

## **REGULATORY ANALYSIS REPORT**

Prepared for:

Carolinas Cement Company LLC  
Castle Hayne, North Carolina Plant

PN 050020.0051

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## SECTION 1

### PROJECT DESCRIPTION

Carolinas Cement Company LLC (CCC) is proposing to construct a modern Portland cement manufacturing facility at the site of an existing cement storage terminal operated by Roanoke Cement Company near Castle Hayne, North Carolina. The plant will include a multi-stage preheater-precalciner kiln with an in-line raw mill, coal mill, and clinker cooler venting through the main stack. Production is expected to be 6000 tons per day (tons/day) and 2,190,000 tons per year (tons/yr) of clinker and 2,310,000 tons/yr of cement. Fuels may include coal, petroleum coke, fuel oil, and natural gas. The raw materials for clinker production may include limestone/marl, clay, quarry spoils, bauxite, fly ash/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, crushing, blending, grinding, material handling, storage for raw materials, fuels, clinker, and finished cement, and cement packing and bulk loadout. Cement will be shipped by rail, truck, and/or barge. The project will also include a diesel emergency generator set.

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 Prevention Significant Deterioration (PSD) rules at 15A NCAC 02D.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.

Pursuant to current U.S. Environmental Protection Agency (EPA) guidance, until EPA issues rules and guidance for addressing  $PM_{2.5}$ ,  $PM_{10}$  will be used as a surrogate for  $PM_{2.5}$ . Although modeling for  $PM_{2.5}$  will not be required for this project, estimates of  $PM_{2.5}$  emissions (including condensables, which are highly uncertain) are included in the application.

As shown in Table 1-1, the emissions from the project of particulate matter (PM), PM less than 10 microns in diameter ( $PM_{10}$ ), sulfur dioxide ( $SO_2$ ), carbon monoxide (CO), nitrogen

oxides (NO<sub>x</sub>), and volatile organic compounds (VOC) will exceed the PSD major source emission rate.

**TABLE 1-1. COMPARISON OF POTENTIAL ANNUAL EMISSIONS INCREASE FROM THE PROJECT TO THE PSD MAJOR SOURCE EMISSION RATES**

<b>Pollutant</b>	<b>Future Potential Emissions (tons/yr)</b>	<b>PSD Major Source Emission Rate (tons/year)</b>	<b>Review Required? (Yes/No)</b>
NO <sub>x</sub>	2,138	100	Yes
PM (TSP)	671	100	Yes
PM <sub>10</sub>	535	100	Yes
PM <sub>2.5</sub>	353	NA	No
SO <sub>2</sub>	1,084	100	Yes
CO	3,068	100	Yes
VOCs	175	100	Yes
Lead	0.09	100	No
Fluorides	1.0	100	No

Note: PM, PM<sub>10</sub>, and PM<sub>2.5</sub> include condensables.

## SECTION 2

### APPLICABLE REGULATIONS

#### 2.1 New Source Performance Standards (NSPS) – 40 CFR Part 60

Equipment constructed or modified after August 31, 1983 used for processing of limestone [crushers, screens, conveyor transfer points (except to a pile), and storage bins] from the quarry up to the storage facility just prior to the raw mill is subject to NSPS Subpart OOO (Nonmetallic Mineral Processing Plants). Truck dumping to a hopper is exempt. Fugitive emissions from the crushers are limited to 15 percent opacity and 10 percent from other affected sources (zero percent for transfer points processing saturated materials). The new quarry crushers will be subject to the 15 percent opacity limit).

The coal handling and crushing equipment is subject to NSPS Subpart Y (Coal Preparation Plants). The opacity from affected sources is limited to 20 percent. The coal mill will be vented through the main stack, which is subject to requirements as specified in Section 2.2.

As set forth at 40 CFR 63.1356, any affected source subject to 40 CFR Subpart 63, Subpart LLL (see below) is exempted from NSPS Subpart F for Portland cement plants.

There will be no new storage tanks that would be subject to NSPS Subpart Kb.

