

**NATIONAL EMISSION STANDARDS FOR HAZARDOUS AIR POLLUTANTS (NESHAP)
FOR THE PORTLAND CEMENT MANUFACTURING INDUSTRY SUBPART LLL**

Rule Guidance

Spring 2013

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PURPOSE AND GOALS FOR GUIDANCE

This document is intended for the use of EPA staff, State and Local regulatory agencies and their staff, and industry plant managers. The discussion in this document is intended solely as guidance. It does not impose legally binding requirements on the United States Environmental Protection Agency, state regulators, or the regulated industry. As new issues emerge on Subpart LLL, this guidance will be updated at <http://www.epa.gov/airquality/cement/actions.html> and a notice will be sent to industry and regulatory contacts for distribution.

POLICY AND TECHNICAL CONTACTS

- Sector Policies and Programs Division, Measurement Policy Group (MPG) and Technical Contacts: Steffan Johnson, (919) 541-4790, or Gerri Garwood, (919) 541-2406, or other MPG staff for technical questions associated with determination of Organic HAP operating limits.
- Regulatory Contact: Sharon Nizich, (919) 541-2825
- Office of Enforcement and Compliance Assurance Contact: Patrick Yellin (202) 564-2970

INDIVIDUAL SECTION GUIDANCE

Section 63.1343 – Emissions Standards

As stated in Section 63.1343(a), “all HAP emissions limits for kilns, clinker coolers, and raw material dryers currently in effect continue to apply until the compliance date of the new limits listed in Section 63.1343(b), or until the source certifies compliance with the new limits listed in Section 63.1343(b), whichever is earlier.” These limits were promulgated in the 1999 or 2006 Portland Cement NESHAP standards and amendments thereto. Please refer to the table of those limits below.

Emissions limits in effect prior to September 9, 2010
for Kilns (Rows 1-4), Clinker Coolers (Row 5), and Raw Material Dryers (Rows 6-9)

	If your source is ...	and it commence construction or reconstruction ...	And is located at ...	Then your emissions limits and units are ¹ :
1.	An existing kiln	on or prior to December 2, 2005	A major source	PM - 0.3 lb/ton feed Opacity - 20 percent D/F - 0.2 ² ng/dscm (TEQ) THC - 50 ^{3,4} ppmvd
2.	An existing kiln ⁸	after December 2, 2005	A major source	PM - 0.3 lb/ton feed Opacity - 20 percent D/F - 0.2 ² ng/dscm (TEQ) THC - 20 ^{5,7} ppmvd Mercury - 41 ⁶ ug/dscm
3.	An existing kiln	on or prior to December 2, 2005	An area source	D/F - 0.2 ² ng/dscm (TEQ) THC - 50 ^{3,4}
4.	An existing kiln	after December 2, 2005	An area source	D/F - 0.2 ² ng/dscm (TEQ) THC - 20 ^{5,7} ppmvd Mercury - 41 ⁶ ug/dscm
5.	An existing clinker cooler	NA	A major source	PM - 0.1 lb/ton feed Opacity - 10 percent
6.	An existing raw material dryer	on or prior to December 2, 2005	A major source	THC - 50 ^{3,4} ppmvd Opacity - 10 percent
7.	An existing raw material dryer	after December 2, 2005	A major source	THC - 20 ^{5,7} ppmvd Opacity - 10
8.	An existing raw material dryer	on or prior to December 2, 2005	An area source	THC - 50 ^{3,4} ppmvd
9.	An existing raw material dryer	after December 2, 2005	An area source	THC - 20 ^{5,7} ppmvd

Footnotes Emissions limits in effect prior to September 9, 2010 table:

¹ All emission limits expressed as a concentration basis (ppmvd, ng/dscm) are corrected to seven percent oxygen.

² If the average temperature at the inlet to the first particulate matter control device (fabric filter or electrostatic precipitator) during the D/F performance test is 400 °F or less, this limit is changed to 0.4 ng/dscm (TEQ).

³ Reported as propane on a 30 day block average (64 FR 31932).

⁴ Only applies to Greenfield kilns or raw material dryers. Note that a new greenfield kiln is a kiln constructed after March 24, 1998 at a site where there are no existing kilns.

