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*Unofficial electronic compilation of the  
U.S. EPA Final Rule on Mandatory Reporting of Greenhouse Gases  
incorporated by reference in California's Regulation for the  
Mandatory Reporting of Greenhouse Gas Emissions*

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*ARB's Regulation for the Mandatory Reporting of Greenhouse Gas Emissions (title 17, California Code of Regulations (CCR), sections 95100-95157) incorporated by reference certain requirements promulgated by the United States Environmental Protection Agency (U.S. EPA) in its Final Rule on Mandatory Reporting of Greenhouse Gases (Title 40, Code of Federal Regulations (CFR), Part 98). Specifically, section 95100(c) of ARB's regulation incorporated those requirements promulgated by U.S. EPA as published in the Federal Register on October 30, 2009, July 12, 2010, September 22, 2010, October 28, 2010, November 30, 2010, December 17, 2010, and April 25, 2011.*

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**40 CFR Part 98  
Subpart S**

**Mandatory Reporting of Greenhouse Gases**

**PART 98—MANDATORY GREENHOUSE GAS REPORTING**

**Subpart S—Lime Manufacturing**

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**§98.190 Definition of the source category.**

(a) Lime manufacturing plants (LMPs) engage in the manufacture of a lime product (e.g., calcium oxide, high-calcium quicklime, calcium hydroxide, hydrated lime, dolomitic quicklime, dolomitic hydrate, or other lime products) by calcination of limestone, dolomite, shells or other calcareous substances as defined in 40 CFR 63.7081(a)(1).

(b) This source category includes all LMPs unless the LMP is located at a kraft pulp mill, soda pulp mill, sulfite pulp mill, or only processes sludge containing calcium carbonate from water softening processes. The lime manufacturing source category consists of marketed and non-marketed lime manufacturing facilities.

(c) Lime kilns at pulp and paper manufacturing facilities must report emissions under subpart AA of this part (Pulp and Paper Manufacturing).

**§98.191 Reporting threshold.**

You must report GHG emissions under this subpart if your facility is a lime manufacturing plant as defined in §98.190 and the facility meets the requirements of either §98.2(a)(1) or (a)(2).

**§98.192 GHGs to report.**

You must report:

- (a) CO<sub>2</sub> process emissions from lime kilns.
- (b) CO<sub>2</sub> emissions from fuel combustion at lime kilns.

(c) N<sub>2</sub>O and CH<sub>4</sub> emissions from fuel combustion at each lime kiln. You must report these emissions under 40 CFR part 98, subpart C (General Stationary Fuel Combustion Sources).

(d) CO<sub>2</sub>, N<sub>2</sub>O, and CH<sub>4</sub> emissions from each stationary fuel combustion unit other than lime kilns. You must report these emissions under 40 CFR part 98, subpart C (General Stationary Fuel Combustion Sources).

(e) CO<sub>2</sub> collected and transferred off site under 40 CFR part 98, following the requirements of subpart PP of this part (Suppliers of Carbon Dioxide (CO<sub>2</sub>)).

**§98.193 Calculating GHG emissions.**

You must calculate and report the annual process CO<sub>2</sub> emissions from all lime kilns combined using the procedure in paragraphs (a) and (b) of this section.

(a) If all lime kilns meet the conditions specified in §98.33(b)(4)(ii) or (b)(4)(iii), you must calculate and report under this subpart the combined process and combustion CO<sub>2</sub> emissions by operating and maintaining a CEMS to measure CO<sub>2</sub> emissions according to the Tier 4 Calculation Methodology specified in §98.33(a)(4) and all associated requirements for Tier 4 in subpart C of this part (General Stationary Fuel Combustion Sources).

(b) If CEMS are not required to be used to determine CO<sub>2</sub> emissions from all lime kilns under paragraph (a) of this section, then you must calculate and report the process and combustion CO<sub>2</sub> emissions from the lime kilns by using the procedures in either paragraph (b)(1) or (b)(2) of this section.

(1) Calculate and report under this subpart the combined process and combustion CO<sub>2</sub> emissions by operating and maintaining a CEMS to measure CO<sub>2</sub> emissions from all lime kilns according to the Tier 4 Calculation Methodology specified in §98.33(a)(4) and all associated requirements for Tier 4 in subpart C of this part (General Stationary Fuel Combustion Sources).

