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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*

### Unofficial Electronic Compilation

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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.*

*This compilation combines the various incorporated Federal Register versions into one document for the reader's convenience; however, this compilation is not an official edition of either the CFR or the CCR. While reasonable steps have been taken to make this unofficial compilation accurate, the officially published requirements, found within the incorporated Federal Register notices with the dates listed above, take precedence if there are any discrepancies.*

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**40 CFR Part 98  
Subpart PP**

**Mandatory Reporting of Greenhouse Gases**

**PART 98—MANDATORY GREENHOUSE GAS REPORTING**

**Subpart PP—Suppliers of Carbon Dioxide**

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

(a) The carbon dioxide (CO<sub>2</sub>) supplier source category consists of the following:

- (1) Facilities with production process units that capture a CO<sub>2</sub> stream for purposes of supplying CO<sub>2</sub> for commercial applications or that capture and maintain custody of a CO<sub>2</sub> stream in order to sequester or otherwise inject it underground. Capture refers to the initial separation and removal of CO<sub>2</sub> from a manufacturing process or any other process.
- (2) Facilities with CO<sub>2</sub> production wells that extract or produce a CO<sub>2</sub> stream for purposes of supplying CO<sub>2</sub> for commercial applications or that extract and maintain custody of a CO<sub>2</sub> stream in order to sequester or otherwise inject it underground.
- (3) Importers or exporters of bulk CO<sub>2</sub>.

(b) This source category is focused on upstream supply. It does not cover:

- (1) Storage of CO<sub>2</sub> above ground or in geologic formations.
- (2) Use of CO<sub>2</sub> in enhanced oil and gas recovery.
- (3) Transportation or distribution of CO<sub>2</sub>.
- (4) Purification, compression, or processing of CO<sub>2</sub>.
- (5) On-site use of CO<sub>2</sub> captured on site.

(c) This source category does not include CO<sub>2</sub> imported or exported in equipment, such as fire extinguishers.

**§98.421 Reporting threshold.**

Any supplier of CO<sub>2</sub> who meets the requirements of §98.2(a)(4) of subpart A of this part must report the mass of CO<sub>2</sub> captured, extracted, imported, or exported.

**§98.422 GHGs to report.**

- (a) Mass of CO<sub>2</sub> captured from production process units.
- (b) Mass of CO<sub>2</sub> extracted from CO<sub>2</sub> production wells.
- (c) Mass of CO<sub>2</sub> imported.
- (d) Mass of CO<sub>2</sub> exported.

**§98.423 Calculating CO<sub>2</sub> Supply.**

(a) Except as allowed in paragraph (b) of this section, calculate the annual mass of CO<sub>2</sub> captured, extracted, imported, or exported through each flow meter in accordance with the procedures specified in either paragraph (a)(1) or (a)(2) of this section. If multiple flow meters are used, you shall calculate the annual mass of CO<sub>2</sub> for all flow meters according to the procedures specified in paragraph (a)(3) of this section.

(1) For each mass flow meter, you shall calculate quarterly the mass of CO<sub>2</sub> in a CO<sub>2</sub> stream in metric tons by multiplying the mass flow by the composition data, according to Equation PP-1 of this section. Mass flow and composition data measurements shall be made in accordance with §98.424 of this subpart.

$$CO_{2,u} = \sum_{p=1}^4 Q_{p,u} * C_{CO_2,p,u} \quad (\text{Eq. PP-1})$$

Where:

- CO<sub>2,u</sub> = Annual mass of CO<sub>2</sub> (metric tons) through flow meter u.
- C<sub>CO<sub>2</sub>,p,u</sub> = Quarterly CO<sub>2</sub> concentration measurement in flow for flow meter u in quarter p (wt. %CO<sub>2</sub>).
- Q<sub>p,u</sub> = Quarterly mass flow rate measurement for flow meter u in quarter p (metric tons).
- p = Quarter of the year.
- u = Flow meter.

