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WV DEP

November 20, 2017

Direction William F. Durham
West Virginia Department of Environmental Protection
Division of Air Quality
601 57th Street, SE
Charleston, West Virginia, 25304

RE: New Source Review
Prevention of Significant Determination (PSD) Application for Permit to Construct Mineral Wool Production Facility – Ranson, West Virginia

Dear Director Durham:

Roxul USA, Inc. (Roxul) submits this PSD permit application to the West Virginia Department of Environmental Protection (WVDEP), Division of Air Quality (WVDAQ) to receive the authority to construct a new mineral wool production facility in Jefferson County, West Virginia.

If you have any questions concerning this permit application, please contact Mr. Grant Morgan of Environmental Resources Management Inc. (ERM) at (304) 757-4777 or by email at grant.morgan@erm.com.

Sincerely,

Ken Cammarato
VP, General Legal Counsel
Roxul USA Inc.

ID # 037-00108
Reg R14-0037
Company Roxul
Facility RAN

Enclosures

NON-CONFIDENTIAL

Part of the ROCKWOOL Group

November 20, 2017

Mr. William F. Durham, Director
West Virginia Division of Air Quality
601- 57th Street
Charleston, West Virginia 25304-2943

Company Name:	Roxul USA, Inc.	**Authorized Representative:**	Ken Cammarato
Company Address:	71 Edmond Road 6 Kearneysville, WV 25430-2781	**Title:**	Vice President and General Legal Counsel

Person/Title: Submitting Confidential Information:	Mette Drejstel Roxul Group Environmental Manager	**Confidential Name:**	Grant Morgan
		Information Title:	Client Project Manager
		Address:	204 Chase Drive Hurricane, WV 25526
		WV Designee Phone:	304-757-4777
		State of WV Fax:	304-757-4799

Document Name: **Roxul PSD New Source Review Permit Application**

Reason for Submittal: **PSD Permit Application containing Confidential Business Information**

Dear Director Durham:

The attached document contains confidential information concerning Roxul USA Inc.'s proposed Ranson, West Virginia manufacturing facility, the disclosure of which would likely cause substantial harm to Roxul's competitive business position. The following lists the pages containing confidential information and a summary explanation and justification as to why disclosure would likely cause substantial harm to Roxul's competitive business position. In accordance with 45 CSR 31-1 et.seq., the confidential pages are included in the confidential document on colored paper, dated, and marked with the words "Claimed Confidential". Redacted copies of pages with confidential information are included within the Redacted documents.

☒	**Process Description** – The disclosure of information claimed confidential within the process description would give competitors key insight into trade secrets related to the manufacture of mineral wool insulation.	Pages:	Pages 10, 12-16, 18, 20-22, 25
☒	**Process Diagram** - The disclosure of information claimed confidential within the process diagram would give competitors key insight into trade secrets related to	Pages:	Pages 107 - 108

the manufacture of mineral wool insulation.

☒	**Raw Materials Safety Data Sheets** – The disclosure of raw materials, including material characteristics, used in the manufacture process would allow competitors to determine the product formula without conducting the industry-specific research, thus providing them an undue economic advantage. Disclosure of material vendors would also provide key insight into trade secrets related to Roxul's supply chain, providing competitors undue economic advantage.	Pages:	Given the amount of SDS's, Roxul has submitted a separate CD-ROM as a part of Appendix B, Attachment H. All content is claimed CBI.
☒	**Process Weight Rate** - The disclosure of the process weight rate used in the manufacture process would allow competitors an ability to discern critical trade secrets related to the manufacture of mineral wool insulation without conducting industry-specific research, thus providing them an undue economic advantage.	Pages:	Page 43 – 46, 83 – 87, 496-497
☒	**Detailed Equipment Sizing** – The disclosure of detailed equipment sizing information would allow competitors an ability to discern critical trade secrets related to the manufacture of mineral wool insulation without conducting industry-specific research, thus providing them an undue economic advantage.	Pages:	83 - 87
☒	**Process Parameters** - The disclosure of information claimed confidential related to process parameters would give competitors key insight into trade secrets related to the manufacture of mineral wool insulation.	Pages:	83 – 87, 269-287, 290, 293, 296-297, 299, 302, 305, 308, 311

The above-noted sections of the referenced document, especially when considered in total and in context, are claimed confidential by Roxul and should not be disclosed to the public. The claim of confidentiality is based on the criteria found in 45 CSR 31 Section 4.1.

Roxul claims business confidentiality protection for the identified parts of this permit application noted above mainly because the information, if released, would allow reasonably competent engineers to determine the manner in which Roxul produces the products of its processes. The raw materials and equipment are available to current and potential competitors; therefore, disclosure of this information would allow these competitors to produce this product without either paying for the technology or conducting the research and development necessary to obtain the technology themselves. This would allow competitors an undue economic advantage since they could potentially produce the product at a lower cost. Some of the information is claimed confidential because if released could provide an unfair advantage to competitors allowing them to prepare marketing strategies based on information not available to companies in the market.

Confidentiality is requested permanently until such time a responsible representative of Roxul declassifies the confidential information. Roxul continues to claim business confidentiality protection for this information. The claim has not expired by its term, or been waived or withdrawn. No statute specifically requires the disclosure of this information.

Roxul has taken, and continues to take, all reasonable measures to protect the confidentiality of this information through such measures as vendor licensee nondisclosure agreements, limited distribution lists, shredding of documents marked confidential prior to disposal, and appropriately marking and redacting copies. This information is not reasonable obtainable without Roxul's consent. Within the company, Roxul has distributed this information on a need-to-know basis only. In addition, Roxul expects its employees to prevent inadvertent dissemination of information. Special provisions for shredding business confidential documents have been made to allow for recycling. There are no plans to relax strict maintenance of business confidentiality for this technology.

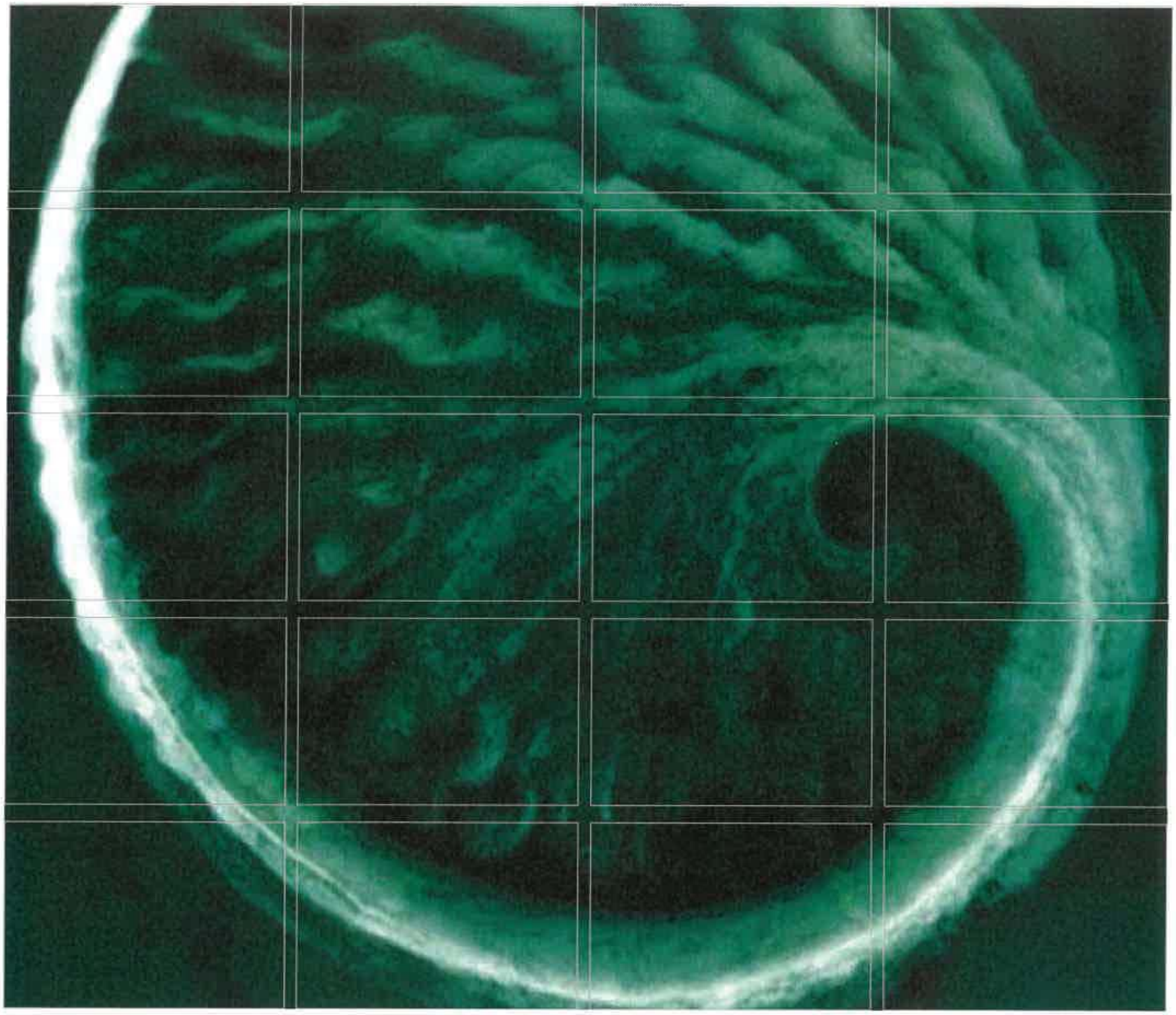
Information revealing the technology in the referenced document is not reasonably obtainable by persons other than the Roxul employees and/or vendors who need to know and personnel in the West Virginia Division of Air Quality.

Roxul requests that the West Virginia Division of Air quality notify the company with regard to any third-party request for disclosure of its confidential information prior to any release of such information, so as to enable Roxul to have the opportunity to object to such release and/or defend its claim of confidentiality.

If you have any questions, please contact Grant Morgan, with Environmental Resources Management, Inc., at 304-757-4777 x 109.

Sincerely,

Ken Cammarato
Vice President and General Legal Counsel
Roxul USA, Inc.



Prevention of Significant Deterioration (PSD) Application for the Construction of a Mineral Wool Manufacturing Facility

Roxul USA, Inc.
Jefferson County, West Virginia

November 2017

www.erm.com

Roxul USA, Inc.