(2) Calculate and report process and combustion CO<sub>2</sub> emissions separately using the procedures specified in paragraphs (b)(2)(i) through (b)(2)(v) of this section.

(i) You must calculate a monthly emission factor for each type of lime produced using Equation S-1 of this section. Calcium oxide and magnesium oxide content must be analyzed monthly for each lime product type that is produced:

$$EF_{LIME,i,n} = [(SR_{CaO} * CaO_{i,n}) + (SR_{MgO} * MgO_{i,n})] * \frac{2000}{2205} \quad (\text{Eq. S-1})$$

Where:

EF<sub>LIME,i,n</sub> = Emission factor for lime type i, for month n (metric tons CO<sub>2</sub>/ton lime).

SR<sub>CaO</sub> = Stoichiometric ratio of CO<sub>2</sub> and CaO for calcium carbonate [see Table S-1 of this subpart] (metric tons CO<sub>2</sub>/metric tons CaO).

SR<sub>MgO</sub> = Stoichiometric ratio of CO<sub>2</sub> and MgO for magnesium carbonate (See Table S-1 of this subpart) (metric tons CO<sub>2</sub>/metric tons MgO).

CaO<sub>i,n</sub> = Calcium oxide content for lime type i, for month n, determined according to §98.194(c) (metric tons CaO/metric ton lime).

MgO<sub>i,n</sub> = Magnesium oxide content for lime type i, for month n, determined according to §98.194(c) (metric tons MgO/metric ton lime).

2000/2205 = Conversion factor for tons to metric tons.

(ii) You must calculate a monthly emission factor for each type of calcined byproduct/waste sold (including lime kiln dust) using Equation S-2 of this section:

$$EF_{LKD,i,n} = \left[ (SR_{CaO} * CaO_{LKD,i,n}) + (SR_{MgO} * MgO_{LKD,i,n}) \right] * \frac{2000}{2205} \quad (\text{Eq. S-2})$$

Where:

- $EF_{LKD,i,n}$  = Emission factor for calcined lime byproduct/waste type i sold, for month n (metric tons CO<sub>2</sub>/ton lime byproduct).
- $SR_{CaO}$  = Stoichiometric ratio of CO<sub>2</sub> and CaO for calcium carbonate (see Table S-1 of this subpart) (metric tons CO<sub>2</sub>/metric tons CaO).
- $SR_{MgO}$  = Stoichiometric ratio of CO<sub>2</sub> and MgO for magnesium carbonate (See Table S-1 of this subpart) (metric tons CO<sub>2</sub>/metric tons MgO).
- $CaO_{LKD,i,n}$  = Calcium oxide content for calcined lime byproduct/waste type i sold, for month n (metric tons CaO/metric ton lime).
- $MgO_{LKD,i,n}$  = Magnesium oxide content for calcined lime byproduct/waste type i sold, for month n (metric tons MgO/metric ton lime).
- 2000/2205 = Conversion factor for tons to metric tons.

(iii) You must calculate the annual CO<sub>2</sub> emissions from each type of calcined byproduct/waste that is not sold (including lime kiln dust and scrubber sludge) using Equation S-3 of this section:

$$E_{waste,i} = \left[ (SR_{CaO} * CaO_{waste,i}) + (SR_{MgO} * MgO_{waste,i}) \right] * M_{waste,i} * \frac{2000}{2205} \quad (\text{Eq. S-3})$$

Where:

- $E_{waste,i}$  = Annual CO<sub>2</sub> emissions for calcined lime byproduct/waste type i that is not sold (metric tons CO<sub>2</sub>).
- $SR_{CaO}$  = Stoichiometric ratio of CO<sub>2</sub> and CaO for calcium carbonate (see Table S-1 of this subpart) (metric tons CO<sub>2</sub>/metric tons CaO).
- $SR_{MgO}$  = Stoichiometric ratio of CO<sub>2</sub> and MgO for magnesium carbonate (See Table S-1 of this subpart) (metric tons CO<sub>2</sub>/metric tons MgO).
- $CaO_{waste,i}$  = Calcium oxide content for calcined lime byproduct/waste type i that is not sold (metric tons CaO/metric ton lime).
- $MgO_{waste,i}$  = Magnesium oxide content for calcined lime byproduct/waste type i that is not sold (metric tons MgO/metric ton lime).
- $M_{waste,i}$  = Annual weight or mass of calcined lime byproducts/wastes for lime type i that is not sold (tons).
- 2000/2205 = Conversion factor for tons to metric tons.

