MARYLAND DEPARTMENT OF THE ENVIRONMENT

AIR AND RADIATION ADMINISTRATION
APPLICATION FOR A PERMIT TO CONSTRUCT

DOCKET #08-21

COMPANY:	Holcim (US), Inc.
LOCATION:	1260 Security Road, Hagerstown, MD 21742
APPLICATION:	To expand the usable fuel source to include Low Carbon Engineered Fuels and install the necessary equipment for unloading and delivery.

ITEM	DESCRIPTION
1	Notice of Application and Informational Meeting
2	Permit to Construct Application Forms – Forms 5, 5EP, 5T, 6, emissions calculations, Material balance calculations, and Flow diagrams.

DEPARTMENT OF THE ENVIRONMENT
AIR AND RADIATION ADMINISTRATION

NOTICE OF APPLICATION AND INFORMATIONAL MEETING

The Maryland Department of the Environment, Air and Radiation Administration (ARA) received a permit-to-construct application from Holcim (US), Inc. on April 26, 2021 for the installation of equipment to process and utilize additional low carbon engineered fuels in the facility's existing cement kiln. The proposed modification will be located at 1260 Security Road, Hagerstown, MD 21742.

An Informational Meeting will be held on September 2, 2021 at 6:30 PM at the Hagerstown Community College, Career Programs Building, Room CPB-125, 11400 Robinwood Drive, Hagerstown, MD 21742.

Pursuant to the Environment Article, Section 1-603, Annotated Code of Maryland, the Informational Meeting has been scheduled so that citizens can discuss the application and the permit review process with the applicant and the Department.

The application and other supporting documents are available for public inspection on the Department's website. Look for Docket #08-21 at the following link:

https://mde.maryland.gov/programs/Permits/AirManagementPermits/Pages/index.aspx

The Department will provide an interpreter for deaf and hearing impaired persons provided that a request is made for such service at least ten (10) days prior to the meeting.

Further information may be obtained by calling Ms. Shannon Heafey by email at shannon.heafey@maryland.gov or by phone at 410-537-4433.

George S. Aburn, Jr., Director
Air and Radiation Administration

PERMIT TO CONSTRUCT APPLICATION
Low Carbon Engineered Fuels Project

Holcim (US) Inc. / Hagerstown Plan

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1. EXECUTIVE SUMMARY

Holcim (U.S.) Inc. (Holcim) is submitting the enclosed air quality Permit to Construct (PTC) application to request authorization from the Maryland Department of the Environment (MDE) to co-process additional types of fuels (commonly referred to as alternative, or engineered, fuels) in the portland cement kiln at their Hagerstown, MD plant (Hagerstown plant). Alternative fuels generally encompass materials that can be co-processed as fuel to recover useful thermal energy, but are not considered "traditional" fuels (e.g., fossil fuels). Alternative fuels are widely utilized in the portland cement industry, including in the fleet for LafargeHolcim[1] operations, due to the environmental and economic benefits they provide. Multiple studies over the last 30 years have shown that the air emissions produced by combusting alternative fuels are comparable, and often lower, than those from traditional fossil fuels. Additionally, in recent years federal regulations, specifically, Title 40 of the Code of Federal Regulations (40 CFR) Part 241, Subpart B, have limited the types of acceptable alternative fuels to those that have comparable or less environmental impact than the traditional fuels a facility is designed to utilize.

In 2016, Holcim initiated a modernization project at the Hagerstown plant to enhance the overall facility environmental performance. Holcim is seeking to further enhance its performance by supplementing its traditional fuel consumption with the co-processing of alternative fuels. The company contemplated and indicated the desire to complement traditional fuels in this modernized kiln system with alternative fuels during the plant modernization project's permitting process. This aspect of the kiln design is recognized in the Hagerstown plant's Title V Operating Permit which currently authorizes Holcim to combust certain specific types of alternative fuels in the kiln system in addition to several types of traditional fuels. The permit also allows Holcim to combust additional types of fuels with approval from MDE. Based on consultation with MDE and Holcim's desire to seek approval for various fuels at this time, Holcim is requesting the authorization to co-process a wider range of low carbon engineered fuels, all of which will meet certain legitimacy criteria outlined by federal regulations (i.e., all materials being considered are not considered wastes [neither solid nor hazardous waste] and are considered fuels under MDE and U.S. Environmental Protection Agency [EPA] regulatory definitions). Although Holcim believes the Hagerstown plant's current Title V Operating Permit allows MDE to approve additional fuels without a formal permitting process on a case-specific basis, MDE has requested a PTC application to approve this request.

This permit application describes the major processes at the Hagerstown plant, provides an explanation of the proposed changes, and includes a detailed review of the air quality regulatory applicability for the project. The recent investment in energy efficiency improvements to the kiln and the reduced reliance on traditional fossil fuels will enhance the environmental benefits for operating the plant. These same actions align the plant's operations with Holcim's corporate goals to operate in a sustainable manner over the long term.

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[1] The Hagerstown plant operates under the legal name of Holcim. On a global basis Lafarge and Holcim merged in 2015 forming a global group name of LafargeHolcim. In general, when we refer to the plant we use the name Holcim and when we refer to the corporation or global company capabilities we use the name LafargeHolcim.

2. FACILITY DESCRIPTION

The Hagerstown plant is one of two portland cement manufacturing facilities in the State of Maryland. Holcim recently made significant investments in the plant and was required to comply with extensive environmental control and monitoring requirements. Given this, the Hagerstown plant operates a safe and modern manufacturing plant with extensive environmental monitoring requirements and controls to assure compliance with MDE and U.S. EPA requirements.

As mentioned above, Holcim underwent a kiln modernization project in 2016. This project was authorized in a PTC issued by MDE on April 11, 2014 and updated on April 18, 2016 (permit numbers 043-0008-6-0494, 6-0495, 6-0496, 6-0497 and 9-0218) and a Prevention of Significant Deterioration (PSD) approval issued April 11, 2014 (permit number PSD-2014-01). Holcim subsequently submitted an application for a modification to the Hagerstown plant's Title V Operating Permit (permit number 24-043-0008) to incorporate the PTC. The modified Title V Operating Permit for the site was issued on May 1, 2018.

2.1 Process Description

Holcim operates a portland cement manufacturing plant in Hagerstown, Maryland (Hagerstown plant) that produces type I/II and type III cement. In 2016, Holcim underwent a kiln modernization project to upgrade their process to a modern preheater, precalciner kiln with an in-line raw mill (i.e., the 2016 modernization project). The kiln modernization has been completed and the modernized plant is currently in operation. The cement manufacturing process at the Hagerstown plant consists of the following main steps, utilizing the raw materials and process equipment as indicated:

1. An onsite quarry produces limestone, which is the primary raw material used in cement production. Limestone is hauled from the quarry to primary and secondary stone crushers which reduce the size of the stone in preparation for the raw mill and the kiln. The crushed limestone is stored in stockpiles and fed into storage bins. Other raw materials that include (but are not limited to) alumina corrective, sand and iron corrective are also unloaded from trucks and maintained in storage piles and storage bins. All raw materials are transferred via conveyor belts and trucks.

2. Raw materials are fed into the raw mill, which grinds and blends the materials into what is commonly referred to as kiln feed. Making kiln feed is a necessary step in preparation for the clinkerization part of the process which occurs in the kiln system. Hot exhaust gases from the kiln are fed through the in-line raw mill, which provides initial drying and pre-heating of the kiln feed in an energy efficient manner.

3. The kiln feed is then fed into kiln system via the preheater tower; the first step in pyro processing. The preheater consists of a series of cyclones where the material is exposed to the hot exhaust gases from the kiln. By-passing through the preheater tower, the gases and kiln feed exchange heat, thereby extracting heat from the gas and heating the feed.

4. Within the preheater, the raw materials are fed through the precalciner. To bring the material to the temperature where limestone is converted to lime (i.e., calcination), fuel is introduced in the precalciner. With the addition of fuel here, the temperature is quickly raised above 900 °C, which triggers a calcination reaction where CO_2 is released from the limestone. Holcim utilizes several fuel types in the precalciner, as outlined in this application.

5. At the bottom of the preheater tower, the kiln feed has been decarbonated and enters the kiln for the final stage of the clinkering process. Fuel combusted in the kiln raises the temperature to approximately 1,500 °C, allowing the next phase in the process to take place. In the kiln, new crystallographic structures form and give the material the properties that create clinker. Clinker has the necessary properties to be manufactured into cement after finish grinding. Holcim combusts several types of fuels to produce the high temperatures needed in the kiln, as outlined in this application.

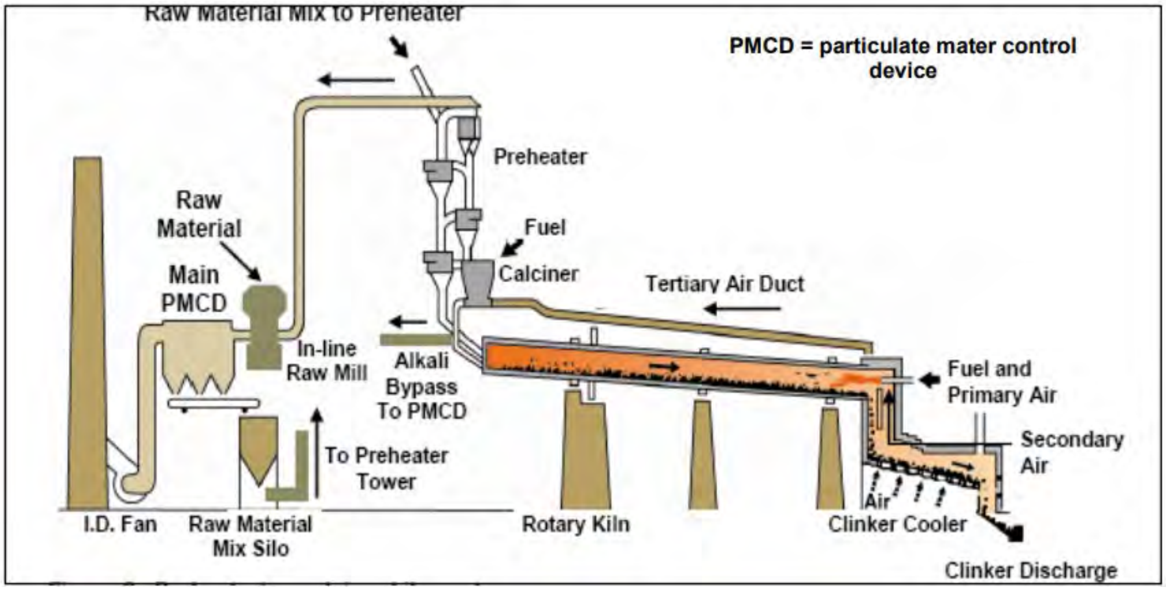
6. The last part of the kiln process is the clinker cooler. Fans blow ambient air underneath the bed of newly formed clinker, cooling it from a temperature of approximately 1,400 °C at the outlet of the kiln to 100 °C at the outlet of the cooler. The heated air from the clinker cooler is recirculated to serve as combustion air and drying air for the raw mill. Cooled clinker is transferred via conveyor belts into storage bins and storage piles.

7. The heated air from the clinker cooler and kiln are used to dry and preheat the kiln feed, which provides inherent reduction of certain air emissions, such as sulfur dioxides (SO_2), via adsorption by the calcium carbonate ($CaCO_3$) in the raw materials. Holcim utilizes a dry lime injection system for SO_2 control to comply with permit limits and a selective non-catalytic reduction (SNCR) system to control nitrogen oxide (NO_X) emissions from the kiln. Both the main kiln exhaust stream and the alkali bypass exhaust stream pass through a high-efficiency filter baghouse for particulate matter (PM) control prior to release into the atmosphere from a single stack.

8. To produce cement, clinker is withdrawn from storage and combined with additional materials, such as gypsum. The mix is then ground into the final cement product in one of two finish mills. The cement product is pneumatically transferred into storage silos, where it is eventually loaded into trucks or rail cars for delivery off site.

An example of a typical preheater/precalciner kiln system is shown in Figure 2-1.

Figure 2-1. Typical Preheater / Precalciner Kiln Process with In-line Raw Mill[2]



2.2 Existing Air Quality Monitoring at the Hagerstown Plant

The kiln system and supporting equipment at the Hagerstown plant are currently subject to several air quality regulations. The air quality regulations establish emissions standards, work practices, recordkeeping, reporting and monitoring requirements for the plant. Holcim employs an extensive monitoring and stack testing regime for multiple pollutants to maintain efficient operation of the plant, and to demonstrate compliance with applicable emissions standards. Table 2-1 provides examples of the air emissions monitoring systems, periodic stack testing and procedures utilized at the Hagerstown plant. Note that Table 2-1 is not a comprehensive list but provides an overview of the key monitoring systems. These systems will continue to be operated and stack testing performed, regardless of whether traditional fuels, low carbon engineered fuels or a combination of both is being utilized in the kiln system. Holcim will continue to meet all applicable emissions standards and will demonstrate such compliance through the continued operation of the site's monitoring systems and stack testing procedures.

We believe it is important to note that monitoring under the National Emissions Standard for Hazardous Air Pollutants (NESHAP) requirements also provide significant protection for potential emissions of toxic air pollutants. In this case, 40 CFR 63 Subpart LLL – NESHAP for Portland Cement Manufacturing Industry (aka PC MACT) applies to the Hagerstown plant. For example, U.S. EPA implemented a well-established surrogate monitoring strategy in setting the limitations in the PC MACT rulemaking. Specifically, the rule relied on the following strategies:

- Use of a particulate matter limit (and continuous monitoring) as a surrogate for non-volatile trace metals;
- Use of a total hydrocarbon limit (and continuous monitoring) as a surrogate for trace organic compound emissions; and

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[2] Neuffer, Bill. Alternative Control Techniques Document Update - NOx Emissions from New Cement Kilns. EPA-453/R-07-006, November 2007. Accessed at https://www3.epa.gov/ttncatc1/dir1/cement_updt_1107.pdf

- Use of a sulfur dioxide limit (and continuous monitoring) as a surrogate for hydrogen chloride and other acid gases.

Given this extensive limitation and monitoring schema, the Hagerstown plant will have significant amounts of continuous data ensuring the co-processing of low carbon engineered fuels is safe and compliant with requirements for federal hazardous air pollutants and MDE toxic air pollutants.

Table 2-1. Key Monitoring and Testing Procedures at the Hagerstown Plant

Pollutant Monitored	Applicable Equipment	Monitoring System / Procedure
Opacity	Material handling equipment (e.g., fuel, raw material, clinker and product handling)	Periodic visible emissions inspections
Particulate matter (PM)	Kiln system/clinker cooler combined stack	Periodic stack testing; Continuous monitoring via a PM Continuous Parametric Monitoring System (CPMS)
Dioxins/furans	Kiln system/clinker cooler combined stack	Periodic stack testing; Continuous temperature monitoring at inlet of baghouses[A]
Nitrogen oxides (NO_X)	Kiln system/clinker cooler combined stack	Continuous Emissions Monitoring System (CEMS)[B]
Sulfur dioxide (SO_2)		
Carbon monoxide (CO)		
Total hydrocarbons (THC)		
Mercury (Hg)		
Carbon dioxide (CO_2)		
Hydrogen chloride (HCl)	Kiln system/clinker cooler combined stack	Periodic stack testing; Continuous monitoring via SO_2 CEMS[C]

[A] Exhaust temperature at the inlet of the baghouse is used a surrogate monitoring parameter for demonstrating compliance with the dioxins/furans limit from the PC MACT rule.

[B] Holcim operates separate CEMS, or individual analyzers as part of a single CEMS, to monitor the emissions indicated.

[C] Compliance with the HCl limit from the PC MACT is demonstrated via periodic stack testing of HCl, and continuous monitoring of SO_2 via SO_2 CEMS against a correlated SO_2 parametric operating limit established during the HCl testing.

3. PROJECT DESCRIPTION

The PTC issued in 2014 and updated in 2016 for Holcim's kiln modernization project (permit numbers 043-0008-6-0494, 6-0495, 6-0496, 6-0497, and 9-0218) included a condition that authorized the types of fuels that may be utilized in the kiln system. This condition was subsequently rolled into the current Title V Operating Permit for the site. Section IV-6, Condition 6.3(11) of the Title V Operating Permit states:

> *"During the normal operation, either the kiln or the calciner shall not burn any type of fuel other than the following unless the Permittee obtains permission from the Department:*
>
> *a) Natural gas, synthetic natural gas, propane, distillate oil, synthesis gas (syngas), and ultra-low sulfur diesel (ULSD);*
> *b) Coal;*
> *c) Pet Coke;*
> *d) Fuel Oil;*
> *e) Tire Derived Fuel (TDF);*
> *f) On-Specification Used Oil which meets the specifications in COMAR 26.11.09.10B; and*
> *g) Wood which has no paints, stains, or other type of coating and/or has not been treated with chromium copper arsenate (CCA) or pentachlorophenol."*

Holcim is submitting this application for a PTC to request authorization to use additional fuel types in the kiln and precalciner. The additional fuels to be used in the kiln and precalciner are collectively known as "low carbon engineered" fuels. Further description of alternative fuels and their use in the portland cement industry, as well as a regulatory review for this project are outlined in this report.

In order to co-process additional types of fuel, Holcim will also need to install equipment to unload and deliver the low carbon engineered fuel to the kiln. This equipment requires a PTC from MDE and has been included in this application.

3.1 Alternative Fuels Background in the Portland Cement Industry

Traditional fossil fuels, such as coal, coke, petroleum products and natural gas, have historically been the predominant fuel types utilized in kiln systems in the cement manufacturing process. However, cement manufacturing is such an energy-intensive process that it is economically beneficial for companies to explore alternatives for fuels that can be used to not only reduce the reliance on traditional fossil fuels, but that also have environmental advantages, such as the beneficial management of material that would otherwise be landfilled. As such, use of alternative fuels in the cement industry is becoming more prevalent, especially over the past 30 years.

The following list provides some examples of solid alternative fuels utilized in the cement manufacturing industry, however this list should not be considered comprehensive or indictive of the the only fuel types that will be used at the Hagerstown plant:

- Paper
- Plastics
- Biomass

- Consumer Products
- Rubber
- Tire and tire chips
- Pulp sludge
- Asphalt shingles
- Agricultural and organic waste

The production of clinker in cement kilns has several characteristics that make it an ideal candidate for the effective use of alternative fuels. These include, but are not limited to, the following:[3],[4]

- High Temperature
- Long residence times
- Oxidizing environment in the kiln system
- Good mixing of gases (i.e., turbulence)
- Ability to accommodate large variations in minerals / metals that naturally occur in fuels
- Ash retention in the clinker
- Inherent scrubbing effect of materials in the kiln system that reduces air emissions

Not only do cement kilns provide a favorable environment for the safe use of alternative fuels, but the co-processing of alternative fuels in cement kilns also provides benefits from an environmental and sustainability standpoint. First, the use of alternative fuels reduces the stream of material that would otherwise be disposed of as waste. If the fuels were not processed in the kiln system, they would either be landfilled or destroyed through municipal or commercial incinerators without providing a useful energy benefit (i.e., creation of a product). Second, the use of alternative fuels in the cement manufacturing process results in less reliance on, and therefore increased conservation of, traditional fossil fuels[5].

Finally, overall air emissions are not significantly impacted through the use of alternative fuels in the cement manufacturing process. The high temperatures in combination with the long residence times and thorough mixing result in the complete combustion of fuel. As noted in the Preamble of the June 16, 2008 Federal Register proposing amendments to the current standards of performance for portland cement plants, the U.S. EPA commented that "Unburned fuel represents an economic loss to the facility. Therefore, new precalciners are designed to combust fuel as efficiently as possible..."[6]. In addition, use of PM control devices on the exhaust of kiln systems (i.e., the baghouses on the kiln system at the Hagerstown plant) means that use of alternative fuels in the kiln system will not affect PM emission rates. Finally, use of alternative fuels in kiln systems, depending on the constituents of the fuel, has been shown to have no impact on emissions of most metals, persistent organic pollutants or dioxins/furans[7]. Section A.2.3 of Appendix A provides more background on the content and characteristics of the low carbon engineered fuels Holcim is proposing to utilize.

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[3] Arron Heinerikson, C.M., and Mike Remsberg, P.E. Clean Air Act Permitting Manual for Alternative Fuels and Raw Materials (AFRs) at Portland Cement Plants. PCA R&D Serial No. SN3083: 6.

[4] Moses P.M. Chinyama, Alternative Fuels in Cement Manufacturing, Alternative Fuel. InTech: 266.

[5] Chinyama. Alternative Fuels in Cement Manufacturing, 266.

[6] 73 Federal Register page 34082, June 16, 2008.

[7] Heinerikson and Remsberg. Clean Air Act Permitting Manual for Alternative Fuels and Raw Materials (AFRs) at Portland Cement Plants, 11-13.

3.2 LafargeHolcim Experience with Low Carbon Engineered Fuels

The proposed low carbon engineered fuel for the Hagerstown plant will be sourced by Geocycle, which is a leading worldwide provider of alternative fuels to the cement industry. Born of the pioneering activities in the area of co-processing during the 1970s and 1980s by their parent company, LafargeHolcim, Geocycle is a trusted brand under the umbrella of the world's largest cement manufacturer dedicated to advancing a zero-waste future. Geocycle services over 10,000 customers in more than 50 countries worldwide, including industrial and service companies, municipalities and companies in the agricultural sector. The co-processing solution provided by Geocycle reduces the total volume of solid material destined for landfills, thereby minimizing the potential for soil and ground water contamination as a result of landfilling these materials. As opposed to other potential outlets for these materials, a commodity product (i.e., cement) is also created while achieving these environmental benefits.

In the U.S., Geocycle has extensive experience in the sourcing and processing of materials for use as alternative fuels and raw materials. Geocycle currently operates a network of nine pre-processing facilities and ten co-processing facilities, delivering in excess of 366,000 tons of alternative fuels and 1.3 million tons of alternative raw materials to LafargeHolcim cement plants. Of the ten co-processing facilities in operation, eight facilities utilize an engineered fuel similar to that proposed for the Hagerstown plant, with some of these existing facilities being in operation for decades. Based on cement kiln technology and local supply markets, Geocycle and LafargeHolcim determined that the Hagerstown plant is an ideal candidate for co-processing of the proposed low carbon engineered fuel. This program will provide a sustainable solution to local waste management pressures, while reducing facility reliance on traditional fossil fuels; thereby, reducing the overall environmental impact of the facility.

As indicated by its 2030 Plan, which includes worldwide corporate sustainability targets, LafargeHolcim and Geocycle not only have extensive experience and expertise with similar projects in the U.S., but also worldwide. The proposed Hagerstown project and similar projects worldwide play a critical role in achieving the LafargeHolcim global sustainability targets of: reducing the net carbon dioxide (CO_2) emissions per metric ton of cement by 40 percent when compared to 1990 emissions; and to reduce its reliance on natural resources (e.g., traditional fuels, raw materials, etc.) by using 80 million metric tons per year of resources that are typically landfilled. From its worldwide experience, LafargeHolcim and Geocycle identified the Hagerstown plant as a facility that can contribute to achieving the global sustainability targets by supplementing traditional fuel (i.e., coal) with a low carbon engineered fuel to reduce CO_2 emissions and by reducing the consumption of a natural resource through the use of the low carbon engineered fuel.

3.3 Proposed Changes at Hagerstown Plant

3.3.1. Authorization for the Use of Low Carbon Engineered Fuels

As part of this project, Holcim is requesting authorization to utilize additional fuels beyond the list currently included in the Hagerstown plant’s Title V Operating Permit. As discussed above, the use of low carbon engineered fuels is common in the cement manufacturing industry as fuel for both calciners and main kiln combustion zones. Holcim is requesting the flexibility to co-process low carbon engineered fuels that meet the criteria for non-waste fuels as outlined in Section A.2.3 of Appendix A, without the need for additional specific pre-approval from MDE.

Holcim cannot currently predict which exact fuels will be utilized (or their exact composition) at the Hagerstown plant for the life of the kiln system; however, we can certify that any low carbon engineered fuel used will meet the criteria for non-waste materials outlined in 40 CFR 241, Subpart B, as described in

Section A.2.3 of Appendix A. Fuel types and sources will be dependent on the fuel's availability in the region and overall cost. However, based on its experience at other facilities and preliminary market research, Holcim believes the examples of the types of fuels that may be considered at the Hagerstown plant include, but are not limited to a combination of the following:

- Solid Recovered Fuel (SRF) from municipal recycled streams
- Carpet / Textiles
- Plastics
- Construction and Demolition (C&D) Debris
- Consumer Products
- Rubber
- Biomass
- Paper / Cardboard

The primary sources of these materials are anticipated to be material recovery facilities (MRF), individual manufacturing facilities, and third-party processors (or brokers).

- Material recovery facilities (MRF) - These facilities receive collected recyclables (plastic, cardboard, paper, etc.) from municipalities. The material is sorted into recyclables and non-recyclables (types 4-7 plastics, labels, packaging, etc.) via a number of separation technologies and methodologies, which are dependent on the manner in which the materials are received (i.e, single stream or commingled v. multiple streams). The low carbon engineered fuel is comprised of the non-recyclable portion of these streams in lieu of it being landfilled.

- Manufacturing Facilities - Many manufacturing facilities are seeking zero waste to landfill solutions to meet their own sustainability targets. As part of their strategies, they seek outlets for their non-recyclable materials, which typically consist of packaging materials and off-specification consumer products (does not include office or lunchroom streams).

- Third-Party Processors (or Brokers) – These companies often work with individual smaller sources to collect the aforementioned types of materials to generate a low carbon engineered fuel product for delivery.

Regardless of the source of the low carbon engineered fuel to be supplied to Holcim, it must meet the fuel specifications set forth by Holcim and will be subject to the quality assurance process highlighted below.

3.3.2. Assurance of Fuel Quality and Safety

Given that we are requesting fuel flexibility in this permit, Holcim also realizes the need to assure ourselves for regulatory and product quality reasons, to honor our commitment to the environment and to our community stakeholders that the fuels we use are safe and meet various specifications. There is a wide range of precautions internally applied by Holcim to meet these expectations and a wide range of legal requirements that need to be satisfied to meet these goals. This application documents the voluminous air quality requirements to ensure safe usage of low carbon engineered fuels; however, Holcim is also required to assure that the proposed low carbon engineered fuel is, in fact, considered a fuel by demonstrating that it does not differ adversely in constituent makeup from our existing fuels. Therefore, Holcim will employ internal controls that help us assure these parameters are continuously met.

In general, the quality assurance program for the low carbon engineered fuel consists of both a pre-qualification process and an ongoing quality assurance process. At a minimum, the pre-qualification process includes the evaluation of the fuel for compliance with EPA's non-hazardous secondary materials (NHSM) legitimacy criteria, which includes criteria listed below. Furthermore, it should be noted, that Holcim has additional specifications than those prescribed by NHSM due to product quality, operational, or other limitations. Among the characteristics evaluated are:

- Calorific Value - Minimum heating value of over 5,000 British thermal units per pound (Btu/lb);
- Processing Criteria - Minimum of two steps of processing is required for acceptance (sizing, contaminant removal, improvement of fuel characteristics, improvement of constituents, better "as fired" fuel characteristics, etc.);
- Valuable Commodity - Must be managed as a valuable commodity (purchase orders or contracts, inventory management, storage, recipes, etc.); and
- Constituent Levels - Must be below the upper range of constituent levels of the traditional fuels (e.g., coal, natural gas, fuel oil, etc.) the facility is currently designed to use. In this comparison, the fuels are benchmarked against the EPA accepted values for constituent concentrations for traditional fuels.[8]

Before accepting a fuel, Holcim completes a pre-qualification review. During the pre-qualification process, the variability and level of constituents of each stream is documented from generator knowledge and sampling/analysis to develop initial criteria for the ongoing quality assurance process. Based on this information, all constituents, including heating value, are placed into several quality assurance categories based on the levels of concentration and variability. Each quality assurance category has specific QA/QC procedures ranging from the requirement to sample and analyze at time of delivery to documenting that very low concentrations are anticipated based on material knowledge and generator information (e.g., presence of metals in plastic material).

Over time as data on fuel sources and quality is accumulated, some constituents may move from one quality assurance category to another based on variability or a general increase or decrease in constituent concentration. The goal of this program is to ensure that in all cases the low carbon engineered fuel delivered to the cement kiln for co-processing will meet the NHSM legitimacy requirement (i.e., the material is not regulated as a waste), as well as Holcim internal specifications, prior to being fed into the kiln.

3.3.3. Low Carbon Engineered Fuel Handling System

As part of this project, Holcim proposes to install equipment for the receiving and transfer of additional solid NHSM-compliant alternative fuels at the plant. Solid alternative fuels will be received via truck at the site on as-needed basis, replacing a portion of traditional fuels. The increase in potential truck traffic is expected to be minimal. No permanent storage bins or piles for these fuels will be installed. Conceptually, the fuel handling system will function as follows:

- The low carbon engineered fuel will be transported to the site in walking floor trailers. Once onsite, the trailer will be parked in an unloading bay, and the fuel will be automatically moved out of the trailer onto a belt conveyor via the trailer's walking floor. The design of the unloading bay is optimized in order to allow for seamless unloading from the walking floors. The docking bay will accommodate two trailers at a time, each with a separate belt conveyor.
- The two docking station conveyors will discharge to a common chain belt conveyor. Material will then transfer to a weightbelt feeder and then to a flexowell belt which will carry material vertically up the preheater tower.

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[8] See Compilation of U.S. EPA Contaminant Concentrations in Traditional Fuels Tables for comparison (11/29/2011) and the Materials Characterization Paper (2/7/2011).

- Once in the preheater tower, the material will transfer to a sacrificial belt conveyor which will feed the fuel into the kiln system.

The capacity of the proposed fuel handling system is up to 100,000 metric tons (110,231 short tons) of material per year. The feed system will include four nuisance dust collectors / dust catridges for mitigating any dust generated from the handling process. Emissions calculations for the system are provided as Appendix F and a process flow diagram for the system is provided as Appendix G. The process flow diagram provided is preliminary and minor adjustments may occur as the design is finalized; however, it is not anticipated that the number of emissions sources or the types of emissions mitigation measures will change.

4. REGULATORY REVIEW

This section provides a summary of the applicable state and federal regulations to the proposed project at the Hagerstown plant. Detailed analyses of the applicability of individual programs are provided as Appendix A to this application.

4.1 Maryland Regulatory Applicability

This section of the application provides a summary of the applicable regulations contained in the Title 26 of the Code of Maryland Regulations (COMAR) Subtitle 11 to the project sources at the Hagerstown plant. A full analysis and explanation of potentially applicable regulations is provided in Appendix A.

4.1.1. COMAR 26.11.02 (Permits, Approvals, and Registration)

Under COMAR 26.11.02, this project requires a PTC for the material handling equipment and kiln system. In addition, this project is subject to PSD permitting for carbon monoxide (CO) and carbon dioxide equivalent (CO_2e). The PSD review for this project is required primarily as a result of the design of the PSD regulations when a project occurs shortly after the plant's major modification (i.e., the 2016 modernization project) and it is not reflective of the actual change in emissions related to the use of low carbon engineered fuels. As discussed in detail in Appendix B, the modernized kiln system already meets Best Available Control Technology (BACT) standards under the PSD requirements.

4.1.2. COMAR 26.11.06 (General Emission Standards, Prohibitions, and Restrictions)

The following regulations are generally applicable to the proposed fuel handling equipment and to all existing emission sources currently in operation at the Hagerstown plant. Holcim will operate all new and existing equipment in accordance with the applicable requirements of these regulations:

- COMAR 26.11.06.02 – Visible Emissions
- COMAR 26.11.06.03 – Particulate Matter
- COMAR 26.11.06.05 – Sulfur Compounds from Other than Fuel-Burning Equipment
- COMAR 26.11.06.06 – Volatile Organic Compounds
- COMAR 26.11.06.07 – Control of Sources of Fluoride Emissions
- COMAR 26.11.06.08 – Nuisance Air Pollution
- COMAR 26.11.06.09 – Odors
- COMAR 26.11.06.12 – Control of New Source Performance Standard (NSPS) Sources

4.1.3. COMAR 26.11.15 and 26.11.16 (Toxic Air Pollutants)

COMAR 26.11.15.02 requires a facility to meet applicable 40 CFR 63 National Emission Standards for Hazardous Air Pollutants (NESHAP) requirements. Refer to Section 4.2 and Appendix A for discussions on the applicability of the NESHAP regulations to the proposed project.

In addition, Holcim will continue to operate in accordance with the toxic air pollutant (TAP) regulations for all new and existing equipment at the Hagerstown plant in accordance with COMAR 26.11.15.03 and COMAR 26.11.16.

4.1.4. COMAR 26.11.30 (Control of Portland Cement Manufacturing Plants)

This section applies to portland cement manufacturing plants per COMAR 26.11.30.02A. The requirements of COMAR 26.11.30 are already incorporated into the Hagerstown plant's Title V Operating Permit and the applicability will not be impacted by the proposed project. Holcim will continue to comply with this regulation, as applicable.

4.2 Federal Regulatory Applicability

4.2.1. 40 CFR Part 60, Subpart F - Standards of Performance for Portland Cement Plants

NSPS promulgated under 40 CFR Part 60 apply to certain types of equipment that are newly constructed, modified, or reconstructed after a given applicability date. NSPS Subpart F, Standards of Performance for Portland Cement Plants, provides standards of performance for affected facilities in portland cement plants which have been constructed, reconstructed or modified after August 17, 1971.[9] NSPS Subpart F will apply to the proposed conveyor transfer points associated with the low carbon engineered fuel handling equipment, but the project will not trigger applicability of NSPS Subpart F for the kiln.

4.2.2. 40 CFR Part 63, Subpart LLL - National Emission Standards for Hazardous Air Pollutants for the Portland Cement Manufacturing Industry

NESHAPs have been established in 40 CFR 61 and 63 to control the emissions of HAPs. NESHAP regulations codified in 40 CFR 63 establish MACT standards for specific types of equipment at qualifying facilities. The Hagerstown plant is currently a major source of HAPs. 40 CFR Part 63, Subpart LLL applies to portland cement manufacturing plants, and is commonly known as the "PC MACT". Holcim operates several sources at the Hagerstown plant that are subject to the PC MACT as existing sources. These sources, including the kiln system, will continue to be subject to the existing source requirements of the PC MACT. The proposed low carbon engineered fuel handling equipment will also be subject to the PC MACT, and Holcim will meet all the requirements for this equipment once it has been installed.

4.2.3. 40 CFR Part 60, Subpart DDDD - Emissions Guidelines and Compliance Times for Commercial and Industrial Solid Waste Incineration Units (NOT APPLICABLE)

40 CFR Part 60, Subpart DDDD contains emissions guidelines and compliance times for commercial and industrial solid waste incineration (CISWI) units. Holcim will maintain all required records to ensure the kiln system at the Hagerstown plant remains a non-CISWI unit.

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[9] 40 CFR 60.60

APPENDIX A. DETAILED REGULATORY APPLICABILITY ANALYSIS

This appendix provides a detailed analysis of the applicable state and federal regulations to the proposed project at the Hagerstown plant. A summary of the results of this analysis is provided in Section 4 of the application report. A detailed discussion of NSR permitting applicability is provided in Appendix B.

A.1 Maryland Regulatory Applicability

This section lists the regulations contained in COMAR 26.11 that potentially apply to the project sources at the Hagerstown plant. Only regulations with reasonable potential applicability to the project are discussed. Rules that are categorically non-applicable to the project have not been included.

A.1.1. COMAR 26.11.06 (General Emission Standards, Prohibitions, and Restrictions)

COMAR 26.11.06.02C(1) limits visible emissions from any installation or building in excess of 20% opacity for sources located in the Area I region of the state. Per COMAR 26.11.06.02A(2), this regulation does not apply to emissions during start-up and process modifications or adjustments, or occasional cleaning of control equipment, if the visible emissions are not greater than 40 percent opacity and the visible emissions do not occur for more than 6 consecutive minutes in any 60-minute period.

COMAR 26.11.06.03B(1) limits the particulate matter discharged from any installation which is a confined source based on the construction date (before or on/after January 17, 1972) for sources in the Area I region. This section also requires facilities to take reasonable precaution to control particulate matter emissions form unconfined sources per COMAR 26.11.06.03C and from materials handling and construction per COMAR 26.11.06.03D.

COMAR 26.11.06.05B contains sulfur dioxide and sulfuric acid emission standards based on construction date, which are generally applicable.

COMAR 26.11.06.06 contains standards for VOC, which are generally not applicable to the Hagerstown plant since it is located in Washington County. Only the VOC disposal requirements are applicable to the Hagerstown plant under COMAR 26.11.06.06D if the facility disposes of waste containing VOC in the outside atmosphere in a manner that may cause evaporation of greater than 20 pounds per day.

The following standards in COMAR 26.11.06 are also generally applicable to the proposed project:

- COMAR 26.11.06.07 contains fluoride standards which are generally applicable to the Hagerstown plant.
- COMAR 26.11.06.08 and 26.11.06.09 contain the generally applicable nuisance and odor standards, respectively.
- COMAR 26.11.06.12 requires a facility to comply with New Source Performance Standards (NSPS) requirements as applicable.

Holcim will ensure compliance with the requirements of COMAR 26.11.06, as applicable to the sources associated with the proposed project. Note that the applicability COMAR 26.11.06 to the kiln is not impacted by the proposed additional fuels.

A1.2. COMAR 26.11.09 (Control of Fuel-Burning Equipment, Stationary Internal Combustion Engines, and Certain Fuel-Burning Installations) (NOT APPLICABLE)

This section contains standards for fuel-burning equipment, which is defined under COMAR 26.11.01.01B(17) as:

> *"Fuel-burning equipment" means any:*
> *(a) Boiler that has the primary function of heating air, water, or any other medium through indirect heat transfer from the burning of fuels; or*
> *(b) Stationary internal combustion engine or stationary combustion turbine used to produce mechanical or electrical energy.*

No sources included in the proposed project meet the definition of fuel-burning equipment. As such, COMAR 26.11.09 is not applicable.

A.1.3. COMAR 26.11.15 and 26.11.16 (Toxic Air Pollutants)

COMAR 26.11.15.02 requires a facility to meet applicable 40 CFR 63 NESHAP requirements. Refer to Section A.2.2 for a detailed applicability discussion of the NESHAP regulations to the proposed project.