Prevention of Significant Deterioration (PSD) Application for the Construction of a Mineral Wool Manufacturing Facility

November 2017

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Jefferson County, West Virginia

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1.0 INTRODUCTION

1.1 BACKGROUND

ROXUL USA Inc. dba Rockwool, (Roxul) submits this New Source Review (NSR) Prevention of Significant Deterioration (PSD) construction air permit application to the West Virginia Department of Environmental Protection (WVDEP), Division of Air Quality (WVDAQ) to authorize the construction of a mineral wool insulation manufacturing facility in Jefferson County, West Virginia. The proposed facility will consist of a 460,000-square-foot manufacturing facility on an estimated 130 acres site in the city of Ranson in Jefferson County, West Virginia. The plant will produce mineral wool insulation for building insulation, customized solutions for industrial applications, acoustic ceilings and other applications.

1.2 APPLICATION OVERVIEW

The proposed project will require the construction of a new facility subject to the requirements of West Virginia 45 CSR 14 – "*Permits for Construction and Major Modification of Major Stationary Sources for the Prevention of Significant Deterioration of Air Quality*". This permit application narrative is provided to add clarification and/or further detail to the permit application forms being provided to the WVDAQ for this project.

Concurrent with the submittal of this air quality application, other required environmental permits and approvals are being pursued with the appropriate regulatory agencies.

This section (Section 1) contains introductory information. Section 2 presents an overview of the proposed process and equipment. A Prevention of Significant Deterioration review is provided as Section 3. Section 4 provides a review of federal regulatory requirements. A review of state regulatory requirements is provided as Section 5.

Four (4) Appendices are included with this submittal. Appendix A contains the emission calculations for the proposed facility. Appendix B includes the WVDAQ emission forms. The air modeling protocols and modeling results are included as Appendix C of this submittal. Appendix D contains that Best Available Control Technology (BACT) review.

2.0 PROCESS OVERVIEW

Roxul is proposing to construct a manufacturing facility that will produce mineral wool insulation, and associated products, e.g., ceiling tile products.

For this application, the facility has been divided into the following process sources:

- Source L1 – Mineral Wool Line (including Recycle Plant),
- Source RFN1 – Rockfon Line, and
- Source COAL1 – Coal Milling.

Other facility wide operations include:

- Oxygen production,
- Natural gas heating,
- Emergency fire pump engine, and
- Storage tanks.

A description of the manufacturing process and associated emission points is provided in the sections below. In addition, more detailed process flow diagrams illustrating each source and operation are included in Appendix A.

2.1 MINERAL WOOL LINE

The Mineral Wool Line will produce mineral wool insulation for residential, commercial, and industrial uses and mineral wool for off-line production e.g. ceiling tiles (Rockfon). Various types of insulating products can be produced with different densities, binder content, or dimensions to meet the requirements for various market sectors.

Mineral wool or "stone wool" is a natural product made partly from volcanic rocks. Rock may be supplemented with recycled mineral wool and slag from the steel industry. The following types of mineral raw materials are typically used in stone wool production:

- Eruptive stones such as basalt/diabase, amphibolite and anorthosite,
- Slags such as blast furnace slag and converter slag,
- Dolomite and/or limestone,
- Mineral additives, such as olivine sand and high alumina content materials such as bauxite, kaoline clay and aludross[1].

[1] By-product of the smelting process in the creation of aluminum from bauxite.

The mineral wool fibers are made from melted stone raw materials at very high temperatures (>2,700°F /1480°C), binder, and de-dusting oil. The various raw materials used in the melting furnace are mixed in the correct ratio to achieve the required chemistry of the fibers.

The mineral wool manufacturing process consists of material handling/charging, melting, spinning, curing, cooling, cutting, and packing.

Raw materials will be delivered to the site via truck, and products will leave the site via truck.

2.1.1 *Raw Material Handling*

2.1.1.1 *Melt Raw Material Handling*

Melting raw materials will be delivered in bulk by truck and unloaded and transferred with a front-end loader into the enclosures (B210). The storage building is divided in to three-sided concrete enclosures covered under a roof. The middle of the building where the trucks unload is uncovered.

Raw materials may also be delivered to an outdoor stockpile with three-sided enclosures (RMS) and moved from here with a front end loader.

From each enclosure or from the stockpile a front-end loader will feed the raw materials into a covered loading hopper (B215). The loading hopper feeds material onto a series of enclosed conveyors to the charging building (B220), where all subsequent melting raw material handling activities occur. A fraction of oversized material is directed to an indoor sieve and crusher, if required. Materials are then distributed to individual raw material bins. From here, they are dosed onto a belt scale conveyor to create a batch of charge material. The batch is conveyed into a bucket or similar vertical conveyor and then loaded into a mixer to create a homogenous charge. The mixer is kept closed and equipped with an add-on filter that vents indoors during mixing.

Belt conveyors transport the mixed charge to day bins in the furnace building (B300). Transition points on conveyors are equipped with local de-dusting units that vent indoor or outdoor depending on the location. Transition point vents located outdoor are shown on the emission layout (IMF11, IMF12, IMF14, IMF15, IMF16).

The charging building is equipped with 2 roof vents (IMF17, IMF18).

In the event that raw materials entering the charging building are found to be outside of specifications it is possible to collect these materials in two locations, either after the sieve or after the raw material bins. The material is directed into collection bins by conveyor, which is equipped with curtains for enclosure (S_REJ, RM_REJ).

Emissions from material handling consist of filterable $PM/PM_{10}/PM_{2.5}$.

Emission points from material handling include:

- Charging Building Material Handling Building Vents (IMF17, IMF18), and
- Five (5) Conveyor Transition Points,
  - Conveyor Transition Point (B215 to B220) (IMF11),
  - Conveyor Transition Point (B210 to B220) (IMF12),
  - Conveyor Transition Point (B220 No. 1) (IMF14),
  - Conveyor Transition Point (B220 No. 2) (IMF15), and
  - Conveyor Transition Point (B220 to B300) (IMF16).

Fugitive emissions from material handling consist of:

- Raw Material Storage (B210),
- Raw Material Outdoor Stockpile (RMS),
- Raw Material Loading Hopper (B215),
- Raw Material Reject Collection Bin (RM_REJ),
- Sieve Reject Collection Bin (S_REJ), and
- Paved Haul Roads.

2.1.1.2 *Energy Material Handling*

Coal burners and natural gas burners
will provide energy to the Melting Furnace. Petroleum coke (pet coke) may also be used in place of coal. Natural gas is delivered to the site by pipeline.

Oxygen is delivered to the site by truck or produced onsite from the ambient air.

Coal in milled form ready to use is delivered to the site by truck and loaded by means of pneumatic transport from the powder transport truck into one of the 3 outdoor storage silos (B238) equipped with bin vent filters (IMF03).

The coal is transferred from the storage silos (B238) to furnace building (B300) where an indoor feed tank equipped with a vent to a particulate filter exhausting to the atmosphere (IMF25).

For substitution of coal or pet coke, secondary combustible materials may be used as an energy source. These include but are not limited to anodes and coke fines. Secondary combustible materials will be delivered to the site by truck and loaded into one of the coal storage silos or into the Filter Fines Day Silo (IMF07) in the furnace building.

Emissions from energy material handling consist of filterable $PM/PM_{10}/PM_{2.5}$.

Emission points are:

- Three (3) Coal Storage Silos (IMF03), and
- One (1) Coal Feed Tank (IMF25).

2.1.1.3 *Coal Milling*

Coal or pet coke for on-site milling will be delivered in lump size by truck and unloaded at the coal bunker enclosed at 3 sides and roofed (B230). From the coal bunker the coal is loaded by a front-end loader into the loading hopper (B231) enclosed on 3 sides and roofed. The coal loading hopper (B231) feeds material onto a series of enclosed conveyors that direct the material to a day bin inside the coal milling building (B235). The milling will be done by a combined vertical coal mill and fluidized bed dryer equipped with a natural gas-fired direct heating unit rated at 6.00 Million British Thermal Units (MMBtu/hr) (1,760 kilowatts (kW)) and a separator equipped with a dust filter. Heater and dust filter exhausts through a stack (IMF05).

After milling coal is pneumatically transported into the 3 outdoor storage silos (B238), which are the same silos used for delivered coal (IMF03).

A separate de-dusting filter will be installed for the coal milling building (IMF06).

Emissions from coal milling consist of filterable $PM/PM_{10}/PM_{2.5}$, Condensable Particulate Matter (CPM), nitrogen oxides (NO_x), carbon monoxide (CO), sulfur dioxide (SO_2), volatile organic compounds (VOC), and greenhouse gases (GHG) including carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O) from natural gas combustion. Filterable $PM/PM_{10}/PM_{2.5}$ results from physical milling (sizing) of coal in the mill. CPM[2] and VOC may also be emitted from the milling process as the coal mill operates at 180 °F (82 °C).

Emission points from the Coal Milling operation consist of:

- Coal Conveyor Transition Point (B231 to B235) (IMF13),
- Coal Mill Burner & Baghouse (IMF05),
- Coal Milling De-dusting Baghouse (IMF06), and
- Coal Conveyor Transition Point (B231 to B235) (IMF04).

Fugitive emissions from the Coal Milling operation consist of:

[2] Emission due to water vapor as the water content in coal is approximately 15%.

- Coal Unloading (B230),
- Coal Loading Hopper (B231), and
- Coal Milling Building (B235).

2.1.2 *Melting Furnace Portable Crusher*

Any diverted melt or melt from tapping of the Melting Furnace will be crushed in the portable crusher and reused in the melting process. Diverted melt consists of large pieces of solid material.

The portable crusher operation will take place in the dedicated area (B170). The crusher will be brought onsite periodically during the year and will not operate continuously. Roxul is proposing to limit operation of the crusher to 12 hours per day up to 45 days or 540 hours per year. Crushed material will be stored in three-sided concrete enclosures.

The crushing operation and storage of the crushed material is source of fugitive dust (filterable $PM/PM_{10}/PM_{2.5}$).

2.1.3 *Melting*

During start-up, a natural gas-fired preheater burner is used to warm the Melting Furnace baghouses to prevent condensation. Hot exhaust from the burner will indirectly heat the Melting Furnace baghouses before exhausting through the preheat burner stack (IMF24). The indirect heat transfer will be done by a thermal oil system including an expansion tank which is used both for pre-heating transfer of energy and also to extract surplus heat for heat recovery. The natural gas preheat burner is rated at 5.1 MMBtu/hr (1,490 kW) heat input. The pre-heat burner will operate for approximately 2 hours (120 minutes) prior to the Melting Furnace startup[3].

During melting furnace operation, temperatures in the melter reach approximately 3,000 °F (1,650 °C) and the resultant melt flows out of the furnace to the spinner. Gutter channels are used to direct melt from the furnace onto the

[3] The last 15 minutes of this sequence will be with both pre-heat burner and coal burners in operation. Although the pre-heat burner will only operate for a limited duration, it will be permitted to operate 8,760 hours per year.

spinners. An exhaust is located above the gutters to remove heat from the area to lower the temperature in the working environment, which will be directed to the Wet Electrostatic Precipitator (WESP) (HE01).

