

NORTH CAROLINA DIVISION OF AIR QUALITY		Region: Wilmington Regional Office County: New Hanover NC Facility ID: 6500296 Inspector's Name: Terry McCall Date of Last Inspection: 10/22/2007 Compliance Code: 3/In Compliance - Inspection
PSD Preliminary Review – modification 300 construction/operation permit (Draft Revision 8, July 2011 – Assistant Secretary)		
Permit Issue Date: XXXX, XXX		
Facility Data		Permit Applicability (this application only)
Applicant (Facility's Name): Carolinas Cement Company LLC (Formerly known as Roanoke Cement Company, LLC)		SIP: 15A NCAC 2D .0510, 2D .0513, 2D .0515, 2D .0516, 2D .0530, 2D .0540, 2D .0524, 2D .1100, 2D .1111
Facility Address: Carolinas Cement Company LLC 6411 Ideal Cement Road Castle Hayne, North Carolina 28429		NSPS: 40 CFR Part 60, Subpart F, Subpart OOO, Subpart IIII, Subpart Y
SIC: 3241 / Cement, Hydraulic NAICS: 327310 / Cement Manufacturing		NESHAP: 40 CFR Part 63, Subpart LLL PSD: for PM, PM ₁₀ , PM _{2.5} , SO ₂ , NO _x , CO, VOCs, and GHGs PSD Avoidance: N/A NC Toxics: Modeling required 112(r): N/A Other: N/A
Facility Classification: Before: Small After: Title V Fee Classification: Before: Small After: Title V		
Contact Data		Application Data
Facility Contact James S. Willis Corporate Environ. Mgr. 6071 Catawba Road Troutville, Va. 24175 Office: (540) 966-6534 Mobile: (540) 892-9983 jwillis@titanamerica.com	Authorized Contact Russell A. Fink Vice President, General Council, and Secretary 1151 Azalea Garden Rd. Norfolk, Va. 23502 (757) 858-6523 Rfink@titanamerica.com	Technical Contact James S. Willis Corporate Environ. Mgr. 6071 Catawba Road Troutville, Va. 24175 Office: (540) 966-6534 Mobile: (540) 892-9983 jwillis@titanamerica.com
		Application Number: 6500296.08A Initial Application Rec'd: 02/26/2008 Amendment to Application Rec'd: 10/21/2008 Amendment to Application Rec'd: 12/22/2008 Amendment to Application Rec'd: 01/07/2011 Amendment to Application Rec'd: 03/02/2011 Application Type: Modification Application Schedule: PSD
		Existing Permit Data Existing Permit Number: 07300R07 Existing Permit Issue Date: 01/24/2007 Existing Permit Expiration Date: 01/01/2012
Consultant: Environmental Quality Management, Inc. Contact: Kent Berry Phone: (919) 489-5299 email: kberry@eqm-rtp.com Consultant: QSEM Solutions, Inc. Contact: John Carroll Phone: (919) 848-4003 email: jcarroll@qsemsolutions.com		
Review Engineer: Booker Pullen Regional Engineer: Dean Carroll	Review Engineer's Signature: _____ Begin Date: January 2011	Comments / Recommendations: Issue: 07300R08 Permit Issue Date: XXXX, XXXXX Permit Expiration Date: January 1, 2012

I. Introduction/Description:

The Division of Air Quality (DAQ) received a copy of application No. 6500296.08A for a Prevention of Significant Deterioration (PSD) modification from Titan America LLC/Carolinas Cement Company LLC, on February 26, 2008. The application was considered administratively complete for processing on that date. The following amendments to the application have been received by the DAQ:

- An amendment to the application No. 6500296.08A was received on October 21, 2008. The amendment included the results of onsite testing of the raw materials from the mine that indicated the sulfide content in the materials was higher than originally estimated. This higher sulfide content will produce a higher sulfur dioxide emission rate emitted from the manufacturing process than was originally estimated. Also included in the amendment was the removal of the proposed barge loading equipment and the associated emissions points (cement storage, transfer, and loading spouts).
- An additional amendment to the application No. 6500296.08A was received on December 22, 2008. The amendment included revised toxic air pollutant modeling, revised Class I modeling analysis for PM₁₀ and SO₂, revised plant-wide potential emissions for arsenic and chromium VI, and revised the flow rate and temperature of the main stack.

I. Introduction/Description: Continued

- The PM2.5 BACT analysis was received on August 26, 2009.
- An additional amendment to the application No. 6500296.08A was received on January 7, 2011. The amendment revised the application to reflect the regulatory changes that have been promulgated since the initial application was submitted. New Source Performance Standards (NSPS) Subparts OOO, F, and Y have been revised and the MACT, Subpart LLL has been revised for the Portland Cement Industry.
- An additional amendment to the application No. 6500296.08A was received on March 2, 2011. The amendment included the best available control technology (BACT) analysis for greenhouse gases, and changed the BACT grain loading for the miscellaneous bagfilters to 0.005 gr/scf.

This permit will be processed as a 15A NCAC 2Q .0300 State Permit to construct and operate a modern Portland Cement manufacturing facility. The permit modification will go through a 30-day public notice with the possibility of a public hearing. A condition will be placed in the permit that states that the applicant shall submit the application meeting the Title V requirements within 12 months of commencing operation of the facility.

This facility will be located in Castle Hayne, North Carolina, at an existing cement storage terminal that is currently operated by the Roanoke Cement Company. Titan America owns both the Carolinas Cement Company (CCC) and the existing Roanoke Cement Company. CCC will take over all operations at the site (including new and existing sources) when the new plant is constructed. Thus, this is a major modification to an existing facility. This location previously manufactured Portland Cement under the name of Ideal Cement. Ideal Cement stopped operation in 1982.

The proposed Portland Cement plant will include a multi-stage preheater-precalciner kiln with an in-line raw mill, coal mill, and clinker cooler system that will vent through a common main stack. Production will be limited in the permit to 2,190,000 tons per year of clinker. The fuels burned at this facility will be coal and petroleum coke with distillate fuel oil used for startup. The raw materials for clinker production will include limestone/marl, clay, quarry spoils, bauxite, flyash/bottom ash, sand, and/or mill scale. Synthetic gypsum or natural gypsum will be milled with the clinker to produce cement.

Associated processes will include mining, blasting, crushing, blending, grinding, material handling, storage for raw materials, fuels, clinker, finished cement, and cement packing and bulk loadout. Cement will be shipped by rail, or truck. The project will also include one Diesel-fired emergency generator.

The Castle Hayne area is in attainment with all the National Ambient Air Quality Standards (NAAQS). The existing Roanoke Cement terminal is considered a minor source under North Carolina's PSD rules in accordance with 15A NCAC 2D.0530 for all PSD pollutants. A modification to a PSD minor source is subject to PSD if the modification itself exceeds the major source threshold for any PSD regulated pollutant. In the case of Portland Cement plants, the major source threshold is 100 tons/yr, which includes all quantifiable fugitive emissions.

Table 1-1

Pollutant	Future Potential Emissions (tons/yr)	PSD Major Source Emission Rate (tons/yr)	Review Required (Yes/No)
NOx	1,645	100	Yes
PM (TSP)	276	100	Yes
PM ₁₀	200	100	Yes
PM _{2.5}	160	100	Yes
SO ₂	438	100	Yes
CO	3,068	100	Yes
VOCs	175	100	Yes
GHGs	1,895,000	75,000	Yes
Lead	0.09	100	No
Fluorides	1.0	100	No

In September of 2009 the NCDAQ made available for public comment a draft permit and review. In addition to making these documents available, in October of 2009 the NCDAQ held two public hearings soliciting comments on the draft permit. Since that time there have been changes to the applicable air quality regulations and those changes are reflected in the current draft permit. The details of these changes are contained in this review document and the current draft permit.

Summary of Changes Between The 2009 Draft Permit and The Current Draft Permit

Federal Sulfur Dioxide Limit & Addition of Sulfur Dioxide Scrubber

On August 6, 2010 the federal EPA promulgated revised emissions standards for Portland cement plants. One of the revised regulations, the New Source Performance Standard (NSPS Subpart F), established a sulfur dioxide (SO₂) limit of 0.4 lb per ton of clinker. The 2009 draft permit proposed a limit, based on a BACT review, of 1.33 lb per ton of clinker. (Note: the NSPS standard applicable at the time of the 2009 draft did not include a limitation on SO₂ emissions). In order to demonstrate compliance with the new 0.4 lb per ton limit the applicant is proposing the installation of a SO₂ scrubber system. Compliance will be verified with the use of a continuous emissions monitoring (CEM) system.

Federal Mercury Limit & Additional Mercury Controls

As part of the August 6, 2010 rulemaking, the federal EPA revised the existing Maximum Achievable Control Technology (MACT Subpart LLL) standard and established a mercury emission limit of 21 lb per MM tons of clinker. At maximum production this would equate to 46 pounds of mercury annually. The 2009 draft permit included the then applicable federal standard of 41 micrograms per dry standard cubic foot which, at maximum production, equated to 263 pounds of mercury per year. In its review of the 2009 draft the EPA, and subsequently several public commentors, noted that emission limits in the then-proposed MACT were more stringent than some of the proposed BACT limits in the 2009 draft and requested an explanation as to why they were different. As a matter of law, §112(b)(6) of the Clean Air Act prohibits the application of BACT to mercury so NCDAQ lacked the authority to require a lower emission limit for mercury than was contained in the then-current MACT requirements. NCDAQ recognized the value of the public process and therefore recognized that the proposed limits might not be formalized as final rules. In this case, the EPA also recognized the value of comments made during the public process since the agency subsequently relaxed the mercury limit over the proposed value by approximately 40%. The final federal revised mercury limit of 21 lb per MM tons of clinker is less stringent than the proposed limit of 14 lb per MM tons of clinker. In order to demonstrate compliance with the 21 lb per MM ton of clinker limit the applicant is relying on the existing control systems, including bagfilter and scrubber systems (discussed above). In addition the applicant is proposing the use of carbon injection prior to the bagfilter. Compliance will be verified with the use of a continuous emissions monitoring (CEM) system.

In addition to the revised mercury limit discussed above, one of the hearing officer recommendations made following the public hearings held in October 2009 was to request the facility to provide an amended analysis addressing the impact the mercury emissions will have in the North Cape Fear River Basin. On March 23, 2010 the NCDAQ requested the applicant provide this analysis. On March 26, 2010 the applicant submitted the requested information. The submittal concluded that because their original impacts analysis found there would be no risk of adverse health effects at the then applicable mercury emission rate of 263 pounds per year, mercury emissions based on the proposed MACT would not pose a risk of adverse health effects.

(See http://daq.state.nc.us/permits/psd/docs/titan/Response_letter_to_NCDAQ.pdf)

National Ambient Air Quality Standard Revisions

Since the 2009 draft was made available for comment the federal EPA issued two new National Ambient Air Quality Standards (NAAQS). In June of 2010 the EPA established a new one-hour SO₂ NAAQS of 75 ppb based on the 3-year average of the annual 99th percentile of 1-hour daily maximum concentrations. The applicant was required to demonstrate that emissions from their proposed facility would not cause or contribute to a violation of the new ambient one-hour SO₂ NAAQS. As discussed in this review, emissions from this facility are not predicted to result in ambient impacts that exceed the significance level of 10 microgram per cubic meter anywhere outside the Titan fence line. (Note the significance level is a level established by the NCDAQ that represents a de minimis concentration. The new one-hour standard of 75 ppb equates to an ambient concentration of approximately 196 microgram per cubic meter). In February of 2010 the federal EPA established a new 1-hour standard for Nitrogen Dioxide (NO₂) at a level of 100 ppb, based on the 3-year average of the 98th percentile of the yearly distribution of 1-hour daily maximum concentrations.

The applicant was required to demonstrate that emissions from their proposed facility would not cause or contribute to a violation of the new ambient one-hour NO₂ NAAQS. As discussed in this review later in this review, emissions from this facility are not predicted to cause or contribute to any existing predicted exceedance of the one-hour NO₂ NAAQS outside the fence line of the proposed facility. While exceedances of the one-hour NO₂ standard were predicted by the air dispersion model, the applicant demonstrated that their contribution to these modeled exceedances were less than the 10 microgram per cubic meter significance level.

SEPA & NEPA

There were considerable comments received on the 2009 Draft related to the applicability and potential impact of the North Carolina Environmental Policy Act (SEPA). On November 9, 2009 the NC Department of Administration issued a Declaratory Ruling finding that SEPA did not apply to Carolina's Cement. Several groups challenged that ruling and on April 30, 2010 the Wake County Superior Court Judge, the Honorable Donald W. Stephens, held that SEPA did apply and enjoined DENR from taking any action on the proposed facility. Following this ruling Carolina's Cement decided to forego the economic incentives and requested a lifting of the Judge Stephens injunction. On December 27, 2010 Judge Stephens dissolved this order enjoining DENR from taking action on the application. Similar to SEPA, there were several comments received during the public notice period for the 2009 Draft that raised the applicability of the National Environmental Policy Act (NEPA). Under NEPA the Corps of Engineers has an obligation to review the environmental impacts of subject project before issuing a Clean Water Act permit. Several years ago, however, Congress exempted Clean Air Act permits from NEPA review. The state was advised by lawyers representing the Corps of Engineers that there was no basis under federal law for delaying a decision on the Clean Air Act permit until the EIS had been completed for the Clean Water Act permit. Since, as discussed above, Titan gave up all state and local economic incentives for the project, there was no basis for requiring an EIS under N.C. law.

II. Purpose and Scope:

The purpose of this application is to build a Portland Cement Manufacturing facility. The following equipment will be added:

- Quarry crushing and handling (FQ)
- Raw material unloading, handling, and storage (RMHS)
- Raw mill and kiln feed (RMKF) with associated fabric filters (CD5 through 13)
- Coal/coke handling and storage (Coal) with associated fabric filters (CD1 through 4, CD14 through 18, and CD44B)
- Kiln system (KS) with associated fabric filters (CD44A)
- Clinker handling and storage (CHS) with associated fabric filters (CD19 through 21)
- Finish mills (FM) with associated fabric filters (CD22 through 31 & CD45 through 47)
- Cement handling, storage, and loadout (FM) with associated fabric filters (CD32 through 43)
- Emergency generator (GEN)
- Storage piles (SP)
- Mining operations (MINE)
- Plant roads (PLTRD)
- Quarry roads (QURD)

III. Detailed Process Description:

Portland Cement is used in almost all construction applications including homes, public buildings, roads, industrial plants, dams, bridges, and many other structures. Therefore, the quality of Portland Cement must meet very demanding standards. The manufacture of a high quality Portland Cement begins with the use of a high quality calcium carbonate material (i.e., marl or limestone) and the production of a high quality cement clinker. In the Portland Cement manufacturing process, raw materials such as limestone, marl, clay, sand, and iron ore are heated to their fusion temperature, typically 1,400° to 1,500°C (2,550° to 2,750°F), in a refractory lined kiln by burning various fuels such as coal, coke, and natural gas. Burning an appropriately proportioned mixture of raw materials at a suitable temperature produces hard fused nodules called clinker, which are cooled and then mixed with calcium sulfate (gypsum) and ground to a desired fineness. Different types of cements are produced by using appropriate kiln feed composition, blending the clinker with the desired amount of gypsum, and grinding the product mixture to appropriate fineness. The manufacture of cements of all types involves the same basic high temperature fusion, clinkering and fine grinding process. The newer preheater kilns with a riser duct and the preheater/precalciner kilns have two or more fuel combustion zones. These newer designs of dry pyroprocessing systems increase the overall energy efficiency of the cement plant.

The energy efficiency of the cement making process is important as it determines the amount of heat input needed to produce a unit quantity of cement clinker. A high thermal efficiency leads to less consumption of heat and fuel, with correspondingly lower emissions. CCC will be using a multi-stage preheater/ precalciner kiln system with an in-line raw mill, in-line clinker cooler, and coal mill.

Note: The following website offers a general description of the process at a Portland Cement plant. Some of the specific details and functions will be different from the CCC facility proposed for the Castle Hayne Plant.

[<http://www.cement.org/basics/images/flashtour.html>]

A. Mining Operations:

CCC will obtain the required limestone/marl from a quarry that is located on the property. The raw materials will be removed from the quarry. The rock is removed from the quarry by blasting, drilling, and ripping the material from the rock face using large dozers. The limestone vein at this facility is approximately 80 feet in height and contains a high level of moisture.

The large pieces of rock will be collected by large front-end loaders and transferred to haul trucks. The haul trucks will transfer the large pieces of rock to the primary jaw crushers located in the mine/quarry area that will reduce the rock to smaller sizes. These smaller stones are then conveyed to the secondary crusher that is located near the plant.

B. Proportioning, Blending, & Grinding:

Cement uses minerals containing the four essential elements for its creation: calcium, silicon, aluminum, and iron. The most common combination of ingredients is limestone (for calcium) coupled with much smaller quantities of clay and sand. The raw materials for clinker production at this facility may include limestone/marl, clay, quarry spoils, bauxite (principal ore of aluminum), fly ash/bottom ash, sand, and mill scale (iron). Synthetic gypsum or natural gypsum will be milled with the clinker to produce cement. The bauxite, flyash/bottom ash, mill scale will be brought in from the outside and will be added to the mixture. Flyash will be received wet and will be stored in piles inside the raw material storage building, thus minimizing fugitive emissions from material handling and wind erosion.

Rock ripped or blasted from the limestone mine in the quarry is transported to the primary crusher, where chair size rocks are broken into pieces the size of baseballs. Per the CCC PSD application, 50% of the material crushed (mostly overburden – dirt and other materials) will be waste and would not be conveyed to the plant. This material would be returned to the quarry. A secondary crusher located near the plant reduces the baseball-sized rock to the size of gravel. The next step in Portland Cement manufacturing is preparing the raw mix, or kiln feed, for the pyroprocessing operation. Raw material preparation includes a variety of blending and sizing operations that are designed to provide a feed with appropriate chemical and physical properties. Cement raw materials are received with an initial moisture content varying from 1 to more than 50 percent.

C. Preheater Tower:

The preheater tower at this facility contains a series of vertical cyclone chambers through which the raw materials pass on their way to the kiln. To save energy, the exhaust gases from the kiln rises some 200 feet and is used to preheat the raw materials as they swirl through the preheater cyclones. In the preheater/precalciner stage, materials are heated up to temperatures just below the melting or fusion point. Material transport associated with dry raw milling systems can be accomplished by a variety of mechanisms, including screw conveyors, belt conveyors, drag conveyors, bucket elevators, air slide conveyors, and pneumatic conveying systems.

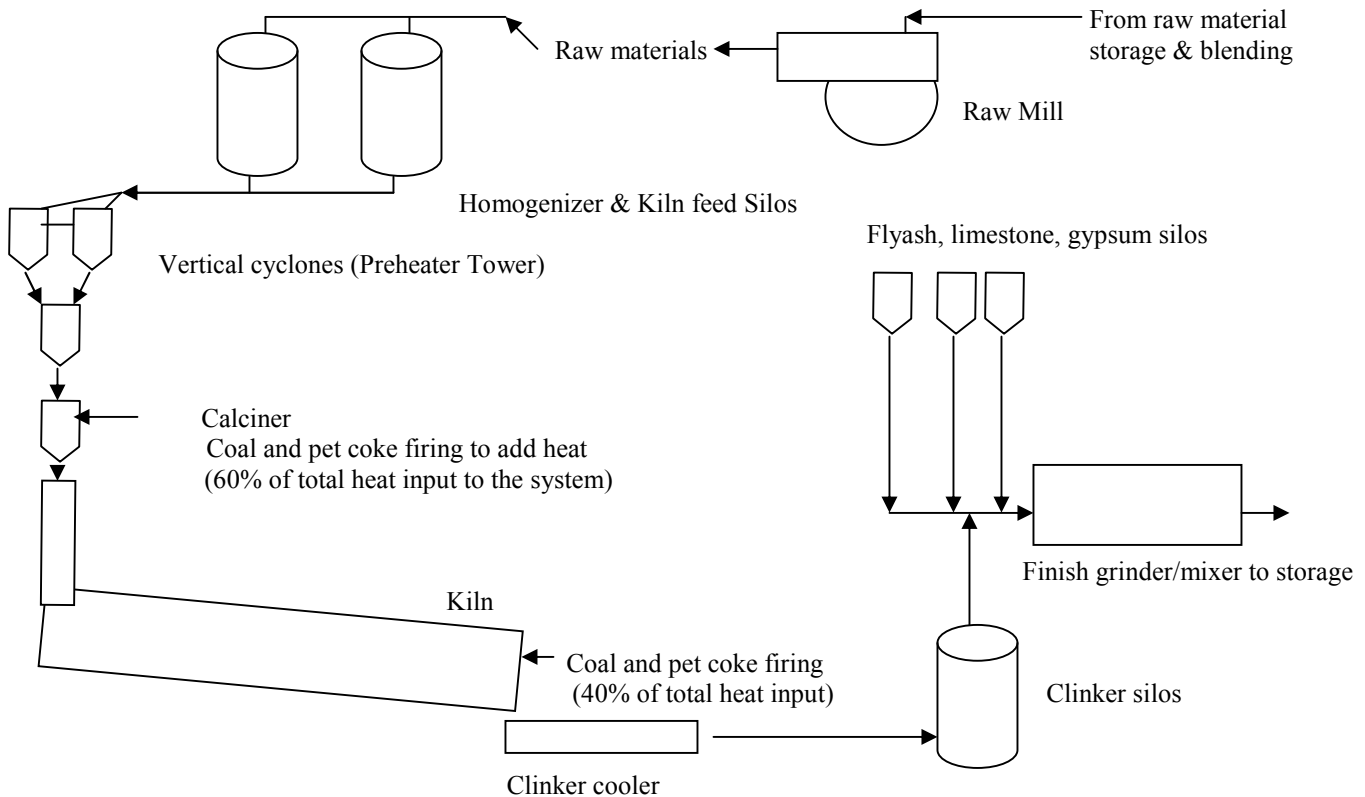
Approximately 60% of the heat input for this Portland Cement manufacturing facility occurs at the calciner. Powdered coal and/or petroleum coke is injected and burned in the calciner. This is a direct-fired process.

D. Kiln (Clinker Production):

Central to the Portland Cement manufacturing process is the pyroprocessing system. CCC uses a preheater/ precalciner dry process system. Raw preheated material enters the huge rotating furnace called a kiln. The raw material mix enters the kiln at the elevated end, and the combustion fuels are introduced into the lower end of the kiln in a countercurrent manner. The materials are continuously and slowly moved to the lower end by rotation of the kiln. This horizontally sloped steel cylinder, lined with firebrick, turns from one to three revolutions per minute. As the materials move down the kiln, the material passes through progressively hotter zones toward the flame. At the lower end of the kiln (hottest part) the material may become partially molten. This system transforms the raw mix into red hot clinkers, which are gray, glass-hard, spherically shaped nodules that range from 0.32 to 5.1 centimeters (0.125 to 2.0 inches) in diameter. The chemical reactions and physical processes that constitute the transformation are quite complex, but they can be viewed conceptually as the following sequential events:

This sequence of events may be conveniently divided into four stages, as a function of location and temperature of the materials in the rotary kiln.

1. Evaporation of uncombined water from raw materials, as material temperature increases to 100°C (212°F);
2. Dehydration, as the material temperature increases from 100°C to approximately 430°C (800°F) to form oxides of silicon, aluminum, and iron;
3. Calcination (conversion of limestone fraction to lime), carbon dioxide (CO₂) is evolved, between 900°C (1650°F) and 982°C (1800°F), to form CaO; and
4. Reaction, of the oxides in the burning zone of the rotary kiln, to form cement clinker at temperatures of approximately 1510°C (2750°F).



Gases go back through the raw mill (mill on condition) before going to the baghouse or the gases go straight to the baghouse (raw mill off condition) prior to going to main stack.

E. Clinker Cooler:

The last component of the pyroprocessing system is the clinker cooler. This process step recoups up to 30 percent of the heat input to the kiln system by recirculating some of the exhaust air back into the intake air of the kiln. The clinker cooler removes enough heat from the product so that it can be handled with conventional conveying equipment. The more common types of clinker coolers are (1) reciprocating grate, (2) planetary, and (3) rotary. In these coolers, the clinker is cooled from about 1100°C to 93°C (2000°F to 200°F) by ambient air that passes through the clinker and into the rotary kiln for use as combustion air.

F. Finish Grinding:

The clinker tumbles onto a grate cooled by forced air. Once cooled, the clinker is ready to be ground into the gray power called Portland Cement. The clinker is ground in a vertical roller mill. The cement is ground so fine that it will easily pass through a sieve that is fine enough to hold water. Up to 5 percent gypsum or natural anhydrite is added to the clinker during grinding to control the cement setting time. Other specialty chemicals are added as needed to impart specific product properties. Typically, finishing is conducted in a closed circuit system, with product sizing by air separation.

G. Storage and Shipping:

From the grinding mills, the Portland Cement is conveyed to domes where it awaits shipment. CCC will ship cement offsite by rail or truck.

H. Emissions:

Particulate matter (PM₁₀, PM_{2.5}), nitrogen oxides (NO_x), sulfur dioxide (SO₂), carbon monoxide (CO), green house gases (GHGs - including CO₂), volatile organic compounds (VOC), ammonia (NH₃), chlorine (Cl), hydrogen chloride (HCl), and mercury (Hg) are emitted.

Sources of PM at cement plants include (1) quarrying and crushing, (2) raw material storage, (3) grinding and blending (in the dry process only), (4) clinker production, (5) finish grinding, and (6) packaging and loading. The largest emission source of PM within cement plants is the pyroprocessing system that includes the in-line kiln and in-line clinker cooler exhaust stack. At this facility the dust from the kiln is collected and recycled into process. This system will also include a kiln exhaust bypass (alkali bypass). Additional sources of PM are raw material storage piles, conveyors, storage silos, and unloading facilities.

Oxides of nitrogen are generated during fuel combustion by oxidation of chemically-bound nitrogen in the fuel and by thermal fixation of nitrogen in the combustion air. As flame temperature increases, the amount of thermally generated NO_x increases. The amount of NO_x generated from fuel increases with the quantity of nitrogen in the fuel. In the cement manufacturing process, NO_x is generated in both the burning zone of the kiln and the burning zone of a precalcining vessel. Fuel usage affects the quantity and type of NO_x generated.

Sulfur dioxide may be generated both from the sulfur compounds in the raw materials and from sulfur in the fuel. The sulfur content of both raw materials and fuels varies from plant to plant and with geographic location. However, the alkaline nature of the cement provides for direct absorption of SO₂ into the product, thereby mitigating the quantity of SO₂ emissions in the exhaust stream. Depending on the process and the source of the sulfur, SO₂ adsorption ranges from about 70 percent to more than 95 percent.

The CO₂ emissions from Portland Cement manufacturing are generated by two mechanisms. As with most high-temperature, energy-intensive industrial processes, combusting fuels to generate process energy releases substantial quantities of CO₂. Substantial quantities of CO₂ also are generated through calcining of limestone or other calcareous material. This calcining process thermally decomposes CaCO₃ to CaO and CO₂. Typically, Portland Cement contains the equivalent of about 63.5 percent CaO. Consequently, about 1.135 units of CaCO₃ are required to produce 1 unit of cement, and the amount of CO₂ released in the calcining process is about 500 kilograms (kg) per Mg of Portland Cement produced (1,000 pounds per ton of cement).

If the combustion reactions do not reach completion, CO and volatile organic pollutants, typically measured as total organic compounds (TOC), VOC, or organic condensable particulate, can be emitted. Incomplete combustion also can lead to emissions of specific hazardous organic air pollutants, although these pollutants are generally emitted at substantially lower levels than CO or TOC.

Emissions of metal compounds from Portland Cement kilns can be grouped into three general classes: volatile metals, including mercury (Hg) and thallium (Tl); semivolatile metals, including antimony (Sb), cadmium (Cd), lead (Pb), selenium (Se), zinc (Zn), potassium (K), and sodium (Na); and refractory or nonvolatile metals, including barium (Ba), chromium (Cr), arsenic (As), nickel (Ni), vanadium (V), manganese (Mn), copper (Cu), and silver (Ag). Although the partitioning of these metal groups is affected by kiln operating conditions, the refractory metals tend to concentrate in the clinker, while the volatile and semivolatile metals tend to be discharged through the primary exhaust stack and the bypass stack, respectively.

Fugitive Dust Sources (Haul roads, etc.)

Fugitive dust sources in the industry include quarrying and mining operations, vehicle traffic during mineral extraction and at the manufacturing site, raw materials storage piles, and clinker storage piles.

IV. Summary of Permit Changes to permit No. 07300R08 per application 6500296.08A:

Old page	New page	Condition No.	Change
Cover Letter			
Page 1	Page 1	Cover page	Name change of facility, responsible official name change, changed issue date, added "PSD modification" to first sentence of the first paragraph, changed revision No. T08, placed permit into Title V format
Page 2	Page 2	Cover letter	Changed date in heading, changed effective date of the Permit, changed permit into Title V format, changed review engineer's name and contact information
Page 3	Page 3	Cover letter	Added "insignificant activities" list
Page 4	Page 4	Cover letter	Added "changes to the permit" table to reflect modification in application 6500296.08A
Body of Permit			
Page 1	Page 1	Permit Cover Page	Changed: cover letter layout, date of permit, permit revision number, name of the applicant per the application, the "complete application" received date, and name of responsible official
Page 2	Page 2	Permit Cover letter	Changed: date in heading, responsible official, effective date, engineer's name and contact number, signature person of letter
Page 1	Pages 1 - 2	Body of Permit	Changed: date of permit, permit revision number, name of the applicant per the application, the "complete application" received date, application number, added new sources to table and applicable regulation per the application
All pages	All pages	Heading of Permit	Revised permit number
N/A	Pages 3 - end	Revised entire permit	Added permitted equipment list, applicable regulations, specific conditions and limitations for PSD modification

V. Table of Sources added per application No. 6500296.08A:

The following table contains a summary of all permitted emission sources and associated pollution control devices:

Emission Source ID No.	Emission Source Description	Control Device ID No.	Control Device Description
Mining/Quarrying Operations (MINE/FQ)			
ES-Mine1, PSD	Rock/limestone removal using heavy equipment, drilling, and blasting	None	None
ES-Mine2, PSD	Rock/limestone loading operations (front end loader rock pickup, loader to haul truck, haul truck to jaw crusher)	None	None
ES-FQSP1, PSD	Limestone/marl pile located in the quarry	None	None
ES-FQSP2, PSD	Spoils pile located in the quarry	None	None
ES-FQSP4, PSD	Overburden located in the quarry	None	None
ES-QURD, PSD	Quarry roads	None	None
ES-FQ6, PSD	Spoils stacker pile	None	None

Quarry Operations (MINE/FO)			
ES-FQ1PC1 NSPS OOO, PSD	Primary crusher #1	None	None
ES-FQ3PC2 NSPS OOO, PSD	Primary crusher #2 (spoils)	None	None
ES-FQ8SC NSPS OOO, PSD	Secondary crusher (quarry blend)	None	None
ES-FQ8BC NSPS OOO, PSD	Belt conveyor transfer	None	None
ES-FQ2MC1 NSPS OOO, PSD	Conveyor #1 transfer (limestone/marl)	None	None
ES-FQ7SC NSPS OOO, PSD	Conveyor #1 transfer (spoils)	None	None
ES-FQ1MC2 NSPS OOO, PSD	Conveyor #2 transfer (limestone/marl)	None	None
ES-FQ3SC2 NSPS OOO, PSD	Conveyor #2 transfer (spoils)	None	None
ES-FQ4SC3 NSPS OOO, PSD	Conveyor #3 transfer (spoils)	None	None
ES-FQ8SCF NSPS OOO, PSD	Secondary crusher feeder (quarry blend)	None	None
ES-FQ1HF NSPS OOO, PSD	Hopper/feeder #1 (limestone/marl)	None	None
ES-FQ3HF2 NSPS OOO, PSD	Hopper/feeder #2 (spoils)	None	None
ES-FQ5RS NSPS OOO, PSD	Radial stacker transfer (spoils)	None	None
Coal/Coke System (COAL)			
ES-COALF1HF2 NSPS Y, PSD	Coal/coke hopper/feeder #2	None	None
ES-COALF1BCT NSPS Y, PSD	Coal/coke belt conveyor transfer	None	None
ES-COALF2EH NSPS Y, PSD	Coal/coke enclosed hopper w/dust suppression (water spray)	None	None
ES-COALF3B NSPS Y, PSD	Coal/coke belt to tripper belt	None	None
ES-COALF3TB NSPS Y, PSD	Coal/coke tripper belt to piles	None	None
ES-COALF3PR NSPS Y, PSD	Coal/coke pile reclaimer	None	None
ES-COALFERB NSPS Y, PSD	Coal/coke reclaimer to belt	None	None
ES-COALPILE NSPS Y	Coal pile (covered)	None	None
ES-COALE1 NSPS Y, PSD	Coal unloading by rail to hopper/transport system	CD1 (211.BF320)	One bagfilter with outlet grain loading not to exceed 0.005 grains/scf
ES-COALE2 NSPS Y, PSD	Coal unloading by truck to hopper/transport system	CD2 (231.BF310)	One bagfilter with outlet grain loading not to exceed 0.005 grains/scf

ES-COALE3 NSPS Y, PSD	Coal transport to storage	CD3 (231.BF330)	One bagfilter with outlet grain loading not to exceed 0.005 grains/scf
ES-COALE4 NSPS Y, PSD	Coal transport from storage	CD4 (241.BF120)	One bagfilter with outlet grain loading not to exceed 0.005 grains/scf
ES-COALE16 NSPS Y, PSD	Coal mill feed transport	CD16 (461.BF350)	One bagfilter with outlet grain loading not to exceed 0.005 grains/scf
ES-COALE17 NSPS Y MACT LLL, PSD	Fine coal bin	CD17 (461.BF650)	One bagfilter with outlet grain loading not to exceed 0.005 grains/scf
ES-COALE18 NSPS Y MACT LLL, PSD	Fine coal bin	CD18 (461.BF750)	One bagfilter with outlet grain loading not to exceed 0.005 grains/scf
ES-COALE14 NSPS Y, PSD	Coal mill feed bin	CD14 (461.BF130)	One bagfilter with outlet grain loading not to exceed 0.005 grains/scf
ES-COALE15 NSPS Y, PSD	Coal mill feed bin	CD15 (461.BF230)	One bagfilter with outlet grain loading of 0.005 grains/scf
ES-COAL NSPS Y, PSD MACT LLL, PSD	Coal mill (vents to main stack)	CD44B (461.BF500)	One bagfilter with outlet grain loading not to exceed 0.005 grains/scf
Plant Roadways			
ES-PLTRD, PSD	Vehicular traffic on paved plant roads	None	None
Storage Piles			
ES-SPCoal1, PSD	Coal/coke storage pile at the plant	None	None
ES-SPCoal2, PSD	Coal/coke storage pile at the plant	None	None
ES-SPBlend1 PSD	Blended stone pile at the plant	None	None
ES-SPBlend2, PSD	Blended stone pile at the plant	None	None
ES-SPMillscale PSD	Mill scale storage pile at the plant	None	None
ES-SPBauxite PSD	Bauxite storage pile at the plant	None	None
ES-SPAsh, PSD	Bottom ash storage pile at the plant	None	None
ES-SPLimestone PSD	Limestone storage pile at the plant	None	None
ES-SPGypsum, PSD	Gypsum storage pile at the plant	None	None
Emergency Generator			
ES-GEN NSPS III MACT ZZZZ, PSD	Diesel-fired emergency generator (800 kW, 1072.82 hp output, generator vents through main stack)	None	None
Plant additives unloading and handling			
ES-F1HF1 NSPS F MACT LLL, PSD	Additives hopper/feeder	None	None
ES-F1BCT NSPS F MACT LLL, PSD	Additives belt conveyor transfer	None	None
ES-F5 NSPS F MACT LLL, PSD	Additives belt conveyor transfer	None	None
ES-F7 NSPS F MACT LLL, PSD	Additives belt conveyor transfer	None	None

ES-F7C NSPS F MACT LLL, PSD	Bottom Ash conveyor to silo	None	None
ES-F7D NSPS F MACT LLL, PSD	Bottom ash silo to enclosed belt	None	None
Raw Material Unloading & Handling (RMH)			
ES-RMHF3B NSPS F MACT LLL, PSD	Quarry blend belt to tripper belt	None	None
ES-RMHF3TB, NSPS F MACT LLL, PSD	Quarry blend tripper belt to piles	None	None
ES-RMHF3PR NSPS F MACT LLL, PSD	Quarry blend pile reclaimer	None	None
ES-RMHF3R NSPS F, PSD	Quarry blend reclaimer to belt	None	None
ES-RMHF3ABT NSPS F MACT LLL, PSD	Additives belt to tripper belt	None	None
ES-RMHF3ATB NSPS F MACT LLL, PSD	Additives tripper belt to piles	None	None

Raw Material Unloading & Handling (RMH)			
ES-RMHF3APR NSPS F MACT LLL, PSD	Additives pile reclaimer	None	None
ES-RMHF3RB NSPS F MACT LLL, PSD	Additives reclaimer to belt	None	None
ES-RMHF6BCT NSPS F MACT LLL, PSD	Quarry blend belt conveyor transfer	None	None
ES-RMHF7A NSPS F MACT LLL, PSD	Quarry blend conveyor to silo	None	None
ES-RMHF7B NSPS F MACT LLL, PSD	Quarry blend silo to enclosed belt	None	None
Raw Mill Handling System (RMHS)			
ES-RMHSE5 NSPS F MACT LLL, PSD	Raw mill feed bin	CD5 (143.BF650)	One bagfilter with outlet grain loading not to exceed 0.005 grains/scf
ES-RMHSE6 NSPS F MACT LLL, PSD	Raw mill feed transport	CD6 (311.BF750)	One bagfilter with outlet grain loading not to exceed 0.005 grains/scf

ES-RMHSE7 NSPS F MACT LLL, PSD	Raw mill feed	CD7 (321.BF470)	One bagfilter with outlet grain loading not to exceed 0.005 grains/scf
ES-RMHSE8 NSPS F MACT LLL, PSD	Raw mill reject	CD8 (321.BF950)	One bagfilter with outlet grain loading not to exceed 0.005 grains/scf
ES-RMHSE9 NSPS F MACT LLL, PSD	Kiln dust bin	CD9 (331.BF400)	One bagfilter with outlet grain loading not to exceed 0.005 grains/scf
ES-RMHSE10 NSPS F MACT LLL, PSD	Raw mill transport to silo	CD10 (341.BF410)	One bagfilter with outlet grain loading not to exceed 0.005 grains/scf
ES-RMHSE11 NSPS F MACT LLL, PSD	Raw mill silo	CD11 (341.BF350)	One bagfilter with outlet grain loading not to exceed 0.005 grains/scf
ES-RMHSE12 NSPS F MACT LLL, PSD	Raw mill silo extraction	CD12 (351.BF440)	One bagfilter with outlet grain loading not to exceed 0.005 grains/scf
ES-RMHSE13 NSPS F MACT LLL, PSD	Kiln feed	CD13 (351.BF470)	One bagfilter with outlet grain loading not to exceed 0.005 grains/scf
Clinker Handling and Storage (CHS)			
ES-CHSE19 NSPS F MACT LLL, PSD	Clinker discharge from cooler	CD19 (441.BF540)	One bagfilter with outlet grain loading not to exceed 0.005 grains/scf
ES-CHSE20 NSPS F MACT LLL, PSD	Clinker dome	CD20 (471.BF150)	One bagfilter with outlet grain loading not to exceed 0.005 grains/scf
ES-CHSE21 NSPS F MACT LLL, PSD	Off-spec bin	CD21 (471.BF240)	One bagfilter with outlet grain loading not to exceed 0.005 grains/scf
Finish Mills (FM)			
ES-FME22 NSPS F MACT LLL, PSD	Cement mill #1 feed bin	CD22 (511.BF090)	One bagfilter with outlet grain loading not to exceed 0.005 grains/scf
ES-FME23 NSPS F MACT LLL, PSD	Cement mill #2 feed bin	CD23 (512.BF050)	One bagfilter with outlet grain loading not to exceed 0.005 grains/scf
ES-FME24 NSPS F MACT LLL, PSD	Cement mill #1 feed	CD24 (531.BF290)	One bagfilter with outlet grain loading not to exceed 0.005 grains/scf
ES-FME25 NSPS F MACT LLL, PSD	Cement mill #1 recirculation bin	CD25 (531.BF020)	One bagfilter with outlet grain loading not to exceed 0.005 grains/scf
ES-FME26 NSPS F MACT LLL, PSD	Cement mill #1 reject	CD26 (531.BF215)	One bagfilter with outlet grain loading not to exceed 0.005 grains/scf
ES-FME27 NSPS F MACT LLL, PSD	Cement mill #1 transport	CD27 (531.BF615)	One bagfilter with outlet grain loading not to exceed 0.005 grains/scf

ES-FME28 NSPS F MACT LLL, PSD	Cement mill #2 feed	CD28 (532.BF290)	One bagfilter with outlet grain loading not to exceed 0.005 grains/scf
ES-FME29 NSPS F MACT LLL, PSD	Cement mill #2 recirculation bin	CD29 (532.BF020)	One bagfilter with outlet grain loading not to exceed 0.005 grains/scf
ES-FME30 NSPS F MACT LLL, PSD	Cement mill #2 reject	CD30 (532.BF215)	One bagfilter with outlet grain loading not to exceed 0.005 grains/scf
ES-FME31 NSPS F MACT LLL, PSD	Cement mill #2 transport	CD31 (532.BF615)	One bagfilter with outlet grain loading not to exceed 0.005 grains/scf
ES-FM45A NSPS F MACT LLL, PSD	Exhaust from finish mill #1	CD45A (531.BF500)	One bagfilter with outlet grain loading not to exceed 0.005 grains/scf
ES-FM45B NSPS F MACT LLL, PSD	Exhaust from finish mill #2	CD45B (532.BF500)	One bagfilter with outlet grain loading not to exceed 0.005 grains/scf
ES-FME46 NSPS F MACT LLL, PSD	Cement additive bin	CD46 (511.BF300)	One bagfilter with outlet grain loading not to exceed 0.005 grains/scf
ES-FME47 NSPS F MACT LLL, PSD	Cement additive intake	CD47 (232.BF150)	One bagfilter with outlet grain loading not to exceed 0.005 grains/scf
ES-FMEF8TU, PSD NSPS F MACT LLL, PSD	Gypsum/limestone unloading	None	None
ES-FMF8HF NSPS F MACT LLL, PSD	Gypsum/limestone hopper/feeder	None	None
ES-FMF8BCT NSPS F MACT LLL, PSD	Gypsum/limestone belt conveyor transfer	None	None
Cement Handling, Storage, and Loadout (CHSL)			
ES-CHSLE32 NSPS F MACT LLL, PSD	Cement dome	CD32 (611.BF600)	One bagfilter with outlet grain loading not to exceed 0.005 grains/scf
ES-CHSLE33 NSPS F MACT LLL, PSD	Cement dome extraction rail	CD33 (621.BF305)	One bagfilter with outlet grain loading not to exceed 0.005 grains/scf
ES-CHSLE34 NSPS F MACT LLL, PSD	Cement dome extraction truck	CD34 (621.BF315)	One bagfilter with outlet grain loading not to exceed 0.005 grains/scf
ES-CHSLE40 NSPS F MACT LLL, PSD	Cement silo	CD40 (612.BF600)	One bagfilter with outlet grain loading not to exceed 0.005 grains/scf
ES-CHSLE41 NSPS F MACT LLL, PSD	Cement silo extraction	CD41 (612.BF620)	One bagfilter with outlet grain loading not to exceed 0.005 grains/scf

ES-CHSLE42 NSPS F MACT LLL, PSD	Cement transport	CD42 (622.BF410)	One bagfilter with outlet grain loading not to exceed 0.005 grains/scf
ES-CHSLE43 NSPS F MACT LLL, PSD	Packaging plant	CD43 (641.BF150)	One bagfilter with outlet grain loading not to exceed 0.005 grains/scf
ES-4 ** NSPS F MACT LLL, PSD	Cement silo (2,200 tons est. capacity)	CDP43	One bagfilter (540 square feet of filter surface area)
ES-R33 ** NSPS F MACT LLL, PSD	Screw conveyor and truck load-out spout	CDP30	One bagfilter with outlet grain loading not to exceed 0.005 grains/scf
ES-1 **	Railcar/truck unloading system (screw/pneumatic) in partially enclosed building	CDP1	One bagfilter (339 square feet of filter surface area)
Kiln System			
ES-KS NSPS F MACT LLL, PSD	One coal/petroleum coke-fired, (distillate fuel used for startup only) multistage preheater-precalciner kiln @ 675 million Btu per hour heat input capacity with inline raw mill, coal mill, alkali bypass and inline clinker cooler	CD44N	Selective non-catalytic reduction (SNCR) system using ammonia containing solution
		CD44S	Wet scrubber system (46,000 gallons per min minimum injection rate of water/CaCO ₃)
		CD44A (331.BF200)	Bagfilter for kiln, cooler, and raw mill with outlet grain loading not to exceed 0.0008 grains/scf (as measured at the main stack)
		CD44B (461.BF500)	Bagfilter for coal mill with outlet grain loading not to exceed 0.005 grains/scf (as measured at the main stack)
		CD44C (451.BF200)	Bagfilter for preheater bypass with outlet grain loading not to exceed 0.005 grains/scf (as measured at the main stack)
		CD44D (331.BF300)	Activated carbon injection system with bagfilter having an outlet grain loading not to exceed 0.005 grains/scf (as measured at the main stack)

The Permittee shall file a Title V Air Quality Permit Application on or before 12 months after commencing operation.

** Existing sources (all other sources are proposed); ES-1 to be removed from service prior to startup of cement plant

VI. Regulatory Summary

A. Mining/Quarry Operations (Mine/FQ):

- Rock/limestone removal using heavy equipment, drilling, and blasting (ES-Mine1)
- Rock/limestone loading operations (rock from front end loader to haul truck, unloading haul truck to jaw crusher, ES-Mine2)
- Limestone/marl pile located in quarry area (ES-FQSP1)
- Spoils pile located in quarry area (ES-FQSP2)
- Overburden pile located in quarry area (ES-FQSP4)
- Quarry roads (ES-QURD)
- Spoils stacker pile (ES-FQ6)

1. Description: The rock will be removed from the quarry by ripping the material from the rock face using large dozers or by blasting. The large pieces of rock will be collected by a large front-end loader and transferred into the beds of haul trucks. The haul trucks will transfer the large pieces of rock to the primary jaw crushers that will reduce the rock to softball-sized pieces.

2. Applicable Regulatory Requirements:

NSPS, Subpart F “Standards of Performance for Portland Cement Plants” does not cover the sources that are located in the quarry/mining area. Subpart F covers the processes located at the plant site (beginning with raw material unloading and storage, through the finished product bulk loading and unloading systems where the raw materials are blended, ground up, heated to form the Portland Cement, finished, and shipped.

The quarry/mining operations are not subject to the Portland Cement MACT, Subpart LLL because this MACT does not cover the equipment in this portion of a Nonmetallic Mineral Processing Plant. The affected sources that the MACT (Subpart LLL) covers in the Portland Cement production process are the raw material unloading, handling, and storage operations through the finishing operations. [40 CFR §63.1340(b)]

The quarry/mining operations are not subject 15A NCAC 2D .0513 “Particulates From Portland Cement Plants” because this regulation does not cover mining and quarrying operations.

The following provides a summary of limits and/or standards for the emission sources described above

Regulated Pollutant	Limits/Standards	Applicable Regulation
Particulate emissions (PM10/PM2.5)	Best management practices for drilling, blasting, stone removal, and truck loading operations (See Multiple Emissions Section VII B)	15A NCAC 2D .0530 PSD (BACT)
Fugitive dust emissions	Avoid fugitive dust emissions to cause or contribute to substantive complaints or excess visible emissions beyond the property boundary. (State Enforceable Only (See Multiple Emissions Section VIIA))	15A NCAC 2D .0540
Toxic air pollutants	Modeled emissions rates (State Enforceable Only (See Multiple Emissions Section VIIC))	15A NCAC 2D .1100

B. Quarry Operations (FQ):

- Primary crusher #1 (limestone/marl, ES-FQ1PC1, NSPS Subpart OOO)
- Primary crusher #2 (spoils, ES-FQ3PC2, NSPS Subpart OOO)
- Secondary crusher (quarry blend, ES-FQ8SC, NSPS Subpart OOO)
- Mining conveyor #1 transfer (limestone/marl, ES-FQ2MC1, NSPS Subpart OOO)
- Spoils conveyor #1 transfer (spoils, ES-FQ7SC, NSPS Subpart OOO)
- Mining conveyor #2 transfer (limestone/marl, ES-FQ1MC2, NSPS Subpart OOO)
- Spoils conveyor #2 transfer (spoils, ES-FQ3SC2, NSPS Subpart OOO)

- Spoils conveyor #3 transfer (spoils, ES-FQ4SC3, NSPS Subpart OOO)
 - Secondary crusher feeder (Quarry blend, ES-FQ8SCF, NSPS Subpart OOO)
 - Hopper/feeder #1 (limestone/marl, ES-FQ1HF, NSPS Subpart OOO)
 - Hopper/feeder #2 (spoils, ES-FQ3HF2, NSPS Subpart OOO)
 - Radial stacker transfer (spoils, ES-FQ5RS, NSPS Subpart OOO)
1. Description: The large pieces of rock will be collected by a large front end loader and transferred into the beds of haul trucks. The haul trucks will transfer the large pieces of rock to the primary jaw crushers that will reduce the rock to softball sized pieces. These smaller stones are then conveyed to a secondary crusher and then to the main plant to begin the cement making process.

2. Applicable Regulatory Requirements:

The Quarry/Mining operations will be subject to NSPS, Subpart OOO “Standards of Performance for Nonmetallic Mineral Processing Plants” because this equipment will be constructed or modified after April 28, 2008 and will be used for processing of limestone using crushers, screens, bucket elevators, belt conveyors, grinding mills, bagging operations, storage bins, enclosed truck or railcar loading stations.

The Quarry/Mining operations are not subject to NSPS, Subpart F “Standards of Performance for Portland Cement Plants” because Subpart F only covers the processes located at the plant site (beginning with the raw material storage through to the finished product bulk loading and unloading systems) where the raw materials are blended, ground up, heated to form the Portland Cement, finished, and shipped.

The Quarry/mining operations at this site are not subject to the Portland Cement MACT, Subpart LLL because this MACT does not cover the equipment in this portion of a Nonmetallic Mineral Processing Plant. The affected sources that the MACT (Subpart LLL) covers in the Portland Cement production process are the on-site raw material unloading, handling, and storage operations through the finishing operations. [40 CFR §63.1340(b)]

The Quarry/mining operations at this site are not subject to 15A NCAC 2D .0513 “Particulates From Portland Cement Plants” because this regulation does not cover this section of the plant site.