In addition, the Hagerstown plant is required to demonstrate compliance with the TAP requirements per COMAR 26.11.15.03. This is a state-only enforceable program and includes an assessment of the Class I and II TAPs emitted from the facility (as defined under COMAR 26.11.16.06 and 26.11.16.07), quantification of TAP emissions, review of Best Available Control Technology for emissions of TAPs (T-BACT), and demonstration of compliance with the Maryland ambient air standards. The proposed project is not expected to change emissions of TAPs from the Hagerstown plant. The low carbon engineered fuels will replace coal and quality requirements for the fuels should actually result in decreases of TAP emissions. As such, the previously submitted TAPs analysis and T-BACT demonstration are still accurate and no update is required as a result of the project.

There is the potential for a future fuel to result in material handling emissions of a TAP, such as crystalline silica. However, based on the total PM emissions for the material handling equipment (refer to Appendix F), any potential TAP emissions would be minimal. Although low carbon engineered fuels are not expected to contain crystalline silica, Holcim has conservatively assumed that all low carbon engineered fuels will be 20 percent crystalline silica and updated the air dispersion modeling used to demonstrate compliance with the crystalline silica TAPs thresholds. This modeling shows that the low carbon engineered fuels handling emissions will not cause an exceedance of the TAPs thresholds. Details of the dispersion modeling are provided in Appendix D.

A.1.4. COMAR 26.11.30 (Control of Portland Cement Manufacturing Plants)

This section applies to portland cement manufacturing plants per COMAR 26.11.30.02A. The requirements of COMAR 26.11.30 are already incorporated into the Hagerstown plant's Title V Operating Permit and the applicability will not be impacted by the proposed project. Holcim will continue to comply with this regulation, as applicable.

A.2 Federal Regulatory Applicability

A.2.1. 40 CFR Part 60, Subpart F - Standards of Performance for Portland Cement Plants

NSPS promulgated under 40 CFR Part 60 apply to certain types of equipment that are newly constructed, modified, or reconstructed after a given applicability date. NSPS Subpart F, *Standards of Performance for Portland Cement Plants*, provides standards of performance for affected facilities in portland cement plants which have been constructed, reconstructed or modified after August 17, 1971.[10] There are two key dates to determine which emission standard an affected facility must meet: August 17, 1971 and June 16, 2008. If an affected facility is constructed, reconstructed or modified after June 16, 2008, the emission unit must meet separate emission limits than an affected facility constructed, reconstructed or modified after August 17, 1971. Since the proposed project is occurring after the June 16, 2008 date, any constructed, reconstructed or modified units would need to meet the June 16, 2008 standards under NSPS Subpart F.

The following are considered affected facilities under NSPS Subpart F:

- Kiln
- Clinker Cooler
- Raw Mill System
- Finish Mill System
- Raw Mill Dryer
- Raw Mill Storage
- Clinker Storage
- Finished Product Storage
- Conveyor Transfer Points
- Bagging and Bulk Loading and Unloading Systems

The proposed project the Hagerstown plant is to expand the types of fuels that the plant is authorized to use in the kiln system. In order to utilize additional types of fuel, Holcim will be installing material handling processes, as described above.

NSPS Subpart F Applicability - Fuel Material Handling System

The conveyor transfer points in the proposed low carbon engineered fuel material handling system will be subject to NSPS Subpart F. Per 40 CFR 60.62(c), each transfer point will be subject to an emission limit of 10% opacity. Initial compliance with this limit will be demonstrated in accordance with 40 CFR 60.8 using Method 9 from Appendix A of 40 CFR Part 60, and the requirements from 40 CFR 60.11. Ongoing monitoring of the conveyor transfer points will be performed as required by the relevant sections of 40 CFR Part 63, Subpart LLL.

NSPS Subpart F Applicability – Kiln (Not Applicable)

The preheater, precalciner kiln at the Hagerstown plant was not constructed, reconstructed or modified after August 17, 1971; therefore it is not subject to NSPS Subpart F. While this project proposes to expand the types of fuels utilized in the kiln, the applicability of NPSP Subpart F would only be triggered should the kiln be modified, as defined in NSPS Subpart A:

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[10] 40 CFR 60.60

> ***Modification:*** *Any physical change in, or change in the method of operation of, an existing facility which increases the amount of any air pollutant (to which a standard applies) emitted into the atmosphere by that facility or which results in the emission of any air pollutant (to which the standard applies) into the atmosphere not previously emitted.*[11]

The project will not result in the increase in the amount of any pollutant to which an NSPS standard applies, therefore it is not considered a modification under NSPS Subpart F. As such, the project will not change the non-applicability of NSPS Subpart F to the kiln.

A.2.2. 40 CFR Part 63, Subpart LLL - National Emission Standards for Hazardous Air Pollutants for the Portland Cement Manufacturing Industry

NESHAPs have been established in 40 CFR 61 and 63 to control the emissions of HAPs. NESHAP regulations codified in 40 CFR 63 establish MACT standards for specific types of equipment at qualifying facilities. MACT regulations typically apply to facilities that are major sources. Under 40 CFR 63, a major source is defined as "any stationary source or group of stationary sources located within a contiguous area and under common control that emits or has the potential to emit considering controls, in the aggregate, 10 tons per year or more of any HAP or 25 tons per year or more of any combination of HAP..." The Hagerstown plant is currently a major source of HAPs.

40 CFR Part 63, Subpart LLL applies to portland cement manufacturing plants, and is commonly known as the "PC MACT". The following are considered affected sources under the PC MACT:

- Kiln including Alkali Bypasses and Inline Coal Mills
- Clinker Cooler
- Raw Mill
- Finish Mill
- Raw Material Dryer
- Raw Material, Clinker, or Finished Product Storage Bin
  - Conveying System Transfer Points (including those associated with coal preparation used to convey coal from the mill to the kiln)
- Bagging and Bulk Loading/Unloading Systems
- Open Clinker Piles

The Hagerstown plant is currently subject to the PC MACT as an existing source, and operates in compliance with all emission standards, work practices, monitoring, recordkeeping and reporting requirements from the rule. Holcim is currently operating in compliance with the applicable emission limits in Table A-1 for the kiln from the PC MACT.

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[11] Note that modification is based on an increase of emissions of a regulated pollutant on an hourly basis [40 CFR 60.14(b)] and does not include solely increasing hours of operation [40 CFR 60.14(e)(3)].

Appendix Table A-1. Summary of 40 CFR 63 Subpart LLL Limits

Emission Unit	Pollutant	MACT Limit
Kiln (Existing source under LLL) (Normal Operation)	PM [a]	0.15 lb/ton clinker
	THC	24 ppmvd @ 7% O_2
	Hg	55 lb/MMtons clinker
	HCl	3 ppmvd @ 7% O_2
	Dioxins and Furans	0.2 ng/dscm (TEQ) @ 7% O_2

a. PM limit was calculated using the alternate PM equation (Equation 1 of 40 CFR 63, Subpart LLL) and design flowrates. The PC MACT limit is an operational limit that varies depending on the actual flowrates to the combined main stack. Based on the most recent stack testing conducted in April 2020, the emission limit for the main kiln stack is 0.105 lb/ton of clinker when the raw mill is on or off.

The PC MACT emissions standards are not fuel-specific, therefore there will be no changes to applicable requirements due to the introduction of additional fuels in the kiln system, and Holcim will continue to operate in compliance with these standards.

The conveyor transfer points associated with the new fuel material handling equipment will be subject to the PC MACT as well. The standard applicable to these sources is 10% opacity. Holcim will perform initial compliance demonstrations on these sources as required.

A.2.3. 40 CFR Part 60, Subpart DDDD - Emissions Guidelines and Compliance Times for Commercial and Industrial Solid Waste Incineration Units (NOT APPLICABLE)

40 CFR Part 60, Subpart DDDD contains emissions guidelines and compliance times for CISWI units. A CISWI unit is defined in 40 CFR 60.2875 as:

> *Any distinct operating unit of any commercial or industrial facility that combusts, or has combusted in the preceding 6 months, any solid waste as that term is defined in 40 CFR part 241. If the operating unit burns materials other than traditional fuels as defined in § 241.2 that have been discarded, and you do not keep and produce records as required by § 60.2740(u), the operating unit is a CISWI unit. While not all CISWI units will include all of the following components, a CISWI unit includes, but is not limited to, the solid waste feed system, grate system, flue gas system, waste heat recovery equipment, if any, and bottom ash system. The CISWI unit does not include air pollution control equipment or the stack. The CISWI unit boundary starts at the solid waste hopper (if applicable) and extends through two areas: The combustion unit flue gas system, which ends immediately after the last combustion chamber or after the waste heat recovery equipment, if any; and the combustion unit bottom ash system, which ends at the truck loading station or similar equipment that transfers the ash to final disposal. The CISWI unit includes all ash handling systems connected to the bottom ash handling system.*

Holcim will not co-process any fuels that meet the following definition of solid waste from 40 CFR Part 241:

> *Solid waste means any garbage, or refuse, sludge from a wastewater treatment plant, water supply treatment plant, or air pollution control facility and other discarded material, including solid, liquid, semi-solid, or contained gaseous material resulting from industrial, commercial, mining, and agricultural operations, and from community activities, but does not include solid or dissolved materials in domestic sewage, or solid or dissolved materials in irrigation return flows or industrial discharges that are point sources subject to permit under 33 U.S.C.*

> *1342, or source, special nuclear, or by-product material as defined by the Atomic Energy Act of 1954, as amended (68 Stat. 923)*[12]

Holcim intends to co-process fuels that are not included on the list of traditional fuels in 40 CFR Part 241.2. Therefore, Holcim will maintain the records required by 40 CFR 60.2740(u)[13]:

> *For operating units that combust non-hazardous secondary materials that have been determined not to be solid waste pursuant to § 241.3(b)(1) of this chapter, you must keep a record which documents how the secondary material meets each of the legitimacy criteria under § 241.3(d)(1). If you combust a fuel that has been processed from a discarded non-hazardous secondary material pursuant to § 241.3(b)(4), you must keep records as to how the operations that produced the fuel satisfies the definition of processing in § 241.2 and each of the legitimacy criteria in § 241.3(d)(1) of this chapter. If the fuel received a non-waste determination pursuant to the petition process submitted under § 241.3(c), you must keep a record that documents how the fuel satisfies the requirements of the petition process. For operating units that combust non-hazardous secondary materials as fuel per § 241.4, you must keep records documenting that the material is a listed non-waste under § 241.4(a).*

Holcim will keep the required records demonstrating that each type of fuel meets the legitimacy criteria outlined in Table A-2.

Appendix Table A-2. 40 CFR Part 241 Legitimacy Criteria

Reference	Required Records
40 CFR 241.3(d)(1)(i)	The non-hazardous secondary material must be managed as a valuable commodity based on the following factors: A) The storage of the non-hazardous secondary material prior to use must not exceed reasonable time frames; B) Where there is an analogous fuel, the non-hazardous secondary material must be managed in a manner consistent with the analogous fuel or otherwise be adequately contained to prevent releases to the environment; C) If there is no analogous fuel, the non-hazardous secondary material must be adequately contained so as to prevent releases to the environment;
40 CFR 241.3(d)(1)(ii)	The non-hazardous secondary material must have a meaningful heating value and be used as a fuel in a combustion unit that recovers energy.

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[12] Note that the definition for solid waste in 40 CFR Part 241 redirects to the same definition in 40 CFR 258.2, which is listed here.

[13] The proposed federal implementation plan for CISWI units in 40 CFR Part 62, Subpart III contains the same definition for "CISWI unit" as shown above, and contains the same list of required records as 40 CFR 60.2740(u).

Reference	Required Records
40 CFR 241.3(d)(1)(iii)	The non-hazardous secondary material must contain contaminants or groups of contaminants at levels comparable in concentration to or lower than those in traditional fuel(s) that the combustion unit is designed to combust. In determining which traditional fuel(s) a unit is designed to combust, persons may choose a traditional fuel that can be or is burned in the particular type of combustion unit, whether or not the unit is permitted to combust that traditional fuel. In comparing contaminants between traditional fuel(s) and a non-hazardous secondary material, persons can use data for traditional fuel contaminant levels compiled from national surveys, as well as contaminant level data from the specific traditional fuel being replaced. To account for natural variability in contaminant levels, persons can use the full range of traditional fuel contaminant levels, provided such comparisons also consider variability in non-hazardous secondary material contaminant levels. Such comparisons are to be based on a direct comparison of the contaminant levels in both the non-hazardous secondary material and traditional fuel(s) prior to combustion.
40 CFR 241.4	Records documenting that the fuel has been categorically listed as non-waste when used as a fuel in a combustion unit, as listed in 40 CFR 241.4(a).

APPENDIX B. NSR APPLICABILITY ANALYSIS

B.1 Project Overview

Although the 2016 PSD approval to implement the kiln modernization project contemplated, as discussed elsewhere in the application, the use of a variety of fuels in the modernized kiln system, we are providing an emissions change analysis relative to NSR Review applicability even though the project would logically not be expected to significantly increase actual emissions as: 1) The addition of a fuel will not change the design capacity of the kiln system; and 2) Generally, the use of alternative fuels is expected to replace the use of traditional fuels that have similar or greater impacts on NSR regulated air emissions. However, current federal and state NSR regulations do not offer a simple exemption for a project such as this.

While the design of the kiln at the Hagerstown plant allows for the co-processing of low carbon engineered fuels without significant physical changes, a port for the delivery of the low carbon engineered fuels will need to be installed in the precalciner. In addition, a new fuel handling system only emitting small amounts of particulate matter will need to be installed as part of this project. Given that there are no physical changes beyond these, we have defined the project sources to only include the existing kiln system and the new low carbon engineered fuel handling system.

As our detailed analysis shows below, this project is de minimus (not major) for Prevention of Significant Deterioration (PSD) and Nonattainment New Source Review (NA NSR) permitting, except for CO and GHG which will require PSD review. This outcome is primarily due the nature of the current design of the PSD regulations when undertaking a project soon after a major modification such as the kiln modernization project. In fact, this project is in effect re-triggering the same level of review as the 2016 modernization project primarily due to the circumstance that the modernized kiln has yet to operate at its new design capacity for an extended period of time. In other words, the aspect of adding fuels at this time is not the main driver for triggering PSD – the main aspect remains the recently modernized kiln and the unrealized, to date, actual design capacity over a long time period.

B.2 Site Location and Background

The low carbon engineered fuels project at the Hagerstown plant has the potential for requiring air permitting under the major NSR program which is comprised of two primary regulatory components: (1) major NSR permitting in accordance with federal PSD; and (2) major NSR permitting in accordance with the NA NSR regulations codified by the state of Maryland in the Code of Maryland Regulations Title 26 Subtitle 11 Chapter 17 (COMAR 26.11.17).

The Hagerstown plant is located in Washington County, which has been designated by U.S. EPA as attainment or maintenance for all criteria pollutants. However, because Maryland is part of the Ozone Transport Region (OTR), Washington County is regulated under NA NSR as a moderate nonattainment area with respect to ozone. Attainment pollutants are regulated under the PSD program and nonattainment pollutants and ozone precursors (e.g., NO_x and VOCs) are regulated under the NA NSR program.

B.3 Prevention of Significant Deterioration Applicability

Attainment pollutants under PSD follow COMAR 26.11.06.14 which incorporates the federal PSD rules into the Maryland State Implementation Plan (SIP). Portland cement plants are classified as one of the 28 listed source categories in 40 CFR 52.21(b)(1)(i)(a) with a 100 ton per year (tpy) “major” source PSD threshold. Holcim is considered an existing major source under PSD based on potential emissions of TSP, PM_{10}, $PM_{2.5}$,

NO_2, CO, SO_2, and CO_2e. If a major source will undergo a physical or operational change, the facility must determine whether the project will be considered a major modification. Per 40 CFR 52.21(b)(2)(i), in order to be a major modification the project must result in a significant emissions increase, and a significant *net* emissions increase. Per 40 CFR 52.21(b)(3), the net emissions increase applicability test includes evaluating the pollutant increases and decreases associated with the proposed project as well as any projects occurring contemporaneously with the proposed project. If a significant emissions increase and a significant net emissions increase results, then PSD permitting is required, which is determined on a pollutant specific basis.

A significant emissions increase or a significant net emissions increase is defined by comparing the emissions increase or net emissions increase value with the established Significant Emission Rate (SER) for that pollutant. Table B-1 identifies the PSD regulated pollutants typically associated with portland cement plants and their associated SERs.

Appendix Table B-1. PSD Significant Emission Rates[14]

Pollutant	Significant Emission Rate (tpy)
Greenhouse Gas Emissions (CO2e)	75,000
Carbon Monoxide (CO)	100
Nitrogen Dioxide (NO2)	40
Sulfur Dioxide (SO2)	40
PM with a diameter of 10 microns or less (PM10)	15
PM with a diameter of 2.5 microns or less (PM2.5)	10
Total Suspended Particulate Matter (TSP)	25
Lead (Pb)	0.6
Fluorides	3

B.3.1. Baseline Actual Emissions

An emissions increase is defined as the amount by which the new level of emissions associated with the proposed project exceeds the old or baseline levels (i.e., the emissions from existing operations prior to the change associated with the proposed project). For existing emission units (other than an electric utility steam generating unit), 40 CFR 52.21(b)(48)(ii) defines “baseline actual emissions” as the average rate, in tons per year, at which an emissions unit actually emitted the pollutant. This baseline period is to be based on any consecutive 24-month period selected by the owner/operator within the 10-year period immediately preceding the date that construction begins on the proposed project or the date that a complete permit application is received by the Administrator or permitting authority, whichever is earlier. If the project involves multiple emission units, then only one 24-month period can be used to determine baseline actual emissions for all emissions units being changed as part of the proposed project; however, different baseline periods can be used for different pollutants. For new emission units, 40 CFR 52.21(b)(48)(iii) defines the baseline emissions for each new unit to be zero.

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[14] Note that other regulated air pollutants, such as hydrogen sulfide, total reduced sulfur, and reduced sulfur compounds, have defined SERs but have not been listed here as existing and project emissions are expected to be insignificant for these pollutants.

40 CFR 52.21(b)(48)(ii) defines the baseline emissions as follows:

> *For an existing emissions unit (other than an electric utility steam generating unit), baseline actual emissions means the average rate, in tons per year, at which the emissions unit actually emitted the pollutant during any consecutive 24-month period selected by the owner or operator within the 10-year period immediately preceding either the date the owner or operator begins actual construction of the project, or the date a complete permit application is received by the Administrator for a permit required under this section or by the reviewing authority for a permit required by a plan, whichever is earlier, except that the 10-year period shall not include any period earlier than November 15, 1990.*

For the low carbon engineered fuels project, the kiln system is an existing emission unit and the low carbon engineered fuel handling system is comprised of new emission units. As such, baseline actual emissions only include emissions from the kiln system.

Baseline actual emissions for the kiln system were determined for each pollutant based on emissions submitted by Holcim in annual emission certification reports. Baseline actual emissions are provided in Table B-2.

Appendix Table B-1. PSD Actual Emissions

Pollutant	Baseline Actual Emissions (tpy)	Baseline Period[15]
CO_2e	433,147	2018-2019
CO	282	2018-2019
NO_2	1,199	2014-2015
SO_2	707	2013-2014
PM_{10}	92	2014-2015
$PM_{2.5}$	85	2014-2015
TSP	57	2011-2012
Pb	0.02	2014-2015
Fluorides	0.2	2018-2019

B.3.2. PSD Applicability Determination – Step 1

To determine the emissions increase, the difference between the baseline actual emissions (BAE) and the expected new level of emissions after the change is computed for the project. This is commonly referred to as Step 1 of the applicability procedure (Step 2 is referred to as contemporaneous site-wide netting). For existing sources, there are two methods that may be used: 1) Comparison of post-change potential to emit (PTE) to pre-change baseline actual emissions; or 2) Comparison of post-change projected actual emissions (PAE) to pre-change baseline actual emissions. Specifically, the NSR Reform provisions under 40 CFR 52.21(a)(2)(iv) allow for the new level of emissions (post-change) to be based on either the projected actual emissions (for existing units only) or the potential emissions (for new and existing units).

For this analysis, Holcim utilized potential emissions for determining PSD permitting applicability for CO_2e, CO, NO_2, SO_2, TSP, lead, and fluorides, and utilized projected actual emissions for PM_{10} and $PM_{2.5}$.

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[15] For simplification, Holcim has elected to use two consecutive calendar years for the 24-month period even though the applicable regulations allow any 24-month.

BAE-PTE Analysis – CO_2e, CO, NO_2, SO_2, TSP, Lead and Fluorides

The emissions increase for CO_2e, CO, NO_2, SO_2, TSP, lead, and fluorides was determined by comparing potential future emissions to baseline actual emissions. Potential emissions for this project include emissions from the kiln system and TSP emissions from low carbon engineered fuel handling. The potential emissions from the kiln system are those limits that currently exist in the facility's Title V permit. The emissions increases of these pollutants from the project, compared to the applicable SERs, are provided in Table B-3.

Appendix Table B-1. Project Emissions Increase – CO_2e, CO, NO_2, SO_2, TSP, Lead, and Fluorides

Pollutant	Baseline Actual Emissions (tpy)	Future Potential Emissions (tpy)	Project Emissions Increase (tpy)	Significant Emission Rate (tpy)	Project Increase >SER?
CO_2e	433,147	799,000	365,853	75,000	Yes
CO	282	1,700	1,418	100	Yes
NO_2	1,199	765	-434	40	**No**
SO_2	707	655	-52	40	**No**
TSP	57	64	8	25	**No**
Pb	0.02	0.17	0.15	0.6	**No**
Fluorides	0.2	0.4	0.1	3	**No**

As shown in Table B-3, the project emissions increase is below the SER for NO_2, SO_2, TSP, lead, and fluorides. As such, no contemporaneous site-wide net emissions increase evaluation (Step 2) is needed and PSD permitting is not applicable to these pollutants. However, the project emissions increase is above the SER for CO_2e and CO. These are the same two pollutants that required PSD permitting for the kiln modernization project. Since the increase from that project was previously relied upon for PSD permitting and there have been no subsequent increases or decreases in these pollutants since the kiln modernization project, there are no contemporaneous changes to attempt Step 2 applicability. Furthermore, the difference between baseline actuals and potential emissions for the modernized kiln is sufficiently large, use of projected actual emissions is not feasible in terms of supporting a non-applicability determination. Therefore, PSD permitting is required for CO_2e and CO. As required under the PSD regulations, a best available control technology (BACT) analysis for CO and CO_2e is provided in Appendix C and an air dispersion modeling analysis for CO is provided in Appendix D.

BAE-PAE Analysis – PM_{10} and $PM_{2.5}$

For PM_{10} and $PM_{2.5}$, Holcim utilized projected actual emissions to determine PSD permitting non-applicability.

For the kiln system, projected actual emissions were calculated utilizing stack testing data and PC MACT emission limits. Five rounds of annual particulate stack testing have been conducted on the modernized kiln. In accordance with 40 CFR 63.1343(b)(2), Holcim is required to meet an alternative PM emissions limit to demonstrate compliance with the PC MACT. This alternative PM (PM_{alt}) emission limit changes with each stack test based on the flowrates and clinker production rate during the test. Projected actual emissions were calculated using the highest PM_{alt} from stack testing, 0.109 pounds of PM per ton of clinker produced (lb/ton of clinker). To calculate emission factors for filterable PM_{10} and $PM_{2.5}$, Holcim assumed all PM is smaller than 10 microns (i.e., PM = PM_{10}) and utilized particle sizing data published by the Portland Cement

Association (PCA) for $PM_{2.5}$.[16] These assumptions are consistent with how Holcim calculates filterable PM_{10} and $PM_{2.5}$ emissions for annual emission certification reports.

No stack testing has been conducted for condensable PM since the startup of the modernized kiln. Therefore, the average of available stack testing data for condensable PM between 2003 and 2012 was utilized to calculate projected actual condensable PM emissions.

Projected actual production was determined based on the 30-day maximum actual clinker production since the startup of the modernized kiln. This production amount was extrapolated to a full year assuming 10% annual downtime. Table B-4 shows the calculated projected actual emissions for the kiln system.

Appendix Table B-1. Projected Actual Emissions for Kiln System – PM_{10} and $PM_{2.5}$

Pollutant	Emission Factor (lb/ton of clinker)	Projected Clinker Production (tpy)	Projected Actual Emissions (tpy)
PM_{10}	0.257	818,679	105.2
$PM_{2.5}$	0.250	818,679	102.5

Since the low carbon engineered fuel material handling equipment is new, the projected actual emissions of this equipment is equal to the potential to emit of the equipment.

As part of the baseline actual emissions to projected actual emissions analysis, Holcim has excluded the portion of the projected actual emissions from the kiln that could have been accommodated during the baseline period as allowed under 40 CFR 52.21(b)(41)(ii)(c). Emissions to be excluded were calculated based on the same emission factors used to calculate baseline actual emissions (i.e., stack testing data). The total clinker production that could have been accommodated was calculated based on the maximum daily production during the baseline period, extrapolated to an annual production amount assuming annual downtime of 10%. Then, the production for the amount of emissions to be excluded was calculated as the difference between this projected amount and the actual production (two-year average) during the baseline period. This calculation is shown in Table B-5.

Appendix Table B-2. Excluded Production – PM_{10} and $PM_{2.5}$

	Value	Source
Baseline Production (tpy)	517,079	Actual average annual production during baseline period
Daily Production (tons per day)	1,877	Actual maximum daily clinker production during baseline period
CHA Production (tpy)	616,595	Calculated as daily production (1,877) x 365 days/year x 0.90 to account for 10% downtime
Excluded Production (tpy)	99,515	Calculated as difference between CHA production and baseline production

Table B-6 provides the emissions for the could have been accommodated exclusion.

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[16] PCA, *Innovations in Portland Cement Manufacturing*, Tables 6.2.2 and 6.2.3.

Appendix Table B-3. Could Have Accommodated Excluded Emissions – PM_{10} and $PM_{2.5}$

Pollutant	Emission Factor (lb/ton of clinker)	Excluded Production (tpy)	Excluded Emissions (tpy)
PM_{10}	0.354	99,515	17.6
$PM_{2.5}$	0.328	99,515	16.3

Utilizing the baseline actual emissions (pre-project emissions), projected actual emissions (post-project emissions), and excluded emissions (emissions that could have been accommodated before this project) in Tables B-2, B-4, and B-6, respectively, the project emissions increase was calculated and compared to the SER. Table B-7 provides the results of this analysis.

Appendix Table B-4. Project Emissions Increase – PM_{10} and $PM_{2.5}$

	PM_{10}	$PM_{2.5}$
Baseline Actual Emissions – Kiln System (tpy)	91.5	84.9
Excluded Emissions – Kiln System (tpy)	17.6	16.3
Projected Actual Emissions – Kiln System (tpy)	105.2	102.5
Potential Emissions – New Material Handling System (tpy)	0.7	0.6
Project Emissions Increase (tpy)	-3.2	1.9
Significant Emission Rate (tpy)	15	10
Project Increase >SER?	**No**	**No**

As shown in Table B-7, the project emissions increases of PM_{10} and $PM_{2.5}$ are below their respective SERs. Therefore, PSD permitting is not required for these pollutants.

B.4. Nonattainment New Source Review

In Maryland, the NA NSR program is implemented through COMAR 26.11.17 for ozone. Holcim is considered an existing major source under NA NSR for NO_x and existing minor source for VOC. For emissions of VOC, the proposed project would be subject to NA NSR if it meets the definition of major stationary source in itself under the NA NSR program [i.e., potential to emit emissions from the proposed project are above the Major Source Threshold (MST)]. For emissions of NO_x, the facility must determine whether the project will be considered a major modification. Per COMAR 26.11.17.02F, in order to be a major modification the project must result in a significant emissions increase, and a significant *net* emissions increase. In accordance with COMAR 26.11.17.01B(19), the net emissions increase applicability test includes evaluating the pollutant increases and decreases associated with the proposed project as well as any projects occurring contemporaneously with the proposed project. If a significant emissions increase and a significant net emissions increase results, then NA NSR permitting is required, depending on the regulated air pollutant.

COMAR 26.11.17.01B(3)(c) defines the baseline emissions as follows:

> *For an existing emissions unit, other than an electric utility steam generating unit, "baseline actual emissions" is determined by the average rate, in tons per year, at which the emissions unit actually emitted the pollutant during any consecutive 24-month period selected by the owner or operator within the 5-year period immediately preceding the date on which a complete application was submitted. The Department may allow a different 24-month consecutive time period, within the last 10 years, upon a demonstration that it is more representative of normal source operations.*

A significant emissions increase or a significant net emissions increase is defined by comparing the emissions increase or net emissions increase value to the established SER/MST for that pollutant. Table B-8 identifies the NA NSR regulated pollutants and their corresponding SERs/MSTs.

Appendix Table B-1. NA NSR Significant Emission Rates/Major Source Thresholds

Pollutant	Significant Emission Rate/Major Source Threshold (tpy)
Nitrogen Oxides (NO_x)[A]	40 (SER)
Volatile Organic Compounds (VOC)[B]	50 (MST)

[A] Note that NO_x and VOC are regulated as precursors to ozone.

[B] The facility is an existing minor source for VOC. The NA NSR emissions threshold for an existing minor source is the major source threshold.

Baseline actual emissions for NA NSR applicability were determined using monthly CEMS and clinker production data. Holcim has selected the baseline period for NO_X and VOC as indicated in Table B-9. Note that for NA NSR permitting purposes, the same baseline period must be used for all pollutants.

Appendix Table B-2. NA NSR Baseline Actual Emissions

Pollutant	Baseline Actual Emissions (tpy)	Baseline Period
NO_X	370	December 2018 – November 2020
VOC	38.1	December 2018 – November 2020

B.4.1. BAE-PTE Analysis – VOC

The emissions increase for VOC was determined by comparing potential emissions to baseline actual emissions. Potential emissions for this project only include emissions from the kiln system for VOC. The VOC emissions increase from the project, compared to the applicable MST, is provided in Table B-10.

Appendix Table B-1. Project Emissions Increase – VOC

Pollutant	Baseline Actual Emissions (tpy)	Future Potential Emissions (tpy)	Project Emissions Increase (tpy)	Significant Emission Rate or Major Source Threshold (tpy)	Project Increase >SER or MST?
VOC	38.1	46.8	8.6	50	No

Based on the analysis summarized in Table B-10, the low carbon engineered fuels project does not trigger NA NSR permitting for VOC.

B.4.2. BAE-PAE Analysis – NO_X

For NO_X, Holcim utilized projected actual emissions to determine NA NSR permitting non-applicability.

The only source of NO_X emissions included in the project is the kiln system. For the kiln system, projected actual emissions were calculated utilizing the kiln's average NO_X emissions during the baseline period and the same production values as used for the PM_{10} and $PM_{2.5}$ PAE calculations detailed above. Table B-11 shows the calculated projected actual emissions for the kiln system.

Appendix Table B-1. Projected Actual Emissions for Kiln System – NO_X

Pollutant	Emission Factor (lb/ton of clinker)	Projected Clinker Production (tpy)	Projected Actual Emissions (tpy)
NO_X	1.313	818,679	537.4

As part of the baseline actual emissions to projected actual emissions analysis, Holcim has excluded the portion of the projected actual emissions from the kiln that could have been accommodated during the baseline period as allowed under COMAR 26.11.17.01B(23)(b)(iii). Emissions to be excluded were calculated based on the same emission factors used to calculate baseline actual emissions (i.e., CEMS data). The total clinker production that could have been accommodated was calculated based on the maximum monthly production during the baseline period, extrapolated to an annual production amount assuming annual downtime of 10%. Then, the production for the amount of emissions to be excluded was calculated as the difference between this projected amount and the actual production (two-year average) during the baseline period. This calculation is shown in Table B-12.

Appendix Table B-2. Excluded Production – PM_{10} and $PM_{2.5}$

	Value	Source
Baseline Production (tpy)	554,852	Actual average annual production during baseline period
Monthly Production (tons per month)	69,756	Actual maximum monthly clinker production during baseline period
CHA Production (tpy)	753,364	Calculated as monthly production (69,756) x 12 months/year x 0.90 to account for 10% downtime
Excluded Production (tpy)	198,512	Calculated as difference between CHA production and baseline production

Table B-13 provides the emissions for the could have been accommodated exclusion.

Appendix Table B-3. Could Have Accommodated Excluded Emissions – NO_X

Pollutant	Emission Factor (lb/ton of clinker)	Excluded Production (tpy)	Excluded Emissions (tpy)
NO_X	1.313	198,512	130.3

Utilizing the baseline actual emissions (pre-project emissions), projected actual emissions (post-project emissions), and excluded emissions (emissions that could have been accommodated before this project) in Tables B-9, B-11, and B-13, respectively, the project emissions increase was calculated and compared to the SER. Table B-14 provides the results of this analysis.

Appendix Table B-4. Project Emissions Increase – NO_X

	NO_X
Baseline Actual Emissions (tpy)	369.6
Excluded Emissions (tpy)	130.3
Projected Actual Emissions (tpy)	537.4
Project Emissions Increase (tpy)	37.5
Significant Emission Rate (tpy)	40
Project Increase >SER?	**No**

As shown in Table B-14, the project emissions increase of NO_X is below the SER. Therefore, NA NSR permitting is not required for NO_X.

B.5. NSR Permitting Conclusion

As discussed above, the low carbon engineered fuels project will require PSD permitting for CO_2e and CO. The required BACT analysis and air dispersion modeling provisions for PSD permitting are addressed in Appendix C and Appendix D, respectively. No NA NSR permitting or PSD permitting for other pollutants is required.

APPENDIX C. BACT ANALYSIS

A CO and GHG Best Available Control Technology (BACT) analysis is required for the proposed project as it results in a significant emissions increase and a significant net emissions increase for these pollutants. A BACT analysis takes into account energy, environmental, and economic concerns. Given the lack of changes to potential control options since the 2013 PSD Permit to Construct application for the modernized kiln, this analysis is essentially a re-analysis of BACT for these pollutants. The information below has been updated but the conclusions remain the same.

C.1. BACT Methodology

Attainment pollutants under PSD follow COMAR 26.11.06.14 which incorporates the federal PSD rules into the Maryland SIP. Because of this, the federal PSD regulations as stated in 40 CFR 52.21 apply to facilities in Maryland, which trigger PSD requirements.

40 CFR 52.21(b)(12) defines BACT as:

> *an emissions limitation (including a visible emission standard) based on the maximum degree of reduction for each pollutant subject to regulation under Act which would be emitted from any proposed major stationary source or major modification which the Administrator, on a case-by-case basis, taking into account energy, environmental, and economic impacts and other costs, determines is achievable for such source or modification through application of production processes or available methods, systems, and techniques, including fuel cleaning or treatment or innovative fuel combustion techniques for control of such pollutant. In no event shall application of best available control technology result in emissions of any pollutant which would exceed the emissions allowed by any applicable standard under 40 CFR parts 60 and 61. If the Administrator determines that technological or economic limitations on the application of measurement methodology to a particular emissions unit would make the imposition of an emissions standard infeasible, a design, equipment, work practice, operational standard, or combination thereof, may be prescribed instead to satisfy the requirement for the application of best available control technology. Such standard shall, to the degree possible, set forth the emissions reduction achievable by implementation of such design, equipment, work practice or operation, and shall provide for compliance by means which achieve equivalent results.*

U.S. EPA's memo dated December 1, 1987, instated the policy of the "top-down" BACT analysis, in which all available control technologies are ranked in descending order according to their effectiveness.[17] The most stringent option is considered BACT unless it can be shown that the limit cannot be achieved, based on technical considerations or on energy, environmental, or economic impacts.

U.S. EPA issued the New Source Review Workshop Manual in October of 1990 and PSD and Title V Permitting Guidance for Greenhouse Gases in March 2011, which both contain detailed guidance on establishing BACT limit through the "top down" analysis.[18] The five key steps to the analysis are as follows:

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[17] U.S. EPA, Office of Air and Radiation, Memorandum from J.C. Potter to the Regional Administrators, Washington, D.C., December 1, 1987.

[18] U.S. EPA, New Source Review Workshop Manual (Draft): Prevention of Significant Deterioration and Nonattainment Area Permitting, October 1990.

- Step 1. *Identify all control technologies.* The first step in the BACT analysis is to identify all potential control technologies for each pollutant.

- Step 2. *Eliminate technically infeasible options.* The second step in the BACT analysis is to eliminate any technically infeasible control technologies. Each control technology for each pollutant is considered, and those that are clearly technically infeasible are eliminated. U.S. EPA states the following with regard to technical feasibility:[19]

  > *A demonstration of technical infeasibility should be clearly documented and should show, based on physical, chemical, and engineering principles, that technical difficulties would preclude the successful use of the control option on the emissions unit under review.*

- Step 3. *Rank remaining control technologies by control effectiveness.* The control technologies are then ranked in order of effectiveness.

- Step 4. *Evaluate most effective controls and document results.* The remaining control technologies are evaluated on the basis of economic, energy, and environmental considerations.

- Step 5. Select BACT.

U.S. EPA has consistently interpreted the statutory and regulatory BACT definitions as containing two core requirements that the agency believes must be met by any BACT determination, irrespective of whether or not it is conducted in a "top-down" manner. First, the BACT analysis must include consideration of the most stringent available technologies (i.e., those which provide the "maximum degree of emissions reduction"). Second, any decision to require a lesser degree of emissions reduction must be justified by an objective analysis of "energy, environmental, and economic impacts" contained in the record of the permit decision.[20] In addition, the minimum control efficiency to be considered in a BACT analysis must result in an emission rate less than or equal to the NSPS emission rate for the source (if one exists).

This BACT analysis presents the top-down approach to determine BACT limits for emissions of CO and GHGs from the Hagerstown plant. Various control technologies were identified using the RACT/BACT/LAER Clearinghouse, studying available literature, researching current air regulations, and drawing from past engineering experience. Applicability of BACT to the project is discussed in detail below. In short, this project only involves the kiln system (which includes emissions from the kiln, coal mill, alkali removal system and clinker cooler through a combined stack) and new low carbon engineered fuel handling equipment. The new low carbon engineered fuel handling equipment does not emit CO or GHGs and thus is not subject to BACT review.

C.2. BACT Analysis for CO

A BACT analysis was conducted for each modified source of CO emissions. For the project at the Hagerstown plant, the kiln system sources have been included in the BACT analysis.

