval in minutes
- $n$  = total number of gas collection flowrates in past quarter
- $i$  = interval counter

- b. Each flowrate record during which the measured oxygen concentration established pursuant to Subsection E.3 exceeds the current baseline oxygen concentration established pursuant to Subsection E.2.b by a measured value greater than two (2) percent, shall be corrected using the following equation:

$$\text{Corrected flow} = \text{Measured flow} \times \frac{20.9 - O_2 \text{ measured} (\%)}{20.9 - O_2 \text{ baseline} (\%)}$$

where:

- 20.9 the assumed oxygen concentration in ambient air

- $O_2$  measured = the oxygen concentration in the gas stream as specified in Subsection E.3
- $O_2$  baseline = the oxygen concentration in the gas stream before adding combustion air as specified in Subsection E.2.b.

- c. The owner shall use this corrected flowrate data to calculate the total volume of gas collected for the quarter.
6. If the volume of gas collected in any quarter is less than 90 percent of the target volume established for that quarter, the baseline gas collection flowrate and the baseline oxygen concentration shall be re-established pursuant to Subsection E.2 within the first four weeks of the following quarter.
  7. Notwithstanding the requirements of Subsection E.6, the owner of any active landfill shall re-establish the baseline gas collection flowrate and the baseline oxygen concentration pursuant to Subsection E.2 at least once every six months.
  8. Leak requirements:
    - a. The owner shall maintain, monitor, operate, and improve the gas collection system and landfill cover to prevent leaks from:
      - 1) all locations on the surface of the landfill covered by final cover,
      - 2) all locations on the surface of the landfill which have been covered by intermediate cover for over six (6) months, and
      - 3) all locations along the gas transfer path of the gas collection system.
    - b. All leaks shall be conspicuously tagged with a marker which displays the date of leak detection. The marker shall remain in place until the leak is repaired and reinspected. Each leak shall be repaired to a leak-free state within three (3) calendar days of detection unless such repair requires excavation.
    - c. If a leak repair requires excavation, the owner shall submit an excavation plan within 15 calendar days of detection for approval by the APCO. The excavation plan shall include the expected date of completion.
    - d. Leaks shall be repaired to a leak-free state using at least one of the following methods:
      - 1) Increasing the gas collection flowrate of existing wells.
      - 2) Repairing the landfill cover.
      - 3) Installing additional gas collection wells.

- 4) Repairing the gas transfer path.
  - 5) An equivalent method subject to the approval of the APCO.
9. Whenever previously buried waste is brought to the surface during installation or preparation of wells, trenches, piping, or other equipment, or when solid waste is to be excavated and moved, the owner shall cover the excavated waste using fresh soil, plastic sheeting, vapor retarding foam, or other California Integrated Waste Management Board (CIWMB) approved "Alternate Daily Cover," by the end of the working day or as necessary to prevent a public nuisance, whichever is sooner.
  10. The condensate from the gas collection system shall be collected, stored, and treated in a manner approved by the Regional Water Quality Control Board (RWQCB) and the CIWMB.

F. REQUIREMENTS - CONTROL EQUIPMENT. All landfill gases collected pursuant to this Rule shall be processed using control devices that meet the following requirements:

1. All control devices shall:
  - a. Have a VOC destruction/treatment efficiency of at least 98 percent by weight; or
  - b. Reduce the VOC concentration at the outlet of the control device to a maximum of 30 ppmv measured as methane and corrected to three (3) percent oxygen on a dry basis.
2. Flares used as control devices shall meet all of the following additional requirements:
  - a. Flares shall be of the enclosed ground type with automatic dampers, an automatic shutdown device, a flame arrester, and continuous recording temperature sensors. There shall be a sufficient flow of propane or commercial natural gas to the pilot flame to ensure immediate ignition when in contact with landfill gases during startup, restart, or when the flow of landfill gases is inadequate to sustain combustion of the flare.
  - b. Oxides of nitrogen (NO<sub>x</sub>) emissions shall not exceed 0.06 pounds per million BTU of heat input.
  - c. Carbon monoxide (CO) emissions shall not exceed 0.20 pounds per million BTU of heat input.
3. Energy recovery equipment used as a control device shall be subject to the requirements of Rule 204, Requirements.

4. The owner shall demonstrate that each control device meets the requirements of this Section using the source testing procedures in Section G. Source testing shall be performed when the device begins operation. Flares shall be source tested to demonstrate continuing compliance every two years thereafter. All other control devices shall be source tested annually to demonstrate continuing compliance.
5. All control devices shall be located in such a manner as to minimize the effect of noise and exhaust emissions on nearby residences. The location shall be subject to approval by the APCO.

G. TEST METHODS. The test methods referenced in this Section may be substituted with equivalent methods subject to the approval of the APCO.

1. The following procedures shall be used to establish baseline conditions pursuant to Subsection E.2:
  - a. The landfill surface integrity shall be evaluated and brought to the baseline condition by testing for leaks and repairing all such leaks using the repair methods listed in Subsection E.8.d. Surface leak testing shall be performed in accordance with the specifications of EPA Method 21. The monitoring instrument shall be calibrated before and after each test using zero air and a standard calibration gas of approximately 500 ppmv methane in accordance with the instrument manufacturer's recommendations.
  - b. Surface leak testing shall be performed by holding the detector probe two (2) inches from the landfill surface while walking a pattern of parallel paths not more than 50 feet apart over all surface areas specified in Subsection E.8.a. Cracks, holes, and other breaches in the surface, as well as areas where buried waste interfaces with undisturbed native soil, shall also be evaluated. The owner is not required to monitor surfaces on steep slopes and other areas posing a hazard to testing personnel, however, leaks identified in such areas are not exempt from the provisions of Subsection E.8.
  - c. Surface leak testing shall be performed by the operator only when the average wind speed is less than five (5) miles per hour and instantaneous wind speed is less than ten (10) miles per hour, unless the APCO approves alternate wind speed limits based on demonstrated recurrent site-specific conditions. Average wind speed shall be determined on a ten (10) minute average using an on-site anemometer. Surface testing shall not be conducted when the surface is wet or when there has been measurable rainfall during the preceding 72 hours. Surface testing of landfill surfaces that are normally wet when in use (i.e., a golf course) may be performed when the surface is wet.
2. California Air Resources Board (ARB) Method 2 or EPA Method 2D shall be used for flowrate measurements and stack gas velocities.