The following provides a summary of limits and/or standards for the emission sources described above

Regulated Pollutant	Limits/Standards	Applicable Regulation
Particulate emissions (PM10/PM2.5)	<ul style="list-style-type: none"> • Crushers without a capture system No owner/operator shall cause to be discharged into the atmosphere from any crusher, at which a capture system is not used, fugitive emissions which exhibit greater than 12 percent opacity.	15A NCAC 2D .0524 40CFR Part 60, Subpart OOO
	<ul style="list-style-type: none"> • Any transfer point on belt conveyor not enclosed in a building No owner/operator shall cause to be discharged into the atmosphere from any transfer point on belt conveyors or from any other affected facility any fugitive emissions which exhibit greater than 7 percent opacity.	
	<ul style="list-style-type: none"> • Any transfer point on belt conveyors or any other affected facility No owner/operator shall cause to be discharged into the atmosphere from any transfer point on belt conveyors or from any other affected facility, any emissions which exhibit greater than 7 percent opacity.	
	Avoid fugitive dust emissions to cause or contribute to substantive complaints or excess visible emissions beyond the property boundary. State Enforceable Only (See Multiple Emissions Section VIIA)	15A NCAC 2D .0540

Particulate emissions (PM10/PM2.5)	Best management practices	15A NCAC 2D .0530 PSD (BACT)
Toxic air pollutants	Modeled emissions rates State Enforceable Only (See Multiple Emissions Section VIIC)	15A NCAC 2D .1100

- a. 15A NCAC 2D .0524, 40 CFR Part 60, Subpart OOO “Standards of Performance for Nonmetallic Mineral Processing Plants”
- i. 15A NCAC 2D .0524 “New Source Performance Standards” - The Permittee shall comply with all applicable provisions, including the notification, testing, recordkeeping, and monitoring requirements contained in Environmental Management Commission Standard 15A NCAC 2D .0524 "New Source Performance Standards" (NSPS) as promulgated in 40 CFR Part 60 Subpart OOO, including Subpart A "General Provisions" for affected facilities that commence construction, modification, or reconstruction after April 22, 2008.
- ii. NSPS Test Methods and Procedures [40 CFR §60.675]
On and after the sixtieth day after achieving the maximum production rate at which the affected facility will be operated, but not later than 180 days after initial startup as required under 40 CFR §60.11 of Part 60, the Permittee shall perform an initial performance test.
- (A) The Permittee shall use as reference methods and procedures the test methods in appendices A–1 through A–7 of 40 CFR Part 60 or other methods and procedures as specified in Subpart OOO except as provided in 40 CFR §60.8(b).
- (B) The Permittee shall determine compliance with the PM standards in 40 CFR §60.672(a) as follows:
- (1) Method 9 of Appendix A–4 of this part and the procedures in 40 CFR §60.11 shall be used to determine opacity.
 - (2) In determining compliance with the particulate matter standards in §60.672(b), the Permittee shall use Method 9 of Appendix A–4 of Part 60 and the procedures in 40 CFR §60.11, with the following additions:
 - (a) The minimum distance between the observer and the emission source shall be 4.57 meters (15 feet).
 - (b) The observer shall, when possible, select a position that minimizes interference from other fugitive emission sources (e.g., road dust). The required observer position relative to the sun (Method 9 of Appendix A–4 of Part 60, Section 2.1) shall be followed.
 - (c) When determining compliance with the fugitive emissions standard for any affected facility described under §60.672(b) of Subpart OOO the duration of the Method 9 (40 CFR Part 60, Appendix A–4) observations shall be 30 minutes (five 6-minute averages). Compliance with the applicable fugitive emission limits in Table 3 of Subpart OOO shall be based on the average of the five 6-minute averages.
- iii. Standards For Particulate Emissions [40 CFR §60.672]
(A) On and after the date on which the performance test required to be conducted by 40 CFR §60.8 is completed, the Permittee who is subject to the provisions of this subpart shall cause to be discharged into the atmosphere, any fugitive emissions (from the following affected facilities constructed after April 22, 2008) that exhibit greater than 7 percent opacity.
- Grinding mills
 - Screening operation (wet screening operations are exempt)
 - Bucket elevator
 - Transfer points on belt conveyors
 - Bagging operations
 - Storage bins
 - Enclosed truck or railcar loading stations

- (B) On and after the date on which the performance test required to be conducted by 40 CFR §60.8 is completed, no Permittee subject to the provisions of this subpart shall cause to be discharged into the atmosphere, any fugitive emissions (from crushers without capture systems that are constructed after April 22, 2008) that exhibit greater than 12 percent opacity.
 - Primary crusher #1 (ES-FQ1PC)
 - Primary crusher #2 (ES-FQ3PC2)
 - Secondary crusher (ES-FQ8SC)
- (C) Truck dumping of nonmetallic minerals into any screening operation, grizzlies, feed hopper, or crusher is exempt from the requirements of section 40 CFR §60.672.
- (D) Static non-agitating grizzlies are exempt from the requirements of section 40 CFR §60.672.
- (E) Dropping of nonmetallic minerals from a conveyor to a pile is not defined as a transfer point and is exempt from the requirements of section 40 CFR §60.672.
- (F) Equipment that breaks up clumps but does not reduce the size of the materials is not a crusher and is exempt from the requirements of section 40 CFR §60.672.
- (G) Wet material processing operations as defined in 40 CFR §60.671 are exempt from the requirements of 40 CFR Part 60, Subpart OOO.

Monitoring [15A NCAC 2Q .0508(f), 40 CFR §60.674]

- iv. The Permittee that uses wet suppression to control emissions from the affected facility shall perform monthly periodic inspections to check that water is flowing to discharge spray nozzles in the wet suppression system. The Permittee shall initiate corrective action within 24 hours and complete corrective action as expeditiously as practical if they find that water is not flowing properly during an inspection of the water spray nozzles. The Permittee shall record each inspection of the water spray nozzles, including the date of each inspection and any corrective actions taken, in the logbook required under 40 CFR §60.676(b).
 - (A) If an affected facility relies on water carryover from upstream water sprays to control fugitive emissions, then that affected facility is exempt from the 5-year repeat testing requirement specified in Table 3 of this subpart provided that the affected facility meets the criteria in paragraphs below:
 - (1) The Permittee shall conduct periodic inspections of the upstream water sprays that are responsible for controlling fugitive emissions from the affected facility. These inspections are conducted according to paragraph (b) of this section and 40 CFR §60.676(b), and
 - (2) The Permittee shall designate which upstream water sprays will be periodically inspected at the time of the initial performance test required under 40 CFR §60.11 of this Part and 40 CFR §60.675 of Subpart OOO.
 - (B) If an affected facility that routinely uses wet suppression water sprays ceases operation of the water sprays or is using a control mechanism to reduce fugitive emissions other than water sprays during the monthly inspection (for example, water from recent rainfall), the logbook entry required under 40 CFR §60.676(b) shall specify the control mechanism being used instead of the water sprays.
 - (C) Except as specified in 40 CFR §60.674(d) or (e), the Permittee that uses a baghouse to control particulate emissions from the affected facility shall conduct quarterly 30-minute visible emissions inspections using EPA Method 22 (40 CFR part 60, Appendix A-7). The Method 22 (40 CFR Part 60, Appendix A-7) test shall be conducted while the baghouse is operating. The test is successful if no visible emissions are observed. If any visible emissions are observed, the Permittee shall initiate corrective action within 24 hours to return the baghouse to normal operation. The Permittee shall record each Method 22 (40 CFR Part 60, Appendix A-7) test, including the date and any corrective actions taken, in the logbook required under 40 CFR §60.676(b). The Permittee may establish a different baghouse-specific success level for the visible emissions test (other than no visible emissions) by conducting a PM performance test according to 40 CFR §60.675(b) simultaneously with a Method 22 (40 CFR Part 60, Appendix A-7) to determine what constitutes normal visible emissions from that affected facility's baghouse when it is in compliance with the applicable PM concentration limit in Table 2 of this subpart. The revised visible emissions success level shall be incorporated into the permit for the affected facility.

v. Recordkeeping [40 CFR §60.674]

The Permittee shall record each periodic inspection required under 40 CFR §60.674(b) or (c), including dates and any corrective actions taken, in a logbook (in written or electronic format). The logbook shall be kept onsite or electronic copies (whichever is requested) of the logbook shall be made available to the Administrator upon request.

- (A) The Permittee shall submit written reports of the results of all performance tests conducted to demonstrate compliance with the standards set forth in 40 CFR §60.672 of this subpart, including reports of opacity observations made using Method 9 (40 CFR Part 60, Appendix A-4) to demonstrate compliance with 40 CFR §60.672(b), (e) and (f).
- (B) Any wet material processing operation that processes saturated and subsequently processes unsaturated materials, shall submit a report of this change within 30 days following such change. At the time of such change, this screening operation, bucket elevator, or belt conveyor becomes subject to the applicable opacity limit in 40 CFR §60.672(b) and the emission test requirements of 40 CFR §60.11.
- (C) The Subpart A requirement under §60.7(a)(1) for notification of the date construction or reconstruction commenced is waived for affected facilities under this subpart.
- (D) A notification of the actual date of initial startup of each affected facility shall be submitted to the Administrator.
 - (1) For a combination of affected facilities in a production line that begin actual initial startup on the same day, a single notification of startup may be submitted by the Permittee to the Administrator. The notification shall be postmarked within 15 days after such date and shall include a description of each affected facility, equipment manufacturer, and serial number of the equipment, if available.

vi. Reporting [40 CFR §60.674]

- (A) The Permittee shall submit written reports of the results of all performance tests conducted to demonstrate compliance with the standards set forth in 40 CFR §60.672 of Subpart OOO, including reports of opacity observations made using Method 9 (40 CFR Part 60, Appendix A-4) to demonstrate compliance with 40 CFR §60.672(b).
- (B) The Subpart A requirement under §60.7(a)(1) for notification of the date construction or reconstruction commenced is waived for affected facilities under this subpart.
- (C) A notification of the actual date of initial startup of each affected facility shall be submitted to the Administrator.
 - (1) For a combination of affected facilities in a production line that begin actual initial startup on the same day, a single notification of startup may be submitted by the Permittee to the Administrator. The notification shall be postmarked within 15 days after such date and shall include a description of each affected facility, equipment manufacturer, and serial number of the equipment, if available.

C. Coal/Pet Coke Handling System (COAL) and associated control devices

- Coal/pet coke hopper/feeder #2 (ES-COALF1HF2, NSPS Subpart Y)
- Coal/pet coke belt conveyor transfer (ES-COALF1BCT, NSPS Subpart Y)
- Coal/pet coke enclosed hopper w/dust suppression (water spray) (ES-COALF2EH, NSPS Subpart Y)
- Coal/pet coke belt to tripper belt (ES-COALF3B, NSPS Subpart Y)
- Coal/pet coke tripper belt to piles (ES-COALF3TB, NSPS Subpart Y)
- Coal/pet coke pile reclaimer (ES-COALF3PR, NSPS Subpart Y)
- Coal/pet coke reclaimer to belt (ES-COALFERB, NSPS Subpart Y)
- Coal pile (covered, ES-COALPILE, NSPS Subpart Y)
- Coal unloading by rail (ES-COALE1, NSPS Subpart Y) with associated bagfilter (CD1)
- Coal unloading by truck (ES-COALE2, NSPS Subpart Y) with associated bagfilter (CD2)
- Coal transport to storage (ES-COALFE3, NSPS Subpart Y) with associated bagfilter (CD3)
- Coal transport from storage (ES-COALE4, NSPS Subpart Y) with associated bagfilter (CD4)
- Coal mill feed bin (ES-COALE14, NSPS Subpart Y) with associated bagfilter (CD14)
- Coal mill feed bin (ES-COALE15, NSPS Subpart Y) with associated bagfilter (CD15)
- Coal mill feed transport (ES-COALE16, NSPS Subpart Y) with associated bagfilter (CD16)
- Fine coal bin (ES-COALE17, MACT Subpart LLL, NSPS Subpart Y) with associated bagfilter (CD17)
- Fine coal bin (ES-COALE18, MACT Subpart LLL, NSPS Subpart Y) with associated bagfilter (CD18)
- Coal mill (ES-COAL, MACT LLL, NSPS Subpart Y) with associated bagfilter (CD44B) venting to the main stack

1. **Description:** The process of making cement clinker requires heat. Coal or petroleum coke is used as the fuel for providing heat. Raw coal/petroleum coke will be received by truck or rail and stored in a coal yard. Raw coal/coke is dropped on a belt conveyor from a hopper and is taken to and crushed in a crusher. Crushed coal or pet coke discharged from the Coal Crusher is stored in a longitudinal stockpile from where it is reclaimed by a reclaimer and taken to the coal mill hoppers for grinding into fine coal. The coal/pet coke will be ground to a powder and burned as fuel in the preheat tower calciner and in the kiln.
2. **Applicable Regulatory Requirements:**
 The coal handling system is subject to NSPS, 40 CFR Part 60, Subpart Y “Standards of Performance for Coal Preparation Plants” from the coal unloading stations to the transfer point after the coal mill that is used to convey coal to the kiln. This system is subject to NSPS Subpart Y because it will be built after October 24, 1974 and has a design processing capacity greater than 200 tons per day. A portion (from the transfer point after the coal mill to the kiln) of the coal handling system is subject to 40 CFR Part 63, Subpart LLL “National Emission Standards for Hazardous Air Pollutants From the Portland Cement Manufacturing Industry”. [see 40 CFR §63.1356 (b)].

NSPS, Subpart Y and MACT Subpart LLL do not have a particulate emission rate standard for uncontrolled emission points in this system. However, the NSPS does have an emission rate standard for points in the process that are controlled by mechanical vents (contains a powered machine to induce air flow). Therefore, particulate emissions from the emission points in the system that are controlled by a bagfilter shall be subject to the standard in 40 CFR §60.254(b)(2). The miscellaneous particulate standard listed in 15A NCAC 2D .0515 does not apply since the NSPS contains an emissions standard for the bagfilter stacks.

The following provides a summary of limits and/or standards for the emission sources described above

Regulated Pollutant	Limits/Standards	Applicable Regulation
Visible Emissions	10 percent opacity (For ES-COALE1, COALE2, COALFE3, COALE4, COALE14, COALE15, and COALE16)	15A NCAC 2D .0524 40 CFR Part 60, Subpart Y
	10 percent opacity (For COALE17, COALE18, and ES-COAL only)	15A NCAC 2D .0524 40 CFR Part 60, Subpart Y
		15A NCAC 2D .1111 40 CFR Part 60, Subpart LLL
Fugitive emissions from building enclosures	10 percent opacity	15A NCAC 2D .0524 40 CFR Part 60, Subpart Y
Fugitive emissions from storage piles	Work practice standards	15A NCAC 2D .0524 40 CFR Part 60, Subpart Y
Particulate	Outlet grain loading not to exceed 0.01 gr/scf	15A NCAC 2D .0524 40 CFR Part 60, Subpart Y
	Outlet grain loading not to exceed 0.005 gr/scf	15A NCAC 2D .0530 PSD (BACT)
Toxic air pollutant	Modeled emissions rates (State Enforceable Only) (See Multiple Emissions Section VIIC)	15A NCAC 2D .1100

- a. Bagfilters with outlet grain loading of 0.005 grains/standard cubic foot
 - Coal unloading by rail (ES-COALE1, NSPS Subpart Y) with associated bagfilter CD1)
 - Coal unloading by truck (ES-COALE2, NSPS Subpart Y) with associated bagfilter (CD2)
 - Coal transport to storage (ES-COALFE3, NSPS Subpart Y) with associated bagfilter (CD3)
 - Coal transport from storage (ES-COALE4, NSPS Subpart Y) with associated bagfilter (CD4)
 - Coal mill feed bin (ES-COALE14, NSPS Subpart Y) with associated bagfilter (CD14)
 - Coal mill feed bin (ES-COALE15, NSPS Subpart Y) with associated bagfilter (CD15)
 - Coal mill feed transport (ES-COALE16, NSPS Subpart Y) with associated bagfilter (CD16)
 - Fine coal bin (ES-COALE17, MACT Subpart LLL) with associated bagfilter (CD17)
 - Fine coal bin (ES-COALE18, MACT Subpart LLL) with associated bagfilter (CD18)
 - Coal mill (ES-COAL, NSPS Subpart Y) with associated bagfilter (CD44B) venting to the main stack

These sources are controlled by a bagfilter having an outlet grain loading not to exceed 0.005 gr/standard cubic foot (scf) and is considered BACT for particulate from the coal handling system. Condensable particulate (PM2.5) is not expected here because there is not a combustion source in this portion of the system.

The standard gas flow rate is the gas flow rate expressed at standard conditions [68 degrees F (528 degrees Rankine) and 14.7 psia (407 inches water)]. Standard gas flow rates are useful when material balances are prepared, for calculations in which the gas stream may undergo chemical reactions, and for comparing the flow rate in a system with the flow rate capacity of a fan.

The maximum inlet airflow rate of each bagfilter is given in actual cubic feet per minute (ACFM). In order to calculate the PM output from each bagfilter, the following equation shall be used.

$$ACFM = SCFM \times \left[\frac{T_{\text{actual}}}{T_{\text{STP}}} \right] \times \left[\frac{P_{\text{STP}}}{P_{\text{actual}}} \right]$$

- Where: T_{actual} = actual temperature at the outlet of the bagfilter
- T_{STP} = standard temperature at the outlet of the bagfilter (68 degrees F)
- P_{actual} = actual pressure at the outlet of the bagfilter (14.7 psia or 407 inches W.C.)
- P_{STP} = standard pressure at the outlet of the bagfilter (14.7 psia or 407 inches W.C.)

Solve equation for SCF

$$SCFM = ACFM \times \left[\frac{T_{\text{STP}}}{T_{\text{Actual}}} \right] \times \left[\frac{P_{\text{Actual}}}{P_{\text{STP}}} \right]$$

Example Calculation using source (Coal unloading by rail, ES-COALE1) controlled by bagfilter (CD1)

$$SCFM = 5535 \text{ ACFM} \times \left[\frac{(460 + 68) \text{ STP}}{(460 + 77) \text{ Actual}} \right] \times \left[\frac{(407 \text{ inches water column})_{\text{Actual}}}{(407 \text{ inches water column})_{\text{STP}}} \right] = 5442.23 \text{ SCFM}$$

Outlet grain loading for each bagfilter = 0.005 grains/SCF

$$\text{Maximum emissions of PM (lbs/hr)} = \frac{0.005 \text{ grains}}{\text{standard cubic feet}} \times \frac{5442.23 \text{ standard cubic feet}}{\text{minute}} \times \frac{60 \text{ minute}}{\text{hour}} \times \frac{1 \text{ lb}}{7000 \text{ grains}} = \frac{0.233 \text{ lbs}}{\text{hour}}$$

Potential PM emissions including bagfilter efficiency from the Coal/Coke Handling System using the equations above

Source	ACFM to bagfilter	Stand. Temp.	Actual Temp.	Stand. Pressure	Actual Pressure	PM Output * (lbs/hr)
Coal unloading by rail (CD1)	5535 acfm	68 °F	77 °F	14.7 psia	14.7 psia	0.23 lbs/hr
Coal unloading by truck (CD2)	5535 acfm	68 °F	77 °F	14.7 psia	14.7 psia	0.23 lbs/hr
Coal transport to storage (CD3)	6868 acfm	68 °F	77 °F	14.7 psia	14.7 psia	0.29 lbs/hr
Coal transport from storage (CD4)	6868 acfm	68 °F	77 °F	14.7 psia	14.7 psia	0.29 lbs/hr
Coal mill feed bin (CD14)	1540 acfm	68 °F	90 °F	14.7 psia	14.7 psia	0.06 lbs/hr
Coal mill feed bin (CD15)	1540 acfm	68 °F	90 °F	14.7 psia	14.7 psia	0.06 lbs/hr
Coal mill feed transport (CD16)	6100 acfm	68 °F	90 °F	14.7 psia	14.7 psia	0.25 lbs/hr
Fine coal bin (CD17)	175 acfm	68 °F	140 °F	14.7 psia	14.7 psia	0.01 lbs/hr
Fine coal bin (CD18)	175 acfm	68 °F	140 °F	14.7 psia	14.7 psia	0.01 lbs/hr
Coal mill (CD44B)	30,000 acfm	68 °F	435 °F	14.7 psia	14.7 psia	1.52 lbs/hr
Total						1.44 lbs/hr

* PM10 is 84% of the PM number in accordance with AP-42 Table 11.6-5

- i. Monitoring/Recordkeeping [Bagfilter monitoring will be added in condition 15A NCAC 2D .0530 in the permit]
Particulate matter emissions from the controlled sections of the coal handling system shall be captured by bagfilters (ID Nos. CD1, 2, 3, 4, 14, 15, 16, 17, 18, and 44B). To assure compliance, the Permittee shall perform inspections and maintenance as recommended by the manufacturer. In addition to the manufacturer's inspection and maintenance recommendations, or if there is no manufacturer's inspection and maintenance recommendations, as a minimum, the inspection and maintenance requirement shall include the following:
 - (A) a monthly visual inspection of the system ductwork and material collection unit for leaks; and
 - (B) an annual (for each 12 month period following the initial inspection) internal inspection of the bagfilter's structural integrity.
- ii. The results of inspection and maintenance shall be maintained in a logbook (written or electronic format) on-site and made available to an authorized representative upon request. The logbook shall record the following:
 - (A) the date and time of each recorded action;
 - (B) the results of each inspection;
 - (C) the results of any maintenance performed on the bagfilters; and
 - (D) any variance from manufacturer's recommendations, if any, and corrections made.

Reporting [15A NCAC 02Q .0508(f)]

- iii. The Permittee shall maintain a monthly summary report, acceptable to the Regional Air Quality Supervisor, of monitoring and recordkeeping listed above and shall submit the results within 30 days of a written request by the DAQ.
- b. 15A NCAC 2D .0524, 40 CFR Part 60, Subpart Y "Standards of Performance For Coal Preparation Plants" --Visible Emissions --
- The Permittee shall comply with all applicable provisions, including the notification, testing, recordkeeping, and monitoring requirements contained in Environmental Management Commission Standard 15A NCAC 2D .0524 "New Source Performance Standards" (NSPS) as promulgated in 40 CFR Part 60 Subpart Y, including Subpart A "General Provisions."
- i. On and after the date on which the performance test required to be conducted by 40 CFR §60.8 is completed, the Permittee shall not cause to be discharged into the atmosphere from any coal processing and conveying equipment, coal storage system, or coal transfer and loading system processing coal constructed after April 28, 2008 gases which exhibit 10 percent opacity or greater.
 - ii. The Permittee shall not cause to be discharged into the atmosphere from any mechanical vent on an affected facility gases that contain particulate matter in excess of 0.01 gr/dscf.
 - iii. Equipment used in the loading, unloading, and conveying operations of open storage piles are not subject to the opacity limitations of 40 CFR §60.254(b)(1).
 - iv. Open storage piles including the equipment used in the loading, unloading, and conveying operations of the affected facility, constructed, reconstructed, or modified after May 27, 2009, shall prepare and operate in accordance with a submitted fugitive coal dust emissions control plan that is appropriate for the site conditions as specified in 40 CFR §60.254(c)(1) through (6).
 - (A) The fugitive coal dust emissions control plan shall identify and describe the control measures the Permittee will use to minimize fugitive coal dust emissions from each open storage pile.
 - (B) For open coal storage piles, the fugitive coal dust emissions control plan shall require that one or more of the following control measures be used to minimize to the greatest extent practicable fugitive coal dust: Locating the source inside a partial enclosure, installing and operating a water spray or fogging system, applying appropriate chemical dust suppression agents on the source (when the provisions of paragraph 40 CFR §60.254 (c)(6) are met), use of a wind barrier, compaction, or use of a vegetative cover. The Permittee shall select, for inclusion in the fugitive coal dust emissions control plan, the control measure or measures listed in this paragraph that are most appropriate for site conditions. The plan shall also explain how the measure or measures selected are applicable and appropriate for site conditions. In addition, the plan shall be revised as needed to reflect any changing conditions at the source.

- (C) An affected facility that is required to have a fugitive coal dust emissions control plan may petition the Administrator to approve, for inclusion in the plan for the affected facility.

Testing [40 CFR §60.255]

- v. The Permittee shall conduct an initial and periodic performance tests for the affected sources to demonstrate compliance with the standards in 40 CFR §60.254 within 60 days of achieving the maximum sustained production rate, but not later than 180 days after initial start-up.
 - (A) For each affected facility subject to a PM emissions standard, an initial performance test shall be performed. Thereafter, a new performance test shall be conducted according the following requirements, as applicable.
 - (1) If the results of the most recent performance test demonstrate that emissions from the affected facility are greater than 50 percent of the applicable emissions standard, a new performance test shall be conducted within 12 calendar months of the date that the previous performance test was required to be completed.
 - (2) If the results of the most recent performance test demonstrate that emissions from the affected facility are 50 percent or less of the applicable emissions standard, a new performance test shall be conducted within 24 calendar months of the date that the previous performance test was required to be completed.
 - (3) A Permittee of an affected facility that has not operated for the 60 calendar days prior to the due date of a performance test is not required to perform the subsequent performance test until 30 calendar days after the next operating day.
 - (B) For each affected facility subject to an opacity standard, an initial performance test shall be performed. Thereafter, a new performance test shall be conducted according the following requirements, as applicable.
 - (1) If any 6-minute average opacity reading in the most recent performance test exceeds half the applicable opacity limit, a new performance test shall be conducted within 90 operating days of the date that the previous performance test was required to be completed.
 - (2) If all 6-minute average opacity readings in the most recent performance test are equal to or less than half the applicable opacity limit, a new performance test shall be conducted within 12 calendar months of the date that the previous performance test was required to be completed.
 - (3) The Permittee of an affected facility that is continuously monitoring scrubber parameters as specified in 40 CFR §60.256(b)(2) is exempt from the requirements in paragraphs (b)(2)(i) and (ii) if opacity performance tests are conducted concurrently with (or within a 60-minute period of) PM performance tests.
 - (C) If any affected coal processing and conveying equipment (*e.g.*, breakers, crushers, screens, conveying systems), coal storage systems, or coal transfer and loading systems are enclosed in a building, and emissions from the building do not exceed any of the standards in § 60.254 that apply to the affected facility, then the facility shall be deemed to be in compliance with such standards.
 - (E) Coal Mill Feed bins (ES-COALE14 and ES-COAL15) are exempted (each source has a controlled potential filterable PM emission rate of less than 1.1 tons per year) from the performance testing in 40 CFR §60.255(b)(1)(i) and (ii) of this section per 40 CFR 60.255(d) provided that the Permittee meets all of the conditions specified below:
 - (1) PM emissions, as determined by the most recent performance test, are less than or equal to the applicable limit,
 - (2) The control device manufacturer's recommended maintenance procedures are followed, and
 - (3) All 6-minute average opacity readings from the most recent performance test are equal to or less than half the applicable opacity limit or the monitoring requirements in 40 CFR §60.255(e) and (f) are followed.

- v. Coal Unloading System (ES-COALE2) shall meet the testing requirements of 40 CFR §60.255(h) as listed below and is exempt from 40 CFR §60.255(b)(1)(i) and (ii).
 - (A) Conduct an initial performance test using Method 9 of Appendix A-4 of 40 CFR Part 60 according to the following requirements:
 - (i) Opacity readings shall be taken during the duration of three separate truck dump events. Each truck dump event commences when the truck bed begins to elevate and concludes when the truck bed returns to a horizontal position.
 - (ii) Compliance with the applicable opacity limit is determined by averaging all 15-second opacity readings made during the duration of three separate truck dump events.
 - (B) Conduct monthly visual observations of all process and control equipment. If any deficiencies are observed, the necessary maintenance shall be performed as expeditiously as possible.
 - (C) Conduct a performance test using Method 9 of Appendix A-4 of 40 CFR Part 60 at least once every 5 calendar years for each affected facility.

Recordkeeping/Monitoring/Reporting [40 CFR §60.258]

- vi. The Permittee shall maintain in a logbook (written or electronic) on-site and make it available upon request. The logbook shall record the following:
 - (A) The manufacturer's recommended maintenance procedures and the date and time of any maintenance and inspection activities and the results of those activities. Any variance from manufacturer recommendation, if any, shall be noted.
 - (B) The date and time of periodic coal preparation and processing plant visual observations, noting those sources with visible emissions along with corrective actions taken to reduce visible emissions. Results from the actions shall be noted.
 - (C) The amount and type of coal processed each calendar month.
 - (D) The amount of chemical stabilizer or water purchased for use in the coal preparation and processing plant.
 - (E) Monthly certification that the dust suppressant systems were operational when any coal was processed and that manufacturer's recommendations were followed for all control systems. Any variance from the manufacturer's recommendations, if any, shall be noted.
 - (F) Monthly certification that the fugitive coal dust emissions control plan was implemented as described. Any variance from the plan, if any, shall be noted. A copy of the applicable fugitive coal dust emissions control plan and any letters from the Administrator providing approval of any alternative control measures shall be maintained with the logbook. Any actions, *e.g.* objections, to the plan and any actions relative to the alternative control measures, *e.g.* approvals, shall be noted in the logbook as well.
 - (G) For the purpose of reports required under 40 CFR §60.7(c), the Permittee that is subject to the provisions of this Subpart shall report semiannually all 6-minute average opacities that exceed the applicable standard.
- vii. The Permittee shall submit the results of initial performance tests to the Administrator or delegated authority, consistent with the provisions of section 60.8. The Permittee who elects to comply with the reduced performance testing provisions of 40 CFR 60.255(c) or (d) shall include in the performance test report identification of each affected facility that will be subject to the reduced testing. The Permittee electing to comply with 40 CFR §60.255(d) shall also include information that demonstrates that the control devices are identical.
- viii. After July 1, 2011, within 60 days after the date of completing each performance evaluation conducted to demonstrate compliance with this Subpart, the Permittee shall submit the test data to the EPA by successfully entering the data electronically into EPA's WebFIRE data base available at <http://cfpub.epa.gov/oarweb/index.cfm?action=fire.main>. For performance tests that cannot be entered into WebFIRE (*i.e.*, Method 9 of appendix A-4 of this part opacity performance tests) the Permittee of the affected facility shall mail a summary copy to United States Environmental Protection Agency; Energy Strategies Group; 109 TW Alexander DR; mail code: D243-01; RTP, NC 27711.

- c. 15A NCAC 2D .0614 “Compliance Assurance Monitoring (CAM)”
Compliance Assurance Monitoring (CAM) does not apply because these sources are regulated by both an NSPS and MACT that were promulgated after 1990 and control the pollutants that would be subject to the CAM.
- d. 15A NCAC 2D .1111, 40 CFR Part 63, Subpart LLL “National Emissions Standards For Hazardous Air Pollutants From the Portland Cement Manufacturing Industry” - Visible Emissions [40 CFR §63.1345]
- Fine coal bin (ES-COALE17) with associated bagfilter (CD17)
 - Fine coal bin (ES-COALE18) with associated bagfilter (CD18)
- i. Filterable particulate emissions (PM10/PM2.5) from the Fine Coal Bins shall be controlled by bagfilters (CD17, and CD18) with an outlet grain loading not to exceed 0.005 gr/scf.
- ii. Monitoring, Recordkeeping, and Reporting:
The monitoring, recordkeeping, and reporting requirements for 15A NCAC 2D .1111, Subpart LLL shall be met by the monitoring, testing, recordkeeping, and reporting requirements listed in 15A NCAC 2D .0530. [See Section VI. F. 2. b. of this Review]
- e. 15A NCAC 2D .0530 “Prevention of Significant Deterioration” – PM10/PM2.5
- i. To comply with the best available control technology (BACT) determination pursuant to 15A NCAC 2D .0530, "Prevention of Significant Deterioration":
- Filterable particulate emissions (PM10/PM2.5) from the Coal Handling System shall be controlled by bagfilters (CD1, 2, 3, 4, 14, 15, 16, 17, and 18) with an outlet grain loading not to exceed 0.005 gr/scf.
- ii. If emission testing is required, the testing shall be performed in accordance with 15A NCAC 2D .2602 and General Condition 18 of the Permit. If the results of this test are above the applicable limit, the Permittee shall be deemed in noncompliance with 15A NCAC 2D .0530.

Monitoring/Recordkeeping [15A NCAC 02Q .0508(f)]

- iii. Particulate emissions (PM10/PM2.5) from the Coal Handling System shall be controlled by bagfilters (ID Nos. CD1, 2, 3, 4, 14, 15, 16, 17, 18). To assure compliance, the Permittee shall perform inspections and maintenance as recommended by the manufacturer. In addition to the manufacturer’s inspection and maintenance recommendations, or if there is no manufacturer’s inspection and maintenance recommendations, as a minimum, the inspection and maintenance requirement shall include the following:
- i. a monthly visual inspection of the system ductwork and material collection unit for leaks; and
 - ii. an annual (for each 12 month period following the initial inspection) internal inspection of the bagfilter’s structural integrity.
- iv. The results of inspection and maintenance shall be maintained in a logbook (written or electronic format) on-site and made available to an authorized representative upon request. The logbook shall record:
- i. the date and time of each recorded action;
 - ii. the results of each inspection;
 - iii. the results of any maintenance performed on the bagfilters; and
 - iv. any variance from manufacturer’s recommendations, if any, and corrections made.

Reporting [15A NCAC 02Q .0508(f)]

- e. The Permittee shall submit a semi-annual summary report of operations, acceptable to the Regional Air Quality Supervisor, of monitoring and recordkeeping activities postmarked on or before January 30 of each calendar year for the preceding six-month period between July and December, and July 30 of each calendar year for the preceding six-month period between January and June. The report shall contain the following:
- i. the monthly summary log of the Coal Handling System for the previous 17 months.
 - ii. any deviations from monitoring requirements.

D. Paved Plant Roads (PLTRD), Storage piles (SP)

- Vehicular traffic on paved plant roads (ES-PLTRD)
- Coal/coke storage pile at the plant (ES-SPCoal1)
- Coal/coke storage pile at the plant (ES-SPCoal2)
- Blended stone pile at the plant (ES-SPBlend1)
- Blended stone pile at the plant (ES-SPBlend2)
- Mill scale storage pile at the plant (ES-SPMillscale)
- Bauxite storage pile at the plant (ES-SPBauxite)
- Bottom ash storage pile at the plant (ES-SPAsh)
- Limestone storage pile at the plant (ES-SPLimestone)
- Gypsum storage pile at the plant (ES-SPGypsum)

1. Description: The roads on the plant site will be paved. There will be some onsite storage piles of raw material. All clinker storage piles will be fully enclosed. Emissions from the storage of limestone, marl, and other high moisture quarried raw materials are very low and do not need additional control measures. Fugitive emissions from lower moisture raw materials and solid furl will be minimized by storage under roof, in a partial enclosure, or behind wind screens.

2. Applicable Regulatory Requirements:
 15A NCAC 2D .0513 “Particulates From Portland Cement Plants” does not cover the fugitive particulate emissions caused by vehicular travel on plant roads or fugitive particulate emissions from raw material storage piles.

NSPS, Subpart F “Standards of Performance for Portland Cement Plants” does not cover the fugitive particulate emissions caused by vehicular travel on plant roads or fugitive particulate emissions from raw material storage piles.

NSPS, Subpart OOO “Standards of Performance for Nonmetallic Mineral Processing Plants” does not cover the fugitive particulate emissions caused by vehicular travel on plant roads or fugitive particulate emissions from raw material storage piles.

The following provides a summary of limits and/or standards for the emission sources described above.

Regulated Pollutant	Limits/Standards	Applicable Regulation
Particulate emissions	Vacuum sweeping and/or water flushing of paved road surfaces (See Multiple Emissions Section VIIB)	15A NCAC 2D .0530 PSD (BACT)
Fugitive dust emissions	Avoid fugitive dust emissions to cause or contribute to substantive complaints or excess visible emissions beyond the property boundary. State Enforceable Only (See Multiple Emissions Section VIIA)	15A NCAC 2D .0540

E. Emergency generator (Diesel-fired, 800 kW, 1072.8 hp, GEN-1)

1. Description: This generator is an emergency generator that shall not exceed 500 hours of operation per year. All emissions from this generator are uncontrolled.

2. Applicable Regulatory Requirements: Generator (GEN-1) will be installed after July 1, 1971 and will be subject to 20% opacity.

NSPS, 40 CFR Part 60, Subpart IIII does apply to the compression ignition, Diesel-fired emergency generator (GEN-1). This unit is by definition a “new” generator because it will be manufactured after April 1, 2006.

MACT, 40 CFR Part 63, Subpart ZZZZ (as revised in the January 18, 2008 Federal Register) *does* apply to emergency generator GEN-1. This unit has a capacity rating greater than 500 brake horsepower and will be considered “new” because the final installation date on-site will be after December 19, 2002. The final rule for this MACT (Subpart ZZZZ) was revised, and re-published in the Federal Register on January 18, 2008 with an effective date of March 18, 2008. Per 40 CFR §63.6590(b), new RICE engines used as emergency generators at major sources of HAPs, must only meet the initial notification requirements of §63.6645(h). [40 CFR §63.6590(b)]

The following provides a summary of limits and/or standards for the emission source(s) described above.

Regulated Pollutant	Limits/Standards	Applicable Regulation
Visible emissions	20 percent opacity	15A NCAC 2D .0521
Sulfur dioxide	15 parts per million sulfur fuel content	15A NCAC 2D .0524
NMHC + NO _x , HC, NO _x , CO, PM	Purchase engine certified to meet the applicable engine design emission limits	40 CFR Part 60, Subpart IIII
NO _x PM10/PM2.5 SO ₂ CO VOCs	Purchase engine certified to meet the applicable engine design emission limits in accordance with NSPS Subpart IIII	15A NCAC 2D .0530 PSD (BACT)
GHGs	This generator is routed to the main stack. Combined emissions from the main stack shall not exceed 0.91 lbs CO _{2e} per ton clinker, 12 month calendar average, in accordance with 40 CFR Part 98	15A NCAC 2D .0530 PSD (BACT)
Hazardous air pollutants	Initial notification requirements	15A NCAC 2D .1111 40 CFR Part 63, Subpart ZZZZ
Toxic air pollutants	Modeled emissions rates (State enforceable only) (See Multiple Emissions Section VII C)	15A NCAC 2D .1100

a. 15A NCAC 2D .0521"Control Of Visible Emissions”

Regulation Analysis:

- i. Generator (GEN-1) will be installed after July 1, 1971, and is therefore subject to the State regulation 15A NCAC 2D .0521(d). Per this regulation visible emissions shall not be more than 20 percent opacity when averaged over a six-minute period except that six-minute periods averaging more than 87 percent opacity may occur not more than once in any hour nor more than four times in any 24-hour period.

Compliance is expected with this regulation because this generator will be firing Diesel fuel only.

Monitoring/Recordkeeping/Reporting [15A NCAC 2Q .0508(f)]

- ii. No monitoring, recordkeeping, or reporting is required for visible emissions from the firing of Diesel fuel in generator (GEN-1) because it should always be in compliance with the opacity standard during normal operation.

b. 15A NCAC 2D .0524, NSPS, 40 CFR Part 60, Subpart IIII

Regulation Analysis:

- i. Diesel fuel sulfur content used in generator (GEN-1) shall not exceed 15 parts per million sulfur content. [40 CFR §60.4207(a)]

Monitoring/Recordkeeping/Reporting [15A NCAC 2Q .0508(f)]

- ii. No monitoring, recordkeeping, or reporting is required for sulfur dioxide emissions from the firing of Diesel fuel in generator (GEN-1).
 - Owner/operators who purchase an emergency generator that is less than 30 liters per cylinder must purchase units that are certified by the manufacturer to meet the applicable engine design emission limits. [40 CFR §60.4211(c)].

- Owners/operators must operate and maintain engines and control devices in accordance with the manufacturer’s written instructions or procedures developed by the owner or operator that are approved by the engine manufacturer, over the life of the engine. {§60.4206 and §60.4211 (a)}.
 - No testing is required for units less than 30 liter per cylinder displacement that have been certified by the manufacturer to meet design limits.
 - Install a nonresettable hour meter {(§60.4209(a)}.
- c. 15A NCAC 2D .0530 “Prevention of Significant Deterioration” – Particulate (PM10/PM2.5)/SO₂/NO_x emissions
- i. To comply with the best available control technology determination (BACT) pursuant to 15A NCAC 2D .0530, "Prevention of Significant Deterioration":
 - Filterable particulate (PM10/PM2.5), SO₂, and NO_x emissions shall be controlled by the purchase of an engine that is certified to meet the applicable engine design emission limits in accordance with NSPS Subpart III.
 - ii. If emission testing is required, the testing shall be performed in accordance with 15A NCAC 2D .2602 and General Condition 18 of this Permit. If the results of this test are above the applicable limit, the Permittee shall be deemed in noncompliance with 15A NCAC 2D .0530.
- Monitoring/Recordkeeping/Reporting [15A NCAC 2Q .0508(f)]
- iii. Monitoring, recordkeeping, and reporting requirements for 15A NCAC 2D .0530 shall be met by the 15A NCAC 2D .1111, Subpart III, monitoring, recordkeeping, and reporting requirements listed in Section e. 2. b. i. above.
- d. 15A NCAC 2D .1111, 40 CFR Part 63, Subpart ZZZZ “National Emission Standards for Hazardous Air Pollutants For Stationary Reciprocating Internal Combustion Engines”
- GEN-1 (800 kW, 1072.8 brake horsepower)
- i. General Provisions [40 CFR §63.6665]:

The Permittee shall comply with the requirements of 40 CFR part 63 Subpart A “General provisions,” according to the applicability of Subpart A to such sources, as identified in Table No. 8 in Subpart ZZZZ, “Applicability Of General Provisions to Subpart ZZZZ”.
 - ii. Compliance/Notification Procedures [40 CFR §63.6645]

Stationary RICE that are emergency generators are subject to limited requirements of Subpart ZZZZ and do not have to meet the requirements of Subpart ZZZZ and of Subpart A of this part, except for the initial notification requirements. Notification should include the following information:

The owner or operator of an affected source that has an initial startup before the effective date of a relevant standard under this part shall notify the Administrator in writing that the source is subject to the relevant standard. The notification, which shall be submitted not later than 120 calendar days after startup of the emergency generator and shall provide the following:

 - (A) The name and address of the owner or operator;
 - (B) The address (i.e., physical location) of the affected source;
 - (C) An identification of the relevant standard, or other requirement, that is the basis of the notification and the source’s compliance date;
 - (D) A brief description of the nature, size, design, and method of operation of the source and an identification of the types of emission points within the affected source subject to the relevant standard and types of hazardous air pollutants emitted;
 - (E) A statement of whether the affected sources is a major source or an area source.
 - (F) A statement that the generators have no additional requirements and explain the basis for the exclusion (for example, that the units operate exclusively as emergency stationary RICE).

Recordkeeping Requirement For Applicability Determination [40 CFR §63.10(b)(3)]

- iii. The applicability determination for exclusion of these generators from the requirements of 40 CFR Part 63, Subpart ZZZZ and Subpart A of this part, shall be maintained on site for a period of 5 years after the determination, or until the source changes its operations to become an affected source, whichever comes first. The analyses, or other information, that demonstrates the exemption from the requirements of Subpart ZZZZ and part A of this subpart, shall be signed by the person making the determination.

F. Plant additives unloading and handling system

- Additives hopper/feeder (ES-F1HF1MACT Subpart LLL, NSPS Subpart F)
- Additives belt conveyor transfer (ES-F1BCT, MACT Subpart LLL, NSPS Subpart F)
- Additives belt conveyor transfer (ES-F5, MACT Subpart LLL, NSPS Subpart F)
- Additives belt conveyor transfer (ES-F7, MACT Subpart LLL, NSPS Subpart F)
- Bottom Ash conveyor to silo (ES-F7C, MACT Subpart LLL, NSPS Subpart F)
- Bottom ash silo to enclosed belt (ES-F7D, MACT Subpart LLL, NSPS Subpart F)

Raw Material Unloading & Handling (RMH)

- Quarry blend belt to tripper belt (ES-RMHF3B, MACT Subpart LLL, NSPS Subpart F)
- Quarry blend tripper belt to piles (ES-RMHF3TB, MACT Subpart LLL, NSPS Subpart F)
- Quarry blend pile reclaimers (ES-RMHF3PR, MACT Subpart LLL, NSPS Subpart F)
- Quarry blend reclaimers to belt (ES-RMHF3R, MACT Subpart LLL, NSPS Subpart F)
- Additives belt to tripper belt (ES-RMHF3ABT, MACT Subpart LLL, NSPS Subpart F)
- Additives tripper belt to piles (ES-RMHF3ATB, MACT Subpart LLL, NSPS Subpart F)
- Additives pile reclaimers (ES-RMHF3APR, MACT Subpart LLL, NSPS Subpart F)
- Additives reclaimers to belt (ES-RMHF3RB, MACT Subpart LLL, NSPS Subpart F)
- Quarry blend belt conveyor transfer (ES-RMHF6BCT, MACT Subpart LLL, NSPS Subpart F)
- Quarry blend conveyor to silo (ES-RMHF7A, MACT Subpart LLL, NSPS Subpart F)
- Quarry blend silo to enclosed belt (ES-RMHF7B, MACT Subpart LLL, NSPS Subpart F)

1. Description: The Plant additive unloading and handling and the Raw Material Unloading and Handling areas are where raw materials from the quarry and materials that are transported in by truck or rail car are stored and handled.

2. Applicable Regulatory Requirements:

Both of these areas are subject MACT, 40 CFR Part 63, Subpart LLL “National Emission Standards for Hazardous Air Pollutant From the Portland Cement Manufacturing Industry” and NSPS Subpart F. However, according to 40 CFR §63.1356 and 40 CFR §60.62(d), when sources are subject to two regulations with different emission limits under Title 40, the more stringent requirements apply.

The following provides a summary of limits and/or standards for the emission source(s) described above

Regulated Pollutant	Limits/Standards	Applicable Regulation
Visible Emissions	10 percent opacity	15A NCAC 2D .0524 40 CFR Part 60, Subpart F 15A NCAC 2D .1111 40 CFR Part 63, Subpart LLL
Particulate emissions (PM10/PM2.5)	MACT Subpart LLL limits	15A NCAC 2D .0530 PSD (BACT)
Toxic air pollutants	Modeled emissions rates (State enforceable only) (See Multiple Emissions Section VIIC)	15A NCAC 2D .1100

- a. 15A NCAC 2D .0524, 40 CFR Part 60, Subpart F “Standards of Performance for Portland Cement Plants” – Visible emissions
The Permittee shall comply with all applicable provisions, including the notification, testing, recordkeeping, and monitoring requirements contained in Environmental Management Commission Standards 15A NCAC 2D .0524 “New Source Performance Standards (NSPS) as promulgated in 40 CFR Part 60 Subpart F “Standards of Performance for Portland Cement Plants”, including Subpart A “General Provisions.” [40 CFR Part 60, Subpart F]
 - i. Emission Standard [40 CFR §60.62]:
10 percent opacity or less from each affected facility
 - ii. Monitoring, Recordkeeping, and Reporting:
Monitoring, recordkeeping, and reporting requirements for 15A NCAC 2D .0524, Subpart F shall be met by the monitoring, recordkeeping, and reporting requirements listed in 15A NCAC 2D .1111, Subpart LLL, Section VI. F. 2.b. of this Review.
- b. 15A NCAC 2D .1111, 40 CFR Part 63, Subpart LLL “National Emissions Standards For Hazardous Air Pollutants From the Portland Cement Manufacturing Industry” - Visible emissions
 - i. The Permittee shall comply with all applicable provisions, including the reporting, record keeping, and monitoring requirements contained in Environmental Management Commission Standard 15A NCAC 2D .1111 “Maximum Achievable Control Technology” (MACT) as promulgated in 40 CFR 63, Subpart LLL “National Emission Standards For Hazardous Air Pollutants From the Portland Cement Manufacturing Industry”, including Subpart A “General Provisions”.
 - ii. Emission Standard [40 CFR §63.1345]:
10 percent opacity or less from each transfer point
 - iii. Performance Testing Requirement [40 CFR §63.1349]
Performance test results shall be documented in complete test reports that contain the information required below as well as all other relevant information. As described in §63.7(c)(2)(i), the site-specific plan to be followed during testing shall be made available to the Administrator prior to testing, if requested.
 - (A) A brief description of the process and the air pollution control system;
 - (B) Sampling location description(s);
 - (C) A description of sampling and analytical procedures and any modifications to standard procedures;
 - (D) Test results;
 - (E) Quality assurance procedures and results;
 - (F) Records of operating conditions during the test, preparation of standards, and calibration procedures;
 - (G) Raw data sheets for field sampling and field and laboratory analyses;
 - (H) Documentation of calculations;
 - (I) All data recorded and used to establish parameters for compliance monitoring; and
 - (J) Any other information required by the test method.
 - iv. The Permittee shall conduct opacity tests in accordance with Method 9 of Appendix A-4 to Part 60. The duration of the Method 9 performance test shall be 3 hours (30 6-minute averages), except that the duration of the Method 9 performance test may be reduced to 1 hour if the conditions of paragraphs (i) and (ii) below apply. For batch processes that are not run for 3-hour periods or longer, compile observations totaling 3 hours when the unit is operating.
 - (A) There are no individual readings greater than 10 percent opacity;
 - (B) There are no more than three readings of 10 percent for the first 1-hour period.

v. Monitoring Requirements [40 CFR §63.1350]

The Permittee shall monitor opacity in accordance with the operation and maintenance plan developed in accordance with 40 CFR §63.1347 for sources subject to 40 CFR §63.1345.

(A) The plan shall be submitted to the Administrator for review and approval as part of the application for a Part 70 permit and shall include the following information:

(1) Procedures for proper operation and maintenance of the affected source and air pollution control devices in order to meet the emission limits and operating limits of 40 CFR §§63.1343 through §63.1348;

(B) The Permittee shall conduct a monthly 10-minute visible emissions test of each affected source in accordance with Method 22 of Appendix A-7 to Part 60. The performance test shall be conducted while the affected facility is in operation.

(1) If no visible emissions are observed in six consecutive monthly tests for any affected source, the Permittee may decrease the frequency of testing from monthly to semi-annually for that affected source. If visible emissions are observed during any semi-annual test, the Permittee shall resume testing of that affected source on a monthly basis and maintain that schedule until no visible emissions are observed in six consecutive monthly tests.

(2) If no visible emissions are observed during the semi-annual test for any affected source, the Permittee may decrease the frequency of testing from semi-annually to annually for that affected source. If visible emissions are observed during any annual test, the Permittee shall resume testing of that affected source on a monthly basis and maintain that schedule until no visible emissions are observed in six consecutive monthly tests.

(3) If visible emissions are observed during any Method 22 test, the Permittee shall conduct a 6-minute test of opacity in accordance with Method 9 of Appendix A to Part 60 of this chapter. The Method 9 test shall begin within one hour of any observation of visible emissions.

(4) The requirement to conduct Method 22 visible emissions monitoring under this paragraph shall not apply to any totally enclosed conveying system transfer point, regardless of the location of the transfer point. "Totally enclosed conveying system transfer point" shall mean a conveying system transfer point that is enclosed on all sides, top, and bottom. The enclosures for these transfer points shall be operated and maintained as total enclosures on a continuing basis in accordance with the facility operations and maintenance plan.

(5) If any partially enclosed or unenclosed conveying system transfer point is located in a building, the Permittee shall have the option to conduct a Method 22 performance test, of appendix A-7 to Part 60 according to the requirements of 40 CFR §63.1350 (f)(1)(i) through (f)(1)(iv) for each such conveying system transfer point located within the building, or for the building itself, according to paragraph §63.1350 (f)(1)(vii)

(6) If visible emissions from a building are monitored, the requirements of §63.1350 (f)(1)(i) through (f)(1)(iv) of this section apply to the monitoring of the building, and the Permittee shall also test visible emissions from each side, roof and vent of the building for at least 10 minutes.

vi. Notification Requirements [40 CFR §63.1353]

(A) The notification provisions of 40 CFR Part 63, Subpart A that apply and those that do not apply to a Permittee of affected sources subject to 40 CFR Part 63, Subpart LLL are listed in Table 1 of this Subpart. If any State requires a notice that contains all of the information required in a notification listed in this section, the Permittee may send the Administrator a copy of the notice sent to the State to satisfy the requirements of this section for that notification.

(B) Each Permittee subject to the requirements of this subpart shall comply with the notification requirements in 40 CFR §63.9 as follows:

(1) Initial notifications as required by 40 CFR §63.9(b) through (d). For the purposes of this subpart, a Title V or 40 CFR Part 70 permit application may be used in lieu of the initial notification required under 40 CFR §63.9(b), provided the same information is contained in the permit application as required by §63.9(b), and the State to which the permit application has been submitted has an approved operating permit program under part 70 of this chapter and has received delegation of authority from the EPA. Permit applications shall be submitted by the same due dates as those specified for the initial notification.