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[19] U.S. EPA, New Source Review Workshop Manual (Draft): Prevention of Significant Deterioration and Nonattainment Area Permitting, October 1990.

[20] Draft BACT Guidelines, March 15, 1990.

C.2.1. Step 1: Identify All Control Technologies

The first step in the BACT analysis is to identify all control technologies for each pollutant. Table C-1 presents the potential control technologies identified for the kiln.

Appendix Table C-1. Potential Control Technologies for CO

Portland Cement Kiln Control Technology
Regenerative Thermal Oxidation
Catalytic Incineration
Excess Air
Good Combustion Practices

U.S. EPA's RACT/BACT/LAER Clearinghouse lists good combustion practices as the only control for emissions of CO from kilns. The Clearinghouse provides a listing of recent RACT, BACT, and LAER determinations in the United States. We have supplemented this list with potential other control technologies for emissions of CO, which are explored further in the following sections. It should be noted that there has never been an add-on control technology applied to a cement kiln in the United States to specifically control CO emissions from a kiln.

C.2.2. Step 2: Eliminate Technically Infeasible Options

The second step in the BACT analysis is to eliminate any technically infeasible control technologies. Each control technology which is considered to be clearly infeasible based on physical, chemical, and engineering principles is eliminated. The control technologies and their technical feasibilities are summarized below.

Appendix Table C-1. Technical Feasibility Analysis for CO

Potential Cement Kiln Control Technologies	Technically Feasible (Y/N)?
Regenerative Thermal Oxidation	Y
Catalytic Incineration	N
Excess Air	N
Good Combustion Practices	Y

The following sections discuss the technologies listed in Table C-2 and the mechanisms through which they control the specified pollutants.

- **Regenerative Thermal Oxidation.** A regenerative Thermal Oxidizer (RTO) can be used for CO control in certain industries, although they are more typically employed to control VOC emissions. An RTO supplies sufficient combustion air at a suitable temperature to allow for up to 90% oxidation of CO to CO_2 and greater than 90% destruction of VOC. A properly designed and operated RTO will recover up to 95% of all heat energy in the gas stream. If necessary, the influent gas stream must be heated to the operating temperature of the RTO (>1,500°F) through the combustion in the gas stream of a relatively clean fuel (e.g., natural gas) and the direct contact of the gas stream with heat recovery media. Following oxidation, the gas with reduced CO concentration is exhausted through downstream direct-contact heat exchangers to recover the heat in the gas stream.

There are two cement plants in the U.S. that have RTOs installed for CO control: the TXI plant in Midlothian, Texas, and the Holcim plant in Dundee, Michigan. The Holcim plant installed the RTO as a result of a consent order regarding odors from the VOC emissions as a result of a kiln feed with high organic material content. The RTO/scrubber combination at the Holcim plant has not operated continuously because of operational problems and is now shutdown.

It should be pointed out that both of these installations rely solely on natural gas for supplemental fuel.

The addition of another source of combustion emissions to the kiln could also result in an increase in criteria pollutant emissions and would result in increased energy consumption. Although RTOs are technically feasible, site-specific engineering assessments would need to be completed to fully verify the technical feasibility of an RTO at the Hagerstown plant. For purposes of this BACT screening analysis, we have carried this technology forward and will conduct an economic feasibility analysis under Step 3 and 4.

- **Catalytic Incineration.** In a catalytic incineration (CI) system, the combustion gases pass over a catalyst (usually platinum) where the CO is converted into CO_2. CI systems use less fuel than RTO systems because the catalyst lowers the combustion temperature of the exhaust gas. The primary environmental hazards expected from this process is poisoning of the catalyst by raw material dust and SO_2 generated from the kiln pyroprocessing system. CI systems have been successfully applied to many industrial processes, but no attempt has ever been made to apply a CI system to a cement kiln.

A CI on a cement kiln would likely require pretreatment with a cleaning device as is done at the two facilities mentioned above. Due to the sensitive nature of the catalyst bed, a CI system is much more susceptible to plugging, fouling, and corrosion. For these reasons, CIs are considered technically infeasible and are eliminated as an option for the purposes of BACT.

- **Total Excess Air – Combustion Zone.** Excess air above the stoichiometric ratio of oxygen to fuel in combustion reactions reduces CO emissions by oxidizing CO to CO_2. However, cement kilns require a large amount of excess air for proper operation. Oxidizing conditions in the burning zone of the kiln are necessary for producing quality clinker, because high levels of O_2 and low levels of CO tend to stabilize alkali and calcium sulfates.[21] Adding excess air above the amount necessary for proper operation to either the kiln or the pre-calciner would cause a large increase in the NO_x emissions from the kiln. Figure C-1 shows the relation between percent oxygen in the kiln and concentrations of CO and NO_x in the kiln. It can be seen from this figure that as the percent oxygen increases in the kiln, concentration of CO decreases, while concentration of NO_x increases significantly.

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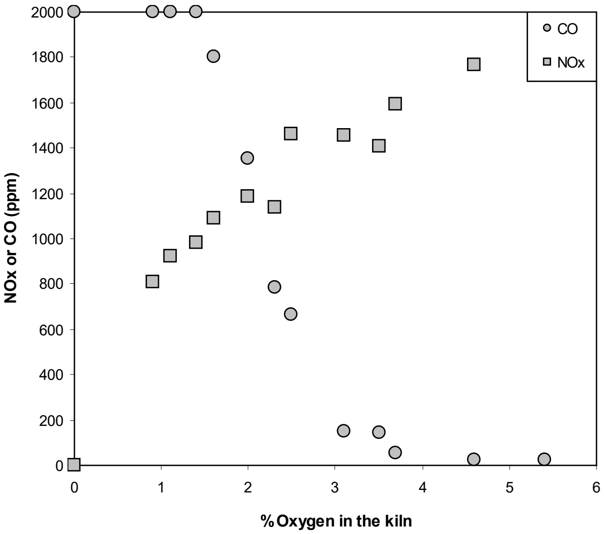
[21] Miller, F. M., Young, G. L., and von Seebach, M. "Formation and Techniques for Control of Sulfur Dioxide and Other Sulfur Compounds in Portland Cement Kilns." Portland Cement Association, Skokie, IL, 2001.

Appendix Figure C-1. Effect of Excess Oxygen on Concentrations of CO and NO$_x$ in Cement Kilns[22]



Creating more NO$_x$ to reduce CO emissions is an unacceptable compromise, particularly in an ozone nonattainment area. Further, rate of clinker production decreases with increase in excess air thus lowering the operating efficiency of the plant.[23]

Total excess air technology is not listed as a control option for cement kilns in the RACT/BACT/LAER Clearinghouse (RBLC). Because this method is inherent to the overall efficient operation of the kiln, excess air is not considered further in the BACT analysis for CO.

- **Good Combustion Practices (GCP).** A properly designed and operated portland cement kiln system minimizes CO formation from fuel combustion. GCP, however, has little to no effectiveness in controlling the generation of CO that emanates from raw materials used in the process. The kiln operator desires to minimize CO formation because excess CO indicates unutilized thermal energy potential which results in increased operating costs. The RBLC indicates that GCP is the predominant BACT technology used for the control of CO emissions.

C.2.3. Step 3: Rank Remaining Control Technologies by Control Effectiveness

The third step in the BACT analysis is to rank remaining control technologies by control effectiveness. Table C-3 summarizes the rankings for the remaining control technologies.

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[22] Hansen E., “The use of carbon monoxide and other gases for process control”, IEEE Transactions on Industrial Applications, v IA-22, n 2, pp 338-344, 1986.

[23] Hansen, E., “Changing process priorities when firing alternate fuels”, 45th IEEE-IAS/PCA Cement Industry Technical Conference, May 2002.

Appendix Table C-1. Control Technology Rankings

Potential Cement Kiln Control Technologies	Ranking
Regenerative Thermal Oxidation	1
Good Combustion Practices	2

C.2.4. Step 4: Evaluate Most Effective Controls and Document Results

The fourth step in a BACT analysis is to complete the top-down analysis of the applicable control technologies and document the results. The control technologies are evaluated on the basis of economic and environmental considerations.

- **Regenerative Thermal Oxidation.** Holcim has performed an economic analysis for this control technology to demonstrate that regenerative thermal oxidation does not constitute BACT. The basis of this analysis was the portland cement MACT cost analysis in the document "Summary of Environmental and Cost Impacts for Final Portland Cement NESHAP and NSPS" dated August 6, 2010 from U.S. EPA. Data was used from the U.S. EPA analyses and scaled to the size of the kiln at the Hagerstown facility.

The capital and operating costs for the RTO are approximately $5,311/ton of CO removed, as shown in the cost calculations in Appendix H. This estimate does not include the costs for obtaining a source of natural gas or the natural gas fuel costs necessary to operate the RTO. With all factors considered, this technology is not considered to be cost effective, and considering the adverse environmental effects of the RTO system, the RTO is eliminated from consideration as a BACT for CO control.

- **Good Combustion Practices – *Current BACT.*** A properly designed and operated kiln functions as a thermal oxidizer. CO formation is minimized with the kiln temperature and excess oxygen availability is adequate for complete combustion.

There are no material incremental costs associated with optimal operation of a properly designed kiln. Hence proper design and operation of the kiln is the most effective control operation for CO. This is supported by the RACT/BACT/LAER determinations for CO BACT on cement kilns.

Appendix Table C-1. Summary of U.S. EPA RBLC Information for Portland Cement Kilns (CO Determinations, 1990 to present)[A]

Company	Location	Kiln Type[A]	Permit Date	Technology Applied	In Operation (Yes/No)	Limit (lb/ton clinker)	Rejected Technology and $/Ton
Holcim	***Hagerstown, MD***	***PC (mod)***	***4/11/14***	***GCP***	***Yes***	***4.0***	***RTO-$4,700***
Lafarge – Kiln 1	Harleyville, SC	PC (mod)	8/18/06	GCP	Yes	10.5[B]	
Lafarge – Kiln 2	Harleyville, SC	PC (new)	8/18/06	GCP	No	6.8[B]	
Suwannee American Cement – Kiln 2	Branford, FL	PC (new)	2/15/06	GCP	No	2.90[B]	RTO
Sumter Cement	Sumter Co., FL	PC (new)	2/6/06	GCP	No	2.9[B]	RTO
American Cement	Sumter Co., FL	PC (new)	2/06	GCP	No	2.9[B]	RTO
Florida Rock Industries – Kiln 2	Newberry, FL	PC (new)	7/22/05	GCP	No	3.6-24 hr	RTO
Rinker/Florida Crushed Stone – Kiln 2	Brooksville, FL	PC (new)	7/6/05	GCP	No	3.6-24 hr	RTO
Holcim	Lee Island, MO	PC (new)	6/8/04	GCP	No	6.0[B]	
GCC Rio Grande	Pueblo, CO	PC (new)	3/5/04	GCP	Yes	2.11	
Lehigh Portland Cement	Mason City, IA	PC (mod)	12/11/03	GCP	Yes	3.7-3 hr	RTO-$5,900
Roanoke Cement Co.	Troutville, VA	PC (mod)	6/12/03	GCP	Yes	3.0-24 hr	RTO
GCC Dacotah	Rapid City, SD	PC (mod)	4/10/03	GCP	Yes	4.88	
Holcim	Theodore, AL	PC (mod)	2/4/03	GCP	Yes	10.6-annual	
Holcim (Devil's Slide)	Morgan, UT	PC (mod)	11/20/02	GCP	Yes	4.56	
Suwannee American Cement – Kiln 1	Branford, FL	PC (new)	6/1/00	GCP	Yes	3.60-3 hr	RTO
Monarch Cement	Humboldt, KS	PC (mod)	1/27/00	GCP	Yes	3.7-annual	RTO-$2,713
Holcim	Holy Hill, SC	PC (new)	12/22/99	GCP	Yes	6.8	
Lafarge	Davenport, IA	PC (mod)	11/9/99	GCP	Yes	1.64	
North Texas Cement	Whitewright, TX	PC (new)	3/4/99	GCP	No	2.9[B]	RTO
TXI	Midlothian, TX	PC (mod)	11/98	RTO	Yes	1.56	

Company	Location	Kiln Type[A]	Permit Date	Technology Applied	In Operation (Yes/No)	Limit (lb/ton clinker)	Rejected Technology and $/Ton
Ash Grove Cement[c]	Midlothian, TX	PC (mod)	5/12	GCP	No	1.23[B]	RTO-$11,464
Cemex, Inc.	AL	Kiln	9/14/02			3.72[D]	
Tarmac America LLC	Titan Florida Pennsuco, FL	Kiln	12/2/05	GCP		2[B]	
Houston American Cement, LLC	GA	Kiln (new)	6/19/07	GCP		2.9[B]	
Cemex, Inc.	GA	Kiln (new)	1/27/10	GCP		2.9[B]	
Lafarge Corporation	IA	PC (mod)	7/1/02	GCP		4.5	
Lafarge Midwest Inc.	Grand Chain, IL	Kiln (new)	7/6/07	GCP		2.5-12 month rolling	
Universal Cement	IL	PC (new)	12/20/11	GCP		1.05[B]	TO-$14,631
Lehigh Portland Cement	Union Bridge, MD	PC (new)	6/8/00	GCP		3.0[D]	
Holnam, Inc.	MI	Kiln (mod)	3/20/00			6.4	
Continental Cement Company	MO	Kiln (mod)	9/24/02			12-1 hr rolling, 10-8 hr rolling	
Continental Cement Company	MO	PC (new)	7/11/06	GCP		3.6	
Continental Cement Company	MO	PC (mod)	1/18/17	GCP		6.0[B]	
Argos USA, Kiln 1E	SC	PC (mod)	12/14/07	GCP		10.5[B]	
Argos USA, Kiln 2E	SC	PC (new)	12/14/07	GCP		6.8[B]	
Alamo Cement Company II, LTD	TX	Kiln (mod)	6/29/01	GCP		3.71[D]	
Texas Lehigh Cement Company LP	TX	PC (new)	10/24/19	GCP		3.0	

Company	Location	Kiln Type [A]	Permit Date	Technology Applied	In Operation (Yes/No)	Limit (lb/ton clinker)	Rejected Technology and $/Ton
Ash Grove Cement	WA		10/5/01			5.38[D]	
ESSROC Cement Corporation	Martinsburg, WV	PC (new)	6/2/05	GCP		4.0	
Ash Grove Cement	KS	PC (mod)	07/14/17	GCP	Yes	1169 tpy	
Alamo Cement Company Kiln No. 2	TX	PC (new)	8/27/17	GCP		1.67	
Capitol Aggregates	TX	PC (new)	6/30/17	GCP		3.0	
Cemex	TX	PC (mod)	10/8/13	GCP	Yes	1.38	
Lonestar Industries	TX	PC (new)	4/10/09	GCP		2.0	
Lehigh Cement Company	IN	PC (new)	06/27/19	GCP		1.4	
GCC Permian, LLC	TX	PC (new)	12/06/17	GCP		1.5[B]	
TXI Operations LP	TX	Kiln (mod)	11/07/17				
Lafarge Ravena	NY	Kiln	12/9/14			2.5[B]	

[A] PC = pre-calciner, mod = modification

[B] 30-day rolling average

[C] This project did not trigger PSD but was required to meet state BACT requirements

[D] Value is a calculated value. Limit was provided on a different basis (e.g., tpy).

[E] Kiln 2 has not been built yet. As such, the limit on Kiln 1 is not in effect currently.

C.2.5. Step 5: Select BACT

The fifth step in a BACT analysis is to select BACT based on the most stringent option not eliminated as technically, environmentally, or economically infeasible.

Holcim proposes a limit of 1,700 tons per year on a 12-month rolling average, as BACT for CO, using good combustion practices. Table C-4 lists is based on recent RACT/BACT/LAER Clearinghouse entries for CO emission limits applied to recent cement kiln permitting projects, as well as some additional permits issued in the last decade. The proposed CO BACT limit for the Hagerstown plant falls within the range of permitted BACT limits. CO emissions are generated from two sources in the cement pyroprocessing system: 1) organic carbon in the raw material, and 2) fuel combustion in the calciner and/or kiln. The lowest limits in the RBLC are from several facilities in Florida, Iowa, Texas, and Illinois, which are based on the geology of the limestone in those particular areas. When looking at the BACT limits near the Hagerstown plant (ESSROC Cement in West Virginia), the comparable rate is 4 lb/ton and the geology of the stone is more representative of the stone utilized at the Hagerstown plant. As such, the proposed level of 4 lb/ton represents BACT.

C.3. BACT for GHG Emissions

A BACT analysis was conducted for CO_2e (aka GHG) emissions from the kiln system. There are no other modified sources as part of this project that emit CO_2e and would require a BACT analysis.

For this GHG BACT analysis, various control technologies or combination of technologies were identified using the RACT/BACT/LAER Clearinghouse, available literature including guidance published by EPA, current air regulations, and engineering experience. Due to the relatively recent nature of the GHG BACT requirements, information on control technologies in the RACT/BACT/LAER Clearinghouse database is limited. In March 2011, EPA published GHG permitting guidance, as well as a white paper on available and emerging technologies for reducing GHG emissions from the portland cement industry in October 2010. Additionally, EPA published a series of videos on GHG permit training in December 2010. These publications from EPA were also considered in this GHG BACT analysis.

EPA has defined in 40 CFR 86.1818-12(a) GHGs as group of six gases: carbon dioxide (CO_2), nitrous oxide (N_2O), methane (CH_4), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF_6). GHG emissions from the kiln result from calcination and fuel combustion. Since the primary GHG emitted by a kiln is CO_2, the BACT analysis focuses on CO_2 emissions from the kiln. Emissions of CH_4 and N_2O are minimal from cement kilns.

Per EPA guidance, source-wide energy efficiency strategies are a consideration during a project, this kiln is designed to burn multiple fuels, including coal, petroleum coke, and tires. Accordingly, measures that Holcim already included in the design and operation include:

- Use of a pre-heater/pre-calciner kiln utilizing five stage pre-heater (discussed further under energy efficiency section of BACT for cement kiln).
- Use of “waste heat” from the kiln system to dry raw feed and fuel.
- Use of a high-efficiency clinker cooler.
- Use of a computerized process control and management system.
- Use of belt conveyors and bucket elevators (instead of pneumatic transport) since mechanical conveyor systems use less energy than pneumatic systems.

- Use of a vertical roller mill system with a high efficiency air separator and a high efficiency cyclone system (gravity type silos) in the raw mill. Use of the high efficiency separation process will result in less particle loading to the raw mill and therefore reduces the number of circulations to the raw mill.[24] This results in less electricity usage and could also reduce GHG emissions in the kiln system.
- Use of vertical roller mills in coal mill.[25]
- Use of high efficiency motors, variable speed drives, and high efficiency fans on all other miscellaneous handling and control devices to reduce energy consumption.

The current project under review is the addition of low carbon engineered fuel. Therefore, we incorporate the GHG BACT from the modernization kiln by reference into our analysis and note that low carbon engineered fuel is a sustainable fuel that reduces the reliance on traditional fossil fuels and does not compromise the existing GHG BACT for the kiln system. In fact, there are some benefits of using the low carbon engineered fuel in lieu of traditional fuels in terms of carbon intensity.

C.3.1. Step 1: Identify All Control Technologies

The CO_2 emissions from a cement kiln are generated by the calcination process (conversion of the calcium carbonate in limestone to calcium oxide) and by combustion of fuel in the kiln. Potential control technologies to reduce these CO_2 emissions for a cement kiln are addressed in EPA’s white paper on available and emerging technologies for reducing GHG emissions from portland cement industry.[26] These technologies are listed below in Table C-5.

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[24] Cement Sustainability Initiative, World Business Council for Sustainable Development (WBCSD), “Development of State of the Art-Techniques in Cement Manufacturing: Trying to Look Ahead”, (CSI/ECRA – Technology Papers), Section 3.16, June 2009. The referenced report was developed by Cement Sustainability Initiative (CSI), a member-led program of the WBCSD and represents independent research efforts of the European Cement Research Academy (ECRA).

[25] Cement Sustainability Initiative, World Business Council for Sustainable Development, “Development of State of the Art-Techniques in Cement Manufacturing: Trying to Look Ahead”, (CSI/ECRA – Technology Papers), Section 3.15, June 2009.

[26] U.S.EPA, Office of Air and Radiation, Available and Emerging Technologies for Reducing Greenhouse Gas Emissions from the Portland Cement Industry, Oct 2010.

Appendix Table C-1. Potential Control Technologies for CO_2

Category	Potential Cement Kiln Control Technologies
Energy Efficiency of the Clinker Production Process	Pre-heater/Pre-calciner Kiln Process
	Kiln Seal Management Program
	Refractory Selection (Kiln Insulation)
	Energy Recovery from Clinker Cooler
	Use of Fluxes and Mineralizers
Heat Recovery for Power	Cogeneration
Fuel Substitution	Use of Alternate Fuels (such as natural gas, whole tires, biofuels, etc.)
Product Composition	Use of Supplemental Raw Materials and Cement Additives
Carbon Capture/Removal and Storage	Carbon Sequestration
	Calera Process
	Oxy-combustion
	Post-combustion Solvent Capture and Stripping
	Post-combustion Membranes
	Superheated Calcium Oxide (CaO)

C.3.2. Step 2: Eliminate Technically Infeasible Options

The second step in the BACT analysis is to eliminate any technically infeasible control technologies. Each control technology which is considered to be clearly infeasible based on physical, chemical, and engineering principles is eliminated. The control technologies and their technical feasibilities are summarized in the Table C-6.

Appendix Table C-1. Technical Feasibility Analysis

Category	Potential Cement Kiln Control Technologies	Technically Feasible (Y/N)?
Energy Efficiency of the Clinker Production Process	Pre-heater/Pre-calciner Kiln Process	Y
	Kiln Seal Management Program	Y
	Refractory Selection (Kiln Insulation)	Y
	Energy Recovery from Clinker Cooler	Y
	Use of Fluxes and Mineralizers	N
Heat Recovery for Power	Cogeneration	N
Fuel Substitution	Use of Alternate Fuels (such as natural gas, whole tires, biofuels, etc.)	Y
Product Composition	Use of Supplemental Raw Materials and Cement Additives	N
Carbon Capture/Removal and Storage	Carbon Sequestration	N
	Calera Process	N
	Oxy-combustion	N
	Post-combustion Solvent Capture and Stripping	N
	Post-combustion Membranes	N
	Superheated CaO	N

Energy Efficiency of the Clinker Production Process

Pre-heater/Pre-calciner Kiln Process – Current BACT

Clinker production in the kiln generally accounts for over 95% of the energy use at a portland cement facility with in-line raw mill.[27] There are five types of cement kilns – wet process, long dry process, semidry process, dry process with pre-heater, and dry process with pre-heater/pre-calciner. Fuel consumption decreases and energy efficiency increases with the order of the kilns with the dry process with pre-heater/pre-calciner being the most energy efficient process.

The energy efficiency of pre-heater/pre-calciner kilns is achieved through the use of cyclone pre-heaters and a pre-calciner vessel. Standard pre-heater towers typically have three stages of preheat process. The kiln at the Hagerstown facility will have five stages. In the pre-heater stages, the kiln feed is pre-heated with the hot exhaust gases from the kiln. This staging occurs in cyclone structures contained in a pre-heater tower where hot flue gases from the kiln move counter currently to the kiln feed material. Thus, with the heat from the kiln flue gases recovered, process time is reduced due to contact between the raw feed materials and the hot gases. The length of the rotary kiln is also reduced. Gases exiting the pre-heater tower are further recovered and used to dry raw materials in the raw mill.

The pre-calciner will have a new separate tertiary air duct to supply hot air from the kiln hood or grate cooler. The pre-calciner will utilize multi-stage combustion technology and the existing selective non-catalytic reduction (SNCR) system. The pre-calciner improves fuel efficiency of the kiln by separating the majority of the “clinkering” step from the majority of the “calcination” step. This enables better management of fuels. Pre-heater/pre-calciner kiln technology is commercially available and has been demonstrated successfully at a number of cement plants and is therefore considered technically feasible.

Kiln Seal Management Program – *Current BACT*

Kilns have seals at their inlet and outlet to reduce heat “losses” due to air infiltration. Leakage increases fuel consumption due to the cooling effect of the air, reducing energy efficiency of the kiln, and increasing fuel requirements. At one existing cement facility, fuel consumption was reduced by 4% by maintaining an adequate kiln seal management program. Various types of seals are commercially available (include pneumatic, lamella-type, and spring-type seals) and are considered technically feasible.[28]

Refractory Selection (Kiln Insulation) – *Current BACT*

A cement kiln’s steel shell is lined in the combustion zone with heat resistant refractory to insulate the shell, reducing heat losses through the shell (and thus increasing energy efficiency) and protecting the shell from corrosive nature of the raw materials. Refractories can be made of materials such as bricks or cast refractory concrete. Having a high temperature insulating refractory reduces kiln fuel usage.

Choice of a refractory material depends on fuels, raw materials, and operating conditions. Selection of a refractory material needs to balance insulating abilities with durability to withstand possible localized acidic corrosion.

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[27] http://www.energystar.gov/ia/business/industry/LBNL-54036.pdf

[28] U.S.EPA, Office of Air and Radiation, Available and Emerging Technologies for Reducing Greenhouse Gas Emissions from the Portland Cement Industry, Oct 2010.

Refractory selection is thus considered a technically feasible control technology to reduce CO_2 emissions.[29]

Design of Clinker Cooler – *Current BACT*

In the cement production process, clinker produced by the cement kiln is sent to the clinker cooler for rapid air-cooling before it is sent to the finish mill. In this process, clinker is cooled from about 2,000°F to 200°F.[30] This rapid cooling improves grindability of the clinker and optimizes cement reactivity.[31] The cooling process is commonly utilized to reduce energy consumption by using heat from the clinker to preheat combustion air and fuel the kiln. In the clinker cooler, ambient air is blown through the blended material to enhance the cooling process. Hot air from the clinker cooler can be used as secondary combustion air for the kiln burner. A portion of the hot air can also be passed to the kiln pre-calciner as combustion air or to heat raw feed or coal.

Depending upon the design and complexity of the clinker cooler, recovery of up to 30% of the heat input to the kiln system is possible.

While older cement plants may use rotary coolers, modern cement plants use more efficient grate coolers. Grate coolers include travelling grate, reciprocating grate, or vertical coolers. Reciprocating grate coolers are more energy efficient than other types of clinker coolers.[32,33] Although reciprocating grate coolers increase electricity consumption by about 2.5 kWh/ton cement, use of a reciprocating grate cooler can reduce kiln fuel consumption by as much as 8 percent.[34] Grate coolers are a commercially available technology that has been demonstrated in practice at other cement plants and is therefore considered technically feasible.

Use of Fluxes and Mineralizers

The use of fluxes and mineralizers has been studied extensively in the cement industry. Reportedly, fluxes and mineralizers can be added to the cement kiln raw feed to lower the peak temperature required to form cementitious compounds in the clinker. This can correspondingly reduce fuel consumption and therefore has the potential to reduce GHG emissions.

Generally, the most useful fluxing agent is fluoride. Other fluxes exist but have less positive impact and more negative side effects to the cement kiln operations and product quality. Small amounts of fluoride can reduce the peak temperature in the cement kiln required to form cement clinker by 100-200 °F. Currently, the most common source of fluoride as a flux is spent aluminum potliner which is a hazardous waste and can therefore only be used at cement plants permitted to burn hazardous wastes.

There are a number of significant potential negative side effects of using fluoride as a fluxing agent. Decreases in product strength are a concern (which limits the uses of cement), as well as a possible negative impact on the downstream use of fly ash and slags to create blended cements. Fluorides are also known to be corrosive to cement kiln refractory and this can increase the frequency of kiln maintenance and

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[29] Ibid

[30] http://www.cdphe.state.co.us/ap/down/FSclinkcool.pdf

[31] http://www.ippc-russia.org/public/cluster07/BREF_Cement_Lime_Magnesia_EN.pdf

[32] Cement Sustainability Initiative, World Business Council for Sustainable Development, "Development of State of the Art-Techniques in Cement Manufacturing: Trying to Look Ahead", (CSI/ECRA – Technology Papers), Section 3.4, June 2009.

[33] U.S.EPA, Office of Air and Radiation, Available and Emerging Technologies for Reducing Greenhouse Gas Emissions from the Portland Cement Industry, October 2010.

[34] Ibid

decrease the overall kiln thermal efficiency. Further, because some cement kiln raw mixes and kiln systems can be over-sensitive to fluxing agents, there is the very real hazard that the use of fluorides in this manner could result in a kiln "going liquid" which results in molten material pouring into the clinker cooler, destroying the grate system in the cooler and resulting in significant damage and repairs (as well as a potential safety hazard to plant personnel). Based on the foregoing, this technology must be considered technically not feasible at this time.

Heat Recovery for Power - Cogeneration

Since the exhaust streams from cement manufacturing processes such as the kiln, clinker cooler, and pre-heater/pre-calciner contain significant amounts of heat energy, a portion of this heat could theoretically be used to generate power using steam or Rankine cycles, meeting some of the plant's electrical needs.

Given the inherent moisture content of the limestone feed to a kiln, as present when quarried, it is more appropriate to use the low-quality heat energy in the exhaust gases from the kiln system to dry the raw materials than for power generation. Holcim recently modernized the kiln to an appropriately designed five stage pre-heater/pre-calciner kiln with in-line raw mill. Since the kiln flue gases are relied upon to preheat the raw mix, the exhaust temperature from the kiln system that would be available for cogeneration would be approximately 200 °F. At this temperature, cogeneration is not an energy efficient option.

Therefore, cogeneration is not considered technically feasible.

Fuel Substitution

CO_2 emissions from fossil fuel burning in the kiln could be potentially reduced by using relatively cleaner burning fuels such as oil, natural gas, low carbon engineered fuels, and biomass. Although cement kilns in the U.S. use coal and petroleum coke as primary fuels, use of alternate fuels such as natural gas is technically feasible. The additional considerations on environmental and economic impacts of using alternate fuels are discussed in further sections.

Product Composition

At a cement plant, supplemental materials can be added in the raw feed (replacing raw limestone) or in the finish mill (replacing clinker). Since the supplemental materials would replace a portion of the clinker in the final product, less clinker is required to produce the same amount of final product; therefore, less fuel is required to produce clinker resulting in reduction of GHG emissions from the kiln. The additive materials are of two types: cementitious material and pozzolans. Cementitious materials have properties similar to cement and include materials such as blast furnace slag, iron slag, foundry sand etc. Pozzolan material exhibits cementitious properties when mixed with calcium hydroxide and includes materials such as diatomite, calcined clay, calcined shale, metakaolin, silica fume, and fly ash from coal combustion. It should be also noted that blending clinker with these supplemental materials creates blended cement products with different cement properties (for example, strength) depending on the supplemental material used. Regardless, cement produced must meet required quality standards set for all intended uses of the cement.

Likewise, since supplemental materials would replace a portion of the limestone in the raw feed, less limestone is required to produce the same amount of clinker; therefore, GHG emissions from calcinations could be reduced.

Potential use of any additive materials whether to replace clinker or limestone depends on quality, availability, and cost of the additive materials where the cement plant is located, cement standards based on type of cement to be produced (including minimum cement contents defined in the standards for concrete), demand and acceptance of the blended cement in the local market, and intended use of the cement.[35] For example, use of fly ash as a supplemental material strongly depends on availability of suitable fly ash. Use of fly ash may be limited depending on the mercury control technology used at the power plant that supplies fly ash. If the power plant uses activated carbon for mercury control, fly ash from such plant cannot be used as an additive since ash containing activated carbon can cause quality concerns given the finished cement may fail ASTM standards for air entrainment. Another example is of the 'blastfurnace cement' which is produced by mixing 80 – 95% of granulated blast furnace slag with clinker; however, due to low strength developments, this type of cement would be suitable only for very special applications and fail quality requirements for other applications. Availability of blast furnace slag is also limited by raw iron production levels, level of slag granulation, and competitive use for other applications. Further, quality (homogeneity) and cost of slag, market acceptance of the blended cement product, and design performance of the blended cement with respect to standards and regulations could limit the production of blended cement.[36] Likewise, introduction of supplemental raw materials into the raw feed, replacing limestone, is in general limited by the supplemental material composition since the raw reed is a precise recipe needed to assure clinker consistency. Excess silica, magnesium, aluminum, and other trace elements are of particular concern.[37]

If desired quality additive is not available in the local market, long distance procurement of the additives will result in additional GHG emissions from the additional long-distance transportation of the materials. In many cases, blending of the cement with supplemental materials primarily occurs at ready mix concrete plants when concrete is mixed.[38,39] The pre-blending of cement at the cement plant is prohibitive due to the large volume of cement produced and handled at the plant.

Reducing GHG emissions using additives in the product either to produce clinker or finished cement depends entirely on market demands for blended cement (which are not predictable) and availability of quality additives in the local area (the long-term nature of which is not presently established). Therefore, considering these factors, Holcim does not consider product composition as technically feasible.

Carbon Capture/Removal and Storage

The following potential carbon capture/removal and storage technologies can be considered for CO_2 emission control from cement kilns: Carbon Sequestration, the Calera Process, Oxy-combustion, post-combustion solvent capture and stripping, post-combustion membrane removal, and superheated calcium oxide (CaO).

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[35] Cement Sustainability Initiative, World Business Council for Sustainable Development, "Development of State of the Art-Techniques in Cement Manufacturing: Trying to Look Ahead", (CSI/ECRA – Technology Papers), Section 2.4.3, June 2009.

[36] Ibid.

[37] Cement Sustainability Initiative, World Business Council for sustainable Development, "Development of State of the Art-Techniques in Cement Manufacturing: Trying to Look Ahead", (CSI/ECRA-Technology Papers), Section 3.9, June 2009.

[38] World Business Council for Sustainable Development, "CO2 Accounting and Reporting Standard for the Cement Industry", June 2005.

[39] Ready-mix concrete plant may utilize as much as 14% of supplemental recycled raw materials, like fly ash and slag (byproducts of other nearby industries) in lieu of portland cement to make concrete. Making a pre-blended cement at the cement plant is not only prohibitive due to the large amounts of cement produced but also limits the potential for supplemental material use at the ready-mix concrete plants.

Carbon Sequestration

Carbon sequestration involves separation and capture of CO_2 from the kiln exhaust gases, pressurization of the captured CO_2, transportation of the captured CO_2 via pipeline, and injection and long-term geologic storage of the captured CO_2. The carbon sequestration technology is still under development and has not been demonstrated at any cement plant in the U.S. Further, the Hagerstown facility is located in an area with little to no known potential for nearby CO_2 sequestration, and there are no available CO_2 pipelines that could transport emissions from the Hagerstown plant. Carbon sequestration is therefore considered technically infeasible.

Oxy-combustion

Oxy-combustion is a process in which fuel (coal) is burned in presence of nearly pure oxygen instead of air. Nitrogen from the combustion air is removed using an air separation unit prior to feeding the air to the kiln. Under these conditions, the exhaust gases are rich in CO_2 (up to 80%). CO_2 from the exhaust gases is discharged to a CO_2 separation, purification, and compression facility. This technology is still in research stages, has not been demonstrated in practice at any cement plant in the U.S. Therefore, oxy-combustion is considered technically infeasible.

Calera Process

The Calera process involves capture of CO_2 by chemically converting CO_2 to carbonates. In this process, kiln exhaust gases are passed through a wet scrubber with high pH water containing calcium, magnesium, sodium, and chloride as the scrubbing liquid. CO_2 in the exhaust gases is absorbed in the water and is converted to carbonic acid. High pH of the water results in dissociation of the carbonic acid which reacts with the calcium and magnesium ions in the water to form carbonate minerals. The carbonate minerals can be precipitated from the solution for use in blended cement or other building materials. The scrubbing water can be treated to remove sodium chloride and reused as potable water. Although the Calera process has potential to be configured such that no industrial waste is discharged to the environment, it is still in research stages and has not been demonstrated in practice at more than pilot scale at any cement plant in the U.S. Therefore, the Calera process is considered technically infeasible.

Post-combustion Solvent Capture and Stripping

Post-combustion solvent capture and stripping involves a solvent based scrubber. The technology uses a scrubbing solvent such as monoethanolamine which chemically binds the CO_2 in the flue gas. The scrubbing solvent is then passed through a stripper where it is heated to release the bound CO_2. The stripped CO_2 can be then compressed and transported to a storage site for sequestration. Such type of post-combustion control has been studied extensively for combustion sources at gas fired power stations and has been used in the natural gas processing industry to remove hydrogen sulfide and CO_2 from natural gas. However, little information is available on application of this technology at cement plants. As detailed in the EPA's guidance on reducing GHG emissions from portland cement industry published in Oct 2010, several issues that still need to be addressed for application of this technology at cement plants include effect of SO_2 in the flue gas on formation of amine salts, solvent degradation due to NO_x in the flue gas, reduction in scrubber efficiency due to particulate in the flue gas, large steam requirements to strip CO_2 from the solvent, requirement to maintain oxidizing conditions in the kiln, cooling of the flue gas to optimum scrubber operating temperature, presence of other acidic compounds in the flue gas that may reduce efficiency of the scrubber, and management of large amount of wastewater that may be generated in the process. Since the technology is still being researched for cement plants and not commercially available and demonstrated in practice, it is considered technically infeasible.

Post-combustion Membrane

Post-combustion membrane technology uses permeable or semi-permeable membranes to separate CO_2 from flue gas. The separated CO_2 can be then compressed and sent to storage site for sequestration. This technology is still in the research stages for cement plants as membranes large enough to handle the kiln exhaust are not available yet. Therefore, this technology is considered technically infeasible.

Superheated Calcium Oxide (CaO)

In the superheated CaO process, calcination and combustion reactions are separated in independent chambers so that exhaust gases from the calcination process are rich in CO_2. This is achieved by providing heat to calciner using circulation of superheated CaO particles between a fluidized bed combustor and a fluidized bed calciner. The CO_2 rich exhaust from the calciner can be then collected, compressed, and sent for sequestration. This technology is still in theoretical phases and has not been demonstrated practically. Therefore, this technology is considered technically infeasible.