3. ARB Method 100 or EPA Method 3 or 3A shall be used for oxygen and carbon dioxide concentration measurements.
4. The VOC destruction/treatment efficiency of a control device shall be determined using the following equation:

$$Efficiency = ( 1 - \frac{VOC_{out} \times exhaust \ flow}{VOC_{in} \times inlet \ flow} ) \times 100$$

where:

$VOC_{out}$  = the measured concentration of VOCs in the exhaust  
 $VOC_{in}$  = the measured concentration of VOCs in the landfill gas entering the control device

- a.  $VOC_{in}$  and  $VOC_{out}$  shall be determined using EPA Method 25, Determination of Total Gaseous Nonmethane Organic Emissions as Carbon. Grab samples of landfill gas at the inlet to the control device, and exhaust from the control device shall be collected simultaneously at a constant rate over a period of at least ten (10) minutes in new Tedlar bags or equivalent. Each sample volume shall be sufficient to perform two VOC analyses and to measure the sample's oxygen content.
- b. The inlet flow shall be determined using:
  - 1) EPA Method 2; or
  - 2) A continuous flow measuring system installed pursuant to Subsection E.4. The continuous flow measuring system shall be used if the entire flow it measures is directed to the control device being tested.
5. ARB Method 100 or EPA Method 7E shall be used to determine NOx emissions.
6. ARB Method 100 or EPA Method 10 shall be used to determine CO emissions.
7. EPA Method 19 shall be used to determine the NOx emission rate on a heat input basis (pounds per million BTU heat input).
8. EPA Method 4 shall be used to determine stack gas moisture content.
9. The higher heating value of the landfill gas shall be determined by using the most current version of one of the following test methods:

- a. The American Society for Testing and Materials (ASTM) Method D 1826;  
or
- b. ASTM Method D 1945 in conjunction with ASTM Method D 3588.

#### H. RECORDKEEPING

- 1. The owner of any landfill subject to the requirements of this Rule shall maintain the following records:
  - a. A map indicating the location and date of cover placement for each area with intermediate and final cover.
  - b. The results of all perimeter well testing.
  - c. The results of all methane or VOC emission tests including off-site migration tests, perimeter well tests, and surface cover tests.
  - d. Annual records of the tonnage of refuse accepted for the prior year.
- 2. The owner of any landfill subject to the requirements of Section E shall maintain the following records:
  - a. Records of the baseline gas collection flowrate, in dscfm, and the baseline oxygen concentration, in percent, for each time that a baseline condition is re-established. .
  - b. Records of measurements of the total gas collection flowrate, in dscfm, including notes describing the reasons for down-time.
  - c. Records of the oxygen concentration measurements required pursuant to Subsection E.3.
  - d. Records of all surface monitoring including the date, time, weather conditions, areas sampled, calibration records, and test results. Test results shall include the approximate location of each detected leak, the date of detection, the date of correction, and the repair method used.
  - e. Source test reports showing the VOC destruction/treatment efficiency for the control device.
  - f. If applicable, source test reports showing emissions of CO and NO<sub>x</sub>, in units of pounds per million BTU of heat input, and continuous records of flare temperature showing dates and times.

#### I. COMPLIANCE SCHEDULE

- 1. The owner of any solid waste disposal site subject to the requirements of this Rule shall submit an application for an Authority to Construct no later than 90 days

after determination that the disposal site is emitting more than fifteen (15) tons per year of VOCs or 180 days after committing to the installation of a gas collection system without performing an emissions quantification in accordance with Section D. The application for an Authority to Construct shall contain at a minimum:

- a. A schedule of actions, indicating projected completion dates, that will be taken to demonstrate compliance with all provisions of this Rule. Such actions shall include, but are not limited to:
  - 1) An evaluation of the existing surface integrity to determine if there is a need for modification or additional installation of surface cover.
  - 2) The installation or modification of surface cover.
  - 3) Surface leak testing and control device source testing to demonstrate final compliance.
  - 4) An operations and maintenance plan for the approval of the APCO. The operations and maintenance plan shall be updated periodically as determined by the APCO.
2. The owner of any solid waste disposal site subject to the requirements of Section E of this Rule shall demonstrate final compliance no later than 18 calendar months after determination that the disposal site is emitting more than fifteen (15) tons per year of VOCs or 21 calendar months after committing to the installation of a gas collection system without performing an emissions quantification in accordance with Section D.
3. Any person planning to re-open a previously closed solid waste disposal site which may be subject to the requirements of this Rule, shall submit an emissions quantification plan, as specified in Subsection D.4, or commit to the installation of a landfill gas collection system at least 180 calendar days prior to receipt of waste.
4. Any person planning to open a new solid waste disposal site which may be subject to the requirements of this Rule shall:
  - a. Submit an application for an Authority to Construct, as specified in Subsection I.1, at least 180 calendar days prior to receipt of waste.
  - b. Make provisions for the installation of a gas collection system and demonstrate compliance when at least 100 dscfm of combustible gas is available for collection.
5. Records required by Section H shall be maintained for a period of two years from the date of each entry and shall be made available to the District upon request.