(2) For each volumetric flow meter, you shall calculate quarterly the mass of CO<sub>2</sub> in a CO<sub>2</sub> stream in metric tons by multiplying the volumetric flow by the concentration and density data, according to Equation PP-2 of this section. Volumetric flow, concentration and density data measurements shall be made in accordance with §98.424 of this section.

$$CO_{2,u} = \sum_{p=1}^4 Q_p * D_p * C_{CO_2,p} \quad (\text{Eq. PP-2})$$

Where:

- CO<sub>2,u</sub> = Annual mass of CO<sub>2</sub> (metric tons) through flow meter u.
- C<sub>CO<sub>2</sub>,p</sub> = Quarterly CO<sub>2</sub> concentration measurement in flow for flow meter u in quarter p (measured as either volume % CO<sub>2</sub> or weight % CO<sub>2</sub>).
- Q<sub>p</sub> = Quarterly volumetric flow rate measurement for flow meter u in quarter p (standard cubic meters).

- $D_p$  = Density of CO<sub>2</sub> in quarter p (metric tons CO<sub>2</sub> per standard cubic meter) for flow meter u if  $C_{CO_2,p}$  is measured as volume % CO<sub>2</sub>, or density of the whole CO<sub>2</sub> stream for flow meter u (metric tons per standard cubic meter) if  $C_{CO_2,p}$  is measured as weight % CO<sub>2</sub>.
- p = Quarter of the year.
- u = Flow meter.

(3) To aggregate data, use either Equation PP-3a or PP-3b in this paragraph, as appropriate.

- (i) For facilities with production process units that capture a CO<sub>2</sub> stream and either measure it after segregation or do not segregate the flow, calculate the total CO<sub>2</sub> supplied in accordance with Equation PP-3a.

$$CO_2 = \sum_{p=1}^U CO_{2,u} \quad (\text{Eq. PP-3a})$$

Where:

- CO<sub>2</sub> = Total annual mass of CO<sub>2</sub> (metric tons).
- CO<sub>2,u</sub> = Annual mass of CO<sub>2</sub> (metric tons) through flow meter u.
- u = Flow meter.

- (ii) For facilities with production process units that capture a CO<sub>2</sub> stream and measure it ahead of segregation, calculate the total CO<sub>2</sub> supplied in accordance with Equation PP-3b.

$$CO_2 = \sum_{p=1}^U CO_{2,u} - \sum_{p=1}^V CO_{2,v} \quad (\text{Eq. PP-3b})$$

Where:

- CO<sub>2</sub> = Total annual mass of CO<sub>2</sub> (metric tons).
- CO<sub>2,u</sub> = Annual mass of CO<sub>2</sub> (metric tons) through main flow meter u.
- CO<sub>2,v</sub> = Annual mass of CO<sub>2</sub> (metric tons) through subsequent flow meter v for use on site.
- u = Main flow meter.
- v = Subsequent flow meter.

(b) As an alternative to paragraphs (a)(1) through (3) of this section for CO<sub>2</sub> that is supplied in containers, calculate the annual mass of CO<sub>2</sub> supplied in containers delivered by each CO<sub>2</sub> stream in accordance with the procedures specified in either paragraph (b)(1) or (b)(2) of this section. If multiple CO<sub>2</sub> streams are used to deliver CO<sub>2</sub> to containers, you shall calculate the annual mass of CO<sub>2</sub> supplied in containers delivered by all CO<sub>2</sub> streams according to the procedures specified in paragraph (b)(3) of this section.

- (1) For each CO<sub>2</sub> stream that delivers CO<sub>2</sub> to containers, for which mass is measured, you shall calculate CO<sub>2</sub> supply in containers using Equation PP-1 of this section.

Where:

- CO<sub>2,u</sub> = Annual mass of CO<sub>2</sub> (metric tons) supplied in containers delivered by CO<sub>2</sub> stream u.

- $C_{CO_2,p,u}$  = Quarterly CO<sub>2</sub> concentration measurement of CO<sub>2</sub> stream u that delivers CO<sub>2</sub> to containers in quarter p (wt. %CO<sub>2</sub>).
- $Q_{p,u}$  = Quarterly mass of contents supplied in all containers delivered by CO<sub>2</sub> stream u in quarter p (metric tons).
- p = Quarter of the year.
- u = CO<sub>2</sub> stream that delivers to containers.