C.3.3. Step 3: Rank Remaining Control Technologies by Control Effectiveness

The third step in the BACT analysis is to rank remaining control technologies by control effectiveness. Table C-7 presents a summary of the remaining control technologies and their associated control efficiencies.[40]

Appendix Table C-1. Summary of Control Technologies

Potential Cement Kiln Control Technologies	Status
Fuel Substitution	Possible BACT
Pre-heater/Pre-calciner Kiln Process (multistage pre-heater)	Current BACT
Energy Recovery from 3rd Generation Rotary Clinker Cooler	Current BACT
Refractory Selection (Kiln Insulation)	Current BACT
Kiln Seal Management Plan	Current BACT

C.3.4. Step 4: Evaluate Most Effective Controls and Document Results

The fourth step in a BACT analysis is to complete the top-down analysis of the applicable control technologies and document the results. The control technologies are evaluated on the basis of economic and environmental considerations.

Fuel Substitution

Holcim uses coal as the primary kiln fuel with diesel fuel for start-up and pet coke and tires as an alternative fuel. Firing natural gas as the primary kiln fuel can reduce CO_2 emissions from fuel combustion by as much as 40%.[41] However, studies have shown that use of natural gas as primary kiln fuel results in three times

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[40] While evaluating available technologies for reducing GHGs and improving energy efficiency, it should be noted that it is not feasible to simply sum the energy efficiency savings for single measures to calculate total reduction potential since some of the technologies have interacting impacts, one unit of energy can be reduced only once, and many thermal energy reducing measures increase electrical energy consumption. (Reference - Cement Sustainability Initiative, World Business Council for Sustainable Development, “Development of State of the Art-Techniques in Cement Manufacturing: Trying to Look Ahead”, (CSI/ECRA – Technology Papers), Section 2.1.3, June 2009.)

[41] U.S.EPA, Office of Air and Radiation, Available and Emerging Technologies for Reducing Greenhouse Gas Emissions from the Portland Cement Industry, October 2010.

more NO_x emissions than NO_x emissions from coal firing.[42] Creating more NO_x to reduce GHG emissions is undesirable, particularly in an ozone nonattainment area like the Hagerstown area where impacts of the Hagerstown plant on ambient ozone air quality are of concern. Further, use of natural gas as the primary kiln fuel leads to limitation or decrease in kiln capacity due to large gas volumes.[43]

Although technically a cement kiln can be fueled exclusively by natural gas, in many regions it is not an economically feasible option.[44] We demonstrated in our 2013 BACT analysis for the kiln modernization project that the incremental cost of CO_2 control from using natural gas was more than $50 per ton of CO_2 removed which is considered economically infeasible.

Other alternative fuels that can be potentially used in a cement kiln include products such as low carbon engineered fuel that we are proposing. Use of such fuels depends primarily on availability.

Pre-heater/Pre-calciner Kiln Process – Current BACT

As explained previously, a pre-heater/pre-calciner kiln is the most energy efficient process to produce cement. The Holcim kiln is already the most energy efficient type: pre-heater/pre-calciner kiln with a five stage pre-heater. The kiln is appropriately designed as a five stage pre-heater for heat recovery from kiln exhaust gases given the expected moisture levels in the raw materials that are planned at the proposed site.

Energy Recovery from Clinker Cooler – Current BACT

As explained previously, grate coolers can be effectively used to recover energy from the clinker cooling process. Holcim utilizes a modern grate cooler in the clinker cooling process. Hot air from the clinker cooler is sent to the kiln burner as combustion air and to the pre-heater to heat raw feed, thus reducing the overall fuel usage in the kiln system.

Refractory Selection (Kiln Insulation) – Current BACT

As explained previously, kiln refractory in the combustion zone reduces heat loss from the kiln and protects the kiln shell from chemical and thermal stresses. Holcim installed proper kiln insulation by researching available kiln refractory materials to select proper refractory that will provide high insulating capacity and have long life for the design operating conditions at the Hagerstown plant.

Kiln Seal Management Program – Current BACT

As explained previously, properly maintained kiln seals can reduce fuel usage and increase energy efficiency of the kiln. Holcim has installed effective and long lasting kiln seals. Additionally, Holcim prepared an operation and maintenance plan for the facility to maintain the kiln seals in optimal operation condition to mitigate heat loss from the kiln.

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[42] Neuffer, B., Laney, M., “Alternative Control Techniques Document Update – NOx Emissions from New Cement Kilns”, US EPA # EPA-453/R-07-006, November 2007.

[43] Cement Sustainability Initiative, World Business Council for Sustainable Development, “Development of State of the Art-Techniques in Cement Manufacturing: Trying to Look Ahead”, (CSI/ECRA – Technology Papers), Section 3.11, June 2009.

[44] Ibid.

C.3.5. Step 5: Select BACT

The fifth step in a BACT analysis is to select BACT based on the most stringent control option not eliminated as technically, environmentally, or economically infeasible. Holcim proposes to continue to use an appropriately designed in-line raw mill pre-heater/pre-calciner kiln with five (5) stage pre-heater as BACT for GHG emissions. The proposed in-line raw mill pre-heater/pre-calciner kiln will provide finished product to the local market produced in the most energy efficient and environmentally sound method of producing portland cement, as well as in the most economical method. Additionally, Holcim utilizes modern grate coolers in the clinker cooling process, uses proper refractory that provides high insulating capacity and have long life for the design operating conditions at the Hagerstown plant, and implements a kiln seal management program as additional measures specific to the kiln system, that will reduce fuel requirements of the kiln which in turn will reduce GHG emissions. The proposed low carbon engineered fuel will not compromise these existing BACT elements.

Given the recent addition of GHGs as an NSR regulated pollutant, few if any comparable BACT limits are available to use as representative of a quantitative BACT limit. Nevertheless, Table C-8 provides BACT limits from cement kilns that we have been able to identify:

Appendix Table C-1. Normalized GHG BACT Limits for Cement Kilns

Plant	Normalized Emission Rate (ton CO_2e/ton clinker)
Holcim (Hagerstown, MD)	***0.94***
GCC Permian	0.92
Universal Cement	0.93
Carolinas Cement Company	0.91
Lafarge Ravena	0.95
GCC Rio Grande	0.95
Alamo Cement	0.961
Capitol Aggregates	0.97
Texas Lehigh Cement Company	0.97
Lehigh Cement Company	0.97

As such, Holcim is proposing a BACT limit equivalent to 0.94 ton CO_2e/ton clinker by complying with a 12-month total emissions limit of 801,270 tons per year. Holcim will use a continuous emission monitoring system (CEMS) for CO_2 to demonstrate compliance with this limit.

APPENDIX D. AIR DISPERSION MODELING REPORT

APPENDIX D – AIR DISPERSION MODELING REPORT

Holcim (US) Inc. / Hagerstown Plant

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April 2021

Project 202101.0007

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1. INTRODUCTION

Holcim (US) Inc. (Holcim) operates a cement manufacturing plant in Hagerstown, Maryland (Hagerstown Plant). Holcim is proposing a project that would allow co-processing of low carbon engineered fuels in the plant's existing kiln.

The proposed project will trigger Prevention of Significant Deterioration (PSD) permitting requirements for carbon monoxide (CO) and greenhouse gases (GHGs). The Maryland Department of the Environment (MDE) has adopted the federal PSD permitting program by reference in Title 26, Subtitle 11, Chapter 6, Section 14 of the Code of Maryland Regulations (COMAR 26.11.06.14) and has the full authority to implement this program through its United States Environmental Protection Agency (U.S. EPA) approved State Implementation Plan (SIP).

This modeling report outlines the methodologies used to conduct the air dispersion modeling analysis required under PSD for the proposed project. Air dispersion modeling is relied upon to demonstrate that the proposed project complies with the applicable National Ambient Air Quality Standards (NAAQS) for CO. There are no PSD Increment standards for CO. There are no NAAQS or PSD Increment standards for GHGs; as such, no air dispersion modeling is required for GHGs.

Holcim has included, as Attachment 1 of this modeling report, a flash drive containing all of the files associated with the air dispersion modeling analyses. This flash drive includes those files associated with importing terrain elevations, building downwash, meteorological data and AERMOD.

1.1 Proposed Facility Location

The Hagerstown Plant is located at 1260 Security Road in Hagerstown (Washington County), Maryland. Figure 1-1 presents a map indicating the location of the Hagerstown Plant. This area map shows the location of the facility relative to surrounding terrain and other features, such as roads and rivers.

Figure 1-1. Area Map of Hagerstown Plant

1.2 Project Overview

The Hagerstown Plant produces cement, masonry cement, and blended cement. The current kiln has been in operation since 1971 and was modernized in 2016 to a preheater/precalciner configuration. The plant currently operates under Maryland's Part 70 air operating permit program (Permit #24-043-00008). The existing plant consists of a quarry, raw mill, a preheater/precalciner cement kiln, clinker cooler, finish mill and associated equipment.

Holcim is proposing to co-process additional types of fuels (referred to as low carbon engineered fuels) in the portland cement kiln at the Hagerstown Plant.

Section 3 of the Permit to Construct Application Report provides details of the proposed project.

2. MODELING PROCEDURES

The following sections outline the air dispersion modeling analyses required under the PSD permitting program.

2.1 Significance Analysis

A significance analysis was used as part of a federal PSD modeling exercise to determine whether the calculated emissions resulting from the proposed project will result in a significant impact upon the area surrounding the Hagerstown Plant.

Before a significance analysis is performed, a project emission assessment is made (see Appendix B of the Permit to Construct Application Report) to determine for which pollutants modeling is required. To make this determination, Holcim compared the proposed emissions increases and net emissions increases of GHGs, CO, nitrogen dioxide (NO_2), sulfur dioxide (SO_2), particulate matter with an aerodynamic diameter less than 10 microns (PM_{10}), total suspended particulate (TSP), lead, and fluorides to the PSD significant emission rates (SERs). The results of that comparison are presented in Tables B-3 and B-7 of the Permit to Construct Application Report. A significance analysis is required for each pollutant with an emissions increase and net emissions increase above the SERs for which ambient air quality standards or PSD Increments apply. If the emissions increase or net emission increase does not exceed a SER for a PSD pollutant or if no ambient air quality standards exist for the pollutant, no modeling analysis is required for that pollutant. For the proposed project, emissions of CO and GHGs are above the SER. There are no ambient air quality standards for GHGs. As such, a significance analysis was performed for CO only.

Significant impact levels (SILs) are ambient concentration thresholds that represent a fraction of the NAAQS and PSD Increment standards and, based on U.S. EPA guidance, are deemed to indicate the level above which a particular facility may cause or contribute to air quality degradation.[1] Predicted air quality impacts of a project in excess of the SILs indicate a need for further analysis to determine whether a project's emissions might cause or contribute to an exceedance of a NAAQS or PSD Increment. In the significance analysis, the maximum-modeled ground-level concentrations are compared to the appropriate Class II SIL established by U.S. EPA (shown in Table 2-1).

Table 2-1. Applicable Significant Impact Levels

PSD Pollutant	Averaging Period	Federal Class II SIL ($\mu g/m^3$)
CO	1-hour	2,000
	8-hour	500

Typically, if predicted maximum impacts are below the applicable SILs for each pollutant and averaging period, no further modeling analysis is needed for demonstrating compliance with the NAAQS or the PSD Class II Increments. If the significance analysis finds project ambient impacts in excess of the SILs, a full impacts analysis with a regional source inventory is required to demonstrate that the proposed project does not cause or contribute to a violation of the NAAQS or consume more than the available PSD Class II Increment. Note that in the significance analysis, the highest first high (H1H) modeled impacts are

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[1] U.S. EPA Memorandum from Gerald Emison, U.S. EPA OAQPS, to Thomas Maslany, U. S EPA Air Management Division, Air Quality Analysis for Prevention of Significant Deterioration (PSD), July 5, 1988.

generally used for comparison against the SIL. The results of the significance analysis are outlined in Section 4.1.

2.2 Ambient Monitoring Requirements

In addition to determining whether the applicant can forego further analysis, the significance analysis is used to determine whether the applicant is exempt from ambient monitoring requirements. To determine whether pre-construction monitoring should be considered, the maximum impacts attributable to the project are assessed against significant monitoring concentrations (SMC). The SMC for the applicable averaging periods for CO are provided in 40 CFR §52.21(i)(5)(i) and are listed in Table 2-2.

Table 2-2. Applicable Significant Monitoring Concentrations

PSD Pollutant	Averaging Period	Federal Class II SMC (μg/m^3)
CO	1-hour	--
	8-hour	575

A pre-construction air quality analysis using continuous monitoring data may be required for pollutants subject to PSD review per 40 CFR §52.21(m). If either the predicted modeled impact from an emissions increase or the existing ambient concentration is less than the SMC, an applicant may be exempt from pre-construction ambient monitoring.

2.3 Class I Area Modeling Analyses

Class I areas are federally protected areas for which more stringent air quality standards apply to protect unique natural, cultural, recreational, and/or historic values. There are five Class I areas within 300 kilometers (km) of the Hagerstown Plant:

- Shenandoah National Park (95 km southwest);
- Brigantine Wilderness (291 km east);
- Dolly Sods Wilderness (166 km southwest);
- James River Face Wilderness (279 km southwest); and
- Otter Creek Wilderness (191 km southwest).

The Federal Land Managers (FLMs) have the authority to review and request impacts on Air Quality Related Values (AQRV) at Class I areas with the potential to be impacted by a proposed project. The FLM's AQRV Work Group (FLAG) 2010 guidance states that a ratio of visibility-affecting emissions to distance (Q/D) value of ten or less indicates that AQRV analyses should not be required.[2] Visibility-affecting pollutants are defined by the FLMs as: SO_2, NO_2, PM_{10} and sulfuric acid mist (H_2SO_4). Given that the proposed project is below the SERs for all visibility-affecting pollutants, no Class I area modeling analysis is required.

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[2] U.S. Forest Service, National Park Service, and U.S. Fish and Wildlife Service, Federal land managers' air quality related values work group (FLAG): phase I report – revised (2010), Natural Resource Report NPS/NRPC/NRR-2010/232, National Park Service, Denver, Colorado, 2010.

2.4 Toxic Air Pollutants Modeling Analysis

Maryland's Toxic Air Pollutants (TAPs) program under COMAR 26.11.15 and 26.11.16 requires a facility-wide evaluation of the potential to emit for all TAPs to be conducted if a source is required to obtain a permit to construct. Appendix A, Section A.1.3 of the Permit to Construct Application Report provides further detail on the TAPs program. As discussed in Section A.1.3, the only TAP potentially impacted by the project is crystalline silica. For other TAPs, the previously submitted TAPs analysis, including dispersion modeling, is still accurate.

A TAPs modeling analysis may include screening or refined modeling to demonstrate compliance with allowable ambient levels (AALs). Holcim conducted TAPs refined modeling as modeling for PSD compliance was already being conducted. For the kiln modernization project, Holcim conducted TAPs refined dispersion modeling for nineteen TAPs. This report provides an updated analysis for crystalline silica. Table 2-3 provides the AALs with which Holcim was required to demonstrate compliance through air dispersion modeling for this project. The results of this modeling are outlined in Section 6 of this report.

Table 2-3. Applicable TAP Allowable Ambient Levels

Pollutant	Averaging Period	AAL ($\mu g/m^3$)
Crystalline Silica	8-hour	1 [A]

a. Based on the 1991/1992 American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Value (TLV) per COMAR 26.11.15.01B(18).

3. MODELING METHODOLOGY

This section outlines the modeling procedures utilized in the PSD Class II modeling and TAP analyses for the proposed project at the Hagerstown Plant. The air dispersion modeling analyses were generally conducted in accordance with the following guidance documents:

- U.S. EPA's Guideline on Air Quality Models 40 CFR Part 51, Appendix W (Revised, November 9, 2005) (Guideline);
- U.S. EPA's AERMOD Implementation Guide http://www.epa.gov/scram001/7thconf/aermod/aermod_implmtn_guide_19March2009.pdf; and
- U.S. EPA's New Source Review Workshop Manual (Draft, October, 1990).

For the kiln modernization project, Holcim also conducted air dispersion modeling for CO and TAPs. Note that this analysis is identical to that analysis which was approved and accepted by MDE with the following exceptions:

- The version of AERMOD was updated to the latest version released by U.S. EPA; and
- The meteorological data was updated to the most recent data available from MDE.

This general methodology was approved by MDE on May 5, 2018.[3]

3.1 Model Selection

Dispersion models predict ambient pollutant concentrations by simulating the evolution of the pollutant plume over time and space given data inputs including the quantity of emissions, stack exhaust parameters (e.g., velocity, flowrate, and temperature) and meteorological data. Building structures that obstruct wind flow near emission points may cause stack discharges to become caught in the turbulent wakes of these structures leading to downwash of the plumes. Wind blowing around a building creates zones of turbulence that are greater than if the building were absent. These effects generally cause higher ground-level pollutant concentrations since building downwash inhibits dispersion from elevated stack discharges. For this reason, building downwash algorithms are considered an integral component of the selected air dispersion model.

The latest version (v19191) of the AERMOD model was used to estimate maximum ground-level concentrations in all air pollutant analyses conducted for this application. AERMOD is a refined, steady-state, multiple source dispersion model that was promulgated in December 2005 as the U.S. EPA-preferred model to use for industrial sources in this type of air dispersion modeling analysis.[4] Following procedures outlined in the Guideline, the AERMOD modeling was performed using regulatory default options except as otherwise noted in this report. The AERMOD model has the Plume Rise Modeling Enhancements (PRIME) incorporated in the regulatory version, so the direction-specific building downwash dimensions used as input were

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[3] Email from LiAn Zhuang (MDE) to Susan Barnes (Trinity Consultants) on May 7, 2018.

[4] 40 CFR 51, Appendix W-*Guideline on Air Quality Models*, Appendix A.1- AMS/EPA Regulatory Model (AERMOD), November 9, 2005.

determined by the Building Profile Input Program, PRIME version (BPIP PRIME), version 04274.[5] Table 3-1 summarizes the model control options that were utilized in this analysis.

Table 3-1. Model Selection Options

Control Option	Option Selected	Justification
Pollutant ID	CO	--
Terrain	Elevated, Meters	The receptor grid covers varying terrain elevations; as such, the elevated option was selected.
Flagpole Receptors	N/A	--
Run or Not	Run	--
Averaging Times	1-hour, 8-hour	CO has 1-hour and 8-hour standards
Model	PRIME	The PRIME algorithms are default.
Dispersion	Concentration, Rural, Regulatory Default Option	This modeling analysis is assessing compliance with concentration standards. Holcim is located in a predominantly rural area. The regulatory default option was selected as it is recommended in the *Guideline*.
Output Files	.aml	Model output file from Breeze User Interface

3.2 Meteorological Data

Site-specific dispersion models require a sequential hourly record of dispersion meteorology representative of the region within which the source is located. In the absence of site-specific measurements, the U.S. EPA guidelines recommend the use of readily available data from the closest and most representative National Weather Service (NWS) station. Regulatory air dispersion modeling using AERMOD requires five years of quality-assured meteorological data that includes hourly records of the following parameters:

- Wind speed;
- Wind direction;
- Air temperature;
- Micrometeorological Parameters (e.g., friction velocity, Monin-Obukhov length);
- Mechanical mixing height; and
- Convective mixing height.

The first three of these parameters are directly measured by monitoring equipment located at typical surface observation stations. The friction velocity, Monin-Obukhov length, and mixing heights are derived from characteristic micrometeorological parameters and from observed and correlated values of cloud cover, solar insulation, time of day and year, and latitude of the surface observation station. Surface observation stations form a relatively dense network, are almost always found at airports, and are typically operated by the NWS. Upper air stations are fewer in number than surface observing points since the upper atmosphere

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[5] Earth Tech, Inc., Addendum to the ISC3 User's Guide, The PRIME Plume Rise and Building Downwash Model, Concord, MA, November 1997.

is less vulnerable to local effects caused by terrain or other land influences and is therefore less variable. The NWS operates virtually all available upper air measurement stations in the United States.

The Guideline states in Section 8.3.1.2, “Meteorological Input Data – Recommendations” that:

> *... five years of representative meteorological data should be used when estimating concentrations with an air quality model. Consecutive years from the most recent, readily available 5-year period are preferred. The meteorological data may be collected either onsite or at the nearest National Weather Service (NWS) station.*

The meteorological data that are “representative” for a particular facility are typically determined subjectively, and the Guideline offers the following guidance in Section 8.3(a).

> *The meteorological data ... should be selected on the basis of spatial and climatological (temporal) representativeness as well as the ability of the individual parameters selected to characterize the transport and dispersion conditions in the area of concern. The representativeness of the data is dependent on: (1) the proximity of the meteorological monitoring site to the area under consideration; (2) the complexity of the terrain; (3) the exposure of the meteorological monitoring site; and (4) the period of time during which data are collected. The spatial representativeness of the data can be adversely affected by large distances between the source and receptors of interest and the complex topographic characteristics of the area.*

Holcim utilized 2012 to 2016 meteorological data from the Baltimore-Washington International Airport (KBWI), located roughly 100 km southeast of the Hagerstown Plant. Figure 3-1 shows the relative location of the Baltimore-Washington International Airport meteorological tower to the Hagerstown Plant.

Figure 3-1. Location of KBWI in Relation to Hagerstown Plant

AERSURFACE (version 13016) was used as an objective method for evaluating land use characteristics and their associated micrometeorological parameters for a given location. The AERSURFACE program was used in the evaluation of potential meteorological stations in the area. AERSURFACE was used to create seasonal values of albedo, Bowen ratio and surface roughness, across 12 directional sectors (e.g., 0-30 degrees). The albedo and Bowen ratio values were determined from taking the geometric mean over a 10-kilometer (km) area out from the location of interest. The surface roughness values assigned by AERSURFACE were based on a 1 km radius out from the site.

The figures in Attachment 2 illustrate the magnitude of the micrometeorological differences between the Holcim Plant and Baltimore-Washington International (BWI) Airport sites, as determined by AERSURFACE. For both meteorological data options, the albedo and Bowen ratio values show reasonable agreement across the directional sectors. There are some variations in surface roughness values over several sectors, but when averaged across the whole domain, differences are less than 60%. In addition, the BWI meteorological tower was chosen to be consistent with previous modeling efforts as this station was previously approved by MDE for PSD modeling of the Hagerstown Plant.

The KBWI meteorological tower has traditionally been used by Holcim as the most representative meteorological data for use in PSD air dispersion modeling analyses. The KBWI data was processed through the latest version of AERMET (v16216) to include upper air measurements from the Sterling, Virginia NWS site (WBAN ID# 93734). Per recent U.S. EPA guidance, 1-minute Automated Surface Observing System

(ASOS) wind data was also incorporated in the processing, using the latest version of AERMINUTE (v15272). This processor meteorological data was provided by MDE in April 2018.[6]

3.3 Treatment of Terrain

Through the use of the AERMOD terrain preprocessor (AERMAP), AERMOD incorporates not only the receptor heights, but also an effective height (hill height scale) that represents the significant terrain features surrounding a given receptor that could lead to plume recirculation and other terrain interaction.[7]

Receptor terrain elevations input to the model were interpolated from 1/3 arc second National Elevation Dataset (NED) data obtained from the U.S. Geological Survey (USGS). The array elevations were interpolated using the latest version of AERMAP (v11103). Base elevations for facility sources and buildings were based on site-specific survey data.

3.4 Receptor Grids

For this air dispersion modeling analysis, ground-level concentrations were calculated along the property line, within a Cartesian receptor grid outside of Holcim's property and in publicly-accessible points within Holcim's property. The property line receptors were spaced 25 meters apart starting at an arbitrary point on the boundary. The Cartesian grid used in the initial significance analysis generally consisted of the following receptor spacing:

- 50 meter-spaced receptors from the edge of Holcim's property boundary out to 2 kilometers;
- 100 meter-spaced receptors from 2 to 5 kilometers;
- 500 meter-spaced receptors from 5 to 10 kilometers; and
- 1,000 meter-spaced receptors from 10 to 25 kilometers.

Within Holcim's property, there are several publicly-accessible locations including residences, public roads, a railroad, and a farm. To ensure compliance with air standards at these locations, Holcim placed receptors in publicly-accessible locations.[8] These receptors were spaced 25 meters apart.

Figure 3-2 shows the full receptor grid used in the modeling analyses.

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[6] Email from LiAn Zhuang (MDE) to Susan Barnes (Trinity Consultants) on April 18, 2018.

[7] U.S. EPA, Users Guide for the AERMOD Terrain Preprocessor (AERMAP), EPA-454/B-03-003, Research Triangle Park, NC, October 2004.

[8] Several of the houses on Holcim's property are not lived in currently and are expected to be demolished. However, as a conservative measure, receptors have been placed at these locations.

Figure 3-2. Receptor Grid

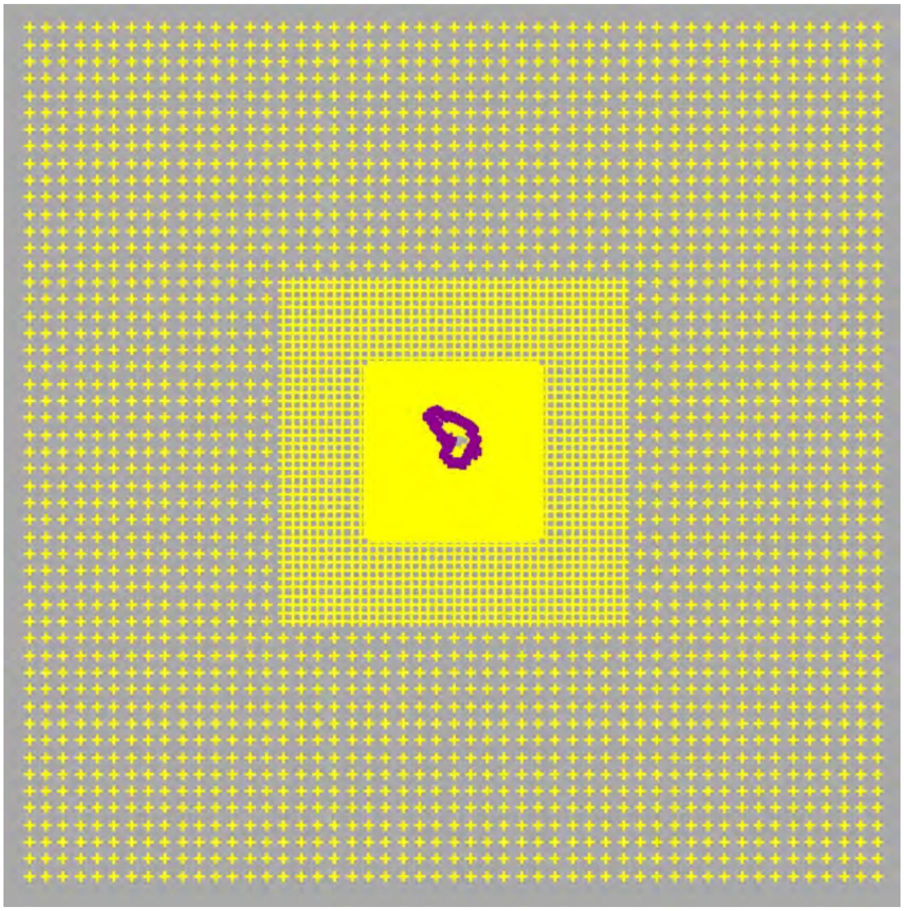


Figure 3-3 shows the receptor grid in further detail.

Figure 3-3. Receptor Grid Detail

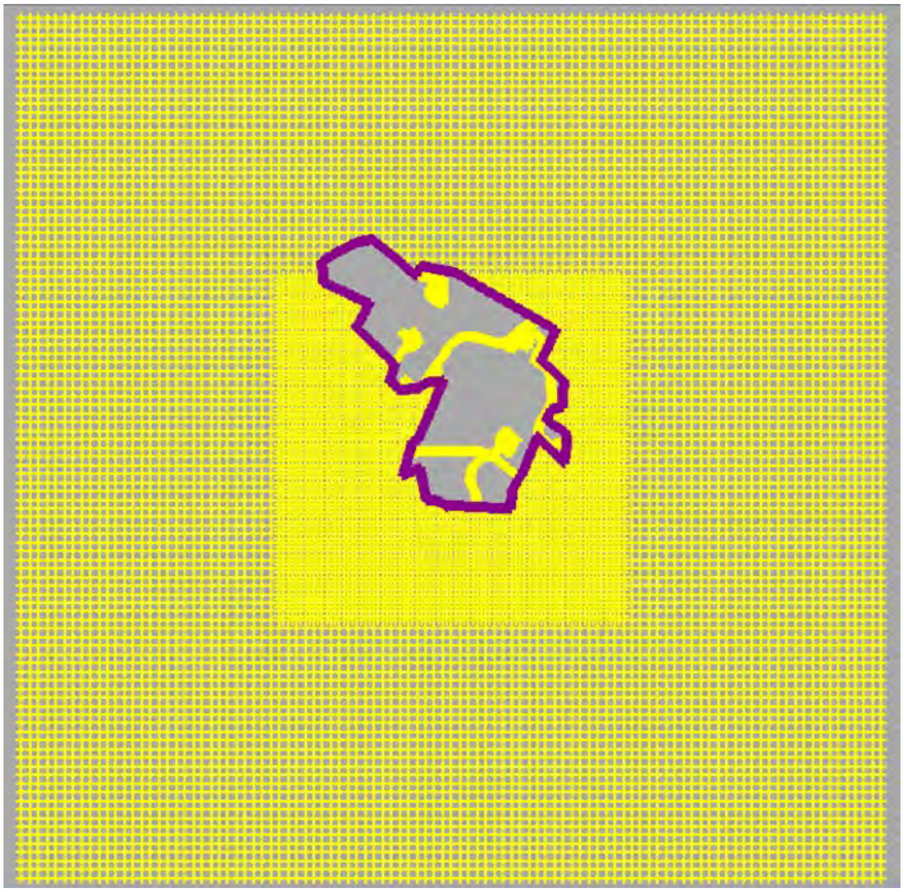
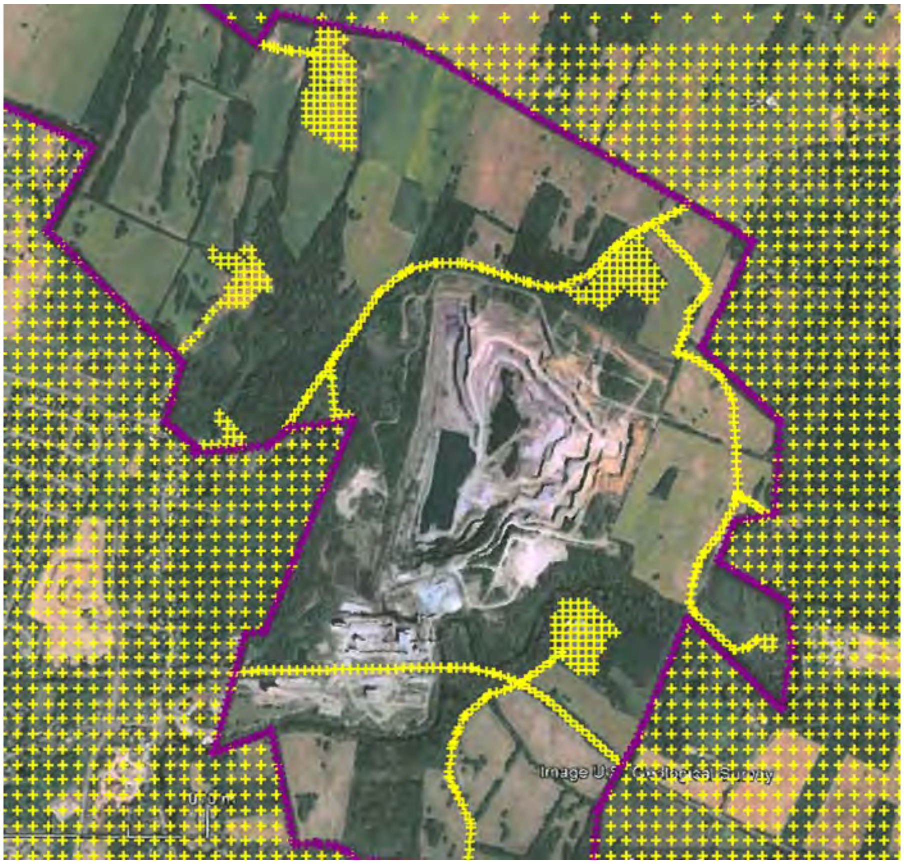


Figure 3-4 shows the receptor grid within the property boundary overlaid on an aerial map showing how receptor grids were placed in publicly-accessible locations.

Figure 3-4. Receptor Grid on Publicly-Accessible Areas within Property Boundary



3.5 Building Downwash

The kiln was evaluated in terms of its proximity to nearby structures. The site buildings were imported from past PSD air dispersion modeling and compared to aerial maps to ensure accuracy. The purpose of the building downwash evaluation is to determine if stack discharges might become caught in the turbulent wakes of these structures, leading to downwash of the plumes. Wind blowing around a building creates zones of turbulence that are greater than if the building were absent.

The kiln stack was evaluated for cavity and wake effects from building downwash. The current version of the AERMOD dispersion model treats the trajectory of the plume near the building and uses the position of the plume relative to the building to calculate interactions with the building wake. AERMOD calculates fields of turbulence intensity, wind speed, and slopes of the mean streamlines as a function of the projected building dimensions.

The direction-specific building dimensions used as input to the AERMOD model were calculated using BPIP-PRIME (version 04274).[9] BPIP-PRIME is sanctioned by U.S. EPA and is designed to incorporate the concepts

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[9] U.S. EPA, User's Guide to the Building Profile Input Program, EPA 454/R-93-038, Research Triangle Park, NC, Revised April 21, 2004.

and procedures expressed in the "Good Engineering Practice" (GEP) Technical Support document, the Building Downwash Guidance document, and other related documents.[10]

3.6 GEP Stack Height Analysis

U.S. EPA has promulgated stack height regulations that restrict the use of stack heights in excess of GEP in air dispersion modeling analyses. Under these regulations, that portion of a stack in excess of the GEP is generally not creditable when modeling to determine source impacts. This essentially prevents the use of excessively tall stacks to reduce ground-level pollutant concentrations. The minimum stack height not subject to the effects of downwash, called the GEP stack height, is defined by the following formula:

$$H_{GEP} = H + 1.5L \tag{Eq. 3-1}$$

Where:

H_{GEP}	=	Minimum GEP stack height	(meters)
H	=	Structure height	(meters)
L	=	Lesser dimension of the structure (height or projected width)	(meters)

The wind direction-specific downwash dimensions and the dominant downwash structures used in this analysis are determined using BPIP-PRIME. In general, the lowest GEP stack height for any source is 65 meters by default.[11] A source may construct a stack that exceeds GEP, but is limited to the GEP stack height in the air quality analysis demonstration. The kiln stack is 96 meters tall. GEP height for the stack, as calculated by BPIP-PRIME, is 128.37 meters. As such, the kiln stack is below GEP height and in compliance with this requirement.

3.7 Representation of Kiln Stack

3.7.1 Coordinate System

In all modeling analysis data files, the location of the kiln stack, structures, and receptors, are represented in the Universal Transverse Mercator (UTM) coordinate system. The UTM grid divides the world into coordinates that are measured in north meters (measured from the equator) and east meters (measured from the central meridian of a particular zone, which is set at 500 km). The datum for this modeling analysis is based on World Geodetic System 1984 (WGS84). UTM coordinates for this analysis all reside within UTM Zone 18.

3.7.2 Source Type

The AERMOD dispersion model allows for emission units to be represented as point, area, or volume sources. If an emission unit has an unobstructed vertical release, the source is modeled based on the methods in the AERMOD Implementation Guide. The kiln stack has an unobstructed vertical release and

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[10] U.S. EPA, Office of Air Quality Planning and Standards, Guidelines for Determination of Good Engineering Practice Stack Height (Technical Support Document for the Stack Height Regulations) (Revised), EPA 450/4-80-023R, Research Triangle Park, NC, June 1985.

[11] 40 CFR §51.100(ii).

was therefore modeled as a point source. Stack parameters (i.e., height, diameter, exhaust gas temperature, and gas exit velocity) used in the modeling analyses were based on design values for the kiln.

3.7.3 Source Parameters and Emission Rates

The source parameters and emissions utilized in the PSD air dispersion modeling analysis are provided in Table 3-2. The kiln is the only source of CO emissions which will be constructed or modified as a result of the proposed project and as such, is the only source to be included in the significance analysis. With regards to NAAQS modeling and in accordance with Tables 8-1 and 8-2 of the Guideline, short-term maximum potential or allowable emission rates were used for all analyses as CO has only short-term standards (i.e., 1-hour and 8-hour).

Table 3-2. Kiln Stack Parameters

Parameter	Value	Units
ID	KILN	N/A
X Coordinate	269974	meters
Y Coordinate	4392581.1	meters
Elevation	159.23	meters
Emission Rate	800	pounds/hour
Stack Height	96	meters
Exhaust Temperature	214	degrees Fahrenheit
Exit Velocity	23.6	meters/second
Stack Diameter	3.2	meters

4. CLASS II MODELING RESULTS

This section presents the results of Class II modeling analysis performed for the proposed project following the procedures outlined in Sections 2 and 3. Electronic input and output files for all AERMOD model runs are included in Appendix A.

4.1 Significant Impact Analysis Results

Emissions from the proposed project were modeled and compared to the appropriate SILs. The SILs are used to determine the level of impact associated with the proposed project. This analysis was conducted to determine if a refined NAAQS modeling analysis would be required.

The results of the significance analysis are shown in Table 4-1 and Table 4-2 for the 1-hour and 8-hour CO standards, respectively. The results represent the highest first high (H1H) modeled concentrations. Modeled project impacts were compared to the Class II SILs.

Table 4-1. AERMOD Significance Analysis Results - 1-hour CO

Model Year	Significant Impact Level (µg/m^3)	Modeled Concentration (µg/m^3)
2012	2,000	743.9
2013		727.7
2014		722.5
2015		709.8
2016		721.8

Table 4-2. AERMOD Significance Analysis Results - 8-hour CO

Model Year	Significant Impact Level (µg/m^3)	Modeled Concentration (µg/m^3)
2012	500	295.7
2013		315.4
2014		288.0
2015		240.5
2016		219.7

As shown above in Tables 4-1 and 4-2, the maximum modeled impacts were below the SILs for both the 1-hour and 8-hour CO averaging periods. As such, no refined NAAQS air dispersion modeling is required.