- (2) Notification of performance tests, as required by 40 CFR §§63.7 and 63.9(e).
- (3) Notification of opacity and visible emission observations required by 40 CFR §63.1349 in accordance with 40 CFR §§63.6(h)(5) and 63.9(f).
- (4) Notification of compliance status, as required by 40 CFR §63.9(h).

vii. Recordkeeping Requirements [40 CFR §63.1355]

- (A) The Permittee shall maintain files of all information (including all reports and notifications) required by this section recorded in a form suitable and readily available for inspection and review as required by 40 CFR §63.10(b)(1). The files shall be retained for at least five years following the date of each occurrence, measurement, maintenance, corrective action, report, or record. At a minimum, the most recent two years of data shall be retained on site. The remaining three years of data may be retained off site. The files may be maintained on microfilm, on a computer, on floppy disks, on magnetic tape, or on microfiche.
- (B) The Permittee shall maintain records for each affected source as required by 40 CFR §63.10(b)(2) and (b)(3) of this Part; and
 - (1) All documentation supporting initial notifications and notifications of compliance status under 40 CFR §63.9;
 - (2) All records of applicability determination, including supporting analyses; and
 - (3) If the Permittee has been granted a waiver under 40 CFR §63.8(f)(6), any information demonstrating whether a source is meeting the requirements for a waiver of recordkeeping or reporting requirements.

viii. Reporting [40 CFR §63.1354]

- (A) The reporting provisions of Subpart A of 40 CFR Part 63, Subpart LLL that apply and those that do not apply to the Permittee of affected sources subject to this Subpart are listed in Table 1 of 40 CFR Part 63, Subpart LLL. If any State requires a report that contains all of the information required in a report listed in this section, the Permittee may send the Administrator a copy of the report sent to the State to satisfy the requirements of this section for that report.
- (B) The Permittee shall comply with the reporting requirements specified in 40 CFR §63.10 of the general provisions of this Part 63, Subpart A as follows:
 - (1) As required by 40 CFR §63.10(d)(2), the Permittee shall report the results of performance tests as part of the notification of compliance status.
 - (2) As required by 40 CFR §63.10(d)(3), the Permittee of an affected source shall report the opacity results from tests required by 40 CFR §63.1349.
 - (3) As required by 40 CFR §63.10(d)(4), the Permittee of an affected source who is required to submit progress reports as a condition of receiving an extension of compliance under 40 CFR §63.6(i) shall submit such reports by the dates specified in the written extension of compliance.
 - (4) As required by 40 CFR §63.10(d)(5), if actions taken by the Permittee during a startup, shutdown, or malfunction of an affected source (including actions taken to correct a malfunction) are consistent with the procedures specified in the source's startup, shutdown, and malfunction plan specified in 40 CFR §63.6(e)(3), the Permittee shall state such information in a semiannual report. Reports shall only be required if a startup, shutdown, or malfunction occurred during the reporting period. The startup, shutdown, and malfunction report may be submitted simultaneously with the excess emissions and continuous monitoring system performance reports; and
 - (5) Any time an action taken by a Permittee during a startup, shutdown, or malfunction (including actions taken to correct a malfunction) is not consistent with the procedures in the startup, shutdown, and malfunction plan, the Permittee shall make an immediate report of the actions taken for that event within 2 working days, by telephone call or facsimile (Fax) transmission. The immediate report shall be followed by a letter, certified by the Permittee or other responsible official, explaining the circumstances of the event, the reasons for not following the startup, shutdown, and malfunction plan, and whether any excess emissions and/or parameter monitoring exceedances are believed to have occurred.

(6) The Permittee shall submit a summary report semi-annually that contains the information specified in 40 CFR §63.10(e)(3)(vi). In addition, the summary report shall include:

(a) All failures to comply with any provision of the operation and maintenance plan developed in accordance with 40 CFR §63.1350(a).

c. 15A NCAC 2D .0530 “Prevention of Significant Deterioration” – Particulate (PM10/PM2.5)

i. To comply with the best available control technology determination (BACT) pursuant to 15A NCAC 2D .0530, "Prevention of Significant Deterioration":

- Filterable particulate (PM10/PM2.5) emissions shall be controlled in accordance with MACT Subpart LLL limits

ii. If emission testing is required, the testing shall be performed in accordance with 15A NCAC 2D .2602 and General Condition 18 of this Permit. If the results of this test are above the applicable limit, the Permittee shall be deemed in noncompliance with 15A NCAC 2D .0530.

Monitoring/Recordkeeping/Reporting [15A NCAC 2Q .0508(f)]

iii. Monitoring, testing, recordkeeping, and reporting requirements for 15A NCAC 2D .0530 shall be met by the 15A NCAC 2D .1111, Subpart LLL, monitoring, recordkeeping, and reporting requirements as listed in Section VI. H. 2.c. of this Review.

G. Raw Mill Handling System (RMHS)

- Raw mill feed bin (ES-RMHSE5, MACT Subpart LLL, NSPS Subpart F) with associated bagfilter (CD5)
- Raw mill feed transport (ES-RMHSE6, MACT Subpart LLL, NSPS Subpart F) with associated bagfilter (CD6)
- Raw mill feed (ES-RMHSE7, MACT Subpart LLL, NSPS Subpart F) with associated bagfilter (CD7)
- Raw mill reject (ES-RMHSE8, MACT Subpart LLL, NSPS Subpart F) with associated bagfilter (CD8)
- Kiln dust bin (ES-RMHSE9, MACT Subpart LLL, NSPS Subpart F) with associated bagfilter (CD9)
- Raw mill transport to silo (ES-RMHSE10, MACT Subpart LLL, NSPS Subpart F) with associated bagfilter (CD10)
- Raw mill silo (ES-RMHSE11, MACT Subpart LLL, NSPS Subpart F) with associated bagfilter (CD11)
- Raw mill silo extraction (ES-RMHSE12, MACT Subpart LLL, NSPS Subpart F) with associated bagfilter (CD12)
- Kiln feed (ES-RMHSE13, MACT Subpart LLL, NSPS Subpart F) with associated bagfilter (CD13)

Clinker Handling System (CHS)

- Clinker discharge and cooler (ES-CHSE19, MACT Subpart LLL, NSPS Subpart F) with associated bagfilter CD19)
- Clinker dome (ES-CHSE20, MACT Subpart LLL, NSPS Subpart F) with associated bagfilter (CD20)
- Off spec bin (ES-CHSE21, MACT Subpart LLL, NSPS Subpart F) with associated bagfilter (CD21)

Finish Mills (FM)

- Cement mill #1 feed bin (ES-FME22, MACT Subpart LLL, NSPS Subpart F) with associated bagfilter (CD22)
- Cement mill #2 feed bin (ES-FME23, MACT Subpart LLL, NSPS Subpart F) with associated bagfilter (CD23)
- Cement mill #1 feed (ES-FME24, MACT Subpart LLL, NSPS Subpart F) with associated bagfilter (CD24)
- Cement mill #1 recirculation bin (ES-FME25, MACT Subpart LLL, NSPS Subpart F) with associated bagfilter (CD25)
- Cement mill #1 reject (ES-FME26, MACT Subpart LLL, NSPS Subpart F) with associated bagfilter (CD26)
- Cement mill #1 transport (ES-FME27, MACT Subpart LLL, NSPS Subpart F) with associated bagfilter (CD27)
- Cement mill #2 feed (ES-FME28, MACT Subpart LLL, NSPS Subpart F) with associated bagfilter (CD28)
- Cement mill #2 recirculation bin (ES-FME29, MACT Subpart LLL, NSPS Subpart F) with associated bagfilter (CD29)
- Cement mill #2 reject (ES-FME30, MACT Subpart LLL, NSPS Subpart F) with associated bagfilter (CD30)
- Cement mill #2 transport (ES-FME31, MACT Subpart LLL, NSPS Subpart F) with associated bagfilter (CD31)
- Exhaust from finish mill #1 (ES-FME45A, MACT Subpart LLL, NSPS Subpart F) with associated bagfilter (CD45A)
- Exhaust from finish mill #2 (ES-FME45B, MACT Subpart LLL, NSPS Subpart F) with associated bagfilter (CD45B)
- Cement additive bin (ES-FME46, MACT Subpart LLL, NSPS Subpart F) with associate bagfilter (CD46)
- Cement additive intake (ES-FME47, MACT Subpart LLL, NSPS Subpart F) with associate bagfilter (CD47)
- Gypsum/limestone unloading (ESFMEF8TU, MACT Subpart LLL, NSPS Subpart F)
- Gypsum/limestone hopper/feeder (ES-FMF8HF, MACT Subpart LLL, NSPS Subpart F)
- Gypsum/limestone belt conveyor transfer (ES-FMF8BCT, MACT Subpart LLL, NSPS Subpart F)
- Gypsum/limestone belt conveyor transfer

1. Description: The Raw Mill Handling System (RMHS) system stores and transports the raw materials and reusable kiln dust to the raw mill for the Portland Cement process.

The clinker handling process is the final process in the production of Portland Cement prior to the finish mills. PM/PM10 emissions are controlled by bagfilters that vent directly to the atmosphere versus being routed to the main stack.

The finish mills take the cooled clinker and grind it into a fine gray powder. Gypsum and other materials are added to the powder to add special properties to the cement. PM/PM10 emissions are controlled by bagfilters that vent directly to the atmosphere versus being routed to the main stack.

2. Applicable Regulatory Requirements:

Each of these systems is subject to both the MACT, Part 63, Subpart LLL “National Emission Standards for Hazardous Air Pollutants From the Portland Cement Manufacturing Industry” and NSPS Subpart F “Standards of Performance for Portland Cement Plants”. However, according to 40 CFR §63.1356 and 40 CFR §60.62(d), when sources are subject to two regulations with different emissions limits under Title 40, the more stringent requirements apply.

Neither the MACT Subpart LLL nor the NSPS Subpart F have a particulate emission rate standard for the miscellaneous emission points at a Portland Cement Plant. But since 15A NCAC 2D .0530 has a BACT outlet grain loading to control the emissions of PM, the PM emissions will be subject to the BACT for particulate emissions. State Regulation 15A NCAC 2D .0515 will not apply.

The following provides a summary of limits and/or standards for the emission sources described above

Regulated Pollutant	Limits/Standards	Applicable Regulation
Visible Emissions	10 percent opacity (See Multiple Emissions Section VII D)	15A NCAC 2D .0524 40 CFR Part 60, Subpart F 15A NCAC 2D .1111 40 CFR Part 63, Subpart LLL
Particulate emissions (PM10/PM2.5)	Bagfilter with outlet grain loading of 0.005 gr/scf	15A NCAC 2D .0530 PSD (BACT)
Toxic air pollutants	Modeled emissions rates (State enforceable only) (See Multiple Emissions Section VIIC)	15A NCAC 2D .1100

- a. 15A NCAC 2D .0524, 40 CFR Part 60, Subpart F “Standards of Performance for Portland Cement Plants” – Visible emissions
The Permittee shall comply with all applicable provisions, including the notification, testing, recordkeeping, and monitoring requirements contained in Environmental Management Commission Standard 15A NCAC 2D .0524 "New Source Performance Standards (NSPS) as promulgated in 40 CFR Part 60 Subpart F “Standards of Performance for Portland Cement Plants”, including Subpart A "General Provisions."
 - i. Emission Standard [40 CFR §60.62]:
10 percent opacity or less from each affected facility
 - ii. Monitoring, Recordkeeping, and Reporting:
Monitoring, testing, recordkeeping, and reporting requirements for 15A NCAC 2D .0524, Subpart F shall be met by the monitoring, recordkeeping, and reporting requirements listed in 15A NCAC 1111, Subpart LLL, Section VI. H. 2. c. in this Review.
- b. 15A NCAC 2D .0614 “Compliance Assurance Monitoring (CAM)”
Compliance Assurance Monitoring (CAM) does not apply because these sources are regulated by both an NSPS and MACT that were promulgated after 1990 and control the pollutants that would be subject to CAM.

- c. 15A NCAC 2D .1111, 40 CFR Part 63, Subpart LLL “National Emissions Standards For Hazardous Air Pollutants From the Portland Cement Manufacturing Industry” - Visible Emissions [40 CFR §63.1348]
 - i. The Permittee shall comply with all applicable provisions, including the reporting, record keeping, and monitoring requirements contained in Environmental Management Commission Standard 15A NCAC 2D .1111 “Maximum Achievable Control Technology” (MACT) as promulgated in 40 CFR 63, Subpart LLL “National Emission Standards For Hazardous Air Pollutants From the Portland Cement Manufacturing Industry”, including Subpart A “General Provisions”.
 - ii. Emission Standard [40 CFR §63.1345]:
10 percent opacity or less from each transfer point
 - iii. Performance Testing Requirement [40 CFR §63.1349]
Performance test results shall be documented in complete test reports that contain the information required below as well as all other relevant information. As described in 40 CFR §63.7(c)(2)(i), the site-specific plan to be followed during testing shall be made available to the Administrator prior to testing, if requested.
 - (A) A brief description of the process and the air pollution control system;
 - (B) Sampling location description(s);
 - (C) A description of sampling and analytical procedures and any modifications to standard procedures;
 - (D) Test results;
 - (E) Quality assurance procedures and results;
 - (F) Records of operating conditions during the test, preparation of standards, and calibration procedures;
 - (G) Raw data sheets for field sampling and field and laboratory analyses;
 - (H) Documentation of calculations;
 - (I) All data recorded and used to establish parameters for compliance monitoring; and
 - (J) Any other information required by the test method.
 - iv. The Permittee shall conduct opacity tests in accordance with Method 9 of Appendix A-4 to Part 60. The duration of the Method 9 performance test shall be 3 hours (30 6-minute averages), except that the duration of the Method 9 performance test may be reduced to 1 hour if the conditions of paragraphs (A) and (B) below apply. For batch processes that are not run for 3-hour periods or longer, compile observations totaling 3 hours when the unit is operating.
 - (A) There are no individual readings greater than 10 percent opacity;
 - (B) There are no more than three readings of 10 percent for the first 1-hour period.
 - v. Monitoring Requirements [40 CFR §63.1350]
The Permittee shall monitor opacity in accordance with the operation and maintenance plan developed in accordance with §63.1347 for sources subject to 40 CFR §63.1345.
 - (A) The plan shall be submitted to the Administrator for review and approval as part of the application for a Part 70 permit and shall include the following information:
 - (1) Procedures for proper operation and maintenance of the affected source and air pollution control devices in order to meet the emission limits and operating limits of 40 CFR §§63.1343 through §63.1348;
 - (B) The Permittee shall conduct a monthly 10-minute visible emissions test of each affected source in accordance with Method 22 of Appendix A-7 to Part 60. The performance test shall be conducted while the affected facility is in operation.
 - (1) If no visible emissions are observed in six consecutive monthly tests for any affected source, the Permittee may decrease the frequency of testing from monthly to semi-annually for that affected source. If visible emissions are observed during any semi-annual test, the Permittee shall resume testing of that affected source on a monthly basis and maintain that schedule until no visible emissions are observed in six consecutive monthly tests.

- (2) If no visible emissions are observed during the semi-annual test for any affected source, the Permittee may decrease the frequency of testing from semi-annually to annually for that affected source. If visible emissions are observed during any annual test, the Permittee shall resume testing of that affected source on a monthly basis and maintain that schedule until no visible emissions are observed in six consecutive monthly tests.
 - (3) If visible emissions are observed during any Method 22 test, the Permittee shall conduct a 6-minute test of opacity in accordance with Method 9 of Appendix A to Part 60 of this chapter. The Method 9 test shall begin within one hour of any observation of visible emissions.
 - (4) The requirement to conduct Method 22 visible emissions monitoring under this paragraph shall not apply to any totally enclosed conveying system transfer point, regardless of the location of the transfer point. "Totally enclosed conveying system transfer point" shall mean a conveying system transfer point that is enclosed on all sides, top, and bottom. The enclosures for these transfer points shall be operated and maintained as total enclosures on a continuing basis in accordance with the facility operations and maintenance plan.
 - (5) If any partially enclosed or unenclosed conveying system transfer point is located in a building, the Permittee shall have the option to conduct a Method 22 performance test, of appendix A-7 to Part 60 according to the requirements of 40 CFR §63.1350 (f)(1)(i) through (f)(1)(iv) for each such conveying system transfer point located within the building, or for the building itself, according to paragraph §63.1350 (f)(1)(vii)
 - (6) If visible emissions from a building are monitored, the requirements of 40 CFR §63.1350 (f)(1)(i) through (f)(1)(iv) of this section apply to the monitoring of the building, and the Permittee shall also test visible emissions from each side, roof and vent of the building for at least 10 minutes.
- vi. Notification Requirements [40 CFR §63.1353]
- (A) The notification provisions of 40 CFR Part 63, Subpart A that apply and those that do not apply to Permittee of affected sources subject to 40 CFR Part 63, Subpart LLL are listed in Table 1 of this Subpart. If any State requires a notice that contains all of the information required in a notification listed in this section, the Permittee may send the Administrator a copy of the notice sent to the State to satisfy the requirements of this section for that notification.
 - (B) Each Permittee subject to the requirements of this Subpart shall comply with the notification requirements in 40 CFR §63.9 as follows:
 - (1) Initial notifications as required by 40 CFR §63.9(b) through (d). For the purposes of this V or 40 CFR Part 70 permit application may be used in lieu of the initial notification required under 40 CFR §63.9(b), provided the same information is contained in the permit application as required by §63.9(b), and the State to which the permit application has been submitted has an approved operating permit program under part 70 of this chapter and has received delegation of authority from the EPA. Permit applications shall be submitted by the same due dates as those specified for the initial notification.
 - (2) Notification of performance tests, as required by 40 CFR §§63.7 and 63.9(e).
 - (3) Notification of opacity and visible emission observations required by 40 CFR §63.1349 in accordance with 40 CFR §§63.6(h)(5) and 63.9(f).
 - (4) Notification of compliance status, as required by 40 CFR §63.9(h).
- vii. Recordkeeping Requirements [40 CFR §63.1355]
- (A) The Permittee shall maintain files of all information (including all reports and notifications) required by this section recorded in a form suitable and readily available for inspection and review as required by 40 CFR §63.10(b)(1). The files shall be retained for at least five years following the date of each occurrence, measurement, maintenance, corrective action, report, or record. At a minimum, the most recent two years of data shall be retained on site. The remaining three years of data may be retained off site. The files may be maintained on microfilm, on a computer, on floppy disks, on magnetic tape, or on microfiche.

- (B) The Permittee shall maintain records for each affected source as required by 40 CFR §63.10(b)(2) and (b)(3) of this part; and
 - (1) All documentation supporting initial notifications and notifications of compliance status under 40 CFR §63.9;
 - (2) All records of applicability determination, including supporting analyses; and
 - (3) If the Permittee has been granted a waiver under 40 CFR §63.8(f)(6), any information demonstrating whether a source is meeting the requirements for a waiver of recordkeeping or reporting requirements.

viii. Reporting [40 CFR §63.1354]

- (A) The reporting provisions of Subpart A of 40 CFR Part 63, Subpart LLL that apply and those that do not apply to a Permittee of affected sources subject to this Subpart are listed in Table 1 of 40 CFR Part 63, Subpart LLL. If any State requires a report that contains all of the information required in a report listed in this section, the Permittee may send the Administrator a copy of the report sent to the State to satisfy the requirements of this section for that report.
- (B) The Permittee shall comply with the reporting requirements specified in 40 CFR §63.10 of the general provisions of this Part 63, Subpart A as follows:
 - (1) As required by 40 CFR §63.10(d)(2), the Permittee shall report the results of performance tests as part of the notification of compliance status.
 - (2) As required by 40 CFR §63.10(d)(3), the Permittee of an affected source shall report the opacity results from tests required by 40 CFR §63.1349.
 - (3) As required by 40 CFR §63.10(d)(4), the Permittee of an affected source who is required to submit progress reports as a condition of receiving an extension of compliance under 40 CFR §63.6(i) shall submit such reports by the dates specified in the written extension of compliance.
 - (4) As required by 40 CFR §63.10(d)(5), if actions taken by a Permittee during a startup, shutdown, or malfunction of an affected source (including actions taken to correct a malfunction) are consistent with the procedures specified in the source's startup, shutdown, and malfunction plan specified in 40 CFR §63.6(e)(3), the Permittee shall state such information in a semiannual report. Reports shall only be required if a startup, shutdown, or malfunction occurred during the reporting period. The startup, shutdown, and malfunction report may be submitted simultaneously with the excess emissions and continuous monitoring system performance reports; and
 - (5) Any time an action taken by a Permittee during a startup, shutdown, or malfunction (including actions taken to correct a malfunction) is not consistent with the procedures in the startup, shutdown, and malfunction plan, the Permittee shall make an immediate report of the actions taken for that event within 2 working days, by telephone call or facsimile (FAX) transmission. The immediate report shall be followed by a letter, certified by the Permittee or other responsible official, explaining the circumstances of the event, the reasons for not following the startup, shutdown, and malfunction plan, and whether any excess emissions and/or parameter monitoring exceedances are believed to have occurred.
 - (6) The Permittee shall submit a summary report semi-annually which contains the information specified in 40 CFR §63.10(e)(3)(vi). In addition, the summary report shall include:
 - (a) All failures to comply with any provision of the operation and maintenance plan developed in accordance with 40 CFR §63.1350(a).

- d. 15A NCAC 2D .0530 "Prevention of Significant Deterioration" – PM10/PM2.5
- i. To comply with the best available control technology determination (BACT) pursuant to 15A NCAC 2D .0530, "Prevention of Significant Deterioration":
 - Filterable particulate emissions (PM10/PM2.5) from the Raw Mill Handling System (RMHS), Clinker Handling System (CHS), and the Finish Mills shall be controlled by bagfilters with an outlet grain loading not to exceed 0.005 gr/scf.
 - ii. If emission testing is required, the testing shall be performed in accordance with 15A NCAC 2D .2602 and General Condition 18 of the Permit. If the results of this test are above the applicable limit, the Permittee shall be deemed in noncompliance with 15A NCAC 2D .0530.

Monitoring/Recordkeeping [15A NCAC 02Q .0508(f)]

- iii. Particulate emissions (PM10/PM2.5) from the Raw Mill Handling System (RMHS), Clinker Handling System (CHS), and the Finish Mills shall be controlled by bagfilters. To assure compliance, the Permittee shall perform inspections and maintenance as recommended by the manufacturer. In addition to the manufacturer's inspection and maintenance recommendations, or if there is no manufacturer's inspection and maintenance recommendations, as a minimum, the inspection and maintenance requirement shall include the following:
 - (A) a monthly visual inspection of the system ductwork and material collection unit for leaks; and
 - (B) an annual (for each 12 month period following the initial inspection) internal inspection of the bagfilter's structural integrity.
- iv. The results of inspection and maintenance shall be maintained in a logbook (written or electronic format) on-site and made available to an authorized representative upon request. The logbook shall record the following:
 - i. the date and time of each recorded action;
 - ii. the results of each inspection;
 - iii. the results of any maintenance performed on the bagfilters; and
 - iv. any variance from manufacturer's recommendations, if any, and corrections made.

Reporting [15A NCAC 02Q .0508(f)]

- v. The Permittee shall submit a semi-annual summary report of operations, acceptable to the Regional Air Quality Supervisor, of monitoring and recordkeeping activities postmarked on or before January 30 of each calendar year for the preceding six-month period between July and December, and July 30 of each calendar year for the preceding six-month period between January and June. The report shall contain the following:
 - (A) the monthly summary log of the Raw Mill Handling System (RMHS), Clinker Handling System (CHS), and Finish Mills System for the previous 17 months.
 - (B) any deviations from monitoring requirements.

These sources are controlled by a bagfilter using an outlet grain loading not to exceed 0.005 gr/standard cubic foot (scf). The standard gas flow rate is the gas flow rate expressed at standard conditions [(68 degrees F (528 degrees Rankine) and 14.7 psia (407 inches water)]. Standard gas flow rates are useful when material balances are prepared, for calculations in which the gas stream may undergo chemical reactions, and for comparing the flow rate in a system with the flow rate capacity of a fan.

The maximum inlet airflow rate of each bagfilter is given in actual cubic feet per minute (ACFM). In order to calculate the PM output from each bagfilter, the following equation shall be used.

$$ACFM = SCFM \times \left[\frac{T_{\text{actual}}}{T_{\text{STP}}} \right] \times \left[\frac{P_{\text{STP}}}{P_{\text{actual}}} \right]$$

Where: T_{actual} = actual temperature at the outlet of the bagfilter
 T_{STP} = standard temperature at the outlet of the bagfilter (68 degrees F)
 P_{actual} = actual pressure at the outlet of the bagfilter (14.7 psia or 407 inches W.C.)
 P_{STP} = standard pressure at the outlet of the bagfilter (14.7 psia or 407 inches W.C.)

Solve equation for SCF

$$SCFM = ACFM \times \left[\frac{T_{\text{STP}}}{T_{\text{Actual}}} \right] \times \left[\frac{P_{\text{Actual}}}{P_{\text{STP}}} \right]$$

Example Calculation using source (Raw mill feed bin controlled by bagfilter CD5).

$$SCFM = 8500 \text{ ACFM} \times \left[\frac{(460 + 68) \text{ STP}}{(460 + 77) \text{ Actual}} \right] \times \left[\frac{(407 \text{ inches water column})_{\text{Actual}}}{(407 \text{ inches water column})_{\text{STP}}} \right] = 8357.54 \text{ SCFM}$$

Outlet grain loading for each bagfilter = 0.005 grains/SCF

$$\text{Maximum emissions of PM(lbs/hr)} = \frac{0.005 \text{ grains}}{\text{standard cubic foot}} \times \frac{8357.54 \text{ standard cubic feet}}{\text{minute}} \times \frac{60 \text{ minutes}}{\text{hour}} \times \frac{1 \text{ lb}}{7000 \text{ grains}} = \frac{0.36 \text{ lbs}}{\text{hour}}$$

Potential PM emissions including bagfilter efficiency from the Coal/Coke Handling System using the equations above

Source	ACFM to bagfilter	Stand. Temp.	Actual Temp.	Stand. Pressure	Actual Pressure	PM Output * (lbs/hr)
Raw mill feed bin (CD5)	8500 acfm	68 °F	77 °F	14.7 psia	14.7 psia	0.36 lbs/hr
Raw mill feed transport (CD6)	7750 acfm	68 °F	77 °F	14.7 psia	14.7 psia	0.33 lbs/hr
Raw mill feed (CD7)	10800 acfm	68 °F	77 °F	14.7 psia	14.7 psia	0.46 lbs/hr
Raw mill reject (CD8)	11700 acfm	68 °F	90 °F	14.7 psia	14.7 psia	0.48 lbs/hr
Kiln dust bin (CD9)	4200 acfm	68 °F	302 °F	14.7 psia	14.7 psia	0.12 lbs/hr
Raw mill transport to silo (CD10)	4000 acfm	68 °F	150 °F	14.7 psia	14.7 psia	0.15 lbs/hr
Raw mill silo (CD11)	4200 acfm	68 °F	150 °F	14.7 psia	14.7 psia	0.16 lbs/hr
Raw mill silo extraction (CD12)	4760 acfm	68 °F	150 °F	14.7 psia	14.7 psia	0.18 lbs/hr
Kiln feed (CD13)	4300 acfm	68 °F	150 °F	14.7 psia	14.7 psia	0.16 lbs/hr
Total						2.39 lbs/hr

* PM10 is 84% of the PM number in accordance with AP-42 Table 11.6-5

Potential PM emissions including bagfilter efficiency from the Clinker handling and Storage System using the equations above

Source	ACFM to bagfilter	Stand. Temp.	Actual Temp.	Stand. Pressure	Actual Pressure	PM Output * (lbs/hr)
Clinker discharge and cooler (bagfilter CD19)	4,600 ACFM	68 °F	257 °F	14.7 psia	14.7 psia	0.15 lbs/hr
Clinker dome (bagfilter CD20)	3,672 ACFM	68 °F	257 °F	14.7 psia	14.7 psia	0.12 lbs/hr
Off spec bin (bagfilter CD21)	2,260 ACFM	68 °F	257 °F	14.7 psia	14.7 psia	0.07 lbs/hr
Total						0.33 lbs/hr

* PM10 is 84% of the PM number in accordance with AP-42 Table 11.6-5

Potential PM emissions including bagfilter efficiency from the Finish Mills (FM) using the equations above

Source	ACFM to bagfilter	Stand. Temp.	Actual Temp.	Stand. Pressure	Actual Pressure	PM Output * (lbs/hr)
Cement mill #1 feed bin (bagfilter CD22)	9,820 ACFM	68 °F	156 °F	14.7 psia	14.7 psia	0.36 lbs/hr
Cement mill #2 feed bin (bagfilter CD23)	8,830 ACFM	68 °F	156 °F	14.7 psia	14.7 psia	0.32 lbs/hr
Cement mill #1 feed (bagfilter CD24)	4,697 ACFM	68 °F	156 °F	14.7 psia	14.7 psia	0.17 lbs/hr
Cement mill #1 recirculation bin (bagfilter CD25)	2,719 ACFM	68 °F	212 °F	14.7 psia	14.7 psia	0.09 lbs/hr
Cement mill #1 reject (bagfilter CD26)	5,262 ACFM	68 °F	212 °F	14.7 psia	14.7 psia	0.18 lbs/hr
Cement mill #1 transport (bagfilter CD27)	2,154 ACFM	68 °F	212 °F	14.7 psia	14.7 psia	0.07 lbs/hr
Cement mill #2 feed (bagfilter CD28)	5,580 ACFM	68 °F	178 °F	14.7 psia	14.7 psia	0.20 lbs/hr
Cement mill #2 recirculation bin (bagfilter CD29)	2,719 ACFM	68 °F	212 °F	14.7 psia	14.7 psia	0.09 lbs/hr
Cement mill #2 reject (bagfilter CD30)	5,262 ACFM	68 °F	212 °F	14.7 psia	14.7 psia	0.18 lbs/hr
Cement mill #2 transport (bagfilter CD31)	2,154 ACFM	68 °F	212 °F	14.7 psia	14.7 psia	0.07 lbs/hr
Exhaust from finish mill #1 (bagfilter CD45A)	125,438 ACFM	68 °F	210 °F	14.7 psia	14.7 psia	4.24 lbs/hr
Exhaust from finish mill #2 (bagfilter CD45B)						
Cement additive bin (bagfilter CD46)	4,810 ACFM	68 °F	156 °F	14.7 psia	14.7 psia	0.18 lbs/hr
Cement additive intake (bagfilter CD47)	10,587 ACFM	68 °F	77 °F	14.7 psia	14.7 psia	0.45 lbs/hr
Total						6.60 lbs/hr

* PM10 is 84% of the PM number in accordance with AP-42 Table 11.6-5

H. Cement handling, Storage, and Loadout (CHSL)

- Cement dome with associated bagfilter (CD32)
- Cement dome extraction rail with associated bagfilter (CD33)
- Cement dome extraction truck with associated bagfilter (CD34)
- Cement silo with associated bagfilter (CD40)
- Cement silo extraction with associated bagfilter (CD41)
- Cement transport with associated bagfilter (CD42)
- Packaging plant with associated bagfilter (CD43)
- Cement silo with associated bagfilter (CDP43)
- Screw conveyor and truck load-out spout

1. Description: The cement handling, storage, and load out system prepares the final product for shipment offsite. PM/ PM10 emissions are controlled by bagfilters that vent directly to the atmosphere versus being routed to the main stack.
2. Applicable Regulatory Requirements:
The Cement Handling, Storage, and Loadout System is subject to both the MACT, Subpart LLL “National Emission Standards for Hazardous Air Pollutants From the Portland Cement Manufacturing Industry” and NSPS Subpart F “Standards of Performance for Portland Cement Plants”. However, according to 40 CFR §63.1356 and 40 CFR §60.62(d), when sources are subject to two regulations with different emission limits under Title 40, the more stringent requirements apply.

Neither the MACT Subpart LLL nor the NSPS Subpart F have a particulate emission rate standard for the miscellaneous emission points at a Portland Cement Plant. But since 15A NCAC 2D .0530 has a BACT outlet grain loading to control the emissions of PM, the PM emissions will be subject to the BACT for particulate emissions. State Regulation 15A NCAC 2D .0515 will not apply.

The following provides a summary of limits and/or standards for the emission source(s) described above.

Regulated Pollutant	Limits/Standards	Applicable Regulation
Visible emissions	10 percent opacity (See Multiple Emissions Section VII D)	15A NCAC 2D .0524 40 CFR Part 60, Subpart F 15A NCAC 2D .1111 40 CFR Part 63, Subpart LLL
Particulate emissions	Outlet grain loading not to exceed 0.005 gr/SCF	15A NCAC 2D .0530 PSD (BACT)
Toxic air pollutants	Modeled emission rates (State Enforceable Only) See Multiple Emissions Section 2.2B	15A NCAC 2D .1100

- a. 15A NCAC 2D .0524, 40 CFR Part 60, Subpart F “Standards of Performance for Portland Cement Plants” – Visible emissions
The Permittee shall comply with all applicable provisions, including the notification, testing, recordkeeping, and monitoring requirements contained in Environmental Management Commission Standard 15A NCAC 2D .0524 "New Source Performance Standards (NSPS) as promulgated in 40 CFR Part 60 Subpart F “Standards of Performance for Portland Cement Plants”, including Subpart A "General Provisions."
- i. Emission Standard [40 CFR §60.62]:
10 percent opacity or less from each affected facility
 - ii. Monitoring, Recordkeeping, and Reporting:
Monitoring, testing, recordkeeping, and reporting requirements for 15A NCAC 2D .0524, Subpart F shall be met by the monitoring, recordkeeping, and reporting requirements listed in 15A NCAC 1111, Subpart LLL, Section VI. H. 2. c. in this Review.
- b. 15A NCAC 2D .0614 “Compliance Assurance Monitoring (CAM)”
Compliance Assurance Monitoring (CAM) does not apply because these sources are regulated by both an NSPS and MACT that were promulgated after 1990 and control the pollutants that would be subject to the CAM.
- c. 15A NCAC 2D .1111, 40 CFR Part 63, Subpart LLL “National Emissions Standards For Hazardous Air Pollutants From the Portland Cement Manufacturing Industry” - Visible Emissions [40 CFR §63.1348]
- i. The Permittee shall comply with all applicable provisions, including the reporting, record keeping, and monitoring requirements contained in Environmental Management Commission Standard 15A NCAC 2D .1111 “Maximum Achievable Control Technology” (MACT) as promulgated in 40 CFR 63, Subpart LLL “National Emission Standards For Hazardous Air Pollutants From the Portland Cement Manufacturing Industry”, including Subpart A “General Provisions”.
 - ii. Emission Standard [40 CFR §63.1345]:
10 percent opacity or less from each transfer point
 - iii. Performance Testing Requirement [40 CFR §63.1349]
Performance test results shall be documented in complete test reports that contain the information required below as well as all other relevant information. As described in 40 CFR §63.7(c)(2)(i), the site-specific plan to be followed during testing shall be made available to the Administrator prior to testing, if requested.
 - (A) A brief description of the process and the air pollution control system;
 - (B) Sampling location description(s);
 - (C) A description of sampling and analytical procedures and any modifications to standard procedures;
 - (D) Test results;

- (E) Quality assurance procedures and results;
 - (F) Records of operating conditions during the test, preparation of standards, and calibration procedures;
 - (G) Raw data sheets for field sampling and field and laboratory analyses;
 - (H) Documentation of calculations;
 - (I) All data recorded and used to establish parameters for compliance monitoring; and
 - (J) Any other information required by the test method.
- iv. The Permittee shall conduct opacity tests in accordance with Method 9 of Appendix A-4 to Part 60. The duration of the Method 9 performance test shall be 3 hours (30 6-minute averages), except that the duration of the Method 9 performance test may be reduced to 1 hour if the conditions of paragraphs (i) and (ii) below apply. For batch processes that are not run for 3-hour periods or longer, compile observations totaling 3 hours when the unit is operating.
- (A) There are no individual readings greater than 10 percent opacity;
 - (B) There are no more than three readings of 10 percent for the first 1-hour period.
- v. Monitoring Requirements [40 CFR §63.1350]
The Permittee shall monitor opacity in accordance with the operation and maintenance plan developed in accordance with §63.1347 for sources subject to 40 CFR §63.1345.
- (A) The plan shall be submitted to the Administrator for review and approval as part of the application for a Part 70 permit and shall include the following information:
 - (1) Procedures for proper operation and maintenance of the affected source and air pollution control devices in order to meet the emission limits and operating limits of 40 CFR §§63.1343 through §63.1348;
 - (B) The Permittee shall conduct a monthly 10-minute visible emissions test of each affected source in accordance with Method 22 of Appendix A-7 to Part 60. The performance test shall be conducted while the affected facility is in operation.
 - (1) If no visible emissions are observed in six consecutive monthly tests for any affected source, the Permittee may decrease the frequency of testing from monthly to semi-annually for that affected source. If visible emissions are observed during any semi-annual test, the Permittee shall resume testing of that affected source on a monthly basis and maintain that schedule until no visible emissions are observed in six consecutive monthly tests.
 - (2) If no visible emissions are observed during the semi-annual test for any affected source, the Permittee may decrease the frequency of testing from semi-annually to annually for that affected source. If visible emissions are observed during any annual test, the Permittee shall resume testing of that affected source on a monthly basis and maintain that schedule until no visible emissions are observed in six consecutive monthly tests.
 - (3) If visible emissions are observed during any Method 22 test, the Permittee shall conduct a 6-minute test of opacity in accordance with Method 9 of Appendix A to Part 60 of this chapter. The Method 9 test shall begin within one hour of any observation of visible emissions.
 - (4) The requirement to conduct Method 22 visible emissions monitoring under this paragraph shall not apply to any totally enclosed conveying system transfer point, regardless of the location of the transfer point. "Totally enclosed conveying system transfer point" shall mean a conveying system transfer point that is enclosed on all sides, top, and bottom. The enclosures for these transfer points shall be operated and maintained as total enclosures on a continuing basis in accordance with the facility operations and maintenance plan.
 - (5) If any partially enclosed or unenclosed conveying system transfer point is located in a building, the Permittee shall have the option to conduct a Method 22 performance test, of appendix A-7 to Part 60 according to the requirements of 40 CFR §63.1350 (f)(1)(i) through (f)(1)(iv) for each such conveying system transfer point located within the building, or for the building itself, according to paragraph §63.1350 (f)(1)(vii)
 - (6) If visible emissions from a building are monitored, the requirements of 40 CFR §63.1350 (f)(1)(i) through (f)(1)(iv) of this section apply to the monitoring of the building, and the Permittee shall also test visible emissions from each side, roof and vent of the building for at least 10 minutes.

- vi. Notification Requirements [40 CFR §63.1353]
 - (A) The notification provisions of 40 CFR Part 63, Subpart A that apply and those that do not apply to Permittee of affected sources subject to 40 CFR Part 63, Subpart LLL are listed in Table 1 of this Subpart. If any State requires a notice that contains all of the information required in a notification listed in this section, the Permittee may send the Administrator a copy of the notice sent to the State to satisfy the requirements of this section for that notification.
 - (B) Each Permittee subject to the requirements of this Subpart shall comply with the notification requirements in 40 CFR §63.9 as follows:
 - (1) Initial notifications as required by 40 CFR §63.9(b) through (d). For the purposes of this V or 40 CFR Part 70 permit application may be used in lieu of the initial notification required under 40 CFR §63.9(b), provided the same information is contained in the permit application as required by §63.9(b), and the State to which the permit application has been submitted has an approved operating permit program under part 70 of this chapter and has received delegation of authority from the EPA. Permit applications shall be submitted by the same due dates as those specified for the initial notification.
 - (2) Notification of performance tests, as required by 40 CFR §§63.7 and 63.9(e).
 - (3) Notification of opacity and visible emission observations required by 40 CFR §63.1349 in accordance with 40 CFR §§63.6(h)(5) and 63.9(f).
 - (4) Notification of compliance status, as required by 40 CFR §63.9(h).

- vii. Recordkeeping Requirements [40 CFR §63.1355]
 - (A) The Permittee shall maintain files of all information (including all reports and notifications) required by this section recorded in a form suitable and readily available for inspection and review as required by 40 CFR §63.10(b)(1). The files shall be retained for at least five years following the date of each occurrence, measurement, maintenance, corrective action, report, or record. At a minimum, the most recent two years of data shall be retained on site. The remaining three years of data may be retained off site. The files may be maintained on microfilm, on a computer, on floppy disks, on magnetic tape, or on microfiche.
 - (B) The Permittee shall maintain records for each affected source as required by 40 CFR §63.10(b)(2) and (b)(3) of this part; and
 - (1) All documentation supporting initial notifications and notifications of compliance status under 40 CFR §63.9;
 - (2) All records of applicability determination, including supporting analyses; and
 - (3) If the Permittee has been granted a waiver under 40 CFR §63.8(f)(6), any information demonstrating whether a source is meeting the requirements for a waiver of recordkeeping or reporting requirements.

- viii. Reporting [40 CFR §63.1354]
 - (A) The reporting provisions of Subpart A of 40 CFR Part 63, Subpart LLL that apply and those that do not apply to a Permittee of affected sources subject to this Subpart are listed in Table 1 of 40 CFR Part 63, Subpart LLL. If any State requires a report that contains all of the information required in a report listed in this section, the Permittee may send the Administrator a copy of the report sent to the State to satisfy the requirements of this section for that report.
 - (B) The Permittee shall comply with the reporting requirements specified in 40 CFR §63.10 of the general provisions of this Part 63, Subpart A as follows:
 - (1) As required by 40 CFR §63.10(d)(2), the Permittee shall report the results of performance tests as part of the notification of compliance status.
 - (2) As required by 40 CFR §63.10(d)(3), the Permittee of an affected source shall report the opacity results from tests required by 40 CFR §63.1349.
 - (3) As required by 40 CFR §63.10(d)(4), the Permittee of an affected source who is required to submit progress reports as a condition of receiving an extension of compliance under 40 CFR §63.6(i) shall submit such reports by the dates specified in the written extension of compliance.

- (4) As required by 40 CFR §63.10(d)(5), if actions taken by a Permittee during a startup, shutdown, or malfunction of an affected source (including actions taken to correct a malfunction) are consistent with the procedures specified in the source's startup, shutdown, and malfunction plan specified in 40 CFR §63.6(e)(3), the Permittee shall state such information in a semiannual report. Reports shall only be required if a startup, shutdown, or malfunction occurred during the reporting period. The startup, shutdown, and malfunction report may be submitted simultaneously with the excess emissions and continuous monitoring system performance reports; and
 - (5) Any time an action taken by a Permittee during a startup, shutdown, or malfunction (including actions taken to correct a malfunction) is not consistent with the procedures in the startup, shutdown, and malfunction plan, the Permittee shall make an immediate report of the actions taken for that event within 2 working days, by telephone call or facsimile (FAX) transmission. The immediate report shall be followed by a letter, certified by the Permittee or other responsible official, explaining the circumstances of the event, the reasons for not following the startup, shutdown, and malfunction plan, and whether any excess emissions and/or parameter monitoring exceedances are believed to have occurred.
 - (6) The Permittee shall submit a summary report semi-annually which contains the information specified in 40 CFR §63.10(e)(3)(vi). In addition, the summary report shall include:
 - (b) All failures to comply with any provision of the operation and maintenance plan developed in accordance with 40 CFR §63.1350(a).
- d. 15A NCAC 2D .0530 "Prevention of Significant Deterioration" – PM10/PM2.5
- i. To comply with the best available control technology determination (BACT) pursuant to 15A NCAC 2D .0530, "Prevention of Significant Deterioration":
 - Filterable particulate emissions (PM10/PM2.5) from the Cement handling, Storage, and Loadout (CHSL) shall be controlled by bagfilters with an outlet grain loading not to exceed 0.005 gr/scf.
 - ii. If emission testing is required, the testing shall be performed in accordance with 15A NCAC 2D .2602 and General Condition 18 of the Permit. If the results of this test are above the applicable limit, the Permittee shall be deemed in noncompliance with 15A NCAC 2D .0530.
- Monitoring/Recordkeeping [15A NCAC 02Q .0508(f)]
- iii. Particulate emissions (PM10/PM2.5) from the Raw Mill Handling System (RMHS), Clinker Handling System (CHS), and the Finish Mills shall be controlled by bagfilters. To assure compliance, the Permittee shall perform inspections and maintenance as recommended by the manufacturer. In addition to the manufacturer's inspection and maintenance recommendations, or if there is no manufacturer's inspection and maintenance recommendations, as a minimum, the inspection and maintenance requirement shall include the following:
 - (A) a monthly visual inspection of the system ductwork and material collection unit for leaks; and
 - (B) an annual (for each 12 month period following the initial inspection) internal inspection of the bagfilter's structural integrity.
 - iv. The results of inspection and maintenance shall be maintained in a logbook (written or electronic format) on-site and made available to an authorized representative upon request. The logbook shall record the following:
 - (A) the date and time of each recorded action;
 - (B) the results of each inspection;
 - (C) the results of any maintenance performed on the bagfilters; and
 - (D) any variance from manufacturer's recommendations, if any, and corrections made.

Reporting [15A NCAC 02Q .0508(f)]

- v. The Permittee shall submit a semi-annual summary report of operations, acceptable to the Regional Air Quality Supervisor, of monitoring and recordkeeping activities postmarked on or before January 30 of each calendar year for the preceding six-month period between July and December, and July 30 of each calendar year for the preceding six-month period between January and June. The report shall contain the following:
- (A) the monthly summary log of the Raw Mill Handling System (RMHS), Clinker Handling System (CHS), and Finish Mills System for the previous 17 months.
 - (B) any deviations from monitoring requirements.

These sources are controlled by a bagfilter using an outlet grain loading not to exceed 0.005 gr/standard cubic foot (scf). The standard gas flow rate is the gas flow rate expressed at standard conditions [(68 degrees F (528 degrees Rankine) and 14.7 psia (407 inches water)]. Standard gas flow rates are useful when material balances are prepared, for calculations in which the gas stream may undergo chemical reactions, and for comparing the flow rate in a system with the flow rate capacity of a fan.

The maximum inlet airflow rate of each bagfilter is given in actual cubic feet per minute (ACFM). In order to calculate the PM output from each bagfilter, the following equation shall be used.

$$\text{ACFM} = \text{SCFM} \times \left[\frac{T_{\text{actual}}}{T_{\text{STP}}} \right] \times \left[\frac{P_{\text{STP}}}{P_{\text{actual}}} \right]$$

Where: T_{actual} = actual temperature at the outlet of the bagfilter
 T_{STP} = standard temperature at the outlet of the bagfilter (68 degrees F)
 P_{actual} = actual pressure at the outlet of the bagfilter (14.7 psia or 407 inches W.C.)
 P_{STP} = standard pressure at the outlet of the bagfilter (14.7 psia or 407 inches W.C.)

Solve equation for SCF

$$\text{SCFM} = \text{ACFM} \times \left[\frac{T_{\text{STP}}}{T_{\text{Actual}}} \right] \times \left[\frac{P_{\text{Actual}}}{P_{\text{STP}}} \right]$$

Example Calculation using source (Raw mill feed bin controlled by bagfilter CD32).

$$\text{SCFM} = 26,910 \text{ ACFM} \times \left[\frac{(460 + 68) \text{ STP}}{(460 + 212) \text{ Actual}} \right] \times \left[\frac{(407 \text{ inches water column})_{\text{Actual}}}{(407 \text{ inches water column})_{\text{STP}}} \right] = 21,144 \text{ SCFM}$$

Outlet grain loading for each bagfilter = 0.005 grains/SCF

$$\text{Maximum emissions of PM(lbs/hr)} = \frac{0.005 \text{ grains}}{\text{standard cubic foot}} \times \frac{21,144 \text{ standard cubic feet}}{\text{minute}} \times \frac{60 \text{ minutes}}{\text{hour}} \times \frac{1 \text{ lb}}{7000 \text{ grains}} = \frac{0.91 \text{ lbs}}{\text{hour}}$$

Source	ACFM to bagfilter	Stand. Temp.	Actual Temp.	Stand. Pressure	Actual Pressure	PM Output * (lbs/hr)
Cement dome (bagfilter CD32)	26,910 ACFM	68 °F	212 °F	14.7 psia	14.7 psia	0.91 lbs/hr
Cement dome extraction rail (bagfilter CD33)	1,800 ACFM	68 °F	212 °F	14.7 psia	14.7 psia	0.06 lbs/hr
Cement dome extraction truck (bagfilter CD34)	1,800 ACFM	68 °F	212 °F	14.7 psia	14.7 psia	0.06 lbs/hr
Cement silo (bagfilter CD40)	22,750 ACFM	68 °F	212 °F	14.7 psia	14.7 psia	0.77 lbs/hr
Cement silo extraction (bagfilter CD41)	1,271 ACFM	68 °F	212 °F	14.7 psia	14.7 psia	0.04 lbs/hr
Cement transport (bagfilter CD42)	2,578 ACFM	68 °F	212 °F	14.7 psia	14.7 psia	0.09 lbs/hr
Packaging plant (bagfilter CD43)	7,416 ACFM	68 °F	212 °F	14.7 psia	14.7 psia	0.25 lbs/hr
Total						2.17 lbs/hr

* PM10 is 84% of the PM number in accordance with AP-42 Table 11.6-5

- I. Kiln System: One coal/petroleum coke-fired, (distillate fuel used for startup only) multi-stage preheater-precalsiner kiln @ 675 million Btu per hour heat input capacity with inline raw mill, coal mill, alkali bypass and inline clinker cooler with associated selective non-catalytic reduction (SNCR, CD44N), one bagfilter (CD44A), one carbon injection system/bagfilter (CD44D), one coal mill bagfilter (CD44B), one preheater bypass bagfilter (CD44C), and one wet scrubber (CD44S).

1. Description:

The preheater tower at this facility contains a series of vertical cyclone chambers through which the raw materials pass on their way to the kiln. The exhaust gas from the kiln rises about 200 feet and is used to preheat the raw materials as they swirl through the preheater cyclones. In the preheater/precalsiner stage, materials are heated up to temperatures just below the melting or fusion point. Powdered coal or pet coke is injected and burned in the preheater/precalsiner section. 60% of the total heat input for the system occurs in this section.

The most common combination of ingredients is limestone (for calcium) coupled with much smaller quantities of clay and sand. The raw materials for clinker production at this facility include limestone/marl, bauxite (principal ore of aluminum), bottom ash, sand, and mill scale (iron). Synthetic gypsum or natural gypsum will be milled with the clinker to produce cement. The bauxite, fly ash/bottom ash, mill scale will be brought in from the outside and will be added to the mixture.

Raw preheated material enters the rotating furnace called a kiln. The raw material mix enters the kiln at the elevated end, and the combustion fuels are introduced into the lower end of the kiln in a countercurrent manner. The materials are continuously and slowly moved to the lower end by rotation of the kiln. This horizontally sloped steel cylinder, lined with firebrick, turns from one to three revolutions per minute. As the materials move down the kiln, the material passes through progressively hotter zones toward the flame. At the lower end of the kiln (hottest part) the material may become partially molten. This system transforms the raw mix into red-hot clinkers, which are gray, glass-hard, spherically shaped nodules that range from 0.32 to 5.1 centimeters (cm) (0.125 to 2.0 inches) in diameter. Emissions from the preheater/precalsiner kiln system exit the main stack after being treated by a Selective Non Catalytic Reduction system (SNCR, for NO_x), one main bagfilter (for filterable PM10/PM2.5, CD44A), one Activated Carbon Injection System (for Hg), one Activated Carbon bagfilter, and one wet scrubber (for SO₂). Emissions from the coal mill are routed through the Coal Mill Baghouse (CD44B) before joining the exhaust stream from the kiln just upstream of bagfilter CD44A and scrubber CD44S.

2. Applicable Regulatory Requirements:

The kiln system (ES-KS) is subject to MACT regulations in accordance with 40 CFR Part 63, Subpart LLL "National Emission Standards for Hazardous Air Pollutant From the Portland Cement Manufacturing Industry" and NSPS regulations in accordance with Subpart F "Standards of Performance for Portland Cement Plants". According to 40 CFR §63.1356 and 40 CFR §60.62(d), when sources are subject to two regulations with different emission limits under Title 40, the more stringent requirements apply.