(2) For each CO<sub>2</sub> stream that delivers to containers, for which volume is measured, you shall calculate CO<sub>2</sub> supply in containers using Equation PP–2 of this section.

Where:

- $CO_{2,u}$  = Annual mass of CO<sub>2</sub> (metric tons) supplied in containers delivered by CO<sub>2</sub> stream u.
- $C_{CO_2,p}$  = Quarterly CO<sub>2</sub> concentration measurement of CO<sub>2</sub> stream u that delivers CO<sub>2</sub> to containers in quarter p (measured as either volume % CO<sub>2</sub> or weight % CO<sub>2</sub>).
- $Q_p$  = Quarterly volume of contents supplied in all containers delivered by CO<sub>2</sub> stream u in quarter p (standard cubic meters).
- $D_p$  = Quarterly CO<sub>2</sub> density determination for CO<sub>2</sub> stream u in quarter p (metric tons per standard cubic meter) if CO<sub>2,p</sub> is measured as volume % CO<sub>2</sub>, or density of CO<sub>2</sub> stream u (metric tons per standard cubic meter) if CO<sub>2,p</sub> is measured as weight % CO<sub>2</sub>.
- p = Quarter of the year.
- u = CO<sub>2</sub> stream that delivers to containers.

(3) To aggregate data, sum the mass of CO<sub>2</sub> supplied in containers delivered by all CO<sub>2</sub> streams in accordance with Equation PP–3a of this section.

Where:

- $CO_2$  = Annual mass of CO<sub>2</sub> (metric tons) supplied in containers delivered by all CO<sub>2</sub> streams.
- $CO_{2,u}$  = Annual mass of CO<sub>2</sub> (metric tons) supplied in containers delivered by CO<sub>2</sub> stream u.
- u = CO<sub>2</sub> stream that delivers to containers.

(c) Importers or exporters that import or export CO<sub>2</sub> in containers shall calculate the total mass of CO<sub>2</sub> imported or exported in metric tons based on summing the mass in each CO<sub>2</sub> container using weigh bills, scales, or load cells according to Equation PP-4 of this section.

$$CO_2 = \sum_{p=1}^I Q \quad (\text{Eq. PP-4})$$

Where:

- $CO_2$  = Annual mass of CO<sub>2</sub> (metric tons).
- Q = Annual mass in all CO<sub>2</sub> containers imported or exported during the reporting year (metric tons).

**§98.424 Monitoring and QA/QC requirements.**

(a) Determination of quantity.

(1) Reporters following the procedures in § 98.423(a) shall determine quantity using a flow meter or meters located in accordance with this paragraph.

(i) If the CO<sub>2</sub> stream is segregated such that only a portion is captured for commercial application or for injection, you must locate the flow meter according to the following:

(A) For reporters following the procedures in §98.423(a)(3)(i), you must locate the flow meter(s) after the point of segregation.

(B) For reporters following the procedures in paragraph (a)(3)(ii) of §98.423, you must locate the main flow meter(s) on the captured CO<sub>2</sub> stream(s) prior to the point of segregation and the subsequent flow meter(s) on the CO<sub>2</sub> stream(s) for on-site use after the point of segregation. You may only follow the procedures in paragraph (a)(3)(ii) of §98.423 if the CO<sub>2</sub> stream(s) for on-site use is/are the only diversion(s) from the main, captured CO<sub>2</sub> stream(s) after the main flow meter location(s).

(ii) Reporters that have a mass flow meter or volumetric flow meter installed to measure the flow of a CO<sub>2</sub> stream that meets the requirements of paragraph (a)(1)(i) of this section shall base calculations in §98.423 of this subpart on the installed mass flow or volumetric flow meters.