⁵ As an alternative, a source may demonstrate a 98 percent reduction in THC emissions from the exit of the kiln or raw material dryer to discharge to the atmosphere. Inline raw mills are considered to be an integral part of the kiln.

⁶ As an alternative, a source may route the emissions through a packed bed or spray tower wet scrubber with a liquid-to-gas ratio of 30 gallons per 1000 actual cubic feet per minute or more and meet a site-specific emission limit based on the measured performance of the wet scrubber.

⁷ For facilities complying with the 20 ppmv THC emissions limit, any hourly average THC concentration in any gas discharged from a raw material dryer, the main exhaust of a Greenfield kiln, or the main exhaust of a kiln or inline kiln/raw mill, exceeding 20 ppmvd, reported as propane, corrected to seven percent oxygen, is a violation of the standard.

⁸ For purposes of this table an existing kiln is defined as a kiln where construction commenced prior to May 6, 2009 (i.e., it is an existing kiln under the 2012 rule definitions). This same kiln may have been initially defined as a new kiln in the 1999 or 2006 rules and is thus also subject to new source limits from previous rules.

Sections 63.1345, 63.1348, and 63.1350 – Opacity Limits and Monitoring

The opacity limits and the requirement for opacity monitoring of kilns and clinker coolers at major sources have been removed (effective date September 2015), since facilities will now be required to use a particulate matter continuous parameter monitoring system (PM CPMS) for demonstration of continuing compliance with PM emissions limits. However, Section 63.1345 still requires a 10 percent opacity limit for raw material, clinker, or finished product storage bins, conveying system transfer points, bagging systems, bulk loading or unloading systems, raw and finish mills, and raw material dryers. For demonstration of continuous compliance, the rule allows for use of either a continuous opacity monitoring system (COMS) or Method 22. If a source has a COMS, they must follow 63.1348(b)(3)(i) and 63.1350(f)(4)(i), but if they do not have a COMS, they must follow 63.1350(f)(iv).

Section 63.1346(g)(3) – Startup and Shutdown Work Practices

This section states that all air pollution control devices must be turned on and operating prior to combustion of any fuels. This requirement is intended for air pollution control devices that are used to reduce HAP, and is not intended for non-HAP pollutants regulated under other standards (since the subpart LLL standards apply only to HAP emissions). Thus, air pollution control devices for NO_x or SO_x control, for example, would not be covered under this subsection (unless these devices are used to demonstrate compliance with HAP emission standards (e.g. SO_x control device used for purposes of parametric monitoring of the HCl standard)) (see 78 FR 10011/1 (Feb. 13, 2013)).

Section 63.1349(b)(7) – Total Organic HAP Testing and Setting the THC Operating Limit

A source with an in line raw mill must do an initial performance test for each of two conditions: one with the raw mill on and one with the raw mill off. Below is a step by step example for setting a THC operating limit when a facility has an in line raw mill.

Organic HAP Test. Use Method 320, Method 18, or ASTM D6348-03 or a combination of the methods. Method 320 and ASTM D6348-03 both employ an FTIR instrument that can detect a number of organic HAP simultaneously; however interferences in some spectra exist such that Method 18 may be necessary to target individual HAP and conduct GC analysis of the sample.

THC CEMS. At the same time as the organic HAP test, a THC CEMS must be in operation. See 63.1349 (b)(7)(ii). The CEMS measurement scale must be capable of reading THC concentrations from zero to a level equivalent to two times your highest THC emissions average determined during the performance test. See 63.1349(b) (7) (v).

Performance testing and THC monitoring must be conducted both while the raw mill is on and while the raw mill is off. When testing is complete, you must calculate both a weighted average organic HAP emission test result and a weighted average THC value using the fraction of the time the raw mill is on and the fraction of the time that the raw mill is off. See 63.1349 (b)(7) (iii). The fractions of raw mill on/off are determined based on historical representative averages. The operating limit will be calculated using these weighted averages.

WEIGHTED AVERAGING

Organic HAP Averaging

The following is an example of how to weight the average to determine both whether the facility is in compliance, and whether scaling would be allowed.