The kiln system (preheater/precalciner kiln/in-line raw mill/clinker cooler) is subject to 15A NCAC 2D .0513 "Particulates From Portland Cement Plants". This regulation requires that particulate emissions from a kiln be controlled by at least 99.7 percent and that the PM emission rate not exceed 0.327 lbs/barrel. However, the kiln system at this facility will be controlled by a bagfilter with greater than 99.9 percent efficiency and with a PM emission rate much less than 0.04 lbs/barrel of cement. Therefore, the more stringent requirements of the MACT Subpart LLL and NSPS Subpart F will be placed into the Air Permit.

NSPS (40 CFR Part 60, Subpart F) "Standards Of Performance For Portland Cement Plants" does apply to the kiln system and raw mill system. In accordance with NSPS 40 CFR Part 60, §60.62 when a source is subject to another Part 40 regulation, the source shall be subject to the more stringent requirement. The sources at this facility are also subject to 40 CFR Part 63 "National Emissions Standards For Portland Cement Plants". NSPS OOO does not apply to sources at a Portland Cement Plant that are also subject to NSPS Subpart F, and MACT Subpart LLL.

NSPS (40 CFR Part 60, Subpart UUU) "Standards Of Performance For Calciners and Dryers in Mineral Industries" does not apply to this Portland Cement manufacturing plant because this cement plant does not process or produce any of the following seventeen minerals, their concentrates or any mixture of which the majority is greater than 50%. The minerals are: alumina, ball clay, bentonite, diatomite, feldspar, fire clay, fuller's earth, gypsum, industrial sand, kaolin, lightweight aggregate, magnesium compounds, perlite, roofing granules, talc, titanium dioxide, and vermiculite.

The kiln is specifically exempted from NSPS Subpart CCCC "Standards of Performance for Commercial and Industrial Solid Waste Incineration Units (CISWI) in accordance with §60.2020(l) "Definitions". In a preheater/precalciner/kiln system, the calciner is an integral part of the kiln and is considered to be part of the kiln. The Final rule for NSPS, Subpart CCCC was published in the Federal Register on March 21, 2011.

The kiln system (preheater/precalciner kiln/in-line raw mill/clinker cooler) is not subject to 15A NCAC 2D .0537 "Control of Mercury Emissions". This regulation applies to all new and existing stationary sources engaged in the handling or processing of mercury that are not subject to standards for the emissions of mercury in Rule 2D .0530 (PSD), 2D .1110 (NESHAP) or 2D .1111 (MACT). On November 8, 2010 the MACT (Subpart LLL) for Portland Cement Plants became effective and contained an emission standard for mercury emissions.

The kiln system (preheater/precalciner kiln/in-line raw mill/clinker cooler) is not subject to 15A NCAC 2D .0516 "Sulfur Dioxide Emissions From Combustion Sources". This regulation applies to all sources that emit sulfur dioxide from a vent, stack, or chimney. However, this regulation does not apply if the source is also subject to an emission standard for sulfur dioxide in 2D .0524 (NSPS). On November 8, 2010 the NSPS (Subpart F) for Portland Cement Plants became effective and contained an emission standard for sulfur dioxide emissions.

The kiln system (preheater/precalciner kiln/in-line raw mill/clinker cooler) is not subject to the NO_x Rules under 15A NCAC 2D .1400 because this rule does not apply to cement kilns.

The following provides a summary of limits and/or standards for the emission sources described above.

Regulated Pollutant	Limits/Standards	Applicable Regulation
Particulate emissions (PM10/PM2.5)	Combined filterable particulate emissions from the kiln/inline raw mill/inline clinker cooler main stack shall not exceed PM10/PM2.5 emissions as calculated by the following equation: $PM_{alt} = \frac{0.0008 \times 1.65 \times (Q_k + Q_c)}{7000}$	15A NCAC 2D .0524 40 CFR Part 60, Subpart F
		15A NCAC 2D .1111 40 CFR Part 63, Subpart LLL
		15A NCAC 2D .0530 PSD (BACT)
Particulate emissions (Condensable PM10/PM2.5)	50 percent removal across the wet scrubber using test Method 202	15A NCAC 2D .0530 PSD (BACT)
Particulate emissions (PM10/PM2.5) (startup/shutdown)	Filterable particulate emissions shall not exceed 0.0008 gr/dscf, 7-day rolling average, as determined by a PM CEMS	15A NCAC 2D .0530 PSD (BACT)
		15A NCAC 2D .1111 40 CFR Part 63, Subpart LLL
Visible emissions	20 percent or Continuous Emissions Monitor	15A NCAC 2D .0524 40 CFR Part 60, Subpart F
Sulfur dioxide	Combined emissions from the kiln/inline raw mill/inline clinker cooler/coal mill shall not exceed 0.4 lbs per ton of clinker, 30 day rolling average as measured by a Continuous Emissions Monitor or demonstrate a 90% SO ₂ control efficiency across the SO ₂ control device (wet scrubber)	15A NCAC 2D .0524 40 CFR Part 60, Subpart F
		15A NCAC 2D .0530 PSD (BACT)
	Combined emissions from the kiln/inline raw mill/inline clinker cooler/coal mill shall not exceed 173 pounds per hour as measured by a Continuous Emissions Monitor	40 CFR 51.166(k) National Ambient Air Quality Standards
Nitrogen oxides	Combined emissions from the kiln/inline raw mill/inline clinker cooler/coal mill shall not exceed 1.50 pounds per ton clinker, 30 day rolling average as measured by a Continuous Emissions Monitor	15A NCAC 2D .0524 40 CFR Part 60, Subpart F
	Combined emissions from the kiln/inline raw mill/inline clinker cooler/coal mill shall not exceed 1.40 pounds per ton clinker, 30 day rolling average as measured by a Continuous Emissions Monitor	15A NCAC 2D .0530 PSD (BACT)
	Combined emissions from the kiln/inline raw mill/inline clinker cooler/coal mill shall not exceed 700 pounds per hour as measured by a Continuous Emissions Monitor	40 CFR 51.166(k) National Ambient Air Quality Standards
Carbon monoxide	Combined emissions from the kiln/inline raw mill/inline clinker cooler/coal mill shall not exceed 2.80 lbs per ton of clinker, 30 day rolling average as measured by a Continuous Emissions Monitor	15A NCAC 2D .0530 PSD (BACT)
Volatile organic compounds (VOCs)	Combined emissions from the kiln/inline raw mill/inline clinker cooler/coal mill shall not exceed 0.16 lbs per ton of clinker, 30 day rolling average as measured by a Continuous Emissions Monitor	15A NCAC 2D .0530 PSD (BACT)
GHGs	Combined emissions from the kiln/inline raw mill/inline clinker cooler/coal mill/emergency generator shall not exceed 0.91 lbs CO _{2e} per ton of clinker, 12-month calendar average, in accordance with 40 CFR Part 98	15A NCAC 2D .0530 PSD (BACT)
Dioxins and Furans	Combined emissions from the kiln/inline raw mill/clinker cooler/coal mill shall not exceed 0.2 ng/dscm (TEQ) on a dry basis, corrected to 7 percent oxygen. If the average temperature at the inlet to the particulate matter control device is 400 degrees F or less, the limit is changed to 0.4 ng/dscm (TEQ).	15A NCAC 2D .1111 40 CFR Part 63, Subpart LLL

-Table continued on the next page-

The following provides a summary of limits and/or standards for the emission source s described above. – continued-

Regulated Pollutant	Limits/Standards	Applicable Regulation
Total hydrocarbons (THC)	24 ppmvd, 30 day rolling average, during normal operation, corrected to 7 percent oxygen, measured as propane using a CEMs 24 ppmvd, 7 day rolling average, during startup and shutdown, uncorrected oxygen, measured as propane using a CEMs Alternative limit of 9 ppmvd for total HAPs	15A NCAC 2D .1111 40 CFR Part 63, Subpart LLL
Hydrogen chloride (HCl)	3 ppmvd, 30 day rolling average, during normal operation 3 ppmvd, 7-day rolling average, during startup and shutdown	15A NCAC 2D .1111 40 CFR Part 63, Subpart LLL
Mercury	Combined emissions from the kiln/inline raw mill/clinker cooler/coal mill shall not exceed 21 lbs per million tons of clinker, 30 day rolling average, during normal operation Combined emissions from the kiln/inline raw mill/clinker cooler/coal mill shall not exceed 4 µg/dscm, 7-day rolling average, during startup and shutdown Both limits measured by CEMs	15A NCAC 2D .1111 40 CFR Part 63, Subpart LLL
Toxic air emissions	Modeled emission rates (State Enforceable Only, See Multiple Emissions VIIC)	15A NCAC 2D .1100

- a. 15A NCAC 2D .0524, 40 CFR Part 60, Subpart F “Standards of Performance for Portland Cement Plants”
The Permittee shall comply with all applicable provisions, including the notification, testing, recordkeeping, and monitoring requirements contained in 15A NCAC 2D .0524 "New Source Performance Standards (NSPS) as promulgated in 40 CFR Part 60 Subpart F “Standards of Performance for Portland Cement Plants”, including Subpart A "General Provisions." [40 CFR Part 60, Subpart F]

If the Permittee demonstrates compliance with any applicable emission limit through performance stack testing or other emissions monitoring, they shall develop a site-specific monitoring plan according to the requirements in 40 CFR §60.63(i)(1) through (4). This requirement also applies to the Permittee who petitions the EPA Administrator for alternative monitoring parameters under 40 CFR §60.63 and 40 CFR §63.8(f).

- i. PM10/PM2.5 Emission Standard [40 CFR §60.61]:
The filterable particulate (PM10/PM2.5) emission standard for 15A NCAC 2D .0524, NSPS Subpart F shall be met by compliance with the particulate (PM10/PM2.5) standard for 15A NCAC 2D .1111, MACT Subpart LLL. (See Section VI. I. 2. b. of this Review)

Monitoring, recordkeeping, and reporting requirements for 15A NCAC 2D .0524, NSPS Subpart F shall be met by the monitoring, recordkeeping, and reporting requirements listed in 15A NCAC 1111, MACT Subpart LLL, (See Section VI. I. 2. b. of this Review).

- ii. Visible Emissions Standard [40 CFR §60.62(a)(2)]:
The visible emissions standard for 15A NCAC 2D .0524, NSPS Subpart F shall be met by operating a PM Continuous Emission Monitor (CEM) in accordance with 15A NCAC 2D .1111, MACT Subpart LLL.

Monitoring, recordkeeping, and reporting requirements for 15A NCAC 2D .0524, NSPS Subpart F shall be met by the monitoring, recordkeeping, and reporting requirements listed in 15A NCAC 1111, MACT Subpart LLL. [See Section VI. I. 2. b. iv. of this Review]

iii. NO_x Emission Standard [40 CFR §60.62(a)(3)]:

Emissions shall not exceed 1.5 lbs/ton of clinker except this limit does not apply to any alkali bypass installed on the kiln. An operating day includes all valid data obtained in any daily 24-hour period during which the kiln operates and excludes any measurements made during the daily 24-hour period when the kiln was not operating.

Monitoring Requirements [40 CFR 60.63] – NO_x

(A) Clinker Production Requirements

- (1) Clinker production requirements for NO_x emissions shall be met in accordance with the clinker production requirements of 15A NCAC 2D .1111 MACT Subpart LLL. [See Section 2.1 I. 3. d. ii. of this Review]
- (2) The Permittee shall install, operate, calibrate, and maintain an instrument for continuously monitoring and recording the concentration by volume of NO_x emissions into the atmosphere for any kiln subject to the NO_x emissions limit in §60.62(a)(3). If the kiln has an alkali bypass, NO_x emissions from the alkali bypass do not need to be monitored, and NO_x emission monitoring of the kiln exhaust may be done upstream of any comingled alkali bypass gases.
- (3) The Permittee shall install, operate, and maintain according to Performance Specification 2 (40 CFR Part 60, Appendix B) and the requirements in paragraphs (f)(1) through (5) of 40 CFR §60.63 each CEMS required under paragraphs 40 CFR §60.63(d) as follows:
 - (a) The span value of each NO_x monitor shall be set at 125 percent of the maximum estimated hourly potential NO_x emission concentration that translates to the applicable emission limit at full clinker production capacity.
 - (b) The Permittee shall conduct performance evaluations of each NO_x monitor according to the requirements in §60.13(c) and Performance Specification 2 of Appendix B to Part 60. The Permittee shall use Methods 7, 7A, 7C, 7D, or 7E of Appendix A–4 to Part 60 for conducting the relative accuracy evaluations. The method ASME PTC 19.10–1981, “Flue and Exhaust Gas Analyses,” (incorporated by reference—see §60.17) is an acceptable alternative to EPA Method 7 or 7C of Appendix A–4 to Part 60.
 - (c) The Permittee shall comply with the quality assurance requirements in Procedure 1 of Appendix F to Part 60 for each monitor, including quarterly accuracy determinations for monitors, and daily calibration drift tests.
- (4) For each CEMS required under 40 CFR §60.63(d):
 - (a) The Permittee shall operate the monitoring system and collect data at all required intervals at all times the affected source is operating, except for periods of monitoring system malfunctions, repairs associated with monitoring system malfunctions, and required monitoring system quality assurance or quality control activities (including, as applicable, calibration checks and required zero and span adjustments).
 - (b) The Permittee shall not use data recorded during the monitoring system malfunctions, repairs associated with monitoring system malfunctions, or required monitoring system quality assurance or control activities in calculations used to report emissions or operating levels. A monitoring system malfunction is any sudden, infrequent, not reasonably preventable failure of the monitoring system to provide valid data. Monitoring system failures that are caused in part by poor maintenance or careless operation are not malfunctions. A Permittee shall use all the data collected during all other periods in assessing the operation of the control device and associated control system.
 - (c) The Permittee shall meet the requirements of §60.13(h) when determining the 1-hour averages of emissions data.

- (5) The Permittee shall install, operate, calibrate, and maintain instruments for continuously measuring and recording the pollutant per mass flow rate to the atmosphere for each kiln subject to the NO_x emissions limit in 40 CFR §60.62(a)(3) according to the following requirements:
- (a) The Permittee shall install each sensor of the flow rate monitoring system in a location that provides representative measurement of the exhaust gas flow rate at the sampling location of the NO_x CEMS, taking into account the manufacturer's recommendations. The flow rate sensor is that portion of the system that senses the volumetric flow rate and generates an output proportional to that flow rate.
 - (b) The flow rate monitoring system shall be designed to measure the exhaust gas flow rate over a range that extends from a value of at least 20 percent less than the lowest expected exhaust flow rate to a value of at least 20 percent greater than the highest expected exhaust gas flow rate.
 - (c) The flow rate monitoring system shall have a minimum accuracy of 5 percent of the flow rate.
 - (d) The flow rate monitoring system shall be equipped with a data acquisition and recording system that is capable of recording values over the entire range specified in paragraph (h)(2) of this section.
 - (e) The signal conditioner, wiring, power supply, and data acquisition and recording system for the flow rate monitoring system shall be compatible with the output signal of the flow rate sensors used in the monitoring system.
 - (f) The flow rate monitoring system shall be designed to complete a minimum of one cycle of operation for each successive 15-minute period.
 - (g) The flow rate sensor shall have provisions to determine the daily zero and upscale calibration drift (CD) (*see* sections 3.1 and 8.3 of Performance Specification 2 in Appendix B to Part 60 of this chapter for a discussion of CD).
 - (a) Conduct the CD tests at two reference signal levels, zero (e.g., 0 to 20 percent of span) and upscale (e.g., 50 to 70 percent of span).
 - (b) The absolute value of the difference between the flow monitor response and the reference signal shall be equal to or less than 3 percent of the flow monitor span.
 - (h) The Permittee shall perform an initial relative accuracy test of the flow rate monitoring system according to section 8.2 of Performance Specification 6 of Appendix B to Part 60 of the chapter, with the exceptions noted in paragraphs (h)(8)(i) and (ii).
 - (i) The relative accuracy test is to evaluate the flow rate monitoring system alone rather than a continuous emission rate monitoring system.
 - (ii) The relative accuracy of the flow rate monitoring system shall be no greater than 10 percent of the mean value of the reference method data.
 - (i) The Permittee shall verify the accuracy of the flow rate monitoring system at least once per year by repeating the relative accuracy test specified in paragraph (h)(8).
 - (j) The Permittee shall operate the flow rate monitoring system and record data during all periods of operation of the affected facility including periods of startup, shutdown, and malfunction, except for periods of monitoring system malfunctions, repairs associated with monitoring system malfunctions, and required monitoring system quality assurance or quality control activities (including, as applicable, calibration checks and required zero and span adjustments).

Emissions of NO_x shall not exceed 1.5 lbs/ton of clinker except this limit does not apply to any alkali bypass installed on the kiln.

Maximum clinker production: 2,190,000 tons per year
 Allowable emission rate: 1.5 lbs NO_x per ton clinker

$$\text{Allowable NO}_x \text{ (lbs/hr)} = \frac{1.5 \text{ lbs NO}_x}{\text{ton clinker}} \times \frac{2,190,000 \text{ tons}}{\text{year}} \times \frac{1 \text{ year}}{8760 \text{ hour}} = \frac{375.0 \text{ lbs}}{\text{hour}}$$

The US EPA states in the preface to NSPS Subpart F (Vol. 73, No. 116, 2008/proposed rules, page 34079) that based on data from equipment vendors and representatives from facilities with more difficult-to-burn raw materials, they believe that future well designed and operated cement kilns, will incorporate staged combustion in the calciner (SCC) and low-NOx burners, will meet a level of 2.5 lb/ton of clinker on average, without consideration of end-of-stack air pollution control. Therefore, the EPA used this level as the baseline level of control that would occur with no additional regulatory action. However, the EPA does recognize that in some applications the level achieved even when using low-NOx burners, indirect firing and well designed kiln system may be as high as 3.0 lb/ton of clinker due to the burnability of raw materials.

The uncontrolled limit at CCC is 2.8 lbs/ton of clinker because of the high burnability and moisture of the raw material. NOx emissions at CCC shall be controlled by using indirect firing, low-NOx burners, staged combustion, and selective noncatalytic reduction with an estimated efficiency of 50% (ammonia spray).

2.80 lbs NOx/ton of clinker (1 - 0.50) = 1.4 lbs/ton of clinker

Compliance is indicated. Monitoring will be performed with the use of a continuous emission rate monitor meeting the requirements of Performance Specification PS-2 in accordance with 40 CFR Part 60, Appendix B.

- iv. Sulfur Dioxide Emission Standard [40 CFR §60.62(a)(4)]:
Emissions shall not exceed 0.4 pounds of sulfur dioxide (SO₂) per ton of clinker on a 30-operating day rolling average unless the Permittee is demonstrating a 90 percent SO₂ emissions reduction measured across the SO₂ control device. An operating day includes all valid data obtained in any daily 24-hour period during which the kiln operates, and excludes any measurements made during the daily 24-hour period when the kiln was not operating.

Monitoring Requirements [40 CFR 60.63] – Sulfur dioxide

(A) Clinker Production Requirements

- (1) Clinker production requirements for sulfur dioxide emissions shall be met in accordance with the clinker production requirements of 15A NCAC 2D .1111 MACT Subpart LLL. [See Section VI. I. 2. b. v. of this Review]
- (2) The Permittee shall install, operate, calibrate, and maintain an instrument for continuously monitoring and recording the concentration by volume of SO₂ emissions into the atmosphere for any kiln subject to the SO₂ emissions limit in 40 CFR §60.62(a)(4). If the Permittee is complying with the alternative 90 percent SO₂ emissions reduction emission limit, then they shall also continuously monitor and record the concentration by volume of SO₂ present at the wet scrubber inlet.
- (3) The Permittee shall install, operate, and maintain according to Performance Specification 2 (40 CFR Part 60, Appendix B) and the requirements in paragraphs (f)(1) through (5) of 40 CFR §60.63 each CEMS required under paragraphs 40 CFR §60.63(e) as follows:
 - (a) The span value for the SO₂ monitor shall be set at 125 percent of the maximum estimated hourly potential SO₂ emission concentration that translates to the applicable emission limit at full clinker production capacity.
 - (b) The Permittee shall conduct performance evaluations of each SO₂ monitor according to the requirements in §60.13(c) and Performance Specification 2 of Appendix B to Part 60. The Permittee shall use Methods 6, 6A, or 6C of Appendix A–4 to Part 60 for conducting the relative accuracy evaluations. The method ASME PTC 19.10–1981, “Flue and Exhaust Gas Analyses,” (incorporated by reference—see §60.17) is an acceptable alternative to EPA Method 6 or 6A of Appendix A–4 to Part 60.
 - (c) The Permittee shall comply with the quality assurance requirements in Procedure 1 of Appendix F to Part 60 for each monitor, including quarterly accuracy determinations for monitors, and daily calibration drift tests.

Emissions of sulfur dioxide shall not exceed 0.4 lbs/ton of clinker (except this limit does not apply to any alkali bypass installed on the kiln) or 90% reduction efficiency measured across the SO₂ control device.

Maximum clinker production: 2,190,000 tons per year
 Allowable emission rate: 0.4 lbs SO₂ per ton clinker

$$\text{Allowable } SO_2 \text{ (lbs/hr)} = \frac{0.4 \text{ lbs } SO_2}{\text{ton clinker}} \times \frac{2,190,000 \text{ tons}}{\text{year}} \times \frac{1 \text{ year}}{8760 \text{ hour}} = \frac{100.0 \text{ lbs}}{\text{hour}}$$

Sulfur liberation and absorption processes take place in the rotary kiln, the precalciner, and the lower section of the preheater tower. Using raw material sulfur sampling and mix design data, CCC estimates that the worst-case uncontrolled SO₂ emissions from the raw material, prior to the preheater will be 10.75 lbs per ton of clinker. A portion of the SO₂ from the kiln gases is absorbed into the kiln feed in the preheater tower. The SO₂ removal efficiency of the preheater has been estimate at 60 percent. The SO₂ at the preheater exit are approximately 4.30 lbs/ton clinker.

$$10.75 \text{ lbs/ton clinker} \times (1 - 0.60, \text{ control efficiency}) = 4.30 \text{ lbs/ton clinker}$$

A small portion of the gas (approximately 7.8% or 0.34 lbs/ton clinker) is diverted to the coal mill to aid in the coal drying process. Subtracting the SO₂ that is vented to the coal mill leaves 3.96 lbs/ton clinker that will go directly to the main stack when the raw mill is not running. A small amount of SO₂ absorption occurs (25%) in the coal mill system that reduces the amount going back into the main stack to 0.25 lbs/ton clinker.

$$0.34 \text{ lbs/ton clinker} \times (1 - 0.25, \text{ control efficiency}) = 0.25 \text{ lbs/ton clinker (from the coal mill)}$$

The total amount of SO₂ entering the main stack during “mill off” conditions = 0.25 + 3.96 = 4.22 lbs ton of clinker.

When the raw mill is in operation, the reduction efficiency for SO₂ is 50%.

$$3.96 \text{ lbs/ton clinker} \times (1 - 0.50, \text{ control efficiency}) = 1.98 \text{ lbs/ton of clinker.}$$

The total amount of SO₂ entering the main stack during “mill on” conditions = 0.25 + 1.98 = 2.23 lbs/ ton of clinker.

The raw mill is expected to operate 80% of the time. Factoring a 20% “mill off” condition, the average long term untreated SO₂ emission rate = 2.63 lbs/ton of clinker.

$$\text{Potential to emit before scrubber: } (0.80 \times 2.23 \text{ lbs/ton of clinker}) + (0.20 \times 4.22 \text{ lbs/ton of clinker}) = 2.63 \text{ lbs/ton of clinker}$$

SO₂ emissions shall be controlled by the inherent scrubbing in the preheater, precalciner, kiln, and raw mill, and a wet scrubber (85-90% efficiency).

$$\text{Potential to emit after scrubber: } 2.63 \text{ lbs/ton of clinker} \times (1 - 0.85) = 0.3945 \text{ lbs/ton of clinker}$$

Compliance is indicated since the actual emissions (0.3945 lbs/ton clinker) are less than the allowable emissions (0.4 lbs/ton clinker). Monitoring is performed using continuous emission rate monitor meeting the requirements of Performance Specification PS-2 in accordance with 40 CFR Part 60, Appendix B.

- (4) For each CEMS required under 40 CFR §60.63(e):
 - (a) The Permittee shall operate the monitoring system and collect data at all required intervals at all times the affected source is operating, except for periods of monitoring system malfunctions, repairs associated with monitoring system malfunctions, and required monitoring system quality assurance or quality control activities (including, as applicable, calibration checks and required zero and span adjustments).
 - (b) The Permittee shall not use data recorded during the monitoring system malfunctions, repairs associated with monitoring system malfunctions, or required monitoring system quality assurance or control activities in calculations used to report emissions or operating levels. A monitoring system malfunction is any sudden, infrequent, not reasonably preventable failure of the monitoring system to provide valid data. Monitoring system failures that are caused in part by poor maintenance or careless operation are not malfunctions. The Permittee shall use all the data collected during all other periods in assessing the operation of the control device and associated control system.
 - (c) The Permittee shall meet the requirements of 40 CFR §60.13(h) when determining the 1-hour averages of emissions data.
- (5) The Permittee shall install, operate, calibrate, and maintain instruments for continuously measuring and recording the pollutant per mass flow rate to the atmosphere for each kiln subject to the SO₂ emissions limit in §60.62(a)(4) according to the following requirements:
 - (a) The Permittee shall install each sensor of the flow rate monitoring system in a location that provides representative measurement of the exhaust gas flow rate at the sampling location of the SO₂ CEMS, taking into account the manufacturer's recommendations. The flow rate sensor is that portion of the system that senses the volumetric flow rate and generates an output proportional to that flow rate.
 - (b) The flow rate monitoring system shall be designed to measure the exhaust gas flow rate over a range that extends from a value of at least 20 percent less than the lowest expected exhaust flow rate to a value of at least 20 percent greater than the highest expected exhaust gas flow rate.
 - (c) The flow rate monitoring system shall have a minimum accuracy of 5 percent of the flow rate.
 - (d) The flow rate monitoring system shall be equipped with a data acquisition and recording system that is capable of recording values over the entire range specified in paragraph (h)(2) of this section.
 - (e) The signal conditioner, wiring, power supply, and data acquisition and recording system for the flow rate monitoring system shall be compatible with the output signal of the flow rate sensors used in the monitoring system.
 - (f) The flow rate monitoring system shall be designed to complete a minimum of one cycle of operation for each successive 15-minute period.
 - (g) The flow rate sensor shall have provisions to determine the daily zero and upscale calibration drift (CD) (*see* sections 3.1 and 8.3 of Performance Specification 2 in Appendix B to Part 60 of this chapter for a discussion of CD).
 - (a) Conduct the CD tests at two reference signal levels, zero (e.g., 0 to 20 percent of span) and upscale (e.g., 50 to 70 percent of span).
 - (b) The absolute value of the difference between the flow monitor response and the reference signal shall be equal to or less than 3 percent of the flow monitor span.
 - (h) The Permittee shall perform an initial relative accuracy test of the flow rate monitoring system according to section 8.2 of Performance Specification 6 of Appendix B to Part 60 of the chapter, with the exceptions noted in paragraphs (h)(8)(i) and (ii).
 - (i) The relative accuracy test is to evaluate the flow rate monitoring system alone rather than a continuous emission rate monitoring system.
 - (ii) The relative accuracy of the flow rate monitoring system shall be no greater than 10 percent of the mean value of the reference method data.

- (i) The Permittee shall verify the accuracy of the flow rate monitoring system at least once per year by repeating the relative accuracy test specified in paragraph (h)(8).
 - (j) The Permittee shall operate the flow rate monitoring system and record data during all periods of operation of the affected facility including periods of startup, shutdown, and malfunction, except for periods of monitoring system malfunctions, repairs associated with monitoring system malfunctions, and required monitoring system quality assurance or quality control activities (including, as applicable, calibration checks and required zero and span adjustments).
- b. 15A NCAC 2D .1111, 40 CFR Part 63, Subpart LLL “National Emissions Standards For Hazardous Air Pollutants from the Portland Cement Manufacturing Industry”
- Kiln System: One coal/petroleum coke-fired multi-stage preheater-precalsiner kiln @ 675 million Btu per hour heat input with inline raw mill, coal mill, alkali bypass and inline clinker cooler with associated selective non-catalytic reduction (SNCR, CD44N), one bagfilter (CD44A), one carbon injection system/bagfilter (CD44D), one coal mill bagfilter (CD44B), one preheater bypass bagfilter (CD44C), and one wet scrubber (CD44S)
- i. The Permittee shall comply with all applicable provisions, including the reporting, record keeping, and monitoring requirements contained in Environmental Management Commission Standard 15A NCAC 2D .1111 “Maximum Achievable Control Technology” (MACT) as promulgated in 40 CFR 63, Subpart LLL “National Emission Standards For Hazardous Air Pollutants From the Portland Cement Manufacturing Industry”, including Subpart A “General Provisions.
- (A) PM/PM10 Emission Standards (main stack) [40 CFR §63.1343(b)(2)]:
- (1) PM/PM10 emissions from new kilns that combine kiln exhaust and clinker cooler gas shall be calculated using the following equation during normal operation, 30 day rolling average:

$$PM_{alt} = \frac{0.0008 \times 1.65 \times (Q_k + Q_c)}{7000}$$

- Where: P_{alt} = Calculated particulate emission (lbs/ton clinker) limit when kiln exhaust and clinker cooler exhaust are combined
 0.0008 = PM exhaust concentration (gr/dscf) where kiln exhaust and clinker cooler exhaust are not combined
 1.65 = Conversion factor of lb feed per lb clinker
 Q_k = The exhaust flow of the kiln (dscf/ton raw feed)
 Q_c = The exhaust flow of the clinker cooler (dscf/ton raw feed)
 7000 = grains per pound

The maximum air flow rate expected through the kiln and the clinker cooler ($Q_k + Q_c$) system when the raw mill is in operation is = 515,677 dscf/minute.

The maximum air flow rate expected through the kiln and the clinker cooler ($Q_k + Q_c$) system when the raw mill is not in operation is = 411,876 dscf/minute.

Raw virgin feed into the kiln = 385.5 tons/hour

$$(Q_k + Q_c) = \frac{515,677 \text{ dscf}}{\text{minute}} \times \frac{60 \text{ minutes}}{\text{hour}} \times \frac{\text{hour}}{385.5 \text{ ton raw feed}} = \frac{80,261 \text{ dscf}}{\text{ton raw feed}} \text{ (mill on)}$$

$$(Q_k + Q_c) = \frac{411,876 \text{ dscf}}{\text{minute}} \times \frac{60 \text{ minutes}}{\text{hour}} \times \frac{\text{hour}}{385.5 \text{ ton raw feed}} = \frac{64,105 \text{ dscf}}{\text{ton raw feed}} \text{ (mill off)}$$

$$P_{alt} \text{ (lbs/ton clinker)} = \frac{0.0008 \text{ grains}}{\text{dscf}} \times \frac{1.65 \text{ tons feed}}{\text{ton clinker}} \times \frac{80,261 \text{ dscf}}{\text{ton raw feed}} \times \frac{1 \text{ lb}}{7000 \text{ grains}} = \frac{0.0151 \text{ lbs}}{\text{ton clinker}} \text{ (mill on)}$$

$$P_{alt} \text{ (lbs/ton clinker)} = \frac{0.0008 \text{ grains}}{\text{dscf}} \times \frac{1.65 \text{ tons feed}}{\text{ton clinker}} \times \frac{64,105 \text{ dscf}}{\text{ton raw feed}} \times \frac{1 \text{ lb}}{7000 \text{ grains}} = \frac{0.0121 \text{ lbs}}{\text{ton clinker}} \text{ (mill off)}$$

In a 30-day rolling average, assuming 80% mill on, and 20% mill off conditions, the allowable P_{alt} limit is = 0.0145 lbs PM/ton clinker [(80% x 0.0151) + (20% x 0.0121)] = 0.0145 lbs PM/ton clinker.

Allowable emissions: [(2,190,000 tons clinker/year x 0.0145 lbs PM/ton clinker) ÷ 8760 hours/year] = 3.63 lbs PM per hour].

Filterable particulate emissions shall be removed by using fabric filter with greater than 99% efficiency. Some additional filterable and condensable particulate will be removed by the wet scrubber that is located after the main bagfilter and after the activated carbon bagfilter.

The main bagfilter that controls the kiln system has an outlet grain loading not to exceed 0.0008 gr/standard cubic foot (scf). The standard gas flow rate is the gas flow rate expressed at standard conditions [68 degrees F (528 degrees Rankine) and 14.7 psia (407 inches water)]. Standard gas flow rates are useful when material balances are prepared, for calculations in which the gas stream may undergo chemical reactions, and for comparing the flow rate in a system with the flow rate capacity of a fan.

The maximum inlet airflow rate into the main bagfilter from the kiln and the inline "raw mill on" condition is approximately 515,677 dry standard cubic feet per minute (scfm).

Outlet grain loading for bagfilter = 0.0008 grains/SCF

$$Potential \text{ emissions (lbs/hr)} = \frac{0.0008 \text{ grains}}{\text{standard cubic foot}} \times \frac{515,677 \text{ standard cubic feet}}{\text{minute}} \times \frac{60 \text{ minutes}}{\text{hour}} \times \frac{1 \text{ lb}}{7000 \text{ grains}} = \frac{3.5 \text{ lbs}}{\text{hour}}$$

The actual emissions (3.5 lbs/hour or 0.014 lbs/ton clinker) clinker) are less than the allowable emissions (3.63 lbs/hr or 0.0145 lbs/ton clinker). Additional filterable PM10/PM2.5 will be removed at the wet scrubber. Compliance is indicated. Monitoring shall be performed using a PM continuous emission monitor with a 30-day rolling average.

- (2) PM/PM10 emissions from new kilns that combine kiln exhaust and clinker cooler gas shall be limited to 0.0008 gr/dscf for startup and shutdown. [40 CFR §63.1343(b)(1)]
- (B) Dioxins and Furans Emission Standard (main stack) [40 CFR §63.1343(b)(1)]:
- (1) Dioxins and Furan emissions shall be limited to 0.2 ng/dscm (TEQ) on a dry basis, corrected to 7 percent oxygen. If the average temperature of the inlet to the first particulate matter control device during the D/F performance test is 400 degrees F or less, the limit is 0.4 ng/dscm (TEQ) – Normal operation
 - (2) Dioxins and Furan emissions shall be limited to 0.2 ng/dscm (TEQ) on a dry basis, uncorrected for oxygen content. If the average temperature of the inlet to the first particulate matter control device during the D/F performance test is 400 degrees F or less, the limit is 0.4 ng/dscm (TEQ) - Startup/shutdown

These emissions shall be limited by good combustion practices. Compliance with this standard will be achieved during the initial performance test as measured by a Method 23 test in accordance with 40 CFR Part 60 Appendix A-7. Thereafter, the tests shall be performed every 30 months.

- (C) Mercury Emission Standard (main stack) [40 CFR §63.1343(b)(1)]:
- (1) Mercury emissions shall be limited to 21 lbs/million tons clinker (45.99 lbs Hg/year), 30-day rolling average (normal operation)
 - = 45.99 lbs Hg/year at 2,190,000 tons per year clinker production
 - = 0.126 lbs Hg/day at 2,190,000 tons per year clinker production
 - = 0.0053 lbs Hg/hour at 2,190,000 tons per year clinker production
 - (2) Mercury emissions shall be limited to 4 µg/dscm, 7-day rolling average (startup and shutdown)

The mercury emissions that will be emitted from the kiln System {Preheater/precalciner kiln/in-line raw mill/in-line clinker cooler} will come from three sources, the coal/pet coke, the raw material from the mine, and the flyash/bottom ash used in the process.

Carolina Cement Company, LLC performed site-specific sampling of the raw material at the proposed site during the initial stages of modeling. The samples ranged in mercury content from 1 part per billion (ppb) to 14 ppb. The higher limit was used for the following calculation.

Maximum raw material kiln feed input rate into kiln = 3,677,010 tons feed per year (from application)

$$\frac{3,677,010 \text{ tons raw mat'l}}{\text{year}} \times \frac{2000 \text{ lbs raw mat'l}}{\text{tons raw mat'l}} \times \frac{14 \text{ lbs Hg}}{1 \times 10^9 \text{ lbs raw mat'l}} = \frac{102.96 \text{ lb Hg}}{\text{year}} \text{ (from raw material)}$$

The following calculations were used to estimate the mercury content from representative coal that is supplied in the area and will be used at the Carolinas Portland Cement Plant. These values were obtained from data for the Sutton coal-fired power plant that is located in the Wilmington area.

LV Sutton			
	lbs Hg/trillion Btu	lbs Hg/hour	µg Hg/dscm @ 7% O ₂
Mean	7.41	0.005002	8.07
95%	10.02	0.006764	10.91
Max	10.93	0.007378	11.91

$$\frac{10.93 \text{ lbs Hg}}{1 \times 10^{12}} \times \frac{675 \times 10^6 \text{ Btu}}{\text{hour}} \times \frac{8760 \text{ hours}}{\text{year}} = \frac{64.6 \text{ lb Hg}}{\text{year}} \text{ (from coal)}$$

From the application (page 22 of 53, Tab C, “Plantwide Potential Emissions Inventory”), the mercury content in the bottom ash is listed as 0.24 ppm. The tons of fly ash/bottom ash used per year for this plant = 332,633 tons per year (page 6 of 53, Tab C).

$$\frac{332,633 \text{ tons ash}}{\text{year}} \times \frac{0.24 \text{ tons Hg}}{1 \times 10^6 \text{ tons ash}} \times \frac{2000 \text{ lbs Hg}}{1 \text{ ton Hg}} = \frac{159.66 \text{ lbs Hg}}{\text{year}} \text{ (from bottom ash/flyash)}$$

The total calculated mercury emissions using the most conservative values = $(102.96 + 64.6 + 159.66 = 327.22$ lbs per year). The MACT Subpart LLL allows a maximum mercury emission rate of 21 lbs per million tons clinker produced or 46 lbs Hg per year at an annual production rate of 2,190,000 tons of clinker.

Mercury emissions shall be controlled by using a activated carbon injection system followed by a Polishing baghouse (90% efficiency according to recent EPA impact analysis) and a wet scrubber.

$(327.22 \times (1 - 0.90)) = 32.72$ lbs Hg/year. Compliance is indicated prior to the control efficiency of the wet scrubber.

Compliance with this standard will be indicated by using a PM continuous emission monitor, meeting Performance Standard PS 12A or PS 12B of Appendix B to 40 CFR Part 60, with a 30-day rolling average.

- (D) Total Hydrocarbon Emission Standard (main stack) [40 CFR §63.1343(b)(1)]:
- (1) Total hydrocarbon emissions shall be limited to 24 ppmvd, 30-day rolling average (normal operation), corrected to 7 % oxygen
 - (2) Total hydrocarbon emissions shall be limited to 24 ppmvd, 7-day rolling average (startup and shutdown), uncorrected for oxygen content.

The Permittee may elect to meet an alternative limit of 9 ppmvd for total organic HAP. If the source demonstrates compliance with the total organic HAP under the requirements of 40 CFR §63.1349 then the source's THC limit will be adjusted to equal the average THC emissions measured during the organic HAP compliance test.

THC emissions are closely related to VOC emissions, but have different measurement and averaging criteria. Good combustion practices are expected to limit the THC emissions below the MACT, Subpart LLL threshold limits without add-on controls. However, the US EPA believes that the use of an activated carbon injection system followed by a polishing baghouse will decrease THC emissions (50% efficiency according to recent EPA impact analysis).

Maximum THC Emissions (NESHAP)

Limit = 24 ppmdv @ 7% oxygen (measured as propane) or alternate limit = 9 ppmdv total organic HAPs
Molecular weight of propane = 44.1 grams/gmole

Gas Conditions (Raw Mill On)

688,771 Actual Cubic Feet per Minute (ACFM)
131 degrees F
615,348 Wet Standard Cubic Feet per Minute (WSCFM)
16.2% Moisture
515,677 Dry Standard Cubic Feet per Minute (DSCFM)
11.97% Oxygen (wet)
14.29% Oxygen (dry)
245,369 Dry Standard Cubic Feet per Minute @7% Oxygen
416,884 Dry Standard Cubic Meters per Hour @7% Oxygen

Gas Conditions (Raw Mill Off)

585, 103 Actual Cubic Feet per Minute (ACFM)
139 degrees F
515,750 Wet Standard Cubic Feet per Minute (WSCFM)
20.14% Moisture
411,876 Dry Standard Cubic Feet per Minute (DSCFM)
10.6% Oxygen (wet)
13.27% Oxygen (dry)
226,028 Dry Standard Cubic Feet per Minute @7% Oxygen
384,025 Dry Standard Cubic Meters per Hour @7% Oxygen

$$ACFM = SCFM \times \left[\frac{T_{\text{actual}}}{T_{\text{STP}}} \right] \times \left[\frac{P_{\text{STP}}}{P_{\text{actual}}} \right]$$

Where: T_{actual} = actual temperature at the outlet (131 degrees F)
 T_{STP} = standard temperature at the outlet (68 degrees F)
 P_{actual} = actual pressure at the outlet of the bagfilter (14.7 psia or 407 inches W.C.)
 P_{STP} = standard pressure at the outlet of the bagfilter (14.7 psia or 407 inches W.C.)

Solve equation for SCF

$$SCFM = ACFM \times \left[\frac{T_{\text{STP}}}{T_{\text{Actual}}} \right] \times \left[\frac{P_{\text{Actual}}}{P_{\text{STP}}} \right]$$

$$SCFM = 688,771 \text{ ACFM} \times \left[\frac{(460 + 68) \text{ STP}}{(460 + 131) \text{ Actual}} \right] \times \left[\frac{(407 \text{ inches water column})_{\text{Actual}}}{(407 \text{ inches water column})_{\text{STP}}} \right] = 615,348 \text{ SCFM (wet)}$$

Moisture Correction For Mill On Condition @ 16.2% Moisture:

$$\frac{615,348 \text{ SCF}}{\text{Minute}} \times \frac{(100 - 16.20)}{100} = \frac{515,662 \text{ DSCF}}{\text{Minute}}$$

Oxygen Correction For Mill On Condition @7% Oxygen:

$$\frac{515,662 \text{ SCF}}{\text{Minute}} \times \frac{(20.9\% - 14.29\%)}{(20.9\% - 7.0\%)} = \frac{245,218 \text{ DSCF}}{\text{Minute}}$$

$$\frac{245,218 \text{ DSCF}}{\text{Minute}} \times \frac{\text{cubic meter}}{35.31 \text{ cubic feet}} \times \frac{60 \text{ Minutes}}{\text{Hour}} = \frac{416,628 \text{ DSCM}}{\text{Hour}}$$

Concentration Calculation:

The gas molecules will occupy a volume of 22.4 liters a pressure of 1 atm and a temperature of T = 273.15 degrees Kelvin. One gram mole of gas at standard conditions will occupy a volume of 24.04 liters.

$$V_1/T_1 = V_2/T_2$$

Where: V_1 is the initial volume (22.4 liters)
 V_2 the final volume (?)
 T_1 the initial temperature (273.15 degrees Kelvin), and
 T_2 the final temperature (293.15 degrees Kelvin)

$$\frac{22.4 \text{ liters}}{\text{mole}} \times \frac{293.15 \text{ degrees K}}{273.15 \text{ degrees K}} = 24.04 \text{ liters}$$

Comparison of the requested Volatile Organic Compound limit of 0.16 lbs VOC per ton of clinker to the MACT THC limit of 24 ppmvd @ 7% oxygen.

$$\frac{0.16 \text{ lbs VOCs}}{\text{ton clinker}} \times \frac{2,190,000 \text{ tons clinker}}{\text{year}} \times \frac{1 \text{ year}}{8760 \text{ Hour}} = \frac{40 \text{ lbs VOCs}}{\text{Hour}}$$

0.16 lbs VOC per ton of clinker = 40 lbs VOCs/hour = 175.2 tons VOCs per year = 18,144 g VOCs/hour

Concentration calculation of VOCs at the THC limit (@7% oxygen)
 THC measured as propane = VOCs = 44.1 molecular weight

$$\frac{18,144 \text{ grams}}{\text{hour}} \times \frac{\text{hour}}{416,884 \text{ dry standard cubic meter}} \times \frac{1 \times 10^6 \text{ micrograms}}{1 \text{ gram}} = \frac{43,522 \text{ micrograms VOCs}}{\text{dry standard cubic meter}}$$

$$\frac{44.1 \text{ grams}}{\text{mole}} \times \frac{\text{mole}}{24.04 \text{ liters}} \times \frac{1 \text{ liter}}{1000 \text{ cubic meters}} \times \frac{1 \times 10^6 \text{ micrograms}}{1 \text{ gram}} = \frac{1834.44 \text{ micrograms VOCs}}{\text{cubic meters}}$$

43,522 micrograms VOCs/DSCM ÷ 1834.44 micrograms VOCs/cubic meter = 23.7 ppmv (Mill on condition)

The “mill off” calculations were made in the same manner as the “mill on” calculations and a concentration value of 47,246 micrograms VOCs/DSCM was found.

47,246 micrograms VOCs/DSCM ÷ 1834.44 micrograms VOCs/cubic meter = 25.8 ppmv (Mill off condition)

Theoretically the “mill on” condition will be the predominant operating scenario at a minimum of 80% of the time. The “mill off” scenario will occur for a maximum of 20% of the time. The averaging time for VOCs will be a rolling 30 day average, measured by a continuous emissions monitor.

$$(23.7 \text{ ppmv} \times 0.80) + (0.20 \times 25.8 \text{ ppmv}) = 24.1 \text{ ppmv}$$

The requested BACT limit for VOCs (0.16 lbs per ton of clinker) is approximately equivalent to the THC MACT value of 24 parts per million by volume. VOCs are a subset of total hydrocarbons and would not be expected to be equivalent to the total THC amount.

These emissions shall be limited by good combustion practices.

- (E) Hydrogen Chloride (main stack) [40 CFR §63.1343(b)(1)]
- (1) Hydrogen chloride emissions shall be limited to 3 ppmvd, corrected to 7 percent oxygen, 30-day rolling average, during normal operation.
 - (2) Hydrogen chloride emissions shall be limited to 3 ppmvd, uncorrected for oxygen content, 7-day rolling average, for startup and shutdown.

Hydrogen Chloride (HCl) is formed within the cement kiln system when small amounts of chlorine compounds from fuels and raw materials are liberated during the combustion process.

Much of the HCl is believed to be absorbed back into the process in the calcium-rich environment of the preheater tower and raw mill. The resulting HCl compounds are largely incorporated into the cement kiln dust. HCl is also reduced in the presence of ammonia, which will be introduced to the kiln exhaust by the selective noncatalytic reduction system. The MACT HCl limit of 3 ppmvd in the kiln exhaust corresponds to roughly 18 tons per year.

HCl emissions that pass through the last baghouse will be controlled by a wet scrubber (99.9% efficiency according to recent EPA impact analysis).

- ii. Operating Limits For Kilns [40 CFR §63.1346]:
 - (A) The Permittee shall operate the kiln such that the temperature of the gas at the inlet to the kiln particulate matter control device (PMCD) and alkali bypass PMCD, if applicable, does not exceed the applicable temperature limit specified in 40 CFR §63.1346(b). The Permittee shall operate the in-line kiln/raw mill, such that:
 - (1) When the raw mill of the in-line kiln/raw mill is operating, the applicable temperature limit for the main in-line kiln/raw mill exhaust, specified in 40 CFR §63.1346(b) and established during the performance test when the raw mill was operating is not exceeded, except during periods of startup/shutdown when the temperature limit may be exceeded by no more than 10 percent.
 - (2) When the raw mill of the in-line kiln/raw mill is not operating, the applicable temperature limit for the main in-line kiln/raw mill exhaust, specified in 40 CFR §63.1346(b) and established during the performance test when the raw mill was not operating, is not exceeded, except during periods of startup/shutdown when the temperature limit may be exceeded by no more than 10 percent.
 - (3) If the in-line kiln/raw mill is equipped with an alkali bypass, the applicable temperature limit for the alkali bypass specified in 40 CFR §63.1346(b) and established during the performance test, with or without the raw mill operating, is not exceeded, except during periods of startup/shutdown when the temperature limit may be exceeded by no more than 10 percent.
 - (B) The temperature limit for affected sources meeting the limits of 40 CFR §63.1346(a) or 40 CFR §63.1346(a)(1) through (a)(3) is determined in accordance with 40 CFR §63.1349(b)(3)(iv).
- iii. Performance Testing Requirement [40 CFR §63.1349]:
 - (A) Performance test results shall be documented in complete test reports that contain the following information, as well as all other relevant information. The plan to be followed during testing shall be made available to the Administrator prior to testing, if requested.
 - (1) A brief description of the process and the air pollution control system;
 - (2) Sampling location description(s);
 - (3) A description of sampling and analytical procedures and any modifications to standard procedures;
 - (4) Test results;
 - (5) Quality assurance procedures and results;
 - (6) Records of operating conditions during the test, preparation of standards, and calibration procedures;
 - (7) Raw data sheets for field sampling and field and laboratory analyses;
 - (8) Documentation of calculations;
 - (9) All data recorded and used to establish parameters for compliance monitoring; and
 - (10) Any other information required by the test method.
 - (B) PM Emissions Tests [40 CFR §63.1349(b)]:
 - (1) The Permittee shall install, operate, calibrate, and maintain a PM CEMS in accordance with the requirements in 40 CFR §63.1350(b) as listed below.
 - (2) The Permittee shall determine, record, and maintain a record of the accuracy of the volumetric flow rate monitoring system according to the procedures in 40 CFR §63.1350(m)(5). [See Section 2.1 3. d. ix. (B) of this Permit]
 - (3) The initial compliance test shall be based on the first 30 operating days in which the affected source operates using a CEMS. Hourly PM concentration and stack gas volumetric flow rate data shall be obtained.
 - (4) The Permittee shall determine the clinker production rate using the methods in §63.1350(d). [See Section 2.1 3. d. ii. of this Permit]

- (5) The emission rate, E of PM (lb/ton of clinker) shall be computed for each run using the following equation:

$$E = (C_s Q_s) / (PK)$$

Where:

E = emission rate of particulate matter, lb/ton of clinker production

C_s = concentration of particulate matter, gr/scf

Q_s = volumetric flow rate of effluent gas, where C_s and Q_s are on the same basis (either wet or dry), scf/hr

P = total kiln clinker production rate, tons/hr

K = conversion factor, 7000 gr/lb.

- (C) D/F Emissions Tests [40 CFR §63.1349(b)(3)]

The Permittee shall conduct a performance test using Method 23 of appendix A-7 to Part 60. The Permittee demonstrate initial compliance by conducting separate performance tests while the raw mill of the inline kiln/raw mill is under normal operating conditions and while the raw mill of the inline kiln/raw mill is not operating.

- (1) Each performance test shall consist of three separate runs conducted under representative conditions. The duration of each run shall be at least 3 hours, and the sample volume for each run shall be at least 2.5 dscm (90 dscf).
- (2) The temperature at the inlet to the kiln or in-line kiln/raw mill PMCD, and, where applicable, the temperature at the inlet to the alkali bypass PMCD shall be continuously recorded during the period of the Method 23 test, and the continuous temperature records shall be included in the performance test report.
- (3) Hourly average temperatures shall be calculated for each run of the performance test.
- (4) The run average temperature shall be calculated for each run, and the average of the run average temperatures shall be determined and included in the performance test report and will determine the applicable temperature limit in accordance with §63.1344(b).

- (D) THC CEMS, Relative Accuracy Test [40 CFR §1349(b)(4)]:

The Permittee shall operate a continuous emissions monitoring system (CEMS) in accordance with the requirements in 40 CFR §63.1350(1). For the purposes of conducting the accuracy and quality assurance evaluations for CEMS, the THC span value (as propane) is 50 ppmvd. The Permittee shall demonstrate compliance with a Relative Accuracy Test Audit (RATA) when the accuracy between the CEMS and the test audit is within 20 percent or when the test audit results are within 10 percent of the standard.