4.2 Conclusions

This analysis demonstrated that CO emissions from the proposed project at the Hagerstown Plant were insignificant. In accordance with U.S. EPA guidance, this modeling analysis demonstrates compliance with PSD permit requirements for the proposed project.[12]

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[12] U.S. EPA, Office of Air Quality Planning and Standards, DRAFT New Source Review Workshop Manual: Prevention of Significant Deterioration and Nonattainment Area Permitting, Research Triangle Park, NC, October 1990.

5. ADDITIONAL IMPACTS ANALYSIS

PSD regulations require that three additional impacts analyses be performed as part of a PSD permitting action. These are: 1) a growth analysis, 2) a visibility analysis, and 3) a soil and vegetation analysis. This PSD modeling report addresses these elements below. The focus of these analyses is related to the permanent air quality impacts that are the result of the proposed project and not those that are temporary in nature such as construction activities.

5.1 Growth Analysis

The purpose of the growth analysis is to quantify associated growth; that is, to predict how much new growth is likely to occur in order to support the proposed project under review, and then to estimate the air quality impacts from this growth. First, an assessment was made regarding the amount of residential growth the proposed project will bring to the area. The amount of residential growth will depend on the size of the available work force, the number of new employees, and the availability of housing in the area. Associated commercial and industrial growth consists of new sources providing goods and services to the new employees and to the modified source itself.

As the proposed project will not change the overall operations of the plant and there is no expected change in production, there is not expected to be any increase in the full-time workforce at the Hagerstown Plant. Given the negligible increase in the full-time workforce at the Hagerstown Plant, coupled with little to no associated residential and commercial growth associated with this proposed project, no quantifiable adverse impact on the air quality of the area surrounding the Hagerstown Plant is anticipated.

Thus, the proposed project is not expected to adversely impact air quality in the region surrounding the site due to direct or indirect growth.

5.2 Visibility Analysis

A visibility impairment analysis is required to demonstrate that emissions from the proposed project will not have an adverse impact on visibility. The proposed project only required PSD permitting for GHGs and CO. Neither of these pollutants is considered a visibility-affecting pollutant. Visibility-affecting pollutants are defined by the FLMs are: SO_2, NO_2, PM_{10} and H_2SO_4. The project is below the respective SERs for each of these pollutants. Given the de minimis nature of the potential net emissions increase from the proposed project of visibility-affecting pollutants, no adverse impact on visibility is expected from the proposed project.

5.3 Soils and Vegetation Analysis

The modeling results from the PSD NAAQS were assessed against the secondary NAAQS standards, which provide protection for public welfare, including protection against decreased visibility, damage to animals, crops, vegetation, and buildings. This proposed project triggered PSD permitting for GHGs and CO, neither of which has established secondary NAAQS. As discussed in Section 4, it was demonstrated that the proposed project will be insignificant for the primary NAAQS for CO. As secondary NAAQS are generally equal to or higher than primary NAAQS, through a demonstration that predicted impacts are insignificant with respect to the primary NAAQS, it has been demonstrated that no adverse impacts on soil or vegetation will result from the proposed project at the Hagerstown Plant.

6. TOXIC AIR POLLUTANT ANALYSIS FOR CRYSTALLINE SILICA

For the TAPs modeling analysis, AERMOD was utilized to quantify potential ground-level crystalline silica concentrations throughout the receptor grid for each of the five meteorological data years. See the modeling files in Attachment 1 for AERMOD input and output files for the TAPs analysis.

6.1 TAP Emissions

New and existing sources are included in the modeling analyses for demonstrating compliance with the TAPs regulations. Per COMAR 26.11.15.03B(2)(a), fuel burning equipment is exempt from the requirements of the Maryland TAPs program. As such, the only emission sources subject to the TAPs requirements at the Hagerstown Plant are the kiln and material handling operations for respirable crystalline silica.

Table 6-1 presents the emission rate used in the TAP modeling analysis for the kiln. Source parameters were the same as those used for the PSD modeling analyses, refer to Table 3-2.

Table 6-1. Kiln Emission Rates for TAP Analysis

Pollutant	Modeled Emission Rate (lb/hr)
Crystalline Silica	2.89E-03

For the air dispersion modeling analysis for crystalline silica, emissions from material handling operations were split into groups based on location. The emissions were then entered into the model as an area or volume source. Area sources were used for outside areas such as the quarry while volume sources were used for emissions inside of buildings such as the bulk silos. With the exception of road traffic in the quarry, emissions from haul roads were entered into the model as a series of volume sources along the haul road path. Since the quarry haul roads have no specific path of travel, these emissions were modeled as an area source over the entire quarry. The source parameters and emission rates used in the dispersion modeling analysis for crystalline silica are presented in Tables 6-2, 6-3, and 6-4 for area sources, volume sources, and haul road volume sources, respectively.

Table 6-2. Area Source Parameters for Crystalline Silica TAP Analysis

Model ID	Description	X-Coordinate (m)	Y-Coordinate (m)	Elevation (m)	Area (m^2)	Release Height (m)[a]	Initial Vertical Dimension (m)	Emissions (g/s-m^2)
CRUSH	Crushing operations and dust collectors 211-BF1 and 311-BF1	270159.8	4393752.4	155	541835.8	1	0	8.83E-11
BURN	Clinker burning operations and dust collector 4A1-BF1	269966.4	4392588.2	155	2470.875	1	0	8.59E-10
COAL	Coal handling operations, dust collector L91-BF1	270106.1	4392691.8	155	6489.0	1	0	2.09E-09
MATPILE	GAF, iron ore, sand, and gypsum stockpiles	269876.4	4392735.2	155	1626.875	1	0	1.48E-10
STPILE	Outside stone storage and enclosed stone storage piles	270094.5	4392793.9	155	15051.32	1	0	1.96E-11
EMCOAL	Emergency coal pile	269951.6	4392820.2	155	3485.328	1	0	3.94E-11
COALSTOR	Coal storage and dust collectors V14-BF1 and L91-BF2	270112.6	4392688.6	155	308.0938	1	0	9.42E-09
CKDPILE	CKD storage pile	270495.2	4392961.9	155	24320.0	1	0	8.02E-10
QUARRY	Quarry haul roads	270154.5	4393758.0	155	510992.0	1	0	1.05E-10
ENGFUEL	Low carbon engineered fuels material handling and dust collectors V81-BF01, V81-CF01, V81-CF02, and V81-CF03	269899.9	4392583.3	155	1870.609	1	0	2.23E-08

a. The release height for area sources was conservatively assumed to be one meter for all sources.

Table 6-3. Volume Source Parameters for Crystalline Silica TAP Analysis

Model ID	Description	X-Coordinate (m)	Y-Coordinate (m)	Elevation (m)	Release Height [a] (m)	Initial Lateral Dimension [b] (m)	Initial Vertical Dimension [c] (m)	Emission Rate (lb/hr)
RAW	Raw grinding operations, reject pile, and dust collectors 311-BF4, 311-BF5, 331-BF1, 331-BF2, 331-BF3, 331-BF4, 361-BF1, 361-BF9, and 391-BF2	270092.7	4392615.1	155	16.34	10.47	15.20	5.47E-04
FEED	Kiln feed blending operations and dust collectors 391-BF1, blending silo DC, 431-BF1, 431-BF4, and P72-BF1	270090.8	4392582.9	155	8.30	5.00	7.72	1.92E-04
COOL	Clinker cooling operations and dust collectors 491-BF7 and 491-BF8	270090.8	4392582.9	155	8.30	5.00	7.72	1.02E-04
CLHAND	Clinker handling operations and dust collectors 491-BF1, 491-BF2, 491-BF4, 491-BF6, 511-BF1, 511-BF2, and 511-BF4	269940.3	4392657.7	155	8.45	7.21	7.86	7.48E-04
FINISH	Finish grinding operations and dust collectors 511-BF3, 561-BF1, 561-BF2, finish mill de-dusting, 592-BF1, 592-BF2, and 592-BF3	270092.7	4392615.1	155	16.34	10.47	15.20	1.35E-03
BULK	Bulk silos and dust collectors 591-BF1, 591-BF3, 621-BF1, and 621-BF2	269631.6	4392462.8	155	23.75	6.28	22.09	1.75E-04

a. Release height was calculated as half of the height of the building/structure in which emissions occur.

b. Initial lateral dimension was calculated as the width of the building/structure in which emissions occur divided by 4.3. For buildings/structures that were not square, the smaller dimension was used as the width to be conservative.

c. Initial vertical dimension was calculated as the height of the building/structure in which emissions occur divided by 2.15.

Table 6-4. Haul Road Volume Source Parameters for Crystalline Silica TAP Analysis

Model ID	Description	Number of Sources	Release Height [a] (m)	Initial Lateral Dimension [b] (m)	Initial Vertical Dimension [c] (m)	Emission Rate per Source (lb/hr)	Total Emission Rate (lb/hr)
HAUL	Coal, wood chips, shale, gypsum, sand, and iron ore delivery haul roads	36	4.3	12.09302	4	1.60E-06	5.76E-05
CKDRD	CKD haul road to pile	21	4.3	16.74419	4	9.45E-07	1.98E-05
SALES	Sales haul road	28	4.3	13.48837	4	2.11E-06	5.91E-05

a. Release height was set equal to the height of the haul vehicle.
b. Initial lateral dimension was calculated based on an adjusted road width. The adjusted road width is equal to two times the actual road width. The initial lateral dimension is then equal to the adjusted road width times 4, divided by 4.3.
c. Initial vertical dimension was calculated as twice the height of the haul vehicle divided by 2.15.

6.2 TAPS Analysis Results

Table 6-5 presents the maximum modeled concentrations (i.e., H1H) of crystalline silica from AERMOD for the Hagerstown Plant for the 8-hour averaging period and model year. The maximum impact over the five-year period was then utilized for comparison against the AAL.

Table 6-5. Results of TAPs Modeling Analysis

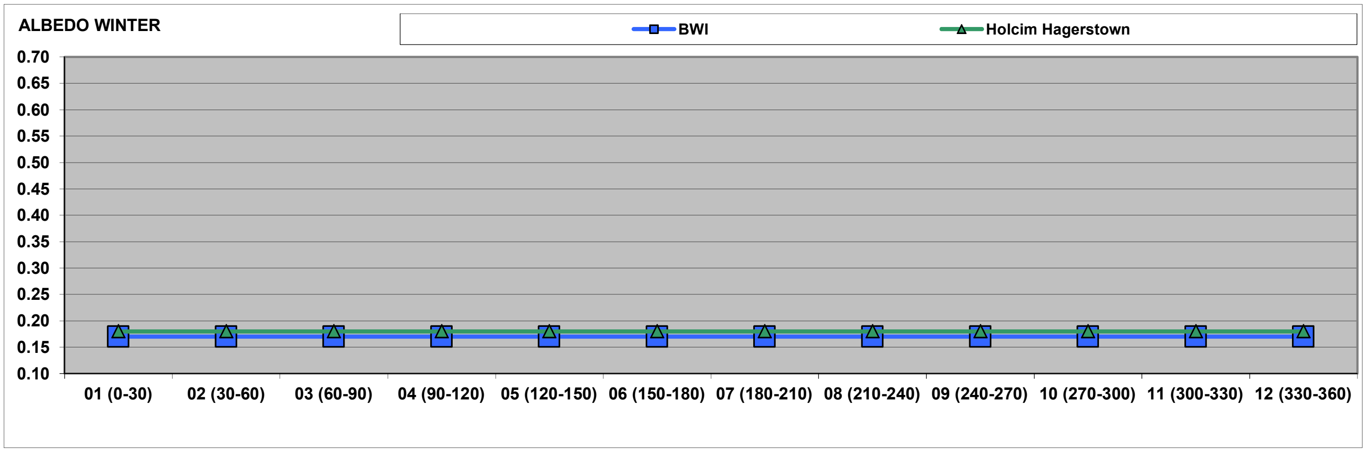
Pollutant	Averaging Period	H1H Modeled Concentration (µg/m³)					AAL (µg/m³)
		2012	2013	2014	2015	2016	
Crystalline Silica	8-hour	0.27	0.38	0.27	0.33	0.23	1

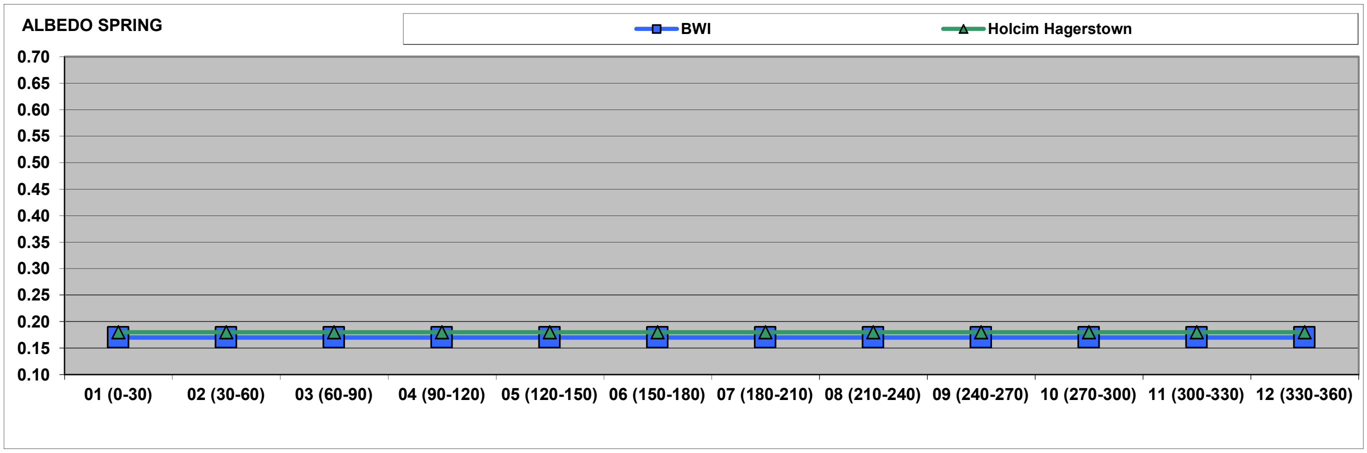
As shown in Table 6-5, the maximum modeled concentrations of crystalline silica are below the applicable AAL. As such, Holcim has no further requirements to demonstrate compliance with the AAL under the state TAPs program.

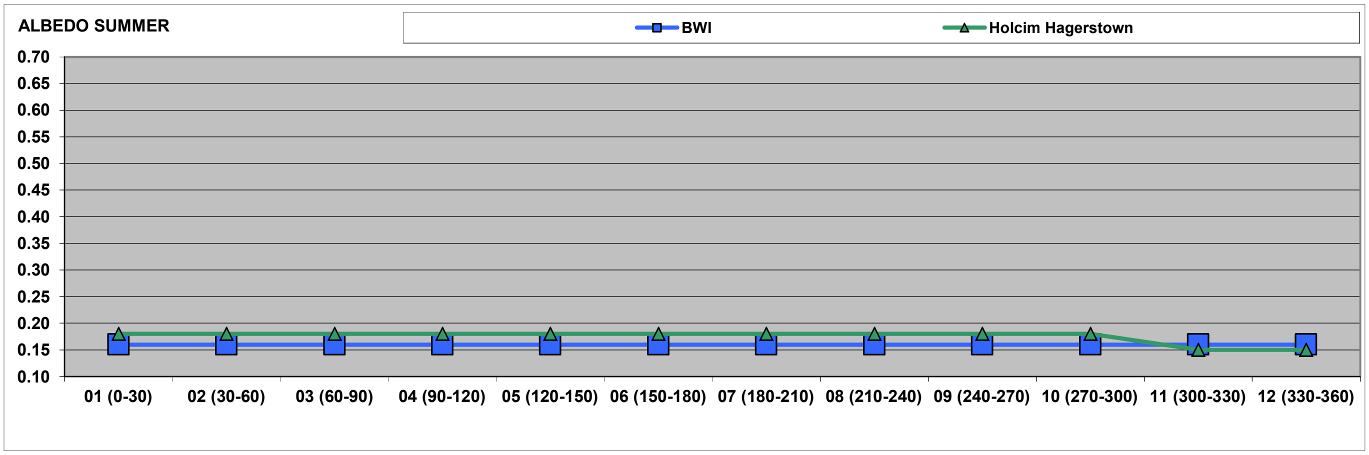
ATTACHMENT 1: MODELING FILES FLASH DRIVE

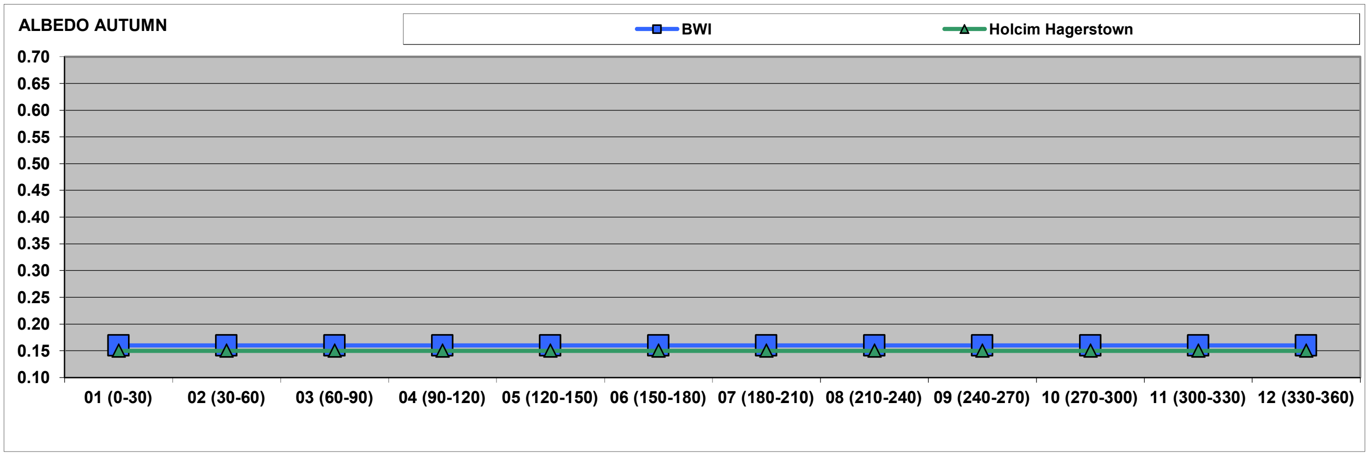
ATTACHMENT 2: COMPARISON OF SURFACE CHARACTERISTICS

COMPARISON OF ALBEDO VALUES



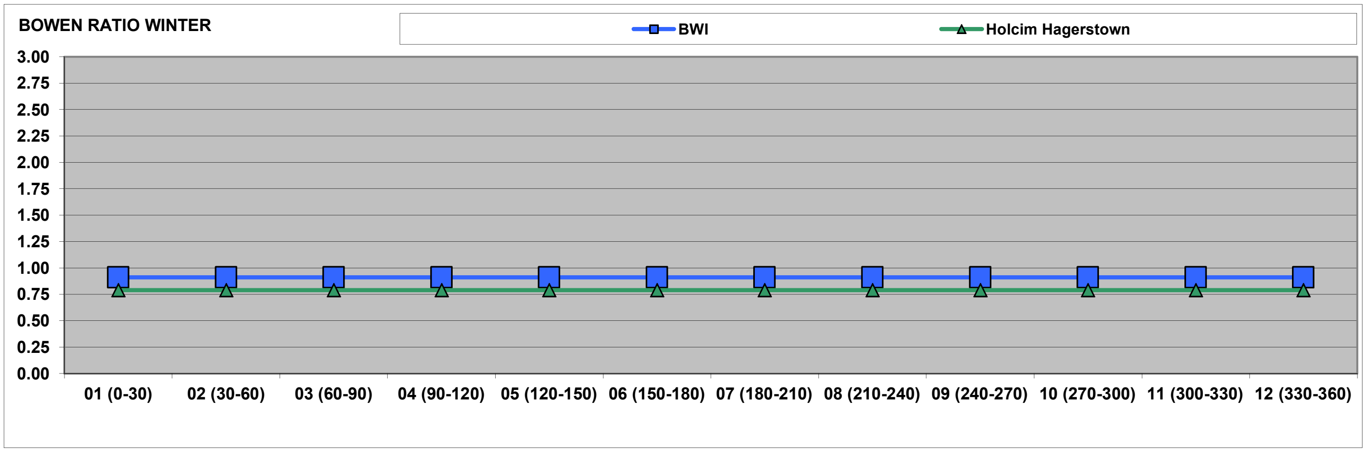


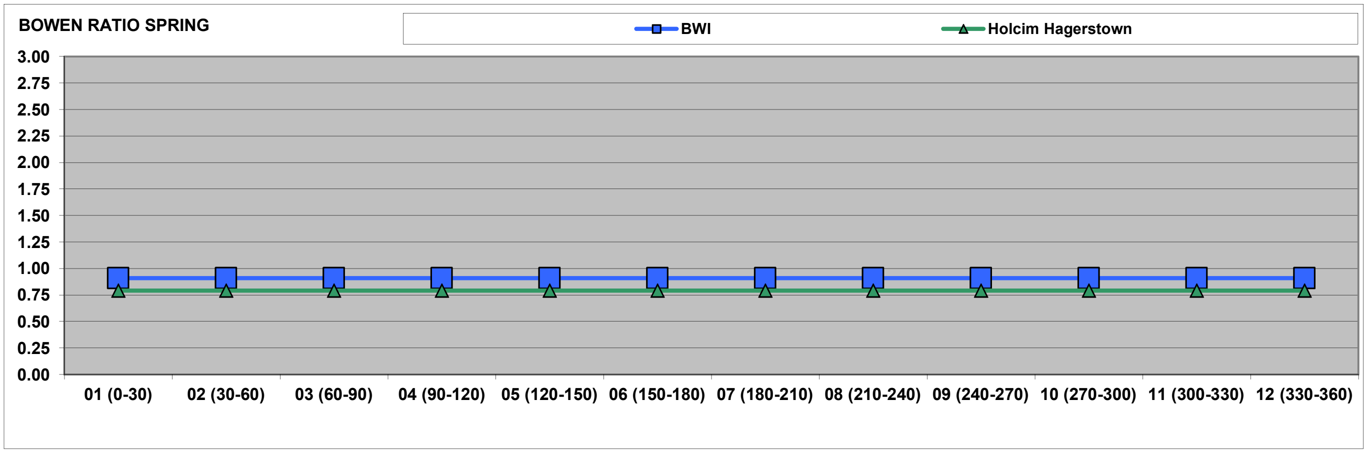


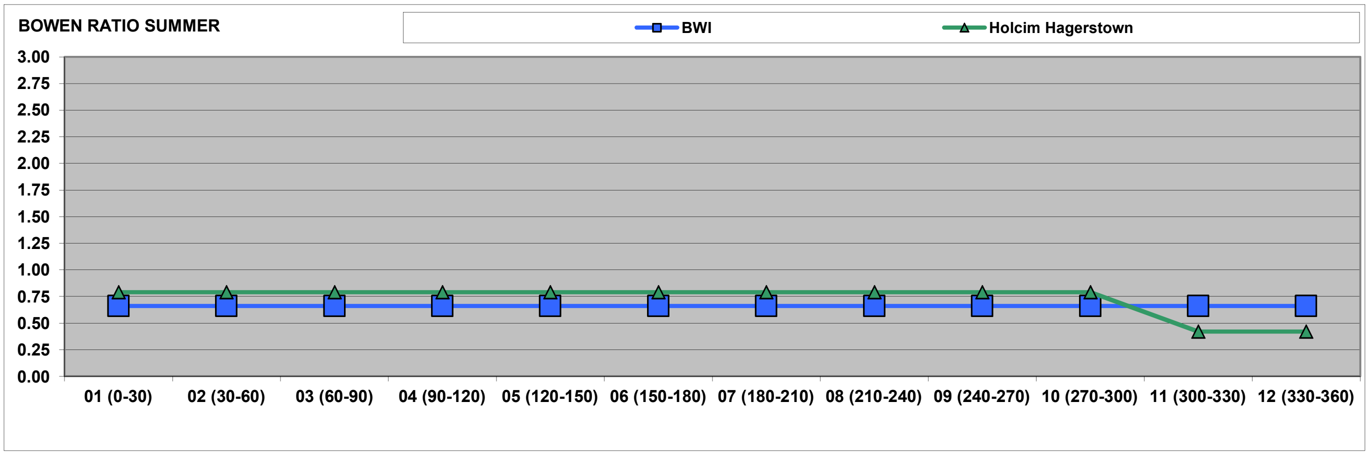


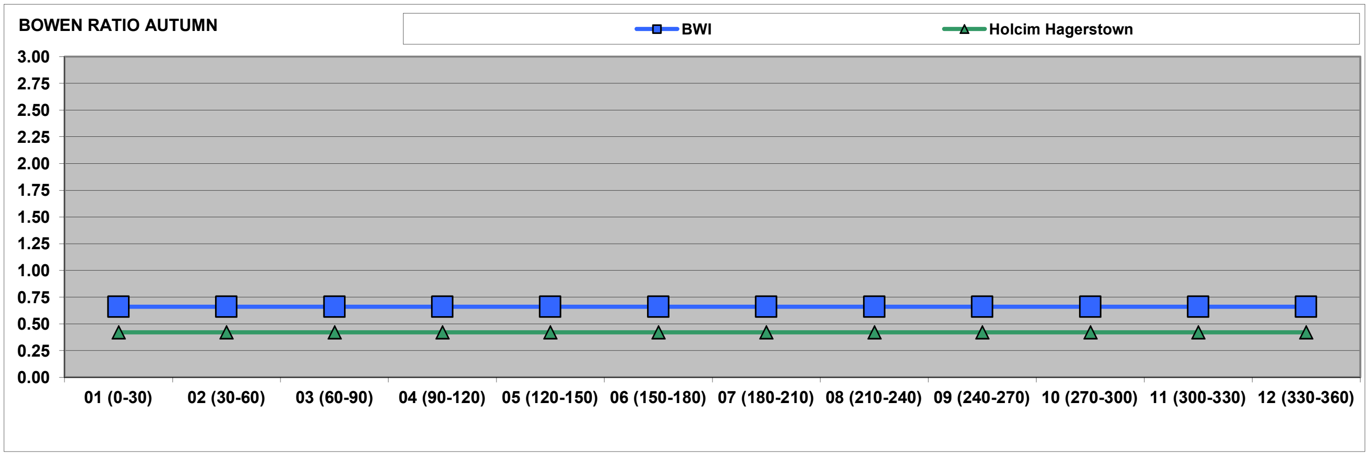
9/18/2013

COMPARISON OF BOWEN RATIO VALUES



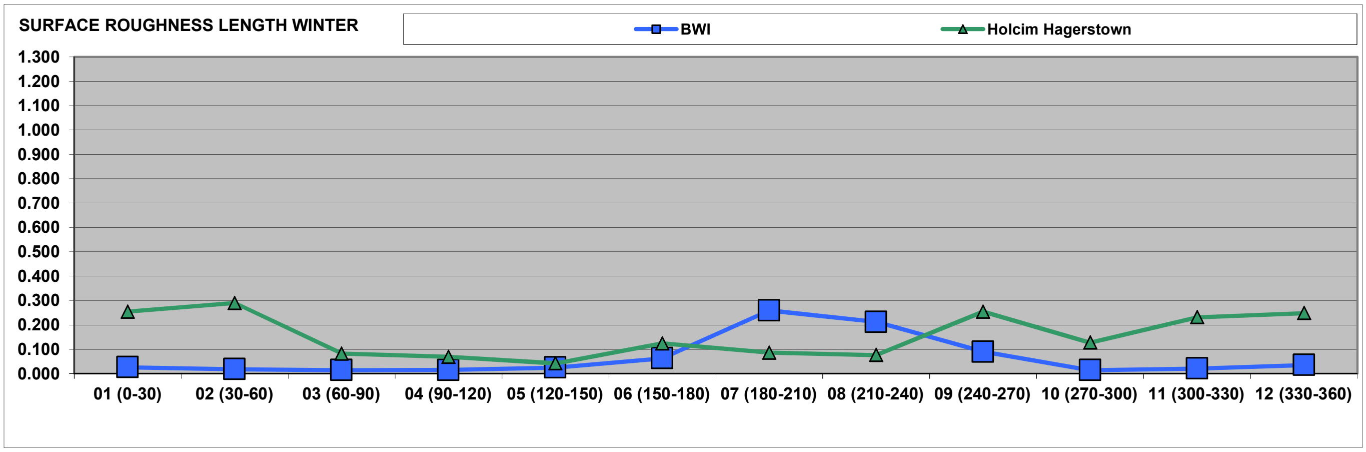


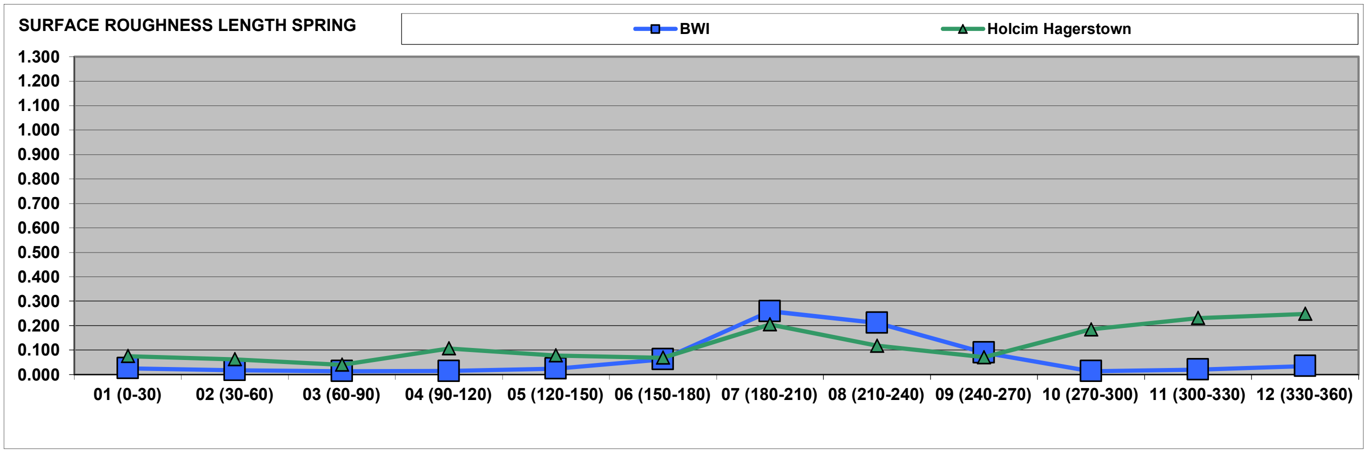


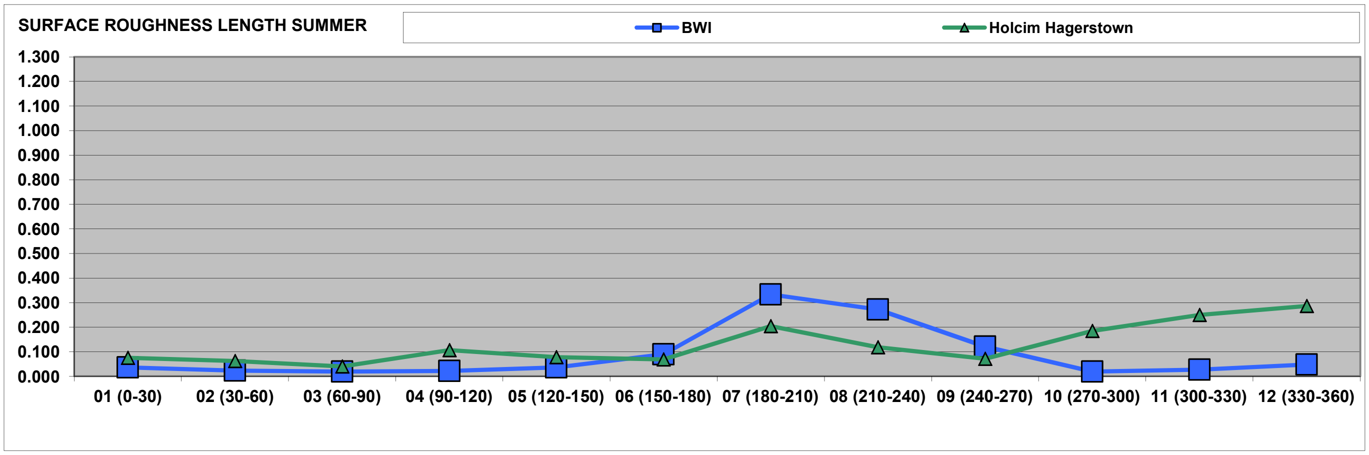


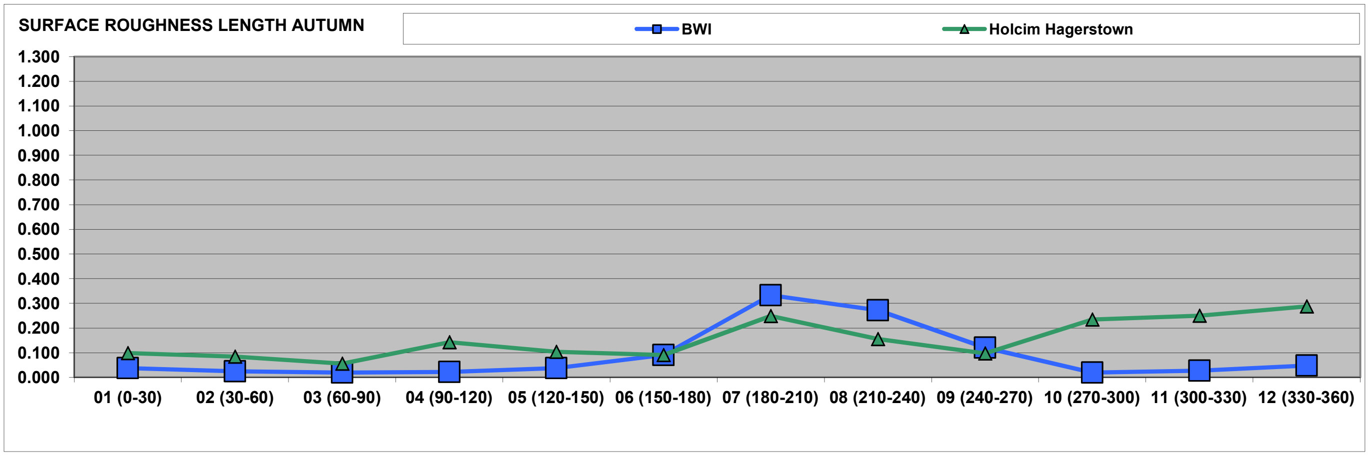
9/18/2013

COMPARISON OF SURFACE ROUGHNESS LENGTH VALUES









9/18/2013

APPENDIX E. PERMIT APPLICATION FORMS

AIR QUALITY PERMIT TO CONSTRUCT
APPLICATION CHECKLIST

OWNER OF EQUIPMENT/PROCESS	
COMPANY NAME:	Holcim (US), Inc.
COMPANY ADDRESS:	1260 Security Road, Hagerstown, MD 21742
LOCATION OF EQUIPMENT/PROCESS	
PREMISES NAME:	Holcim (US), Inc.
PREMISES ADDRESS:	1260 Security Road, Hagerstown, MD 21742
CONTACT INFORMATION FOR THIS PERMIT APPLICATION	
CONTACT NAME:	Michael Noll
JOB TITLE:	Environmental and Public Affairs Manager
PHONE NUMBER:	(240) 452-4896
EMAIL ADDRESS:	michael.noll@lafargeholcim.com
DESCRIPTION OF EQUIPMENT OR PROCESS	
In-line roller mill, in-line coal mill, cement kiln and clinker cooler.	

Application is hereby made to the Department of the Environment for a Permit to Construct for the following equipment or process as required by the State of Maryland Air Quality Regulation, COMAR 26.11.02.09.

Check each item that you have submitted as part of your application package.

☒ Application package cover letter describing the proposed project

☒ Complete application forms (Note the number of forms included or NA if not applicable.)

No. 1 Form 5
No. 1 Form 5T
No. 1 Form 5EP
No. 4 Form 6
No. N/A Form 10

No. N/A Form 11
No. N/A Form 41
No. N/A Form 42
No. N/A Form 44

☐ Vendor/manufacturer specifications/guarantees

☐ Evidence of Workman's Compensation Insurance

☒ Process flow diagrams with emission points

☐ Site plan including the location of the proposed source and property boundary

☒ Material balance data and all emissions calculations

☐ Material Safety Data Sheets (MSDS) or equivalent information for materials processed and manufactured.

☐ Certificate of Public Convenience and Necessity (CPCN) waiver documentation from the Public Service Commission (1)

☐ Documentation that the proposed installation complies with local zoning and land use requirements (2)

(1) Required for emergency and non-emergency generators installed on or after October 1, 2001 and rated at 2001 kW or more.

(2) Required for applications subject to Expanded Public Participation Requirements.

MARYLAND DEPARTMENT OF THE ENVIRONMENT
Air and Radiation Management Administration ▪ Air Quality Permits Program
1800 Washington Blvd ▪ Baltimore, Maryland 21230
(410) 537-3230 ▪ 1-800-633-6101 ▪ www.mde.state.md.us

APPLICATION FOR FUEL BURNING EQUIPMENT

Information Regarding Public Outreach

For Air Quality Permit to Construct applications subject to public review, applicants should consider the following information in the initial stages of preparing a permit application.

If you are not sure at the time you are applying for a permit whether public review of your application is required or for information on steps you can take to engage the surrounding community where your planned project will be located, please contact the Air Quality Permits Program at 410-537-3225 and seek their advice.

Communicating and engaging the local community as early as possible in your planning and development process is an important aspect of your project and should be considered a priority. Environmental Justice or "EJ" is a movement to inform, involve, and engage communities impacted by potential and planned environmental projects by affording citizens opportunities to learn about projects and discuss any concerns regarding impacts.

Although some permit applications are subject to a formal public review process prescribed by statute, the Department strongly encourages you to engage neighboring communities separate from and well ahead of the formal permitting process. Sharing your plans by way of community meetings, informational outreach at local gatherings or through local faith-based organizations can initiate a rewarding and productive dialogue that will reduce anxiety and establish a permanent link with your neighbors in the community.

All parties benefit when there is good communication. The Department can assist applicants in developing an outreach plan that fits the needs of both the company and the public.

