**Appendix A**

**CSAPR U States Regulations for Cement Kilns**



**OTC State Regulations for Cement Kilns**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **State** | **NOx Limit (lbs/ton clinker)**  **30 day rolling average** | | | | **Number of facilities in the state** | **Regulations** |
| **Long Dry** | **Long Wet** | **Pre-heater** | **Pre-calciner** |
| **MD** | 3.4 | None in the state | 2.4\* | 2.4\* | 2 | COMAR 26.11.30: <http://www.dsd.state.md.us/comar/SubtitleSearch.aspx?search=26.11.30>. |
| **ME** | 2.33 | - | - | - | 1 | EPA Consent Agreement (Docket 01-2013-0053, Sept 2013) |
| **PA** | 3.44 | 3.88 | 2.36 | 2.36 | 7 | Final RACT 2 Rule (46 Pa.B. 2036, April 23, 2016): <http://www.pabulletin.com/secure/data/vol46/46-17/694.html> |
| **NY** | 2.88 (using SNCR) (SCC: 3-05-006-06) | 5.2(SCC: 3-05-007-06) |  |  | 2 | Subpart 220-1 - Effective: 7/11/2010 Submitted: 8/19/2010; Final: 77 FR 13974, 78 Fr 41846: <https://www3.epa.gov/region02/air/sip/ny_reg.htm> |
| **VA - OTR jurisdiction** | No Limits | | | | | |

## Uncontrolled NOx Emission Data from the EPA 2000 ACT[[1]](#footnote-1)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **1994 ACT Document** | | **AP-42** | **2000 State Data** | |
| **Cement kiln type** | **Average**  **(lb/ton clinker)** | **Range**  **(lb/ton clinker)** | **(lb/ton clinker)** | **Average rate (lb/ton clinker)** | **Range of rates (lb/ton clinker)** |
| Wet kiln | 9.7 | 3.6 to 19.5 | 7.4 | 6.2 | 1.9 - 13.4 |
| Long dry kiln | 8.6 | 6.1 to 10.5 | 6.0 | 4.5 | 2.5 - 7.1 |
| Preheater kiln | 5.9 | 2.5 to 11.7 | 4.8 | 1.7 | 0.4 - 3.7 |
| Precalciner kiln | 3.8 | 0.9 to 7.0 | 4.2 | 2.9 | 1.1 - 5.6 |

## Cement Plant Settlements[[2]](#footnote-2)

* [Lone Star Industries, Inc. (Buzzi)](https://www.epa.gov/enforcement/lone-star-industries-inc-buzzi-clean-air-act-settlement) (8/01/16)
* [Cemex, Inc.,](https://www.epa.gov/enforcement/cemex-inc-global-clean-air-act-settlement) (07/27/16)
* [Ash Grove](https://www.epa.gov/enforcement/ash-grove-cement-corporation) (6/19/13)
* [Holcim Hagerstown Maryland](https://www.epa.gov/enforcement/holcim-us-inc-settlement) (7/11/13)
* [Cemex Inc. (Lyons)](https://www.epa.gov/enforcement/cemex-lyons-plant-settlement) (4/19/13)
* [Essroc Cement Company](https://www.epa.gov/enforcement/essroc-cement-company-clean-air-act-settlement-0) (12/29/11)
* [California Portland Cement Company](https://www.epa.gov/enforcement/california-portland-company-settlement) (12/15/11)
* [CEMEX Fairborn Plant](https://www.epa.gov/enforcement/cemex-fairborn-plant-clean-air-act-settlement) (2/10/11)
* [Lafarge North America, Inc.](https://www.epa.gov/enforcement/lafarge-north-america-inc-clean-air-act-settlement) (1/21/10)
* [Cemex (California)](https://www.epa.gov/enforcement/cemex-california-cement-clean-air-act-settlement) (1/15/09)
* [St. Mary's Cement (Illinois)](https://www.epa.gov/enforcement/st-marys-cement-inc-clean-air-act-settlement) (9/08/08)

Currently Maryland is the only OTR State with a facility under the EPA enforcement actions. Maryland has one facility under EPA enforcement action, listed as having a long dry kiln at the Holcim facility in Hagerstown MD. The facility started operation in 1903, however a long kiln has been in operation since 1971. Between 2003-2007 the company made modifications and upgrades, including installing a mid-kiln tire injection system, in order to use whole tires as a fuel source which resulted in significant net increases in SO2 emissions, but without first obtaining the required permit.