- (1) The initial compliance test shall be based on the first 30 operating days of operation in which the affected source operates using a CEMS.
- (2) Total organic HAP emissions tests. Instead of conducting the performance test specified in 40 CFR §63.1349(b)(4)(i), the Permittee may conduct a performance test to determine emissions of total organic HAP by following the procedures in 40 CFR §63.1349(b)(4)(iii) through (b)(4)(iv).
- (3) Method 320 of Appendix A to 40 CFR Part 60 or ASTM D6348-03 (incorporated by reference— See §63.14) shall be used to determine emissions of total organic HAP. Each performance test shall consist of three separate runs under the conditions that exist when the affected source is operating at the representative performance conditions in accordance with 40 CFR §63.7(e). Each run shall be conducted for at least 1 hour.
- (4) At the same time that the Permittee is conducting the performance test for total organic HAP, they shall also determine THC emissions by operating a CEMS in accordance with the requirements of 40 CFR §63.1350(j). The duration of the performance test shall be 3 hours and the average THC concentration (as calculated from the 1-minute averages) during the 3-hour test shall be calculated.

(E) Mercury Emissions Tests [40 CFR §1349(b)(5)]:

The Permittee shall operate a mercury CEMS in accordance 40 CFR §63.1350(k). The initial compliance test shall be based on the first 30 operating days in which the affected source operates using a CEMS. Hourly mercury concentration and stack gas volumetric flow rate data shall be obtained. If the Permittee uses a sorbent trap monitoring system, daily data shall be obtained with each day assumed to equal the daily average of the sorbent trap collection period covering that day.

- (1) The Permittee shall install, operate, calibrate, and maintain an instrument for continuously measuring and recording the exhaust gas flow rate to the atmosphere in accordance with 40 CFR §63.1350(k)(4).
- (2) The emission rate shall be computed by dividing the average mercury emission rate by the clinker production rate during the same 30-day rolling period using the equation 5 of this section:

$$E = (C_s Q_s) / (PK)$$

Where:

E = emission rate of mercury, lb/million tons of clinker production;

C_s = concentration of mercury, g/scm;

Q_s = volumetric flow rate of effluent gas, where C_s and Q_s are on the same basis (wet or dry), scm/hr;

P = total kiln clinker production rate, million ton/hr; and

K = conversion factor, 1000 g/kg (454 g/lb).

(F) HCl Emissions Tests [40 CFR §63.1349(b)(6)]:

The Permittee shall conduct performance testing by one of the following methods:

- (1) Sources equipped with a wet scrubber, or tray tower, shall conduct performance testing using Method 321 of Appendix A to 40 CFR Part 60 unless the Permittee has installed a CEMS that meets the requirements 40 CFR §63.1350(l)(1).
- (2) The Permittee shall establish site-specific parameter limits by using the continuous parameter monitoring system (CPMS) required in 40 CFR §63.1350(l)(1). Measure and record the pressure drop across the scrubber and/or liquid flow rate and pH in intervals of no more than 15 minutes during the HCl test. Compute and record the 24-hour average pressure drop, pH, and average scrubber water flow rate for each sampling run in which the applicable emissions limit is met.

(G) Performance Test Frequency [40 CFR §63.1349(c)]:

Except as provided in 40 CFR §63.1348(b), performance tests are required for affected sources that are subject to a dioxin, total organic HAP, or HCl emissions limit and shall be repeated every 30 months except for pollutants where that specific pollutant is monitored using CEMS.

(H) Performance Test Reporting Requirements [40 CFR §63.1349(d)]:

The Permittee shall submit the information specified in 40 CFR §63.1349(d)(1)(i) and (d)(2) listed below no later than 60 days following the initial performance test. All reports shall be signed by the facility's manager.

- (1) The initial performance test data.
- (2) The values for the site-specific operating limits or parameters established pursuant to 40 CFR §63.1349(b)(3), (b)(4)(iii), (b)(5)(ii), and (b)(6)(i), as applicable, and a description, including sample calculations, of how the operating parameters were established during the initial performance test.
- (3) As of December 31, 2011 and within 60 days after the date of completing each performance evaluation or test, as defined in 40 CFR §63.2, conducted to demonstrate compliance with this Subpart, the Permittee shall submit the relative accuracy test audit data and performance test data, except opacity data, to EPA by successfully submitting the data electronically to EPA's Central Data Exchange (CDX) by using the Electronic Reporting Tool (ERT) (see http://www.epa.gov/ttn/chief/ert/ert_tool.html).

- (4) Performance tests shall be conducted under such conditions as the Administrator specifies to the Permittee based on representative performance of the affected source for the period being tested. Upon request, the Permittee shall make available to the Administrator such records as may be necessary to determine the conditions of performance tests.
- iv. Monitoring Requirements [40 CFR §63.1350]:

All continuous monitoring data for periods of startup and shutdown shall be compiled and averaged separately from data gathered during periods of normal operation.

 - (A) PM monitoring requirements for sources using PM CEMS.
 - (1) For a kiln or clinker cooler subject to emissions limitation on particulate matter emissions in 40 CFR §63.1343(b) and using a PM CEMS, the Permittee shall install and operate a continuous emissions monitor in accordance with Performance Specification 11 of Appendix B and Procedure 2 of Appendix F to Part 60. The performance test method and the correlation test method for Performance Specification 11 shall be Method 5 or Method 5i of Appendix A to Part 60.
 - (2) The Permittee shall perform Relative Response Audits annually and Response Correlation Audits every 3 years.
 - (3) If the Permittee is using a PM CEMS, they shall install, operate, calibrate, and maintain an instrument for continuously measuring and recording the exhaust gas flow rate to the atmosphere according to the requirements in 40 CFR §63.1350 (n)(1) through (n)(10).
 - (4) In order to calculate the 30-day or 7-day rolling average, collect readings at least every 15 minutes. Sum the hourly data to daily data and then into a 30-day rolling average. The Permittee shall use all data, except those recorded during monitoring system malfunctions, repairs associated with monitoring system malfunctions, or required monitoring system quality assurance or control activities, in calculations.
- v. Clinker Production Monitoring Requirements [40 CFR §63.1350(d)]:
 - (A) Determine hourly clinker production by one of two methods.
 - (1) Install, calibrate, maintain, and operate a permanent weigh scale system to measure and record weight rates in tons-mass per hour of the amount of clinker produced. The system of measuring hourly clinker production shall be maintained within ± 5 percent accuracy.
 - (2) Install, calibrate, maintain, and operate a permanent weigh scale system to measure and record weight rates in tons-mass per hour of the amount of feed to the kiln. The system of measuring feed shall be maintained within ± 5 percent accuracy. Calculate the hourly clinker production rate using a kiln specific feed to clinker ratio based on reconciled clinker production determined for accounting purposes and recorded feed rates. This ratio shall be updated monthly. Note that if this ratio changes at clinker reconciliation, the Permittee shall use the new ratio going forward, but do not have to retroactively change clinker production rates previously estimated.
 - (3) Determine, record, and maintain a record of the accuracy of the system of measuring hourly clinker production (or feed mass flow if applicable) before initial use (for new sources) or within 30 days of the effective date of this rule (for existing sources). During each quarter of source operation, the Permittee shall determine, record, and maintain a record of the ongoing accuracy of the system of measuring hourly clinker production (or feed mass flow).
 - (4) Record the daily clinker production rates and kiln feed rates; and
 - (5) Develop an emissions monitoring plan in accordance with 40 CFR §63.1350(o)(1) through (o)(4).

- vii. D/F Monitoring Requirements [40 CFR §63.1350(g)]:
The Permittee shall comply with the following monitoring requirements to demonstrate continuous compliance with the D/F emissions standard.
- (A) The Permittee shall develop an emissions monitoring plan in accordance 40 CFR §63.1350(p)(1) through (p)(4).
 - (B) The Permittee shall install, calibrate, maintain, and continuously operate a continuous monitor to record the temperature of the exhaust gases from the kiln, in-line kiln/raw mill, and alkali bypass, if applicable, at the inlet to, or upstream of, the kiln, in-line kiln/raw mill and/or alkali bypass PMCDs.
 - (1) The temperature recorder response range shall include zero and 1.5 times the average temperature established according to the requirements in §63.1349 (b)(3)(iv).
 - (2) The calibration reference for the temperature measurement shall be a National Institute of Standards and Technology calibrated reference thermocouple-potentiometer system or alternate reference, subject to approval by the Administrator.
 - (3) The calibration of all thermocouples and other temperature sensors shall be verified at least once every three months.
 - (C) The Permittee shall monitor and continuously record the temperature of the exhaust gases from the kiln, in-line kiln/raw mill, and alkali bypass, if applicable, at the inlet to the kiln, in-line kiln/raw mill and/or alkali bypass PMCD.
 - (D) The required minimum data collection frequency shall be one minute.
 - (E) Each hour, calculate the three-hour average temperature for the previous 3 hours of process operation using all of the one-minute data available (i.e., the continuous monitoring system is not out-of-control.)
 - (F) When the operating status of the raw mill of the in-line kiln/raw mill is changed from off to on or from on to off, the calculation of the three-hour rolling average temperature shall begin anew, without considering previous recordings.
- viii. THC Monitoring Requirements [40 CFR §63.1350 (i)]:
The Permittee shall also develop an emissions monitoring plan in accordance with 40 CFR §63.1350(p)(1) through (p)(4).
- (A) The Permittee shall install, operate, and maintain a THC continuous emission monitoring system in accordance with Performance Specification 8 of Appendix B to Part 60 and comply with all of the requirements for continuous monitoring systems found in the general provisions, Subpart A. The Permittee shall operate and maintain each CEMS according to the quality assurance requirements in Procedure 1 of Appendix F in Part 60.
 - (B) For sources equipped with an alkali bypass stack, instead of installing a CEMS, the Permittee may use the results of the initial or subsequent performance test to demonstrate compliance with the THC emission limit.
- ix. Total Organic HAP Monitoring Requirements. [40 CFR §63.1350(j)]:
If the Permittee is complying with the total organic HAP emissions limits, they shall continuously monitor THC according to 40 CFR §63.1350(i)(1) and (2) or in accordance with Performance Specification 15 of Appendix B to Part 60 and comply with all of the requirements for continuous monitoring systems found in the general provisions, Subpart A. The Permittee shall operate and maintain each CEMS according to the quality assurance requirements in Procedure 1 of Appendix F in Part 60. In addition, the Permittee shall follow the monitoring requirements in 40 CFR §63.1350(m)(1) through (m)(4). The Permittee shall also develop an emissions monitoring plan in accordance with 40 CFR §63.1350 (p)(1) through (p)(4).

- x. Mercury Monitoring Requirements [40 CFR §63.1350(k)]:
The Permittee shall install and operate a mercury continuous emissions monitoring system (Hg CEMS) in accordance with Performance Specification 12A of Appendix B to Part 60 or a sorbent trap-based integrated monitoring system in accordance with Performance Specification 12B of Appendix B to part 60. The Permittee shall continuously monitor mercury according 40 CFR §63.1350 (k)(1) through (k)(3) and (m)(1) through (m)(4). The Permittee shall also develop an emissions monitoring plan in accordance with 40 CFR §63.1350 (p)(1) through (p)(4).
- (A) The span value for any Hg CEMS shall include the intended upper limit of the mercury concentration measurement range during normal “mill on” operation which may be exceeded during “mill off” operation or other short term conditions lasting less than 24 consecutive kiln operating hours. However, the span should be at least equivalent to approximately two times the emissions standard and it may be rounded to the nearest multiple of 10 $\mu\text{g}/\text{m}^3$ of total mercury.
 - (B) The Permittee shall operate and maintain each Hg CEMS or sorbent trap-based integrated monitoring system according to the quality assurance requirements in Procedure 5 of Appendix F to Part 60.
 - (C) Relative accuracy testing of mercury monitoring systems under Performance Specification 12A, Performance Specification 12B, or Procedure 5 shall be at normal operating conditions with the raw mill on.
 - (D) The Permittee shall install, operate, calibrate, and maintain an instrument for continuously measuring and recording the exhaust gas flow rate to the atmosphere according to the requirements in 40 CFR §63.1350(n)(1) through (n)(10). [See Section 2.1 3. d. x. of this Permit]
- xi. HCl Monitoring Requirements [40 CFR §63.1350(l)]:
The Permittee shall continuously monitor HCl according to 40 CFR §63.1350(l)(1) and (2) and 40 CFR §63.1350(m)(1) through (m)(4) of this section. The Permittee shall also develop an emissions monitoring plan in accordance with 40 CFR §63.1350(p)(1) through (p)(4).
- (A) The Permittee shall install, operate, and maintain a continuous monitoring system to monitor wet scrubber parameters as specified in 40 CFR §63.1350(m)(5) and (m)(7) as follows:
 - (1) Locate the flow sensor and other necessary equipment in a position that provides a representative flow.
 - (2) Use a flow sensor with a measurement sensitivity of 2 percent of the flow rate.
 - (3) Reduce swirling flow or abnormal velocity distributions due to upstream and downstream disturbances.
 - (4) Conduct a flow sensor calibration check at least semiannually.
 - (5) Locate the pH sensor in a position that provides a representative measurement of scrubber effluent pH.
 - (6) Ensure the sample is properly mixed and representative of the fluid to be measured.
 - (7) Check the pH meter's calibration on at least two points every 8 hours of process operation.
- xii. Parameter Monitoring Requirements [40 CFR §63.1350(m)]:
For continuous monitoring systems, the Permittee shall install, operate, and maintain each continuous parameter monitoring system (CPMS) according to the procedures in 40 CFR §63.1350 (n)(1) through (4) by the compliance date specified in 40 CFR §63.1351.
- (A) The Permittee shall also meet the specific parameter monitoring requirements in 40 CFR §63.1350(m) as applicable.
 - (1) The continuous monitoring system shall complete a minimum of one cycle of operation for each successive 15-minute period. The Permittee shall have a minimum of four successive cycles of operation to have a valid hour of data.
 - (2) The Permittee shall conduct all monitoring in continuous operation at all times that the unit is operating.
 - (3) Determine the 3-hour block average of all recorded readings.
 - (4) Record the results of each inspection, calibration, and validation check.
 - (B) Liquid flow rate monitoring requirements.
 - (1) Locate the flow sensor and other necessary equipment in a position that provides a representative flow.
 - (2) Use a flow sensor with a measurement sensitivity of 2 percent of the flow rate.
 - (3) Reduce swirling flow or abnormal velocity distributions due to upstream and downstream disturbances.
 - (4) Conduct a flow sensor calibration check at least semiannually.

- (C) Specific pressure monitoring requirements. If an applicable limit that requires the use of a pressure measurement device, the Permittee shall meet the following requirements.
 - (1) Locate the pressure sensor(s) in a position that provides a representative measurement of the pressure.
 - (2) Minimize or eliminate pulsating pressure, vibration, and internal and external corrosion.
 - (3) Use a gauge with a minimum tolerance of 1.27 centimeters of water or a transducer with a minimum tolerance of 1 percent of the pressure range.
 - (4) Check pressure tap pluggage daily.
 - (5) Using a manometer, check gauge calibration quarterly and transducer calibration monthly.
 - (6) Conduct calibration checks any time the sensor exceeds the manufacturer's specified maximum operating pressure range or install a new pressure sensor.
- (D) Specific pH monitoring requirements. If an applicable limit requires the use of a pH measurement device, the Permittee shall meet the following requirements.
 - (1) Locate the pH sensor in a position that provides a representative measurement of scrubber effluent pH.
 - (2) Ensure the sample is properly mixed and representative of the fluid to be measured.
 - (3) Check the pH meter's calibration on at least two points every 8 hours of process operation.
- (E) Mass flow rate (for sorbent injection) monitoring requirements. If an applicable limit requires the use of equipment to monitor sorbent injection rate (e.g., weigh belt, weigh hopper, or hopper flow measurement device), the Permittee shall meet the following requirements.
 - (1) Locate the device in a position(s) that provides a representative measurement of the total sorbent injection rate.
 - (2) Install and calibrate the device in accordance with manufacturer's procedures and specifications.
 - (3) At least annually, calibrate the device in accordance with the manufacturer's procedures and specifications.
- (F) Continuous Emissions Rate Monitoring System [40 CFR §63.1350(n)(1) through (n)(10)]:
The Permit shall install, operate, calibrate, and maintain instruments for continuously measuring and recording the pollutant per mass flow rate to the atmosphere from sources subject to an emissions limitation that has a pounds per ton of clinker unit.
 - (1) The Permittee shall install each sensor of the flow rate monitoring system in a location that provides representative measurement of the exhaust gas flow rate at the sampling location of the mercury or PM CEMS, taking into account the manufacturer's recommendations. The flow rate sensor is that portion of the system that senses the volumetric flow rate and generates an output proportional to that flow rate.
 - (3) The flow rate monitoring system shall be designed to measure the exhaust flow rate over a range that extends from a value of at least 20 percent less than the lowest expected exhaust flow rate to a value of at least 20 percent greater than the highest expected exhaust flow rate.
 - (4) The flow rate monitoring system shall have a minimum accuracy of 5 percent of the flow rate or greater.
 - (5) The flow rate monitoring system shall be equipped with a data acquisition and recording system that is capable of recording values over the entire range specified in 40 CFR §63.1350(n)(1).
 - (6) The signal conditioner, wiring, power supply, and data acquisition and recording system for the flow rate monitoring system shall be compatible with the output signal of the flow rate sensors used in the monitoring system.
 - (7) The flow rate monitoring system shall be designed to complete a minimum of one cycle of operation for each successive 15-minute period.

- (8) The flow rate sensor shall have provisions to determine the daily zero and upscale calibration drift (CD) (see sections 3.1 and 8.3 of Performance Specification 2 in appendix B to Part 60 of this chapter for a discussion of CD).
 - (a) Conduct the CD tests at two reference signal levels, zero (e.g., 0 to 20 percent of span) and upscale (e.g., 50 to 70 percent of span).
 - (b) The absolute value of the difference between the flow monitor response and the reference signal shall be equal to or less than 3 percent of the flow monitor span.
 - (9) The Permittee shall perform an initial relative accuracy test of the flow rate monitoring system according to Section 8.2 of Performance Specification 6 of Appendix B to Part 60 with the exceptions in 40 CFR §63.1350(n)(8)(i) and (n)(8)(ii).
 - (a) The relative accuracy test is to evaluate the flow rate monitoring system alone rather than a continuous emission rate monitoring system.
 - (b) The relative accuracy of the flow rate monitoring system shall be no greater than 10 percent of the mean value of the reference method data.
 - (10) The Permittee shall verify the accuracy of the flow rate monitoring system at least once per year by repeating the relative accuracy test specified in 40 CFR §63.1350(n)(8).
 - (11) The Permittee shall operate the flow rate monitoring system and record data during all periods of operation of the affected facility including periods of startup, shutdown, and malfunction, except for periods of monitoring system malfunctions, repairs associated with monitoring system malfunctions, and required monitoring system quality assurance or quality control activities (including, as applicable, calibration checks and required zero and span adjustments).
- xiii. Notification Requirements [40 CFR§63.1353]:
- (A) The Permittee shall comply with the notification requirements in §63.9 as follows:
 - (1) Initial notifications as required by 40 CFR §63.9(b) through (d). For the purposes of this Subpart, a Title V or 40 CFR Part 70 permit application may be used in lieu of the initial notification required under 40 CFR §63.9(b), provided the same information is contained in the permit application as required by 40 CFR §63.9(b), and the State to which the permit application has been submitted has an approved operating permit program under Part 70 and has received delegation of authority from the EPA. Permit applications shall be submitted by the same due dates as those specified for the initial notification.
 - (2) Notification of performance tests, as required by 40 CFR §§63.7 and 63.9(e).
 - (3) Notification of opacity and visible emission observations required by 40 CFR §63.1349 in accordance with 40 CFR §§63.6(h)(5) and 63.9(f).
 - (4) Notification, as required by §63.9(g), of the date that the continuous emission monitor performance evaluation required by 40 CFR §63.8(e) is scheduled to begin.
 - (5) Notification of compliance status, as required by 40 CFR §63.9(h).
- xix. Reporting Requirements [40 CFR §63.1354]:
- (A) The reporting provisions of Subpart A that apply are listed in Table 1 of 40 CFR § 63.1354. If any State requires a report that contains all of the information required in a report listed in this section, the Permittee may send the Administrator a copy of the report sent to the State to satisfy the requirements of this section for that report.
 - (B) The Permittee of an affected source shall comply with the reporting requirements specified in 40 CFR §63.10 of the general provisions of Part 63, Subpart A as follows:
 - (1) As required by 40 CFR §63.10(d)(2), the Permittee shall report the results of performance tests as part of the notification of compliance status.
 - (2) As required by 40 CFR §63.10(d)(3), the Permittee of an affected source shall report the opacity results from tests required by §63.1349.

- (3) As required by 40 CFR §63.10(d)(4), the Permittee of an affected source who is required to submit progress reports as a condition of receiving an extension of compliance under §63.6(i) shall submit such reports by the dates specified in the written extension of compliance.
- (4) As required by 40 CFR §63.10(d)(5), if actions taken by a Permittee during a startup, shutdown, or malfunction of an affected source (including actions taken to correct a malfunction) are consistent with the procedures specified in the source's startup, shutdown, and malfunction plan specified in 40 CFR §63.6(e)(3), the Permittee shall state such information in a semiannual report. Reports shall only be required if a startup, shutdown, or malfunction occurred during the reporting period. The startup, shutdown, and malfunction report may be submitted simultaneously with the excess emissions and continuous monitoring system performance reports; and
- (5) Any time an action taken by a Permittee during a startup, shutdown, or malfunction (including actions taken to correct a malfunction) is not consistent with the procedures in the startup, shutdown, and malfunction plan, the Permittee shall make an immediate report of the actions taken for that event within 2 working days, by telephone call or facsimile (FAX) transmission. The immediate report shall be followed by a letter, certified by the Permittee or other responsible official, explaining the circumstances of the event, the reasons for not following the startup, shutdown, and malfunction plan, and whether any excess emissions and/or parameter monitoring exceedances are believed to have occurred.
- (6) As required by 40 CFR §63.10(e)(2), the Permittee shall submit a written report of the results of the performance evaluation for the continuous monitoring system required by §63.8(e). The Permittee shall submit the report simultaneously with the results of the performance test.
- (7) As required by 40 CFR §63.10(e)(2), the Permittee of an affected source using a continuous opacity monitoring system to determine opacity compliance during any performance test required under 40 CFR §63.7 and described in 40 CFR §63.6(d)(6) shall report the results of the continuous opacity monitoring system performance evaluation conducted under 40 CFR §63.8(e).
- (8) As required by §63.10(e)(3), the Permittee of an affected source equipped with a continuous emission monitor shall submit an excess emissions and continuous monitoring system performance report for any event when the continuous monitoring system data indicate the source is not in compliance with the applicable emission limitation or operating parameter limit.
- (9) The Permittee shall submit a summary report semiannually which contains the information specified in 40 CFR §63.10(e)(3)(vi). In addition, the summary report shall include:
 - (a) All exceedances of maximum control device inlet gas temperature limits specified in 40 CFR §63.1344(a) and (b);
 - (b) All failures to calibrate thermocouples and other temperature sensors as required under 40 CFR §63.1350(f)(7) of this subpart; and
 - (c) 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 40 CFR §63.1344(c).
 - (d) The results of any combustion system component inspections conducted within the reporting period as required under §63.1350(i).
 - (e) All failures to comply with any provision of the operation and maintenance plan developed in accordance with §63.1350(a).
 - (f) Monthly rolling average mercury, THC, PM, and HCl (if applicable) emissions levels in the units of the applicable emissions limit for each kiln, clinker cooler, and raw material dryer.
- (10) If the total continuous monitoring system downtime for any CEM or any continuous monitoring system for the reporting period is ten percent or greater of the total operating time for the reporting period, the Permittee shall submit an excess emissions and continuous monitoring system performance report along with the summary report.

- (C) The semiannual report required by 40 CFR §63.1354 (b)(9) of this section shall include the number, duration, and a brief description for each type of malfunction which occurred during the reporting period and which caused or may have caused any applicable emission limitation to be exceeded. The report shall also include a description of actions taken by a Permittee during a malfunction of an affected source to minimize emissions in accordance with 40 CFR §63.1348(d), including actions taken to correct a malfunction.
- xx. Recordkeeping Requirements [40 CFR §63.1355]
- (A) The Permittee shall maintain files of all information (including all reports and notifications) required by this section recorded in a form suitable and readily available for inspection and review as required by 40 CFR §63.10(b)(1). The files shall be retained for at least five years following the date of each occurrence, measurement, maintenance, corrective action, report, or record. At a minimum, the most recent two years of data shall be retained on site. The remaining three years of data may be retained off site. The files may be maintained on microfilm, on a computer, on floppy disks, on magnetic tape, or on microfiche.
 - (B) The Permittee shall maintain records for each affected source as required by 40 CFR §63.10(b)(2) and (b)(3); and
 - (1) All documentation supporting initial notifications and notifications of compliance status under 40 CFR §63.9;
 - (2) All records of applicability determination, including supporting analyses; and
 - (3) If the Permittee has been granted a waiver under 40 CFR §63.8(f)(6), any information demonstrating whether a source is meeting the requirements for a waiver of recordkeeping or reporting requirements.
 - (C) In addition to the recordkeeping requirements in 40 CFR §63.1355(b), the Permittee of an affected source equipped with a continuous monitoring system shall maintain all records required by 40 CFR §63.10(c).
 - (D) The Permittee shall keep annual records of the amount of cement kiln dust that is removed from the kiln system and either disposed of as solid waste or otherwise recycled for a beneficial use outside of the kiln system.
 - (E) The Permittee shall keep records of the daily clinker production rates and kiln feed rates.
 - (F) The Permittee shall keep records of the occurrence and duration of each startup or shutdown.
 - (G) The Permittee shall keep records of the occurrence and duration of each malfunction of operation (i.e., process equipment) or the air pollution control and monitoring equipment.
 - (1) The Permittee shall keep records of actions taken during periods of malfunction to minimize emissions in accordance with 40 CFR §63.1348(d) including corrective actions to restore malfunctioning process and air pollution control and monitoring equipment to its normal or usual manner of operation.
- c. 15A NCAC 2D .0530 "Prevention of Significant Deterioration (PSD)", 40 CFR 51.166
PSD regulations apply to major "sources" of pollutants. In the case of Portland Cement plants, the major stationary source threshold is 100 tons/yr, which includes all quantifiable fugitive emissions. Carolinas Cement Company, LLC is considered a major source with regards to PSD because it will emit greater than 100 tons per year of a regulated NSR pollutant. To comply with the best available control technology determination pursuant to 15A NCAC 2D .0530, "Prevention of Significant Deterioration," PM, PM10, nitrogen dioxide (NO_x), sulfur dioxide (SO₂), carbon monoxide (CO), volatile organic compound (VOCs), and greenhouse gas emissions (GHGs) from the preheater/precalciner kiln system, shall not exceed:

- 1,643 tons NOx /year per consecutive 12-month period
 - 104 tons PM/year per consecutive 12-month period
 - 104 tons PM10/year per consecutive 12-month period
 - 104 tons PM2.5/year per consecutive 12-month period
 - 438 tons SO₂/year per consecutive 12-month period
 - 3,066 tons CO/year per consecutive 12-month period
 - 175 tons VOCs/year per consecutive 12-month period
 - 1,992,900 tons CO_{2e}/year per consecutive 12-month period
- i. Pursuant to 15A NCAC 2D .0530 "Prevention of Significant Deterioration" the facility shall comply with the following limits:
- (A) Less than or equal to 6000 tons per day clinker production
 - (B) Less than or equal to 2,190,000 tons per year of clinker production
 - (C) Less than or equal to 2,400,000 tons per year of cement production

ii. Best Available Control Technology

(A) In order to comply with the best available control technology (BACT) determination pursuant to 15A NCAC 2D .0530, "Prevention of Significant Deterioration" – Particulate PM10/PM2.5:

- Filterable particulate (PM10/PM2.5) shall be controlled from the Kiln System (Coal/petroleum coke-fired preheater/precalciner kiln with inline raw mill and inline clinker cooler) such that emissions shall not exceed 104 tons per consecutive 12-month period
- Clinker production shall not exceed 2,190,000 tons per consecutive 12-month period
- Filterable particulate (PM10/PM2.5) shall be controlled by a bagfilter with an outlet grain loading not to exceed limited to 0.0008 gr/dscf during startup/shutdown, 7 day rolling average
- Filterable particulate (PM10/PM2.5) emissions shall be limited according to the following Equation, 30 day rolling average:

$$PM_{alt} = \frac{0.0008 \times 1.65 \times (Q_k + Q_c)}{7000}$$

- Where: P_{alt} = Calculated particulate emission (lbs/ton clinker) limit when kiln exhaust and clinker cooler exhaust are combined
- 0.0008 = PM exhaust concentration (gr/dscf) where kiln exhaust and clinker cooler exhaust are not combined
- 1.65 = Conversion factor of lb feed per lb clinker
- Q_k = The exhaust flow of the kiln (dscf/ton raw feed)
- Q_c = The exhaust flow of the clinker cooler (dscf/ton raw feed)
- 7000 = grains per pound

- (B) In order to comply with the best available control technology (BACT) determination pursuant to 15A NCAC 2D .0530, "Prevention of Significant Deterioration" – condensable particulate (PM10/PM2.5):
- Clinker production shall not exceed 2,190,000 tons per consecutive 12-month period
 - Condensable particulate (PM10/PM2.5) shall be controlled with a wet scrubber having a minimum 50 percent removal efficiency in accordance with the General Emissions Testing and Reporting Requirements listed in Section 3.0, Item 18 of the Permit.

- (C) In order to comply with the best available control technology (BACT) determination pursuant to 15A NCAC 2D .0530, "Prevention of Significant Deterioration"- SO₂:
- SO₂ emissions shall be controlled from the Kiln System (Coal/petroleum coke-fired preheater/precalciner kiln with inline raw mill and inline clinker cooler) such that emissions shall not exceed 438 tons per consecutive 12-month period,
 - Clinker production shall not exceed 2,190,000 tons per consecutive 12-month period,
 - SO₂ emissions from the kiln/inline raw mill/inline clinker cooler/ coal mill shall not exceed 0.4 lbs per ton of clinker, 30 day rolling average as measured by a Continuous Emissions Monitor or the Permittee shall demonstrate a 90% SO₂ control efficiency across the SO₂ control device (wet scrubber)
- (D) In order to comply with the best available control technology (BACT) determination pursuant to 15A NCAC 2D .0530, "Prevention of Significant Deterioration"- NO_x:
- NO_x emissions shall be controlled from the Kiln System (Coal/petroleum coke-fired preheater/precalciner kiln with inline raw mill and inline clinker cooler) such that emissions shall not exceed 1,643 tons per consecutive 12-month period,
 - NO_x emissions shall be controlled by the use of indirect firing, low NO_x burners, staged combustion, and non catalytic reduction (ammonia)
 - Clinker production shall not exceed 2,190,000 tons per consecutive 12-month period,
 - NO_x emissions shall not exceed 1.5 lbs/ton clinker, 30 day rolling average, as measured using a Continuous Emission Rate Monitoring System meeting Performance Specification - PS 2.
- (E) In order to comply with the best available control technology (BACT) determination pursuant to 15A NCAC 2D .0530, "Prevention of Significant Deterioration"- VOCs:
- VOC emissions shall be controlled from the Kiln System (Coal/petroleum coke-fired preheater/precalciner kiln with inline raw mill and inline clinker cooler) such that emissions shall not exceed 175 tons per consecutive 12-month period.
 - Clinker production shall not exceed 2,190,000 tons per consecutive 12-month period
 - VOC emissions shall be controlled by good combustion practices
 - VOC emissions shall not exceed 0.16 lbs/ton clinker, 30 day rolling average, as measured using a Continuous Emission Rate Monitoring System meeting Performance Specification - PS 2
- (F) In order to comply with the best available control technology (BACT) determination pursuant to 15A NCAC 2D .0530, "Prevention of Significant Deterioration"- CO:
- CO emissions shall be controlled from the Kiln System {Coal/petroleum coke-fired preheater/precalciner kiln with inline raw mill and inline clinker cooler} such that emissions shall not exceed 3,066 tons per consecutive 12-month period.
 - Clinker production shall not exceed 2,190,000 tons per consecutive 12-month period
 - CO emissions shall be controlled by good combustion practices
 - CO emissions shall not exceed 2.80 lbs/ton clinker, 30 day rolling average, as measured using a Continuous Emission Rate Monitoring System meeting Performance Specification – PS4B
- (G) To comply with the best available control technology (BACT) determination pursuant to 15A NCAC 2D .0530, "Prevention of Significant Deterioration"- GHGs:
- GHG emissions shall be controlled from the Kiln System {Coal/petroleum coke-fired preheater/precalciner kiln with inline raw mill and inline clinker cooler} such that emissions shall not exceed 1,895,900 tons CO_{2e} per consecutive 12-month period.
 - Clinker production shall not exceed 2,190,000 tons per consecutive 12-month period.
 - GHG emissions shall not exceed 0.91 lbs/ton clinker, 12-month calendar average, determined with procedures used for reporting GHG emissions pursuant to 40 CFR Part 98.

- (H) If emission testing is required, the testing shall be performed in accordance with 15A NCAC 2D .2602 and General Condition 18 of the Permit. If the results of this test are above the applicable limit, the Permittee shall be deemed in noncompliance with 15A NCAC 2D .0530.
- (I) The maximum sulfur content of any coal or pet coke burned in the preheater-precalsiner/kiln system shall not exceed 5.0 percent by weight. The Permittee shall be deemed in noncompliance with 15A NCAC 2D .0530 if the sulfur content of the coal or pet coke exceeds this limit.
- (1) To assure compliance, the Permittee shall monitor the sulfur content of the coal and/or pet coke by using coal supplier certification per total shipment received. The coal supplier certification shall be recorded in a logbook (written or electronic format) per total shipment and include the following information:
- (a) the name of the coal and/or pet coke supplier;
 - (b) the maximum sulfur content of the coal and/or pet coke received per total shipment; a statement verifying that the methods used to determine the maximum sulfur content of the coal and/or pet coke was in accordance with the following:
 - (i) sampling -- ASTM Method D 2234;
 - (ii) preparation -- ASTM Method D 2013;
 - (iii) gross calorific value (Btu) -- ASTM Method D-5865
 - (iv) moisture content --ASTM Method D 3173; and
 - (v) sulfur content -- ASTM Method D 3177 or ASTM Method D 4239
- (2) The Permittee has stated that the inline precalsiner/kiln/inline raw mill/inline clinker cooler system has inherent scrubbing capability of sulfur dioxide (SO₂) emissions from fuel.

Prior to utilizing a fuel source with a sulfur content greater than 2%, the Permittee shall conduct a demonstration to show the variability (if any) of SO₂ emissions from the firing of coal and/or pet coke with sulfur contents between 2.0% by weight and 5.0% by weight in the precalsiner/kiln/inline raw mill/inline clinker cooler system. The Permittee shall monitor and record the following:

- (A) the sulfur content of the coal/and or pet coke being burned, and
- (B) the sulfur dioxide emissions from the stack on an hourly basis.

The Permittee shall submit a test protocol to the director prior to the demonstration. If this demonstration indicates that sulfur dioxide emissions have a statistically significant increase or decrease as defined in the protocol with the increase or decrease in fuel sulfur content, the permit will be administratively revised and the allowable fuel sulfur content shall be limited to 2.0% or less.

- (3) Filterable particulate (PM10/PM2.5) emissions from the preheater/precalsiner/kiln/inline raw mill/clinker cooler/coal mill system shall be controlled by bagfilters (CD44A and CD44B). To assure compliance, the Permittee shall perform inspections and maintenance as recommended by the manufacturer. In addition to the manufacturer's inspection and maintenance recommendations, or if there is no manufacturer's inspection and maintenance recommendations, as a minimum, the inspection and maintenance requirement shall include the following:
- (A) a monthly visual inspection of the system ductwork and material collection unit for leaks; and
 - (B) an internal inspection of the bagfilter's structural integrity during scheduled kiln system shutdowns.
- (4) The results of inspection and maintenance shall be maintained in a logbook (written or electronic format) on-site and made available to an authorized representative upon request. The logbook shall record the following:
- (A) the date and time of each recorded action;
 - (B) the results of each inspection;
 - (C) the results of any maintenance performed on the bagfilters; and
 - (D) any variance from manufacturer's recommendations, if any, and corrections made.

Reporting Requirements [15A NCAC 2Q .0508(f)]

- (5) The Permittee shall maintain a monthly summary report, acceptable to the Regional Air Quality Supervisor, of monitoring and recordkeeping listed above and shall submit the results within 30 days of a written request by the DAQ.
- d. The following emission limits apply in order to demonstrate compliance with the National Ambient Air Quality Standards as required by 15A NCAC 2D .0530 and 40 CFR 51.166(k):

Affected Sources	Pollutant	Hourly Emission Limit
Kiln/inline raw mill/inline clinker cooler/coal mill	Nitrogen Dioxide	700 lbs per hour
	Sulfur Dioxide	173 lbs per hour

- i. The Kiln System (Coal/petroleum coke-fired preheater/ precalciner kiln) with inline raw mill and inline clinker cooler shall be operated such that Nitrogen Dioxide emissions shall not exceed 700 pounds per hour and Sulfur Dioxide emissions shall not exceed 173 pounds per hour.
- ii. Compliance shall be determined using a Continuous Emissions Monitor as required in 40 CFR §60.63 “Monitoring of Operations”.

VII. MULTIPLE EMISSIONS:

A. 15A NCAC 2D .0540 “Particulates From Fugitive Dust Emission Sources” (State Enforceable Only)

Mining/Quarry Operations (Mine/FQ)

- Rock/limestone removal using heavy equipment, drilling, and blasting (ES-Mine1)
- Rock/limestone loading operations (rock from front end loader to haul truck, unloading haul truck to jaw crusher, ES-Mine2)
- Limestone/marl pile located in quarry area (ES-FQSP1)
- Spoils pile located in quarry area (ES-FQSP2)
- Overburden pile located in quarry area (ES-FQSP4)
- Quarry roads (ES-QURD)
- Spoils stacker pile (ES-FQ6)

Paved Plant Roads (PLTRD), Storage piles (SP)

- Vehicular traffic on paved plant roads (ES-PLTRD)
- Coal/coke storage pile at the plant (ES-SPCoal1)
- Coal/coke storage pile at the plant (ES-SPCoal2)
- Blended stone pile at the plant (ES-SPBlend1)
- Blended stone pile at the plant (ES-SPBlend2)
- Mill scale storage pile at the plant (ES-SPMillscale)
- Bauxite storage pile at the plant (ES-SPBauxite)
- Bottom ash storage pile at the plant (ES-SPAsh)
- Limestone storage pile at the plant (ES-SPLimestone)
- Gypsum storage pile at the plant (ES-SPGypsum)

- 1. This facility relied upon air dispersion modeling for rock quarries to demonstrate compliance with the ambient air quality standards for total suspended particulate (TSP) and particulate matter with an aerodynamic diameter of less than 10 microns (PM-10). The Fugitive Dust Control Plan provides control and recordkeeping methods that will be used at the facility to reduce fugitive dust emissions in a manner that is consistent with the modeling.

The plan is required pursuant to 15A NCAC 2D .0540(e)(1) which provides that, if dispersion modeling shows the potential to violate an ambient air quality standard, the facility may be required to develop and submit a Fugitive Dust Control Plan. This plan will be included in the body of the Title V permit after the facility has constructed the roads, etc. Fugitive emissions are generated in the pit during the loading of the raw materials into trucks or onto conveyors. Generally, the material being excavated in the pit has high moisture content and fugitive dust emissions from these processes are inherently low.

2. PLAN MAINTENANCE

A copy of this Fugitive Dust Control Plan will be retained on-site, and it will be made available to an authorized NC DAQ representative upon request.

Any revisions to the Plan shall be submitted to the NC DAQ Regional Supervisor for approval. NC DAQ shall notify the Permittee if the revisions are not approved within 30 days or receipt. If no such notification is provided, the Permittee may assume the revised plan is approved as submitted.

3. STAFF TRAINING

All facility staff that are responsible or fugitive dust suppression activities shall be made aware of this plan and its contents, including control methods and associated recordkeeping requirements. Staff should immediately be made aware of any revisions to the plan.

A copy of the plan shall be maintained in a location that is accessible to facility staff (e.g., in this main office).

B. 15A NCAC 2D .0530 "Prevention of Significant Deterioration"

Mining/Quarry Operations (Mine/FQ)

- Rock/limestone removal using heavy equipment, drilling, and blasting (ES-Mine1)
- Rock/limestone loading operations (rock from front end loader to haul truck, unloading haul truck to jaw crusher, ES-Mine2)
- Limestone/marl pile located in quarry area (ES-FQSP1)
- Spoils pile located in quarry area (ES-FQSP2)
- Overburden pile located in quarry area (ES-FQSP4)
- Quarry roads (ES-QURD)
- Spoils stacker pile (ES-FQ6)

Paved Plant Roads (PLTRD), Storage piles (SP)

- Vehicular traffic on paved plant roads (ES-PLTRD)
 - Coal/coke storage pile at the plant (ES-SPCoal1)
 - Coal/coke storage pile at the plant (ES-SPCoal2)
 - Blended stone pile at the plant (ES-SPBlend1)
 - Blended stone pile at the plant (ES-SPBlend2)
 - Mill scale storage pile at the plant (ES-SPMillscale)
 - Bauxite storage pile at the plant (ES-SPBauxite)
 - Bottom ash storage pile at the plant (ES-SPAsh)
 - Limestone storage pile at the plant (ES-SPLimestone)
 - Gypsum storage pile at the plant (ES-SPGypsum)
1. To comply with the best available control technology (BACT) determination pursuant to 15A NCAC 2D .0530, "Prevention of Significant Deterioration":
 - Filterable particulate emissions (PM10/PM2.5) from the drilling, blasting, stone removal, and truck loading operations shall be controlled by best management practices.
 - When a bagfilter or wet suppression is used, monitoring, and recordkeeping shall be done in accordance with Section VI. B. 2. a. iv. of this Review.
 2. If emission testing is required, the testing shall be performed in accordance with 15A NCAC 2D .2602 and General Condition 18 of the Permit. If the results of this test are above the applicable limit, the Permittee shall be deemed in noncompliance with 15A NCAC 2D .0530.

Reporting [15A NCAC 2Q .0508(f)]

3. The Permittee shall submit a semi-annual summary report of operations, acceptable to the Regional Air Quality Supervisor, of monitoring and recordkeeping activities postmarked on or before January 30 of each calendar year for the preceding six-month period between July and December, and July 30 of each calendar year for the preceding six-month period between January and June. The report shall contain the following:
 - i. The monthly summary log of Mining/Quarrying Operations for the previous 17 months.
 - ii. Any deviations from best management practices for the drilling, blasting, stone removal, and truck loading operations.

C. 15A NCAC 2D .1100 “Toxic Air Pollutants” (STATE ONLY REQUIREMENT)

Facility-wide air toxic pollutant modeling was performed for those air toxics with emission rates greater than the TPER limits.

- Kiln system
- Raw mill and kiln feed
- Solid fuel system
- Clinker transfer and storage
- Finish mills
- Cement transfer & storage
- Existing terminal
- Quarry equipment
- Process fugitive
- Storage piles
- Mining operation

1. Toxic Air Pollutants:

CCC modeled 11 toxic air pollutants (Ammonia, Arsenic, Benzene, Beryllium, Cadmium, Chromium VI, Fluorides, Formaldehyde, Hydrogen Chloride, Manganese, and Mercury) using AERMOD with the same receptor array and meteorology as in the NAAQS analysis. All the modeled pollutants demonstrated compliance with the applicable NC Acceptable Ambient Levels (AAL).

a. Ammonia, Arsenic, Beryllium, Cadmium, Formaldehyde, Fluorides, and Manganese emissions factors were taken from the EPA’s AP-42 Table 11.6-9.

b. Chromium VI

The original permit application, chromium VI (Cr VI or hexavalent chromium) emissions from the main stack were based on actual stack test results from similar preheater/precalciner kilns with filter fabric dust controls. Data from three kilns were available, and the highest test value was rounded up to 4.0×10^{-7} lbs/ton clinker.

The North Carolina Department of Environment and Natural Resources (NCDENR) contacted the applicant and requested that they use the July 7, 1999 coal combustion memo to evaluate the Chromium VI emissions from this facility using the total chromium (Cr) value from the EPA AP-42 manual and a DENR guideline memo dated July 7, 1999 “Updated Guidelines for Implementing Acceptable Ambient Levels (AALs) for Chromium (VI) Compounds” for estimating the Cr (VI) emissions from values of total Chromium. Both total Cr and Cr (VI) emissions were estimated for the proposed CCC kiln stack. Cr (VI) compounds were evaluated under the North Carolina toxic air pollutant (TAP) rules at 15A NCAC 2D Section .1100. The TAP rules address three separate categories of Cr (VI) compounds: Bioavailable Chromate Pigments, Soluble Chromate Compounds, and Non-specific Chromium (VI) Compounds.

Chromium is introduced to the kiln system in both the coal (which is used as the primary fuel) and from raw materials entering as kiln feed. Cr (VI) is formed in the high-temperature combustion process through oxidation of the total Cr within the kiln system. Not all of the Cr entering the system is converted to Cr (VI), and not all of the Cr and Cr (VI) are exhausted into the gas stream. Almost all of the chromium is retained in the clinker product as a trace component. Both total Cr and Cr (VI) have been identified in clinker and cement products.

Emissions associated with material handling sources including clinker and cement are included in the permit application. Although total Cr (VI) emissions can be measured from combustion sources, measurement of specific speciated Cr (VI) compounds present is not possible because test methods for Cr (VI) cannot distinguish between different Cr (VI) compounds. According to the “Updated Guidelines for Implementing Acceptable Ambient Levels (AALs) for Chromium (VI) Compounds” memo dated July 7, 1999, the primary form of Cr (VI) present in combustion processes is chromic acid (CrO₃). Chromic acid is classified as a soluble chromate compound under the NC TAP rules. For this project it can be assumed that all Cr (VI) emissions from the kiln stack consist of chromic acid (soluble chromate category).

Total Cr emissions for the kiln system were estimated using the AP-42 emission factor for Portland Cement kilns with fabric filters in Table 11.6-9. The total Chromium emission factor is 1.4 E-04 lb/ton of clinker. There is no AP-42 emission factor for Cr (VI) and no other known published emission factors for Cr (VI) or any specific chromium compounds for cement kilns. Cr (VI) test data for cement kilns are also scarce, as most states (except California) do not specifically regulate or require testing for Cr (VI) emissions. Available stack test data and emission factors are presented in Table 1 below for comparison and reference purposes only. These data were taken from emission inventory reports or stack test summaries. Note that all emission factors are reported as the weight of chromium metal only (no compounds).

Review of the data indicates that the AP-42 Cr emission factor for kilns with a fabric filters is higher than any of the other actual test data examined and will result in a conservative estimate of total Chromium emissions.

Plant	Kiln	Type	Total Cr lbs/ton clinker	Cr (VI) lbs/ton clinker	Date
CEMEX Victorville, CA	Q2	PH-PC w/ FF	1.76E-05	3.95E-07	Jun-2005
CEMEX Victorville, CA	Q3	PH-PC w/ FF	8.63E-06	2.19E-07	Feb-2004
CEMEX Davenport, CA PH-	K1	PC w/ FF	3.26E-07	1.46E-07	Jun-2003
CEMEX Odessa, TX	K2	PH-PC w/ FF	1.93E-05	Not tested	Sep-2004
Lafarge Harleyville, SC	K1	PH-PC w/ FF	2.62E-05	Not tested	Nov-2008
Lehigh Glens Falls, NY	K1	Preheater w/FF	4.81E-06	Not tested	May-2002
Roanoke Cement, Troutville, VA.	K5	PH-PC w/ ESP	1.20E-05	Not tested	Oct-1999
Highest Actual Test Data for Above Plants	NA	All Above	2.62E-05	3.95E-07	NA
AP-42 – Chromium	NA	1 Kiln w/ FF	1.40E-04	No data	Jan-1993
AP-42 – Chromium	NA	1 Kiln w/ ESP	7.70E-06	No data	Nov-1991
Cr (VI) @ 11% of Cr Using AP-42*	NA	Kiln w/ FF	NA	1.54E-05	NA

*Factor associated with NCDENR guidance memo

Published Cr (VI) emission factors are not readily available in the US and there have only been a few actual stack tests performed in the US for Chromium and Chromium VI. Actual stack test data from a CEMEX California Portland Cement facility was used in the original model for this pollutant.

Revised calculation using DENR coal combustion memo:

The EPA AP-42 value for total Chromium = 1.4E-04 lbs Chromium/ton of clinker

Clinker capacity: 250 tons clinker/hour = 6000 tons clinker/day = 2,190,000 tons clinker/year

The average chromium VI emitted from coal-fired combustion is 11% of the total chromium (from combustion memo)

TPER for soluble chromate compounds as chromium equivalent = 0.013 lbs/day

$$\frac{6000 \text{ tons clin ker}}{\text{day}} \times \frac{1.4 \times 10^{-4} \text{ lbs Cr}}{\text{ton clin ker}} \times \frac{11}{100} = \frac{0.094 \text{ lbs Cr}}{\text{day}} \quad (33.73 \text{ lbs per year})$$

Since this calculated value for Cr VI is greater than the TPER limit of 0.013 lbs per day, chromium VI requires modeling.

Cr VI Category	Kiln Emissions	Other Sources	Plant wide Total	TPER	Result
Soluble Chromate Compounds	0.0924 lbs/day	0.0004 lbs/day	0.0928 lbs/day	0.013 lbs/day	Model
Bioavailable Chromate Pigments	0.0	1,4776 lbs/year	1,4776 lbs/year	0.0056 lbs/year	Model

c. Benzene

The following table lists the stack test results from nine Portland Cement plants around the United States. The lower AP-42 emission factor is consistent with the more recent stack test results of preheater/precalciner kilns with fabric filters. The average benzene emission factor for preheater/precalciner kilns from the nine stack tests is 2.76E-03 lbs benzene/ton clinker. It should also be noted that benzene and other organic hazardous air pollutants (HAPs) were tested by Fourier Transform Infrared (FTIR) spectrometry at the Titan America/Roanoke Cement Company kiln in 1999 as part of a NESHAP area source demonstration. No benzene was detected in the stack gas at a detection limit of 0.3 ppmv during the stack test.

Modeling of the benzene emissions in this modification resulted in a maximum annual impact of 3.13 E-3 $\mu\text{g}/\text{m}^3$ (about 2.6 percent of the AAL). Even if the higher AP-42 emission factor were used, the maximum benzene impact would be increased by a factor of 5.16, and the resulting impact would still be only 13.4 percent of the AAL.

Benzene emission stack test data

Plant tested	Kiln	Type	Emissions factor	Test Date	Data Source
Ash Grove Durkee, OR	K1	PH-PC w/ FF	3.54E-03	April 2002	EPA Docket
Ash Grove Louisville, NE	K2	PH-PC	2.63E-03	2005	EPA Docket
CEMEX Victorville, CA	Q2	PH-PC w/ FF	2.12E-04	June 2005	Emission Inventory file
CEMEX Victorville, CA	Q3	PH-PC w/ FF	1.97E-03	February 2004	Emission Inventory file
CEMEX Davenport, CA	K1	PH-PC w/ FF	2.03E-03	June 2003	Emission Inventory file
CEMEX Lyons, CO	K1	PH-PC w/ FF	1.36E-03	November 2002	ASTDR Health Consultation
Lafarge Sugar Creek, MO	K3	PH-PC w/ FF	7.56E-03	August 2002	EPA Docket
Lafarge Whitehall, PA	K3	Preheater w/ FF	8.04E-04	March 2006	EPA Docket
Lehigh Glens Falls, NY	K1	Preheater w/ FF	2.66E-04	February 2003	Proprietary report
Average of all kilns above			2.26E-03		
Average of PH-PC kilns			2.76E-03		
Roanoke Cement, VA	K5	PH-PC w/ ESP	ND*		
AP-42 emission factor	NA	1 kiln w/ESP	3.10E-03	November 1991	AP-42, Table 11.6-9
AP-42 emission factor	NA	1 kiln w/ FF	1.60E-02	April 1990	AP-42, Table 11.6-9

* = not detected in stack gas at 0.3 ppmv

FF = fabric filter

ESP = electrostatic precipitator

PH-PC = preheater/precalciner kiln

- d. Mercury and Hydrogen Chloride emission factors were taken from the MACT (Subpart LLL) for Portland Cement Plants.