3 run average organic HAP measurement with mill off = 5.6 ppmv

3 run average organic HAP measurement with mill on = 7.7 ppmv

Percent operating time with mill on = 90%

Percent operating time with mill off = 10%

Time weighted organic HAP emission = $(y*t)+(x*(1-t))$

Where:

y = Average organic HAP value during mill on operations, ppmv

t = Percentage of operating time with mill on

x = Average organic HAP value during mill off operations, ppmv

(1-t) = Percentage of operating time with mill off

So in the above example we have: $(7.7 * 0.9) + (5.6 * 0.1)$, therefore the time weighted organic HAP concentration would be $(6.93 + 0.56)$ or 7.49 ppmv

THC Continuous Monitoring Averaging

As specified in Section 63.1349(b)(7)(ii), at the same time that you are conducting the performance test for total organic HAP, you must also determine a site-specific THC emissions limit by operating a THC CEMS in accordance with the requirements of §63.1350(j). The duration of the performance test must be at least 3 hours and the average THC concentration (as calculated from the 1-minute averages) during the 3-hour test period must be calculated. It is permissible to extend the testing time of the organic HAP performance test beyond 3 hours if you believe extended testing is required to adequately capture THC variability over time.

You must establish your THC operating limit and determine compliance with it according to paragraphs (b)(7)(vii) through (viii) of section 63.1349. (Please note the final rule lists it as (a)(7)(vii) through (viii), but that was a typographical error and will be corrected through a technical correction). Note that there are two different procedures to establish the THC limit depending on the measured level of organic HAP. If the measured weighted average organic HAP level is 9 ppmv or above, you establish the THC operating limit as the weighted average of the raw mill on/off measured THC levels. Continuing with the example stated above,

3 run average organic THC measurement with mill off = 30 ppmv

3 run average organic THC measurement with mill on = 40 ppmv

Percent operating time with mill on = 90%

Percent operating time with mill off = 10%

Time weighted organic HAP emission = $(y*t)+(x*(1-t))$

Where:

y = Average organic THC value during mill on operations, ppmv

t = Fraction of operating time with mill on.

x = Average organic THC value during mill off operations, ppmv

(1-t) = Percentage of operating time with mill off.

So in the above example we have: $(40 * 0.9) + (30 * 0.1)$, therefore the time weighted THC operating limit would be $(36 + 3)$ or 39 ppmv

If the measured weighted average organic HAP is less than 9 ppmv, Section 63.1349(b)(7)(iv) provides a scaling option for setting the THC site-specific parametric operating limit. The scaling procedure estimates the expected THC emission level that would occur if the measured organic HAP level was exactly 9 ppmv (versus the 7.49 ppmv level in the example above).

This is calculated by using the following formula which is found under 63.1349(b)(7)(vii)(B):

$$T = \left(\frac{9}{Y_1}\right) * X_1$$

Where:

T = the 30-day operating limit for a parametric THC instrument, ppmvw

Y_1 = the average organic HAP concentration from performance testing, and

X_1 = the average parametric THC concentration during performance testing, ppmvw

So in the above example we have: $T = (9/7.49) * 39$, therefore $T = 47$ ppmvw

PM CPMS scaling

Section 63.1349(b) (1)(i)(A) states: "Your PM CPMS must provide a 4-20 milliamp output and the establishment of its relationship to manual reference method measurements must be determined in units of milliamps."

We note that many new CEMs no longer use an analog signal output (such as 4-20 milliamp) but make use of a digital signal output instead. Conversion of a digital signal to analog, then transporting that signal down a stack to an analog display that reads the analog signal, then reconvertng that back to a digital signal before sending that signal to the Data Acquisition Handling System, requires the installation of equipment and unnecessary complexity which EPA did not intend. This guidance is directed at demonstrating the equivalency of each signal output and providing a means of compliance with the rule when a source uses an instrument equipped only with a digital signal output.

It is important to understand that any digital or analog value from an instrument output uses some percentage of the output scale available to the instrument, between 0 and 100%

of the output range. Think of this in terms of some fraction of the scale between zero and 100.