Holcim was part of the EPA enforcement initiative, and on 7/11/13 a Consent Decree was enacted which states the following requirements:

***SO2 Emission Controls****: By no later than September 9, 2016, Holcim will: (1) convert the kiln from the current kiln configuration to a preheater/precalciner kiln configuration; (2) install and continuously operate a Lime Injection System for the control of SO2 emissions; (3) comply with an SO2 30-day rolling average emission rate limit of 1.6 lbs/ton; and (4) comply with an SO2 12-month rolling total emission tonnage limit of 655 tons.*

***NOx Emission Controls****: By no later than September 9, 2016, Holcim will (1) install and continuously operate SNCR technology for the control of NOx emissions; and (2) comply with a NOx 30-day rolling average emission rate limit of 1.8 lbs/ton.*

Holcim has converted the cement kiln to a preheater/precalciner and is currently meeting the NOx emission standards of this order. In addition Maryland, has adopted regulations effective as of July 20, 2015, with new RACT rates for cement plants.

**Cement Kilns in CSAPR U and OTR States\***

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **State** | **Facility** | **2014 NOx Emissions (TPY)** | **Number of Units** | | | | **Potential Reduction Calculation Annual tons(Regardless of Regulations)** | **High Range NOx reduction** | **Potential Reduction Calculation Annual tons(Regardless of Regulations)** | **Low Range NOx reduction** |
|  |  |  | **Long Dry** | **Long Wet** | **Pre-heater** | **Pre-calciner (PH/PC - 5 stage)** | **Apply NOx reduction %:**  **Long Wet kiln 75%**  **Long Dry Kiln 50%, Preheater Kiln 25%** | **State Total Reduction (tons)** | **Apply NOx reduction %:**  **Long Wet kiln 50%,**  **Long Dry Kiln 20%,**  **Preheater Kiln 0%** | **State Total Reduction (tons)** |
| **AL** | National Cement Co of Alabama | 1,776.0 |  | **1** |  |  | 1332 | **2099** | 888 | **1194.8** |
| Argos Cement, LLC | 1,073.0 |  |  |  | **1** | 0 |  | 0 |  |
| LEHIGH CEMENT COMPANY | 1,534.0 | **2** |  |  |  | 767 |  | 306.8 |  |
| Holcim Inc | 2,168.0 |  |  |  | **1** | 0 |  | 0 |  |
| CEMEX Inc, Demopolis (2016 Settlement) | 2,274.0 |  |  |  | **1** | 0 |  | 0 |  |
| **AR** | Ash Grove Cement Company Foreman Cement Plant | 1,569.0 | **1** |  |  |  | 784.5 | **784.5** | 313.8 | **313.8** |
| **IA** | LAFARGE NORTH AMERICA, INC | 1,602.0 | **1** |  |  |  | 801 | **801** | 320.4 | **320.4** |