MARYLAND DEPARTMENT OF THE ENVIRONMENT

1800 Washington Blvd - Baltimore, Maryland 21230
(410) 537-3230 - 1-800-633-6101 - www.mde.state.md.us

Air and Radiation Management Administration Air Quality Permits Program

APPLICATION FOR PROCESSING/MANUFACTURING EQUIPMENT

Permit to Construct ☒ Registration Update ☐ Initial Registration ☐

1A. OWNER OF EQUIPMENT/COMPANY NAME

Holcim (US), Inc.

Mailing Address

1260 Security Road
Street Address

City	State	Zip
Hagerstown	MD	21742

Telephone Number

(301) 739-1150

Signature

DO NOT WRITE IN THIS BLOCK

2. REGISTRATION NUMBER

County No.	**Premises No.**
☐☐ 1-2	☐☐☐☐ 3-6
Registration Class	**Equipment No.**
☐ 7	☐☐☐☐ 8-11
Data Year	
☐☐ 12-13	Application Date

Alan Greer, General Manager
Print Name and Title

Date

1B. EQUIPMENT LOCATION AND TELEPHONE NUMBER (IF DIFFERENT FROM ABOVE)

Same
Street Number and Street Name

City/Town State Zip Telephone Number

Premises Name (if different from above)

3. STATUS (A=New, B=Modification to Existing Equipment, C=Existing Equipment)

STATUS	New Construction Begun MONTH/YEAR	New Construction Completed MONTH/YEAR	Existing Initial Operation MONTH/YEAR
B			- - 7 0
15	16-19	20-23	20-23

4. DESCRIBE THIS EQUIPMENT: MAKE, MODEL, FEATURES, MANUFACTURER (INCLUDE MAXIMUM HOURLY INPUT RATE, ETC.)

In-line roller mill, in-line coal mill, cement kiln and clinker cooler. Registration number 043-0008-6-0495.

5. WORKMEN'S COMPENSATION COVERAGE

WLR C6 74 61 12 5
Binder/Policy Number

10/1/2021
Expiration Date

Company Indemnity Insurance Company of North America

NOTE: Before a Permit to Construct may be issued by the Department, the applicant must provide the Department with proof of worker's compensation coverage as required under Section 1-202 of the Worker's Compensation Act.

6A. NUMBER OF PIECES OF IDENTICAL EQUIPMENT UNITS TO BE REGISTERED/PERMITTED AT THIS TIME 1

6B. NUMBER OF STACKS/EMISSION POINTS ASSOCIATED WITH THIS EQUIPMENT See flow diagrams

7. PERSON INSTALLING THIS EQUIPMENT (IF DIFFERENT FROM NUMBER 1 ON PAGE 1)

NAME Same as Number 1 on Page 1 TITLE

COMPANY

MAILING ADDRESS/STREET

CITY, TOWN STATE TELEPHONE ( )

8. MAJOR ACTIVITY, PRODUCT OR SERVICE OF COMPANY AT THIS LOCATION

Limestone quarrying and cement manufacturing.

9. CONTROL DEVICES ASSOCIATED WITH THIS EQUIPMENT

None ☐ 24-0

SIMPLE/MULTIPLE CYCLONE	SPRAY/ADSORB TOWER	VENTURI SCRUBBER	CARBON ADSORBER	ELECTROSTATIC PRECIPITATOR	BAGHOUSE	THERMAL/ CATALYTIC AFTERBURNER	DRY SCRUBBER
☐	☐	☐	☐	☐	2	☐	☐
24-1	24-2	24-3	24-4	24-5	24-6	24-7	24-8

OTHER ☒ 24-9 DESCRIBE: 24 dust collectors (20 existing, 4 new to be installed for low carbon engineered fuel handling)

10. ANNUAL FUEL CONSUMPTION FOR THIS EQUIPMENT

OIL - 1000 GALLONS*	SULFUR %	GRADE	NATURAL GAS - 1000 FT^3	LP GAS - 100 GALLONS	GRADE
TBD			TBD	TBD	
26-31	32-33	34	35-41	42-45	

* Facility-wide fuel use estimates - not intended to be a limitation on fuel use.

COAL - TONS	SULFUR %	ASH %	WOOD - TONS	MOISTURE %
1 2 0 0 1 2			TBD	
46-52	53-55	56-58	59-63	64-65

Other Fuels: Other Non-CISWI Fuels (Specify Type) ☐ 66-1 Annual Amount Consumed: Varies (Specify Units of Measure)

Other Fuels: (Specify Type) ☐ 66-2 Annual Amount Consumed: (Specify Units of Measure)

1 = Coke 2 = COG 3 = BFG 4 = Other

11. OPERATING SCHEDULE [for this equipment]

CONTINUOUS OPERATION	BATCH PROCESS	HOURS PER BATCH	BATCH PER WEEK	HOURS PER DAY	DAYS PER WEEK	DAYS PER YEAR
X	☐		☐	2 4	7	3 6 5
67-1	67-2	68-69		70-71	72	73-75

SEASONAL VARIATION IN OPERATION:

NO VARIATION	WINTER PERCENT	SPRING PERCENT	SUMMER PERCENT	FALL PERCENT	(TOTAL SEASONS=100%)
X					
76	77-78	79-80	81-82	83-84	

12. EQUIVALENT STACK INFORMATION - IS EXHAUST THROUGH DOORS, WINDOWS, ETC., ONLY?

(Y/N) N
85

	HEIGHT ABOVE GROUND (FT)	INSIDE DIAMETER AT TOP (INCHES)	EXIT TEMPERATURE (^{O}F)	EXIT VELOCITY (FT/SEC)
IF NOT, THEN →	303	52	214	454
	86-88	89-91	92-95	96-98

NOTE: ATTACH A BLOCK DIAGRAM OF PROCESS/PROCESS LINE, INDICATING NEW EQUIPMENT AS REPORTED ON THIS FORM AND ALL EXISTING EQUIPMENT, INCLUDING CONTROL DEVICES AND EMISSION POINTS.

13. INPUT MATERIALS [for this equipment only]

IS ANY OF THIS DATA TO BE CONSIDERED CONFIDENTIAL? N Y or N (all input material types and quantities)

NAME	CAS NUMBER (if applicable)	INPUT RATE PER HOUR	UNITS	PER YEAR	UNITS
1. Coal		14	tons	120,012	tons
2. Kiln Feed Blend		171	tons	1,498,053	tons
3. Low Carbon Engineered Fuels		13	tons	110,231	tons
4. Other Non-CISWI Fuels		Varies		Varies	
5.					
6.					
7.					
8.					
9.					
TOTAL					

14. OUTPUT MATERIALS [for this equipment]

NAME	CAS NUMBER (if applicable)	OUTPUT RATE PER HOUR	UNITS	PER YEAR	UNITS
1. Clinker		97	tons	850,000	tons
2.					
3.					
4.					
5.					
6.					
7.					
8.					
9.					
TOTAL					

15. WASTE STREAMS - SOLID AND LIQUID

NAME	CAS NUMBER (if applicable)	OUTPUT RATE PER HOUR	UNITS	PER YEAR	UNITS
1. Alkali Bypass Dust / CKD		2.8	tons	24,141	tons
2.					
3.					
4.					
5.					
6.					
7.					
8.					
9.					
TOTAL					

16. TOTAL STACK EMISSIONS (FOR THIS EQUIPMENT ONLY) IN POUNDS PER OPERATING DAY

** Refer to Appendix F for emissions from low carbon engineered fuel handling equipment, other emissions associated with this equipment are unchanged from this project.

PARTICULATE MATTER	OXIDES OF SULFUR	OXIDES OF NITROGEN
☐☐☐☐☐☐	☐☐☐☐☐☐	☐☐☐☐☐☐
99-104	105-110	111-116
CARBON MONOXIDE	VOLATILE ORGANIC COMPOUNDS	PM-10
☐☐☐☐☐☐	☐☐☐☐☐☐	☐☐☐☐☐☐
117-122	123-128	129-134

17. TOTAL FUGITIVE EMISSIONS (FOR THIS EQUIPMENT ONLY) IN POUNDS PER OPERATING DAY

PARTICULATE MATTER	OXIDES OF SULFUR	OXIDES OF NITROGEN
☐☐☐☐☐☐	☐☐☐☐☐	☐☐☐☐☐
135-139	140-144	145-149
CARBON MONOXIDE	VOLATILE ORGANIC COMPOUNDS	PM-10
☐☐☐☐☐	☐☐☐☐☐☐	☐☐☐☐☐
150-154	155-159	160-164

METHOD USED TO DETERMINE EMISSIONS **(1 = ESTIMATE 2 = EMISSION FACTOR 3 = STACK TEST 4 = OTHER)**

TSP	SOX	NOX	CO	VOC	PM10
4	4	4	4	4	4
165	166	167	168	169	170

* See application report for a full description of calculation methodologies

AIR MANAGEMENT USE ONLY

18. DATE REC'D. LOCAL ____________

DATE REC'D. STATE ____________

RETURN TO LOCAL JURISDICTION

DATE ____________ BY ____________

REVIEWED BY LOCAL JURISDICTION

DATE ____________ BY ____________

REVIEWED BY STATE

DATE ____________ BY ____________

19. INVENTORY DATE

MONTH YEAR	EQUIPMENT CODE	SCC CODE
☐☐☐☐	☐☐☐	☐☐☐☐☐☐☐☐
171-174	175-177	178-185

20.

ANNUAL OPERATING RATE	MAXIMUM DESIGN HOURLY RATE	PERMIT TO OPERATE MONTH	TRANSACTION DATE (MM/DD/YR)
☐☐☐☐☐☐☐	☐☐☐☐☐☐☐	☐☐	☐☐☐☐☐☐
186-192	193-199	200-201	202-207

STAFF CODE	VOC CODE	SIP CODE	REGULATION CODE	CONFIDENTIALITY
☐☐☐	☐☐	☐☐	☐☐☐☐	☐
208-210	211 212	213 214	215-218	219

POINT DESCRIPTION

☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐

220-238

ACTION ☐ 239

A: ADD

C: CHANGE

MARYLAND DEPARTMENT OF THE ENVIRONMENT

Air and Radiation Management Administration ● Air Quality Permits Program
1800 Washington Boulevard ● Baltimore, Maryland 21230
(410)537-3225 ● 1-800-633-6101● www.mde.maryland.gov

FORM 5EP: Emission Point Data

Complete one (1) Form 5EP for EACH emission point (stack or fugitive emissions) related to the proposed installation.

Applicant Name: Holcim (US), Inc.

1. Emission Point Identification Name/Number

List the applicant assigned name/number for this emission point and use this value on the attached required plot plan:
421-3K3

2. Emission Point Description

Describe the emission point including all associated equipment and control devices:
Combined stack for preheater, kiln, in-line roller mill, in-line coal mill, and clinker cooler.

3. Emissions Schedule for the Emission Point

Continuous or Intermittent (C/I)?	C	**Seasonal Variation** Check box if none: ☒ Otherwise estimate seasonal variation:	
Minutes per hour:	60	Winter Percent	
Hours per day:	24	Spring Percent	
Days per week:	7	Summer Percent	
Weeks per year:	52	Fall Percent	

4. Emission Point Information

Height above ground (ft):	303.42	Length and width dimensions at top of rectangular stack (ft):	Length: N/A		Width: N/A
Height above structures (ft):	10				
Exit temperature (ºF):	214	Inside diameter at top of round stack (ft):			4.33
Exit velocity (ft/min):	27,269	Distance from emission point to nearest property line (ft):			1,190
Exhaust gas volumetric flow rate (acfm):	402,151	Building dimensions if emission point is located on building (ft)	Height 293.42	Length 67	Width 33

5. Control Devices Associated with the Emission Point

Identify each control device associated with the emission point and indicate the number of devices. ***A Form 6 is also required for each control device***. If none check none:

☐ None
☒ Baghouse No. 1
☐ Cyclone No. ____
☐ Elec. Precipitator (ESP) No. ____
☐ Dust Suppression System No. ____
☐ Venturi Scrubber No. ____
☐ Spray Tower/Packed Bed No. ____
☐ Carbon Adsorber No. ____
- ☐ Cartridge/Canister
- ☐ Regenerative

☐ Thermal Oxidizer No. ____
- ☐ Regenerative

☐ Catalytic Oxidizer No. ____
☒ Nitrogen Oxides Reduction No. 1
- ☒ Selective ☐ Non-Selective
- ☐ Catalytic ☒ Non-Catalytic

☐ Other No. ____
Specify:

FORM 5EP: Emission Point Data

6. Estimated Emissions from the Emission Point

Criteria Pollutants	At Design Capacity (lb/hr)	At Projected Operations		
		(lb/hr)	(lb/day)	(ton/yr)
Particulate Matter (filterable as PM10)				
Particulate Matter (filterable as PM2.5)	See Appendix F for emissions from low carbon engineered fuel handling equipment, other emissions unchanged by this project			
Particulate Matter (condensables)				
Volatile Organic Compounds (VOC)				
Oxides of Sulfur (SOx)				
Oxides of Nitrogen (NOx)				
Carbon Monoxide (CO)				
Lead (Pb)				

Greenhouse Gases (GHG)	At Design Capacity (lb/hr)	At Projected Operations		
		(lb/hr)	(lb/day)	(ton/yr)
Carbon Dioxide (CO_2)				
Methane (CH_4)				
Nitrous Oxide (N_2O)				
Hydrofluorocarbons (HFCs)				
Perfluorocarbons (PFCs)				
Sulfur Hexafluoride (SF6)				
Total GHG (as CO_2e)				

List individual federal Hazardous Air Pollutants (HAP) below:	At Design Capacity (lb/hr)	At Projected Operations		
		(lb/hr)	(lb/day)	(ton/yr)

(Attach additional sheets as necessary.)

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FORM 5T: Toxic Air Pollutant (TAP) Emissions Summary and Compliance Demonstration

Applicant Name: Holcim (US), Inc.

Step 1: Quantify premises-wide emissions of Toxic Air Pollutants (TAP) from new and existing installations in accordance with COMAR 26.11.15.04. Attach supporting documentation as necessary.

Toxic Air Pollutant (TAP)	CAS Number	Class I or Class II?	Screening Levels (µg/m³)			Estimated Premises Wide Emissions of TAP			
						Actual Total Existing TAP Emissions	Projected TAP Emissions from Proposed Installation	Premises Wide Total TAP Emissions	
			1-hour	8-hour	Annual	(lb/hr)	(lb/hr)	(lb/hr)	(lb/yr)
ex. ethanol	*64175*	*II*	*18843*	*3769*	*N/A*	*0.60*	*0.15*	*0.75*	*1500*
ex. benzene	*71432*	*I*	*80*	*16*	*0.13*	*0.5*	*0.75*	*1.00*	*400*
Refer to Appendix D									

(attach additional sheets as necessary.)

Note: Screening levels can be obtained from the Department's website (http://www.mde.maryland.gov) or by calling the Department.

Step 2: Determine which TAPs are exempt from further review. A TAP that meets either of the following Class I or Class II small quantity emitter exemptions is exempt from further TAP compliance demonstration requirements under Step 3 and Step 4.

Class II TAP Small Quantity Emitter Exemption Requirements (COMAR 26.11.15.03B(3)(a))
A Class II TAP is exempt from Step 3 and Step 4 if the Class II TAP meets the following requirements: Premises wide emissions of the TAP shall not exceed 0.5 pounds per hour, and any applicable 1-hour or 8-hour screening level for the TAP must be greater than 200 µg/m^3.

Class I TAP Small Quantity Emitter Exemption Requirements (COMAR 26.11.15.03B(3)(b))
A Class I TAP is exempt from Step 3 and Step 4 if the Class I TAP meets the following requirements: Premises wide emissions of the TAP shall not exceed 0.5 pounds per hour and 350 pounds per year, any applicable 1-hour or 8-hour screening level for the TAP must be greater than 200 µg/m^3, and any applicable annual screening level for the TAP must be greater than 1 µg/m^3.

If a TAP meets either the Class I or Class II TAP Small Quantity Emitter Exemption Requirements, no further review under Step 3 and Step 4 are required for that specific TAP.

FORM 5T: Toxic Air Pollutant (TAP) Emissions Summary and Compliance Demonstration

Step 3: Best Available Control Technology for Toxics Requirement (T-BACT, COMAR 26.11.15.05)
In the following table, list all TAP emission reduction options considered when determining T-BACT for the proposed installation. The options should be listed in order beginning with the most effective control strategy to the least effective strategy. Attach supporting documentation as necessary.

Target Pollutants	Emission Control Option	% Emission Reduction	Costs		T-BACT Option Selected? (yes/no)
			Capital	Annual Operating	
ex. ethanol and benzene	*Thermal Oxidizer*	*99*	*$50,000*	*$100,000*	*no*
ex. ethanol and benzene	*Low VOC materials*	*80*	*0*	*$100.000*	*yes*

(attach additional sheets as necessary)

Step 4: Demonstrating Compliance with the Ambient Impact Requirement (COMAR 26.11.15.06)
Each TAP not exempt in Step 2 must be individually evaluated to determine that the emissions of the TAP will not adversely impact public health. The evaluation consists of a series of increasingly non-conservative (and increasingly rigorous) tests. Once a TAP passes a test in the evaluation, no further analysis is required for that TAP. "Demonstrating Compliance with the Ambient Impact Requirement under the Toxic Air Pollutant (TAP) Regulations (COMAR 26.11.15.06)" provides guidance on conducting the evaluation. Summarize your results in the following table. Attach supporting documentation as necessary.

Toxic Air Pollutant (TAP)	CAS Number	Screening Levels ($\mu g/m^3$)			Premises Wide Total TAP Emissions		Allowable Emissions Rate (AER) per COMAR 26.11.16.02A		Off-site Concentrations per Screening Analysis ($\mu g/m^3$)			Compliance Method Used?
		1-hour	8-hour	Annual	(lb/hr)	(lb/yr)	(lb/hr)	(lb/yr)	1-hour	8-hour	Annual	AER or Screen
ex. ethanol	*64175*	*18843*	*3769*	*N/A*	*0.75*	*1500*	*0.89*	*N/A*	*N/A*	*N/A*	*N/A*	*AER*
ex. benzene	*71432*	*80*	*16*	*0.13*	*1.00*	*400*	*0.04*	*36.52*	*1.5*	*1.05*	*0.12*	*Screen*

(attach additional sheets as necessary)

If compliance with the ambient impact requirement cannot be met using the allowable emissions rate method or the screening analysis method, refined dispersion modeling techniques may be required. Please consult with the Department's Air Quality Permit Program prior to conducting dispersion modeling methods to demonstrate compliance.

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Air and Radiation Management Adminstration Air Quality Permits Program

APPLICATION FOR PERMIT TO CONSTRUCT
GAS CLEANING OR EMISSION CONTROL EQUIPMENT

1.	**Owner of Installation** Holcim (US), Inc.	**Telephone No.** (301) 739-1150		**Date of Application**
2.	**Mailing Address** 1260 Security Road	**City** Hagerstown	**Zip Code** 21742	**County** Washington
3.	**Equipment Location** Same	**City/Town or P.O.**		**County**
4.	**Signature of Owner or Operator**	**Title** General Manager		**Print or Type Name** Alan Greer

5. **Application Type:** **Alteration** ☐ **New Construction** ☒

6. **Date Construction is to Start:** TBD **Completion Date (Estimate):** TBD

7. **Type of Gas Cleaning or Emission Control Equipment**

Simple Cyclone ☐ **Multiple Cyclone** ☐ **Afterburner** ☐ **Electrostatic Precipitator** ☐

Scrubber ☐ ______ (type) **Other** ☒ Dust collector (V81-BF01) (type)

8.	**Gas Cleaning Equipment Manufacturer** TBD	**Model No.** TBD	**Collection Efficiency (Design Criteria)** 0.0024 gr/dscf 90% collection

9. **Type of Equipment which Control Equipment is to Service:**

This dust collector will collect fugitive dust emissions from transfers in the low carbon engineered fuel material handling operation.

10. **Stack Test to be Conducted:**

Yes ☐ **No** ☒ ______ (Stack Test to be Conducted By) ______ (Date)

11. **Cost of Equipment** TBD

Estimated Erection Cost TBD

12. The Following Shall Be Design Criteria:

	INLET		OUTLET	
Gas Flow Rate	5000	ACFM*	5000	ACFM*
Gas Temperature	TBD	°F	TBD	°F
Gas Pressure	TBD	INCHES W.G.	TBD	INCHES W.G.
		PRESSURE DROP	TBD	
Dust Loading	Varies	GRAINS/ACFD**	0.0024	GRAINS/ACFD**
Moisture Content	Varies	%	Varies	%
OR				
Wet Bulb Temperature	N/A	°F	N/A	°F
Liquid Flow Rate (Wet Scrubber)	N/A	GALLONS/MINUTE		

(WHEN SCRUBBER LIQUID OTHER THAN WATER INDICATE COMPOSITION OF SCRUBBING MEDIUM IN WEIGHT %)

*= ACTUAL CUBIC FEET PER MINUTE **= ACTUAL CUBIC FEET DRY

WHEN APPLICATION INVOLVES THE REDUCTION OF GASEOUS POLLUTANTS, PROVIDE THE CONCENTRATION OF EACH POLLUTANT IN THE GAS STREAM IN VOLUME PERCENT. INCLUDE THE COMPOSITION OF THE GASES ENTERING THE CLEANING DEVICE AND THE COMPOSITION OF EXHAUSTED GASES BEING DISCHARGED INTO THE ATMOSPHERE. USE AVAILABLE SPACE IN ITEM 15 ON PAGE 3.

13. Particle Size Analysis

Size of Dust Particles Entering Cleaning Unit	% of Total Dust	% to be Collected
0 to 10 Microns	100	90% collection
10 to 44 Microns	0	90% collection
Larger than 44 Microns	0	90% collection

14. For Afterburner Construction Only:

Volume of Contaminated Air N/A CFM (DO NOT INCLUDE COMBUSTION AIR)

Gas Inlet Temperature N/A °F

Capacity of Afterburner N/A BTU/HR

Diameter (or area) of Afterburner Throat N/A

Combustion Chamber N/A (diameter) N/A (length) Operating Temperature at Afterburner N/A °F

Retention Time of Gases N/A

Information remains to be determined since manufacturer has not been chosen

15. Show Location of Dust Cleaning Equipment in the System. Draw or Sketch Flow Diagram Showing Emission Path from Source to Exhaust Point to Atmosphere.

See attached diagrams.

Date Received: **Local** ______________________ **State** ______________________

Acknowledgement Date: ____________________

By ____

Reviewed By:

Local ____

State ____

Returned to Local:

Date ____________

By ____

Application Returned to Applicant:

Date ____________

By ____

REGISTRATION NUMBER OF ASSOCIATED EQUIPMENT: ☐ ☐☐☐☐

PREMISES NUMBER: ☐☐ ☐☐☐☐

Emissions Calculations Revised By ______________________ **Date** ____________

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1. Owner of Installation Holcim (US), Inc.	**Telephone No.** (301) 739-1150		**Date of Application**	
2. Mailing Address 1260 Security Road	**City** Hagerstown	**Zip Code** 21742	**County** Washington	
3. Equipment Location Same	**City/Town or P.O.**		**County**	
4. Signature of Owner or Operator	**Title** General Manager		**Print or Type Name** Alan Greer	

5. Application Type: **Alteration** ☐ **New Construction** ☒

6. Date Construction is to Start: TBD

Completion Date (Estimate): TBD

7. Type of Gas Cleaning or Emission Control Equipment

Simple Cyclone ☐ **Multiple Cyclone** ☐ **Afterburner** ☐ **Electrostatic Precipitator** ☐

Scrubber ☐ ________ (type) **Other** ☒ Dust cartridge (V81-CF01) (type)

8. Gas Cleaning Equipment Manufacturer TBD

Model No. TBD

Collection Efficiency (Design Criteria) 0.0024 gr/dscf
90% collection

9. Type of Equipment which Control Equipment is to Service:

This dust cartridge will collect fugitive dust emissions from transfers in the low carbon engineered fuel material handling operation.

10. Stack Test to be Conducted:

Yes ☐ **No** ☒ ________ (Stack Test to be Conducted By) ________ (Date)

11. Cost of Equipment TBD

Estimated Erection Cost TBD

12. The Following Shall Be Design Criteria:

	INLET			OUTLET	
Gas Flow Rate	750	ACFM*		750	ACFM*
Gas Temperature	TBD	°F		TBD	°F
Gas Pressure	TBD	INCHES W.G.		TBD	INCHES W.G.
		PRESSURE DROP	TBD		
Dust Loading	Varies	GRAINS/ACFD**		0.0024	GRAINS/ACFD**
Moisture Content	Varies	%		Varies	%
OR					
Wet Bulb Temperature	N/A	°F		N/A	°F
Liquid Flow Rate (Wet Scrubber)	N/A	GALLONS/MINUTE			

(WHEN SCRUBBER LIQUID OTHER THAN WATER INDICATE COMPOSITION OF SCRUBBING MEDIUM IN WEIGHT %)

*= ACTUAL CUBIC FEET PER MINUTE **= ACTUAL CUBIC FEET DRY

WHEN APPLICATION INVOLVES THE REDUCTION OF GASEOUS POLLUTANTS, PROVIDE THE CONCENTRATION OF EACH POLLUTANT IN THE GAS STREAM IN VOLUME PERCENT. INCLUDE THE COMPOSITION OF THE GASES ENTERING THE CLEANING DEVICE AND THE COMPOSITION OF EXHAUSTED GASES BEING DISCHARGED INTO THE ATMOSPHERE. USE AVAILABLE SPACE IN ITEM 15 ON PAGE 3.

13. Particle Size Analysis

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0 to 10 Microns	100	90% collection
10 to 44 Microns	0	90% collection
Larger than 44 Microns	0	90% collection

14. For Afterburner Construction Only:

Volume of Contaminated Air N/A CFM (DO NOT INCLUDE COMBUSTION AIR)

Gas Inlet Temperature N/A °F

Capacity of Afterburner N/A BTU/HR

Diameter (or area) of Afterburner Throat N/A

Combustion Chamber N/A (diameter) N/A (length) Operating Temperature at Afterburner N/A °F

Retention Time of Gases N/A

Information remains to be determined since manufacturer has not been chosen

15. Show Location of Dust Cleaning Equipment in the System. Draw or Sketch Flow Diagram Showing Emission Path from Source to Exhaust Point to Atmosphere.

See attached diagrams.

Date Received: **Local** ______________________ **State** ______________________

Acknowledgement Date: ________________

By ____

Reviewed By:

Local ____

State ____

Returned to Local:

Date ____________

By ____

Application Returned to Applicant:

Date ____________

By ____

REGISTRATION NUMBER OF ASSOCIATED EQUIPMENT: ☐ ☐☐☐☐

PREMISES NUMBER: ☐☐ ☐☐☐☐

Emissions Calculations Revised By ______________________________ **Date** ____________

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1. **Owner of Installation:** Holcim (US), Inc. — **Telephone No.:** (301) 739-1150 — **Date of Application:**

2. **Mailing Address:** 1260 Security Road — **City:** Hagerstown — **Zip Code:** 21742 — **County:** Washington

3. **Equipment Location:** Same — **City/Town or P.O.:** — **County:**

4. **Signature of Owner or Operator:** — **Title:** General Manager — **Print or Type Name:** Alan Greer

5. **Application Type:** **Alteration** ☐ **New Construction** ☒

6. **Date Construction is to Start:** TBD — **Completion Date (Estimate):** TBD

7. **Type of Gas Cleaning or Emission Control Equipment**

Simple Cyclone ☐ **Multiple Cyclone** ☐ **Afterburner** ☐ **Electrostatic Precipitator** ☐

Scrubber ☐ ________ (type) **Other** ☒ Dust cartridge (V81-CF02) (type)

8. **Gas Cleaning Equipment Manufacturer:** TBD — **Model No.:** TBD — **Collection Efficiency (Design Criteria):** 0.0024 gr/dscf
90% collection

9. **Type of Equipment which Control Equipment is to Service:**

This dust cartridge will collect fugitive dust emissions from transfers in the low carbon engineered fuel material handling operation.

10. **Stack Test to be Conducted:**

Yes ☐ **No** ☒ ________ (Stack Test to be Conducted By) ________ (Date)

11. **Cost of Equipment** TBD

Estimated Erection Cost TBD

12. The Following Shall Be Design Criteria:

	INLET		OUTLET	
Gas Flow Rate	750	ACFM*	750	ACFM*
Gas Temperature	TBD	°F	TBD	°F
Gas Pressure	TBD	INCHES W.G.	TBD	INCHES W.G.
		PRESSURE DROP	TBD	
Dust Loading	Varies	GRAINS/ACFD**	0.0024	GRAINS/ACFD**
Moisture Content	Varies	%	Varies	%
OR				
Wet Bulb Temperature	N/A	°F	N/A	°F
Liquid Flow Rate (Wet Scrubber)	N/A	GALLONS/MINUTE		

(WHEN SCRUBBER LIQUID OTHER THAN WATER INDICATE COMPOSITION OF SCRUBBING MEDIUM IN WEIGHT %)

*= ACTUAL CUBIC FEET PER MINUTE **= ACTUAL CUBIC FEET DRY

WHEN APPLICATION INVOLVES THE REDUCTION OF GASEOUS POLLUTANTS, PROVIDE THE CONCENTRATION OF EACH POLLUTANT IN THE GAS STREAM IN VOLUME PERCENT. INCLUDE THE COMPOSITION OF THE GASES ENTERING THE CLEANING DEVICE AND THE COMPOSITION OF EXHAUSTED GASES BEING DISCHARGED INTO THE ATMOSPHERE. USE AVAILABLE SPACE IN ITEM 15 ON PAGE 3.

13. Particle Size Analysis

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0 to 10 Microns	100	90% collection
10 to 44 Microns	0	90% collection
Larger than 44 Microns	0	90% collection

14. For Afterburner Construction Only:

Volume of Contaminated Air N/A CFM (DO NOT INCLUDE COMBUSTION AIR)

Gas Inlet Temperature N/A °F

Capacity of Afterburner N/A BTU/HR

Diameter (or area) of Afterburner Throat N/A

Combustion Chamber N/A (diameter) N/A (length) Operating Temperature at Afterburner N/A °F

Retention Time of Gases N/A

Information remains to be determined since manufacturer has not been chosen

15. Show Location of Dust Cleaning Equipment in the System. Draw or Sketch Flow Diagram Showing Emission Path from Source to Exhaust Point to Atmosphere.

See attached diagrams.

Date Received: **Local** ______________________ **State** ______________________

Acknowledgement Date: ________________

By ____

Reviewed By:

Local ____

State ____

Returned to Local:

Date ____________

By ____

Application Returned to Applicant:

Date ____________

By ____

REGISTRATION NUMBER OF ASSOCIATED EQUIPMENT: ☐ ☐☐☐☐

PREMISES NUMBER: ☐☐ ☐☐☐☐

Emissions Calculations Revised By ______________________________ **Date** __________

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2.	**Mailing Address** 1260 Security Road	**City** Hagerstown	**Zip Code** 21742	**County** Washington
3.	**Equipment Location** Same	**City/Town or P.O.**		**County**
4.	**Signature of Owner or Operator**	**Title** General Manager		**Print or Type Name** Alan Greer

5. **Application Type:** **Alteration** ☐ **New Construction** ☒

6. **Date Construction is to Start:** TBD **Completion Date (Estimate):** TBD

7. **Type of Gas Cleaning or Emission Control Equipment**

Simple Cyclone ☐ **Multiple Cyclone** ☐ **Afterburner** ☐ **Electrostatic Precipitator** ☐

Scrubber ☐ ______ (type) **Other** ☒ Dust cartridge (V81-CF03) (type)

8.	**Gas Cleaning Equipment Manufacturer** TBD	**Model No.** TBD	**Collection Efficiency (Design Criteria)** 0.0024 gr/dscf 90% collection

9. **Type of Equipment which Control Equipment is to Service:**

This dust cartridge will collect fugitive dust emissions from transfers in the low carbon engineered fuel material handling operation.

10. **Stack Test to be Conducted:**

Yes ☐ **No** ☒ ______ (Stack Test to be Conducted By) ______ (Date)

11. **Cost of Equipment** TBD

Estimated Erection Cost TBD

12. The Following Shall Be Design Criteria:

	INLET			OUTLET	
Gas Flow Rate	1500	ACFM*		1500	ACFM*
Gas Temperature	TBD	°F		TBD	°F
Gas Pressure	TBD	INCHES W.G.		TBD	INCHES W.G.
		PRESSURE DROP	TBD		
Dust Loading	Varies	GRAINS/ACFD**		0.0024	GRAINS/ACFD**
Moisture Content	Varies	%		Varies	%
OR					
Wet Bulb Temperature	N/A	°F		N/A	°F
Liquid Flow Rate (Wet Scrubber)	N/A	GALLONS/MINUTE			

(WHEN SCRUBBER LIQUID OTHER THAN WATER INDICATE COMPOSITION OF SCRUBBING MEDIUM IN WEIGHT %)

*= ACTUAL CUBIC FEET PER MINUTE **= ACTUAL CUBIC FEET DRY

WHEN APPLICATION INVOLVES THE REDUCTION OF GASEOUS POLLUTANTS, PROVIDE THE CONCENTRATION OF EACH POLLUTANT IN THE GAS STREAM IN VOLUME PERCENT. INCLUDE THE COMPOSITION OF THE GASES ENTERING THE CLEANING DEVICE AND THE COMPOSITION OF EXHAUSTED GASES BEING DISCHARGED INTO THE ATMOSPHERE. USE AVAILABLE SPACE IN ITEM 15 ON PAGE 3.

13. Particle Size Analysis

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10 to 44 Microns	0	90% collection
Larger than 44 Microns	0	90% collection

14. For Afterburner Construction Only:

Volume of Contaminated Air N/A CFM (DO NOT INCLUDE COMBUSTION AIR)

Gas Inlet Temperature N/A °F

Capacity of Afterburner N/A BTU/HR

Diameter (or area) of Afterburner Throat N/A

Combustion Chamber N/A (diameter) N/A (length) Operating Temperature at Afterburner N/A °F

Retention Time of Gases N/A

Information remains to be determined since manufacturer has not been chosen

15. Show Location of Dust Cleaning Equipment in the System. Draw or Sketch Flow Diagram Showing Emission Path from Source to Exhaust Point to Atmosphere.

See attached diagrams.