(iv) You must calculate annual CO<sub>2</sub> process emissions for all kilns using Equation S-4 of this section:

$$E_{CO_2} = \sum_{i=1}^t \sum_{n=1}^{12} (EF_{LIME,i,n} * M_{LIME,i,n}) + \sum_{i=1}^b \sum_{n=1}^{12} EF_{LKD,i,n} * M_{LKD,i,n} + \sum_{i=1}^z E_{waste,i} \quad (\text{Eq. S-4})$$

Where:

- ECO<sub>2</sub> = Annual CO<sub>2</sub> process emissions from lime production from all kilns (metric tons/year).
- EF<sub>LIME,i,n</sub> = Emission factor for lime type i produced, in calendar month n (metric tons CO<sub>2</sub>/ton lime) from Equation S-1 of this section.
- M<sub>LIME,i,n</sub> = Weight or mass of lime type i produced in calendar month n (tons).
- EF<sub>LKD,i,n</sub> = Emission factor of calcined byproducts/wastes sold for lime type i in calendar month n, (metric tons CO<sub>2</sub>/ton byproduct/waste) from Equation S-2 of this section.
- M<sub>LKD,i,n</sub> = Monthly weight or mass of calcined byproducts/waste sold (such as lime kiln dust, LKD) for lime type i in calendar month n (tons).
- E<sub>waste,i</sub> = Annual CO<sub>2</sub> emissions for calcined lime byproduct/waste type i that is not sold (metric tons CO<sub>2</sub>) from Equation S-3 of this section.
- t = Number of lime types produced
- b = Number of calcined byproducts/wastes that are sold
- z = Number of calcined byproducts/wastes that are not sold

(v) Calculate and report under subpart C of this part (General Stationary Fuel Combustion Sources) the combustion CO<sub>2</sub> emissions from each lime kiln according to the applicable requirements in subpart C.

#### **§98.194 Monitoring and QA/QC requirements.**

(a) You must determine the total quantity of each type of lime product that is produced and each calcined byproduct/waste (such as lime kiln dust) that is sold. The quantities of each should be directly measured monthly with the same plant instruments used for accounting purposes, including but not limited to, calibrated weigh feeders, rail or truck scales, and barge measurements. The direct measurements of each lime product shall be reconciled annually with the difference in the beginning of and end of year inventories for these products, when measurements represent lime sold.

(b) You must determine the annual quantity of each calcined byproduct/waste generated that is not sold by either direct measurement using the same instruments identified in paragraph (a) of this section or by using a calcined byproduct/waste generation rate.

(c) You must determine the chemical composition (percent total CaO and percent total MgO) of each type of lime product that is produced and each type of calcined byproduct/waste sold according to paragraph (c)(1) or (2) of this section. You must determine the chemical composition of each type of lime product that is produced and each type of calcined byproduct/waste sold on a monthly basis. You must determine the chemical composition for each type of calcined byproduct/waste that is not sold on an annual basis.

(1) ASTM C25-06 Standard Test Methods for Chemical Analysis of Limestone, Quicklime, and Hydrated Lime (incorporated by reference-see §98.7).

(2) The National Lime Association's CO<sub>2</sub> Emissions Calculation Protocol for the Lime Industry English Units Version, February 5, 2008 Revision-National Lime Association (incorporated by reference see §98.7).

(d) You must use the analysis of calcium oxide and magnesium oxide content of each lime product that is produced and that is collected during the same month as the production data in monthly calculations.

(e) You must follow the quality assurance/quality control procedures (including documentation) in National Lime Association's CO<sub>2</sub> Emissions Calculation Protocol for the Lime Industry-English Units Version, February 5, 2008 Revision-National Lime Association (incorporated by reference see §98.7).