Once the system is operating at a steady state, waste wool and filter fines from the process are recycled into the melter along with stone raw materials.

Tapping is an emptying of the furnace, where melt flows directly out of the furnace and into a collection area. The tapped melt can be crushed in the portable crusher and reused in the melting process. Tapping occurs when the line shuts down, or as a result of an upset.

The melt process in the Melting Furnace is an oxidizing process, which operates with an excess of oxygen. The furnace has different burners utilizing various fuels (coal, natural gas, and oxygen injection). The burners are comparable to oxy-fuel burners.

The melting process is open to ambient building air with unrestricted air flow (i.e., there is no cover on the furnace). A "quench hood" is situated above the melter that is connected to an exhaust riser.

Aqueous ammonia will be injected for the de- NO_x reaction to reduce NO_x emission.

The opening at the top of the melter allows for ambient air to be pulled into the riser, which facilitates an adequate temperature for a de- NO_x reaction to occur (typically 1,400-2,000 °F or 760-1,093 °C). Therefore, it can be said that the Melting Furnace has "integrated" Selective Non-Catalytic Reduction (SNCR) technology. Binder contained in the recycled wool can also contribute in the de- NO_x reaction, but is not relied upon for the control of NO_x.

Hot flue gas is used to preheat incoming combustion air to the melter via heat exchangers situated at the outlet of the furnace. Flue gas is then directed to a baghouse to collect raw material fines. A second baghouse in series is used for control of emissions of filterable $PM/PM_{10}/PM_{2.5}$, and is equipped with sorbent injection to control sulfur dioxide (SO_2), sulfuric acid (H_2SO_4) mist, hydrogen chloride (HCl), and hydrogen fluoride (HF) emissions. Carryover of raw materials fines that are collected in the first baghouse will be pneumatically conveyed to a receiving silo and day silo (IMF07, IMF10) prior to reuse in the melter. The silos vent to a bin vent filter exhausting to the atmosphere.

Emissions from the Melting Furnace stack (IMF01) consist of filterable PM/ PM_{10}/ $PM_{2.5}$, CPM, NO_x, CO, SO_2, VOC, H_2SO_4 mist, HCl, HF, metal HAP, CO_2, CH_4, N_2O, and small amounts of organic HAP such as carbonyl sulfide (COS) and formaldehyde (HCHO).

As stated, de-sulfurization is applied for the control of sulfur oxides and acid gases. Sorbent material (e.g., hydrated lime as calcium hydroxide or similar) is delivered to the site by truck and loaded into an outdoor storage silo equipped with a bin vent filter. Sorbent is transported in a closed system and injected into the flue gas prior to the second baghouse as a filter media.

Spent sorbent is stored in a silo (IMF09) equipped with a bin vent filter until it is emptied into a vacuum truck for off-site disposal.

The Sorbent Silo emits filterable PM/PM_{10}/ $PM_{2.5}$ (IMF08) during unloading of new sorbent. The spent sorbent silo emits PM/PM_{10}/$PM_{2.5}$ (IMF09) (with sulfur and acid gasses bound in the material) during the loading of spent sorbent.

2.1.4 *Cooling Towers*

The Melting Furnace is cooled with a water jacket. The Melting Furnace Cooling Tower will be used to reject heat from the furnace. The gutters, which are channels that direct melt to the spinning process, will be water cooled via a recirculating cooling tower .

Heat will be recovered from the cooling water systems and used for building and process heat. Surplus heat will be rejected from the cooling water systems.

The Cooling Towers will be sources of filterable PM/PM_{10}/ $PM_{2.5}$.

Emission points associated with the melting process consists of:

- Preheat Burner (IMF24),
- One (1) Thermal Oil Horizontal Tank (2,642 gal - 10 m^3),
- One (1) Thermal Oil Horizontal Expansion Tank (1,321 gal - 5 m^3),
- Melting Furnace (IMF01),
- Melting Furnace Cooling Tower (IMF02),
- Gutter Exhaust to WESP (part of HE01),
- Gutter Cooling Tower (HE02),
- One (1) Filter Fines Receiving Silo (IMF10),

- Two (2) Storage Silos [Filter Fines Day Silo/Secondary Energy Materials] (IMF07),
- One (1) Sorbent Silo (IMF08), and
- One (1) Spent Sorbent Silo (IMF09).

2.1.5 *Spinning*

The melt flows out of the lower part of the furnace and is led to the spinning machine via the gutter channels. The spinners are equipped with quick-rotating wheels onto which the melt is applied.

The fibers are drawn from the wheels of the spinning machine by centrifugation combined with a powerful air stream that is blown into the spinning chamber. At the same time binder and cooling water is added to the flow of fibers. Also, the material is sprayed with de-dusting oil to give water-repellent properties and reduce dust emission in the factory and the finished products. Binder and water are dosed as small droplets through nozzles on the spinning machine.

Fibers not recovered in the spinning process are directed to the Recycle Plant for re-use in the furnace.

The binder-coated fibers are collected on a perforated surface (filter net). The fibers settle on the surface as primary wool web, and air is sucked through the perforation by means of under pressure in the chamber in a vertical direction.

Emissions from the Spinning Chamber consist primarily of filterable PM/PM10/PM2.5, CPM, VOC, and organic HAP (formaldehyde, methanol, phenol).

Exhaust from the Spinning Chamber will conditioned (e.g. with quenching or water spraying) prior to the WESP (HE01).

2.1.6 *Binder*

Binders will be mixed onsite, either as a batch or by in-line mixing. The binder raw materials (resin and other binder components) are delivered to the site via tank truck and unloaded into storage tanks or delivered in drums/totes.

The binder storage consists of a series of tanks in a tank farm which is covered with a sheet roof but has no facades. A secondary containment is included in the structure.

The materials may be stored in temperature-controlled tanks equipped with heating and cooling as required. From the storage tanks the components are either mixed as a batch in a mixing tank . Binder mixed in the

Binder Mix Tank is pumped to the Circulating Tank and from here to the Binder Day Tank in the Furnace Building.

A separate storage is made for the de-dusting oil due to fire requirements. De-dusting oil is delivered in bulk by truck or in drums or intermediate bulk container (IBC) and unloaded into the storage tank (B252). From the storage tank the oil is pumped into a day tank in the furnace building (B300) and from there dosed into the spinning & wool collection process.

The standard binder is a urea-modified phenolic resin which is cured during the mineral wool process. Roxul will use varying binder formulations as technology advances to produce formaldehyde-free resins. This application is designed to address the use of varying resin materials.

Emissions from unloading, storage, and mixing of binder consist of VOC and organic HAP (formaldehyde, phenol, methanol).

Storage tanks include:

- One (1) Coupling Agent Vertical Storage Tank (264 gal - 1 m^3);
- Ten (10) Coupling Agent Storage Containers (ea. 264 gal - 1 m^3);
- Fifty (50) Coupling Agent Storage Drums (ea. 53 gal - 0.2 m^3);
- One (1) Additive Vertical Storage Tank (53 gal - 0.2 m^3);

- Seven (7) Resin Vertical Storage Tanks (ea. 15,850 gal - 60 m^3);

- One (1) De-dust Oil Vertical Storage Tank (15,850 gal - 60 m^3);
- Thirty (30) De-dust Oil Storage Containers (ea. 264 gal - 1 m^3);
- Forty (40) Silicone Oil/Resin Storage Containers (ea. 264 gal - 1 m^3);

- One (1) Vertical Binder Mix Tank (2,642 gal - 10 m^3);

- One (1) Vertical Binder Circulating Tank (4,227 gal - 16 m^3);
- One (1) Binder Vertical Day Tank (793 gal - 3 m^3);
- Three (3) Binder Storage Containers (ea. 264 gal - 1 m^3); and
- One (1) De-dust Oil Vertical Day Tank (264 gal - 1 m^3).

2.1.7 Dry Ice Cleaning

For mineral wool products where product quality requirements necessitate additional cleaning of the perforated filter net dry ice will be applied for cleaning. The filter net may also be cleaned using with water. Dry ice pellets will be used for cleaning via blasting onto the perforated filter net. A pressurized storage tank will feed liquid CO_2 to a pelletizer unit which will form dry ice pellets (solid CO_2). The system continuously produces dry ice pellets which are fed to a blasting gun that directs the pellets to the perforated filter net.

Emissions from the production of dry ice pellets and the cleaning activities consist of fugitive CO_2.

2.1.8 Fleece Application

Fleece application stations will be added to the line prior to the Curing Oven for use in specialty products.

Rolls of fleece (fiberglass or similar facing) will be situated at two unrolling stations, above and below the mineral wool conveyor. Each upper and lower fleece will be unrolled as a continuous sheet and directed via rollers through an open dip "bath" of binder. Each dip bath will coat one side of the upper and lower fleece with binder. The coated fleece will be directed towards the top and underside of the uncured mineral wool via rollers and placed onto the surface of the uncured wool just prior to entry into the Curing Oven. The uncured mineral wool with fleece applied to the top and underside will enter the Curing Oven, where binder in the wool and on the fleece will be cured.

Binder will be fed to the dip baths via enclosed piping from the Binder Day Tank or from IBC containers (approximately 264 gal or 1 m^3). The binder coating may be the same binder that is applied in the Spinning Chamber, or it can be a special binder.

Emissions from Fleece Application will consist of fugitive VOC and organic HAP emissions resulting from surface evaporation of binder in the dip tank and binder-coated fleece just prior to the Curing Oven. The majority of emissions from the binder applied to the fleece will be controlled by the Curing Oven afterburner as the fleece is cured onto the wet mineral wool in the Curing Oven. The binder's content of organic HAPs will be below requirements for additional control per the National Emission Standards for Hazardous Air Pollutants (NESHAP) for Paper or Other Web Coating (NESHAP Subpart JJJJ).

2.1.9 *Curing and Cooling*

The wool web is conveyed to the pendulum (B400) which arranges multiple layers of wool onto the wool lane. For some products the edges will be cut along the wool lane by means of a mechanical saw before the curing oven. The removed edges, which is uncured wool (wet wool) is sent to the Recycle Plant via conveyors.

The density of the secondary wool lane is measured by means of isotope or x-ray device.

The wool lane is conveyed into the Curing Oven, where the remaining water in the product is evaporated and the binder is cured by means of hot air supplied from two natural gas-fired circulation burners (via direct heating).

A natural-gas fired afterburner controls CO, VOC, and organic HAP emissions, where after the gases are directed to the WESP (HE01).

Emissions from the Curing Oven consist of filterable PM/PM_{10}/ $PM_{2.5}$, CPM, NO_x, CO, SO_2, VOC, organic HAP (formaldehyde, methanol, phenol), CO_2, CH_4, and N_2O.

