(a) If a CEMS is used to measure emissions, retain records of all feedstock purchases in addition to the requirements in §98.37 for the Tier 4 Calculation Methodology.

(b) If a CEMS is not used to measure process CO_2 emissions, you must also retain the records specified in paragraphs (b)(1) through (b)(2) of this section:

(1) Records of all analyses and calculations conducted for reported data as listed in §98.76(b).

(2) Monthly records of carbon content of feedstock from supplier and/or all analyses conducted of carbon content.

§98.78 Definitions.

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

Subpart H—Cement Production

§98.80 Definition of the source category.

The cement production source category consists of each kiln and each in-line kiln/raw mill at any portland cement manufacturing facility including alkali bypasses, and includes kilns and in-line kiln/raw mills that burn hazardous waste.

§98.81 Reporting threshold.

You must report GHG emissions under this subpart if your facility contains a cement production process and the facility meets the requirements of either §98.2(a)(1) or (2).

§98.82 GHGs to report.

You must report:

(a) CO_2 process emissions from calcination in each kiln.

(b) CO_2 combustion emissions from each kiln.

(c) CH_4 and N_2O combustion emissions from each kiln. You must calculate and report these emissions under subpart C of this part (General Stationary Fuel Combustion Sources) by following the requirements of subpart C.

(d) CO_2, CH_4, and N_2O emissions from each stationary combustion unit other than kilns. You must report these emissions under subpart C of this part (General Stationary Fuel Combustion Sources) by following the requirements of subpart C.

§98.83 Calculating GHG emissions.

You must calculate and report the annual process CO_2 emissions from each kiln using the procedure in paragraphs (a) and (b) of this section.

(a) For each cement kiln that meets 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_2 emissions by operating and maintaining a CEMS to measure CO_2 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) For each kiln that is not subject to the requirements in paragraph (a) of this section, calculate and report the process and combustion CO_2 emissions from the kiln by using the procedure in either paragraph (c) or (d) of this section.

(c) Calculate and report under this subpart the combined process and combustion CO_2 emissions by operating and maintaining a CEMS to measure CO_2 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).

(d) Calculate and report process and combustion CO_2 emissions separately using the procedures specified in paragraphs (d)(1) through (d)(4) of this section.

(1) Calculate CO_2 process emissions from all kilns at the facility using Equation H–1 of this section:

$$CO_{2CMF} = \sum_{m=1}^{k} CO_{2Cli,m} + CO_{2rm} \qquad \text{(Eq. H-1)}$$

Where:

$CO_{2\ CMF}$ = Annual process emissions of CO_2 from cement manufacturing, metric tons.

$CO_{2\ Cli,m}$ = Total annual emissions of CO_2 from clinker production from kiln m, metric tons.

$CO_{2\ rm}$ = Total annual emissions of CO_2 from raw materials, metric tons.

k = Total number of kilns at a cement manufacturing facility.

(2) *CO_2 emissions from clinker production.* Calculate CO_2 emissions from each kiln using Equations H–2 through H–5 of this section.

$$CO_{2\ Cli,m} = \sum_{j=1}^{p}\left[\left(Cli_{,j}\right)*\left(EF_{Cli,j}\right)*\frac{2000}{2205}\right] + \sum_{i=1}^{r}\left[\left(CKD_{,i}\right)*\left(EF_{CKD,i}\right)*\frac{2000}{2205}\right] \qquad \text{(Eq. H-2)}$$

Where:

$Cli_{,j}$ = Quantity of clinker produced in month j from kiln m, tons.

$EF_{Cli,j}$ = Kiln specific clinker emission factor for month j for kiln m, metric tons CO_2/metric ton clinker computed as specified in Equation H–3 of this section.

$CKD_{,i}$ = Cement kiln dust (CKD) not recycled to the kiln in quarter i from kiln m, tons.

$EF_{CKD,i}$ = Kiln specific CKD emission factor for quarter i from kiln m, metric tons CO_2/metric ton CKD computed as specified in Equation H–4 of this section.

p = Number of months for clinker calculation, 12.

r = Number of quarters for CKD calculation, 4.

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

(i) *Kiln-Specific Clinker Emission Factor.* (A) Calculate the kiln-specific clinker emission factor using Equation H–3 of this section.

$$EF_{\text{Cli}} = \left(CLi_{CaO} - Cli_{ncCaO}\right)*MR_{CaO} + \left(Cli_{MgO} - Cli_{ncMgO}\right)*MR_{MgO} \qquad \text{(Eq. H-3)}$$

Where:

Cli_{CaO} = Monthly total CaO content of Clinker, wt-fraction.

Cli_{ncCaO} = Monthly non-calcined CaO content of Clinker, wt-fraction.