| LEHIGH CEMENT COMPANY - MASON CITY | 677.0 |  |  |  | **1** | 0 |  | 0 |  |
| **IL** | Illinois Cement Co (2008 Settlement) | 1,367.0 |  |  |  | **1** | 0 | **317** | 0 | **126.8** |
| Lafarge Midwest Inc | 634.0 | **2** |  |  |  | 317 |  | 126.8 |  |
| **IN** | LEHIGH CEMENT COMPANY LLC | 1,859.0 |  |  | **1** |  | 464.75 | **2112.05** | 0 | **1208** |
| LONE STAR INDUSTRIES INC | 1,318.0 |  | **1** |  |  | 988.5 |  | 659 |  |
| ESSROC CEMENT CORP (Sold to Lehigh as of May 1, 2017) 2 Locations (2011 Settlement) | 1,098.0 |  | **2** | **1** |  | 658.8 |  | 549 |  |
| **KS** | Ash Grove Cement – Chanute | 1,532.0 |  |  |  | **1** | 0 | **0** | 0 | **0** |
| Monarch Cement | 1,323.0 |  |  |  | **1** | 0 |  | 0 |  |
| **KY** | Kosmos Cement Company – Cemex (2016 Settlement) | 1,454.0 |  |  |  |  |  |  |  |  |
| **MD** | Lehigh Cement Company – Union Bridge | 2,902.0 | **1** |  |  |  | 1451 | **2037.5** | 580.4 | **815** |
| Holcim (US), Inc. – Hagerstown (2013 Settlement) | 1,173.0 | **1** |  |  |  | 586.5 |  | 234.6 |  |
| **ME** | DRAGON PRODUCTS CO – THOMASTON | 1,105.0 |  |  |  | **1** | 0 | **0** | 0 | **0** |
| **MI** | St. Marys Cement, Inc. (U.S.); ST MARYS CEMENT | 2,407.6 |  |  |  | **1** | 0 | **2336** | 0 | **934.4** |
| LAFARGE MIDWEST INC. | 4,672.0 | **5** |  |  |  | 2336 |  | 934.4 |  |
| **MO** | RIVER CEMENT CO. DBA BUZZI UNICEM USA-SELMA PLANT | 3,330.0 |  |  |  | **1** | 0 | **1575** | 0 | **630** |
| HOLCIM (US) INC-STE. GENEVIEVE PLANT | 3,150.0 | **1** |  |  |  | 1575 |  | 630 |  |
| AUDUBON MATERIALS, LLC-SUGAR CREEK PLANT (2010 Settlement) | 1,074.0 |  |  |  | **1** | 0 |  | 0 |  |
| CONTINENTAL CEMENT COMPANY LLC-ILASCO PLANT | 1,056.0 |  |  |  | **1** | 0 |  | 0 |  |
| BUZZI UNICEM USA –CAPE GIRARDEAU (2016 Settlement) | 1,012.0 |  |  |  | **1** | 0 |  | 0 |  |
| **NY** | LAFARGE BUILDING MATERIALS INC | 1,847.0 |  | **1** |  |  | 1385.25 | **1693.75** | 923.5 | **1046.9** |
| LEHIGH NORTHEAST CEMENT COMPANY | 617.0 | **1** |  |  |  | 308.5 |  | 123.4 |  |
| **OH** | Lafarge North America – Paulding Plant (0363000002) | 798.0 |  | **2** |  |  | 598.5 | **836** | 399 | **494** |
| CEMEX Construction Materials Atlantic, LLC (0829700165) (2011 Settlement) | 475.0 | **1** |  |  |  | 237.5 |  | 95 |  |
| **OK** | PRYOR CEMENT FACLTY | 2,851.0 | **6** |  |  |  | 1425.5 | **2776** | 570.2 | **1110.4** |