The curing oven is equipped with hoods at the inlet and outlet end to control the working environment in the event that hot air escapes the curing oven due to system pressure changes. The inlet and outlet hoods vent to the WESP (HE01).

After leaving the Curing Oven, the wool web is conveyed through a Cooling Section where ambient air (from the production hall) is sucked through the cured wool web to cool it prior to cutting.

Emissions from the Cooling Section consist of filterable PM/PM_{10}/ $PM_{2.5}$, CPM, VOC, organic HAP (formaldehyde, methanol, phenol) and small amounts of NO_x and CO.

In summary, the following sources will be directed to the WESP as a combined emission point HE01:

- Gutter Exhaust,
- Spinning Chamber,
- Curing Oven Hoods,
- Curing Oven (following afterburner control), and
- Cooling Section.

2.1.10 *Cutting Section*

After the cooling zone, the cured wool web is labeled with product features and cut to size by a water jet and/or mechanical cutting. Edges may be trimmed prior to labeling and transported to the Recycle plant via the line granulator. Labels can be branded to the product in three different ways:

a. Branding wheels fired by natural gas combustion (combined maximum burner capacity[4] is 0.4 MMBtu/hr or 120 kW);

b. Laser marking; or

c. Inkjet labeling.

Emissions from the Branding Wheels (option a) vent in the production building and consist of products of natural gas combustion.

Emission from inkjet labeling consists of VOC emissions from evaporation of organics in the ink and cleaner applied. The ink and cleaner are HAP-free. Emissions occur indoor and are fugitive.

Dust from the mechanical saws is removed pneumatically and directed to a baghouse filter (CE01). The collected dust/filter material is transported via closed conveyors to the Recycle Plant.

Water/fiber generated by water jet cutting is collected in the process water system and reused in the process.

Emissions from the De-dusting Baghouse (CE01) stack consist of filterable PM/ PM_{10}/ $PM_{2.5}$.

2.1.11 *Stacking, Packing and Unit Load*

After cutting the products are stacked, packaged in polyethylene film, palletized (as needed), and transported to one of the storage areas for finished goods.

A paper surface may be applied to products either before final cutting or after they are cut to size. The paper applied is a pre-coated polyethylene (PE) paper which is warmed in electrically heated drums so that the paper adheres to the wool product.

Dispatch of finished goods in to trucks takes place from the unit load area.

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[4] Up to 8 branding wheels each 11 kWh equal to 88 kWh (0.3 MMBtu/hr); rounded to 0.4 MMBtu/hr

Dust from the packaging area is collected by vacuum and directed to the Vacuum Cleaning Baghouse (CE02).

Emissions from the Vacuum Cleaning Baghouse consist of filterable PM/ PM_{10}/$PM_{2.5}$.

2.1.12 *Recycling Plant*

The Recycle Plant is used to recovered materials (e.g., waste wool and de-dusting fines such as fibers and dust) from the mineral wool manufacturing line that would otherwise be sent to a landfill for disposal. The Recycling Plant can also receive mineral wool products returned from Roxul customers, such as but not limited to products damaged in shipping, wool waste products from construction sites or directly from customers with the purpose to recover the material for new products.

The Recycle Plant process includes material handling by front end loaders (FEL) and conveyors, milling, and batching.

The cured wool waste is chopped up in pieces by knives in the line granulator, which is placed in the cold end building (B500) or in the edge-trim system with a cutting screw, which is placed in the curing oven building (B400).

The wool pieces are conveyed by covered belt conveyors to a closed recycling silo (B405). From the silo the wool pieces are sent via the dosing system and milled to the required size

The recycling silo and part of the closed conveyor in this system is placed outside the building.

A FEL will be used to transfer wool waste from indoor collection areas inside the recycling building (B240) and into a loading hopper. Mineral wool products returned from Roxul customers will be received in big bags (or similar) and fed to the loading hopper via FEL. The loading hopper feeds wool into the mill via a screw conveyor or similar. Wool waste may also be recycled directly to the mill by means of belt and screw conveyor system. Waste wool is ground in the mill and exits via multiple conveyors to storage silos for milled wool waste. The hopper loading is connected to the de-dusting filter system (CE01). The silo area has one exhaust (CM08), and the area with the mill has one exhaust (CM09).

All of the re-melting recycling plant transfer and milling operations are conducted indoors. The building is kept closed with a fast roller gate controlled by the movement of the FEL. The building is equipped with roof ventilation equipped with particulate filters to control the working environment for industrial hygiene purposes (ammonia odor and mobile FEL exhaust gases).

The recycling plant will consist of the following emission points:

- De-dusting vents to De-dusting Baghouse (CE01), and
- Four (4) Recycle Building Vents (CM08, CM09, CM10, CM11).

2.2 *ROCKFON LINE*

The Rockfon Line will produce ceiling tiles using the mineral wool slabs produced on the Mineral Wool Line. The process will include cutting, sanding, glue application, feeding tissue, hot pressing, curing, paint application, drying, and packaging.

2.2.1 *Rockfon Production*

The Rockfon Line will produce ceiling tiles using the mineral wool slabs produced on the Mineral Wool Line. The mineral wool slabs will be split by a saw and go through a sanding machine to ensure proper dimension. The mineral wool slabs will be directed through a glue cabinet for application of an adhesive. A fleece layer is then applied over the adhesive at an unreeling station. The slabs are then hot pressed passes through an edge trimmer, dividing saw, and a fleece cutter prior to packaging and delivery to the customer.

Emissions from the IR Zone stack (RFNE1) and Hot Press stack (RFNE2) consists of filterable $PM/PM_{10}/PM_{2.5}$, CPM, VOC and organic HAP (formaldehyde and phenol).

Exhaust gases from cutting and sanding operations will be directed to the De-dusting Baghouse (RFNE8) for control of filterable $PM/PM_{10}/PM_{2.5}$ emissions.

The milling and edge sanding exhaust will be directed to the De-dusting Baghouse (RFNE8) for control of filterable $PM/PM_{10}/PM_{2.5}$ emissions. Material collected in RFNE8 will be conveyed in an enclosed container to the Recycle Plant for reuse in the process.

All paints used in the Rockfon Line will be water-based. Specifications are a maximum of 0.67 lb VOC/gal (80 g VOC/L) for any individual paint and 53 g VOC/kg glue.

Heat is supplied to the High Ovens, Drying Oven 1, and Drying Oven 2 & 3 by natural gas-fired burners through direct heating.

After cooling, the board tiles are then stacked, wrapped, and palletized for shipment.

Emissions from Drying Oven 1 (RFNE4), High Oven A (RFNE3), High Oven B (RFNE9), and Drying Oven 2 & 3 (RFNE6) will consist of filterable $PM/PM_{10}/PM_{2.5}$, CPM, NO_x, CO, SO_2, VOC, organic HAP (formaldehyde, phenol), CO_2, CH_4, and N_2O.

The Spray Paint Cabin, Drying Oven 1, and Drying Oven 2 & 3 exhaust will be directed through a particulate filter for control of filterable $PM/PM_{10}/PM_{2.5}$ emissions.

Emissions from the Cooling Zone (RFNE7) will consist of filterable $PM/PM_{10}/PM_{2.5}$, CPM, VOC and organic HAP (formaldehyde and phenol).

The Rockfon Line process consists of the following emission points:

- IR Zone (RFNE1);
- Hot Press and Cure (RFNE2);
- De-dusting Baghouse (RFNE8);
- Drying Oven 1 (RFNE4);
- High Oven A (RFNE3);
- High Oven B (RFNE9);
- Spray Paint Cabin (RFNE5);
- Drying Oven 2 and 3 (RFNE6); and
- Cooling Zone (RFNE7).

2.2.2 *Rockfon Storage Tanks*

The electrically heated thermal oil system will be connected to an expansion tank (to compensate for the changing volume of thermal oil in the system) and drain tank (to facilitate system oil changes). Emissions from storage of thermal oil consist of VOC.

- One (1) Thermal Oil Horizontal Expansion Tank (212 gal - 0.8 m^3), and
- One (1) Thermal Oil Horizontal Drain Tank (159 gal - 0.6 m^3).

Water-based paint used in the Rockfon process may be diluted with water prior to application to Rockfon ceiling tiles. The paint will be mixed in an enclosed dilution tank and staged in the day tank prior to use:

- One (1) Paint Dilution Storage Tank (793 gal - 3 m^3), and
- One (1) Paint Dilution Day Tank (397 gal - 1.5 m^3).

Wash water generated from periodic cleaning of the Rockfon paint stations will be collected for onsite treatment via separation methods. Roxul will use dewatering flocculants and a filter press to separate paint solids from the water used for cleaning. The paint solids will be appropriately managed as waste and the treated water will be shipped offsite (under the appropriate waste category) or discharged (if desired and adequate permits are obtained).

A crusher will be operated inside the Rockfon production building which will accept material reject from the Rockfon Line. The crusher exhaust will be directed to the De-dusting Baghouse (RFNE8) for control of filterable $PM/PM_{10}/PM_{2.5}$ emissions. Crushed material will be conveyed in an enclosed container to the Recycle Plant for reuse in the process.

The De-dusting Baghouse will be designed with an alternative venting option, so that filtered exhaust air can be directed through a High-efficiency Particulate Air (HEPA) filter and used as warm air in the Rockfon production building. Product quality and worker health necessitates the use of a HEPA filter for this exhaust. Any filterable $PM/PM_{10}/PM_{2.5}$ emissions that may be emitted from the enclosed Rockfon production building would be emitted as a fugitive source; however these emissions would be a fraction of those emitted from the De-dusting Baghouse stack, due to the HEPA filter and "building" control. Dispersion modeling is conducted with the De-dusting Baghouse venting, since this is the worst case emissions scenario.

2.3 OTHER FACILITY-WIDE OPERATIONS AND ACTIVITIES

2.3.1 Building Heating with Natural Gas Boilers

Building heat will be supplied with a natural gas fired boilers.

Two natural gas-fired boilers will be installed to provide a source of building heat when the furnace is not in operation (CM03, CM04).

The Rockfon building will have a natural gas-fired boiler for building heating (RFN10).

Each of the three boilers will have a maximum rated heat input capacity of 5.0 MMBtu/hr (1,500 kW) and will be equipped with low-NO_x burners meeting 30 ppmvd @ 3% oxygen.

Although the boilers may only operate for a limited duration, they will be permitted to operate for 8,760 hours per year.

Emissions consist of the products of natural gas combustion.

2.3.2 Process Water System

The process water system consists of a series of tanks and a filter for recirculation of process water. The collected water is filtered on a band filter and stored in buffer tanks.