MR_{CaO} = Molecular-weight Ratio of CO_2/CaO = 0.785.

Cli_{MgO} = Monthly total MgO content of Clinker, wt-fraction.

Cli_{ncMgO} = Monthly non-calcined MgO content of Clinker, wt-fraction.

MR_{MgO} = Molecular-weight Ratio of CO_2/MgO = 1.092.

(B) Non-calcined CaO is CaO that remains in the clinker in the form of $CaCO_3$ and CaO in the clinker that entered the kiln as a non-carbonate species. Non-calcined MgO is MgO that remains in the clinker in the form of $MgCO_3$ and MgO in the clinker that entered the kiln as a non-carbonate species.

(ii) *Kiln-Specific CKD Emission Factor.* (A) Calculate the kiln-specific CKD emission factor for CKD not recycled to the kiln using Equation H–4 of this section.

$$EF_{\text{CKD}} = \left(CKD_{CaO} - CKD_{ncCaO}\right)*MR_{CaO} + \left(CKD_{MgO} - CKD_{ncMgO}\right)*MR_{MgO} \qquad \text{(Eq. H-4)}$$

Where:

CKD_{CaO} = Quarterly total CaO content of CKD not recycled to the kiln, wt-fraction.
CKD_{CaO} = Quarterly non-calcined CaO content of CKD not recycled to the kiln, wt-fraction.
MR_{CaO} = Molecular-weight Ratio of CO_2/CaO = 0.785.
CKD_{MgO} = Quarterly total MgO content of CKD not recycled to the kiln, wt-fraction.
CKD_{MgO} = Quarterly non-calcined MgO content of CKD not recycled to the kiln, wt-fraction.
MR_{MgO} = Molecular-weight Ratio of CO_2/MgO = 1.092.

(B) Non-calcined CaO is CaO that remains in the CKD in the form of $CaCO_3$ and CaO in the CKD that entered the kiln as a non-carbonate species. Non-calcined MgO is MgO that remains in the CKD in the form of $MgCO_3$ and MgO in the CKD that entered the kiln as a non-carbonate species.

(3) *CO_2 emissions from raw materials.* Calculate CO_2 emissions using Equation H–5 of this section:

$$CO_{2,rm} = \sum_{i=1}^{m} rm * TOCrm * \frac{44}{12} * \frac{2000}{2205} \qquad \text{(Eq. H-5)}$$

Where:

rm = The amount of raw material i consumed annually, tons/yr (dry basis).
$CO_{2,rm}$ = Annual CO_2 emissions from raw materials.
TOCrm = Organic carbon content of raw material i (dry basis), as determined in § 98.84(c) or using a default factor of 0.2 percent of total raw material weight.
M = Number of raw materials.
44/12 = Ratio of molecular weights, CO_2 to carbon.
2000/2205 = Conversion factor to convert tons to metric tons.

(4) Calculate and report under subpart C of this part (General Stationary Fuel Combustion Sources) the combustion CO_2 emissions from the kiln according to the applicable requirements in subpart C.

§ 98.84 Monitoring and QA/QC requirements.

(a) You must determine the weight fraction of total CaO and total MgO in CKD not recycled to the kiln from each kiln using ASTM C114–09, Standard Test Methods for Chemical Analysis of Hydraulic Cement (incoporated by reference, see § 98.7). The monitoring must be conducted quarterly for each kiln from a CKD sample drawn either as CKD is exiting the kiln or from bulk CKD storage.

(b) You must determine the weight fraction of total CaO and total MgO in clinker from each kiln using ASTM C114–07 Standard Test Methods for Chemical Analysis of Hydraulic Cement (incorporated by reference, see § 98.7). The monitoring must be conducted monthly for each kiln from a clinker sample drawn from bulk clinker storage.

(c) The total organic carbon contents (dry basis) of each raw material must be determined annually using ASTM C114–09 Standard Test Methods for Chemical Analysis of Hydraulic Cement (incorporated by reference, *see* § 98.7) or a similar industry standard practice or method approved for total organic carbon determination in raw mineral materials. The analysis must be conducted on sample material drawn from bulk raw material storage for each category of raw material (i.e., limestone, sand, shale, iron oxide, and alumina). Facilities that opt to use the default total organic carbon factor provided in § 98.83(d)(3), are not required to monitor for TOC.

(d) The quantity of clinker produced monthly by each kiln must be determined by direct weight measurement using the same plant instruments used for accounting purposes, such as weigh hoppers or belt weigh feeders.

(e) The quantity of CKD not recycled to the kiln by each kiln must be determined quarterly by direct weight measurement using the same plant instruments used for accounting purposes, such as weigh hoppers, truck weigh scales, or belt weigh feeders.