(iii) Reporters that do not have a mass flow meter or volumetric flow meter installed to measure the flow of the CO<sub>2</sub> stream that meets the requirements of paragraph (a)(1)(i) of this section shall base calculations in §98.423 of this subpart on the flow of gas transferred off site using a mass flow meter or a volumetric flow meter located at the point of off-site transfer.

(2) Reporters following the procedures in paragraph (b) of §98.423 shall determine quantity in accordance with this paragraph.

(i) Reporters that supply CO<sub>2</sub> in containers using weigh bills, scales, or load cells shall measure the mass of contents of each CO<sub>2</sub> container to which the CO<sub>2</sub> stream is delivered, sum the mass of contents supplied in all containers to which the CO<sub>2</sub> stream is delivered during each quarter, sample the CO<sub>2</sub> stream delivering CO<sub>2</sub> to containers on a quarterly basis to determine the composition of the CO<sub>2</sub> stream, and apply Equation PP-1.

(ii) Reporters that supply CO<sub>2</sub> in containers using loaded container volumes shall measure the volume of contents of each CO<sub>2</sub> container to which the CO<sub>2</sub> stream is delivered, sum the volume of contents supplied in all containers to which the CO<sub>2</sub> stream is delivered during each quarter, sample the CO<sub>2</sub> stream on a quarterly basis to determine the composition of the CO<sub>2</sub> stream, determine the density quarterly, and apply Equation PP-2.

(3) Importers or exporters that import or export CO<sub>2</sub> in containers shall measure the mass in each CO<sub>2</sub> container using weigh bills, scales, or load cells and sum the mass in all containers imported or exported during the reporting year.

(4) All flow meters, scales, and load cells used to measure quantities that are reported in §98.423 of this subpart shall be operated and calibrated according to the following procedure:

(i) You shall use an appropriate standard method published by a consensus-based standards organization if such a method exists. Consensus-based standards organizations include, but are not limited to, the following: ASTM International, the American National Standards Institute (ANSI), the American Gas Association (AGA), the American Society of Mechanical Engineers (ASME), the American Petroleum Institute (API), and the North American Energy Standards Board (NAESB).

(ii) Where no appropriate standard method developed by a consensus-based standards organization exists, you shall follow industry standard practices.

(iii) You must ensure that any flow meter calibrations performed are NIST traceable.

(5) Reporters using Equation PP-2 of this subpart and measuring CO<sub>2</sub> concentration as weight % CO<sub>2</sub> shall determine the density of the CO<sub>2</sub> stream on a quarterly basis in order to calculate the mass of the CO<sub>2</sub> stream according to the following procedures:

(i) You may use a method published by a consensus-based standards organization to measure density if such a method exists. Consensus-based standards organizations include, but are not limited to, the following: ASTM International (100 Barr Harbor Drive, P.O. Box CB700, West Conshohocken, Pennsylvania 19428–B2959, (800) 262–1373, <http://www.astm.org>), the American National Standards Institute (ANSI, 1819 L Street, NW., 6th floor, Washington, DC 20036, (202) 293–8020, <http://www.ansi.org>), the American Gas Association (AGA, 400 North Capitol Street, NW., 4th Floor, Washington, DC 20001, (202) 824–7000, <http://www.aga.org>), the American Society of Mechanical Engineers (ASME, Three Park Avenue, New York, NY 10016–5990, (800) 843–2763, <http://www.asme.org>), the American Petroleum Institute (API, 1220 L Street, NW., Washington, DC 20005–4070, (202) 682–8000, <http://www.api.org>), and the North American Energy Standards Board (NAESB, 801 Travis Street, Suite 1675, Houston, TX 77002, (713) 356–0060, <http://www.api.org>). The method(s) used shall be documented in the Monitoring Plan required under §98.3(g)(5).

(ii) You may follow an industry standard method.

(b) Determination of concentration.

(1) Reporters using Equation PP-1 or PP-2 of this subpart shall sample the CO<sub>2</sub> stream on a quarterly basis to determine the composition of the CO<sub>2</sub> stream.