The filtered process water is used for dilution of binder and for flushing of processes (e.g. to transport fibers back in the system). Process water is also used for operation of the WESP. Process water is collected storm water from outside areas to compensate for water loss due to evaporation. Additional water is supplied from the public water supply.

2.3.3 *Emergency Fire Pump Engines*

Roxul plans to install two emergency fire pumps that will be used to pump water in the event of a fire. One pump will be diesel driven (in case of power failure) and one pump is electrically powered.

The diesel engine fire pump will be rated at 197 horsepower (hp) (147 kW). The engine will be certified to NSPS Subpart IIII engine standards and will operate only during emergencies or other limited scenarios as allowed by federal rules (i.e., maintenance checks, readiness testing, etc.). Emissions from the diesel fire pump engine will include the products of diesel combustion.

2.3.4 *Oxygen Plant*

Oxygen will be dosed to the Melting Furnaces to ensure oxygen enrichment. Initially, oxygen will be delivered to the site and stored in pressurized storage vessels; later an onsite oxygen plant is to be constructed. Oxygen is produced from ambient air.

The oxygen plant will emit primarily nitrogen and argon and is not a source of criteria pollutants, HAP, or GHG emissions.

2.3.5 *Compressed Air*

A number of air electric compressors will be installed to operate the machinery.

2.3.6 *Miscellaneous Storage Tanks*

Additional storage tanks that will be utilized for utility purposes include the following:

- One (1) Used Oil Horizontal Storage Tank (581 gal - 2.2 m^3) for storage of used motor and gear oil;
- One (1) Diesel Fuel Horizontal Storage Tank (2,642 gal - 10 m^3) for use in mobile equipment (e.g., front-end loaders); and
- Pressurized liquefied propane gas (LPG) storage tanks with filling station for forklift operation in warehouse area.

Emissions from unloading and storage of used oil and diesel fuel consists of VOC.

3.0 *PREVENTION OF SIGNIFICANT DETERIORATION*

West Virginia regulations in WV 45 CSR 14 establishes and adopts a preconstruction permit program in accordance with the policy of §101(b)(1) of the Clean Air Act (CAA), the purposes of §160 of the CAA, and the prevention of significant deterioration (PSD) of air quality requirements of 40 CFR §51.166. The PSD program applies to a new major stationary source or major modification that is located in an area formally designated as attainment or unclassifiable for any pollutant for which a National Ambient Air Quality Standard (NAAQS) exists (criteria pollutants). Jefferson County, West Virginia is designated as attainment or unclassifiable for all criteria pollutants. As shown in Table 3-1, the proposed facility will be a new PSD major source due to potential emissions of VOC in excess of 250 tons per year. Further, emissions of NO_x, CO, SO_2, PM, PM_{10}, $PM_{2.5}$, H_2SO_4 Mist, and CO_2e are also subject to PSD review due to potential emissions greater than the PSD significant emission rate (SER) for each pollutant.

Table 3-1: Summary of PSD Applicability for Regulated NSR Pollutants

Regulated NSR Pollutant	Project Potential Emissions (ton/year)	PSD SER (ton/year)	PSD Review Req'd?
NO_x	238.96	40	Yes
CO	71.40	100	Yes
VOC	471.41	40	Yes
SO_2	147.45	40	Yes
PM(1)	129.23	25	Yes
PM_{10}	153.19	15	Yes
$PM_{2.5}$	133.41	Primary $PM_{2.5}$: 10 NO_X: 40 SO_2: 40	Yes
O_3	NO_X: 238.96 VOC: 471.41	NO_X: 40 VOC: 40	Yes
Lead	0.0002	0.6	No
H_2SO_4 Mist	16.37	7	Yes
Fluorides(2)	0.03	3	No
H_2S	-	10	No
Reduced Sulfur Compounds(2)	-	10	No
Total Reduced Sulfur	-	10	No
CO_2e	152,934.82	75,000	Yes

Notes:

1. As clarified in EPA's October 12, 2012 rulemaking (Implementation of the NSR Program for Particulate Matter Less Than 2.5 Micrometers ($PM_{2.5}$): Amendment to the Definition of "Regulated NSR Pollutant" Concerning Condensable Particulate Matter), "particulate matter emissions" are distinguished as three separate pollutants having separate regulatory classifications and requirements

under regulations for emissions control, permitting, and emissions measurement. The following conventions apply throughout this permit application for consistency with EPA's October 2012 rulemaking:

PM = filterable PM of any size, not including condensable PM
PM_{10} = filterable PM_{10} + condensable PM
$PM_{2.5}$ = filterable $PM_{2.5}$ + condensable PM

2. As described in 40 CFR 52.21(b)(50)(v), "*...the term regulated NSR pollutant shall not include any or all hazardous air pollutants either listed in section 112 of the Act, or added to the list pursuant to section 112(b)(2) of the Act, and which have not been delisted pursuant to section 112(b)(3) of the Act, unless the listed hazardous air pollutant is also regulated as a constituent or precursor of a general pollutant listed under section 108 of the Act.*". Section 108 of the CAA addresses the requirement to establish air quality standards for criteria pollutants (i.e., primary and secondary NAAQS). Fluorides and reduced sulfur compounds are not considered criteria pollutants with NAAQS pursuant to Section 108 of the CAA. As such, the regulated NSR pollutant, fluorides, does not include HF because it is a HAP and similarly, the regulated NSR pollutant, reduced sulfur compounds does not include COS because it is a HAP.

4.0 FEDERAL REGULATORY REQUIREMENTS

New Source Performance Standards (NSPS) are established for specific industrial categories in 40 CFR Part 60. West Virginia regulations in WV 45 CSR 16 incorporate the federal NSPS by reference. A review of the NSPS categories has been performed for applicability and is presented below.

4.1 NON-APPLICABLE NSPS STANDARDS

The NSPS subparts discussed in this section are not applicable, but are addressed for documentation purposes.

4.1.1 NSPS Subpart Dc – Small Industrial Steam Generating Units

NSPS Subpart Dc applies to each steam generating unit that is capable of combusting between 10 and 100 MMBtu/hr (2,930 - 29,300 kW) of fuel and for which construction, modification, or reconstruction is commenced after June 9, 1989. Steam generating units are defined as devices that combust any fuel and produce steam, heat water, or heat any transfer medium (40 CFR 60.41c). This term does not include process heaters, which are devices primarily used to heat a material to initiate or promote a chemical reaction.

The Natural Gas-Fired Boilers (CM03, CM04), Rockfon Building Heat (RFN10), and the Pre-heat Burner (IMF24) are not subject to NSPS Subpart Dc because they have a maximum rated heat input capacity of less than 10 MMBtu/hr (2,930 kW).

The remaining facility combustion equipment do not include any steam generating units as defined by NSPS Subpart Dc since the combustion of fuel in those sources provide direct heating to a process (i.e., combustion gases directly contact process materials). As such, the Melting Furnace (IMF01), Curing Oven (part of HE01), Product Marking (P_MARK), Rockfon Line ovens (RFNE3, RFNE4, RFNE6, RFNE9), and Coal Mill Burner (IMF05) do not meet the definition of steam generating units and are not subject to NSPS Subpart Dc.

4.1.2 NSPS Subpart Kb – Volatile Organic Liquid Storage Vessels

NSPS Subpart Kb applies to each storage tank containing a volatile organic liquid that is greater than 19,813 gal (75 m^3) in capacity and that has been constructed, reconstructed, or modified after July 23, 1984. All tanks that store volatile organic liquids at the Roxul facility will have capacities less than 19,813 gal (75 m^3) and are therefore not subject to NSPS Subpart Kb. Roxul maintains records of the design of each tank and will notify the agency of any changes from the original tank design.

4.1.3 *NSPS Subpart Y – Standards Of Performance For Coal Preparation And Processing Plants*

NSPS Subpart Y applies to affected facilities in coal preparation and processing plants that process more than 200 tons (181 Metric Tonnes (MT)) of coal per day [§60.250 (a)]. Coal preparation and processing plant means any facility (excluding underground mining operations) which prepares coal by one or more of the following processes: breaking, crushing, screening, wet or dry cleaning, and thermal drying. The maximum capacity of the proposed coal milling operation is below the applicability threshold of 200 tons (181 MT) per day and therefore is not subject to NSPS Subpart Y.

4.1.4 *NSPS Subpart CC – Glass Manufacturing Plants*

NSPS Subpart CC for glass manufacturing plants applies to each glass melting furnace that commences construction or modification after June 15, 1979. Glass melting furnace means a unit comprising a refractory vessel in which raw materials are charged, melted at high temperature, refined, and conditioned to produce molten glass. Roxul produces mineral wool insulation by melting rock and other minerals. The Roxul melting furnace does not produce molten glass, nor does it refine or condition melt. As such, the Roxul facility is not subject to the requirements of NSPS Subpart CC.

4.1.5 *NSPS Subpart LL – Standards Of Performance For Metallic Mineral Processing Plants*

NSPS Subpart LL applies to affected facilities in metallic mineral processing plants, such as each crusher, screen, bucket elevator, conveyor belt transfer point, etc.[5] that commences construction or modification after August 24, 1982. A "metallic mineral processing plant" is defined in Subpart LL as "any combination of equipment that produces metallic mineral concentrates from ore…". Roxul is producing mineral wool and not a metallic mineral concentrate; as such, the site does not meet the definition of a metallic mineral processing plant.

4.1.6 *NSPS Subpart PPP – Wool Fiberglass Insulation Manufacturing Plants*

NSPS Subpart PPP applies to each owner or operator of a rotary spin wool fiberglass insulation manufacturing line that commences construction, modification, or reconstruction after February 7, 1984. Wool fiberglass insulation is defined as a thermal insulation material composed of glass fibers. The insulation produced at Roxul is not comprised of glass fibers and as such is not subject to the requirements of NSPS Subpart PPP.

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[5] See §60.380(a) for complete list of affected facilities.