| TULSA ROGERS CNTY LINE | 1,434.0 | **2** |  |  |  | 717 |  | 286.8 |  |
| ADA PLT | 1,267.0 | **2** |  |  |  | 633.5 |  | 253.4 |  |
| **PA** | HERCULES CEMENT CO LP/STOCKERTOWN | 1,559.0 | **2** |  |  |  | 779.5 | **2490.25** | 311.8 | **1077.9** |
| LEHIGH CEMENT CO LLC/EVANSVILLE CEMENT PLT & QUARRY | 1,419.0 | **2** |  |  |  | 709.5 |  | 283.8 |  |
| ESSROC/NAZARETH LOWER CEMENT PLT I II III (2011 Settlement) | 1,043.0 | **1** |  |  |  | 521.5 |  | 208.6 |  |
| KEYSTONE PORTLAND CEMENT/EAST ALLEN | 722.0 |  |  |  | **1** | 0 |  | 0 |  |
| LAFARGE CORP/WHITEHALL PLT | 346.0 | **2** |  |  |  | 173 |  | 69.2 |  |
| ARMSTRONG CEMENT & SUPPLY/WINFIELD | 315.0 |  | **2** |  |  | 236.25 |  | 157.5 |  |
| LEHIGH CEMENT CO LLC/YORK OPERATIONS | 94.0 |  | **1** |  |  | 70.5 |  | 47 |  |
| **TN** | Cemex – Knoxville Plant (2016 Settlement) | 1,598.0 |  |  |  | **1** | 0 | **0** | 0 | **0** |
| Signal Mountain Cement Co. | 910.0 |  |  |  | **1** | 0 |  | 0 |  |
| Cemex, Inc. | 12.0 |  |  |  |  |  |  |  |  |
| **TX** | MIDLOTHIAN PLANT(s)\* | 3,210.0 |  |  |  |  |  | **1654.25** |  | **320.3** |
| \* Holcim Midlothian – 1800 Dove Lane | 956.0 |  |  |  | **1** | 0 |  | 0 |  |
| \* Martin Mareitta – old TXI | 604.0 | **1** | **2** |  |  | 362.4 |  | 120.8 |  |
| \* Ash Grove – 1650 (2013 Settlement) | 1,650.0 |  |  |  | **1** | 0 |  | 0 |  |
| 1604 PLANT – Alamo Cement, San Antonio | 2,486.0 |  |  |  | **1** | 0 |  | 0 |  |
| MARYNEAL CEMENT PLANT – Buzzi Unicem | 2,417.0 |  |  | **3** |  | 604.25 |  | 0 |  |
| TEXAS LEHIGH CEMENT CO – Buda TX | 2,388.0 |  |  |  | **2** | 0 |  | 0 |  |
| BALCONES PLANT – Cemex –New Braunfels (2016 Settlement) | 2,324.0 |  |  |  | **2** | 0 |  | 0 |  |
| HUNTER PLANT – New Braunfels | 1,399.0 |  |  |  | **2** | 0 |  | 0 |  |
| ODESSA CEMENT PLANT – Cemex (2016 Settlement) | 1,314.0 |  |  | **1** |  | 328.5 |  | 0 |  |
| PORTLAND CEMENT – Capital Aggregates – San Antonio | 623.0 |  |  |  | **2** | 0 |  | 0 |  |
| LEHIGH PORTLAND CEMENT – WACO TX | 399.0 |  | **1** |  |  | 359.1 |  | 199.5 |  |
| **VA** | Roanoke Cement Company | 2,007.0 |  |  |  | **1** | 0 | **0** | 0 | **0** |
| **WV** | ESSROC CEMENT – MARTINSBURG (2011 Settlement) | 1,264.0 |  |  |  | **1** | 0 | **0** | 0 | **0** |
|  |  | **82,277.6** | **NOx Reduction per year** | | | | **21,512.3** |  | **9,592.7** |  |
|  |  |  |  |  |  |  | High Range |  | Low Range |  |
| Total | 57 |  | 34 | 13 | 6 | 29 |  |  |  |  |