On July 11, 2006, EPA promulgated final NSPS for stationary compression ignition (diesel) engines constructed or ordered after July 11, 2005 (40 CFR Part 60, Subpart IIII). The rules limit emissions of NO<sub>x</sub>, PM, SO<sub>2</sub>, CO, and HC to the same levels required by EPA's nonroad diesel engine regulations. The rules take effect in three increasingly stringent stages:

1. Transition period for engines built after July 11, 2005 and before model year 2007. Generally, owners or operators will purchase a certified nonroad engine for stationary use.
2. Beginning in model year 2007, owners must purchase certified engines meeting more stringent emission limits.

- Beginning with 2011 model year engines, add-on controls will be required to achieve the emission limits for non-emergency engines.

The requirements vary depending on the size and designated use (e.g., emergency versus non-emergency engines, fire pump engines, etc.). The main burden for meeting the emission limits will fall on the manufacturers, but owners/operators have monitoring, recordkeeping, and reporting requirements, including use of specified low sulfur fuel. The following table summarizes the Subpart III emission limits for the emergency generator.

**NEW EMERGENCY DIESEL GENERATOR EMISSION REQUIREMENTS**

<b>Pollutant</b>	<b>Units</b>	<b>Emission Standards NSPS Subpart III (New Requirements)*</b>
NO <sub>x</sub>	g/kW-hr	-
NMHC	g/kW-hr	-
NMHC + NO <sub>x</sub>	g/kW-hr	6.4
CO	g/kW-hr	3.5
PM	g/kW-hr	0.20
S (6/1/07)	ppm	500
S(6/1/10)	ppm	15

Applicable Requirements

- 40 CFR 60.4200 et al: Standards of Performance for Stationary Compression Ignition Internal Combustion Engines.
- 40 CFR 89.112 Oxides of nitrogen, carbon monoxide, hydrocarbon, and particulate matter exhaust emission standards.
- 40 CFR 80.510 Standards and marker requirements for NRLM diesel fuel.

\*Standards for 2007 model year and later emergency diesel engines with displacement < 30 liters/cylinder and > 560 kW rated power.

**2.2 National Emission Standards for Hazardous Air Pollutants (NESHAPs) – 40 CFR Part 63**

CCC stipulates that it will be a major source of hazardous air pollutants (HAPs) and therefore subject to NESHAPs Subpart LLL (Portland Cement Manufacturing Plants). The kiln is subject to emission limits for particulate matter (PM) (0.3 lb/ton of dry feed) and dioxins and furans (D/F) (see Section 3.1.7) and an opacity limit of 20 percent. All other stack and fugitive process sources, except those subject to the NSPS noted above, are subject to an opacity limit of

10 percent. There is no separate raw material dryer subject to the total hydrocarbon standard. CCC must be in compliance with these limits upon startup of the new equipment.

On December 20, 2006, EPA promulgated amendments to Subpart LLL; the most significant changes involve setting mercury (Hg) and total hydrocarbon (THC) emission limits for new or reconstructed kilns commencing construction after December 2, 2005.

The new requirements applicable to the new kiln at Castle Hayne are:

- A ban on the use of fly ash where the fly ash Hg content has been increased through the use of activated carbon or other sorbent for Hg control at the power plant. A certification must be obtained from the supplier for each shipment of fly ash received to demonstrate compliance with this requirement. Alternately, the facility must demonstrate that Hg emissions will not increase as a result of such fly ash.
- Cement kiln dust (CKD) recycle to the kilns must be minimized consistent with maintaining desired product quality. Records must be kept of the amount of CKD removed from the kiln system on an annual basis. Records must also be kept of the amount of CKD recycled on an hourly basis.
- Mercury – 41 µg/dscm or an alternative limit based on application of a packed-bed or spray tower wet scrubber.
- THC – 20 ppmv or 98 percent reduction.

Periodic testing is required for Hg and continuous monitoring for THC. Operating requirements are specified for certain types of control systems that may be employed. Also on December 20, 2006, EPA announced the reconsideration of the new source standards to allow for additional public comment, since the emission limits were not specifically included in the earlier proposal. CCC reserves the right to request deletion or modification of any permit conditions imposed as a result of the December 20, 2006 EPA amendments that may be changed by EPA at a later date.