4.1.7 *NSPS Subpart VVV - Standards Of Performance For Polymeric Coating Of Supporting Substrates Facilities*

NSPS Subpart VVV applies to any affected facility for which construction, modification, or reconstruction begins after April 30, 1987, except for the facilities specified in §60.740(d) of this section. Per §60.740(a), the affected facility is each coating operation and any onsite coating mix preparation equipment used to prepare coatings for the polymeric coating of supporting substrates. Coating operation means, "*any coating applicator(s), flashoff area(s), and drying oven(s) located between a substrate unwind station and a rewind station that coats a continuous web to produce a substrate with a polymeric coating. Should the coating process not employ a rewind station, the end of the coating operation is after the last drying oven in the process.*" Onsite coating mix preparation equipment means, "*those pieces of coating mix preparation equipment located at the same plant as the coating operation they serve.*"

The proposed paper facing operation in the cutting area is not subject to NSPS Subpart VVV as the paper to be used is pre-coated (i.e., Roxul will not conduct any paper coating operations). The following is a review of the relevant definitions with respect to coating operations included in this application (e.g., Fleece Application on the Mineral Wool Line (CM12, CM13), glue application in the IR Zone (RFNE1), and various Rockfon paint applications). Polymeric coating of supporting substrates means, "*a web coating process that applies elastomers, polymers, or prepolymers to a supporting web other than paper, plastic film, metallic foil, or metal coil.*" Web coating means, "*the coating of products, such as fabric, paper, plastic film, metallic foil, metal coil, cord, and yarn, that are flexible enough to be unrolled from a large roll; and coated as a continuous substrate by methods including, but not limited to, knife coating, roll coating, dip coating, impregnation, rotogravure, and extrusion.*" Substrate means, "*the surface to which a coating is applied.*"

- The application of coating (binder) to the fleece material on the Mineral Wool Line would be considered web coating and in turn polymeric coating of supporting substrates, since it constitutes the coating of fabric that is flexible enough to be unrolled from a large roll and coated as a continuous substrate by roll coating with a polymer. The binder applied may be blended onsite prior to delivery to the Fleece Application station and therefore constitutes onsite coating mix preparation equipment.
- The glue applied to the Rockfon ceiling tiles (i.e., individual cured mineral wool slabs) does not meet the definition of web coating since it will not coat a continuous substrate that is flexible enough to be unrolled from a large roll. Further, the glue is not blended in a mixing vessel with solvent or any other materials prior to delivery and does not meet the definition of coating mix preparation equipment.
- The paints that will be applied to the edges and outer surface of the Rockfon ceiling tiles (i.e., individual cured mineral wool slabs) do not meet the definition of web coating since they will not coat a continuous substrate that is flexible enough to be unrolled from a large roll.

The Fleece Application operation meets the NSPS Subpart VVV definition of a coating operation with associated coating mix preparation equipment. However, per §60.740(d)(2), NSPS Subpart VVV does not apply to, "*Coating mix preparation equipment or coating operations during those times they are used to prepare or apply waterborne coatings so long as the VOC content of the coating does not exceed 9 percent by weight of the volatile fraction;*". The VOC content[6] of the binder coating is much less than 9 percent by weight of the volatile fraction, and as such NSPS Subpart VVV does not apply to the Fleece Application (CM12, CM13) or binder mixing.

4.1.8 NSPS Subpart CCCC – Standards Of Performance For Commercial And Industrial Solid Waste Incineration Units

NSPS Subpart CCCC establishes new source performance standards for commercial and industrial solid waste incineration (CISWI) units. NSPS Subpart CCCC applies if an incineration unit meets all of the requirements in §60.2010(a)-(c) as follows:

- The incineration unit is a new incineration unit as defined in §60.2015;
- The incineration unit is a CISWI unit as defined in §60.2265; and
- The incineration unit is not exempt under §60.2020.

Commercial and industrial solid waste incineration (CISWI) unit is defined 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 §60.2175(v), 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.*"

[6] VOC in the applied coating means, "the product of Method 24 VOC analyses or formulation data (if) those data are demonstrated to be equivalent to Method 24 results) and the total volume of coating fed to the coating applicator."

Anodes and coke fines meet the definition traditional fuels (i.e., fuels that have been historically managed as valuable fuel products rather than being managed as waste materials or alternative fuels) and as such are not solid wastes.

The proposed Roxul facility will accept mineral wool products returned from Roxul customers, such as but not limited to products damaged in shipping, excess wool products from construction sites, or directly from customers with the purpose of recovering the wool material for new mineral wool products. This mineral wool will be sized in the Recycling Plant prior to re-melting in the Melting Furnace (IMF01).

These mineral wool product returns would not meet the 40 CFR part 241 definition of solid waste since they are used as an *ingredient* in a combustion unit that would meet the legitimacy criteria of 40 CFR §241.3(d)(2) (i.e., management of material as valuable commodity, useful contribution to the manufacturing process, used to produce a valuable product, etc.). Per 40 CFR §241.3(b),

> *"(b) The following non-hazardous secondary materials are not solid wastes when combusted: ...(b)(3) Non-hazardous secondary materials used as an ingredient in a combustion unit that meet the legitimacy criteria specified in paragraph (d)(2) of this section."*

Therefore, the Melting Furnace is not a CISWI unit defined in §60.2265 because it does not combust solid waste. Roxul will maintain the records required to demonstrate that returned mineral wool is not a solid waste.

Applicable NSPS Standards

4.1.9 NSPS Subpart OOO – Nonmetallic Mineral Processing

NSPS Subpart OOO applies to the following affected facilities in fixed or portable nonmetallic mineral processing plants that commenced construction after August 31, 1983: each crusher, grinding mill, screening operation, bucket elevator, belt conveyor, bagging operation, storage bin, enclosed truck or railcar loading station. A "nonmetallic mineral processing plant" is defined as any combination of equipment that is used to crush or grind any nonmetallic mineral. The definition of nonmetallic mineral specifically mentions limestone, dolomite, and other minerals which may be contained in stone raw materials that will be sieved, crushed (if necessary), and conveyed in the charging building operations.

Per §60.672(d), truck dumping of nonmetallic minerals into any screening operation, feed hopper, or crusher is exempt from PM standards of NSPS Subpart OOO, which would exclude the Raw Material Loading Hopper (B215). Vacuum systems are not identified as affected facilities in NSPS Subpart OOO; therefore the Charging Building Vacuum Cleaning Filter (IMF21) is not subject to NSPS Subpart OOO. The remaining affected sources subject to PM emissions limits include the belt conveyors connected to the charging building (IMF11, IMF12); indoor sieve, crusher, storage bins, and belt conveyors located inside the charging building (represented by IMF14, IMF15, IMF17, IMF18); various charging building outdoor collection bins (RM_REJ, S_REJ); and belt conveyors leading from the charging building to the furnace building (IMF16). The Filter Fines Day Silo/Secondary Energy Materials Silo (IMF07) and Filter Fines Receiving Silo (IMF10) are conservatively considered as part of the nonmetallic mineral processing plant because the silos will store stone or mineral raw materials that have been through the charging building operations.

After the final belt conveyor transfer from charging building operations to the furnace building, raw materials are dosed to a continuous weigh bin connected to the Melting Furnace. This bin is part of the mineral wool production operations and is not considered part of the nonmetallic mineral processing plant.

A summary of the applicable emission limits to affected sources subject to NSPS Subpart OOO is shown in Table 4-1 below.

Table 4-1: ***Summary of Applicable Emission Limits to NSPS Subpart OOO Affected Sources***

Source ID	Source Description	Control Device (if present)	NSPS Subpart OOO Limit	
			Limit	Citation
RM_REJ	Raw Material Reject Collection Bin	-	7% opacity	§60.672(b) & Table 3 [fugitive emission limits]
S_REJ	Sieve Reject Collection Bin	-	7% opacity	
IMF07	Two (2) Storage Silos (Filter Fines Day/ Secondary Energy Materials)	Bin Vent Filter	7% opacity	§60.672(a) & Table 2; §60.672(f) [opacity in lieu of concentration limit for dry control devices on individual enclosed storage bins]
IMF10	Filter Fines Receiving Silo	Bin Vent Filter	7% opacity	
IMF11	Conveyor Transition Point (B215 to B220)	Fabric Filter	0.032 g/dscm (0.014 gr/dscf)	§60.672(a) & Table 2 [stack emission limits for affected facilities with capture systems]
IMF12	Conveyor Transition Point (B210 to B220)	Fabric Filter	0.032 g/dscm (0.014 gr/dscf)	
IMF14	Conveyor Transition Point (B220 No. 1)	Fabric Filter	0.032 g/dscm (0.014 gr/dscf)	
IMF15	Conveyor Transition Point (B220 No. 2)	Fabric Filter	0.032 g/dscm (0.014 gr/dscf)	
IMF16	Conveyor Transition Point (B220 to B300)	Fabric Filter	0.032 g/dscm (0.014 gr/dscf)	
IMF17	Charging Material Handling Building Vent 1	-	7% opacity	§60.672(e)(1) [fugitive emissions from building openings]

Source ID	Source Description	Control Device (if	NSPS Subpart OOO Limit	
IMF18	Charging Material Handling Building Vent 2	-	7% opacity	

Roxul will be required to submit applicable notifications and initial testing results for affected sources subject to NSPS Subpart OOO. Monitoring of baghouses required by §60.674(c) consists of quarterly 30-minute visible emissions inspections using EPA Method 22 or the alternative specified in §60.674(d) for operation of a bag leak detection system. Recordkeeping and reporting requirements will be applicable and will be conducted as required.

NSPS Subpart OOO does not apply to the following operations at the proposed facility as described below.

- The Recycling Plant is not part of a nonmetallic mineral processing plant because only formed mineral wool fibers are handled in this area (i.e., no stone or mineral raw materials).
- The capacity of the Melting Furnace Portable Crusher (170) will be equal to or less than the exemption threshold of 136 megagrams per hour (150 short tons per hour) per §60.670(c)(2). The portable crushing operation is separate from the charging building operations that are subject to NSPS Subpart OOO.
- Fresh and spent sorbent used in the desulfurization system at Roxul will be stored in silos and pneumatically conveyed either to or from the control system (e.g., no crushing, grinding, or other processing occurs). Sorbent handling is separate from the charging building operations that are subject to NSPS Subpart OOO. Therefore, the Sorbent Storage Silo (IMF08) and Spent Sorbent Silo (IMF09) are not part of a nonmetallic mineral processing plant and are not subject to NSPS Subpart OOO.

4.1.10 NSPS Subpart IIII - Stationary CI ICE

Federal NSPS regulations for stationary compression ignition (CI) internal combustion engines (ICE) are found at 40 CFR Part 60, Subpart IIII ("NSPS Subpart IIII") and include emission limits and operating requirements for emergency CI engines that commenced construction after April 1, 2006. The Emergency Fire Pump Engine (EFP1) is subject to this subpart.

Pursuant to 40 CFR §60.4205(c), the Emergency Fire Pump Engine will be certified to meet the emission standards listed in Table 4 of NSPS Subpart IIII for PM, carbon monoxide (CO), and nitrogen oxides plus non-methane hydrocarbons (NO_x + NMHC).