Mercury emissions from the cement kiln reflect the amount of mercury in the kiln's feedstock and fuel inputs. The amounts of mercury in these inputs and their relative contributions to overall mercury kiln emissions vary by site. In many cases the majority of the mercury emissions result from the mercury present as a trace constituent in the limestone. Limestone is the single largest input, by mass, to a cement kiln's total mass input, typically making up 80 percent of that loading.

Mercury is also found as a trace constituent in the other inputs to the kiln such as the additives that supply the required silica, alumina, and iron. Mercury is also present in the coal and petroleum coke typically used to fuel cement kilns. Mercury levels in limestone can vary significantly, both within a single quarry and between quarries. Since quarries are generally proprietary, this variability is inherent and site-specific. Mercury levels in additives and fuels likewise vary significantly, although mercury emissions attributable to limestone often dominate the total due to the larger amount of mass input contributed by limestone.

For the preheater/precalciner kilns with in-line raw mills, mercury is captured in the ground raw meal in the in-line raw mill and this raw meal (containing mercury) is returned as feed to the kiln. Mercury emissions may remain low during such recycling operations. However, as part of normal kiln operation raw mills must be periodically shut down for maintenance, and mercury-containing exhaust gases from the kiln are then bypassed directly to the main air pollution control device resulting in significantly increased mercury emissions at the stack.

The MACT, Subpart LLL for Portland Cement Plants limits mercury emissions to 21 lbs/million tons of clinker (46 lbs per year) at a 2,190,000 ton/year production rate. This MACT, Subpart LLL regulation was revised since the original application and since the toxic pollutant modeling was first performed. Therefore, the mercury emission rate is less than the rate that was previously modeled in compliance with this facility.

Toxics Modeling Results

Pollutant	Averaging Period	Modeled Emission Rate	Max Impact (ug/m3)	AAL	Percent of AAL
Ammonia *	1-hr	2.5 lbs/hr	3.18E-1	2.70E+03	<1
Arsenic *	Annual	28.10 lbs/yr	7.0E-5	2.30E-04	30
Benzene	Annual	6792.04 lbs/yr	1.33E-3	1.20E-01	1
Berylium*	Annual	1.71 lbs/yr	2.0E-5	4.10E-03	<1
Cadmium*	Annual	5.05 lbs/yr	2.0E-5	5.50E-03	<1
Chromium VI soluble chromate	24-hr	0.093 lbs/day	1.8E-4		<1
Chromium VI bioavailable chromate	Annual	0.76 lbs/yr	3.0E-5	8.30E-05	36
Fluorides*	1-hr	0.225 lbs/hr	2.87E-2	2.50E+02	<1
Fluorides*	24-hr	5.4 lbs/day	4.13E-3	1.60E+01	<1
Formaldehyde	1-hr	0.1156 lbs/hr	1.46E-2	1.50E+02	<1
Hydrogen Chloride**	1-hr	4.1815 lbs/hr	5.32E-1	7.00E+02	<1
Manganese*	24-hr	5.261 lbs/day	1.25E-2	3.10E+01	<1
Mercury **	24-hr	0.45 lbs/day	1.7E-4	6.00E-01	<1

* Emission factor from AP-42, Table 11.6-9 (Summary Of Noncriteria Pollutant Emission Factors For Portland Cement Kilns”

** Emission rate selected by applicant that keeps mercury below the MACT /NESHAP limit

Emission factors used for these toxic air pollutants are believed to be representative for this facility. Both arsenic and bioavailable chromium should be well represented by these values. Note too that these rates represent after control emissions rates where the destruction removal efficiency is better than 99%. Thus, very large variations would be required to effect significant after control values. Finally the Scientific Advisory Board is considering adjusting the Arsenic AAL.

VIII. PSD DISPERSION MODELING ANALYSIS/INCREMENT ANALYSIS

PSD regulations apply to major stationary sources. In the case of Portland Cement plants, the major source threshold is 100 tons/yr and includes all quantifiable fugitive emissions. Carolinas Cement Company, LLC (CCC) is considered a major stationary source with regards to PSD because it has a potential-to-emit greater than 100 tons per year of a regulated NSR pollutant. The significance thresholds for PSD are summarized in Table 1-1 below along with the proposed emissions from the project.

Table 1-1 Comparison of Potential Annual Emission Increases To the PSD Significant Emissions Increase Rates

Pollutant	Potential Emissions (tons/year)	PSD Major Significant Emissions Rate (tons/year)	Review Required?
NOx	1,645	40	Yes
PM ₁₀	200	15	Yes
PM _{2.5}	160	10	Yes
SO ₂	438	40	Yes
CO	3,068	100	Yes
VOCs	175	40	Yes
Lead	0.09	0.6	No
Fluorides	1.0	3.0	No
GHGs	1,895,000	75,000	Yes

Note: PM, PM₁₀, and PM_{2.5} include condensable particulate

The PSD Dispersion modeling analysis submitted by CCC was received by the North Carolina Air Quality Analysis Branch (Mr. Jerry Freeman). An air quality preliminary impact analysis was conducted for NOx, PM₁₀, SO₂, CO, and VOCs. The modeling results were then compared to applicable Significant Impact Levels (SILs) consistent with the DRAFT NSR Workshop Manual to determine if a full impact air quality analysis would be required for that pollutant. For the 1-hour NO₂ and SO₂ NAAQS, the EPA has not yet promulgated the corresponding SILs. NCDAQ followed the same procedure used by the EPA to develop the SIL for the 1-hour CO standard. A discussion of these values is given at http://www.ncair.org/cgi-bin/permit_memos.cgi?sort=date.

The Carolinas Cement facility is located near Castle Hayne, North Carolina, in New Hanover County. The facility area is near the coast with terrain being predominantly flat and is generally agricultural, industrial, and forested-land. For modeling purposes, the area, including and surrounding the site, is classified rural, based on the land use type scheme established by Auer 1978.

CCC used the current version of the AERMOD model to evaluate the pollutants' significant emissions. Full terrain elevations were included, as were normal regulatory defaults. A sufficiently dense (down to 100 meters) array of receptors was placed in ambient air beginning at the fence line and was tailored to ensure that the full extent of the Significant Impact Area (SIA) for each pollutant and pollutant averaging period was detected. The modeling was conducted using five years of representative preprocessed meteorology (Wilmington/Charleston 1988-1992) based on the surface characteristics (Z_o) of the CCC site which were determined using the AERSURFACE model. The modeled results are shown in Table 2 and indicated PM₁₀ and NO₂ would exceed the applicable SILs and would require further modeling. The Significant Impact Areas established by the SIL modeling had maximum radii of 18 km and 4.2 km, for NO₂, and PM₁₀, respectively.

Table 2 - Class II Significant Impact Results (ug/m³)

Pollutant	Averaging Period	Facility maximum Impact ¹	Class II Significant Impact
NO ₂	Annual	0.8	1
	1-hr	28	10
SO ₂	Annual	0.2	1
	24-hr	3.4	5
	3-hr	9.1	25
	1-hr	9.9	10
PM ₁₀	24-hr	30	5
PM _{2.5}	Annual	3.4	0.3
	24-hr	10.1	1.2
CO	8-hr	28	500
	1-hr	46	2000

¹ H1H modeled impact except for SO₂ and NO₂ (1-hr) per EPA guidance

Class II Area Full Impact Air Quality Modeling Analysis

A Class II Area NAAQS analysis was performed using AERMOD for NO₂, PM₁₀, PM_{2.5}, and lead. For NO₂ and PM₁₀, the NAAQS modeling included off-site source emissions and background concentrations from inventories and data provided by NCDAQ. Off-site inventories were appropriately trimmed by application of the “20D” rule in the screening areas (i.e. beyond the SIA). The numerous on-site and off-site sources, included in the modeling discussed here, are provided in a separate attachment to the memo accompanying this report. Facility emissions within the SIA were identified by the individual permitted stacks for each facility.

Facility emissions outside the SIA were identified by a representative stack for each facility. Pollutant background concentrations were provided by NCDAQ. The PM_{2.5} modeling included appropriate background concentrations but did not include off-site source emissions; a PM_{2.5} offsite inventory is currently not available. The modeling for lead evaluated only the CCC emissions; lead off-site inventories and monitoring data are currently not available. The Class II Area NAAQS modeling results are shown below in Table 3, and again in the summary, Table 7.

PM_{2.5} was modeled with the appropriate post-processing technique specified by EPA for the 24-hr period. Both the 24-hr and annual periods modeled below the NAAQS including background values.

Using EPA’s guidance of a three month rolling average evaluation, CCC demonstrated that the maximum modeled lead concentrations would be less than 1% of the applicable NAAQS.

The NO₂ modeling was conducted for the 1-hr averaging period. CCC used current EPA procedures and post processing, specific to NO₂ (1-hr), to arrive at the modeled NAAQS impacts. Since the maximum impacts occurred in an area with a coarse grid, (far from CCC but close to other facilities), CCC remodeled this area with a refined 100 meter grid. The results of the refined grid model runs indicated exceedances of the NO₂ 1-hr NAAQS; subsequently, CCC performed a cause-and-contribute analysis. Post processors, based on EPA guidance, were used to identify all receptors and times with exceedances of the NAAQS. At each of those receptors and times, the cause-and-contribute analysis indicated the CCC contribution was well below the SIL. At the maximum impact receptor, the CCC contribution was zero. The NO₂ modeling incorporated the Plume Volume Molar Ratio Method (PVMRM) module and appropriate parameters (e.g., in-stack conversion ratio, equilibrium ratio, etc.) within AERMOD. To maximize the module’s capabilities, hourly ozone data was used. Since contemporaneous, full-year, monitor data was not available, the latest seasonal data that was available was conservatively represented throughout an entire data year in a statistical manner agreeable to NCDAQ and is described in detail in the CCC modeling report.

Table 3a - Class II Area NAAQS Modeling Results

Pollutant	Averaging Period	Modeled Impact (ug/m3)	Background Concentration (ug/m3)	Total Impact (ug/m3)	NAAQS (ug/m3)	% NAAQS
NO ₂	1-hr	295	82.7	378	188	201**
PM ₁₀	24-hr	125	20	145	150	97
PM _{2.5}	Annual	3.41	8	11.41	15	76
	24-hr	9.4	16.8	26.2	35	75
Lead ***	3-month	0 *	N/A	0	1.5E-01	0

* below model sensitivity

** see cause and contribution discussion above

*** modeled voluntarily

Table 3b - Class II Area NAAQS Cause and Contribute Analysis

Pollutant	Averaging Period	Max All Sources (ug/m3)	CCC Contribution (ug/m3)	SIL (ug/m3)	CCC % SIL	Cause or Contribute?
NO ₂	1-hr	378	0	10	0	No

A 24-hr and annual PM10 PSD increment analysis was conducted for the CCC PM 10 emission sources and used an appropriate increment consuming offsite inventory provided by DAQ. The modeling results are shown in Table 4 and demonstrate compliance with the applicable PSD increments.

Table 4 - Class II Area PSD Increment Modeling Results

Pollutant	Averaging Period	Modeled Impact (ug/m3)	PSD Increment (ug/m3)	% Increment
PM ₁₀	Annual	8	17	47
	24-hour	22.5	30	75

Non Regulated Pollutant Impact Analysis (North Carolina Toxics)

CCC modeled 11 toxic pollutants using AERMOD with the same receptor array and meteorology as in the NAAQS analysis. All the modeled pollutants demonstrated compliance on a source-by-source basis with the applicable NC Acceptable Ambient Levels (AAL). The maximum concentrations occurred along the fencelines; modeled results are presented in Table 5.

Table 5 - Toxics Modeling Results

Pollutant	Averaging Period	Max Impact (ug/m3)	AAL	Percent of AAL
Ammonia	1-hr	3.18E-1	2.70E+03	<1
Arsenic	Annual	7.0E-5	2.30E-04	30
Benzene	Annual	1.33E-3	1.20E-01	1
Beryllium	Annual	2.0E-5	4.10E-03	<1
Cadmium	Annual	2.0E-5	5.50E-03	<1
Chromium VI soluble chromate	24-hr	1.8E-4		<1
Chromium VI bioavailable chromate	Annual	3.0E-5	8.30E-05	36
Fluorides	1-hr	2.87E-2	2.50E+02	<1
Fluorides	24-hr	4.13E-3	1.60E+01	<1
Formaldehyde	1-hr	1.46E-2	1.50E+02	<1
HCL	1-hr	5.32E-1	7.00E+02	<1
Manganese	24-hr	1.25E-2	3.10E+01	<1
Mercury	24-hr	1.7E-4	6.00E-01	<1

Carolinas Cement also modeled Total Suspended Particulates (TSP) to comply with the NC TSP SAAQS. TSP was modeled in the same manner as the PM₁₀ NAAQS analysis but, per NCDAQ direction, did not include background concentrations or off-site sources. The modeled results are shown in Table 6 and demonstrate compliance with the NC TSP SAAQS.

Table 6 - TSP Modeling Results

Pollutant	Averaging Period	Modeled Impact (ug/m3)	SAAQS (ug/m3)	% SAAQS
TSP	Annual	14	75	18
	24-hour	58	150	39

Additional Impact Analysis

Additional impact analyses were conducted for growth, soils and vegetation, and visibility impairment.

Growth Impacts

Carolinas Cement stated that 160 new permanent jobs onsite are expected from this project. About 350 additional area jobs are expected to be created. The facility expects to train local residents for many of the positions. After reviewing the expected road traffic and employment needs for construction, Carolinas Cement does not expect the project to cause additional road construction or upgrade. NCDAQ agrees.

Soils and Vegetation

For most types of soil and vegetation, ambient concentrations of criteria pollutants below the secondary national ambient air quality standards (NAAQS) will not result in harmful effects.

The facility is located in the coastal plain of North Carolina. The local geography is flat with a mix of forests, agricultural crops, and herbaceous vegetation. In addition to demonstrating compliance with the NAAQS and NC’s AALs for all regulated pollutants emitted from the proposed CCC operations, CCC also conducted a separate analysis (See Appendix H to Tab E of the application) in accordance with the 1980 EPA document, “A Screening Procedure for the Impacts of Air Pollution Sources on Plants, Soils, and Animals” to show CCC’s impacts would have a negligible impact on soils and vegetation. Using the results from the SIL modeling and additional deposition modeling for chromium and benzene (PM & VOC representation), CCC demonstrated compliance with the screening standards.

Class II Visibility Impairment Analysis

A Level 1 visibility impairment analysis was performed using the EPA VISCREEN model to demonstrate screening criteria would not be exceeded in any Class II areas that are designated as special visibility protection areas. With background visibility set to 80km, the facility determined that screening visibility parameters were exceeded out to a distance of 95 km. Within that radius, NCDAQ does not have any special, protected-visibility areas, thus no further visibility analysis was required.

Class I Increment/Air Quality Related Values (AQRV) Regional Haze Impact and Deposition Analyses

The closest Class I area to the facility site is Swan Quarter National Wildlife Refuge (NWR) which is about 170 km to the northeast. Cape Romain is the next closest, at 220 km to the south. The Federal Land Manager (FLM) reviewed the project and stated that a Class I increment analysis would not be required. For reference, CCC did submit a Class I increment analysis in 2009 that showed no exceedance, even at the higher emission rates modeled at that time.

PSD Air Quality Modeling Result Summary

Based on the PSD air quality ambient impact analysis performed, the proposed Carolinas Cement project will not cause or contribute to any violation of the Class II NAAQS or PSD increments.

TABLE 7 – CAROLINAS CEMENT PSD AIR QUALITY MODELING RESULTS							
SER Evaluation							
Pollutant	Annual E/R (Tons)	SER (Tons/yr)					
NO _x	1,645	40					
PM ₁₀	200	15					
PM _{2.5}	160	10					
SO ₂	438	40					
CO	3,068	100					
VOC's	175	40					
Class II Area SIL Analysis							
Pollutant	Averaging Period	Maximum Impact (ug/m ³)	SIL (ug/m ³)	SIL Exceeded			
NO ₂	Annual	0.8	1	N			
	1-hr	28	10	Y			
SO ₂	Annual	0.2	1	N			
	24-hr	3.4	5	N			
	3-hr	9.1	25	N			
PM ₁₀	1-hr	9.9	10	N			
	24-hr	30	5	Y			
PM _{2.5}	Annual	3.4	0.3	Y			
	24-hr	10.1	1.2	Y			
CO	8-hr	28	500	N			
	1-hr	46	2000	N			
Class II NAAQS Analysis							
Pollutant	Averaging Period	Maximum Onsite & Offsite Source Impacts (ug/m ³)	Back Ground Conc (ug/m ³)	Total Impact (ug/m ³)	NAAQS (ug/m ³)	% NAAQS	
NO ₂	1-hr	295	82.7	378	188	201	
PM ₁₀	24-hr	125	20	145	150	97	
PM _{2.5}	Annual	3.41	8	11.41	15	76	
	24-hr	9.4	16.8	26.2	35	75	
Class II NAAQS Cause and Contribute Analysis							
Pollutant	Averaging Period	Max All Sources (ug/m3)	CCC Contribution (ug/m3)	SIL (ug/m3)	CCC % SIL		
NO ₂	1-hr	378	0	10	0		
Class II PSD Increment Analysis							

Pollutant	Averaging Period	Modeled Impacts (ug/m ³)	PSD Increment (ug/m ³)	% PSD			
PM ₁₀	Annual	8	17	47			
	24-hour	22.5	30	75			
Total Suspended Particulates (TSP)							
Pollutant	Averaging Period	Maximum Impact (ug/m ³)	SAAQS (ug/m ³)	% SAAQS			
TSP	Annual	14	75	18			
	24-hour	58	150	39			
NC Toxic Pollutants							
Pollutant	Averaging Period	Maximum Impact (ug/m ³)	AAL (ug/m ³)	% AAL			
Ammonia	1-hr	3.18E-1	2.70E+03	<1			
Arsenic	Annual	7E-5	2.30E-04	30			
Benzene	Annual	1.33E-3	1.20E-01	1			
Beryllium	Annual	2E-5	4.10E-03	<1			
Cadmium	Annual	2E-5	5.50E-03	<1			
Chromium VI soluble chromate	24-hr	1.8E-4	6.2E-1	<1			
Chromium VI bioavailable chromate	Annual	3E-5	8.30E-05	36			
Fluorides	1-hr	2.87E-2	2.50E+02	<1			
Fluorides	24-hr	4.13E-3	1.60E+01	<1			
Formaldehyde	1-hr	1.46E-2	1.50E+02	<1			
HCL	1-hr	5.32E-1	7.00E+02	<1			
Manganese	24-hr	1.25E-2	3.10E+01	<1			
Mercury	24-hr	1.7E-4	6.00E-01	<1			
Class 1 Area Analysis							
NA							

IX. Best Available Control Technology (BACT)

Under PSD regulations, the basic control technology requirement is the evaluation and application of BACT. BACT is defined both in the statute (§169) and in the rules as follows [40 CFR 51.155 (b)(12)]:

An emissions limitation...based on the maximum degree of reduction for each pollutant... which would be emitted from any proposed major stationary source or major modification which the reviewing authority, on a case-by-case basis, taking into account energy, environment, and economic impacts and other costs, determines is achievable... for control of such a pollutant.

As evidenced by the statutory definition of BACT, this technology determination must include a consideration of numerous factors. The structural and procedural framework upon which a decision should be made is not prescribed by Congress under the Act. This void in procedure has been filled by several guidance documents issued by the federal EPA. The only final guidance available is the October 1980 "Prevention of Significant Deterioration – Workshop Manual." As the EPA states on page II-B-1, "A BACT determination is dependent on the specific nature of the factors for that particular case. The depth of a BACT analysis should be based on the quantity and type of pollutants emitted and the degree of expected air quality impacts." (emphasis added). The EPA has issued additional DRAFT guidance suggesting the use of a "top-down" BACT determination method. While the EPA Environmental Appeals Board recognizes the "top-down" for delegated state agencies, this procedure has never undergone rulemaking and as such, the "top-down" process is not binding on fully approved states, including North Carolina. The Division prefers to follow closely the statutory language when making a BACT determination and therefore the BACT determination is based on an evaluation of the statutory factors contained in the definition of BACT in the Clean Air Act. As stated in the legislative history and in EPA's final October 1980 PSD Workshop Manual, each case is different and the state must decide how to weigh each of the various BACT factors. The following are passages from the legislative history of the Clean Air Act and provide valuable insight for state agencies when making BACT decisions.

The decision regarding the actual implementation of best available technology is a key one, and the committee places this responsibility with the State, to be determined on a case-by-case judgment. It is recognized that the phrase has broad flexibility in how it should and can be interpreted, depending on site. In making this key decision on the technology to be used, the State is to take into account energy, environmental, and economic impacts and other costs of the application of best available control technology. The weight to be assigned to such factors is to be determined by the State. Such a flexible approach allows the adoption of improvements in technology to become widespread far more rapidly than would occur with a uniform Federal standard. The only Federal guidelines are the EPA new source performance and hazardous emissions standards, which represent a floor for the State's decision. This directive enables the State to consider the size of the plant, the increment of air quality which will be absorbed by any particular major emitting facility, and such other considerations as anticipated and desired economic growth for the area. This allows the States and local communities to judge how much of the defined increment of significant deterioration will be devoted to any major emitting facility.

If, under the design that a major facility proposes, the percentage of increment would effectively prevent growth after the proposed major facility was completed, the State or local community could refuse to permit construction, or limit its size. This is strictly a State and local decision; this legislation provides the parameters for that decision.

One of the cornerstones of a policy to keep clean areas clean is to require that new sources use the best available technology available to clean up pollution. One objection which has been raised to requiring the use of the best available pollution control technology is that a technology demonstrated to be applicable in one area of the country is not applicable at a new facility in another area because of the differences in feedstock material, plant configuration, or other reasons.

For this and other reasons the Committee voted to permit emission limits based on the best available technology on a case-by-case judgment at the State level. [emphasis added]. This flexibility should allow for such differences to be accommodated and still maximize the use of improved technology.

Legislative History of the Clean Air Act Amendments of 1977.

As described above, BACT determinations are site specific and require a case-by-case analysis. North Carolina relies on the statutory language of BACT while EPA relies primarily on a draft 1990 document. As a result of these divergent approaches, it is expected that North Carolina's decisions might not always coincide with those of the federal EPA.

A. BACT for Particulate Matter

While Federal EPA guidance is ambivalent on the definition of PM, NCDAQ requires that both filterable and condensable components be considered as PM. A BACT analysis was conducted for PM10/PM2.5 (filterable and condensable). Condensable particulate consists of particulate matter that is less than or equal to 2.5 microns in diameter and is not filterable at process temperatures.

Sources of PM10/PM2.5

Filterable PM10/PM2.5 at a Portland Cement plant is emitted from process sources (i.e., kilns, coolers, mills, transfer points), condensable PM10/PM2.5 is emitted from combustion sources (ie. kiln, generator) and fugitive dust sources are emitted from paved roads, unpaved roads, and quarrying operations. Process sources of filterable PM10/PM2.5 from the proposed project include:

- (1) Raw material handling and storage
- (2) Solid fuel handling and storage
- (3) Raw material milling and blending
- (4) Pyroprocessing (kiln and clinker cooler)
- (5) Clinker and gypsum handling and storage
- (6) Cement finish grinding
- (7) Cement handling and loadout.

Process sources of condensable PM10/PM2.5 will be emitted by the combustion sources at the plant.

- (1) Kiln
- (2) Precalciner
- (3) Emergency generator

Fugitive sources of PM10/PM2.5 from the proposed project include:

- (1) Quarrying operations (drilling, blasting, marl ripping, and truck loading)
- (2) Truck and loader traffic on unpaved roads
- (3) Truck traffic on paved roads
- (4) Material transfer points
- (5) Wind erosion from storage piles.

Section 1 – Identification of Control Options

A first step in a BACT analysis is to identify candidate control technologies. One of the resources North Carolina uses to identify candidate technologies is the RACT BACT LAER Clearinghouse (RBLC) database. Any reliance on the RBLC beyond the identification of candidate technologies is not recommended. The RBLC typically does not include sufficient documentation to determine if any particular emission rate has been achieved in practice or demonstrated. Additionally, the RBLC fails to provide how each permitting agency considered the statutorily required environmental, economic, and energy impacts of the various candidate technologies. Without this information the best use of the RBLC is to identify technologies that might work to reduce a regulated NSR pollutant.

In addition, the NCDAQ also reviewed the most recently revised MACT/NSPS for cement plants to determine what controls were evaluated as potentially candidate technologies. Where the Division of Air Quality agreed with the applicant, the information from the application was included in this BACT analysis review.

The RBLC database was queried for emission sources and control devices of PM10 from Portland Cement Plants. Specifically the following parameters were entered into the search page:

- Search Database - RBLC Basic Search
- Permit dates: 01/01/2001 – 03/24/2011
- Processes code: 90.028 “Portland Cement Plants”
- Process name: Blank
- Pollutant Name: PM
- Corporate/Company or Facility Name Contains: Blank
- Facility State: All States

RBLC Database Search Results Summary For PSD Projects (precalciner/preheater/kiln/inline raw mill) – PM10/PM2.5

RBLC ID	Company	New or Mod. (primary fuel burned)	Technology Applied	BACT Limit
GA-0136	CEMEX Southeast, LLC	New process @ exist. facility (Coal)	Fabric filter	0.1290 lbs PM10/ton clinker
AZ-0052	Arizona Portland Cement Co.	Modify process at exist. fac. (Coal)	Fabric filter	0.008 grains/dscf
FL-0297	CEMEX Cement, Inc.	New process @ exist. facility (Coal)	Fabric filter	0.10 lbs PM10/ton clinker 3-hr test run
GA-0134	Houston American Cement, LLC	New – Greenfield (Coal)	Fabric filter	0.1290 lbs PM10/ton clinker
MO-0072	Continental Cement Co., LLC	New process @ existing facil.	Fabric Filter	No inline raw mill
FL-0271	Suwanne American Cement Branford Cement Plant	New process @ existing facil. (coal primary fuel)	Fabric Filter	0.100 lbs/ton of dry preheater feed average of 3, 1-hr runs, 21.5 lbs/hr average of 3, 1-hr runs
FL-0282	American Cement Company, LLC	New/Greenfield Facility (coal primary fuel)	Fabric Filter	0.1530 lbs/ton of clink. annual test, 19.13 lbs/hr annual test
FL-0281	Sumter Cement Company, LLC	New/Greenfield Facility (coal primary fuel)	Fabric Filter	0.1530 lbs/ton of clink. annual test 31.87 lbs/hr annual test
FL-0268	Florida Crushed Stone Company, Brooksville Cement Plant (FCS)	New process @ existing facil. (coal primary fuel)	Fabric Filter	0.23 lbs PM/ton clink. 3-hr aver. 0.20 lbs PM10/ton clink. 3-hr aver
FL-0267	Florida Rock Industries, Inc.	New process @ existing facil. (coal primary fuel)	ESP	0.23 lbs PM/ton clink. 3-hr aver. 28.8 lbs/hr 3-hour ave.
IA-0070	Lehigh Cement Company-Mason City Plant	New process @ existing facil. & Modify process @ exist. (coal primary fuel)	ESP	0.516 lbs PM/ton clinker 0.516 lbs PM10/ton clinker
VA-0272	Roanoke Cement Troutville, Va.	New process @ existing facil. & Modify process @ exist. (Coal)	ESP & Good comb.	Has ineffective inline raw mill 83.9 lbs/hr 297.5 tons/yr
SD-0003	GCC Dacotah	New process @ existing facil. & Modify process @ exist.	Fabric Filter	No inline raw mill 0.01 gr/dscf outlet grain loading 11.95 lbs PM10/hr
TX-0466	Texas Lehigh Cement Company, LP	Not listed	Fabric Filter	No inline raw mill 5298.0 lbs/hr 5528 tons/yr
MO-0059	Continental Cement Company, LLC	New/Greenfield Facility (coal primary fuel)	Fabric Filter	No inline raw mill Source not subject to BACT
IA-0052	Lafarge Corporation	New process @ existing facil. & Modify process @ exist. (coal primary fuel)	Fabric Filter	No inline raw mill 0.5160 lbs PM/ton clinker 0.5160 lbs PM10/ton clinker
WA-0307	Ash Brove Cement Company Portland Cement	New process @ existing facil. & Modify process @ exist.	Fabric Filter	No inline raw mill 10.6 lbs/hr
TX-0355	Alamo Cement Company II, LTD Portland Cement Manuf. Company	New process @ existing facil. & Modify process @ exist. (coal/coke/natural gas)	ESP	36.33 lbs PM/hour 40.0 lbs PM10/hour

1.1 Control Options for PM10/PM2.5

The US EPA evaluated several types of control technologies in developing the particulate matter NSPS and NESHAP for Portland Cement plants. In establishing and promulgating the particulate matter NSPS and NESHAP emission limits, EPA focused on fabric filter and electrostatic precipitator (ESP) technologies as a basis for control of PM10 from kilns and clinker coolers. EPA's evaluation on raw material processing (including crushers, mills, and transfer points) was limited to measures needed to ensure opacity levels of 10 percent or less. No specific control technologies were evaluated for these processes.

1.2 Fabric Filter Systems

Fabric filter (bagfilter) systems consist of a structure containing tubular bags made of a woven fabric. Bagfilters remove filterable PM10 and filterable PM2.5 from the flue gas by drawing the dust-laden air through a bank of filter tubes suspended in a housing. PM10 and PM2.5 is collected on the upstream side of the fabric. Dust on the bags is periodically removed, collected in a hopper, and reintroduced to the process. Bagfilters will not capture condensable particulate.

PM10 removal efficiencies of 99 to greater than 99.9 percent are typical for bagfilters at varying operational conditions. The typical air-to-cloth ratio of a standard baghouse ranges from approximately 1.2:1 to 2:1 for reverse air, and from 3:1 to 4:1 for pulse-jet systems. The bags in baghouses used in the Portland Cement industry are made from a variety of materials including Nomex®, Gore-tex®, polyester, Teflon®, and fiberglass.

The technical feasibility of using baghouses is primarily dependent on exhaust gas temperatures and moisture content. Gas temperatures must be less than 260°C (500°F) to preclude damage to the bags. For the application of baghouse systems on cement kilns, this condition is usually achieved by cooling exhaust gases prior to passing them through the baghouse. Moisture contents must also be minimized to avoid condensation and possible blinding of the bags.

Cooling gases from cement kilns can be accomplished in a variety of ways. At this facility, the preheater/precalciner systems, exhaust gases are ducted to an in-line raw mill (or raw material dryer) to dry the raw feed material, and used to preheat combustion air for the kiln. When exhaust gases are not ducted to the raw mill (either by design or when the in-line raw mill is offline), water sprays and/or bleed-in air is needed. These procedures increase the moisture content of exhaust gases entering the bagfilter. When either approach is used, the temperature of gases entering the bagfilter must be maintained above the dew point of the gas to prevent condensation, which leads to blinding of the filter bags.

The primary advantages of bagfilter include: high removal efficiencies, simplicity in their operation, reliability, and the ease of maintenance, as compartments within the baghouse system can be isolated for repairs without shutting down the entire system.

The primary disadvantages of bagfilters include the need for relatively high pressure drops (necessitating high energy consumption), limitation of temperatures to less than 260°C (500°F), and the relatively high maintenance requirements (frequent replacement of bags).

1.3 Electrostatic Precipitator (ESP) Systems

Cleaning of exhaust gases using ESPs involves three steps: (a) passing the suspended particles through a direct current corona to charge them electrically, (b) collecting the charged particles on a grounded plate, and (c) removing the collected particulate from the plate by a mechanical process (i.e., rapping). The specific collection area (SCA) is the parameter used to ensure proper design control efficiency of an ESP. The SCA is defined as the ratio of the total plate area to the gas flow rate. As the SCA of an ESP increases, collection efficiency improves. The high resistivity of particles in exhaust gases from preheater/precalciner kilns requires that they be conditioned prior to entering the ESP. The primary advantages of using an ESP for PM10 control is the high PM10 collection efficiency, low-pressure drop, relatively low operating costs, and its ability to operate effectively at relatively high temperature and flow rates. The primary disadvantages to using an ESP are the high resistivity of the PM10 in cement process exhaust gases (especially from preheater/precalciner kilns), its sensitivity to fluctuations in exhaust gas conditions, and the high initial capital cost.

1.4 Wet Scrubbing Systems

Wet scrubbers remove filterable and condensable particulate matter from exhaust gases by capturing the particles in/on liquid droplets and separating the droplets from the gas stream. Wet scrubbers can be grouped into the following major categories:

- (1) Venturi scrubbers
- (2) Mechanically aided scrubbers
- (3) Pump aided scrubbers
- (4) Wetted filter-type scrubbers
- (5) Tray or sieve-type scrubbers.

The differences between these scrubbers are the manner in which the liquid is introduced to the gas stream, the methods that the particles are captured by the liquid droplets, and the manner in which the liquid droplets are removed. As primary control devices, wet scrubbers are capable of removing 80 to 99 percent of the PM₁₀ from exhaust gas streams when properly designed and operated. The primary advantages of a wet scrubber include its ease of maintenance and known technology with specific design parameters for specific applications. The primary disadvantages of a wet scrubber are their lower PM₁₀/PM_{2.5} control efficiencies, a requirement to treat and/or dispose of effluent if not recyclable into the process, and the possibility of solids buildup at the wet-dry interface. An additional disadvantage for this project is the additional water supply requirement to operate these systems with concomitant water disposal requirements.

1.5 Cyclone Collectors and Inertial Separator Systems

Cyclone collectors and inertial separators provide a low cost, low maintenance method of removing larger diameter PM (> 30 µm) from gas streams. On their own, they are not usually sufficient to meet BACT or NSPS emission standards, but they serve well as precleaners for other more efficient control devices and as dry product recovery devices. Cyclone systems consist of one or more conically shaped vessels in which the gas stream follows a circular motion prior to outlet (typically near the top of the cone). Particles enter the cyclone suspended in the gas stream, which is forced into a vortex by the shape of the cyclone. The inertia of the particles resists the change in direction of the gas and they move outward under the influence of centrifugal force until they strike the walls of the cyclone. At this point, the particles are caught in a thin laminar layer of air next to the cyclone wall and are carried downward by gravity where they are collected in hoppers. Cyclones are capable of removing in excess of 90 percent of the larger diameter (> 30 µm) PM. However, their efficiency decreases significantly for small diameter (< 30 µm) PM. The overall average control efficiency ranges from 50 to 95 percent based on a range of particle sizes in the gas stream. Cyclones vary in dimensions and inlet and outlet conditions. Collection efficiency is a function of (a) size of particles in the gas stream, (b) particle density, (c) inlet gas velocity, (d) dimensions of the cyclone, and (e) smoothness of the cyclone wall. In the cement industry cyclone type collection systems are typically used for product recovery or as pre-collection systems in combination with bagfilters or ESPs.

1.6 Water Sprays, Enclosures and Other PM₁₀ Control Systems

Filterable PM₁₀/PM_{2.5} controls are used for a variety of material handling processes and fugitive dust sources at Portland Cement plants. In the quarries they may include water sprays and enclosures for crushers and conveyor transfer points, wind screens and enclosures for storage piles, watering and chemical stabilizers (emulsions) for unpaved roads, and flushing and vacuum sweeping on paved roads. The efficiencies for these controls range from 50 to 97 percent individually, but in some instances, combining controls can achieve higher overall control levels. Many of the efficiencies assigned to these types of control measures are based on empirical models that take into account the quantity of water used, the frequency of application, the time between applications, and the meteorological conditions present at the time of application.

Section 2 -- Elimination of Technically Infeasible Options for PM10/PM2.5

2.1 Fabric Filter Systems

Fabric filter (bagfilter) systems have been proven to be technically feasible control technologies for preheater/precalciner kilns, clinker coolers, and other process sources. Therefore, this technology shall be considered further for these types of sources.

2.2 ESP Systems

Dry-type ESP control systems have been proven to be technically feasible control technologies for preheater/precalciner kilns and clinker coolers in past applications. However, though ESPs and fabric filters have comparable removal efficiencies based on short-term tests, recently built new kilns have fabric filters as PM controls, and we expect this trend to continue. ESPs applied to cement kilns must be deenergized if the carbon monoxide (CO) or excess air levels rise above a preset critical level where an explosion could occur, which results in short periods of high emissions. The high resistivities of PM from a cement kiln require gas conditioning if an ESP is used. In addition, resistivity can change if the chemistry of the clinker changes. ESP performance can also be affected by the particle size distribution. Fabric filters are not affected by these factors, and fabric filters control generally to the same concentration irrespective of the PM loading at the filter inlet, though some variability in PM emissions from fabric filters does occur due to seepage and leakage. Therefore, the US EPA stated that they expect the long-term performance of a fabric filter to be superior to an ESP. For this reason, the EPA believes that well-operated and maintained fabric filters are the best technology for control of PM emissions at Portland Cement kilns. This technology will not be considered any further.

Wet-type ESPs have not been used on cement kiln systems and because of the large space requirements necessary for ESP systems or the cost associated with collecting and ducting spatially diverse emission points like the finish mill and the transfer points, they are generally not considered feasible. Wet ESPs have been used to control acid gases in other industries and could theoretically reduce condensable particulate from a cement kiln. However, these units perform best on stable concentrated gas streams and would not perform as well on a cement kiln with variable flow and relatively low concentrations of condensable particulate. Wet ESPs are considered technically infeasible for removal of condensable particulate for a cement kiln and will not be considered further.

2.3 Wet Scrubbing Systems

Wet scrubbing systems are not considered technically feasible as stand alone PM10/PM2.5 control technologies for preheater/precalciner kilns and clinker coolers because wet scrubbing systems are not capable of reducing filterable particulate emissions from these sources to the levels that meet the NSPS or MACT standards. However, wet scrubbers have been proven to be a technically feasible control option for process sources in other industries. Therefore, this technology shall be considered further.

2.4 Cyclone Collector and Inertial Separator Systems

Cyclone collector and inertial separator systems can be used to control PM10 emitted from preheater/precalciner kiln systems and clinker coolers. However, because these systems are not capable of reducing particulate matter emissions from these sources to levels that meet the NSPS emission levels, these control options are considered technically infeasible for preheater/precalciner kilns and clinker coolers, unless combined with another control technology. Cyclone collector and inertial separator systems have been proven to be technically feasible control options for process sources. Therefore, these technologies shall not be considered further for particulate control of preheater/precalciner kiln systems and clinker coolers but will be considered for control of other processes.

2.5 Water Sprays, Enclosures, and Other PM10 Control Options

Water sprays, enclosures, and other PM10 control systems cannot be used to control PM10 emitted from preheater/ precalciner kiln systems and clinker coolers because these systems are not capable of reducing PM10 emissions from these sources to levels that meet the NSPS emission levels. Therefore, they are considered a technically infeasible option for preheater/precalciner kilns and clinker coolers. In addition, water sprays cannot be used on sources handling hot clinker or cement due to obvious problems with product damage/solidification and equipment pluggage.

Water sprays, enclosures, and other PM10 control systems have been proven to be technically feasible control options for other process and fugitive dust sources. Therefore, these technologies shall be considered further for these types of sources.

2.6 Condensers

In theory, condensable particulate could be controlled by rapid cooling of the gas stream and collection of the condensed materials (condensate). However, the condensed materials would consist mostly of fine inorganic solid particles. Use of a refrigerated condenser for this purpose would be technically and practically infeasible for multiple reasons including the large gas volume (surface area requirement), low volume of condensable liquids, and “sticky” nature of the collected solids that would tend to build up and foul the condensation surfaces, rendering them ineffective. This technology will not be considered further.

Section - 3 Ranking of Technically Feasible Filterable PM10/PM2.5 Control Options

3.1 Preheater/Precalciner Kiln and Clinker Cooler System

The maximum control efficiency for a membrane bagfilter system on a PH/PC kiln system is in excess of 99.9 percent. A fabric filter, using membrane bags presents the maximum control level for a preheater/precalciner kiln system with inline clinker cooler. A wet scrubber that will follow the main baghouse to reduce condensable PM10/PM2.5.

3.2 Other Process Sources

The control technologies that are technically feasible for controlling PM10/PM2.5 emissions from other miscellaneous process sources are ranked in Table 1 (in order of descending efficiency). The control efficiencies listed are typical values for the indicated technology.

Table 1 Ranking of Technically Feasible Control Options (Non Fugitive) For Process Sources – Filterable PM10/PM2.5

Control Technology	Control Efficiency
Fabric Filter Baghouse	99 - 99.9+%
Wet Scrubbers	80 - 99%
Cyclones and Inertial Separators	50 - 95%
Water Sprays, Partial Enclosures, and Other PM10 Control Methods	50 - 90+%
No Control	0%

3.3 Fugitive Dust Sources

The control technologies that are technically feasible for controlling PM10 emissions from fugitive dust sources are discussed in the following subsections:

3.3.1 Quarrying Operations

Quarrying operations include drilling, blasting, ripping, and loading of limestone rock and marl into loaders for transport to the primary crusher hopper. BACT for unenclosed quarrying sources is generally control of particulate matter emissions by inherent or applied moisture. It should be noted that the quarry materials at the CCC plant are naturally wet (typically > 15% moisture) and as such additional suppressive spray is not necessary at all times.

3.3.2 Paved Roads

The control technologies that are technically feasible for controlling PM10 emissions from paved roads include watering (flushing with water), vacuum sweeping, or a combination of these methods. Primary roadways into and throughout the cement plant will be paved. All paved roadways will remain paved throughout the life of the project.

The use of water flushing followed by vacuum sweeping provides an estimated control efficiency of between 46 to 96 percent. Individually, water flushing and vacuum sweeping have control efficiencies of less than 70 percent. Because of the volume of traffic on most paved plant roads, the efficiency of water flushing in addition to sweeping is essentially the same as sweeping alone, as determined by the formulas in Table 2.

Table 2. Ranking Of Technically Feasible Control Options For Paved Roads - PM10/PM2.5

Operation	Control Technology	Control Efficiency	Source/Notes
Paved Roads	Water Flushing & Vacuum Sweeping	96 - 0.2363V*	Air Pollution Engineering Manual Chpt. 4, p 146, Paved Surface Cleaning
	Water Flushing	69 - 0.231V*	Air Pollution Engineering Manual- Chpt. 4, p 146, Paved Surface Cleaning
	Vacuum Sweeping	46 - 58	Air Pollution Engineering Manual- Chpt. 4, p 146, Paved Surface Cleaning
	No Control	0%	Assumes all Federal and State regulations could be met.

*Where V = number of vehicle passes since application.

3.3.3 Unpaved Roads

The control technologies that are technically feasible for controlling PM10 emissions from unpaved roads include paving, watering, and application of chemical dust suppressants. Due to the constant changes in quarrying activities, travel routes in a quarry are routinely changing. Therefore, paving roads in an active quarry is technically infeasible. The roads within the quarry area will remain unpaved. Vehicle traffic on these roads will be limited to haul trucks and loaders carrying limestone to the primary crusher and vehicles transporting overburden.

PM10 emissions from unpaved roads can be controlled by watering or chemical dust suppression methods. Studies have shown that on heavily traveled unpaved roads, chemical suppression methods are as effective as watering at regular intervals. The use of chemical suppression (such as an emulsion) is expected to provide a 62-90+ percent control efficiency for the unpaved roads. Watering (or natural surface moisture) provides control efficiencies ranging from 0 to 90+ percent, depending on the ability to maintain soil moisture content in the range of 2 to 8 percent. As noted above, soil conditions in the quarry are naturally wet, therefore eliminating the need to water these roads under normal conditions.

Table 3. Ranking Of Technically Feasible Control Options For Unpaved Roads - PM10/PM2.5

Operation	Control Technology	Control Efficiency	Source/Notes
Unpaved Roads	Chemical stabilization	62 - 90+%*	Air Pollution Engineering Manual-Chpt. 4, Fig. 6, Chemical Stabilization of Unpaved Surfaces
	Watering/natural moisture	0 - 90+%*	Air Pollution Engineering Manual -Chpt. 4, Fig. 5, Watering of Unpaved Roads
	No Control	0%	Assumes all Federal and State regulations could be met.

*Depends on frequency of application.

Section 4 – Evaluation Of Technically Feasible PM10/PM2.5 Control Options:

A fabric filter, using membrane bags presents the maximum control level of PM10/PM2.5 for a preheater/ precalciner kiln system with inline clinker cooler and miscellaneous point sources without condensable PM10/PM2.5. A wet scrubber following the membrane bagfilter will achieve the greatest level of control for condensable PM10/PM2.5.

The top control option for unpaved roads inside the Portland Cement Plant is paving. The top control option for unpaved roads in the quarry area is watering, natural moisture, and/or chemical suppression.

Section 5 - BACT For Sources of PM10/PM2.5:

The applicant proposed and the NCDAQ has determined that the BACT limit should be based on the use of:

5.1 Preheater/Precalciner Kilns and Clinker Coolers

Bagfilters with membrane bags are the most effective control technology available for filterable PM10/PM2.5 emissions from a preheater/ precalciner/kilns/in-line clinker cooler system. Consistent with the most recent MACT/NSPS for cement kilns, BACT is a numerical limitation based on the equation at 40 CFR §63.1343(b)(2).

5.2 Other Process Sources

Bagfilters with membrane bags are the most effective control technology available for filterable PM10/PM2.5 emissions from all miscellaneous process point sources associated with the proposed project (e.g., closed conveying systems; clinker and cement silos; coal mill; finish mill; and cement loadout). DAQ asked the applicant to evaluate a 0.0008 grain loading limit. Based on a marginal cost of approximately \$3400 going from a grain loading of 0.005 to 0.0008 and the minimal environmental benefit in the marginal decrease, DAQ is proposing a BACT limit of 0.005 gr/dscf based on stack testing with approved protocol (front half only).

5.3 Fugitive Dust Sources

Best management practices will be used to minimize fugitive dust emissions from drilling, blasting, stone removal, and loading operations. Best management practices include wet suppression for drills and limiting drop heights between loaders and truck beds.

Vacuum sweeping and/or water flushing for paved roadways, and watering/natural surface moisture or chemical emulsions for unpaved roadways are the maximum feasible control methods for PM10/PM2.5 emissions from fugitive dust sources.

Materials from the quarry are naturally wet and no additional measures would reduce emissions from material handling and storage operations. Emissions from crushers will be minimized by partial enclosure and natural or added moisture. Other raw materials and fuels will be stored in bins or under roof to minimize surface drying and wind erosion. These represent the best available control option for these types of processes.

5.4 Fugitive Emissions from Unpaved Roads

Unpaved roads will utilize watering, natural surface moisture, or chemical suppression as necessary to minimize fugitive emissions. It is not practical to pave roads in the quarry due to the broad and changing area on which the trucks and front end loaders move.

5.5 Fugitive Dust from Paved Roads

Vacuum sweeping and/or water flushing at a frequency as necessary to minimize silt loading on paved road surfaces will be utilized to control PM10/PM2.5 on paved roads.

5.6 Fugitive Dust from Quarrying Operations

Best management practices will be utilized for drilling, blasting, stone removal and truck loading operations.

5.7 Fugitive Dust from Storage Piles

All clinker storage will be fully enclosed. Limestone and marl have high inherently high moisture content. Fugitive emissions from lower moisture raw materials and solid fuels will be minimized by storage under roof, in a partial enclosure, or behind wind screens.

-----SULFUR DIOXIDE (SO₂) BACT Analysis -----

The sources of sulfur oxides (SO_x) associated with the proposed project are the preheater/precalciner kiln system, and the emergency Diesel generator. Sulfur oxides, mainly SO₂, are generated from the sulfur compounds in the raw materials and, to a lesser extent, from sulfur in fuels used to fire the preheater/precalciner kiln system. SO₂ emissions from the emergency generator are directly related to the Diesel sulfur content.

SO₂ is both liberated and absorbed throughout the pyroprocessing system, starting at the raw mill, continuing through the preheating/precalcining and burning zones, and ending with clinker production. Sulfides from the raw material (limestone rock) are the predominant source of SO₂. A smaller quantity of SO₂ is liberated from sulfates in fuel, and this SO₂ is more readily absorbed into the kiln feed material and product (clinker) matrix. Coal and petroleum coke are the primary fuels at this facility.

The raw mill and preheater/ precalciner use kiln exhaust gases to heat and calcine the raw feed before it enters the kiln. The counter flow of raw materials and exhaust gases in the raw mill and preheater and precalciner, in effect, act as an inherent dry scrubber to control SO₂ emissions creating CaSO₃ and CaSO₄, which either pass directly with the raw materials to the burning zone or are collected by the main baghouse and re-circulated back into the raw material stream.

Section 1 - Identification of Control Options – SO₂

One of the resources North Carolina uses to identify candidate technologies is the RBLC database. Any reliance on the RBLC beyond the identification of candidate technologies is not recommended. The RBLC typically does not include sufficient documentation to determine if any particular emission rate has been achieved in practice or demonstrated. Additionally, the RBLC fails to provide how each permitting agency considered the statutorily required environmental, economic, and energy impacts of the various candidate technologies. Without this information the best use of the RBLC is to identify technologies that might work to reduce a regulated NSR pollutant. In addition to the RBLC, the NCDAQ also reviewed the most recently revised MACT/NSPS for cement plants to determine what controls were evaluated as potentially candidate technologies. Where the Division of Air Quality agreed with the applicant, the information from the application was included in this BACT analysis review.