As required by 40 CFR 63.1350(a) and 63.6(e)(3), CCC must submit to the Department of Environment and Natural Resources (DENR) a written operation and maintenance (O&M) plan and a startup, shutdown, and malfunction plan for the facility prior to commencing operation. Among other things, these plans provide procedures for: proper O&M of the emission units and their control devices; corrective actions and measures to be taken to minimize emissions in cases of startup, shutdown, or malfunction; and procedures used in inspecting and monitoring the emission units and control equipment.

The new emergency diesel generator set is exempt from Part 63, Subpart ZZZZ [Stationary Reciprocating Internal Combustion Engines (RICE)], except for the initial notification requirements, pursuant to § 63.6590(b)(1).

### **2.3 Compliance Assurance Monitoring (CAM)**

The CAM rules at 40 CFR Part 64 apply to air pollution emission units that meet all the following criteria:

1. The unit is located at a plant that is subject to the Title V operating permit program.
2. The unit is subject to an emission limitation or standard under a State Implementation Plan (SIP) or EPA rule such as an NSPS.
3. The unit uses a control device to achieve compliance with the emission limitation or standard. A control device does not include passive control measures such as low-sulfur fuels, low-NO<sub>x</sub> burners, or good operating practices.
4. The unit has potential emissions before the control device of the regulated pollutant(s) that are 100 percent or more of the major source thresholds, as defined under the Title V program.

There are several exemptions to CAM applicability, including the following types of emission standards or limitations:

- a) Standards proposed by EPA after November 15, 1990 [e.g., all Maximum Achievable Control Technology (MACT) rules are exempt from the CAM requirements].
- b) Standards subject to a continuous compliance determination method (CCDM).

All PM emission limits for sources controlled by baghouses are exempt from CAM under a) above. The gaseous emission limits for the kiln system are not met by a control device except for NO<sub>x</sub>.

Per 40 CFR 64.1, CCDM means a method, specified by the applicable standard or an applicable permit condition, which:

1. Is used to determine compliance with an emission limitation or standard on a continuous basis, consistent with the averaging period established for the emission limitation or standard.
2. Provides data either in units of the standard or correlated directly with the compliance limit.

As discussed below, CCC is requesting a NO<sub>x</sub> emission limit in lb/ton of clinker as measured by a continuous emission rate monitor (CERM). The CERM data will be linked with continuous clinker production data to produce continuous output in lb/ton of clinker, thus qualifying the NO<sub>x</sub> limit for exemption under the CAM rules.

## **2.4 New Source Review (NSR)**

As noted above, the project will trigger the PSD rules under 15A NCAC 020.0530, which requires the following:

1. A Best Available Control Technology (BACT) analysis for each pollutant that exceeds the PSD major source thresholds (PM, PM<sub>10</sub>, SO<sub>2</sub>, CO, NO<sub>x</sub>, and VOC).
2. An analysis of impacts on Federal Class I areas, including Class I PSD increments and air quality related values.
3. A demonstration of compliance with the Ambient Air Quality Standards (AAQS) (Section .0400) and Class II PSD increments, as applicable.
4. An additional impacts analysis (potential impacts on soils, vegetation, visibility, and secondary growth).

In addition, the project will trigger the toxic air pollutant (TAP) procedures for new facilities under 15A NCAC 2Q.0700. These procedures require that a new facility which exceeds certain emission rates specified at 2Q.0711 must demonstrate compliance with the acceptable ambient levels (AAL's) set forth at 15A NCAC 02D.1104. Emission factors for most TAP's are highly uncertain and site-specific, depending on the raw material mix and kiln operating conditions. Nonetheless, emission estimates have been made using available emission factors and AAL compliance demonstrations have made for the applicable TAPs.

These analyses are contained in separate reports attached to the application.