Additional applicable requirements that apply to the Emergency Fire Pump Engine under NSPS Subpart IIII are summarized below:

- Purchase of a certified engine and install/configure the engine to the manufacturer's emission-related written instructions [40 CFR §60.4211(c)];
- Operate and maintain the engine according to the manufacturer's emission-related written instructions, change only those emission-related settings as permitted by the manufacturer, and comply with 40 CFR parts 89, 94 and/or 1068, as they apply [40 CFR §60.4211(a)];
- Install a non-resettable hour meter and limit operation to 100 hours per year of recommended maintenance checks and readiness testing, 50 of those hours may be used for non-emergency operation[7] [40 CFR §§60.4209(a), 60.4211(f)];
- Purchase diesel fuel meeting a sulfur content of 15 ppm and a minimum cetane index of 40 or a maximum aromatic content of 35 volume percent pursuant to 40 CFR §80.510(b) for non-road diesel fuel [40 CFR §60.4207(b)]; and
- Recordkeeping of conducted maintenance and operating hours, including reason for operation, and any other applicable notification[8], reporting, and recordkeeping requirements of 40 CFR §60.4214.

4.2 *NATIONAL EMISSION STANDARDS FOR HAZARDOUS AIR POLLUTANTS (NESHAP)*

NESHAP standards are established for specific pollutants and source categories in 40 CFR Part 61 and Part 63 in accordance with the Clean Air Act Amendments of 1990, which required development standards for sources of HAP. West Virginia regulations in WV 45 CSR 34 incorporate the federal NESHAP by reference. Potential HAP emissions from the Roxul facility are above the major source thresholds of 10 tpy (9.07 MT/year) of an individual HAP or 25 tpy (22.7 MT/year) of total HAP emissions. Thus, Roxul is a major source of HAP and is subject to any applicable MACT standards.

There are no existing or proposed NESHAP standards under 40 CFR Part 61 that are applicable to the Roxul facility.

A review of the NESHAP regulations under 40 CFR Part 63 has been performed for applicability to the Roxul facility and is presented below.

4.2.1 *NESHAP Subpart DDD – Mineral Wool Production*

The requirements of NESHAP Subpart DDD apply to owners or operators of mineral wool production facilities that are located at major sources of HAP emissions. Beginning in November 2011, the EPA proposed a series of revisions

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[7] Hours of operation in emergency situations are not limited.

[8] An initial notification is not required for emergency stationary ICE as specified in 40 CFR §60.4214(b).

to the Mineral Wool MACT as required by the residual risk and technology review per the CAA. The final revisions were promulgated in the Federal Register and made effective on July 29, 2015.

The proposed Roxul facility will be subject to the requirements for new affected facilities under the Mineral Wool MACT[9]. Although the Melting Furnace design can be differentiated from that of a traditional cupola, the Melting Furnace at its basic premise meets the current NESHAP Subpart DDD definition of a cupola (i.e., a large, water-cooled metal vessel to which a mixture of fuel, rock and/or slag, and additives is charged and heated to a molten state for later processing). The revised standard includes emissions limits for COS (replacing the CO limit in the original standard) for open-top and closed-top cupolas, HF and HCl limits for cupolas with and without slag, and combined collection (spinning) and curing oven emission limits for formaldehyde, methanol, and phenol. The final revised emission limitations for new affected sources and the subcategories applicable to Roxul are summarized in Table 4-2 below.

Table 4-2: Summary of Final Revised NESHAP Subpart DDD Emission Limitations Applicable to Roxul

NESHAP Affected Operation	Final Revised NESHAP Limitation for New Sources
Cupolas (PM)(1) [Tbl 2, Item 2]	0.10 lb PM/ton melt
Open-top Cupola [Tbl 2, Item 8]	3.2 lb COS/ton of melt (2)
Cupola using Slag(3) [Tbl 2, Item 10]	0.015 lb HF/ton of melt 0.012 lb HCl/ton of melt
Combined Vertical(4) Collection/Curing [Tbl 2, Item 24]	2.4 lb formaldehyde/ton of melt 0.71 lb phenol/ton of melt 0.92 lb methanol/ton of melt

Notes:
1. The NESHAP Subpart DDD limit for PM is for filterable PM only.
2. The Melting Furnace design is open-top, because there is an opening at the top of the melter and air flow is unrestricted.
3. The Melting Furnace uses slag as a feed material.
4. NESHAP Subpart DDD does not define the various collection designs. As described by the preamble to the proposed rule, Roxul operates a vertical collection process [76 FR 72770, November 25, 2011].

The requirements of NESHAP Subpart DDD include emission and operating limitations (as summarized above) and monitoring requirements for cupolas [§63.1178, §63.1181, §63.1182] and combined collection/curing operations [§63.1179, §63.1183], performance testing [§63.1188], notifications [§63.1191],

[9] Per §63.1196, New Source means "any affected source that commences construction or reconstruction after May 8, 1997 for purposes of determining the applicability of the emissions limits in Rows 1-4 of Table 2. For all other emission limits new source means any affected source that commences construction or reconstruction after November 25, 2011."

recordkeeping [§63.1192], reporting [§63.1193], and General Provisions (NESHAP Subpart A).

The revised Mineral Wool MACT also defines operating requirements during startup and shutdowns [§63.1197]. These requirements prohibit the shutdown of equipment that are utilized for compliance during times when emissions are being, or are otherwise required to be, routed to such items of equipment. In addition for cupolas, per §63.1197(e), you must maintain records during startup and shutdown that either 1) emissions were controlled using air pollution control devices operated at the parameters established by the most recent performance test that showed compliance with the standard; or 2) only clean fuels were used and the cupola was operated with three percent oxygen over the fuel demand for oxygen.

In addition, pursuant to §63.1187, Roxul will be required to prepare an Operation, Maintenance, and Monitoring (OMM) Plan, which specifies how Roxul will operate and maintain equipment used to demonstrate compliance with the Mineral Wool MACT.

Performance testing must be completed as specified in §63.1188 to demonstrate compliance with the emission limits in the revised Mineral Wool MACT. In addition to the performance testing reports, Roxul must submit notification of startup[10] of the Mineral Wool Line and a Notification of Compliance Status (NOCS) report per §63.9(h) and §63.1193 for the Mineral Wool Line Melting Furnace and Combined Collection/Curing Operations (Spinning Chamber and Curing Oven, both part of HE01), which certifies compliance with the rule.

4.2.2 *NESHAP Subpart ZZZZ – Stationary RICE*

Federal NESHAP regulations for stationary Reciprocating Internal Combustion Engines (RICE) are found at 40 CFR Part 63, Subpart ZZZZ ("RICE MACT"). For the Emergency Fire Pump Engines, as new emergency stationary RICE with a site rating less 500 brake hp and located at a major source of HAP, the requirements of NESHAP Subpart ZZZZ are satisfied by meeting the requirements of NSPS Subpart IIII (per §63.6590(c)(7)). No further requirements apply for such engines under this part. As discussed in Section 4.1.10, the Emergency Fire Pump Engines comply with NSPS Subpart IIII.

4.2.3 *NESHAP Subpart DDDDD - Industrial, Commercial, and Institutional Boilers And Process Heaters*

Federal NESHAP regulations for industrial, commercial, and institutional boilers and process heaters that are located at major sources of HAP are found at 40 CFR

[10] §63.9(b)(4)(v) of the NESHAP General Provisions requires submittal of a startup notification within 15 calendar days.

Part 63, Subpart DDDDD ("Boiler MACT"). Relevant definitions are noted below:

> "Boiler means an enclosed device using controlled flame combustion and having the primary purpose of recovering thermal energy in the form of steam or hot water. Controlled flame combustion refers to a steady-state, or near steady-state, process wherein fuel and/or oxidizer feed rates are controlled. ..."

> "Process heater means an enclosed device using controlled flame, and the unit's primary purpose is to transfer heat indirectly to a process material (liquid, gas, or solid) or to a heat transfer material (e.g., glycol or a mixture of glycol and water) for use in a process unit, instead of generating steam. Process heaters are devices in which the combustion gases do not come into direct contact with process materials...."

The Preheat Burner (IMF24), Natural Gas-Fired Boilers (CM03, CM04), and Rockfon Building Heat (RFN10) are subject to Boiler MACT as new affected sources and are required to be in compliance with Boiler MACT upon startup. The only applicable requirements for a natural gas fired boiler or process heater are work practices and applicable recordkeeping and reporting. §63.7540 and Table 3 (Work Practice Standards) allows tune-ups biennially for new gas 1 boilers with a heat input capacity between 5 and 10 MMBtu/hr (1,470-2,930 kW). Roxul will be required to perform tune-ups biennially in accordance with §63.7540 and Table 3 of Boiler MACT according to the capacity of each affected source.

Roxul will be required to submit notifications of startup, an NOCS report, and compliance reports after each periodic tune-up for all affected sources per §63.7550.

The Melting Furnace (IMF01), Curing Oven and emission control afterburner (part of HE01), Rockfon Line ovens (RFNE3, RFNE4, RFNE6, RFNE9), Product Marking (P_MARK) burners, and Coal Mill Burner (IMF05) do not meet the definition of a boiler or a process heater as defined in the final Boiler MACT rule, as these sources are not boilers and do not supply heat indirectly to a process material.

4.2.4 *NESHAP Subpart JJJJ – Paper or Other Web Coating*

The requirements of NESHAP Subpart JJJJ apply to each new and existing facility that is a major source of HAP, at which web coating lines are operated. The affected source subject to NESHAP Subpart JJJJ is the collection of all web coating lines at the facility per [§63.3300].

A web coating line is defined in §63.3310 as, *"any number of work stations, of which one or more applies a continuous layer of coating material across the entire width or any* *portion of the width of a web substrate, and any associated curing/drying equipment between an unwind or feed station and a rewind or cutting station."*[11] A work station means, *"a unit on a web coating line where coating material is deposited onto a web substrate."*

The proposed paper facing operation in the cutting area is not subject to NESHAP Subpart JJJJ as the paper to be used is pre-coated (i.e., Roxul will not conduct any paper coating operations). The following is a review of the definitions of web and coating material with respect to the proposed Fleece Application and Rockfon coating operations.

Per §63.3310, web means, *"a continuous substrate (e.g., paper, film, foil) which is flexible enough to be wound or unwound as rolls."*

- The fleece material would meet the definition of a web since it is a continuous substrate that is flexible enough to be unwound from a roll.
- Cured mineral wool slabs (with fleece applied on one or both sides) are not a continuous substrate which is flexible enough to be wound or unwound as a roll. Therefore, cured mineral wool slabs do not meet the definition of a web.

Per §63.3310, coating material means, *"all inks, varnishes, adhesives, primers, solvents, reducers, and other coating materials applied to a substrate via a web coating line. Materials used to form a substrate are not considered coating materials."*

- The coating (binder) applied to the fleece material at the Fleece Application station on the Mineral Wool Line would meet the definition of a coating material since it is intended to act as an adhesive (by adhering the fleece material to the uncured mineral wool).
- The glue applied to Rockfon ceiling tiles (i.e., individual cured mineral wool slabs) would not meet the definition of a coating material since it will not be applied to a continuous substrate that is flexible enough to be wound or unwound as a roll. Further, the glue is HAP-free.
- The paints that will be applied in the Rockfon process to the edges and outer surface of the cured mineral wool slabs (with fleece adhered on both sides) do not meet the definition of a coating material since they are not applied to a web via a web coating line as described above (i.e., cured mineral wool slabs do not meet the definition of a web).