RBLC Database Search Results Summary For PSD Projects (precalciner/preheater/kiln/inline raw mill) – SO₂

RBLC ID	Company	New or Mod. (primary fuel burned)	Technology Applied	BACT Limit
GA-0136	CEMEX Southeast, LLC	New process @ exist. facility (Coal)	Hydrated lime inject.	1.0 lbs/ton clinker
AZ-0052	Arizona Portland Cement Co.	Modify process at exist. fac. (Coal)	None	0.16 lbs/ton clinker
FL-0297	CEMEX Cement, Inc.	New process @ exist. facility (Coal)	Continuous Emissions Monitor	0.20 lbs/ton clinker
GA-0134	Houston American Cement, LLC	New – Greenfield (Coal)	Hydrated lime inject.	1.0 lbs/ton clinker
MO-0072	Continental Cement Co., LLC	New process @ existing facil.	Inherent scrubbing	1.93 lbs/ton clinker
FL-0271	Suwanne American Cement Branford Cement Plant	New process @ existing facil. (coal primary fuel)	Inherent Scrub.	0.20 lbs/ton clinker CEMS 24-hour rolling average

FL-0282	American Cement Company, LLC	New/Greenfield Facility (<i>coal primary fuel</i>)	Inherent Scrub	0.20 lbs/ton clinker CEMS 24-hour rolling average
FL-0281	Sumter Cement Company, LLC	New/Greenfield Facility (<i>coal primary fuel</i>)	Hydrated lime injection	0.20 lbs/ton clinker CEMS 24-hour rolling average
FL-0268	Florida Crushed Stone Company, Brooksville Cement Plant (FCS)	New process @ existing facil. (<i>coal primary fuel</i>)	Inherent Scrub.	0.23 lbs/ton clinker 24-hour rolling average
FL-0267	Florida Rock Industries, Inc.	New process @ existing facil. (<i>coal primary fuel</i>)	Inherent Scrub.	0.28 lbs/ton clinker 24-hour rolling average
IA-0070	Lehigh Cement Company-Mason City Plant	New process @ existing facil. & Modify process @ exist. (<i>coal primary fuel</i>)	Wet scrubber	1.01 lbs/ton clinker 30-day rolling average
VA-0272	Roanoke Cement Troutville, Va.	New process @ existing facil. & Modify process @ exist. (Coal)	Low sulfur fuel, good comb. pract, CEMs	ineffective inline raw mill 950.0 lbs/hour
SD-0003	GCC Dacotah	New process @ existing facil. & Modify process @ exist.	Inherent Scrub.	No inline raw mill 632.0 lbs/hr
TX-0466	Texas Lehigh Cement Company, LP	Not listed	None	No inline raw mill 416.0 lbs/hour
MO-0059	Continental Cement Company, LLC	New/Greenfield Facility (<i>coal primary fuel</i>)	Wet scrubber	No inline raw mill 12.0 lbs/ton clinker, 3-hr rolling average
IA-0052	Lafarge Corporation	New process @ existing facil. & Modify process @ exist. (<i>coal primary fuel</i>)	Dry lime scrub. equivalent	No inline raw mill 4850.0 tons/yr
WA-0307	Ash Brove Cement Company Portland Cement	New process @ existing facil. & Modify process @ exist.	Operational standards	No inline raw mill, 180.0 ppm @ 10% O ₂ 1 hour ave.
TX-0355	Alamo Cement Company II, LTD Portland Cement Manuf. Company	New process @ existing facil. & Modify process @ exist. (<i>coal/coke/natural gas</i>)	Inherent Scrub	20.0 lbs/hr

1.1 Inherent Dry Scrubbing

Total potential SO₂ emissions from a cement kiln include oxidization of sulfur during fuel combustion and raw feed preheating and calcination. The emissions and projected control efficiency achieved by the inherent dry scrubbing of the preheater/precalciner kiln system can be estimated using sulfur content and projected operating data. Sulfur liberation and absorption processes take place in the rotary kiln, in the precalciner, and in the lower sections of the preheater tower. The SO₂ removal efficiency of the preheater has been estimated at 60 percent. When the raw mill is not running (up to 20 percent of the time), SO₂ emissions are vented through the main stack to the atmosphere. Kiln gases pass through the raw grinding mill when it is running, where additional SO₂ is absorbed into the raw material. The SO₂ removal efficiency of the raw mill has been estimated to be 50 percent. The raw mill is expected to run at least 80 percent of the time. It should be noted that fuel sulfur is not included because the uncontrolled contribution of SO₂ from the fuel is negligible as a result of the more than 99% SO₂ removal efficiency in the lime rich kiln environment. The average system removal efficiency based on the SO₂ emission estimate is before further control. The controlled SO₂ is absorbed into the clinker matrix and kiln dust as calcium or alkali sulfates and eventually becomes part of the finished cement product. The overall predicted SO₂ removal efficiency of this system is lower than some other preheater-precalciner kilns because of the higher levels of sulfur found in the onsite raw materials in combination with the conservative assumptions used. In addition to the inherent scrubbing, additional control consistent with BACT shall be added to lower SO₂ emissions to the limits of the NSPS and MACT for Portland Cement Plants.

1.2 Process Modifications

Process modifications that can affect SO₂ emission levels include: (1) a reduction of the sulfur content in the raw feed material and (2) increasing the oxygen level in the kiln.

1.2.1 Raw Feed Sulfur Reduction

Switching from raw feed materials with high sulfur contents to those with low sulfur contents could reduce potential SO₂ emissions. Limestone always contains sulfates, and often contains sulfur-rich pyrite (FeS₂). Pyrite has been identified as the cause of high SO₂ emissions at several plants throughout the US. Because of the huge volume of limestone used, it is not feasible to ship lower sulfur, cement-quality limestone from other locations. Sulfur is also present in other raw materials and fuels used in the cement making process. Limiting the sulfur contents in these materials would have little effect on the reduction of potential SO₂ emissions.

1.2.2 Increased Oxygen Levels

Several studies have shown that increased oxygen levels at certain locations in the kiln system will reduce SO₂ emissions. It is theorized that the SO₂ reacts with the increased oxygen to form SO₃, which reacts better with the alkali dust from the raw materials, and is absorbed by the clinker or the dust cake on a fabric filter. Advantages are the ease of implementing the technology. Disadvantages include the impact on clinker formation, kiln stability, and increased NO_x and PM₁₀ emissions.

1.3 Flue Gas Desulfurization Systems

The following types of Flue Gas Desulfurization (FGD) systems are available that could provide control of SO₂ emissions from Portland Cement kilns:

- a. Wet scrubbing
- b. Wet absorbent addition
- c. Dry absorbent addition
- d. D-SOX cyclone
- e. Lime hydrator.

1.3.1 Wet Scrubbing

Wet scrubbing can be an effective add-on control technology for SO₂ removal using an aqueous alkaline solution. SO₂ is removed from the exhaust gases by scrubbing because it can be readily neutralized by alkaline solution and is highly soluble in aqueous solutions. Wet scrubbers have been shown to provide SO₂ control in the range of 20 to 95+ percent under various operating conditions. Cyclonic spray towers generally achieve control efficiencies at the higher end of the range. Wet scrubbing can also remove some particulate matter, VOCs, and acid gases. As applied to cement plants, the scrubber is located after the primary PM₁₀ control device and minimal additional particulate is removed. The solids in mist carryover from the scrubber can in some cases be greater than the inlet particulate loading from the fabric filter. In theory, wet scrubbing produces a calcium sulfate (CaSO₄) byproduct, typically referred to as synthetic gypsum. However, in practice, not all cement plants that have used wet scrubbing have been successful in obtaining useable synthetic gypsum. If the cement plant can reclaim the scrubber sludge as synthetic gypsum and reincorporate it in the finish grinding process as synthetic gypsum, the overall environmental benefits associated with a wet scrubber can be considerable. Wet scrubbing increases the water demand for the plant and introduces a new water pollution source. Wastewater generated by the scrubber must be properly treated and disposed. Application of a wet scrubber requires passing the exhaust gases through a particulate control device to reduce the dust load and recover product. The exhaust gas is cooled by spraying quench water or a slurried reagent (such as slaked lime or finely ground limestone) into an absorption chamber. SO₂ is scrubbed from the exhaust gas by the reaction with the slurried lime [Ca(OH)₂] or limestone (calcium carbonate). The Ca(OH)₂ or calcium carbonate reacts with the SO₂ to form synthetic gypsum (CaSO₄ – 2H₂O). In theory, the synthetic gypsum precipitates into small crystals that are dewatered. The dewatered synthetic gypsum can then be used to supplement purchased gypsum in the production of cement and represents a potential beneficial reuse of byproduct materials. However, if the gypsum cannot be effectively crystallized, as has been the experienced by some cement plants utilizing wet scrubbing systems, the scrubber sludge must be disposed of at considerable cost. At the present time there have been only a small number of cement kilns in North America that have employed wet scrubbing technology for abatement of SO₂.

Environmental Impacts

The use of wet scrubbers can have an adverse environmental impact by generating solid waste requiring landfill disposal (if a usable synthetic gypsum cannot be produced), and require treatment and disposal of liquid blow down containing dissolved solids (alkali salts), if the water cannot be recycled back into the process. For CCC, the synthetic gypsum produced by a scrubber should be usable as a cement additive in the finish mills. The scrubber will be designed such that blow down is minimized and the water can be recovered and reused in other plant processes. Wet scrubbers produce an exhaust gas stream that is lower in temperature than otherwise would be the case.

Energy Impacts

The static pressure drop through the wet scrubber and demister increases the electrical energy demand for the project and has an adverse impact on energy usage at the site. In addition, for some plants, when the stack gases must be reheated for dispersion and corrosion prevention, this will have energy impacts. However, it has been determined by CCC that reheating will not be required.

Product Impacts

The wet scrubber does not have an adverse product impact. There are no process impacts if the waste is disposed of, but impacts are possible if synthetic gypsum is returned to the process. Changes in process quality are difficult to predict prior to scrubber startup because the quality of synthetic gypsum is site-specific. Gypsum produced by a CCC scrubber should be usable as a cement additive.

1.3.2 Wet Absorbent Addition

Wet absorbent addition (WAA) to the process gas stream can reduce high levels of SO₂ emissions in dry cement kiln systems. Lime and hydrated lime can be used for this purpose. Various types of wet absorbent systems have been used on dry kilns, with lime slurry addition being the most effective. Wet absorbent addition is limited to kiln systems where the lime slurry droplet can evaporate to dryness before entering the particulate control device. This eliminates use in wet kilns where flue gas temperatures are too low for rapid evaporation and flue gas moisture is near moisture saturation levels. It should be noted that the limestone in the kiln feed and calcium oxide in kiln dust act as natural absorbents of some of the SO₂ emissions produced from fuel combustion and pyritic sulfur in the feed. Further, good burner design and proper operation of the kiln will chemically absorb sulfur into the clinker. Additional SO₂ reduction can be achieved by absorbent addition into the process gas stream. With wet absorbent addition, calcium oxide (CaO) or calcium hydroxide [Ca(OH)₂] slurry is injected into the process gas stream. Solid particles of calcium sulfite (CaSO₃) or calcium sulfate (CaSO₄) are produced, which are removed from the gas stream along with excess reagent by a particulate matter control device. The SO₂ removal efficiency varies widely depending on the point of introduction into the process according to the temperature, degree of mixing, properties of the absorbent (size, surface area, etc.), and retention time. In a dry process cement kiln system, the gases contain a low concentration of water vapor at an elevated temperature and must be cooled and humidified prior to entering the baghouse or ESP. Lime or calcium hydrate slurry can be introduced with the spray cooling water. Flue gas temperatures are reduced through the heat absorbed as sensible heat from evaporation of water.

These temperatures are defined by the system design, kiln heat balance, amount of air leakage into the system, and radiant and convective heat losses. The conditions present are optimal for proper operation of the kiln. For lime slurry injection to succeed as an SO₂ absorption control method several conditions must occur. These include:

- a. Generation of spray droplets of sufficient surface area to adsorb SO₂ (typically 150 to 250 μm).
- b. Droplets exist for sufficient duration to allow absorption and reaction (typically 3 to 5 s).
- c. Sufficient reagent present in the droplet to maintain excess absorbent during droplet life.
- d. Activity of hydrate particle in the droplet sufficient to replenish dissolved solids in the liquid as SO₂ consumes reagent (i.e., particle size, reactivity, etc.).
- e. When used in conjunction with a dry particulate collection device, the droplet must evaporate to dryness prior to entering the device.

An analysis of the heat balance for the dry process kiln determines if there is sufficient sensible heat available in the gas streams to allow evaporation of injected water containing hydrate slurry. Hydrate solids may be introduced in the conditioning water as suspended/dissolved solids. Normal solids content in the water can be as high as 5 percent by weight using air atomizing spray nozzles. The generation of small droplets and fine hydrate particle size allows effective absorption of SO₂ and reaction to form sulfates. SO₂ removal effectiveness can vary between 50 and 70 percent depending on residence time and hydrate surface area. The lower SO₂ removal estimates have been documented in applications where the conditioning towers, duct arrangement, and particulate control devices are not adequate for injection of lime slurry. The constraints of the system result in wet bottoms in the conditioning towers and build up on ducts and baghouse walls. These conditions limit the hydrate slurry injection rates and the removal efficiency.

The higher SO₂ removal estimates have been documented at new greenfield installations in which optimum designs can be implemented. In these designs larger conditioning towers and longer straight runs of ductwork are used along with control device gas distribution systems. The major issues in applying this type of control system to preheater/ precalciner kiln system are the impacts on the thermal efficiency of the system and the effects moisture will have on the PM10 control system. The heat exchange processes that take place in the precalciner, preheater, and raw mill are critical to the overall thermal efficiency of the process.

Gases from the preheater are routed to the raw mill to aid in the grinding and drying process. If the WAA system is installed prior to the raw mill, the reduction in gas temperatures from the spray drying process would decrease the ability of the gases to dry the materials in the raw mill. To adjust for the temperature decrease, additional heat energy would be necessary in the raw mill to ensure that the added moisture in the exhaust gases did not condense in the baghouse. A hybrid system is also possible to optimize the SO₂ reduction effects of a WAA system. In this hybrid system, wet lime slurry is injected into the conditioning/spray tower to reduce SO₂ emissions when the raw mill is not operating. When the raw mill is operating, wet lime is introduced into the raw mill, enhancing SO₂ adsorption as this material is ground with the raw material while kiln gases pass through the mill.

Environmental Impacts

No adverse environmental impacts are expected from the use of wet absorption (hybrid system) at this location. However, if gas reheating is used for a continuous spray tower system, additional products of combustion would be emitted through fuel burning.

Energy Impacts

The change in energy required to implement wet slurry injection (hybrid system) is minimal and does not result in an adverse energy impact. However, if gas reheating is used for a continuous spray tower system, additional energy would be required in the form of fuel burning and additional fan horsepower.

Process Impacts

The injection of wet slurry is not expected to have significant process impacts except in applications with high uncontrolled SO₂ emissions and high dosage rates, when excess sulfate could affect product quality. The addition of Ca(OH)₂ at the expected rates should not adversely affect cement quality.

1.3.3 Dry Absorbent Addition

Dry absorbent addition to the process gas stream or in an add-on control device (dry scrubber) can reduce high levels of SO₂ emissions. Lime, calcium hydrate, limestone, or soda ash could be used for this purpose. Various types of dry absorbent systems have been used on wet and dry cement kilns, and one end-of-pipe dry scrubber has been installed on a kiln in Switzerland. It should be noted that the calcium oxide and limestone in the kiln feed acts as a natural absorbent of the SO₂ emissions produced from fuel combustion and pyrite decomposition.

Further, good burner design and proper operations of the kiln will chemically bond sulfur into the clinker. Additional SO₂ reduction can be achieved by dry absorbent addition into the process gas stream. With absorbent addition, dry CaO or Ca(OH)₂ is injected into the process gas stream. Solid particles of CaSO₃ or CaSO₄ are produced, which are removed from the gas stream along with excess reagent by a particulate matter control device in the process flow. The SO₂ removal efficiency varies widely depending on the point of introduction into the process according to the temperature, degree of mixing, and retention time. The single known application of an add-on dry scrubber uses a venturi reactor column to produce a fluidized bed of dry slaked lime and raw meal. As a result of contact between the exhaust gas and the absorbent, as well as the long residence time and low temperature characteristic of the system, SO₂ is efficiently absorbed by this system. An additional application injects Ca(OH)₂ in the gas stream after the preheater first stage cyclone. The addition of dry absorbent to flue gas streams has been used at Roanoke Cement in Troutville, Virginia and at several other new cement plants. Effectiveness and cost are specific to each application and depend on the gas stream conditions and residence time available for reaction. Typically the molar ratio (Ca/S) for absorption is on the order of 3.0 to 15 and requires approximately 2 seconds for completion. Initial surface reactions occur in the first 0.1 s and the coating retards reaction with the bulk of the particle. For increased effectiveness a very fine particle is required or a high Ca/S ratio. Typical removal efficiency is between 20 and 50 percent depending on gas stream conditions.

For the process to be implemented, hydrate would be received by truck, pneumatically conveyed to a storage silo, and then injected through nozzles into the gas stream. Complete and uniform distribution and mixing in the gas stream are necessary. The best location for injection is at the preheater exhaust, which allows adequate residence time for reaction.

Environmental Impacts

No adverse environmental impacts are expected from the use of dry absorption at this location.

Energy Impacts

The change in energy required to implement dry adsorption is minimal and does not result in adverse energy impact.

Process Impacts

The injection of dry absorbent is not generally expected to have a significant process impact. However, high injection rates of $\text{Ca}(\text{OH})_2$ can impact the calcium to silica ratio and upset the kiln chemistry.

1.3.4 D-SO_x Cyclone

The D-SO_x cyclone system is designed to use some of the free lime (CaO) that is created in the calciner to reduce SO₂ emissions. A portion of the calciner exit gas (about 5% for plants with significant pyritic sulfur) is taken off of the calciner exit duct and goes up to a collection cyclone at the top of the preheater tower that separates most of the entrained dust from the gas. The captured dust is then fed to the cyclone exit duct where the pyritic sulfur is converted to SO₂. The free lime in the calciner dust absorbs some of the SO₂ to give a 25 to 30 percent reduction. This has been proven in two plants in the U.S. according to FLSmidth (supplier of complete cement plants). The exit gas from the D-SO_x cyclone is returned to the outlet of the second stage preheater cyclone. A natural draft is created in the system thereby eliminating the need for an extra fan. Since no outside reagent is required, the system has much lower operating costs than the control systems based on purchased lime addition.

1.3.5 Lime Hydrator

An on-line lime hydrator system has been developed at a pilot test plant in Denmark. The system extracts calcined raw material from the bottom stage cyclone, hydrates the surface of the lime particles in a separate vessel, and returns the material to the top of the preheater where it is mixed with preheater feed to absorb SO₂. FLSmidth (vendor) indicates that a 44 percent SO₂ reduction could be expected with this system. A relatively small amount of additional heat and energy are required for the system. This system has advantages over wet lime injection systems in that the hydrated lime is made on-line, thus saving the costs of added lime, transportation, and storage. However, there have not yet been any full-scale commercial applications of this system.

1.10 Reduced Sulfur Fuel (Coal & petroleum coke):

Sulfur in fuel is typically negligible when estimating potential SO₂ emissions from preheater-preciner kilns because the sulfur in the fuels is much more readily absorbed into the process than sulfides from the quarried raw materials. The sulfur content may range from 0.7% to 2.0% or more for both coal and petroleum coke. CCC estimates that the sulfur input for the fuel at this site will be approximately 3.84 lbs SO₂/ton clinker which is equivalent to an average of 0.8% sulfur in coal at maximum input of 30 tons coal per hour (250 tons per hour of clinker). The results of an analysis of fuel sulfur and SO₂ emissions have been conducted at two of Titan Americas Portland Cement facilities (Roanoke Cement Co. in Virginia and the Pennsuco plant in Medly, Florida). What these studies demonstrate is that regardless of the sulfur content in the fuel, most of the SO₂ is absorbed in the kiln atmosphere before it enters the preheater towers. Similarly, the non-impact of fuel sulfur on SO₂ emissions has been discussed in various cement industry technical literature (Portland Cement Association report, PCA R&D Serial No. 2460a, 2000).

Section 2 - Elimination of Technically Infeasible SO₂ Control Options

Each control technology is considered and those either not commercially available or infeasible based on physical, chemical, and engineering principles are eliminated.

2.1 Inherent Dry Scrubbing

This technology has been demonstrated as technically feasible and is estimated to result in a potential SO₂ absorption efficiency of 82 percent based on a sulfur balance. As an inherent process technology, the underlying reduction efficiency is not comparable to other add-on SO₂ control options.

2.2 Process Modifications

The technical feasibility of process modifications is dependent on several factors that cannot be directly quantified, and factors that impact the emissions of other pollutants. The following subsections discuss the relative feasibility of the identified process modifications.

2.2.1 Raw Material Sulfur Reduction

The raw materials to be used by CCC have a medium sulfur content relative to other US cement plants. As noted above, a high percentage of the sulfur winds up in the clinker. In order to produce cement with good rheological properties (workability and plastic shrinkage) and strength development, it is necessary to produce clinker with a specific SO₃/alkali molar ratio. The raw materials and coal to be used by CCC are adequate for this purpose; reducing sulfur content below current levels may be detrimental to clinker product quality. Absorption of fuel sulfur throughout the calciner, preheater, and raw mill is expected to be very high (exceeding 99%). Moreover, the quality of the raw material to be used is inherent to the project and not considered to be part of a BACT control option. Because the raw material is considered part of the project, material substitution is not considered further in this BACT analysis.

2.2.2 Increased O₂ Levels

Cement kiln operators strive for an oxygen level in the kiln exhaust gases of approximately 3 percent (approximately 10 to 15% excess air) to guarantee the desired oxidizing conditions in the kiln burning zone. Increasing oxygen levels in the kiln through the use of excess air alters the flame characteristics and adversely affects clinker quality. Testing has shown that increasing or decreasing the oxygen level even one percent can result in a clinker product that does not meet industry standards. Because of the potential adverse impact to clinker quality resulting from increasing O₂ levels to reduce SO_x emissions, this technology is not considered a feasible option and is not considered further in this BACT analysis.

2.3 Flue Gas Desulfurization Systems

Five different FGD systems were evaluated for technical feasibility. The additional control efficiency of a FGD system may be difficult to quantify because of the inherent scrubbing efficiency of the preheater/precalciner kiln system.

2.3.1 Wet Scrubbing

There are several disadvantages to a wet lime scrubbing system. A wet scrubber would require up to 230 gallons of water per minute and the water would be vaporized and emitted as a steam/condensation plume from the stack. The gypsum byproduct from the wet scrubber could require treatment and disposal if it does not meet quality standards for use as a cement additive. Because a scrubber would be located downstream of the PM control device, aerosols from the scrubber could be emitted from the kiln stack. These aerosols would increase the PM₁₀ loading from the source, and would tend to build up on equipment used in the exhaust gas processing system (ID fans, etc.). These impacts would be minimized in CCC's case by use of the alkali bypass and multiple high efficiency dust collectors ahead of the scrubber. This technology is considered technically feasible.

2.3.2 Dry Absorbent Addition (DAA)

Because this has been employed in other cement plants, this technology is considered technically feasible and will be reviewed further.

2.3.3 Wet Absorbent Addition (WAA)

Because WAA has been employed at several cement plants, this technology is considered technically feasible and will be reviewed further.

2.3.4 D-SO_x Cyclone

This technology has been employed at two cement plants in the U.S., is considered technically feasible, and will be reviewed further.

2.3.5 Lime Hydrator

This technology has been proposed by FLSmidth but a full-scale commercial system has not yet been employed at a cement plant. However, the technology is considered technically feasible and will be reviewed further.

2.4 Reduced Sulfur Fuel (Coal & petroleum coke):

Because this sulfur control method has shown to have a non-impact on the SO₂ emission rate from preheater-precalciner systems, due to the inherent scrubbing effect in the raw materials, this technology was not explored any further.

Section 3 - Ranking of Technically Feasible SO₂ Control Options

All of the technologies determined to be technically feasible are added to the base case condition of inherent dry scrubbing.

Ranking of the Technically Feasible Control Options for Preheater/Precaliner Kiln System – Sulfur Dioxide

Control Technology	Control Efficiency
Wet Scrubbing System (Post baghouse)	85% - 90% (depending on inlet concentration)
Dry Absorbent Addition (DAA in preheater gases)	50%
Wet Absorbent Addition (WAA in conditioning tower and raw mill)	55%
D-Sox Cyclone (Preheater Gases)	30%
Lime Hydrator (Preheater Gases)	44%
Inherent Dry Scrubbing (Base Case)	NA

Section 4 – Evaluation Of Technically Feasible SO₂ Control Options

Use of the D-SOx cyclone, lime hydrator, WAA and DAA can be eliminated from consideration as stand-alone control technologies because their SO₂ removal efficiencies are lower than the option proposed by the applicant. However, each of these technologies could theoretically be used in combination with wet scrubbing to further reduce SO₂ emissions. Because the D-SOx cyclone, lime hydrator, and the DAA each operate in the preheater tower, it is only feasible to apply one of these options to a given kiln system. The D-SOx cyclone and lime hydrator use kiln feed within in the system to produce lime for absorption, while the DAA adds lime to the system in higher quantities than WAA. Because excess lime adversely affects product quality and kiln stability, DAA can not be used in combination with WAA.

The detailed cost calculations for all options are presented in Appendix D (revised on April 6, 2011) of the application.

Summary of Impact Analysis For SO₂ @ 2,190,000 tons/yr clinker production

Method	System Removal	tpy SO ₂ Removed	Capital Costs Million \$\$	Annualized Cost, 1000\$	Cost (\$/ton) Effectiveness	Impacts Environmental	Impacts Product	Impacts Energy
Wet scrubbing (WS)	85 %	2,443	35.8	8,151	3,337 \$/ton ⁽¹⁾	No	No	Yes
WS + WAA	92 %	2,661	38.7	10,068	8,792 \$/ton *	No	No	Yes
WS + DAA	92 %	2,662	37.6	11,906	17,156 \$/ton *	No	No	Yes
WS + DS	89 %	2,574	36.9	8,909	5,776 \$/ton *	No	No	Yes
WS + LH	91 %	2,635	40.3	9,490	6,953 \$/ton *	No	No	Yes
WS + DS + WAA	95 %	2,727	39.8	10,818	9,391 \$/ton *	No	No	Yes
WS + LH + WAA	96 %	2,757	43.2	11,410	10,354 \$/ton *	No	No	Yes

WAA = Wet absorbent addition, DAA = Dry absorbent addition, DS = D-Sox cyclone, LH = Lime hydrator

⁽¹⁾ Cost effectiveness

* Incremental cost effectiveness

$$\text{Cost effectiveness} = \frac{\text{Control option annualized cost}}{\text{Tons removed per year by the control option}}$$

$$\text{Incremental cost effectiveness (\$/incremental ton removed)} = \frac{\text{Annualized \$\$ of control option} - \text{Annualized \$\$ of next control option}}{\text{Next control option emission rate} - \text{Control option emission rate}}$$

Section 5 - BACT For Sources of SO₂ Emissions

BACT for SO₂ from the kiln system is the use of the inherently low-emitting process, coupled with a wet scrubber that achieves a minimum of 90% SO₂ removal efficiency or 0.4 lbs SO₂ per ton of clinker. The rate base vs. efficiency option is proposed to account for the potential variability of SO₂ in the raw material. This issue was discussed in the development of new NSPS/MACT.

BACT for SO₂ from the emergency Diesel generator set is the fuel sulfur limit (not exceed 15 parts per million sulfur content) in the NSPS Subpart IIII, Standards of Performance for Stationary Compression Ignition Internal Combustion Engines.

-----Carbon Monoxide (CO) AND VOC BACT Analysis -----

The sources of CO and VOC associated with the project are the preheater/precalciner kiln system and the new emergency Diesel generator set. CO and VOC emissions from cement kiln pyroprocessing systems generally occur from two separate and distinct processes in the system: 1) products of incomplete combustion of fuel and 2) decomposition of organic material in the kiln feed. Each CO and VOC formation process occurs under uniquely different conditions and is defined by the process technology and feed materials. Where the Division of Air Quality agreed with the applicant, the information from the application was included in this BACT analysis review.

For the purpose of this discussion, the pyroprocessing technology is confined to the preheater/precalciner design. In this design, raw meal is introduced to the exhaust gas stream from the preheater and preheated through a series of cyclones (stages) in a countercurrent flow design. In the process of heating, organic materials naturally occurring in the feed (kerogen and bitumin) are progressively heated and they begin to thermally degrade. The heating at relatively low temperature and at a low oxygen atmosphere results in complex organic molecules to be cracked, recombined, and re-ordered until the species are reduced to short-chain volatile organic compounds, carbon monoxide (CO), and/or carbon dioxide (CO₂). During the pyrolytic process, a significant fraction of the organic carbon is fully oxidized to CO₂.

Depending on the nature of the organics present in the feed materials, the location of the thermal decomposition in the preheater varies along with the degree of complete oxidation. The presence of light hydrocarbon species in the meal typically results in VOC and condensable hydrocarbons in the kiln preheater gases, but the CO concentrations are low. Conversely, complex hydrocarbons generally produce CO during decomposition, but low concentrations of VOC. Depending on the geological deposit of the feed materials, the composition and concentration of organic materials in the kiln feed (meal) may vary significantly. The spatial distribution within the deposit is both lateral and vertical, and cannot be mitigated by selective mining or material substitution. The level of contaminants in the kiln feed is unique to each site and results in site-specific CO and VOC emission rates. The rate of conversion of meal carbon to CO₂ is influenced by the temperature profile of the preheater, the organic content of the kiln feed, and the composition of the organics in the kiln feed. Recent studies do not indicate that the oxygen content of the flue gases influences the CO emission rate. Papers published in Zement-Kalk-Gips also support the same conclusion. The temperature of the preheater stages is defined by the kiln and mix designs (C₃S, silica, etc.) and cannot be modified sufficiently to complete oxidation of CO and VOC in the preheater.

CO and VOC may also be produced as a product of incomplete combustion of fuel in the precalciner vessel. Modern precalciners burn fuel in suspension with meal. The precalciner vessel is designed to decarbonize (or calcine) the raw feed simultaneously with the combustion of fuel in suspension. This design allows use of liquid, gaseous, and solid fuels over a range of heat values and qualities (ash, moisture, etc.). Because of the continuous generation of thermal energy (combustion) and consumption of thermal energy due to the decarbonization, the temperatures are stabilized and the thermal variation is minimized. This process results in reduced thermal NO_x and promotes de-NO_x of kiln gases entering the precalciner.

Section 1 – Identification of Control Options

RBLC Database Search Results Summary For PSD Projects (precalciner/preheater/kiln/inline raw mill) – CO

RBLC ID	Company	New or Mod. (primary fuel burned)	Technology Applied	BACT Limit
GA-0136	CEMEX Southeast, LLC	New process @ exist. facility (Coal)	Good combustion	2.9 lbs/ton clinker 30 day rolling average
AZ-0052	Arizona Portland Cement Co.	Modify process at exist. fac. (Coal)	None	2.0 lbs/ton clinker 30 day rolling average - CEMs
FL-0297	CEMEX Cement, Inc.	New process @ exist. facility (Coal)	None	2.0 lbs/ton clinker 30 day rolling average - CEMs
GA-0134	Houston American Cement, LLC	New – Greenfield (Coal)	Good combustion	2.9 lbs/ton clinker 30 day rolling average - CEMs
MO-0072	Continental Cement Co., LLC	New process @ existing facil.	Good combustion	No inline raw mill 3.6 lbs/ton clinker
FL-0271	Suwanne American Cement Branford Cement Plant	New process @ existing facil. (coal)	Good combustion	2.9 lbs/ton clinker, CEMS 30 day rolling average

FL-0282	American Cement Company, LLC	New/Greenfield Facility (coal)	Good combustion	2.9 lbs/ton clinker, CEMS 30 day rolling average
FL-0281	Sumter Cement Company, LLC	New/Greenfield Facility (coal)	Good combustion	2.9 lbs/ton clinker, CEMS 30 day rolling average
FL-0268	Florida Crushed Stone Company, Brooksville Cement Plant (FCS)	New process @ existing facil. (coal)	Process control	3.6 lbs/ton clinker, 24 hour average
FL-0267	Florida Rock Industries, Inc.	New process @ existing facil. (coal)	Process control	3.6 lbs/ton clinker, 24 hour average
IA-0070	Lehigh Cement Company-Mason City Plant	New process @ existing facil. & Modify process @ exist. (coal)	Kiln design	3.7 lbs/ton clinker
VA-0272	Roanoke Cement Troutville, Va.	New process @ existing facil. & Modify process @ exist. (Coal)	Good combustion	Inline raw mill, but not effective, 600.0 lbs/hr CEMS
SD-0003	GCC Dacotah	New process @ existing facil. & Modify process @ exist.	Good combustion	No inline raw mill 3250.0 lbs/hr, 2002 tons/year
TX-0466	Texas Lehigh Cement Company, LP	Not listed	None	No inline raw mill 5298.0 lbs/hr, 5528.0 tons/yr
MO-0059	Continental Cement Company, LLC	New/Greenfield Facility (coal)	pyroclon	No inline raw mill 12.0 lbs/ton clinker, 1-hr roll. ave 10.0 lbs/ton clinker, 8-hr roll. ave
IA-0052	Lafarge Corporation	New process @ existing facil. & Modify process @ exist. (coal)	Good combustion	No inline raw mill 4.5 lbs/ton clinker
WA-0307	Ash Brove Cement Company Portland Cement	New process @ existing facil. & Modify process @ exist.	None	No inline raw mill 1045.0 ppm @10% I2 538.0 lbs/hr 8-hr ave
TX-0355	Alamo Cement Company II, LTD Portland Cement Manuf. Company	New process @ existing facil. & Modify process @ exist. (coal/coke/natural gas)	Good combustion	460.0 lbs/hr 1932.0 tons/yr
GA-0136	CEMEX Southeast, LLC	New process @ exist. facility (Coal)	None	0.50 lbs/ton clinker, 30-day rolling average - CEMs
FL-0297	CEMEX Cement, Inc.	New process @ exist. facility (Coal)	None	0.1150 lbs/ton clinker 30 day block
GA-0134	Houston American Cement, LLC	New – Greenfield (Coal)	None	0.50 lbs/ton clinker, 30-day rolling average - CEMs
MO-0072	Continental Cement Co., LLC Ralls County	New process @ existing facil.	Good combustion	No inline raw mill 0.12 lbs/ton clinker
FL-0271	Suwanne American Cement Branford Cement Plant	New process @ existing facil. (coal primary fuel)	Good combustion	0.12 lbs/ton clinker, CEMS 30-day block aver, 15.2 lbs/hr CEMS 30 day block ave
FL-0282	American Cement Company, LLC	New/Greenfield Facility (Coal)	None	0.12 lbs/ton clinker, 30-day block ave., 15.0 lbs/hr 30-day block ave.
FL-0281	Sumter Cement Company, LLC	New/Greenfield Facility (Coal)	None	0.115 lbs/ton clinker, 30-day block ave., 23.95 lb/hr 30-day block ave.
FL-0268	Florida Crushed Stone Company, Brooksville Cement Plant (FCS)	New process @ existing facil. (Coal)	Process control	0.12 lbs/ton clinker, 30-day 15.0 lbs/hr 30-day
FL-0267	Florida Rock Industries, Inc.	New process @ existing facil. (Coal)	Process control	0.12 lbs/ton clinker, 30-day 15.0 lbs/hr 30-day
VA-0272	Roanoke Cement Troutville, Va.	New process @ existing facil. & Modify process @ exist. (Coal)	Good combustion	Inline raw mill, but not effective, 126.0 lbs/hr 493.0 tons/yr
TX-0466	Texas Lehigh Cement Company, LP	Not listed	None	No inline raw mill 118.69 lbs/hr, 258.58 tons/yr
TX-0355	Alamo Cement Company II, LTD Portland Cement Manuf. Company	New process @ existing facil. & Modify process @ exist. (Coal)	None	15.0 lbs/hr 63.0 tons/yr

FL-0139	Suwannee American Cement Company, Inc., Suwannee County	New/Greenfield Facility (natural gas-fired)	Combustion control	0.12 lbs/ton clinker
CO-0047	Holnam, Florence Fremont County	New process @ existing facil. & Modify process @ exist	Good combustion	No inline raw mill 180.5 tons/yr
TX-0279	North Texas Cement Company Grayson County	New/Greenfield Facility	Good combustion	No inline raw mill 686.0 lbs/hr 1008.0 tons/yr

1.1 Thermal Oxidation

Thermal oxidizers operate most effectively at temperatures between 1,200° to 2,000 °F, with a residence time of 0.2 to 2.0 seconds. By raising the temperature, the residence time for complete combustion can be reduced and vice versa. However, temperature is the more important process variable.

Two types of thermal oxidizers are commonly used in industrial plants. The most common thermal oxidizer is an afterburner. Afterburners can be either direct-fired with no heat recovery, or with recuperative heat recovery. A second type of thermal oxidizer is a regenerative thermal oxidizer (RTO). A regenerative thermal oxidizer operates in an enclosed chamber and recovers up to 85 percent of the heat energy input. For the purposes of this analysis, a regenerative thermal oxidizer was evaluated. There are no cement plants currently operating using direct-fired afterburner or a recuperative type afterburner. Afterburners are not desirable for cement kiln applications because of limited residence time resulting in poor CO combustion efficiency, an increase in NOx emissions, and significant additional fuel burning requirements. There are, however, two plants which have attempted to use an RTO. These are at TXI, Midlothian, Texas and Holcim, Inc., Dundee, Michigan. The TXI operation is a precalciner and the Dundee operation involves two wet process kilns.

TXI, Midlothian, Texas

The system was installed during a plant expansion and was used to reduce CO and VOC emissions below a de minimus increase and therefore avoid PSD review. No BACT analysis was conducted and the Texas Commission on Environmental Quality (TCEQ) does not consider the use of an RTO as BACT under State or Federal requirements. The unit has experienced significant operational difficulties including higher than anticipated heat exchanger fouling and pressure drop. This has increased afterburner fuel costs and decreased kiln capacity.

Holcim, Dundee, Michigan

Historically the Dundee kilns have emitted condensable hydrocarbons, which formed visible plumes and an objectionable odor. In an effort to control these problems, the plant installed an RTO. The design was modified from the TXI configuration to include an open type (checker) heat exchanger that was expected to have less potential for fouling. The unit has been effective in control of visible emissions (VE) and odor but has experienced poor heat recovery, high fuel costs, and significant maintenance problems. In some cases under high hydrocarbon loads, the unit has experienced over temperature due to uncontrolled self-fueling. The units were installed to replace existing carbon injection systems for hydrocarbons and did not go through PSD or a BACT analysis. As a result of the failure of the mechanical system, they have been decommissioned.

1.2 Catalytic Oxidation

Catalytic oxidation is performed with devices that use a flame within an enclosed chamber to convert CO and VOCs to CO₂. Catalytic oxidizers operate effectively at lower temperatures than thermal oxidizers (between 600° to 900°F) because of the use of catalysts to drive the reaction. The catalysts (typically platinum based) are placed on an alumina pellet or honeycomb support and the exhaust gases pass over or through the catalyst within the enclosed chamber. The temperature in the oxidizer is maintained either by the exothermic reaction or with supplemental fuel firing. The presence of particulate matter in an exhaust gas stream inhibits the operation of the unit and creates problems with catalyst poisoning.

Advantages of a catalytic oxidizer over a thermal oxidizer include:

1. Lower fuel requirements
2. Lower operating temperatures
3. Little or no insulation required
4. Reduced fire hazards
5. Reduced flashback problems.

Disadvantages of this system include:

1. Initial capital cost is higher
2. Catalyst poisoning (fouling) is possible
3. PM10 must be removed first
4. Disposal of spent catalyst, which may be hazardous.

No catalytic oxidation units are currently being used on any cement kilns in the U.S. or abroad.

1.3 Excess Air

Excess air introduced into the combustion zones tends to reduce the amount of CO and VOC formed by oxidizing them to CO₂. This reaction is limited to areas in the combustion zone where the CO concentration is greater than 50 ppm. The advantages of the use of excess air are the ease of implementing the technology and the potential for lower SO₂ emissions. The major disadvantage is that increasing excess air in the combustion zone increases NO_x formation and can adversely affect clinker quality.

1.4 Good Combustion Practices

Because CO and VOC formation can result from incomplete combustion of fuels and the oxidation of uncombusted carbon in those fuels, the better the combustion practices, the lower the CO and VOC formation. Good combustion practices require the following elements:

1. Proper mixing
2. High temperature.

Good combustion practice is the inherently lowest emitting method of controlling CO and VOC emissions from combustion sources.

Section 2 - Elimination of Technically Infeasible CO/VOC Control Options

Each control technology is considered and those that are infeasible were eliminated.

2.1 Thermal Oxidation

Because PM present in the uncleaned flue gases would routinely plug and foul thermal oxidation equipment, a thermal oxidation unit would have to be placed downstream of the baghouse to be technically feasible. Placing the oxidizer at this location would require supplemental fuel firing to maintain the optimal operating temperature range of 1,200° to 2,000°F. The additional fuel firing would result in an undesirable increase in NO_x emissions, thus negating the NO_x control technology employed upstream. Given the operational difficulty associated with the RTO the NCDAQ does not believe an RTO is technically feasible. Notwithstanding this conclusion, the NCDAQ did request the applicant to further evaluate the technology for completeness purposes.

2.2 Catalytic Oxidation

PM present in Portland Cement kiln flue gases poisons the catalysts used in catalytic oxidation units and would routinely plug and foul catalytic oxidation equipment. The presence of PM in the catalytic oxidation unit will result in poor CO/CO₂ conversion and an increase in operational interruptions. Therefore, the use of a catalytic oxidation unit is an infeasible option and is not considered further in this BACT analysis. In addition to the technical issues, two environmental issues result from the catalytic oxidation control option. Spent catalyst is often classified as a "hazardous waste." Disposal of a hazardous waste represents a significant environmental concern.

2.3 Excess Air

As outlined in the NO_x BACT determination (Section 4), excess air results in an alteration of the flame characteristics in the kiln and precalciner. This change in the flame will have a detrimental affect on the clinker quality. Therefore, the use of excess air is not a technically feasible control alternative and will not be considered further in this BACT analysis. In addition to the technical argument, the effectiveness of this control method is limited by the carbonation process equilibrium and the CO and VOC concentrations. Adding excess air to either the kiln or precalciner combustion zones would result in an increase in NO_x and PM10 emissions from the system.

2.4 Good Combustion Practices

This is a technically feasible option and will be further considered in the BACT analysis.

Section 3 - Ranking of Technically Feasible CO/VOC Control Options

The third step in the BACT analysis for CO/VOC is to rank remaining control technologies by control effectiveness. The table below summarizes the options discussed above. The control costs for CO were based on two scenarios. The first was a 95% control efficiency and the second was a more reasonable and expected efficiency based on an outlet concentration of 50 ppm. The capital cost of the RTO was scaled from actual cost obtained from the applicant’s discussion with TXI-Midlothian.

Pollutant	Control	Removal Efficiency	Tons Controlled	Capital Cost	Annual Cost	Cost Effectivness
CO	RTO	95	2913	49,654,246	25,524,474	8,076
	RTO	83	2541			9,275
VOC	RTO	95	166			141,339

Section 4- Energy, Economic, and Environmental Impacts

The RTO also has significant adverse energy and environmental impacts. These result primarily from the natural gas usage to operate the RTO. The applicant estimated supplemental natural gas to raise and maintain a combustion temperature of 1500 degrees would be 202 mmBtu/hr. It is uncertain whether the facility would be able to obtain an uninterreuptable supply of this volume of natural gas. However, combusting this volume of natural gas to control carbon monoxide and VOCs would result in increased NOx and CO2 emissions.

Section 5 - Selection of BACT for CO/VOCs

BACT on the evaluation of control candidates the NCDAQ is proposing BACT emissions limits based on good combustion practices. The proposed limits are:

CO = 2.80 lbs/ton clinker (30 day rolling average) as determined by CEMS
 VOCs = 1.6 lbs/ton clinker (30 day rolling average) as determined by CEMS

For the new Diesel emergency generator set, CCC proposed to install a unit that complies with the emission standard for CO and hydrocarbons (HC) given in NSPS, Subpart IIII.

-----NITROGEN DIOXIDE (NOx) BACT Analysis-----

The only sources of NOx emissions associated with the proposed project are the preheater/precalciner kiln system and the new emergency Diesel generator set. Where the Division of Air Quality agreed with the applicant, the information from the application was included in this BACT analysis review.

NOx is formed as a result of reactions occurring during combustion of fuels in the main kiln and precalciner vessel of a traditional preheater/precalciner cement kiln and the combustion of Diesel fuel in the emergency generator. NOx is produced through three mechanisms during combustion (1) fuel NOx, (2) thermal NOx, and (3) “prompt” NOx. Fuel NOx is the NOx that is formed by the oxidation of nitrogen and nitrogen complexes in the fuel. In general, approximately 60 percent of fuel nitrogen is converted to NOx. The resulting emissions are primarily affected by the nitrogen content of fuel and excess O₂ in the flame. Nitrogen in the kiln feed may also contribute to NOx formation although to a much smaller extent. Thermal NOx is the most significant NOx mechanism in kiln combustion. The rate of conversion is controlled by both excess O₂ in the flame and the temperature of the flame. In general, NOx levels increase with higher flame temperatures that are typical in the kiln burning zone. “Prompt NOx” is a term applied to the formation of NOx in the flame surface during luminous oxidation. The formation is instantaneous and does not depend on flame temperature or excess air.

At high temperature and excess O₂, a higher concentration of O radicals (or H radicals) is present and therefore NOx forms more rapidly. At lower temperatures, an equilibrium reaction of NO with O₂ further results in NO₂ formation. Fuel NOx is formed by the reaction of nitrogen in the fuel with available oxygen. In a precalciner kiln, fuel combustion occurs at two locations and each follows a separate mechanism in the formation of NOx (i.e., thermal NOx dominates in the kiln burning zone and fuel NOx dominates in the precalciner). For this reason, the effects of process operation on final NOx levels are complex and do not necessarily conform to conventional understanding of combustion as defined through steam generation technology. Experience with various cement kilns also has shown that actual NOx emissions are highly site specific.

Fuel Effects

Fuel type has an effect on NO_x emissions. Data from combustion simulations and field trials indicate combustion of coal produces significantly lower NO_x than natural gas combustion in a main kiln burner. In general, substituting fuels with higher Btu content will reduce NO_x emissions in part because fuel efficiency is increased and less total fuel is consumed.

Main Kiln Firing

In the rotary kiln section, the purpose of combustion is to increase material temperature to a level that will allow calcined meal to become viscous (liquid) and form calcium silicates. The temperature required for “burning” depends on cement type and meal properties and is in excess of 1400°C (2550°F). Some meal types require a higher flame temperature than others to achieve the material temperature required to initiate fusion. Cement kilns are distinct from conventional combustion sources such as steam generation in that the combustion chamber is a confined space that is refractory lined. This radiates energy back into the flame, thereby increasing the flame temperature. At given excess air levels, a confined flame will usually produce higher NO_x emissions than an open flame such as a boiler firebox. NO_x levels from kiln firing are also strongly related to fuel type, flame shape, and peak flame temperature.

At higher peak flame temperatures, more thermal NO_x is formed. Flame shape is also related to the percentage of primary air used in combustion in the kiln. High levels of primary air increase NO_x formation by providing excess O₂ in the hottest portion of the flame. Experience has indicated that a long flame and low primary air volume can minimize NO_x formation in the main kiln. However, in order to obtain high quality clinker with the best microstructure, a relatively short, strong, and steady flame is necessary.

Precalciner Firing

A secondary firing zone is the precalciner vessel. Fuel is introduced and burned in situ with the preheated raw meal. Under these conditions, heat released by fuel oxidation is extracted by meal decarbonization. The efficient use and transfer of energy reduces the peak temperature in the vessel. Normal temperatures are between 900° and 980°C (1650° and 1800°F). This lower temperature and operation at reduced excess air levels reduces the formation of NO_x. Thermal NO_x is small and fuel NO_x predominates. NO_x formed in the main kiln combustion passes through the precalciner and the gases are cooled slowly in the preheater cyclones. NO_x formation is an endothermic process and as gases cool, NO_x tends to revert to N₂ and O₂. This decomposition process is rapid at elevated temperatures but decreases at temperatures below approximately 700°C (1300°F). In effect, if the flue gases can be slowly cooled to 700°C over an extended period, a progressive decrease in NO_x concentration occurs.

RBLC Database Search Results Summary For PSD Projects (precalciner/preheater/kiln/inline raw mill) – NO_x

RBLC ID	Company	New or Mod. (primary fuel burned)	Technology Applied	BACT Limit
GA-0136	CEMEX Southeast, LLC	New process @ exist. facility (Coal)	None	1.95 lbs/ton clinker, 30-day rolling average, CEMS
FL-0297	CEMEX Cement, Inc.	New process @ exist. facility (Coal)	SC, SNCR, Low NO _x	1.5 lbs/ton clinker, 30-day rolling average
GA-0134	Houston American Cement, LLC	New – Greenfield (Coal)	SC, SNCR, Low NO _x	1.95 lbs/ton clinker, 30-day rolling average
MO-0072	Continental Cement Co., LLC	New process @ existing facil.	None	No inline raw mill
FL-0271	Suwanne American Cement Branford Cement Plant	New process @ existing facil. (coal primary fuel)	SNCR	1.95 lbs/ton clinker, 30-day rolling average, CEMS
FL-0282	American Cement Company, LLC	New/Greenfield Facility (coal primary fuel)	SNCR, SC, Low NO _x	1.95 lbs/ton clinker, 30-day rolling average, CEMS
FL-0281	Sumter Cement Company, LLC	New/Greenfield Facility (coal primary fuel)	SNCR, SC, Low NO _x	1.95 lbs/ton clinker, 30-day rolling average, CEMS
FL-0268	Florida Crushed Stone Company, Brooksville Cement Plant (FCS)	New process @ existing facil. (coal primary fuel)	SNCR	1.95 lbs/ton clinker, 30-day rolling average
FL-0267	Florida Rock Industries, Inc.	New process @ existing facil. (coal primary fuel)	SNCR	1.95 lbs/ton clinker, 30-day rolling average
IA-0070	Lehigh Cement Company-Mason City Plant	New process @ existing facil. & Modify process @ exist. (coal primary fuel)	SNCR, Low NO _x , Combustion controls	2.85 lbs/ton clinker, 30-day rolling average

VA-0272	Roanoke Cement Troutville, Va.	New process @ existing facil. & Modify process @ exist. (Coal)	Good combustion	Ineffective raw mill 982.0 lbs/hour, CEMS
SD-0003	GCC Dacotah	New process @ existing facil. & Modify process @ exist.	Preheater- precalciner	No inline raw mill 2267.0 tons/yr
TX-0466	Texas Lehigh Cement Company, LP	Not listed	None	No inline raw mill 600 lbs/hour
MO-0059	Continental Cement Company, LLC	New/Greenfield Facility (coal primary fuel)	SNCR , Low NOx	No inline raw mill 8.0 lbs/ton clink, 30-day roll. ave.
IA-0052	Lafarge Corporation	New process @ existing facil. & Modify process @ exist. (coal primary fuel)	Good combustion	No inline raw mill 2546.0 tons/yr, 4.0 lbs/ton clinker
WA-0307	Ash Brove Cement Company Portland Cement	New process @ existing facil. & Modify process @ exist.	None	No inline raw mill 650.0 ppm @ 10% O ₂ , 24 hr ave.
TX-0355	Alamo Cement Company II, LTD Portland Cement Manuf. Company	New process @ existing facil. & Modify process @ exist. (coal/coke/natural gas)	None	660.0 lbs/hr 2772.0 tons/yr

Section 1.0 - Identification of NOx Control Options

1.1 Indirect Firing and Low NOx Burners

Indirect firing systems (a low NOx technology) can be used on the precalciner and rotary kiln burner systems. This technology functions by grinding the fuel and collecting the pulverized fuel with a fabric filter and receiving bin. The fuel is then fired using a dense phase conveying system that limits the volume of air necessary to transport fuel to the burner. This design reduces primary air injected with fuel. The indirect-firing process allows the flame to be fuel rich, which reduces the oxygen available for NOx formation. In some cases it can also result in higher flame temperatures because the heat release occurs with less combustion gases (i.e., excess air). Low NOx burners in general are not as effective when used on the rotary kiln section of a preheater-precalciner kiln system because gases containing the thermal NOx formed in the main kiln section are gradually cooled as they move through the system resulting in NOx reduction (as previously discussed), and subsequently the gases pass through the precalciner burning zone and preheater cyclones where they are further reduced.

Indirect firing with a low NOx burner attempts to create two combustion zones, primary and secondary, at the end of the main burner pipe. In the high-temperature primary zone, combustion is initiated in a fuel-rich environment in the presence of a less than stoichiometric oxygen level. The submolar level of oxygen at the primary combustion site minimizes NOx formation. The presence of CO in this portion of the flame also chemically reduces some of the NOx that is formed. In the secondary zone, combustion is completed in an oxygen-rich environment. The temperature in the secondary zone is much lower than in the first; therefore, lower NOx formation is achieved as combustion is completed.

Indirect-firing and a low-NOx main kiln burner will be used on the CCC kiln. The emission levels achieved with indirect firing are defined by the burnability of the mix, amount of conveying air required, and design of the burner. In kiln systems where the mix is difficult to burn (crystalline silica, quartz, high lime/silica ratio, etc.) or where high excess air is required, the NOx levels are generally higher and this technology is more effective in such situations. In general, the expected NOx reduction ranges from 0 to 30 percent from baseline levels at the same mix design and excess air levels.

1.2 Semi-Direct Firing and Low NOx Burners

Semi-direct firing practice involves the separation of pulverized fuel from the mill sweep air using a cyclone separator. The fuel is placed in a small feeder bin from which it is metered to the kiln burner pipe. The exhaust gases of the cyclone are used to transport the fuel from the bin discharge. Advantages in the design are that a portion of the sweep air can be returned to the mill or exhausted to the atmosphere and that minor variations in fuel delivery rate are eliminated. The major advantage for NOx abatement is that the volume of primary air can be marginally reduced (i.e., 20 to 25% of combustion air). The system is similar to mill recirculation but can include partial sweep air discharge. The level of NOx reduction would be less than that provided by indirect firing and low NOx burners.