Date Received: **Local** ________________________ **State** ________________________

Acknowledgement Date: ____________________
By ____

Reviewed By:
Local ____
State ____

Returned to Local:
Date ________________
By ____

Application Returned to Applicant:
Date ________________
By ____

REGISTRATION NUMBER OF ASSOCIATED EQUIPMENT: ☐ ☐☐☐☐

PREMISES NUMBER: ☐☐ ☐☐☐☐

Emissions Calculations Revised By ______________________________ **Date** ____________

APPENDIX F. EMISSIONS CALCULATIONS

Fugitive Emissions

Enclosure Efficiency - Partially Enclosed	50%
Enclosure Efficiency - Enclosed in Building	75%
Enclosure Efficiency - Enclosed Underground	90%
Enclosure Efficiency - Airslides, Bucket Elevators, and Screw Conveyors	100%

			Potential Throughput	**Dust Collectors**		**Building Controls**		**Uncontrolled Emission Factor (lb per ton of throughput)**					**Controlled Emission Rates (tpy)[1]**			
Equipment ID	**Description**	**Type of Process**	**tpy**	**Dust Collector ID**	**Capture Efficiency**	**Type of Control**	**Control Efficiency**	**PM_{filt}**	**$PM_{10\text{-}filt}$**	**$PM_{2.5\text{-}filt}$**	**PM_{cond}**	**Reference**	**PM_{filt}**	**$PM_{10\text{-}filt}$**	**$PM_{2.5\text{-}filt}$**	**PM_{cond}**
V81-BC01	Transfer from truck to belt conveyor (V81-BC01)	drop equation	55,116	Dust Collector (V81-BF01)	90%	Enclosed in Building	75%	3.37E-04	1.59E-04	2.41E-05	0.00E+00	AP-42 Section 13.2.4 Drop Equation	2.32E-04	1.10E-04	1.66E-05	0.00E+00
V81-BC02	Transfer from truck to belt conveyor (V81-BC02)	drop equation	55,116	Dust Collector (V81-BF01)	90%	Enclosed in Building	75%	3.37E-04	1.59E-04	2.41E-05	0.00E+00	AP-42 Section 13.2.4 Drop Equation	2.32E-04	1.10E-04	1.66E-05	0.00E+00
V81-BC01/02	Transfer from belt conveyors (V81-BC01 or V81-BC02) to belt conveyor (V81-BC03)	drop equation	110,231	Dust Collector (V81-BF01)	90%	None	0%	3.37E-04	1.59E-04	2.41E-05	0.00E+00	AP-42 Section 13.2.4 Drop Equation	1.86E-03	8.79E-04	1.33E-04	0.00E+00
V81-BF01	Transfer from dust collector (V81-BF01) to belt conveyor (V81-BC03)	drop equation	1,102	Dust Collector (V81-BF01)	90%	None	0%	3.37E-04	1.59E-04	2.41E-05	0.00E+00	AP-42 Section 13.2.4 Drop Equation	1.86E-05	8.79E-06	1.33E-06	0.00E+00
V81-BC03	Transfer from belt conveyor (V81-BC03) to weightbelt feeder (V81-WF01)	drop equation	110,231	Dust Cartridges (V81-CF01 and V81-CF02)	90%	Enclosed in Building	75%	3.37E-04	1.59E-04	2.41E-05	0.00E+00	AP-42 Section 13.2.4 Drop Equation	4.65E-04	2.20E-04	3.33E-05	0.00E+00
V81-WF01	Transfer from weightbelt feeder (V81-WF01) to flexowell belt (V81-BC04)	drop equation	110,231	Dust Cartridges (V81-CF01 and V81-CF02)	90%	Enclosed in Building	75%	3.37E-04	1.59E-04	2.41E-05	0.00E+00	AP-42 Section 13.2.4 Drop Equation	4.65E-04	2.20E-04	3.33E-05	0.00E+00
V81-BC04	Tranfer from flexowell belt (V81-BC04) to sacrificial belt (V81-BC05)	drop equation	110,231	Dust Cartridge (V81-CF03)	90%	None	0%	3.37E-04	1.59E-04	2.41E-05	0.00E+00	AP-42 Section 13.2.4 Drop Equation	1.86E-03	8.79E-04	1.33E-04	0.00E+00
V81-BC05	Transfer from sacrificial belt (V81-BC05) to calciner	drop equation	110,231	Dust Cartridge (V81-CF03)	90%	None	0%	3.37E-04	1.59E-04	2.41E-05	0.00E+00	AP-42 Section 13.2.4 Drop Equation	1.86E-03	8.79E-04	1.33E-04	0.00E+00
												TOTAL:	**6.99E-03**	**3.30E-03**	**5.00E-04**	**0.00E+00**

1. Emissions calculated using the following equation:

$$PM = T \times (1 - \eta_{DC}) \times (1 - \eta_{SE}) \times EF \times \frac{1}{2{,}000}$$

Where:

PM = Annual $PM/PM_{10}/PM_{2.5}$ emissions (tpy)
T = Material handling throughput (tpy)
η_{DC} = Dust collector capture efficiency
η_{SE} = Spray or enclosure efficiency
EF = $PM/PM_{10}/PM_{2.5}$ Emission factor, specific to material and process (lb/ton of throughput)

Drop Equation

$$E = k\,(0.0032)\,\frac{(U/5)^{1.3}}{(M/2)^{1.4}}$$

k = 0.74 PM - (AP-42, Section 13.2.4, for Particle Size < 30 um)
0.35 PM_{10} - (AP-42, Section 13.2.4, for Particle Size < 10 um)
0.053 $PM_{2.5}$ - (AP-42, Section 13.2.4, for Particle Size < 2.5 um)
M = 11 % - (AP-42, Table 13.2.4-1, mean moisture content of miscellaneous fill materials)
U = 7.0 mph - (average wind speed at Hagerstown Regional Airport for 2020

Dust Collectors - Grain Loading Emissions

Source Identification	Description	Flow Rates (dscfm)	Potential Hours of Operation (hr/yr)	PM_{filt} Grain Loading (gr/dscf)	$PM_{10\text{-}filt}$ Grain Loading (gr/dscf)	$PM_{2.5\text{-}filt}$ Grain Loading (gr/dscf)	PM_{cond} Grain Loading (gr/dscf)	Controlled Emission Rates[1]			
								PM_{filt} (tons/yr)	$PM_{10\text{-}filt}$ (tons/yr)	$PM_{2.5\text{-}filt}$ (tons/yr)	PM_{cond} (tons/year)
V81-BF01	Docking Station Dust Collector	5000	8,760	0.0024	0.0024	0.0019	0.000	0.45	0.45	0.36	0.00
V81-CF01	Weighfeeder Tower Dust Cartridge	750	8,760	0.0024	0.0024	0.0019	0.000	0.07	0.07	0.05	0.00
V81-CF02	Weighfeeder Tower Dust Cartridge	750	8,760	0.0024	0.0024	0.0019	0.000	0.07	0.07	0.05	0.00
V81-CF03	Belt Conveyor to Dosing System Dust Collector	1500	8,760	0.0024	0.0024	0.0019	0.000	0.14	0.14	0.11	0.00
							TOTAL:	**0.72**	**0.72**	**0.58**	**0.00**

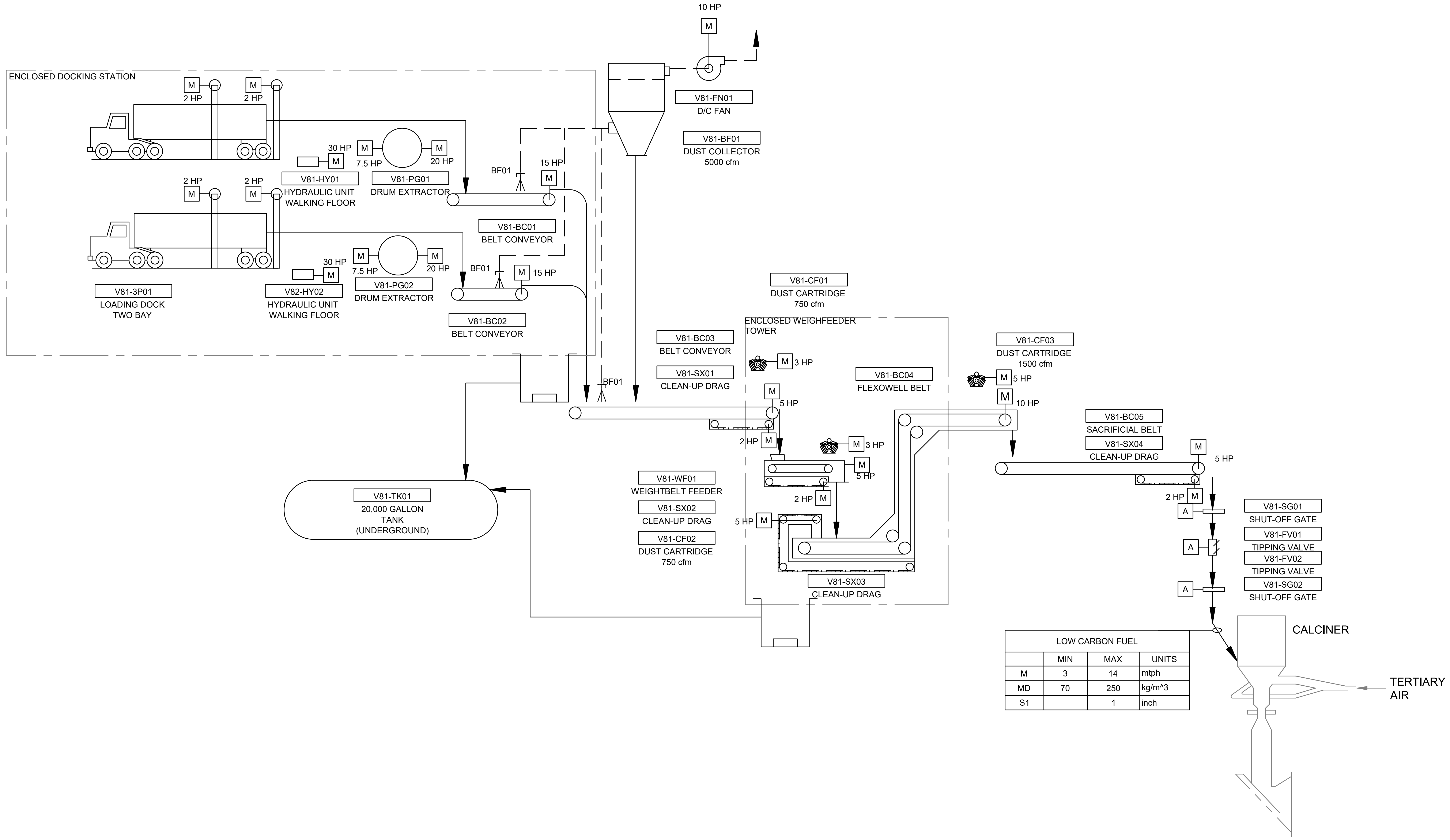
1. Emissions calculated using the following equation:

$$PM = FR \times GL \times \frac{1}{7{,}000} \times \frac{1}{2{,}000} \times 60 \times H$$

Where:

PM = $PM/PM_{10}/PM_{2.5}$ emissions (tpy)
FR = Design flow rate (dscfm)
GL = $PM/PM_{10}/PM_{2.5}$ grain loading (gr/dscf)
H = Hours of operation (hr/yr)

APPENDIX G. PROCESS FLOW DIAGRAMS



LOW CARBON FUEL			
	MIN	MAX	UNITS
M	3	14	mtph
MD	70	250	kg/m^3
S1		1	inch

REV	DATE	REVISION DESCRIPTION	BY	CHK	APP
A	03/05/21	ISSUED FOR REVIEW	RJN	TED	TH

LafargeHolcim

HAGERSTOWN
1260 Security Rd. Hagerstown, MD 21742

DESIGNED:	TED	**DATE:** 03/05/21
DRAWN:	RJN	**DATE:** 03/05/21
CHECKED:	TED	**DATE:** 03/05/21
SMACC APPR:	TH	**DATE:** 03/05/21

Industrial Ally
Engineering and Construction Services
1422 Elbridge Payne Rd. Suite 120
Chesterfield, MO 63017
INDUSTRIAL ALLY PROJECT NUMBER: **1604**

LOW CARBON FUEL STUDY
CALCINER FIRING
FLOWSHEET
MECHANICAL CONVEYING

IA DRAWING NUMBER
1604-FS-003
CLIENT DRAWING NUMBER

REV.	**DWG. SCALE:**
A	As indicated

DRAWING FORMAT: ARCH D - 24"x36"

APPENDIX H. RTO COST EFFECTIVENESS CALCULATIONS

RTO Costs for Kiln (CO BACT)

Holcim Costs for RTO (based on 2005 dollars)			
Flowrate =		206,310	dscfm (combined)
TCI (Total Cost of Installation)	$	14,821,942	PC MACT Section 2.7.4
Capital Recovery	$	2,110,645	14.24%, OAQPS Manual, Section 3.2 Chapter 2 Table 2.10
TAC (Total Allocated Capital)	$	4,430,072	PC MACT Section 2.7.4
CPI, 2005 Average (based on conversation with Keith Barnett at EPA)		195.4	https://www.bls.gov/cpi/data.htm
Holcim Costs for RTO (based on 2021 dollars)			
CPI, February 2021		263.014	https://www.bls.gov/cpi/data.htm
TCI	$	19,950,759	Scaled using CPI
Capital Recovery	$	2,840,988	14.24%, OAQPS Manual, Section 3.2 Chapter 2 Table 2.10
TAC	$	5,963,004	Scaled using CPI
CO Emitted =		1,700	tpy
Total CO Removed		1657.6	98% destruction efficiency
CO Generated		8.4	tpy, AP-42, scaled from burner from Ash Grove Midlothian
Total Cost ($/ton Pollutant Removed)	$	5,311.36	

Note: The above cost does not include the cost of getting natural gas to the site to operate the RTO.

MARYLAND DEPARTMENT OF THE ENVIRONMENT

AIR AND RADIATION ADMINISTRATION
APPLICATION FOR A PERMIT TO CONSTRUCT

SUPPLEMENT TO
DOCKET #08-21

COMPANY:	Holcim (US), Inc.
LOCATION:	1260 Security Road, Hagerstown, MD 21742
APPLICATION:	Installation of a low carbon engineered fuels handling system and authorization to co-process low carbon engineered fuels

ITEM	DESCRIPTION
1	Notice of Tentative Determination, Opportunity to Request a Public Hearing, and Opportunity to Submit Written Comments
2	Fact Sheet and Tentative Determination
3	Draft Permit to Construct and Conditions
4	Supplemental Information - Reference List - Amended Form 6 applications - Amended emissions calculations - Amended Process Diagram
5	Privilege Log – Not Applicable

MARYLAND DEPARTMENT OF THE ENVIRONMENT
AIR AND RADIATION ADMINISTRATION

NOTICE OF TENTATIVE DETERMINATION, OPPORTUNITY TO REQUEST A PUBLIC HEARING, AND OPPORTUNITY TO SUBMIT WRITTEN COMMENTS

FIRST NOTICE

The Department of the Environment, Air and Radiation Administration (ARA) has completed its review of an application for a Permit to Construct submitted by Holcim (US), Inc. on April 26, 2021 for the installation of a low carbon engineered fuels handling system and authorization to co-process low carbon engineered fuels. The proposed installation will be located at 1260 Security Road, Hagerstown, MD 21742.

Pursuant to Section 1-604, of the Environment Article, Annotated Code of Maryland, the Department has made a tentative determination that the Permit to Construct can be issued and is now ready to receive public comment on the application.

Copies of the Department's tentative determination, the application, the draft permit to construct with conditions, and other supporting documents are available for public inspection on the Department's website. Look for Docket #08-21 at the following link:

https://mde.maryland.gov/programs/Permits/AirManagementPermits/Pages/index.aspx

Interested persons may request a public hearing and/or submit written comments on the tentative determination. Requests for a public hearing must be submitted in writing and must be received by the Department no later than 20 days from the date of this notice. Written comments must be received by the Department no later than 30 days from the date of this notice.

Interested persons may request an extension to the public comment period. The extension request must be submitted in writing and must be received by the Department no later than 30 days from the date of this notice or within 5 days after the hearing (if a hearing is requested), whichever is later. The public comment period may only be extended one time for a 60-day period.

All requests for a public hearing, requests for an extension to the public comment period, and all written comments should be emailed to Ms. Shannon Heafey at shannon.heafey@maryland.gov.

Further information may be obtained by contacting Ms. Shannon Heafey by email at shannon.heafey@maryland.gov or by phone at (410) 537-4433.

George S. Aburn, Jr., Director
Air and Radiation Administration

MARYLAND DEPARTMENT OF ENVIRONMENT
AIR AND RADIATION ADMINISTRATION

FACT SHEET AND TENTATIVE DETERMINATION
HOLCIM (US), INC.

PROPOSED INSTALLATION OF A LOW CARBON ENGINEERED FUELS HANDLING SYSTEM AND AUTHORIZATION TO PROCESS LOW CARBON ENGINEERED FUELS

I. INTRODUCTION

The Maryland Department of the Environment (the "Department") received an application from Holcim (US), Inc. (Holcim) on April 28, 2021 for a Permit to Construct for the installation of a low carbon engineered fuels handling system and authorization to process low carbon engineered fuels. The proposed installation will be located at 1260 Security Road, Hagerstown, MD 21742.

A notice was placed in the Herald-Mail on August 18, 2021 and August 25, 2021 announcing a scheduled informational meeting to discuss the permit to construct application. The informational meeting was held on September 2, 2021 at Hagerstown Community College Career Programs Building located at 11400 Robinwood Drive, Hagerstown, MD 21742.

As required by law, all public notices were also provided to elected officials in all State, county, and municipality legislative districts located within a one mile radius of the facility's property boundary.

The Department has reviewed the application and has made a tentative determination that the proposed installation is expected to comply with all applicable air quality regulations. A notice will be published to provide the public with opportunities to request a public hearing and to comment on the application, the Department's tentative determination, the draft permit conditions, and other supporting documents. The Department will not schedule a public hearing unless a legitimate request is received.

If the Department does not receive any comments that are adverse to the tentative determination, the tentative determination will automatically become a final determination. If adverse comments are received, the Department will review the comments, and will then make a final determination with regard to issuance or denial of the permit. A notice of final determination will be published in a newspaper of general circulation in the affected area. The final determination may be subject to judicial review pursuant to Section 1-601 of the Environment Article, Annotated Code of Maryland.

II. CURRENT STATUS AND PROPOSED INSTALLATION

A. Current Status

Holcim operates a Portland Cement Plant in Hagerstown, MD. The plant has a current Title V Operating Permit that expires April 30, 2023. The Portland Cement Kiln at the plant is currently permitted to burn the following fuels:

(a) Natural gas, synthetic natural gas, propane, distillate oil, synthesis gas (syngas), and ultra-low sulfur diesel (ULSD);

(b) Coal;

(c) Pet Coke;

(d) Fuel Oil;

(e) Tire Derived Fuel (TDF);

(f) On-Specification Used Oil which meets the specifications in COMAR 26.11.09.10B; and

(g) Wood which has no paints, stains, or other type of coating and/or has not been treated with chromium copper arsenate (CCA) or pentachlorophenol.

B. Proposed Installation

Holcim submitted an application to install a low carbon engineered fuels handling system and authorization to process low carbon engineered fuels. The system will have a maximum handling capacity of 100,000 metric tons per year and be constructed with three (3) dust collectors for the control of fugitive dust from transfer points within the system. Low caron engineered fuels will meet the fuel requirements of non-hazardous secondary materials outlined in 40 CFR 241, Subpart B.

III. APPLICABLE REGULATIONS

The proposed installation is subject to all applicable Federal and State air quality control regulations, including, but not limited to the following:

(a) 40 CFR 60, Subparts A and F, which establish New Source Performance Standards for Portland Cement Plants.

(b) 40 CFR 63, Subparts A and LLL, which establish National Emission Standards for Hazardous Air Pollutants for the Portland Cement Manufacturing Industry.

(c) COMAR 26.11.01.05 – 1, which requires that the Permittee submit an annual certification of emissions for volatile organic compounds (VOC) and nitrogen oxides (NO_x).

(d) COMAR 26.11.01.07C, which requires that the Permittee report to the Department occurrences of excess emissions.

(e) COMAR 26.11.02.19C & D, which require that the Permittee submit to the Department annual certifications of emissions, and that the Permittee maintain sufficient records to support the emissions information presented in the submittals.

(f) COMAR 26.11.06.03D, which requires that the Permittee take reasonable precautions to prevent particulate matter from materials handling and construction operations from becoming airborne.

(g) COMAR 26.11.06.07B(1)(a), which states that a person may not cause or permit the discharge of fluorides into the atmosphere that causes a violation of any applicable air quality standards for fluorides set forth in COMAR 26.11.04.

(h) COMAR 26.11.06.07B(1)(b), which states that the Department, after written notice to a person discharging fluorides to the atmosphere, may require the person to conduct a surveillance to determine whether ambient air quality standards for fluorides are violated. The manner, scope, and duration of the surveillance program will be determined by the Department.

(i) COMAR 26.11.06.07B(1)(c), which states that the procedures for measuring total fluorides shall be Method 1010 of the Department's Technical Memorandum 91-01, "Test Methods and Equipment Specifications for Stationary Sources," which is incorporated by reference in COMAR 26.11.01.04C.

(j) COMAR 26.11.06.08 and 26.11.06.09, which generally prohibit the discharge of emissions beyond the property line in such a manner that a nuisance or air pollution is created.

(k) COMAR 26.11.15.05, which requires that the Permittee implement "Best Available Control Technology for Toxics" (T – BACT) to control emissions of toxic air pollutants.

(l) COMAR 26.11.15.06, which prohibits the discharge of toxic air pollutants to the extent that such emissions will unreasonably endanger human health.

(m) COMAR 26.11.30.04(B)(1), which states that a person may not cause or permit particulate matter to be discharged from any installation in excess of 0.05 grains per standard cubic foot dry.

(n) COMAR 26.11.30.04(B)(3), which states that compliance with the particulate matter standards of COMAR 26.11.30.04(B)(1) shall be demonstrated by a 3-run stack test using Method 5 or Method 5I of 40 CFR Part 60.

(o) COMAR 26.11.30.04(C) - which establishes particulate matter testing parameters for a cement kiln or clinker cooler at a Portland cement manufacturing plant shall.

(p) COMAR 26.11.30.05(B)(1), which states that a person may not cause or permit the discharge of emissions from any installation or building, other than water in an uncombined form, which is greater than 20 percent opacity.

(q) COMAR 26.11.30.05(B)(3), which states that compliance with the visibility standards of COMAR 26.11.30.05(B)(1) shall be demonstrated by a visible emission observation using Method 9 of 40 CFR Part 60.

(r) COMAR 26.11.30.06A(1) and 26.11.30.06C, which limit the sulfur dioxide concentration in the exhaust gases not to exceed 500 parts per million by volume corrected to 7 percent oxygen.

(s) COMAR 26.11.30.06B(1) and 26.11.30.06C, which limits the content of sulfuric acid, sulfur trioxide, or any combination not to exceed 35 milligrams reported as sulfuric acid per cubic meter of gas corrected to 7 percent oxygen.

(t) COMAR 26.11.30.07A(2) and 26.11.30.07D, which limit NOx emissions to 2.8 pounds per ton of clinker produced for pre-heater/pre-calciner or pre-calciner kilns based on a 30-day rolling average.

(u) COMAR 26.11.30.07C(2) and 26.11.30.07D, which limit NOx emissions to 2.4 pounds per ton of clinker produced for pre-heater/pre-calciner or pre-calciner kilns based on a 30-day rolling average on or after April 1, 2017.

(v) COMAR 26.11.30.08, which requires a person who owns or operates a cement manufacturing facility to install, operate, and maintain a continuous emissions monitor (CEM) for NOx emissions.

(w) COMAR 26.11.31, which specifies quality assurance requirements for COMs.

IV. GENERAL AIR QUALITY

The U.S. Environmental Protection Agency (EPA) has established primary and secondary National Ambient Air Quality Standards (NAAQS) for six (6) criteria pollutants, i.e., sulfur dioxide, particulate matter, carbon monoxide, nitrogen dioxide, ozone, and lead. The primary standards were established to protect public health, and the secondary standards were developed to protect against non-health effects such as damage to property and vegetation.

The Department utilizes a statewide air monitoring network, operated in accordance with EPA guidelines, to measure the concentrations of criteria pollutants in Maryland's ambient air. The measurements are used to project statewide ambient air quality, and currently indicate that Washington County complies with the NAAQS for sulfur dioxide, particulate matter, carbon monoxide, nitrogen dioxide, ozone, and lead.

With regard to toxic air pollutants (TAPs), screening levels (i.e., acceptable ambient concentrations for toxic air pollutants) are generally established at 1/100 of allowed worker exposure levels (TLVs)[1]. The Department has also developed additional screening levels for carcinogenic compounds. The additional screening levels are established such that continuous exposure to the subject TAP at the screening level for a period of 70 years is expected to cause an increase in lifetime cancer risk of no more than 1 in 100,000.

V. COMPLIANCE DEMONSTRATION AND ANALYSIS

The proposed installation must comply with all State imposed emissions limitations and screening levels, as well as the NAAQS. The Department has conducted an engineering and air quality review of the application. The emissions were projected based on EPA AP-42 emission factors. The conservative U.S. EPA's SCREEN3 model was used to project the maximum ground level concentrations from the proposed facility, which were then compared to the screening levels and the NAAQS.

A. **Estimated Emissions** - The maximum emissions of particulate matter from the proposed handling system are listed in Table I. There are not expected to be increases in emissions of other criteria pollutants due to low carbon engineered fuels being cleaner than other authorized and permitted fuels.

B. **Compliance with National Ambient Air Quality Standards -** The maximum ground level concentration for particulate matter based on the emissions from the proposed installation are listed in column 2 of Table II. The combined impact of the projected contribution from the proposed installation and the ambient background concentration for particulate matter shown in column 3 of Table II is less than the NAAQS shown in column 4.

C. **Compliance with Air Toxics Regulations** – Emissions of toxic air pollutants are not expected to increase due to low carbon engineered fuels being cleaner than other authorized and permitted fuels. Holcim has already demonstrated compliance with Air Toxics Regulations using conservative estimates of their permitted fuels. Crystalline silica is an exception and may be present in low carbon engineered fuels, while being

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[1] TLVs are threshold limit values (exposure limits) established for toxic materials by the American Conference of Governmental Industrial Hygienists (ACGIH). Some TLVs are established for short-term exposure (TLV – STEL), and some are established for longer-term exposure (TLV – TWA), where TWA is an acronym for time-weight average.

absent in the currently used fuels. While crystalline silica will not be present in all low carbon engineered fuels, it was assumed to be present for the emissions estimate. The predicted maximum off-site ambient concentrations of crystalline silica shown in column 4 of Table III, and the maximum concentration is less than the screening level for crystalline silica shown in column 2.

VI. TENTATIVE DETERMINATION

Based on the above information, the Department has concluded that the proposed installation will comply with all applicable Federal and State air quality control requirements. In accordance with the Administrative Procedure Act, Department has made a tentative determination to issue the Permit to Construct.

Enclosed with the tentative determination is a copy of the draft Permit to Construct.

TABLE I
PROJECTED MAXIMUM EMISSIONS FROM THE PROPOSED INSTALLATION

POLLUTANT	PROJECTED MAXIMUM EMISSIONS FROM PROPOSED INSTALLATION	
	(lbs/day)	(tons/year)
Particulate Matter (PM_{10})	0.0006	0.00242

TABLE II
PROJECTED IMPACT OF EMISSIONS OF CRITERIA POLLUTANTS FROM THE PROPOSED INSTALLATION ON AMBIENT AIR QUALITY

POLLUTANTS	MAXIMUM OFF-SITE GROUND LEVEL CONCENTRATIONS CAUSED BY EMISSIONS FROM PROPOSED PROCESS ($\mu g/m^3$)	BACKGROUND AMBIENT AIR CONCENTRATIONS ($\mu g/m^3$)*	NATIONAL AMBIENT AIR QUALITY STANDARDS (NAAQS) ($\mu g/m^3$)
Particulate Matter (PM_{10})	24-hr max → 0.006	24-hr max.→ 53	24-hr max.→ 150

*Background concentrations were obtained from Maryland air monitoring stations as follows:
PM_{10} → Oldtown Fire Station in Baltimore City

TABLE III
PREDICTED MAXIMUM OFF-SITE AMBIENT CONCENTRATIONS FOR TOXIC AIR POLLUTANTS EMITTED FROM THE PROPOSED INSTALLATION

TOXIC AIR POLLUTANTS	SCREENING LEVELS ($\mu g/m^3$)	PROJECTED WORST-CASE FACILITY-WIDE EMISSIONS (lbs/hr)	PREDICTED MAXIMUM OFF-SITE GROUND LEVEL CONCENTRATIONS ($\mu g/m^3$)
Crystalline Silica	1-hour→ None 8-hour→ 1 Annual→ None	0.00289	1-hour→ None 8-hour→ 29.6 Annual→ None

The values represent maximum facility-wide emissions of toxic air pollutants during any 1-hour period of facility operation.

The values are based on worst-case emissions from the proposed facility and were predicted by EPA's SCREEN3 model, which provides conservative estimations concerning the impact of pollutants on ambient air quality.

DRAFT PERMIT

Larry Hogan   Ben Grumbles

Air and Radiation Administration

1800 Washington Boulevard, Suite 720
Baltimore, MD 21230

☒ Construction Permit   ☐ Operating Permit

PERMIT NO.: 043-0008-6-0495	DATE ISSUED: TBD
PERMIT FEE: $5,000.00	EXPIRATION DATE: In accordance with COMAR 26.11.02.04B

LEGAL OWNER & ADDRESS	**SITE**
Holcim (US), Inc. 1260 Security Road, Hagerstown, MD 21742 Attention: Mr. Michael Noll, Environmental and Public Affairs Manager	Holcim (US), Inc. 1260 Security Road, Hagerstown, MD 21742 AI # 2255

SOURCE DESCRIPTION

This permit authorizes the installation of a low carbon engineered fuels handling system and authorizes the processing of low carbon engineered fuels in a portland cement kiln.

This permit is issued in conjunction with all valid permits to construct issued to ARA Registration No. 043-0008-6-0495.

This source is subject to the conditions described on the attached pages.

Program Manager   Director, Air and Radiation Administration

INDEX

Part A – General Provisions

(1) The following Air and Radiation Administration (ARA) permit-to-construct applications and supplemental information are incorporated into this permit by reference:

(a) All valid Applications for Processing or Manufacturing Equipment (Form 5) received at the Department prior to the issuance of this permit and pertaining to ARA Registration No. 043-0008-6-0495. This includes the Form 5 submitted to the Department on April 28, 2021 to process low carbon engineered fuels in the portland cement kiln and install a low carbon engineered fuels handling system.

(b) All valid Applications for Gas Cleaning or Emission Control Equipment (Form 6) received at the Department prior to the issuance of this permit and pertaining to ARA Registration No. 043-0008-6-0495. This includes the original Form 6 applications submitted to the Department on April 28, 2021 and the three (3) amended Form 6 applications submitted to the Department on November 9, 2021.

(c) All valid Toxic Air Pollutant (TAP) Emissions Summary and Compliance Demonstration (Forms 5A and 5T) received at the Department prior to the issuance of this permit and pertaining to ARA Registration No. 043-0008-6-0495. This includes the Form 5T submitted to the Department on April 28, 2021.

(d) All valid Emission Point Data (Forms 5B and 5EP) received at the Department prior to the issuance of this permit and pertaining to ARA Registration No. 043-0008-6-0495. This includes the Form 5EP submitted to the Department on April 28, 2021.

(e) Supplemental Information: PSD and NSR analysis, BACT analysis, process flow diagrams, emissions calculations received on April 28, 2021.

If there are any conflicts between representations in this permit and representations in the applications, the representations in the permit shall govern. Estimates of dimensions, volumes, emissions rates, operating rates, feed rates and hours of operation included in the applications do not constitute enforceable numeric limits beyond the extent necessary for compliance with applicable requirements.

(2) Upon presentation of credentials, representatives of the Maryland Department of the Environment ("MDE" or the "Department") and the Washington County Health Department shall at any reasonable time be granted, without delay and without prior notification, access to the Permittee's property and permitted to:

(a) inspect any construction authorized by this permit;

(b) sample, as necessary to determine compliance with requirements of this permit, any materials stored or processed on-site, any waste materials, and any discharge into the environment;

(c) inspect any monitoring equipment required by this permit;

(d) review and copy any records, including all documents required to be maintained by this permit, relevant to a determination of compliance with requirements of this permit; and

(e) obtain any photographic documentation or evidence necessary to determine compliance with the requirements of this permit.

(3) The Permittee shall notify the Department prior to increasing quantities and/or changing the types of any materials referenced in the application or limited by this permit. If the Department determines that such increases or changes constitute a modification, the Permittee shall obtain a permit-to-construct prior to implementing the modification.

(4) Nothing in this permit authorizes the violation of any rule or regulation or the creation of a nuisance or air pollution.

(5) If any provision of this permit is declared by proper authority to be invalid, the remaining provisions of the permit shall remain in effect.

(6) This permit is issued in conjunction with all valid permits to construct issued to ARA Registration No. 043-0008-6-0495.

(7) Subsequent to issuance of this permit, the Department may impose additional and modified requirements that are incorporated into the Title V Operating Permit issued pursuant to COMAR 26.11.03.

Part B – Applicable Regulations

(1) This source is subject to all applicable federal air pollution control requirements including, but not limited to, the following:

(a) All applicable terms, provisions, emissions standards, testing, monitoring, record keeping, and reporting requirements included in federal New Source Performance Standards (NSPS) promulgated under 40 CFR 60, Subparts A and F for Portland Cement Plants.

(b) All applicable terms, provisions, emissions standards, testing, monitoring, record keeping, and reporting requirements included in the National Emissions Standards for Hazardous Air Pollutants (NESHAP) promulgated under 40 CFR 63, Subparts A and LLL for Portland Cement Manufacturing Industry.

All notifications required under 40 CFR 60, Subparts A and F and 40 CFR 63, Subparts A and LLL shall be submitted to both of the following:

The Administrator
Compliance Program
Maryland Department of the Environment
Air and Radiation Administration
1800 Washington Boulevard, STE 715
Baltimore MD 21230

and

Director, Air Protection Division
U.S. EPA – Region 3
Mail Code 3AP00
1650 Arch Street
Philadelphia, PA 19103-2029

(2) This source is subject to all applicable federally enforceable State air pollution control requirements including, but not limited to, the following regulations:

(a) COMAR 26.11.01.05 – 1, which requires that the Permittee submit an annual certification of emissions for volatile organic compounds (VOC) and nitrogen oxides (NO_x).

(b) COMAR 26.11.01.07C, which requires that the Permittee report to the Department occurrences of excess emissions.

(c) COMAR 26.11.02.04B, which states that a permit to construct or an approval expires if, as determined by the Department:

  (i) Substantial construction or modification is not commenced within 18 months after the date of issuance of the permit or approval, unless the Department specifies a longer period in the permit or approval;

  (ii) Construction or modification is substantially discontinued for a period of 18 months after the construction or modification has commenced; or

  (iii) The source for which the permit or approval was issued is not completed within a reasonable period after the date of issuance of the permit or approval.

(d) COMAR 26.11.02.09A, which requires that the Permittee obtain a permit-to-construct if an installation is to be modified in a manner that would cause changes in the quantity, nature, or characteristics of emissions from the installation as referenced in this permit.

(e) COMAR 26.11.02.19C & D, which require that the Permittee submit to the Department annual certifications of emissions, and that the Permittee maintain sufficient records to support the emissions information presented in such submittals.

(f) COMAR 26.11.03.17F(1), which requires that before making a change that qualifies as a significant permit modification, a Permittee shall obtain all permits to construct and approvals if required by COMAR 26.11.02.09A.

(g) COMAR 26.11.03.17F(2), which requires that for modifications that require a permit to construct and, if applicable, approval by COMAR 26.11.02, the Permittee may make the change only after the Permittee has received the required permit to construct, and, if applicable, approval and has submitted a complete application for a significant modification to its Part 70 permit.

(h) COMAR 26.11.03.17F(3), which requires that for significant modifications that do not require a permit to construct, and, if applicable, approval, the Permittee may not make the change until the Department issues a revised Part 70 permit that includes the requirements that apply to the modification.

(i) COMAR 26.11.06.03D, which requires that the Permittee take reasonable precautions to prevent particulate matter from materials handling and construction operations from becoming airborne.

(j) COMAR 26.11.06.07B(1)(a), which states that a person may not cause or permit the discharge of fluorides into the atmosphere that causes a violation of any applicable air quality standards for fluorides set forth in COMAR 26.11.04.

(k) COMAR 26.11.06.07B(1)(b), which states that the Department, after written notice to a person discharging fluorides to the atmosphere, may require the person to conduct a surveillance to determine whether ambient air quality standards for fluorides are violated. The manner, scope, and duration of the surveillance program will be determined by the Department.

(l) COMAR 26.11.06.07B(1)(c), which states that the procedures for measuring total fluorides shall be Method 1010 of the Department's Technical Memorandum 91-01, "Test Methods and Equipment Specifications for Stationary Sources," which is incorporated by reference in COMAR 26.11.01.04C.

(m) COMAR 26.11.06.12, which states that a person may not construct modify, or operate, or cause to be constructed, modified, or operated, a New Source Performance Standard (NSPS) source in a manner which results or will result in violation of the provisions of 40 CFR, Part 60.

(n) COMAR 26.11.30.04(B)(1), which states that a person may not cause or permit particulate matter to be discharged from any installation in excess of 0.05 grains per standard cubic foot dry.

(o) COMAR 26.11.30.04(B)(3), which states that compliance with the particulate matter standards of COMAR 26.11.30.04(B)(1) shall be demonstrated by a 3-run stack test using Method 5 or Method 5I of 40 CFR Part 60.

(p) COMAR 26.11.30.04(C) - which states that the owner or operator of a cement kiln or clinker cooler at a Portland cement manufacturing plant shall:

(i) use a PM continuous parametric monitoring system (CPMS) to establish a site-specific operating parameter limit corresponding to the results of the performance test as required in COMAR 26.11.30.04(B)(3) demonstrating compliance with the PM limits in COMAR 26.11.30.04(B)(1**); [reference COMAR 26.11.30.04(C)(1)]**

(ii) conduct the performance test as required in COMAR 26.11.30.04(B)(3) using Method 5 or Method 5I of 40 CFR part 60; **[Reference: COMAR 26.11.30.04(C)(2)]**

(iii) use the PM CPMS to demonstrate continuous compliance with the site-specific operating parameter limit established in COMAR 26.11.30.04(C)(1); **[Reference: COMAR 26.11.30.04(C)(3)]**

(iv) repeat the performance test as required in COMAR 26.11.30.04(B)(3) annually and reassess and adjust the site-specific operating parameter limit of COMAR 26.11.30.04(C)(1) in accordance with the results of the performance test using the procedures in 40 CFR §63.1349(b)(1)(i)—(ix); **[Reference: COMAR 26.11.30.04(C)(4)]** and

(v) follow the procedures in 40 CFR §63.1350(b)(iii) and (iv) for any exceedance of the established operating parameter limit of COMAR 26.11.30.04(C)(1) on a 30 process operating day basis. **[Reference: COMAR 26.11.30.04(C)(5)]**

(q) COMAR 26.11.30.05(B)(1), which states that a person may not cause or permit the discharge of emissions from any installation or building, other than water in an uncombined form, which is greater than 20 percent opacity.

(r) COMAR 26.11.30.05(B)(3), which states that compliance with the visibility standards of COMAR 26.11.30.05(B)(1) shall be demonstrated by a visible emission observation using Method 9 of 40 CFR Part 60.

(s) COMAR 26.11.30.06A(1) and 26.11.30.06C, which limit the sulfur dioxide concentration in the exhaust gases not to exceed 500 parts per million by volume corrected to 7 percent oxygen.

(t) COMAR 26.11.30.06B(1) and 26.11.30.06C, which limits the content of sulfuric acid, sulfur trioxide, or any combination not to exceed 35 milligrams reported as sulfuric acid per cubic meter of gas corrected to 7 percent oxygen.

(u) COMAR 26.11.30.07A(2) and 26.11.30.07D, which limit NOx emissions to 2.8 pounds per ton of clinker produced for pre-heater/pre-calciner or pre-calciner kilns based on a 30-day rolling average.

(v) COMAR 26.11.30.07C(2) and 26.11.30.07D, which limit NOx emissions to 2.4 pounds per ton of clinker produced for pre-heater/pre-calciner or pre-calciner kilns based on a 30-day rolling average on or after April 1, 2017.

(w) COMAR 26.11.30.08, which requires a person who owns or operates a cement manufacturing facility to install, operate, and maintain a continuous emissions monitor (CEM) for NOx emissions.

(x) COMAR 26.11.31, which specifies quality assurance requirements for COMs.

(3) This source is subject to all applicable State-only enforceable air pollution control requirements including, but not limited to, the following regulations:

(a) COMAR 26.11.06.08 and 26.11.06.09, which generally prohibit the discharge of emissions beyond the property line in such a manner that a nuisance or air pollution is created.

(b) COMAR 26.11.15.05, which requires that the Permittee implement “Best Available Control Technology for Toxics” (T – BACT) to control emissions of toxic air pollutants.

(c) COMAR 26.11.15.06, which prohibits the discharge of toxic air pollutants to the extent that such emissions would unreasonably endanger human health.

(4) The Permittee shall comply with the emissions limits, in accordance with Permit to Construct #043-0008-6-0495, including, but not limited to, the following:

(a) SO_2 emissions not to exceed 1.6 pounds per ton of clinker on a 30-day rolling average; **[Reference: Permit to Construct 043-0008-6-0495 issued April 11, 2014 and updated on April 18, 2016]**

(b) SO_2 emissions not to exceed 655 tons for any 12-month rolling period; **[Reference: Permit to Construct 043-0008-6-0495 issued April 11, 2014 and updated on April 18, 2016]** and

(c) NOx emissions not to exceed 1.8 pounds per ton of clinker on a 30-day rolling average. **[Reference: Permit to Construct 043-0008-6-0495 issued April 11, 2014 and updated on April 18, 2016]**

Part C – Construction Conditions

(1) Except as otherwise provided in this part, the low carbon engineered fuel handling system shall be constructed in accordance with specifications included in the incorporated applications.