(2) Methods to measure the composition of the CO<sub>2</sub> stream must conform to applicable chemical analytical standards. Acceptable methods include, but are not limited to, the U.S. Food and Drug Administration food-grade specifications for CO<sub>2</sub> (see 21 CFR 184.1250) and ASTM standard E1747-95(Reapproved 2005) Standard Guide for Purity of Carbon Dioxide Used in Supercritical Fluid Applications (ASTM International, 100 Barr Harbor Drive, P.O. Box CB700, West Conshohocken, Pennsylvania 19428–B2959, (800) 262–1373, <http://www.astm.org>).

(c) You shall convert the density of the CO<sub>2</sub> stream(s) and all measured volumes of carbon dioxide to the following standard industry temperature and pressure conditions: Standard cubic meters at a temperature of 60 degrees Fahrenheit and at an absolute pressure of 1 atmosphere. If you apply the density value for CO<sub>2</sub> at standard conditions, you must use 0.001868 metric tons per standard cubic meter.



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

(a) Whenever the quality assurance procedures in §98.424(a)(1) of this subpart cannot be followed to measure quarterly mass flow or volumetric flow of CO<sub>2</sub>, the most appropriate of the following missing data procedures shall be followed:

- (1) A quarterly CO<sub>2</sub> mass flow or volumetric flow value that is missing may be substituted with a quarterly value measured during another quarter of the current reporting year.
- (2) A quarterly CO<sub>2</sub> mass flow or volumetric flow value that is missing may be substituted with a quarterly value measured during the same quarter from the past reporting year.
- (3) If a mass or volumetric flow meter is installed to measure the CO<sub>2</sub> stream, you may substitute data from a mass or volumetric flow meter measuring the CO<sub>2</sub> stream transferred for any period during which the installed meter is inoperable.
- (4) The mass or volumetric flow used for purposes of product tracking and billing according to the reporter's established procedures may be substituted for any period during which measurement equipment is inoperable.

(b) Whenever the quality assurance procedures in §98.424(b) of this subpart cannot be followed to determine concentration of the CO<sub>2</sub> stream, the most appropriate of the following missing data procedures shall be followed:

- (1) A quarterly concentration value that is missing may be substituted with a quarterly value measured during another quarter of the current reporting year.
- (2) A quarterly concentration value that is missing may be substituted with a quarterly value measured during the same quarter from the previous reporting year.
- (3) The concentration used for purposes of product tracking and billing according to the reporter's established procedures may be substituted for any quarterly value.

(c) Missing data on density of the CO<sub>2</sub> stream shall be substituted with quarterly or annual average values from the previous calendar year.

(d) Whenever the quality assurance procedures in §98.424(a)(2) of this subpart cannot be followed to measure quarterly quantity of CO<sub>2</sub> in containers, the most appropriate of the following missing data procedures shall be followed:

- (1) A quarterly quantity of CO<sub>2</sub> in containers that is missing may be substituted with a quarterly value measured during another representative quarter of the current reporting year.
- (2) A quarterly quantity of CO<sub>2</sub> in containers that is missing may be substituted with a quarterly value measured during the same quarter from the past reporting year.
- (3) The quarterly quantity of CO<sub>2</sub> in containers recorded for purposes of product tracking and billing according to the reporter's established procedures may be substituted for any period during which measurement equipment is inoperable.

**§98.426 Data reporting requirements.**

In addition to the information required by §98.3(c) of subpart A of this part, the annual report shall contain the following information, as applicable:

(a) If you use Equation PP-1 of this subpart, report the following information for each mass flow meter or CO<sub>2</sub> stream that delivers CO<sub>2</sub> to containers:

- (1) Annual mass in metric tons of CO<sub>2</sub>.
- (2) Quarterly mass in metric tons of CO<sub>2</sub>.

- (3) Quarterly concentration of the CO<sub>2</sub> stream.
- (4) The standard used to measure CO<sub>2</sub> concentration.
- (5) The location of the flow meter in your process chain in relation to the points of CO<sub>2</sub> stream capture, dehydration, compression, and other processing.