1.3 Mill Air Recirculation

A method to reduce primary air usage involves returning a portion of the coal mill sweep air (30 to 50%) to the coal mill inlet. By returning sweep air, the volume of air used to convey pulverized fuel to the burner pipe is reduced. The amount of the return air possible depends on the mill grinding rate (i.e., percent of utilization), volatile content of fuel, moisture in the fuel, grindability of the fuel, and the final conveying air temperature achieved. The reduction in primary air allows the use of low NO_x burner technology that further reduces NO_x formation. The use of mill air recirculation can achieve primary combustion air between 15 and 25 percent but is highly variable. Kilns operating with a hard burning mix do not typically achieve high NO_x reductions. Also, recirculation is not possible for fuels containing high free moisture (i.e., fuels stored outdoors exposed to weather). The level of NO_x reduction would be less than that provided by indirect firing and low NO_x burners.

1.4 Mid-Kiln Firing

Mid-kiln firing (MKF) is a potential NO_x reduction technology that involves injecting solid fuel into the calcining zone of a rotating long kiln using a specially designed feed injection mechanism. The technology is applicable to conventional wet process and long dry kilns. The fuel used is generally whole tires, although containerized waste fuels have also been used at some plants. Fuel is injected near the mid-point of the kiln, once per kiln revolution, using a system consisting of a “feed fork,” pivoting doors, and a drop tube extending through the kiln wall. Another form of mid-kiln firing has been used for certain preheater and preheater/precalciner kiln systems. Whole tires are introduced into the riser duct using a specially designed feed mechanism (drop chute with air lock). This creates an additional secondary firing zone in which the solid fuel is burned in contact with the partially calcined meal. Combustion is initiated in the riser duct (located midway between the calciner and rotary kiln sections of the kiln system) and is completed within the rotary kiln section in a reducing atmosphere away from the elevated temperatures of the main kiln burner.

NO_x formation is inherently lower in this area, and NO_x formation may be further reduced due to improvements in fuel efficiency and the shifting of fuel burning requirements (e.g., less fuel must be burned at the main kiln burner). MKF is a staged combustion technology that allows part of the fuel to be burned at a material calcination temperature of 600° to 900°C, which is much lower than the clinker burning temperature of 1200° to 1480°C, thus reducing the potential for thermal NO_x formation. By adding fuel in the main flame at mid-kiln, MKF changes both the flame temperature and flame length. These changes may reduce thermal NO_x formation by burning part of the fuel at a lower temperature and by creating reducing conditions at the solid waste injection point that may destroy some of the NO_x formed upstream in the kiln burning zone. MKF may also produce additional fuel NO_x depending upon the nitrogen content of the fuel. The additional fuel NO_x, however, is typically insignificant relative to thermal NO_x formation. The discontinuous fuel feed from MKF can also result in increased CO. To control CO emissions, the kiln may require an increase in combustion air, which can decrease production capacity. Test data showing NO_x reduction levels for long dry and wet kilns were compiled for the EPA in the report “NO_x Control Technology for the Cement Industry” (EC/R Inc., 2000). Tests conducted on three wet process kilns using MKF technology showed an average reduction in NO_x emissions of 40 percent, with a range from 28 to 59 percent. MKF in the form of riser duct firing is applicable at CCC. The general concerns in applying this combustion practice include community acceptance of tire burning; reduced sulfur retention in the clinker, and potential product quality impacts. These issues have been successfully managed at many cement plants such that they pose no significant adverse impacts on current or future operations. Because an adequate supply of tires is uncertain in the area, MKF is not planned at the current time and will not be considered further in the BACT analysis review.

1.5 Staged Combustion (SC)/Calciner Modification

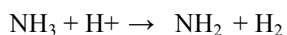
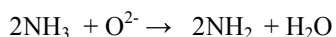
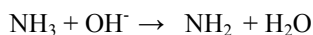
SC is a combustion technology that is currently used with preheater/precalciner kilns to reduce NO_x generation by all major kiln vendors. Multi-staged combustion (MSC) which includes the use of two or more low NO_x burning zones, is supplied by two or more vendors as NO_x control technology on modern preheater/precalciner cement kilns. MSC is also considered a common technology as it has been used for many years throughout the cement industry. Another form of SC combines high temperature combustion and reburning without staging air or fuel in the calciner. This technology creates one high temperature reducing zone by injection of all of the calciner fuel into one reducing zone at the bottom of the calciner. The reducing zone is followed immediately by an oxidizing zone where all the tertiary air is introduced into the calciner. Splitting of feed or staged feed is used to control the temperatures and help in creating and controlling the high temperature reducing zone. However, this form of staged combustion does not utilize splitting of tertiary air to stage air flow.

Staged combustion takes place in and around the precalciner and is accomplished in several ways depending on the system design. The purpose of staged combustion is to burn fuel in two stages, i.e., primary and secondary. Staged air combustion suppresses the formation of NO_x by operating under fuel-rich, reducing conditions (less than stoichiometric oxygen) in the flame or primary zone where most of the NO_x is potentially formed. This zone is followed by oxygen-rich conditions in a downstream, secondary zone where CO is oxidized at a lower temperature with minimal NO_x formation.

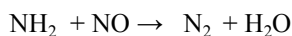
Research and actual emission monitoring on preheater/precalciner cement kilns have shown that SC technology applied to the area of the precalciner works to effectively lower NO_x emissions per unit clinker produced. Although potential disadvantages to SC may exist, experience has shown that when included as part of the kiln system design, it will produce a reduction in NO_x emissions with minimal process problems. The SC control option is capable of reducing NO_x emissions by 10 to 50 percent, depending on the site-specific kiln operating parameters (i.e., kiln feed burnability). Staged combustion will be considered further.

1.6 Selective Non-Catalytic Reduction (SNCR)

Selective non-catalytic reduction (SNCR) involves the injection of an ammonia containing solution into the preheater tower to reduce NO_x within the optimum temperature range of 870° to 1090°C (1600° to 2000°F). Because the optimum temperature range must be present for a sufficient time period to allow the reaction to occur, SNCR is only a viable technology on some preheater or precalciner kiln designs. The ammonia-containing solution may be supplied in the form of anhydrous ammonia, aqueous ammonia, or urea. SNCR involves the following primary reactions:



Following NH₂ formation by any of the above mechanisms, reduction of NO occurs:



At temperatures lower than 870°C, reaction rates are slow, and there is potential for significant amounts of ammonia to exit or “slip” through the system. This ammonia slip may result in a detached visible plume at the main stack, as the ammonia will combine with sulfates and chlorides in the exhaust gases to form inorganic condensable salts. The condensable salts can become a significant source of condensable PM emissions that cannot be controlled with a baghouse or ESP. Ammonium sulfate aerosols would be a concern under upcoming programs to deal with PM_{2.5} and regional haze. In addition, there may be health and safety issues with on-site ammonia generation.

At temperatures within the optimal temperature range, the above reactions proceed at normal rates. However, as noted in the literature as well as by vendors, a minimum of 5 ppm ammonia slip may still occur as a side effect of the SNCR process. At temperatures above 1090°C, the necessary reactions do not occur. In this case, the ammonia or urea reagent will oxidize and result in even greater NO_x emissions. In addition, SNCR secondary reactions can form a precipitate, resulting in preheater fouling and kiln upset.

Ammonia reagent may react with sulfur in kiln gases to form ammonium sulfate. Ammonium sulfate in the preheater can create a solids buildup. Ammonium sulfate in the kiln dust recycle stream may adversely affect the kiln operation. The optimal temperature window for application of the SNCR process occurs somewhere in the preheater system. Fluctuations in the temperature at various points in the preheater are common during normal cement kiln operation. Therefore, selecting one zone for SNCR application in the preheater cannot reliably assure consistent results. Alternatively, selecting multiple zones of injection creates significantly increased complexity to an already complex chemical process.

SNCR has been employed at a significant number of European cement plants for NO_x reduction and recently at several new cement plants in the U.S. The European systems include two precalciner plants (Sweden) and at least 17 preheater plants primarily in Germany. The principal vendor has been Polysius. In Europe the chemical of choice for ammonia reagent is photowater. Photowater is a waste produced during development of film, which contains approximately 5.0 percent ammonia and is classified as a hazardous waste in the U.S. The availability and classification of the waste make it a low cost alternative to other ammonia or urea reagents for NO_x control in Europe. Full-scale SNCR systems have now been installed on at least 6 preheater-precalciner plants in the U.S. The reagent used in these systems is ammonia water or urea solution. The requirements for SNCR include an optimum temperature range (i.e., 870° to 1090°C) and the presence of an oxidizing atmosphere. At the low flue gas temperature the reaction rate is slow and ineffective. Ammonia introduced will not react and will be lost as gas. Some of the ammonia will react with SO₂ in the conditioning tower forming ammonium sulfate (NH₄)₂SO₄ which is a submicron aerosol. This aerosol may form a visible emission at the stack.

Because the raw materials at the plant site contain naturally occurring carbon (i.e., bitumen and kerogens), pyrolysis of organics occurs in the preheater tower producing CO. This results in a reducing atmosphere. The current control practice is to limit oxygen at the calciner exit to reduce NO_x. SNCR requires an oxidizing atmosphere and the two conditions are opposed in theory. CO is expected to increase as NO_x is reduced. In addition, ammonia emitted as gas in the plume will react with SO₂ or HCl in the condensed water vapor plume forming a highly visible plume under certain weather conditions.

A similar plume has been noted at Glens Falls, New York; Permanente, California; Redding, California; Ravena, New York; Midlothian, Texas; Mississauga, Ontario; Edmonton, Alberta; and Exshaw, Alberta as result of naturally occurring ammonia in the kiln feed. Direct mixing of urea with feed would not be effective in system designs where the feed is injected into the gas stream at the inlet of the first stage preheater for meal preheating. At this location flue gas temperatures are too low for the reaction to affect NO_x but sufficiently high to decompose the urea to ammonia, CO₂, and water vapor. SNCR will be investigated as an additional NO_x control option. The kiln will also employ indirect firing and low NO_x burners and staged combustion calciner design.

1.7 Selective Catalytic Reduction

Selective catalytic reduction (SCR) is a process that uses ammonia in the presence of a catalyst to reduce NO_x. The catalyst is typically vanadium pentoxide, zeolite, or titanium dioxide. The SCR process has been proven to reduce NO_x emissions from combustion sources such as incinerators and boilers used in electric power generation plants. No full-scale application of SCR on a Portland Cement plant exists anywhere in North America but there has been one long-term pilot project (Kirchdorf, Austria) and three industrial applications (Solnhofen, Germany, Monselice, Italy, and Sarche di Calavino, Italy) in Europe. The Solnhofen and Monselice kilns are small preheater kilns with relatively high uncontrolled NO_x levels (up to 1800 mg/Nm³ at Monselice). The Sarche di Calavino kiln is a small semi-dry type kiln (no operating experience is yet available). The Monselice kiln has high ammonia and low sulfur in the feed and has experienced very high ammonia slip (120 mg/Nm³). The Kirchdorf system operated in 1996-1998 on only a slipstream (approximately 10%) of the kiln gases.

In the SCR process, the NO_x-containing exhaust gas is injected with anhydrous ammonia and passed through a catalyst bed to initiate the catalytic reaction. As the catalytic reaction is completed, NO_x is reduced to nitrogen and water. The critical temperature range required for the completion of this reaction is 300° to 450°C, which is higher than the typical cement kiln ESP or fabric filter inlet gas temperature.

Technical application of SCR requires the catalyst to be placed either 1) after the preheater tower and before the PM control device (dirty side) or 2) after the particulate control device (clean side). Placement at the preheater tower satisfies the temperature requirements, but subjects the catalyst to the recirculating dust load and potential fouling. Location at the fabric filter exit requires reheating of the gases to the required temperature for catalyst activation

Dirty Side

The most prohibitive disadvantage of the SCR process in this location is the deactivation of the catalyst. Catalyst deactivation occurs as a result several mechanisms:

Poisoning – Poisoning of catalyst involves the chemical reaction between active catalyst sites and components of the gas stream. Usually, poisoning, unlike other mechanisms, is irreversible. Particularly relevant to cement plants are the presence of arsenic trioxide, lead, phosphorous, and to a greater extent alkaline compounds like sodium and potassium.

Plugging and Masking – Plugging or fouling of the catalyst occurs when particles deposit on the catalyst surface or in the pore structure of the catalyst itself. In addition to traditional plugging, cement dust, unlike flyash which is spherical, is jagged and with its irregular shape can easily deposit in the pore structure. Once within the pore structure, the CaO in the pore can react, depending on SO₃ concentrations in the gas stream, to form CaSO₄. This chemical reaction also involves expansion of the particulate thus masking the pore structure itself and limiting the reactivity of the catalyst.

Erosion – Erosion of the catalyst occurs as cement dust passes over and physically degrades the surface. While there are theoretical solutions to minimize erosion, the limited experience with SCR on cement plants make it difficult to predict the rate of erosion and what methods could be available to address the issue.

In addition to the failure to control NO_x, as the catalyst deactivates there is a potential for unreacted ammonia slip to increase significantly. The unreacted ammonia would combine with sulfates and chlorides in the exit gases, forming inorganic condensable salts, which result in a detached visible plume and a significant increase in condensable PM₁₀ emissions. In addition, SCR on power plants has been shown to convert SO₂ to SO₃ as a secondary reaction. SO₃ will react with CaO between preheater stages forming gypsum (CaSO₄), which can plug the tower and cause kiln shutdown.

Two options for dirty side application exist: 1) after the preheater tower and before the raw mill; or 2) after the raw mill and before the particulate control device. Gases exiting the preheater tower are within the optimal temperature range for SCR catalyst activation. However, the dust loading along with the recirculating feed in this region is very high and would render the catalyst useless in a very short timeframe. Gases exiting the raw mill system are much cooler (100° to 120°C) and would require supplemental reheat prior to the SCR catalyst followed by gas cooling to protect the baghouse. The reheat of gases from the raw mill system would be cost prohibitive (see discussion on Clean Side applications).

Clean side

Installation of the catalyst after the pollution control device reduces the potential for fouling from meal/recirculating dust load, but requires significant reheating of the gas stream to obtain the required catalyst temperature. This can be more significant if combined with wet scrubbing prior to the NO_x control. SO₂ removal may be required to prevent conversion of SO₂ to SO₃ in the catalyst bed that would increase SO₃ emissions if the NO_x control were the last system in the gas train. In addition, reheating of the gas stream results in increased emissions of CO, CO₂, VOC, and other pollutants and significant additional cost.

An additional concern to clean side applications is the formation of SO₃ (H₂SO₄). SCR catalysts have been shown to convert SO₂ to SO₃. SO₃ readily combines with water vapor to form H₂SO₄ (sulfuric acid mist), or with ammonia or chlorides to form aerosol particulates. These pollutants are highly visible and would not meet opacity limits. Installation of a wet gas scrubbing system would not be effective in removing H₂SO₄ aerosols (i.e., 0.5 micron) and the cost would be prohibitive. The optimum temperature for reaction is 300° to 450°C. In the presence of the catalyst, the NO_x is reduced to N₂ by reaction with ammonia. For the reaction to occur, the ammonia must be present in excess molar ratio. Typical usage in utility applications is 1.05 - 1.10 to 1.0 (NH₃/NO_x). The excess ammonia required produces “ammonia slip” of between 10 and 15 ppm in the flue gases.

Recent studies of the use of SCR at major utilities have indicated that some SO₂ present in the flue gases is oxidized to SO₃ during the process. The rate of conversion can increase SO₃ by 15 to 100 ppm depending on catalyst composition, temperature, and SO₂ concentration. It has also been noted that the catalyst life is greatly reduced by the presence of SO₃ in the gas stream. The slippage of ammonia and formation of SO₃ has resulted in an intense visible plume as ammonia reacts with SO₂ in the flue gases and when SO₃ condenses forming acid aerosols (H₂SO₄ • 2H₂O).

The application of SCR on cement kilns is fundamentally different than utility boilers due to their differences in gas composition, dust loading, and chemistry, which accounts for the preference for SNCR rather than SCR in cement kilns in both the US and abroad. Because of operational problems and the ability of SNCR to achieve the target NO_x level of 500 mg/Nm³, the SCR system at the Solnhofen plant has been replaced by SNCR. The most serious issues yet to be resolved with SCR in cement kilns are catalyst life, poisoning of the catalyst, fouling of the bed, system resistance, ability to correctly inject ammonia at proper molar ratio under non-steady state conditions, and creation of detached plume.

1.8 Regenerative Selective Catalytic Reduction (RSCR)

SCR with heat recovery, or regenerative SCR (RSCR), has been employed for control of NO_x emissions for industrial scale utility boilers burning biomass fuels. Use of a SCR for biomass fuels before the boiler economizer (typical for coal-fired system) has not been possible due to catalyst failure from alkali salts in the ash. Babcock Power, Inc. has developed a RSCR system that places the SCR after the primary particulate control device and uses regenerative heat recovery to reduce the thermal heat penalty to raise the gases to catalyst activation temperature. As applied to utility boilers, the RSCR used a three-bed ceramic heat exchanger system to raise the flue gases from 350 degrees F to 450 degrees F before entering a combustion chamber where natural gas is used to raise the gases to 470 degrees prior to entering the catalysis bed. Ammonia solution is injected prior to the catalyst at a molar ratio of 1.33 to 1 of which approximately 20 percent is lost as ammonia slip. As designed, the NO_x control effectiveness is in the range of 60 to 80 percent.

Technical issues involving technology transfer for this application include catalyst failure, ammonia slip forming submicron aerosols, and formation of acid gases (SO₃).

Environmental Impacts

There are several adverse environmental impacts of applying RSCR for a cement plant. These include: conversion of SO₂ to SO₃, ammonia slip resulting in PM_{2.5} aerosols, and formation of a visible plume.

SO₃ Formation

SCR catalysts, due to the use of vanadium pentoxide (V₂O₅) as the major active metal, oxidize SO₂ to SO₃ during the process of reducing NO_x. Minimum formation of SO₃ with formulated catalyst (V₂O₅ + WO₃) is estimated to be about 1 percent of SO₂. SO₃ is a strong anhydrous acid gas that reacts with water vapor, forming sulfuric acid gas (H₂SO₄). However, the use of wet scrubbing prior to the RSCR would help minimize the formation of SO₃ and H₂SO₄.

PM_{2.5} Formation (Primary)

Submicron aerosols are formed from reactions of sulfuric acid (H₂SO₄) and ammonia introduced to reduce NO_x. Ammonia slip is estimated to be about 20 percent. If a complete reaction with available H₂SO₄ occurs, this reaction forms a submicron visible plume that will exist after moisture dissipation in the kiln stack plume. Wet scrubbing would help suppress this reaction by removing ammonia prior to the RSCR.

Ammonia Slip

The design molar ratio used for RSCR for biomass boilers is 1.33 to 1. Up to 20 percent of the injected ammonia is lost as ammonia slip. Excess ammonia would react with SO₃ formed in the RSCR forming primary PM_{2.5} aerosols (i.e., ammonium sulfate and ammonium bisulfate). The balance of the ammonia will react over time in the atmosphere forming ammonium sulfate and ammonium chloride aerosols. These species predominate in regional haze and visibility impairment. The use of wet scrubbing prior to the RSCR would minimize these potential problems.

Section 2 - Elimination of Technically Infeasible NO_x Control Options

Each control technology was considered and those that were infeasible based on physical, chemical, and engineering principles or commercially unavailable were eliminated. Indirect firing, a low-NO_x main kiln burner, a SC calciner, and SNCR will be used. These are technically feasible options for NO_x control. The feasibility of the other NO_x control options are discussed below.

2.1 Selective Catalytic Reduction (SCR)

Because of the serious operational problems concerning catalyst plugging and deactivation and the fact that no cement kilns anywhere in the world that have applied SCR in a dirty side application have been successful in operating SCR on a sustained long-term basis, the application of SCR to dirty side kiln gases is not considered technically feasible. Clean side applications without heat recovery have not been installed in cement kilns in either the US or Europe. This technology has not been demonstrated to be technically feasible and will not be considered further.

2.2 Selective Non Catalytic Reduction (SNCR)

SNCR will be evaluated as an additional control option for the precalciner/kiln/in-line raw mill system at CCC.

2.3 Regenerative Selective Catalytic Reduction (RSCR)

RSCR is an unproven technology with respect to cement kilns and considerable uncertainty exists with respect to the technical applicability issues previously discussed. However, assuming that high efficiency PM controls and a wet scrubber are installed to remove PM, ammonia, and acid gases ahead of the unit, RSCR is theoretically applicable. Therefore, this technology will be further evaluated.

2.4 Semi-Direct Firing and Low NOx Burners

Semi-direct firing would not reduce NOx emissions below the base-case design. Therefore it is not applicable and will not be evaluated further.

2.5 Mill Air Recirculation

This technology applies to coal/coke direct-fired kilns not currently using a fuel-rich primary combustion technology. Because the CCC kiln will be indirect-fired, this technology is not applicable.

2.6 Mid-Kiln (Riser Duct) Firing (MKF)

The CCC kiln system will be designed to employ this technology as an option, however, MKF is not expected to reduce emissions below the levels achieved by other selected NOx control technologies. Therefore, no further evaluation of MKF will be conducted.

2.7 Staged Combustion (SC)/Calcliner Modification

Staged Combustion will be evaluated as an additional control option for the precalcliner/kiln/in-line raw mill system at CCC.

Section 3 - Ranking of Technically Feasible NOx Control Options

The remaining NOx control technologies evaluated are SNCR, SCR (clean side) and a combination of indirect firing, low-NOx main kiln burner, and SC. The following table shows the ranking and the estimated control efficiency.

Ranking of Technically Feasible Control Options Preheater/Precalcliner Kiln System - NOx

Control Technology	Control Efficiency
Selective Catalytic Reduction (clean side)	75%
Regenerative Selective Catalytic Reduction (RSCR)	75%
Selective Non Catalytic Reduction (SNCR)	50%
Indirect firing, low-NOx main burner (SC)	N/A

Section 4 - Evaluation of Technically Feasible NOx Control Options

The feasible control technologies are evaluated on the basis of economic, energy, and environmental considerations. CCC is proposing to employ indirect firing, low NOx burners, SC, and SNCR. A NOx control efficiency of 50% was used by the DAQ for SNCR in accordance with NSPS Subpart F.

Summary of Impact Analysis For NOx

Method	Removal %	NOx removed (tons/yr)	Capital Costs MM\$\$	Annualized Costs MM\$/yr	Cost Effectiveness \$/ton	Impacts		
						Environment	Product	Energy
SNCR	50%	1,533	2.71	1.85	1,191	Yes	No	No
SCR ¹	75%	2,299	4.60	37.1	16,152	Yes	No	Yes
RSCR ²	75%	2,299	25.6	11.5	5,007	Yes	No	Yes

¹ Clean side without heat recovery

² Clean side with heat recovery

(Base emissions = 2.8 lbs NOx/ton clinker x 2,190,000 tons clinker/yr divided by 2000 lbs per ton NOx = 3066 tons/yr)

Tons removed SCR = 3066 x 0.75 = 2,299 tons/year

$$\text{Cost effectiveness} = \frac{\text{Control option annualized cost}}{\text{Tons removed per year by the control option}}$$

$$\text{Incremental cost effectiveness (\$/incremental ton removed)} = \frac{\text{Annualized \$\$ of control option} - \text{Annualized \$\$ of next control option}}{\text{Next control option emission rate} - \text{Control option emission rate}}$$

Section 5 - Selection of BACT for NOx

BACT for the Preheater/precalciner Kiln System is the use of indirect firing, low NOx burners, staged combustion (SC), and Selective Non Catalytic Reduction (SNCR) with a not to exceed limit of 1.40 lb/ton of clinker, 30-day rolling average, as measured by a CEMs.

BACT for the new Diesel emergency generator set is compliance with the NOx emission standards in accordance with NSPS Subpart III.

-----Greenhouse Gases (GHGs) BACT Analysis-----

The only sources of GHG emissions associated with the proposed project are the preheater/precalciner kiln system and the new emergency Diesel generator set. GHGs consist chiefly of carbon dioxide (CO₂) with small quantities of other GHG pollutants (methane and nitrous oxide). These pollutants are estimated together as a CO₂-equivalent pollutant (CO_{2e}).

Section 1 - Identification of GHG Control Options

From the outset the NCDAQ observes that performing a BACT on GHG emissions is legally unworkable because of the lack of ability to evaluate environmental impacts of GHG controls. A BACT analysis requires consideration of environmental impacts. In addition to the obvious consideration of the environment, a measurable metric for environmental impact is crucial to determining economic and energy impacts. As discussed above, in establishing BACT, Congress emphasized the local case-by-case nature of the determination and consideration of the local airshed. Traditional PSD pollutants have NAAQS and methods to determine impacts relative to a NAAQS. Having these metrics allows meaningful consideration of the local airshed and allows reasonable environmental based decisions to be made. However, the EPA had not established a NAAQS for GHGs and therefore it is impossible to determine the environmental impact GHG BACT controls may or may not have on the environment from either an absolute or relative impact perspective. One of the suggested GHG NAAQS levels is 350 ppm. See 350.org. Moreover, when BACTs are performed a reasonable consideration, and one recommended by EPA in their 1980 Final PSD workshop manual, is to evaluate economic impact in terms of dollars per unit of environmental benefit (e.g. See page I-B-35 where EPA evaluates ambient impacts of alternative controls to determine which control technology should form the basis for a BACT emissions limit).

While there are no methods to evaluate environmental impacts of GHGs on local airsheds, as one would do for a traditional PSD pollutant, the North Carolina Legislative Commission on Global Climate Change issued a final report in May of 2010 with findings relevant to a GHG BACT determination. Some of the findings of this report will help place GHG's in context for the purpose of evaluating BACT for GHG including:

The Commission concludes that the actions taken by states can have a significant effect on global greenhouse gas levels. The important role states can serve in addressing climate change is illustrated by data from the World Resources Institute indicating that the combined emissions of eight southeastern states (Alabama, Florida, Georgia, Mississippi, North Carolina, South Carolina, Tennessee, and Virginia) are greater than all but four countries in the world.

Since climate change is a global problem, national and international solutions are needed in order to achieve the most significant reductions in greenhouse gas emissions. Nonetheless, because the effects of climate change on North Carolina will be significant, the General Assembly should not wait for national or international action before responding to these threats. Moreover, many of the steps to reduce greenhouse gas emissions will require state action.

On February 11, 2008, the Commission met as part of the Emerging Issues Forum entitled "*North Carolina's Energy Futures*." One of the invited speakers at the Commission was Dr. Rajendra Pachauri, Nobel Prize Winner and Chair of the Intergovernmental Panel on Climate Change. Following Dr. Pachauri's presentation, the Commission adopted by resolution the following findings:

1. Climate change is real.
2. Human activity is a factor in that change.
3. The Commission should move forward to address the issues faced by the State.

In addition to these findings, the Commission also made these findings (that could be relevant to this proposed project).

1. Climate changes are underway in the United States and are projected to grow.
 - a. Climate-related changes are already observed in the United States and its coastal waters. These include increases in heavy downpours, rising temperature and sea level, retreating glaciers, thawing permafrost, lengthening growing seasons, lengthening ice-free seasons in the ocean and on lakes and rivers, earlier snowmelt, and alterations in river flows.
 - b. These changes are projected to grow.
2. Widespread climate-related impacts are occurring now and are expected to increase.
 - a. Climate changes are already affecting water, energy, transportation, agriculture, ecosystems, and health.
 - b. These impacts are different from region to region and will grow under projected climate change.
3. Climate change will stress water resources.
 - a. Water is an issue in every region, but the nature of the potential impacts varies.
 - b. Floods and water quality problems are likely to be amplified by climate change in most regions.
4. Crop and livestock production will be increasingly challenged.
 - a. Agriculture is considered one of the sectors most adaptable to changes in climate. However, increased heat, pests, water stress, diseases, and weather extremes will pose adaptation challenges for crop and livestock production.
5. Coastal areas are at increasing risk from sea-level rise and storm surge.
 - a. Sea-level rise and storm surge place many U.S. coastal areas at increasing risk of erosion and flooding, especially along the Atlantic and Gulf Coasts, Pacific Islands, and parts of Alaska.
 - b. Energy and transportation infrastructure and other property in coastal areas are very likely to be adversely affected.
6. Threats to human health will increase.
 - a. Health impacts of climate change are related to heat stress, waterborne diseases, poor air quality, extreme weather events, and diseases transmitted by insects and rodents.
 - b. Robust public health infrastructure can reduce the potential for negative impacts.
7. Climate change will interact with many social and environmental stresses.
 - a. Climate change will combine with pollution, population growth, overuse of resources, urbanization, and other social, economic, and environmental stresses to create larger impacts than from any of these factors alone.
8. Thresholds will be crossed, leading to large changes in climate and ecosystems.
 - a. There are a variety of thresholds in the climate system and ecosystems. These thresholds determine, for example, the presence of sea ice and permafrost, and the survival of species, from fish to insect pests, with implications for society. With further climate change, the crossing of additional thresholds is expected.

The Commission then made findings specific to the Southeast:

9. Projected increases in air and water temperatures will cause heat-related stresses for people, plants, and animals.
 - a. Effects of increased heat include more heat-related illness; declines in forest growth and agricultural crop production due to the combined effects of heat stress and declining soil moisture; declines in cattle production; increased buckling of pavement and railways; and reduced oxygen levels in streams and lakes, leading to fish kills and declines in aquatic species diversity.
10. Decreased water availability is very likely to affect the region's economy as well as its natural systems.
 - a. Increasing temperatures and longer periods between rainfall events coupled with increased demand for water will result in decreased water availability.
11. Sea-level rise and the likely increase in hurricane intensity and associated storm surge will be among the most serious consequences of climate change.
 - a. Low-lying areas, including some communities, will be inundated more frequently – some permanently – by the advancing sea. Current buildings and infrastructure were not designed to withstand the intensity of the projected storm surge, which would cause catastrophic damage.
 - b. If sea-level rise increases at an accelerated rate (dependent upon ice sheet response to warming) a large portion of the Southeast coastal zone could be threatened.
12. Ecological thresholds are likely to be crossed throughout the region, causing major disruptions to ecosystems and to the benefits they provide to people.
13. Quality of life will be affected by increasing heat stress, water scarcity, severe weather events, and reduced availability of insurance for at-risk properties.

There were also selected findings that were submitted by the Commission members and these were selected below for their potential relevance to the BACT process.

- a. Failing to act and ignoring impending climate change will result in significant impacts to the State's environment, economy, infrastructure, and society.
- b. Actions to reduce greenhouse gas emissions will reduce North Carolina's reliance on foreign sources of energy, lead to the development of technology, attract new businesses to North Carolina, and increase energy efficiency throughout the State, resulting in benefits to the economy and to individual businesses and residents.
- c. According to the Stern Review of the Economics of Climate Change, every dollar invested in addressing greenhouse gas emissions will save five dollars.(see *The Economics of Climate Change. The Stern Review.* By Nicholas Stern. Pp. 692. (Cambridge University Press, Cambridge, 2007.) Online at: http://www.hm-treasury.gov.uk/stern_review_report.htm.
- d. Climate model forecasts suggest an increase in temperature locally to range from 4.5° F under a lower emissions scenario to 9° F under a higher emissions scenario over the next century. The rising temperatures will affect energy use, public health, recreation, and even the types of plants that grow in the State.
- e. Increased temperatures are expected to worsen air quality. Two pollutants of chief concern are ozone and fine particulate matter, both of which can enter the lungs and cause health problems.
- f. The North Carolina Coastal Resources Commission's Science Panel on Coastal Hazards predicted that by 2100, North Carolina will experience sea-level rise of 0.4 – 1.4 meters (15 – 55 inches) with a likely rise of 1 meter (39 inches). The Panel recommends “that a rise of 1 meter (39 inches) be adopted as the amount of anticipated rise by 2100, for policy development and planning purposes.”

- g. Climate change will put additional strain on both the quality and quantity of already stressed water resources.
- h. According to the American Council for an Energy-Efficient Economy (ACEEE), North Carolina stands to gain 38,000 net jobs in 2025 compared to the reference case forecast by making significant investments in energy efficiency technologies and practices. These activities would also save consumers a net \$3.6 billion cumulative in lower energy and water bills.

All of the above findings by the Commission help place GHGs in context for the purpose of evaluating BACT for GHGs for a cement plant. Of particular interest is the finding that for each dollar invested in addressing greenhouse gas emissions there will be a cost savings of five dollars. Where possible the NCDAQ will use this metric to help evaluate the economic impact of potential GHG reduction strategies.

Consistent with the NC Legislative Commission's findings, the DENR Strategic Plan for 2009-2013 (published 7-31-09) also places a premium on the control of GHGs to address Climate Change.

"Specifically, a fierce urgency exists for the department to take unified action through mitigation and adaptation to ensure optimum environmental, economic and social resiliency to climate change." DENR Strategic Plan at 8

The above review of Legislative and DENR materials help fill the void in available tools to evaluate the environmental impact element of the GHG BACT.

Section 1.0 - Identification of GHG Control Options

1.1 Reducing Clinker Content of Cement

The cement to clinker ratio for Portland Cement is limited by the chemistry and current industry and market specifications required for cement products. Reductions in GHG emissions occur when less clinker is needed to produce a given quantity of cement. Process CO₂ emissions are reduced as a result of reduced limestone calcinations, and thermal energy used in the production of clinker. Secondary, or indirect emissions of GHGs due to the production of electricity are not considered under the BACT analysis for any NSR regulated pollutants.

1.2 Alternate Fuels

Coal and pet coke are the primary fuels to be used at the CCC facility. Distillate fuel will be used for startup only. It is estimated by CCC that the energy consumption efficiency is 2.72 million Btu of fuel per short ton of clinker. The primary GHG emitted from cement plants is CO₂. The two main sources of CO₂ emissions are the calcinations/pyro-processing and fuel burning processes.

1.2.1 Natural gas

Natural gas is not included as a primary fuel for the CCC project. The use of natural gas, if feasible, would fundamentally redefine the project. As such, fuel switching to natural gas is not included in the GHG BACT analysis.

1.2.2 Biomass

The substitution in cement kilns of conventional fossil fuels with biomass fuels could result in some apparent reductions of greenhouse gas emissions. If biomass is determined by the EPA to be carbon-neutral, then burning biomass fuels would have less of an impact on climate change than the burning of fossil fuels. Like natural gas, fuel switching is considered a redefinition of source and therefore is not included as an alternative in the GHG BACT analysis.

1.3 Plant Design Optimization

Energy efficiency is achieved by selecting a plant design based on the modern efficient dry process preheater/precalciner kiln technology as well as the use of less energy intensive equipment and practices.

1.4 Electrical Systems Optimization

Secondary or indirect emissions of NSR regulated pollutants are not considered under the NSR program when evaluating BACT. EPA's position is similar in that they have provided that unless the facility is actually generating electricity, BACT does not apply to electric systems and systems that use energy on-site.

1.5 Low Carbonate Alternate Raw Materials

The main two methods of using alternative raw materials in cement manufacturing are using industry byproduct materials in place of traditional raw materials and/or by substituting alternative material that have already been partially or fully calcined.

Blast furnace slag, electric arc furnace slag, cement kiln dust (CKD), steel mill scale, feldspar, and power plant fly ash each contain a number of minerals that make them possible additive materials for cement manufacturing. Slags and CKD in particular have high lime content, and fly ash has high alumina content. An added benefit of using these materials is that they are usually dry and already calcined and only a limited amount additional energy is required to remove the entrained moisture.

1.6 Carbon Capture and Sequestration Systems (CCS)

Carbon capture and sequestration involves the separation, capture, and storage of carbon dioxide (CO₂) from flue gas and other stationary sources. There are four approaches to this process: pre-combustion, post combustion, oxy-combustion, and chemical looping.

- **Pre-combustion**
This process is mainly applicable to gasification plants, where coal is converted into gaseous component by applying heat under pressure in the presence of steam and substoichiometric O₂. By carefully controlling the amount of O₂, only a portion of the fuel burns to provide the heat necessary to decompose the remaining fuel and produce syngas, a mixture of H₂ and carbon monoxide, along with minor amounts of other gaseous constituents. To enable pre-combustion capture, the syngas is further process in a water –gas shift reactor, which converts CO into CO₂ while producing additional H₂, thus increasing the CO₂ and H₂ concentrations. An acid gas removal system can then be used to separate the CO₂ and the H₂. After CO₂ removal, the H₂ is used as fuel.
- **Post-combustion**
This process refers to the removal of CO₂ from combustion flue gas prior to discharge into the atmosphere. In a typical coal-fired plant, fuel is burned with air. Flue gas consists mostly of N₂ and CO₂. The CO₂ capture process would be located downstream of the conventional pollutant controls. Chemical solvent-based technologies are currently used in petroleum refineries, fertilizer manufacturing plants, pharmaceutical manufacturing, food, and beverage applications. The chemical solvent process requires the generation of a relatively large volume of low-pressure steam, in order to release the captured CO₂ and to regenerate the solvent.
- **Oxy-combustion systems**
Oxy-combustion systems for CO₂ capture rely on burning coal with relatively pure O₂ diluted with recycled CO₂ or CO₂/steam mixtures. Under these conditions, the primary product of combustion water (H₂O) and CO₂, with the CO₂ separated by condensing the H₂O. Oxy-combustion overcomes the technical challenge of low CO₂ partial pressure encountered in coal combustion flue gas by producing a highly concentrated CO₂ stream that is separated from H₂O vapor by condensing the H₂O through cooling and compression. Flue gas recycle is necessary for oxy-combustion to approximate the combustion and heat transfer characteristics of combustion with air. An additional purification stage for the highly concentrated CO₂ flue gas may be necessary to remove other minor gas constituents.
- **Chemical looping**
Chemical looping is technology that is similar to oxy-combustion in that it relies on the combustion/gasification of coal in a N₂-free environment. However, rather than using an air separation unit, chemical looping involves the use of a metal oxide or other compound as an O₂ carrier to transfer O₂ from the air to the fuel. Subsequently, the products of combustion (primarily CO₂ and H₂O) are kept separate from the rest of the flue gases.

Section 2 - Elimination of Technically Infeasible Options Greenhouse Gases (GHGs)

2.1 Reducing Clinker Content of Cement

One of the ways to reduce the GHG emissions for cement plants is to maximize the non-clinker component in cement. The non-clinker components are gypsum, limestone, CKD and other hydraulically active material like pozzolona, fly ash, slag, etc. Because of strict product standards, cement manufacturers in North America are constrained from providing cement with similar performance but with lower energy intensity and CO₂ footprint. Government departments typically specify that only Portland Cement be used in major construction projects, even when slag cement would be appropriate. The ability to use blended cement to achieve GHG reductions is wholly dependent on the demand for such cements in the market place. This method of GHG reduction will be considered further.

2.2 Alternate Fuels

Coal and pet coke are the primary fuels to be used at the CCC facility. Distillate fuel will be used for startup only.

2.2.1 Natural gas

Natural gas is not included as a primary fuel for the CCC project. The use of natural gas, if feasible, would fundamentally redefine the project. As such, fuel switching to natural gas is not included in the BACT analysis.

2.2.2 Biomass

Biomass is not included as a primary fuel for the CCC project. The use of biomass would fundamentally redefine the project.

2.3 Plant Design Optimization

CCC has proposed to use the higher efficiency energy systems that are available for Portland Cement manufacturing. The kiln system will be 5-stage preheater/precalciner system, an in-line raw mill with kiln gas drying of coal in the coal mill for maximum heat recovery and energy efficiency.

2.4 Low Carbonate Alternate Raw Materials

CCC will seek to use the alternative raw materials to the maximum content possible, consistent with product quality considerations, economics at the time, and future regulatory restraint. Current Portland Cement manufacturing practices use small amounts of alternative raw materials. Increase of these materials above the standard practices would affect the cement quality and is considered technically infeasible. Alternate raw materials will not be looked at any further as BACT.

2.5 Carbon Capture and Sequestration Systems (CCS)

- Pre-combustion
This process is mainly applicable to gasification plants, where coal is converted into gaseous component by applying heat under pressure in the presence of steam and substoichiometric O₂. This technology has not been demonstrated at Portland Cement plants, is not commercially available for the application needed, nor is it technically feasible for this industry.
- Post-combustion
Separating CO₂ from flue gas is challenging for several reasons; a high volume of gas must be treated because the CO₂ is dilute; the flue gas is at low pressure; trace impurities (particulate matter, sulfur oxides, nitrogen oxides, hydrogen chloride, ammonia, etc.) can degrade the CO₂ capture materials (solvents, sorbents, membranes); and compressing captured CO₂ from near atmospheric pressure to operating pipeline or tank storage pressure requires a large auxiliary power load. This technology is not commercially available for the needed application.
- Oxy-combustion systems
Oxy-combustion systems for CO₂ capture rely on combusting coal with relatively pure O₂ diluted with recycled CO₂ or CO₂/steam mixtures. Under these conditions, the primary product of combustion water (H₂O) and CO₂, with the CO₂ separated by condensing the H₂O. Oxy-combustion overcomes the technical challenge of low CO₂ partial pressure encountered in coal combustion flue gas by producing a highly concentrated CO₂ stream that is separated from H₂O vapor by condensing the H₂O through and compression. Flue gas recycle is necessary for oxy-combustion to approximate the combustion and heat transfer characteristics of combustion with air. An additional purification stage for the highly concentrated CO₂ flue gas may be necessary to remove other minor gas constituents. This technology has not been demonstrated a cement plants and it is not commercially available for the application needed. This technology is not transferable to cement manufacturing. Oxy-combustion systems are not technically feasible.
- Chemical looping
This technology has not been demonstrated at cement plants and is not commercially available for the needed application.

2.5.1 Storage of Captured CO₂

Storage of collected CO₂ is achieved by deep underground injection into suitable geological formations or by terrestrial carbon sequestration.

- Geologic sequestration involves taking the CO₂ that has been captured from the plant's stationary sources and storing it in deep underground geologic formations in such a way that CO₂ will remain permanently stored. Geologic formation such as oil and gas reservoirs, un-mineable coal seams, and underground saline formations are potential options for storing CO₂.

The US Department of Energy National Energy Technology Laboratory has published a Carbon Sequestration Atlas of the United States and Canada. This atlas presents information on carbon storage potential across the majority of the US and portions of western Canada. The distance between the Castle Hayne Plant and the other terrestrial based formations is greater than 500 miles. The distance between the plant and the off shore federally controlled saline formation is greater than 22 miles with approximately 12 miles of this distance under the Atlantic Ocean. There are no pipelines or ocean going ship capable of transporting and injecting the GHG into the off shore saline formations.

- Terrestrial sequestration involves the fixation of the CO₂ into vegetative biomass and soils. This method increases the amount of carbon that the plants and soils naturally store. For example, trees planted to reforest abandoned mines would use CO₂ as they grow, and changing agricultural practices to include no-till farming would keep CO₂ in the soil that would otherwise be released when the land is tilled. The type of tree (hardwood or conifer) and its age determines the amount of carbon it can sequester. The terrestrial sequestration project could consist of trees planted on land that is not committed for industrial process uses. Assuming 100 acres could be set aside as a forest reserve, this acreage would support approximately 1000 trees. At maturity these trees would sequester 15 tons per year or approximately 1155 tons over the expected 75-year lifetime of the trees. The three-foot seedling retails for approximately \$30.00 each and planting cost would be approximately \$5.00 per tree. The plantation would not be managed and natural succession will keep the reserve functioning. The total project cost would be about \$31,500 plus the cost of the land (\$344,000) or \$25,000 per ton of CO₂ sequestered. Evaluating cost is difficult because cost is always relative to environmental benefit and there are no tools to evaluate the environmental benefit of a 1155 ton sequestration of CO₂. One economic metric that has been proposed is to use existing ratios of significant levels to acceptable cost thresholds. For example, SO₂ has a significance level of 40 tons per year and acceptable cost for SO₂ controls could range between \$2,000 and \$10,000 per ton. In other words, it would not be unreasonable to spend between \$80K and \$400K to control an environmentally significant quantity of a regulated pollutant, in this example SO₂. This concept is then transferred to GHGs where the EPA has established a significance level of 75,000 tpy (either directly or through the “subject to regulation” provisions). Under the PSD regulations the EPA may exempt from review increases that are environmentally de minimis. At the heart of EPA’s significance levels is environmental impact. While it was not clear on what basis EPA determined that the significant (or in the alternative the “subject to regulation”) threshold for GHGs was 75,000 tpy, it is inescapable that this value is, like other significance values under PSD, rooted in environmental impact. Applying the same economic thresholds described above, an acceptable economic impact range for GHG would be between \$1 and \$5.30 per ton. Using EPA’s logic with respect to acceptable costs and environmental significance, the cost to control GHGs with terrestrial sequestration (approx. \$25,000/ton) would be adverse relative to cost for traditional pollutants.

Section 3 - Evaluation of Technically Feasible GHG Control Options

- Modern thermally efficient preheater/precalciner kiln design with in-line raw mill technology

Section 4 - Selection of BACT for GHG Emissions

- The kiln system and emergency generator direct emissions shall not exceed 0.91 tons CO_{2e} per ton clinker, calendar 12 month average. Compliance shall be determined in accordance with the procedures used by CCC in reporting GHG emissions pursuant to 40 CFR Part 98. (This limit accounts for uncertainties in future fuels and raw materials and due to the fact that the new kiln has not been constructed and no actual operating data is available).

GHG Emissions Estimate

Description	Proposed	Units	Basis
Clinker rate	6000	tons per day	CCC design
Annual production rate	2,190,000	short tons per year	CCC design
LOI kiln feed	35.16%		FLS
Virgin kiln feed	3,415,743	tons per year	CCC design
CO ₂ from feed	1,200,975	tons per year	
CKD discharged -bypass	26,072	tons per year	FLS 2.7 mtph 15% byp
CKD discharged – PH (raw mill off)	0	tons per year	
CKD Discharged – total	26,072	tons per year	
CKD-PH LOI	33%		Estimate
CKD Loss Free	0	tons per year	
CKD-PH LOI	5%		Estimate
CKD Loss Free	24,768	tons per year	
Kiln feed to produce CKD	38,109	tons per year	Includes kiln & bypass dust
CO ₂ from calcinations - CKD	1,304	tons per year	
CO ₂ from calcination (total)	1,202,279	tons per year	
Kiln heat input	2.72	mmBtu/ton clinker	Estimate with bypass
HHV fuel (dry basis)	12,500	Btu per pound	CCC coal data
LHV (coal)			

Fuel dry basis	238,097	tons per year	coal data
Carbon fuel	75%		
Organic carbon in feed	0.27%		Assume same as tested limestone
CO ₂ from raw materials	33,816	tons per year	Using EPA Part 98 Equation H-5
Total CO ₂	1,889,671	tons per year	
CH ₄ emission factor	1.10E-02	kg/mmBtu	EPA Part 98 Table C-2
N ₂ O	1.60E-03	kg/mmBtu	EPA Part 98 Table C-2
Btu input from fuel	5,952,420	mmBtu/yr	
CH ₄ CO _{2e}			
N ₂ O CO ₂			
Total CH ₄ & N ₂ O CO _{2e}			

Emergency generator			
Diesel firing	57.2	gallons per hour	
Operation hours	500	hours per year	
Maximum fuel fired	28,600	gallons per year	
HHV fuel	137,00	Btu per gallon	
Btu input	3,918	mmBtu per year	
CO ₂ emission factor	165	lbs per mmBtu	EPA AP-42 Table 3.4-1
CO ₂ emission	323	tons per year	
Total CO _{2e} emissions	1,894,764	tons per year	Rounded to 1,895,000 ton CO _{2e} per year
CO _{2e} per ton clinker	0.87	Tons CO _{2e} /ton clinker	

These benchmarked values form the basis for a proposed GHG BACT.

- X. Non Attainment:
New Hanover County has not been designated nonattainment for any pollutant.
- XI. A consistency determination is required and was received by this Division on March 27, 2008 from the New Hanover County Zoning Department. The determination letter from New Hanover County was signed by J. Steven Still, the Assistant Chief Zoning Enforcement Official, and stated the proposed modification is consistent with applicable zoning and subdivision ordinances.
- XII. A Professional Engineer's seal was included with the application. Mr. John P. Carroll, Jr. a Professional Engineer, who is currently registered in the State of North Carolina, sealed the application for the portions containing the engineering plans, calculations, and all supporting documentation.
- XIII. An application fee in the amount of \$13,488.00 was received on February 27, 2008.
- XIV. This facility is not subject to Section 112(r) of the Clean Air Act requirements because it does not store any of the regulated substances in quantities above the thresholds in the Rule.
- XV. PSD Increment Tracking:
The Minor Source Baseline date for New Hanover County was triggered for PM-10 December 14, 1979, for SO₂ on December 14, 1979, and for NOx on November 26, 1991.

$$PM10 \text{ Hourly Emissions after control} = \frac{200 \text{ tons total PM10}}{\text{year}} \times \frac{1 \text{ year}}{8760 \text{ hours}} \times \frac{2000 \text{ lbs}}{\text{ton}} = \frac{46.0 \text{ lbs total PM10}}{\text{hour}}$$

$$SO_2 \text{ Hourly Emissions after control} = \frac{438 \text{ tons } SO_2}{\text{year}} \times \frac{1 \text{ year}}{8760 \text{ hours}} \times \frac{2000 \text{ lbs}}{\text{ton}} = \frac{100.0 \text{ lbs } SO_2}{\text{hour}}$$

$$NOx \text{ Hourly Emissions after control (ki ln)} = \frac{1643 \text{ tons NOx}}{\text{year}} \times \frac{1 \text{ year}}{8760 \text{ hours}} \times \frac{2000 \text{ lbs}}{\text{ton}} = \frac{375.0 \text{ lbs NOx}}{\text{hour}}$$

$$NOx \text{ Hourly Emissions (generator)} = \frac{800 \text{ kW}}{1} \times \frac{6.3 \text{ grams}}{\text{kW} - \text{hour}} \times \frac{0.0022 \text{ lbs NOx}}{\text{grams}} = \frac{11.1 \text{ lbs NOx}}{\text{hour}}$$

For PSD increment tracking purposes, NOx emissions have increased by 386.00 pounds per hour, SO₂ emissions have increased by 100 lbs per hour, and PM-10 emissions have increased by 46.0 pounds per hour as a result of this modification.

XVI. Public Comment:

Public Notice Requirements – 40 CFR 51.166(q) requires that the permitting agency make available to the public a preliminary determination on the proposed project, including all materials considered in making this determination. With respect to this preliminary determination, the NCDAQ:

- A. Will make available in the Wilmington Regional Office, located at 127 Cardinal Drive Extension, Wilmington, North Carolina, all materials submitted, a copy of the preliminary determination, and all other information submitted and considered. In addition, a copy of this same information will be available at the NCDAQ Central Office in Raleigh, NC.
- B. Will publish a public notice, by advertisement in a local paper (Wilmington Star News) including the preliminary decision and the opportunity for public comment.
- C. Send a copy of the public notice to:
 1. The applicant for comments,
 2. EPA Region IV for comments.
 3. Officials having cognizance over the location of the project as follows:
 - a. Any affected state/local air agency – No other state or local agencies are expected to be affected by this project.
 - b. Chief Executives of the city and county in which the proposed project is to be located. Notices will be sent to the City Manager for the City of Wilmington.
 - c. Federal Land Manager – the Federal Land Manager for the closest Class I areas, Swan Quarter National Wilderness, and Cape Romain did not request a Class I increment analysis. A public notice will not be sent.
 - d. Persons on the Title V mailing list and other interested persons.

XVII. Conclusion:

Based on the application submitted and the review of this proposal by the NCDAQ, the NCDAQ is making a preliminary determination that the project can be approved and a permit issued. A final determination will be made following public notice and comment and consideration of all comments.