(2) The system shall be constructed such that it has a maximum handling capacity of 100,000 metric tons per year.

(3) The low carbon engineered fuel handling system shall be constructed with three (3) dust collectors for the control of fugitive dust from transfer points within the system.

(4) Low carbon engineered fuels must meet the following requirements of non-hazardous secondary material outlined in 40 CFR 241, Subpart B.

(a) The storage of the non-hazardous secondary material prior to use must not exceed reasonable time frames;

(b) When there is an analogous fuel, the non-hazardous secondary material must be managed in a manner consistent with the analogous fuel or otherwise be adequately contained to prevent releases to the environment;

(c) If there is no analogous fuel, the non-hazardous secondary material must be adequately contained so as to prevent releases to the environment;

(d) The non-hazardous secondary material must have a meaningful heating value and be used as a fuel in a combustion unit that recovers energy;

(e) The non-hazardous secondary material must contain contaminants or groups of contaminants at levels comparable in concentration to or lower than those in traditional fuel(s) that the combustion unit is designed to combust. In determining which traditional fuel(s) a unit is designed to combust, persons may choose a traditional fuel that can be or is burned in the particular type of combustion unit, whether or not the unit is permitted to combust that traditional fuel. In comparing contaminants between traditional fuel(s) and a non-hazardous secondary material, persons can use data for traditional fuel contaminant levels compiled from national surveys, as well as contaminant level data from the specific traditional fuel being replaced. To account for natural variability in contaminant levels, persons can use the full range of traditional fuel contaminant levels, provided such comparisons also consider variability in non-hazardous secondary material contaminant levels. Such comparisons are to be based on a direct comparison of the contaminant levels in both the non-hazardous secondary material and traditional fuel(s) prior to combustion. **[Reference: §241.3(d)(1)]**

(5) The Permittee shall, at minimum, perform a pre-qualification analysis of the low carbon engineered fuels that includes the following criteria:

(a) The fuel shall have a minimum heating value of 5,000 Btu/lb;

(b) The fuel shall undergo processing, including, but not limited to: sizing, contaminant removal improvement of fuel characteristics, improvement of constituents, better “as fired” fuel characteristics, etc;

(c) The fuel shall be classified as a non-hazardous secondary material using the applicable provisions of 40 CFR 241;

(d) The fuel shall be managed as a valuable commodity; and

(e) The fuel shall have constituent levels below the upper range of EPA accepted constituent levels of traditional fuels the facility is currently designed to use.

Part D – Operating Conditions

(1) Except as otherwise provided in this part, the low carbon engineered fuel handling system shall be operated in accordance with specifications included in the application and any operating procedures recommended by equipment vendors unless the Permittee obtains from the Department written authorization for alternative operating procedures.

(2) The low carbon engineered fuel handling system shall be operated such that fugitive dust from transfer points within the system are controlled by three (3) dust collectors.

(3) Each conveyor transfer point within the low carbon engineered fuel handling system shall not discharge into the atmosphere any gases which exhibit 10 percent opacity or greater. **[Reference: §60.62(c) and §63.1345]**

(4) During the normal operation, either the kiln or the calciner shall not burn any type of fuel other than the followings unless the Permittee obtains permission from the Department:

(a) Natural gas, synthetic natural gas, propane, distillate oil, synthesis gas (syngas), and ultra-low sulfur diesel (ULSD);

(b) Coal;

(c) Pet Coke;

(d) Fuel Oil;

(e) Tire Derived Fuel (TDF);

(f) On-Specification Used Oil which meets the specifications in COMAR 26.11.09.10B;

(g) Wood which has no paints, stains, or other type of coating and/or has not been treated with chromium copper arsenate (CCA) or pentachlorophenol; and

(h) Low carbon engineered fuels.

Part E – Initial Compliance Demonstration

(1) An initial opacity test on each conveyor transfer point of the low carbon engineered fuel handling system must be conducted within 180 days of start-up to demonstrate compliance with the opacity requirements of §60.62(c) and §63.1345. **[Reference: §60.64(b)(2), §60.8, §63.1348(a)(2), and §63.7]**

(2) The Permittee must conduct opacity tests in accordance with Method 9 of appendix A-4 to part 60. The duration of the Method 9 performance test must 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 following conditions apply: **[Reference: §60.11 and §63.1349(b)(2)]**

(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.

Part F – Notifications

(1) The Permittee shall comply with the notification requirements of §60.7, §60.19, §63.9, and §63.1353.

(2) The Permittee of an affected source shall notify the Department in writing of the anticipated date for conducting the opacity or visible emission observations specified in §63.6(h)(5), if such observations are required for the source by a relevant standard.

The notification shall be submitted with the notification of the performance test date, as specified in paragraph (e) of 63.9, or if no performance test is required or visibility or other conditions prevent the opacity or visible emission observations from being conducted concurrently with the initial performance test required under §63.7, the Permittee shall deliver or postmark the notification not less than 30 days before the opacity or visible emission observations are scheduled to take place. **[Reference: §63.9(f) and §63.1353(b)(3)]**

(3) Before a Title V permit has been issued to the affected facility, and each time a notification of compliance status is required under Part 63, the Permittee shall submit to the Department a notification of compliance status, signed by the responsible official who shall certify its accuracy, attesting to whether the source has complied with the relevant standard. The notification shall list at least the following: **[Reference: §63.9(h)(2)(i) and §63.1353(b)(5)]**

(a) The methods that were used to determine compliance;

(b) The results of any performance tests, opacity or visible emission observations, continuous monitoring system (CMS) performance evaluations, and/or other monitoring procedures or methods that were conducted;

(c) The methods that will be used for determining continuing compliance, including a description of monitoring and reporting requirements and test methods;

(d) The type and quantity of hazardous air pollutants emitted by the source (or surrogate pollutants if specified in the relevant standard), reported in units and averaging times and in accordance with the test methods specified in the relevant standard;

(e) If the relevant standard applies to both major and area sources, an analysis demonstrating whether the affected source is a major source (using the emissions data generated for this notification);

(f) A description of the air pollution control equipment (or method) for each emission point, including each control device (or method) for each hazardous air pollutant and the control efficiency (percent) for each control device (or method); and

(g) A statement by the Permittee of the affected existing, new, or reconstructed source as to whether the source has complied with the relevant standard or other requirements.

(4) The notification of compliance status must be sent before the close of business on the 60th day following the completion of the relevant compliance demonstration activity specified in the relevant standard (unless a different reporting period is specified in the standard, in which case the letter must be sent before the close of business on the day the report of the relevant testing or monitoring results is required to be delivered or postmarked). For example, the notification shall be sent before close of business on the 60th (or other required) day following completion of the initial performance test and again before the close of business on the 60th (or other required) day following the completion of any subsequent required performance test. If no performance test is required but opacity or visible emission observations are required to demonstrate compliance with an opacity or visible emission standard under Part 63, the notification of compliance status shall be sent before close of business on the 30th day following the completion of opacity or visible emission observations. Notifications may be combined as long as the due date requirement for each notification is met. **[Reference: §63.9(h)(2)(ii) and §63.1353(b)(5)]**

(5) Any change in the information already provided under §63.9 shall be provided to the Department in writing within 15 calendar days after the change. **[Reference: §63.9(j) and §63.1353(b)(5)]**

Part G – Monitoring

(1) The Permittee must update the opacity monitoring plan in accordance with §63.1350(p)(1) through (4) and (o)(5) and conduct required opacity monitoring in accordance with the plan and the following requirements. **[Reference: §60.64(b)(2) and §63.1350(f)]**

(2) The Permittee must conduct a monthly 10-minute visible emissions test of each affected source subject to opacity requirements under §63.1345 in accordance with Method 22 of appendix A-7 to part 60 of CFR 40. The performance test must be conducted while the affected source is in operation. **[Reference: §63.1350(f)(1)(i)]**

(3) If no visible emissions are observed in six consecutive monthly tests for any affected source, the Permittee may decrease the frequency of performance testing from monthly to semi-annually for that affected source. If visible emissions are observed during any semi-annual test, the Permittee must resume performance testing of that affected source on a monthly basis and maintain that schedule until no visible emissions are observed in six consecutive monthly tests. **[Reference: §63.1350(f)(1)(ii)]**

(4) If no visible emissions are observed during the semi-annual test for any affected source, the Permittee may decrease the frequency of performance testing from semi-annually to annually for that affected source. If visible emissions are observed during any annual performance test, the Permittee must resume performance testing of that affected source on a monthly basis and maintain that schedule until no visible emissions are observed in six consecutive monthly tests. **[Reference: §63.1350(f)(1)(iii)]**

(5) If visible emissions are observed during any Method 22 performance test, of appendix A-7 to part 60 of CFR 40, the Permittee must conduct 30 minutes of opacity observations, recorded at 15-second intervals, in accordance with Method 9 of appendix A-4 to part 60 of CFR 40. The Method 9 performance test, of appendix A-4 to part 60 of this chapter, must begin within 1 hour of any observation of visible emissions. **[Reference: §63.1350(f)(1)(iv)]**

(6) Any totally enclosed conveying system transfer point, regardless of the location of the transfer point, is not required to conduct Method 22 visible emissions monitoring. The enclosures for these transfer points must be operated and maintained as total enclosures on a continuing basis in accordance with the facility operations and maintenance plan. **[Reference: §63.1350(f)(1)(v)]**

(7) If any partially enclosed or unenclosed conveying system transfer point is located in a building, the Permittee must conduct a Method 22 performance test, of appendix A-7 to Part 60, according to the requirements of (f)(1)(i) through (iv) of **§63.1350** for each such conveying system transfer point located within the building, or for the building itself, according to (f)(1)(vii) of **§63.1350**. **[Reference: §63.1350(f)(1)(vi)]**

(8) If visible emissions from a building are monitored, the requirements of (f)(1)(i) through (f)(1)(iv) of **§63.1350** apply to the monitoring of the building, and the Permittee must also test visible emissions from each side, roof, and vent of the building for at least 10 minutes. **[Reference: §63.1350(f)(1)(vii)]**

Part H – Record Keeping and Reporting

(1) The Permittee shall maintain for at least five (5) years, and shall make available to the Department upon request, records of the following information:

(a) When using low carbon engineered fuels, the Permittee must keep records documenting that the fuel has been processed as defined under 40 CFR 241.2 and meets the legitimacy criteria of 40 CFR 241.3(d)(1).

(b) All pre-qualification process results for low carbon engineered fuels, including constituent values and other documentation used in qualification process.

(c) Results of all opacity tests and visible emissions observations made on the low carbon engineered fuel handling system.

(d) All notifications and supporting documentation submitted to the Department regarding the low carbon engineered fuel handling system.

(e) All maintenance conducted on the three (3) dust collectors associated with the low carbon engineered fuel handling system.

(2) The Permittee shall maintain at the facility for at least five (5) years, and shall make available to the Department upon request, records necessary to support annual certifications of emissions and demonstrations of compliance for toxic air pollutants. Such records shall include, if applicable, the following:

(a) mass emissions rates for each regulated pollutant, and the total mass emissions rate for all regulated pollutants for each registered source of emissions;

(b) accounts of the methods and assumptions used to quantify emissions;

(c) all operating data, including operating schedules and production data, that were used in determinations of emissions;

(d) amounts, types, and analyses of all fuels used;

(e) any records, the maintenance of which is required by this permit or by State or federal regulations, that pertain to the operation and maintenance of continuous emissions monitors, including:

  (i) all emissions data generated by such monitors;

  (ii) all monitor calibration data;

  (iii) information regarding the percentage of time each monitor was available for service; and

  (iv) information concerning any equipment malfunctions.

(f) information concerning operation, maintenance, and performance of air pollution control equipment and compliance monitoring equipment, including:

  (i) identifications and descriptions of all such equipment;

  (ii) operating schedules for each item of such equipment;

  (iii) accounts of any significant maintenance performed;

  (iv) accounts of all malfunctions and outages; and

  (v) accounts of any episodes of reduced efficiency.

(g) limitations on source operation or any work practice standards that significantly affect emissions; and

(h) other relevant information as required by the Department.

(3) The Permittee shall submit to the Department by April 1 of each year a certification of emissions for the previous calendar year. The certifications shall be prepared in accordance with requirements, as applicable, adopted under COMAR 26.11.01.05 – 1 and COMAR 26.11.02.19D.

(a) Certifications of emissions shall be submitted on forms obtained from the Department.

(b) A certification of emissions shall include mass emissions rates for each regulated pollutant, and the total mass emissions rate for all regulated pollutants for each of the facility's registered sources of emissions.

(c) The person responsible for a certification of emissions shall certify the submittal to the Department in the following manner:

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

(4) The Permittee shall submit to the Department by April 1 of each year a written certification of the results of an analysis of emissions of toxic air pollutants from the Permittee's facility during the previous calendar year. Such analysis shall include either:

(a) a statement that previously submitted compliance demonstrations for emissions of toxic air pollutants remain valid; or

(b) a revised compliance demonstration, developed in accordance with requirements included under COMAR 26.11.15 & 16, that accounts for changes in operations, analytical methods, emissions determinations, or other factors that have invalidated previous demonstrations.

(5) The Permittee shall report, in accordance with requirements under COMAR 26.11.01.07, occurrences of excess emissions to the Compliance Program of the Air and Radiation Administration.

MARYLAND DEPARTMENT OF THE ENVIRONMENT

AIR AND RADIATION ADMINISTRATION

SUPPLEMENTAL INFORMATION REFERENCES

The Code of Maryland Regulations (COMAR) is searchable by COMAR citation at the following Division of State Documents website:
http://www.dsd.state.md.us/COMAR/ComarHome.html

The Code of Federal Regulations (CFR), including New Source Performance Standards (NSPS) at 40 CFR, Part 60 and National Emission Standards for Hazardous Air Pollutants (NESHAP) at 40 CFR, Parts 61 and 63, is searchable by CFR citation at the following U.S. Government Publishing Office website:
http://www.ecfr.gov

Information on National Ambient Air Quality Standards (NAAQS) is located at the following U.S. Environmental Protection Agency (EPA) website:
https://www.epa.gov/criteria-air-pollutants/naaqs-table

Information on Maryland's Ambient Air Monitoring Program is located at the following Maryland Department of the Environment website:
http://mde.maryland.gov/programs/Air/AirQualityMonitoring/Pages/index.aspx

Information on the U.S. EPA's Screen3 computer model and other EPA-approved air dispersion models is located at the following U.S. EPA website:
http://www.epa.gov/scram001/dispersion_screening.htm

Information on the U.S. EPA TANKS Emission Estimation Software is located at the following U.S. EPA website:
http://www.epa.gov/ttn/chief/software/tanks/index.html

Information on the U.S. EPA Emission Factors and AP-42 is located at the following U.S. EPA website:
https://www.epa.gov/air-emissions-factors-and-quantification/ap-42-compilation-air-emission-factors

MARYLAND DEPARTMENT OF THE ENVIRONMENT

1800 Washington Blvd - Baltimore, Maryland 21230
(410) 537-3230 - 1-800-633-6101 - www.mde.state.md.us

Air and Radiation Management Adminstration Air Quality Permits Program

APPLICATION FOR PERMIT TO CONSTRUCT

GAS CLEANING OR EMISSION CONTROL EQUIPMENT

1. Owner of Installation Holcim (US), Inc.	**Telephone No.** (301) 739-1150		**Date of Application**
2. Mailing Address 1260 Security Road	**City** Hagerstown	**Zip Code** 21742	**County** Washington
3. Equipment Location Same	**City/Town or P.O.**		**County**
4. Signature of ~~Owner or~~ Operator	**Title** General Manager		**Print or Type Name** Alan Greer

5. Application Type: **Alteration** ☐ **New Construction** ☒

6. Date Construction is to Start: TBD **Completion Date (Estimate):** TBD

7. Type of Gas Cleaning or Emission Control Equipment

Simple Cyclone ☐ **Multiple Cyclone** ☐ **Afterburner** ☐ **Electrostatic Precipitator** ☐

Scrubber ☐ ______ (type) **Other** ☒ Dust collector (V81-BF02) (type)

8. Gas Cleaning Equipment Manufacturer TBD	**Model No.** TBD	**Collection Efficiency (Design Criteria)** 0.0024 gr/dscf 90% collection

9. Type of Equipment which Control Equipment is to Service:

This dust collector will collect fugitive dust emissions from transfers in the low carbon engineered fuel material handling operation.

10. Stack Test to be Conducted:

Yes ☐ **No** ☒ ______ (Stack Test to be Conducted By) ______ (Date)

11. Cost of Equipment TBD

Estimated Erection Cost TBD

12. The Following Shall Be Design Criteria:

	INLET			OUTLET	
Gas Flow Rate	2200	ACFM*		2200	ACFM*
Gas Temperature	TBD	°F		TBD	°F
Gas Pressure	TBD	INCHES W.G.		TBD	INCHES W.G.
		PRESSURE DROP	TBD		
Dust Loading	Varies	GRAINS/ACFD**		0.0024	GRAINS/ACFD**
Moisture Content	Varies	%		Varies	%
OR					
Wet Bulb Temperature	N/A	°F		N/A	°F
Liquid Flow Rate (Wet Scrubber)	N/A	GALLONS/MINUTE			

(WHEN SCRUBBER LIQUID OTHER THAN WATER INDICATE COMPOSITION OF SCRUBBING MEDIUM IN WEIGHT %)

*= ACTUAL CUBIC FEET PER MINUTE **= ACTUAL CUBIC FEET DRY

WHEN APPLICATION INVOLVES THE REDUCTION OF GASEOUS POLLUTANTS, PROVIDE THE CONCENTRATION OF EACH POLLUTANT IN THE GAS STREAM IN VOLUME PERCENT. INCLUDE THE COMPOSITION OF THE GASES ENTERING THE CLEANING DEVICE AND THE COMPOSITION OF EXHAUSTED GASES BEING DISCHARGED INTO THE ATMOSPHERE. USE AVAILABLE SPACE IN ITEM 15 ON PAGE 3.

13. Particle Size Analysis

Size of Dust Particles Entering Cleaning Unit	% of Total Dust	% to be Collected
0 to 10 Microns	100	90% collection
10 to 44 Microns	0	90% collection
Larger than 44 Microns	0	90% collection

14. For Afterburner Construction Only:

Volume of Contaminated Air N/A CFM (DO NOT INCLUDE COMBUSTION AIR)

Gas Inlet Temperature N/A °F

Capacity of Afterburner N/A BTU/HR

Diameter (or area) of Afterburner Throat N/A

Combustion Chamber N/A (diameter) N/A (length) Operating Temperature at Afterburner N/A °F

Retention Time of Gases N/A

Information remains to be determined since manufacturer has not been chosen

15. Show Location of Dust Cleaning Equipment in the System. Draw or Sketch Flow Diagram Showing Emission Path from Source to Exhaust Point to Atmosphere.

See attached diagrams.

Date Received: **Local** ____________________ **State** ____________________

Acknowledgement Date: _______________

By ____

Reviewed By:

Local ____

State ____

Returned to Local:

Date ____________

By ____

Application Returned to Applicant:

Date ____________

By ____

REGISTRATION NUMBER OF ASSOCIATED EQUIPMENT: ☐ ☐☐☐☐

PREMISES NUMBER: ☐☐ ☐☐☐☐

Emissions Calculations Revised By ____________________________ **Date** __________

MARYLAND DEPARTMENT OF THE ENVIRONMENT

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Air and Radiation Management Adminstration Air Quality Permits Program

APPLICATION FOR PERMIT TO CONSTRUCT

GAS CLEANING OR EMISSION CONTROL EQUIPMENT

1. Owner of Installation Holcim (US), Inc.	**Telephone No.** (301) 739-1150		**Date of Application**
2. Mailing Address 1260 Security Road	**City** Hagerstown	**Zip Code** 21742	**County** Washington
3. Equipment Location Same	**City/Town or P.O.**		**County**
4. Signature of Owner or Operator	**Title** General Manager		**Print or Type Name** Alan Greer

5. Application Type: **Alteration** ☐ **New Construction** ☒

6. Date Construction is to Start: TBD

Completion Date (Estimate): TBD

7. Type of Gas Cleaning or Emission Control Equipment

Simple Cyclone ☐ **Multiple Cyclone** ☐ **Afterburner** ☐ **Electrostatic Precipitator** ☐

Scrubber ☐ ____________ (type) **Other** ☒ Dust collector (V81-BF01) (type)

8. Gas Cleaning Equipment Manufacturer TBD	**Model No.** TBD	**Collection Efficiency (Design Criteria)** 0.0024 gr/dscf 90% collection

9. Type of Equipment which Control Equipment is to Service:

This dust collector will collect fugitive dust emissions from transfers in the low carbon engineered fuel material handling operation.

10. Stack Test to be Conducted:

Yes ☐ **No** ☒ ____________ (Stack Test to be Conducted By) ____________ (Date)

11. Cost of Equipment TBD

Estimated Erection Cost TBD

12. The Following Shall Be Design Criteria:

	INLET		OUTLET	
Gas Flow Rate	7875	ACFM*	7875	ACFM*
Gas Temperature	TBD	°F	TBD	°F
Gas Pressure	TBD	INCHES W.G.	TBD	INCHES W.G.
		PRESSURE DROP	TBD	
Dust Loading	Varies	GRAINS/ACFD**	0.0024	GRAINS/ACFD**
Moisture Content	Varies	%	Varies	%
OR				
Wet Bulb Temperature	N/A	°F	N/A	°F
Liquid Flow Rate (Wet Scrubber)	N/A	GALLONS/MINUTE		

(WHEN SCRUBBER LIQUID OTHER THAN WATER INDICATE COMPOSITION OF SCRUBBING MEDIUM IN WEIGHT %)

*= ACTUAL CUBIC FEET PER MINUTE **= ACTUAL CUBIC FEET DRY

WHEN APPLICATION INVOLVES THE REDUCTION OF GASEOUS POLLUTANTS, PROVIDE THE CONCENTRATION OF EACH POLLUTANT IN THE GAS STREAM IN VOLUME PERCENT. INCLUDE THE COMPOSITION OF THE GASES ENTERING THE CLEANING DEVICE AND THE COMPOSITION OF EXHAUSTED GASES BEING DISCHARGED INTO THE ATMOSPHERE. USE AVAILABLE SPACE IN ITEM 15 ON PAGE 3.

13. Particle Size Analysis

Size of Dust Particles Entering Cleaning Unit	% of Total Dust	% to be Collected
0 to 10 Microns	100	90% collection
10 to 44 Microns	0	90% collection
Larger than 44 Microns	0	90% collection

14. For Afterburner Construction Only:

Volume of Contaminated Air N/A CFM (DO NOT INCLUDE COMBUSTION AIR)

Gas Inlet Temperature N/A °F

Capacity of Afterburner N/A BTU/HR

Diameter (or area) of Afterburner Throat N/A

Combustion Chamber N/A (diameter) N/A (length) Operating Temperature at Afterburner N/A °F

Retention Time of Gases N/A

Information remains to be determined since manufacturer has not been chosen

15. Show Location of Dust Cleaning Equipment in the System. Draw or Sketch Flow Diagram Showing Emission Path from Source to Exhaust Point to Atmosphere.

See attached diagrams.

Date Received: **Local** ______________________ **State** ______________________

Acknowledgement Date: ________________

By ____

Reviewed By:

Local ____

State ____

Returned to Local:

Date ____________

By ____

Application Returned to Applicant:

Date ____________

By ____

REGISTRATION NUMBER OF ASSOCIATED EQUIPMENT: ☐ ☐☐☐☐

PREMISES NUMBER: ☐☐ ☐☐☐☐

Emissions Calculations Revised By ______________________________ **Date** ____________

MARYLAND DEPARTMENT OF THE ENVIRONMENT

1800 Washington Blvd - Baltimore, Maryland 21230
(410) 537-3230 - 1-800-633-6101 - www.mde.state.md.us
Air and Radiation Management Adminstration Air Quality Permits Program

APPLICATION FOR PERMIT TO CONSTRUCT
GAS CLEANING OR EMISSION CONTROL EQUIPMENT

1.	**Owner of Installation** Holcim (US), Inc.	**Telephone No.** (301) 739-1150		**Date of Application**
2.	**Mailing Address** 1260 Security Road	**City** Hagerstown	**Zip Code** 21742	**County** Washington
3.	**Equipment Location** Same	**City/Town or P.O.**		**County**
4.	**Signature of Owner or Operator**	**Title** General Manager		**Print or Type Name** Alan Greer

5. **Application Type:** **Alteration** ☐ **New Construction** ☒

6. **Date Construction is to Start:** TBD **Completion Date (Estimate):** TBD

7. **Type of Gas Cleaning or Emission Control Equipment**

Simple Cyclone ☐ **Multiple Cyclone** ☐ **Afterburner** ☐ **Electrostatic Precipitator** ☐

Scrubber ☐ ______ (type) **Other** ☒ Dust collector (V81-BF03) (type)

8.	**Gas Cleaning Equipment Manufacturer** TBD	**Model No.** TBD	**Collection Efficiency (Design Criteria)** 0.0024 gr/dscf 90% collection

9. **Type of Equipment which Control Equipment is to Service:**

This dust collector will collect fugitive dust emissions from transfers in the low carbon engineered fuel material handling operation.

10. **Stack Test to be Conducted:**

Yes ☐ **No** ☒ ______ (Stack Test to be Conducted By) ______ (Date)

11. **Cost of Equipment** TBD

Estimated Erection Cost TBD

12. The Following Shall Be Design Criteria:

	INLET			OUTLET	
Gas Flow Rate	2200	ACFM*		2200	ACFM*
Gas Temperature	TBD	°F		TBD	°F
Gas Pressure	TBD	INCHES W.G.		TBD	INCHES W.G.
		PRESSURE DROP	TBD		
Dust Loading	Varies	GRAINS/ACFD**		0.0024	GRAINS/ACFD**
Moisture Content	Varies	%		Varies	%
OR					
Wet Bulb Temperature	N/A	°F		N/A	°F
Liquid Flow Rate (Wet Scrubber)	N/A	GALLONS/MINUTE			

(WHEN SCRUBBER LIQUID OTHER THAN WATER INDICATE COMPOSITION OF SCRUBBING MEDIUM IN WEIGHT %)

*= ACTUAL CUBIC FEET PER MINUTE **= ACTUAL CUBIC FEET DRY

WHEN APPLICATION INVOLVES THE REDUCTION OF GASEOUS POLLUTANTS, PROVIDE THE CONCENTRATION OF EACH POLLUTANT IN THE GAS STREAM IN VOLUME PERCENT. INCLUDE THE COMPOSITION OF THE GASES ENTERING THE CLEANING DEVICE AND THE COMPOSITION OF EXHAUSTED GASES BEING DISCHARGED INTO THE ATMOSPHERE. USE AVAILABLE SPACE IN ITEM 15 ON PAGE 3.

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Volume of Contaminated Air N/A CFM (DO NOT INCLUDE COMBUSTION AIR)

Gas Inlet Temperature N/A °F

Capacity of Afterburner N/A BTU/HR

Diameter (or area) of Afterburner Throat N/A

Combustion Chamber N/A (diameter) N/A (length) Operating Temperature at Afterburner N/A °F

Retention Time of Gases N/A

Information remains to be determined since manufacturer has not been chosen

15. Show Location of Dust Cleaning Equipment in the System. Draw or Sketch Flow Diagram Showing Emission Path from Source to Exhaust Point to Atmosphere.

See attached diagrams.

Date Received: **Local** ____________________ **State** ____________________

Acknowledgement Date: ______________

By ____

Reviewed By:

Local ____

State ____

Returned to Local:

Date ____________

By ____

Application Returned to Applicant:

Date ____________

By ____

REGISTRATION NUMBER OF ASSOCIATED EQUIPMENT: ☐ ☐☐☐☐

PREMISES NUMBER: ☐☐ ☐☐☐☐

Emissions Calculations Revised By ____________________________ **Date** __________

Fugitive Emissions

Enclosure Efficiency - Partially Enclosed	50%
Enclosure Efficiency - Enclosed in Building	75%
Enclosure Efficiency - Enclosed Underground	90%
Enclosure Efficiency - Airslides, Bucket Elevators,	100%

Equipment ID	Description	Potential Throughput tpy	Dust Collectors		Building Controls		Uncontrolled Emission Factor (lb per ton of throughput)					Controlled Emission Rates (tpy)[1]			
			Dust Collector ID	Capture Efficiency	Type of Control	Control Efficiency	PM_{filt}	$PM_{10\text{-}filt}$	$PM_{2.5\text{-}filt}$	PM_{cond}	Reference	PM_{filt}	$PM_{10\text{-}filt}$	$PM_{2.5\text{-}filt}$	PM_{cond}
V81-3P1	Transfer from truck to screw conveyor (V81-SC01)	110,231	Dust Collector (V81-BF01)	90%	Enclosed in Building	75%	3.37E-04	1.59E-04	2.41E-05	0.00E+00	AP-42 Section 13.2.4 Drop Equation	4.65E-04	2.20E-04	3.33E-05	0.00E+00
V81-SC01	Transfer from screw conveyor (V81-SC01) to drag chain conveyor (V81-DG01)	110,231	Dust Collector (V81-BF01)	90%	Enclosed in Building	75%	3.37E-04	1.59E-04	2.41E-05	0.00E+00	AP-42 Section 13.2.4 Drop Equation	4.65E-04	2.20E-04	3.33E-05	0.00E+00
V81-DG01	Transfer from drag chain conveyor (V81-DG01) to tube belt conveyor (V81-TB01)	110,231	Dust Collector (V81-BF02)	90%	Enclosed in Building	75%	3.37E-04	1.59E-04	2.41E-05	0.00E+00	AP-42 Section 13.2.4 Drop Equation	4.65E-04	2.20E-04	3.33E-05	0.00E+00
V81-TB01	Transfer from tube belt conveyor (V81-TB01) to screw weighfeeder (V81-WF01)	110,231	Dust Collector (V81-BF03)	90%	None	0%	3.37E-04	1.59E-04	2.41E-05	0.00E+00	AP-42 Section 13.2.4 Drop Equation	1.86E-03	8.79E-04	1.33E-04	0.00E+00
V81-WF01	Transfer from screw weighfeeder (V81-WF01) to calciner	110,231	Dust Collector (V81-BF03)	90%	None	0%	3.37E-04	1.59E-04	2.41E-05	0.00E+00	AP-42 Section 13.2.4 Drop Equation	1.86E-03	8.79E-04	1.33E-04	0.00E+00
											TOTAL:	**5.11E-03**	**2.42E-03**	**3.66E-04**	**0.00E+00**

1. Emissions calculated using the following equation:

$$PM = T \times (1 - \eta_{DC}) \times (1 - \eta_{SE}) \times EF \times \frac{1}{2{,}000}$$

Where:

PM = Annual $PM/PM_{10}/PM_{2.5}$ emissions (tpy)

T = Material handling throughput (tpy)

η_{DC} = Dust collector capture efficiency

η_{SE} = Spray or enclosure efficiency

EF = $PM/PM_{10}/PM_{2.5}$ Emission factor, specific to material and process (lb/ton of throughput)

Drop Equation

$$E = k\,(0.0032)\,\frac{(U/5)^{1.3}}{(M/2)^{1.4}}$$

k =	0.74	PM - (AP-42, Section 13.2.4, for Particle Size < 30 um)
	0.35	PM_{10} - (AP-42, Section 13.2.4, for Particle Size < 10 um)
	0.053	$PM_{2.5}$ - (AP-42, Section 13.2.4, for Particle Size < 2.5 um)
M =	11	% - (AP-42, Table 13.2.4-1, mean moisture content of miscellaneous fill materials)
U =	7.0	mph - (average wind speed at Hagerstown Regional Airport for 2020

Dust Collectors - Grain Loading Emissions

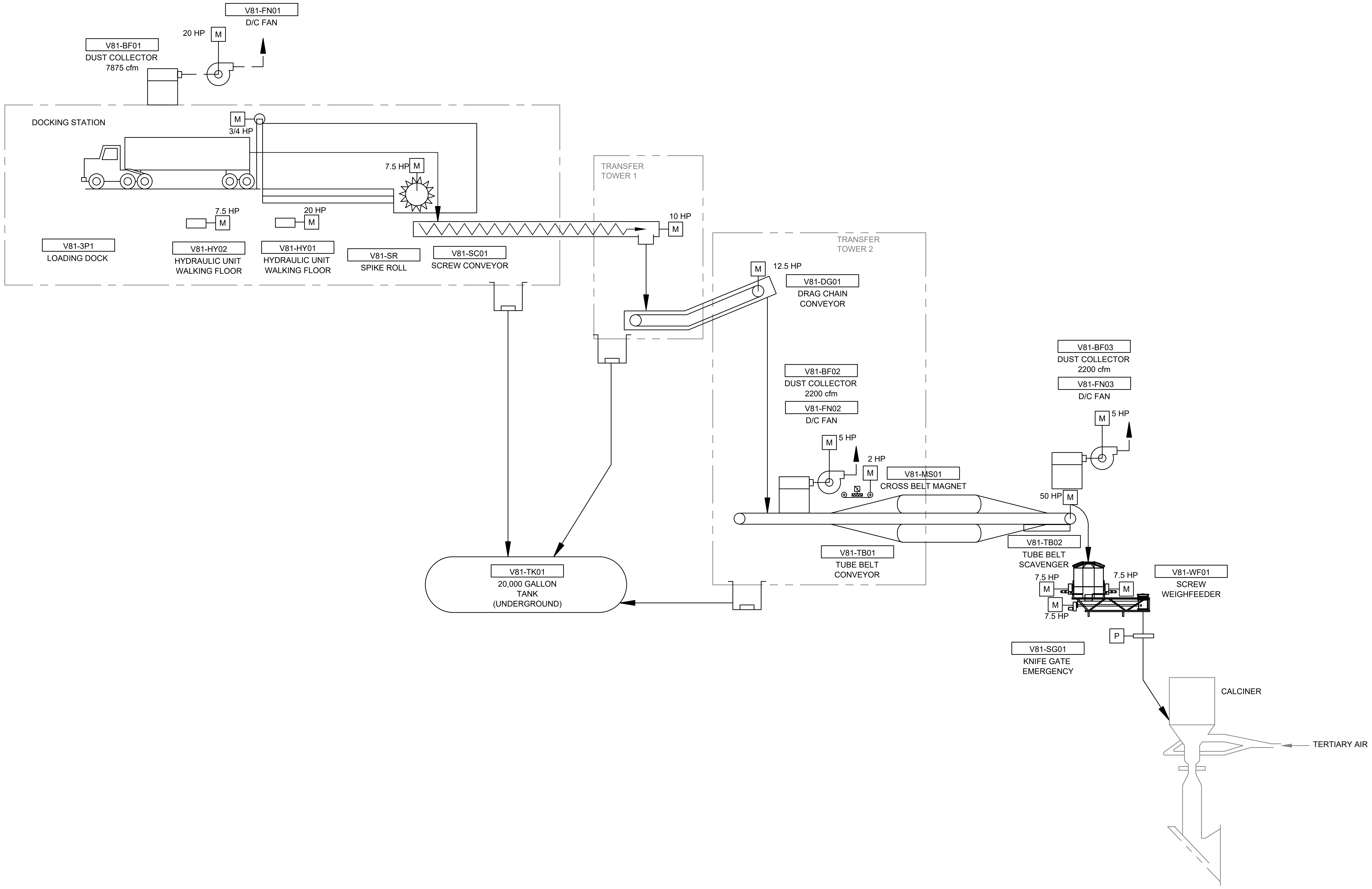
Source Identification	Description	Flow Rates (dscfm)	Potential Hours of Operation (hr/yr)	PM_{filt} Grain Loading (gr/dscf)	$PM_{10\text{-}filt}$ Grain Loading (gr/dscf)	$PM_{2.5\text{-}filt}$ Grain Loading (gr/dscf)	PM_{cond} Grain Loading (gr/dscf)	Controlled Emission Rates[1]			
								PM_{filt} (tons/yr)	**$PM_{10\text{-}filt}$ (tons/yr)**	**$PM_{2.5\text{-}filt}$ (tons/yr)**	**PM_{cond} (tons/year)**
V81-BF01	Docking Station Dust Collector	7875	8,760	0.0024	0.0024	0.0019	0.000	0.71	0.71	0.57	0.00
V81-BF02	Transfer Tower 2 Dust Collector	2200	8,760	0.0024	0.0024	0.0019	0.000	0.20	0.20	0.16	0.00
V81-BF03	Weighfeeder Dust Collector	2200	8,760	0.0024	0.0024	0.0019	0.000	0.20	0.20	0.16	0.00
							TOTAL:	**1.11**	**1.11**	**0.89**	**0.00**

1. Emissions calculated using the following equation:

$$PM = FR \times GL \times \frac{1}{7{,}000} \times \frac{1}{2{,}000} \times 60 \times H$$

Where:

PM = $PM/PM_{10}/PM_{2.5}$ emissions (tpy)
FR = Design flow rate (dscfm)
GL = $PM/PM_{10}/PM_{2.5}$ grain loading (gr/dscf)
H = Hours of operation (hr/yr)



REV	DATE	REVISION DESCRIPTION	BY	CHK	APP
B	09/01/21	ISSUED FOR REVIEW	RJN	TED	TH
A	06/15/21	ISSUED FOR BID	RJN	TED	TH

LafargeHolcim

HAGERSTOWN
1260 Security Rd. Hagerstown, MD 21742

DESIGNED:	TED	**DATE:** 03/05/21
DRAWN:	RJN	**DATE:** 03/05/21
CHECKED:	TED	**DATE:** 03/05/21
SMACC APPR:	TH	**DATE:** 03/05/21

Industrial Ally
Engineering and Construction Services
1422 Elbridge Payne Rd. Suite 120
Chesterfield, MO 63017

INDUSTRIAL ALLY PROJECT NUMBER: **1853**

LOW CARBON FUEL STUDY
PREHEATER TOWER
FLOWSHEET
ALTERNATIVE FUELS

IA DRAWING NUMBER
1853-FS-001
CLIENT DRAWING NUMBER
-

REV.	**DWG. SCALE:**
B	As indicated

DRAWING FORMAT: ARCH D - 24"x36"