§ 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 (incorporated 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 C114–09 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 monthly clinker sample drawn from bulk clinker storage if storage is dedicated to the specific kiln, or from a monthly arithmetic average of daily

\[ EF_{CKD} = (CKD_{CaO} - CKD_{ncCaO}) \times MR_{CaO} + (CKD_{MgO} - CKD_{ncMgO}) \times MR_{MgO} \quad \text{(Eq. H-4)} \]

Where:
- \( CKD_{CaO} \) = Quarterly total CaO content of CKD not recycled to the kiln, wt-fraction.
- \( CKD_{ncCaO} \) = 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.
- \( CKD_{ncMgO} \) = 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.

\[ CO_{2,rm} = \sum_{i=1}^{m} rm \times TOC_{rm} \times \frac{44}{12} \times \frac{2000}{2205} \quad \text{(Eq. H-5)} \]

Where:
- \( rm \) = The amount of raw material \( i \) consumed annually, tons/yr (dry basis) or the amount of raw kiln feed consumed annually, tons/yr (dry basis).
- \( CO_{2,rm} \) = Annual CO\(_2\) emissions from raw materials.
- \( TOC_{rm} \) = Organic carbon content of raw material \( i \) or organic carbon content of combined raw kiln feed (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 or 1 if calculating emissions based on combined raw kiln feed.
- \( \frac{44}{12} \) = Ratio of molecular weights, CO\(_2\) to carbon.
- \( \frac{2000}{2205} \) = 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.

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clinker samples drawn from the clinker conveying systems exiting each kiln.

(c) The total organic carbon content (dry basis) of raw materials 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 either on sample material drawn from bulk raw kiln feed storage or 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 of clinker using the same plant techniques used for accounting purposes, such as reconciling weigh hopper or belt weigh feeder measurements against inventory measurements. As an alternative, facilities may also determine clinker production by direct measurement of raw kiln feed and application of a kiln-specific feed-to-clinker factor. Facilities that opt to use a feed-to-clinker factor must verify the accuracy of this factor on a monthly basis.

(e) The quantity of CKD not recycled to the kiln generated by each kiln must be determined quarterly by careful chemical analysis of feed material and CKD material from each kiln using well documented analytical and calculational methods or the appropriate industry standard practice.

(f) For each missing value of monthly clinker production the substitute data value must be the best available estimate of the monthly clinker production based on information used for accounting purposes, or use the maximum tons per day capacity of the system and the number of days per month.

(g) For each missing value of monthly raw material consumption the substitute data value must be the best available estimate of the monthly raw material consumption based on information used for accounting purposes, or use the maximum tons per day capacity of the system and the number of days per month.