## **2.5 North Carolina's Emission Limiting Rules**

Several provisions of North Carolina's air rules are applicable to the proposed CCC plant, although they are less stringent than the NSPS, NESHAP, or BACT requirements. Applicable provisions in 15A NCAC 2D include:

Section 0510 – Particulates from Sand, Gravel, or Crushed Stone Operations  
Section 0513 – Particulates from Portland Cement Plants

Section 0515 – Particulates from Miscellaneous Industrial Processes  
Section 0516 – Sulfur Dioxide from Combustion Sources  
Section 0540 – Particulates from Fugitive Dust Emission Sources

Section 0510 requires a) measures to limit PM emissions so as to attain the TSP and PM<sub>10</sub> NAAQS beyond the property line, b) fugitive emissions must meet Section 0540, and c) crushers must be controlled by wet suppression, and conveyors, screens and transfer points must be controlled so as to meet opacity standards in Sections 0521 or 0524 (NSPS). The NAAQS modeling demonstration under the PSD rules meets the requirements under Item a; compliance with Section 0540 is discussed below; materials processed by the crusher will generally be saturated with moisture; and the sources under Item c) must meet the opacity standards under NSPS Subpart 000.

Section 0513 requires that PM from the kiln be controlled by at least 99.7 percent and that the emission rate not exceed 0.327 lb/barrel of cement. The proposed BACT for the kiln is a baghouse with control efficiency exceeding 99.9 percent and an emission limit of 0.14 lb/ton of kiln feed (equivalent to 0.0425 lb/barrel of cement). Section 0513 also requires that PM from other stacks or vents not exceed the process weight limits in Section 0515. The proposed BACT for other sources is baghouse controls meeting a limit of 0.01 gr/scf, which results in much lower emissions than the limits in Section 0515.

Section 0516 requires that SO<sub>2</sub> from fuel combustion sources not exceed 2.3 lb/million Btu heat input. The proposed BACT is 2.10 lb/ton of clinker, maximum 24-hour average. This limit is equivalent to 0.78 lb/million Btu.

Section 0540 requires that fugitive dust emissions not cause or contribute to substantive complaints, excessive fugitive dust emissions at the property boundary, or NAAQS violations. BACT will be applied for fugitive dust sources and NAAQS compliance, including fugitive dust sources, is demonstrated as part of this permit application.

## SECTION 3

### REQUESTED PERMIT LIMITS

The permit limits, including the regulatory basis and the associated testing and monitoring requirements, being requested by CCC are discussed below. Where there are multiple regulatory bases (e.g., BACT, NESHAPs, PSD increment compliance), the most restrictive limits that will ensure compliance with other applicable requirements are recommended. CCC requests elimination of multiple redundant forms of emission limits and throughput limits. The kiln emission limits below are applicable for all combinations of fuel to be burned. The emission limits proposed below for PM will ensure the application of BACT for PM<sub>10</sub>; thus, CCC requests that separate PM<sub>10</sub> emission limits not be established.

Pursuant to current EPA guidance at 79 FR 20652 (April 25, 2007), CCC requests that the PM emission limits include filterable PM but not condensables. The current estimate of condensable PM emissions is highly uncertain based on an AP-42 emission factor for inorganic condensables of questionable reliability. Based on experience with cement kilns, condensable emissions are site-specific and variable. In addition, EPA has indicated that additional time is needed to implement a program to assess and improve available test methods for condensable PM.

#### **3.1 Kiln/Raw Mill/Cooler/Alkali Bypass Emission Limit**

##### **3.1.1 PM**

0.14 lb/ton dry preheater feed as determined by Method 5 test every 2 years (BACT).

##### **3.1.2 Opacity**

Ten percent as measured by continuous opacity monitor (COM) on the main stack (BACT).

##### **3.1.3 CO**

2.80 lb/ton of clinker, 30-day rolling average, as measured by CERM meeting Performance Specification (PS) 4B (BACT).

### **3.1.4 VOC (non-methane)**

0.16 lb/ton of clinker, 30-day rolling average as measured by CERM meeting PS 8 (BACT).