The range of any digital signal from zero to 100% covers the range of the digital increments available to the signal. This depends on how many “bits” the digital signal is composed of, and the granularity of the signal value increases proportional to the number of bits carried. An eight bit digital signal has 2^8 , or 256 signal increments, a twelve bit signal as 2^{12} or 4096 signal increments, a sixteen bit digital signal as 2^{16} or 65536 signal increments and so on. In this manner, fifty percent of a digital scale is represented by a value at half of the digital signal increments.

The range of a 4-20 milliamp signal is just that, from 4 to 20 milliamps; or a range of 16 milliamps between a zero value (4) and full (100%) scale (20). Fifty percent of a 4-20 milliamp signal is represented by a value of 12 milliamps $((20 - 4) / 2) + 4$. In this manner a zero to full scale response of a 4 to 20 milliamp signal involves increasing a 4 milliamp reading a total of 16 milliamps until one reaches 20 milliamps. So a 100% rise in signal on a 4 to 20 milliamp output equates to $100 / 16$ or 6.25% of full scale *per milliamp*.

What remains constant about any output signal is that no matter how many increments one is able to divide the signal into, one is always able to determine what percent of output range is indicated by the value of the signal increment itself.

Using this information it is possible to identify the percent of scale that would be representative of 75% of the emission limit on a digital output system in much the same manner the rule prescribes determination of this number on a 4-20 milliamp signal output.

For example, let’s take a digital signal output from a PM CPMS instrument that reads zero when the instrument is not exposed to any particulate matter in the flue gas; this value is equivalent to the instrument zero value in 63.1349(1)(iii)(C) Equation 4, or “z”:

$$R = \frac{Y_1}{(X_1 - Z)} \quad (\text{Eq. 4})$$

Where:

R = The relative lb/ton-clinker per milliamp for your PM CPMS.

Y_1 = The three run average lb/ton-clinker PM concentration.

X_1 = The three run average milliamp output from your PM CPMS.

z = The milliamp equivalent of your instrument zero determined from (b)(1)(iii)(A).

In this example the zero bit from a digital signal is equivalent to a 4 milliamp zero signal, with a value of $z = 0$.

The value of X_1 for this equation would be obtained by monitoring the average digital signal output rather than the average milliamp signal output from the PM CPMS during the PM performance test. For the purposes of this example we set this value at the 1268th signal increment above zero on a 12 bit system (where 4096 increments are possible). This equates to $1268 / 4096$ or 30.957% of the instrument scale. Note that this would represent 8.953 milliamps if the instrument had an analog output.

The value of Y_1 in this equation remains the three run average lb/ton-clinker PM concentration determined by the compliance test. For the purposes of this example we will assume that this value was determined to be 0.04 lb/ton-clinker.

To solve for R with a digital signal output in Equation 4 we would use

$$R = 0.04 / ((1268) - 0)$$

Therefore $R = 0.04 / 1268$ or

$$R = 0.00003154574 \text{ lb-ton clinker per increment (rather than per milliamp)}$$

Carrying this value of R forward we can determine our source specific 30-day rolling average operating limit at 75% of the emission limit using the procedures in 63.1349(1)(iii)(D) as follows:

(D) Determine your source specific 30-day rolling average operating limit using the lb/ton-clinker per milliamp value from Equation 4 in Equation 5, below. This sets your operating limit at the PM CPMS output value corresponding to 75 percent of your emission limit.

$$O_1 = z + \frac{0.75 (L)}{R} \quad (\text{Eq. 5})$$

This gives us the following:

$$O_1 = 0 + (0.75 * 0.07 \text{ lb/ton clinker}) / 0.00003154574 \text{ OR}$$

$$O_1 = 0.0525 / .00003154574 \text{ OR}$$

$$O_1 = 1664.25 \text{ digital signal increments OR}$$

40.63 % of the instrument scale.

If the instrument used an analog output we could calculate the milliamp value by multiplying 16 (the amount of analog milliamp increments) by the percent of scale above, so $16 * 0.4063 = 6.500$ and then we would add 4 (to represent our zero of four milliamps plus the percent scale) which places the 75% operating limit for an analog output signal at 10.5 milliamps on the 4-20 milliamp scale.