**§98.195 Procedures for estimating missing data.**

For the procedure in §98.193(b)(1), a complete record of all measured parameters used in the GHG emissions calculations is required (e.g., oxide content, quantity of lime products, etc.). Therefore, whenever a quality-assured value of a required parameter is unavailable, a substitute data value for the missing parameter shall be used in the calculations as specified in paragraphs (a) or (b) of this section. You must document and keep records of the procedures used for all such estimates.

(a) For each missing value of the quantity of lime produced (by lime type), and quantity of calcined byproduct/waste produced and sold, the substitute data value shall be the best available estimate based on all available process data or data used for accounting purposes.

(b) For missing values related to the CaO and MgO content, you must conduct a new composition test according to the standard methods in §98.194 (c)(1) or (c)(2).

**§98.196 Data reporting requirements.**

In addition to the information required by §98.3(c), each annual report must contain the information specified in paragraphs (a) or (b) of this section, as applicable.

(a) If a CEMS is used to measure CO<sub>2</sub> emissions, then you must report under this subpart the relevant information required by §98.36 and the information listed in paragraphs (a)(1) through (8) of this section.

- (1) Method used to determine the quantity of lime that is produced and sold.
- (2) Method used to determine the quantity of calcined lime byproduct/waste sold.
- (3) Beginning and end of year inventories for each lime product that is produced, by type.
- (4) Beginning and end of year inventories for calcined lime byproducts/wastes sold, by type.
- (5) Annual amount of calcined lime byproduct/waste sold, by type (tons).
- (6) Annual amount of lime product sold, by type (tons).
- (7) Annual amount of calcined lime byproduct/waste that is not sold, by type (tons).
- (8) Annual amount of lime product not sold, by type (tons).

(b) If a CEMS is not used to measure CO<sub>2</sub> emissions, then you must report the information listed in paragraphs (b)(1) through (17) of this section.

- (1) Annual CO<sub>2</sub> process emissions from all kilns combined (metric tons).
- (2) Monthly emission factors for each lime type produced.
- (3) Monthly emission factors for each calcined byproduct/waste by lime type that is sold.
- (4) Standard method used (ASTM or NLA testing method) to determine chemical compositions of each lime type produced and each lime byproduct/waste type.
- (5) Monthly results of chemical composition analysis of each type of lime product produced and calcined byproduct/waste sold.

- (6) Annual results of chemical composition analysis of each type of lime byproduct/waste that is not sold.
- (7) Method used to determine the quantity of lime produced and/or lime sold.
- (8) Monthly amount of lime product sold, by type (tons).
- (9) Method used to determine the quantity of calcined lime byproduct/waste sold.
- (10) Monthly amount of calcined lime byproduct/waste sold, by type (tons).
- (11) Annual amount of calcined lime byproduct/waste not sold, by type (tons).
- (12) Monthly weight or mass of each lime type produced (tons).
- (13) Beginning and end of year inventories for each lime product that is produced.
- (14) Beginning and end of year inventories for calcined lime byproducts/wastes sold.
- (15) Annual lime production capacity (tons) per facility.
- (16) Number of times in the reporting year that missing data procedures were followed to measure lime production (months) or the chemical composition of lime products sold (months).
- (17) Indicate whether CO<sub>2</sub> was used on-site (i.e. for use in a purification process). If CO<sub>2</sub> was used on-site, provide the information in paragraphs (b)(17)(i) and (ii) of this section.
  - (i) The annual amount of CO<sub>2</sub> captured for use in the on-site process.
  - (ii) The method used to determine the amount of CO<sub>2</sub> captured.

**§98.197 Records that must be retained.**

In addition to the records required by §98.3(g), you must retain the records specified in paragraphs (a) and (b) of this section.

- (a) Annual operating hours in calendar year.
- (b) Records of all analyses (e.g. chemical composition of lime products, by type) and calculations conducted.

**§98.198 Definitions.**

All terms used in this subpart have the same meaning given in the Clean Air Act and subpart A of this part.

**Table S-1 of Subpart S—Basic Parameters for the Calculation of Emission Factors for Lime Production**

Variable	Stoichiometric ratio
SR <sub>CaO</sub>	0.7848
SR <sub>MgO</sub>	1.0918