### **3.1.5 SO<sub>2</sub>**

0.99 lb/ton of clinker, 30-day rolling average and 1.80 lb/ton of clinker, maximum 24-hour average, as measured by CERM meeting PS 6 (BACT).

### **3.1.6 NO<sub>x</sub>**

1.95 lb/ton of clinker, 30-day rolling average, as measured by CERM meeting PS 6 (BACT). This averaging time is appropriate to account for the variability in NO<sub>x</sub> emissions from cement kilns and is consistent with EPA's State Implementation Plan (SIP) call guidance for cement kilns. Averaging times for NO<sub>2</sub> air quality concentrations (NAAQS and PSD increments) are based on annual concentrations.

As per the BACT analysis, NO<sub>x</sub> will be controlled by selective non-catalytic reduction (SNCR). Because of the uncertainty and lack of experience with SNCR on cement kilns, CCC requests that for the first year of operation, the emission limits be set at 3.0 lb/ton of clinker to allow shakedown and optimization of the SNCR systems.

### **3.1.7 Dioxins/Furans**

0.4 ng/dscm (TEQ) corrected to 7 percent oxygen as measured by Method 23 initially and every 30 months (NESHAP). The average temperature during the test may not exceed 204°C (400°F).

### **3.1.8 THC and Mercury**

THC: Twenty ppmv, 1-hour block average, as measured by CEM meeting PS 8A (NESHAP).

Hg: 41 µg/dscm, as measured by Method 29 (NESHAP).

Both corrected to 7 percent oxygen. CCC reserves the right to revise these emission limits if the NESHAP limits are modified or recinded.

### **3.1.9 TAP's**

Because CCC has demonstrated compliance with the AAL's for various TAP's and the BACT and NESHAP requirements directly or indirectly (via surrogates such as PM for TAP metals and THC for TAP organics), CCC requests that no additional emission limits be set for individual TAPs.

## **3.2 Finish Mills and Miscellaneous Baghouses**

### **3.2.1 PM**

0.01 gr/scf (BACT) determined by implementation of 10 percent opacity limit (see below).

### **3.2.2 Opacity**

Ten percent as determined by initial and every 5 year Method 9 test and monitoring scheme under 40 CFR 63.1350.

## **3.3 Fugitive Emissions**

Quarry crushers – 15 percent opacity. All process fugitive sources (except those processing saturated materials) – 10 percent opacity (BACT).

## **3.4 Diesel Emergency Generator Set**

NSPS Subpart IIII limits as described in Section 2.2 above.

## **3.5 Throughput Limits**

Throughput limits are needed to limit the potential to emit (PTE) for sources that are subject to lb/ton emission limits and for sources that are not effectively limited by the emission limits outlined above (e.g., fugitive process sources). Throughput limits are not needed for other miscellaneous sources. For example, the handling of cement is controlled by baghouses permitted at 0.01 gr/scf and 8760 h/yr. This defines the PTE for these sources and thus a cement throughput limit would not be necessary or appropriate. CCC requests a throughput limit of 2,190,000 tons/yr clinker, rolling 12-month sum. The clinker throughput limit effectively limits the throughput of all raw materials required for production.

## **3.6 Fuel Limitations**

Emissions of NO<sub>x</sub>, SO<sub>2</sub>, CO, and VOC will be monitored by CERM, and there is little relationship between the sulfur and nitrogen content of kiln/calcliner fuels and resulting emissions (see BACT report). The clinker production limit effectively limits the total quantity of fuel

required. Because of these reasons, CCC requests that no limits be set on the amount or quality of the fuels to be burned.

### **3.7 Operating Hour Limits**

The modeling analyses assume that all sources operate 24 hours per day, 365 days per year except for the following:

Emergency generator – 500 h/yr

Barge loading of cement (emission points E36, E37, E38, and E39) – 6000 h/yr.

Under EPA guidance, States can assume that the potential to emit (PTE) for emergency generators can be based on 500 h/yr. Thus, CCC requests that the only operating hour limits in the permit be for the barge loading baghouses noted above.