**Notes:**

**\* NEI 2014 v 1 - SCC Cement Manufacturing Codes for Wet/Dry Kilns**

**EDITS to the NEI 2014 Chart:**

One Maryland unit at Lehigh Cement upgraded to PH/PC in 2001 and it is not coded as such in the database.

*From MDE TSD. Lehigh Cement Company LLC owns and operates a Portland cement manufacturing plant in Union Bridge, MD. The plant is located in both Carroll and Frederick Counties. The original plant was built in 1910. The plant was purchased by Lehigh Cement Company, a division of the Heidelberg Cement Group, in 1925 and has undergone a series of modernizations and expansions, including replacing four existing long-dry kilns with one preheater/pre-calciner kiln system in 2001. As of 2013, the plant was producing up to 2.3 million tons cement per year.*

**No Sources in CT, DC, DE, LA, MA, MS, NH, NJ, RI, VT, WI**

**EPA’s Non-EGU CoST Review[[3]](#footnote-3)**

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Control Technologies** | **Est. Cost** | **Est. Inst. Time** |
| **Category 1**  -Cement Mfg (dry)  -Incinerators  -Byproduct Coke Manufacturing | SNCR  SNCR  SNCR | $1,255  $1,842  $2,673 | 42-51 weeks  42-51 weeks  42-51 weeks |
| **Category 2**  -Cement Kilns | Biosolid Injection Technology (BSI) | $410 | Uncertain |
| **Category 3**  -Gas Turbines | Low NOx Burner (LNB) | $800 | 6-8 months |
| **Category 4**  -Cement Mfg (wet) | Mid-Kiln Firing | $73 | 5-7 months |
| **Category 5**  -Boilers & Process Heaters  -Ammonia Production | SCR  SCR | $2,235  $2,896 | 28-58 weeks  28-58 weeks |
| **Category 6**  -Glass Manufacturing - Flat | OXY-Firing | $3,097 | Uncertain |
| **Category 7**  -Gas RICE Pipeline Compressors  -Gas RICE Miscellaneous  -Gas RICE Pipeline Compressors, Rich Burn  -Gas RICE Pipeline Compressors, Lean/Clean Burn | Adjust AFR and Ignition Retard  Adjust AFR and Ignition Retard  NSCR  Low Emission Combustion (LEC) | $249  $447  $517  $649 | Uncertain  Uncertain  Uncertain  Uncertain |

Cement kilns are considered as Non-EGU sources in EPA’s Final Technical Support Document on Assessment of Emission Controls, Cost of Controls, and Time for Compliance for the Cross-State Air Pollution Rule for the 2008 Ozone NAAQS[[4]](#footnote-4):

*“For the purpose of identifying a list of non-EGU NOx source groups with controls available, the EPA ran CoST for non-EGU point sources for the 37 eastern U.S. with NOx emissions of greater than 25 tons/year in 2017. The analysis using CoST was a basis for the review of NOx control measures for non-EGUs undertaken by two different contractors for EPA. Through a contractual agreement with EPA, SRA International and RTI International provided reports within which CoST examined a number of source categories of non-EGUs with annualized control costs up to $10,000 per ton (in 2011 dollars).”*

*From page 19 of the TSD- “These source groups are listed below with their control technologies, estimated annualized control costs, and estimated installation time. These groups have been organized into 7 categories for clarity, based on either common control technologies (categories 1 through 6) or similarity of source groups (category 7).”*

1. Adapted from from Table 2-1 in “NOx Control Technologies for the Cement Industry, Final Report”, EPA-457/R00-002, September 19, 2000. https://www3.epa.gov/airquality/ctg\_act/200009\_nox\_epa457\_r-00-002\_cement\_industry.pdf [↑](#footnote-ref-1)
2. <https://www.epa.gov/enforcement/cement-manufacturing-enforcement-initiative#settlements> [↑](#footnote-ref-2)
3. Final Technical Support Document (TSD) for the Cross-State Air Pollution Rule for the 2008 Ozone NAAQS - Assessment of Non-EGU NOx Emission Controls, Cost of Controls, and Time for Compliance Final TSD (Docket ID No. EPA-HQ-OAR-2015-05). <https://www.epa.gov/sites/production/files/2017-05/documents/final_assessment_of_non-egu_nox_emission_controls_cost_of_controls_and_time_for_compliance_final_tsd.pdf> [↑](#footnote-ref-3)
4. <https://www.regulations.gov/document?D=EPA-HQ-OAR-2015-0500-0508> [↑](#footnote-ref-4)