(b) If you use Equation PP-2 of this subpart, report the following information for each volumetric flow meter or CO<sub>2</sub> stream that delivers CO<sub>2</sub> to containers:

- (1) Annual mass in metric tons of CO<sub>2</sub>.
- (2) Quarterly volume in standard cubic meters of CO<sub>2</sub>.
- (3) Quarterly concentration of the CO<sub>2</sub> stream in volume or weight percent.
- (4) Report density as follows:
  - (i) Quarterly density of CO<sub>2</sub> in metric tons per standard cubic meter if you report the concentration of the CO<sub>2</sub> stream in paragraph (b)(3) of this section in weight percent.
  - (ii) Quarterly density of the CO<sub>2</sub> stream in metric tons per standard cubic meter if you report the concentration of the CO<sub>2</sub> stream in paragraph (b)(3) of this section in volume percent.
- (5) The method used to measure density.
- (6) The standard used to measure CO<sub>2</sub> concentration.
- (7) The location of the flow meter in your process chain in relation to the points of CO<sub>2</sub> stream capture, dehydration, compression, and other processing.

(c) For the aggregated annual mass of CO<sub>2</sub> emissions calculated using Equation PP-3a or PP-3b, report the following:

- (1) If you use Equation PP-3a of this subpart, report the annual CO<sub>2</sub> mass in metric tons from all flow meters and CO<sub>2</sub> streams that deliver CO<sub>2</sub> to containers.
- (2) If you use Equation PP-3b of this subpart, report:
  - (i) The total annual CO<sub>2</sub> mass through main flow meter(s) in metric tons.
  - (ii) The total annual CO<sub>2</sub> mass through subsequent flow meter(s) in metric tons.
  - (iii) The total annual CO<sub>2</sub> mass supplied in metric tons.
  - (iv) The location of each flow meter in relation to the point of segregation.

(d) If you use Equation PP-4 of this subpart, report at the corporate level the annual mass of CO<sub>2</sub> in metric tons in all CO<sub>2</sub> containers that are imported or exported.

(e) Each reporter shall report the following information:

- (1) The type of equipment used to measure the total flow of the CO<sub>2</sub> stream or the total mass or volume in CO<sub>2</sub> containers.
- (2) The standard used to operate and calibrate the equipment reported in (e)(1) of this section.
- (3) The number of days in the reporting year for which substitute data procedures were used for the following purpose:
  - (i) To measure quantity.
  - (ii) To measure concentration.
  - (iii) To measure density.

(f) Report the aggregated annual quantity of CO<sub>2</sub> in metric tons that is transferred to each of the following end use applications, if known:

- (i) Food and beverage.
- (ii) Industrial and municipal water/wastewater treatment.
- (iii) Metal fabrication, including welding and cutting.
- (iv) Greenhouse uses for plant growth.
- (v) Fumigants (e.g., grain storage) and herbicides.
- (vi) Pulp and paper.
- (vii) Cleaning and solvent use.
- (viii) Fire fighting.
- (ix) Transportation and storage of explosives.
- (x) Enhanced oil and natural gas recovery.
- (xi) Long-term storage (sequestration).
- (xii) Research and development.
- (xiii) Other.

(g) Each production process unit that captures a CO<sub>2</sub> stream for purposes of supplying CO<sub>2</sub> for commercial applications or in order to sequester or otherwise inject it underground when custody of the CO<sub>2</sub> is maintained shall report the percentage of that stream, if any, that is biomass-based during the reporting year.

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

In addition to the records required by §98.3(g) of subpart A of this part, you must retain the records specified in paragraphs (a) through (c) of this section, as applicable.

(a) The owner or operator of a facility containing production process units must retain quarterly records of captured or transferred CO<sub>2</sub> streams and composition.

(b) The owner or operator of a CO<sub>2</sub> production well facility must maintain quarterly records of the mass flow or volumetric flow of the extracted or transferred CO<sub>2</sub> stream and concentration and density if volumetric flow meters are used.

(c) Importers or exporters of CO<sub>2</sub> must retain annual records of the mass flow, volumetric flow, and mass of CO<sub>2</sub> imported or exported.

**§98.428 Definitions.**

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