75% scaling for PM Performance Test

Note that the intent of Section 63.1349(b)(1)(i) was for the operator to use a weighted average for when the mill is on and the mill is off (as in all mill on/mill off situations). This weighted average would be calculated the same as the weighted average developed and discussed above under the paragraph, "THC Continuous monitoring averaging". However note that the units for averaging PM CPMS output are in milliamp, not ppmv.

Section 63.1349(b)(6)(iii) Choosing to Monitor SO₂ Emissions as Alternative to Section 63.1349(b)(6)(B)

As noted above, the rule allows use of SO₂ parametric monitoring to demonstrate continuous compliance with the HCl standard. Monitoring of SO₂ using a CEMS and setting an SO₂ operating limit must be done when the mill is on and the mill is off. As in the example above for organic HAP scaling, a weighted average should be calculated. The 75% adjustment however, does not apply for setting an SO₂ operating limit.

In addition, please note there is no restriction on the amount of sorbent injection used as long as the SO₂ limit is met. However, if the SO₂ control device is used intermittently, then an HCl monitor as described in 63.1349(b)(6)(i)(B) would be required, since Section 63.1350(l) allows SO₂ parametric monitoring only on a continuous basis.

MISCELLANEOUS ERRORS IN CROSS REFERENCES

Section 63.1349(b)(1)(viii) Performance testing requirements

Note that the first term "EC" for the coal mill exhaust should have been labeled, "Ecm." Thus, currently it reads as if there are two definitions for Ec. Below please find the corrected equation and corrected label for the hourly PM coal mill stack emissions.

(b)(1)

(viii) When there is an alkali bypass and/or an inline coal mill with a separate stack associated with a kiln, the main exhaust and alkali bypass and/or inline coal mill must be tested simultaneously and the combined emission rate of PM from the kiln and alkali bypass and/or inline coal mill must be computed for each run using Equation 8 of this section.

$$E_{Cm} = \frac{E_K + E_B + E_C}{P}$$

Where:

E_{Cm} = Combined hourly emission rate of PM from the kiln and bypass stack and/or inline coal mill, lb/ton of kiln clinker production.

E_K = Hourly emissions of PM emissions from the kiln, lb.

E_B = Hourly PM emissions from the alkali bypass stack, lb.

E_C = Hourly PM emissions from the inline coal mill stack, lb.

P = Hourly clinker production, tons.

Section 63.1350 Monitoring Requirements

Section 63.1350(o)(3) has a reference to paragraph (m) but this actually points to paragraph (o) as in the following:

(3) You must submit the application for approval of alternate monitoring requirements no later than the notification of performance test. The application must contain the information specified in paragraphs (m)(3)(i) through (iii) of this section:

This section above should read:

(3) You must submit the application for approval of alternate monitoring requirements no later than the notification of performance test. The application must contain the information specified in paragraphs (o)(3)(i) through (iii) of this section.

Section 63.1354 Reporting requirements

Section 63.1354(b)(9)(i) through Section 63.1354(b)(9)(v) has some misplaced cross references. Please note the corrections in italics below:

(b) The owner or operator of an affected source shall comply with the reporting requirements specified in § 63.10 of the general provisions of this part 63, subpart A as follows:

- (9) The owner or operator shall submit a summary report semiannually which contains the information specified in § 63.10(e)(3)(vi). In addition, the summary report shall include:
- (i) All exceedances of maximum control device inlet gas temperature limits specified in **§ 63.1344(a) and (b)**; *Reference should be 63.1346(a) and (b)*
 - (ii) All failures to calibrate thermocouples and other temperature sensors as required under **§ 63.1350(f)(7)** of this subpart; and

There is no 63.1350(f)(7). *Reference should be 63.1350(g)(1)(iii)*
 - (iii) All failures to maintain the activated carbon injection rate, and the activated carbon injection carrier gas flow rate or pressure drop, as applicable, as required under **§ 63.1344(c)**. *Reference should be 63.1346(c)(2)*
 - (iv) The results of any combustion system component inspections conducted within the reporting period as required under **§ 63.1350(i)**. *Reference should be 63.1347(a)(3)*
 - (v) All failures to comply with any provision of the operation and maintenance plan developed in accordance with **§ 63.1350(a)**. *Reference should be 63.1347(a)*

EPA intends to make these corrections by means of a technical correction notice.