Given the review of definitions above, NESHAP Subpart JJJJ applies to the following web coating lines at the Roxul facility[12]:

- Fleece Application on the Mineral Wool Line:

[11] Unwind or feed station means, *"a unit from which substrate is fed to a web coating line."* Rewind or cutting station means, *"a unit from which substrate is collected at the outlet of a web coating line."*

[12] The Roxul facility web coating lines would not meet any of the exemption provisions of paragraphs (a) through (g) of §63.3300.

- Web Substrate: Fleece;
- Coating Material: Binder (mixed onsite by Roxul);
- Unwind/Feed Stations: Two (2) for fleece;
- Work Stations: Two (2) for applying binder to fleece;
- Associated Curing/Drying: Curing Oven (part of HE01) on the Mineral Wool Line; and
- No. of Rewind/Cutting Stations: One (1) on mineral wool line (cutting equipment downstream of Cooling Zone).

Roxul will be subject to the requirements for new affected facilities under the standard[13], which include organic HAP (OHAP) emission limitations for web coating lines. For new affected sources, NESHAP Subpart JJJJ requires that OHAP emissions be limited as follows:

- No more than 2 percent of the OHAP applied for each month (98% reduction) [§63.3320(b)(1)];
- No more than 1.6 percent of the mass of coating materials applied for each month [§63.3320(b)(2)];
- No more than 8 percent of the coating solids applied for each month [§63.3320(b)(b)(3)]; or
- Outlet organic HAP concentration of 20 ppmvd by compound and 100% capture efficiency if an oxidizer is used to control organic emissions [§63.3320(b)(4)].

The binder that will be applied at the Fleece Application station is considered a compliant coating per NESHAP Subpart JJJJ without the need for additional controls. Therefore, Roxul will be subject to §63.3320(b)(2) or (b)(3), which correspond to a limit of 0.035 lb OHAP/lb coating material (0.016 kg OHAP/kg coating material) or 0.18 lb OHAP/lb coating solids material (0.08 kg OHAP/kg coating solids material) per 40 CFR §63.3370(a)(2)(i), (ii) for the use of "as-applied" compliant coating materials. Note that NESHAP Subpart JJJJ allows for compliance with these limits using VOC as a surrogate for organic HAP (as allowed by §63.3370(c)(1)(i) and §63.3360(c)(2)).

Once constructed, Roxul will be required to submit a notification for the startup of the Fleece Application (CM12, CM13) line. Roxul will also submit a NOCS report for the Fleece Application (CM12, CM13) line in accordance with §63.3400.

[13] Per §63.3310, "New affected source means any affected source the construction or reconstruction of which is commenced after September 13, 2000."

4.2.5 *NESHAP Subpart OOOO - Printing, Coating, And Dyeing Of Fabrics And Other Textiles*

The requirements of NESHAP Subpart OOOO apply to each new, reconstructed, and existing affected source at a major source of HAP within each of the three subcategories listed in §63.4281(a): 1) the coating and printing subcategory, 2) the slashing subcategory, and 3) the dyeing and finishing subcategory.

§63.4281(d) specifies that web coating lines identified in (d)(1)-(4) are not part of the affected source regulated by NESHAP Subpart OOOO. Per §63.4281(d)(1), "*Any web coating operation that is part of the affected source of subpart JJJJ of this part (national emission standards for hazardous air pollutants for paper and other web coating). This would include any web coating line that coats both a paper and other web substrate and a fabric or other textile substrate for use in flexible packaging, pressure sensitive tape and abrasive materials, or any web coating line laminating a fabric substrate to paper.*" Further, the preamble to the NESHAP Subpart OOOO[14] clarified overlap in applicability between NESHAP Subpart JJJJ and Subpart OOOO by stating, "*The final rule has been written to clarify that web coating lines … where fabric is being laminated to a paper and other web substrate are subject to 40 CFR 63, subpart JJJJ, and not today's final rule.*" The proposed web coating line at Roxul (identified in Section 4.2.4 above) consists of a coating line where both "fabric" and an "other web substrate" (i.e., fleece and mineral wool) are adhered. Therefore, the proposed web coating line at Roxul is subject to NESHAP Subpart JJJJ and is not part of the affected source regulated by NESHAP Subpart OOOO.

The proposed paper facing operation in the cutting area is also not subject to NESHAP Subpart OOOO as the paper to be used is pre-coated (i.e., Roxul will not conduct any paper coating operations).

[14] 68 FR 32172, May 29, 2003.

5.0 STATE REGULATORY REQUIREMENTS

This section outlines the West Virginia state air quality regulations that could be reasonably expected to apply to Roxul and makes an applicability determination for each regulation based on activities conducted at the site and the emissions of regulated air pollutants. This review is presented to supplement and/or add clarification to the information provided in the WVDEP Rule 14 permit application forms.

The West Virginia State Regulations address federal regulations, including Prevention of Significant Deterioration permitting, Title V permitting, New Source Performance Standards, and National Emission Standards for Hazardous Air Pollutants. The regulatory requirements in reference to the facility are described in detail in the below section.

5.1 45 CSR 02 – TO PREVENT AND CONTROL PARTICULATE AIR POLLUTION FROM COMBUSTION OF FUEL IN INDIRECT HEAT EXCHANGERS

This rule establishes emission limitations for smoke and particulate matter (filterable) discharged from fuel burning units. A fuel burning unit is defined as any unit that burns fuel to provide heat or power by indirect heat transfer.

Roxul will operate numerous combustion sources, none of which will be subject to the requirements of WV 45 CSR 02. The Melting Furnace (IMF01), Curing Oven (part of HE01), Product Marking (P_MARK), various drying ovens (RFNE4, RFN3, RFNE6, and RFNE9), and Coal Mill Burner (IMF05) operate as direct-fired units and do not meet the definition of an indirect heat exchanger. Direct-fired units are not subject to the requirements of this Rule.

Roxul will operate a number of indirect heat exchangers, including the Natural Gas-Fired Boilers (CM03, CM04), Rockfon Building Heat (RFN10), and the Pre-heat Burner (IMF24). Each of these units will qualify for the exemption noted in 45 CSR 2 Section 11, as they will have a heat input rating less than 10 MMBtu/hr (2,930 kW).

5.2 45 CSR 04 – TO PREVENT AND CONTROL THE DISCHARGE OF AIR POLLUTANTS INTO THE AIR WHICH CAUSES OR CONTRIBUTES TO AN OBJECTIONABLE ODOR

Operations conducted at the facility are subject to this requirement, which states "No person shall cause, suffer, allow or permit the discharge of air pollutants which causes or contribute to an objectionable odor at any location occupied by the public." Roxul will comply with the requirements of this Rule.

5.3 *45 CSR 05 – TO PREVENT AND CONTROL AIR POLLUTION FROM THE OPERATION OF COAL PREPARATION PLANTS, COAL HANDLING OPERATIONS AND COAL REFUSE DISPOSAL AREAS*

The facility is subject to the requirements of 45 CSR 7 and therefore, is not subject to this rule.

5.4 *45 CSR 06 – CONTROL OF AIR POLLUTION FROM THE COMBUSTION OF REFUSE*

Refuse is defined as "the useless, unwanted or discarded solid, liquid or gaseous waste materials resulting from community, commercial, industrial or citizen activities." Based upon this definition, Roxul will trigger applicability to this Rule for the combustion of the gaseous exhaust stream through the use of afterburners associated with the Curing Oven (CO-AB). Per 45 CSR 6-4.3, opacity of emissions from the afterburner shall not exceed 20 percent, except as provided by 4.4. Particulate matter (PM) emissions from this unit will not exceed the levels calculated in accordance with 6-4.1.

5.4.1 *45 CSR 6-4.1 - Determination for Maximum Allowable Particulate Emissions*

Curing Oven Afterburner (CO-AB):

Maximum Allowable PM Emissions (lb/hr) = F x Incinerator Capacity (tons/hr)

The Maximum Allowable PM Emission exceeds the actual emission applied in the application. Demonstrated compliance with the permitted emission rate will demonstrate compliance with this rule. The estimated Total PM emission rate of 3.31 lb/hr (1.50 kg/hr) from the Curing Oven Afterburner is below the maximum allowable PM emission rate mandated by 45 CSR 06.

5.5 *45 CSR 7 – TO PREVENT AND CONTROL PARTICULATE AIR POLLUTION FROM MANUFACTURING PROCESSES AND ASSOCIATED OPERATIONS*

45 CSR 7 regulates the emissions of filterable particulate matter from source operations within manufacturing processes. Manufacturing processes are defined as any industrial or manufacturing actions or processes that emit smoke, particulate matter, or gaseous matter.

Roxul will operate multiple manufacturer processes that will emit filterable PM into the open air, including a mineral wool manufacturing process, a Rockfon manufacturing process, and material handling activities generating various fugitive emission sources. These separate manufacturing processes operate with separate source operations, which are defined as the last operation in a manufacturing process preceding the emissions of air contaminants.

The facility shall not emit filterable PM into the open air from any process source operation which is greater than twenty (20) percent opacity.

5.5.1 *Mineral Wool Line*

The expected filterable PM emission rate for the mineral wool process source operation is 25.53 lb/hr (11.58 kg/hr) and will demonstrate compliance with the Rule 7 requirements.

5.5.2 *Rockfon Line*

The expected filterable PM emission rate for the rockfon manufacturing process source operation is 1.12 lb/hr (0.51 kg/hr) and will demonstrate compliance with the Rule 7 requirements.

5.5.3 *Materials Handling Sources*

The expected filterable PM emission rate for the materials handling process source operation is 1.64 lb/hr (0.75 kg/hr) and will demonstrate compliance with the Rule 7 requirements.

5.5.4 *Coal Milling*

The expected filterable emission rate for the coal milling process source operation is 0.44 lb/hr (0.20 kg/hr) and will demonstrate compliance with the Rule 7 Requirements.

Per 45 CSR 7-5, Roxul will also have to limit fugitive emissions by equipping manufacturing processes with a system to minimize fugitive PM emissions. Roxul will utilize a combination of good housekeeping practices, partial/full enclosures, baghouses, and various filters throughout the facility to minimize fugitive PM emissions. All haul roads will be paved to minimize fugitive PM emissions. The facility is evaluated for BACT for all sources included within this application, including fugitive sources. Demonstration of compliance with BACT is expected to comply with the requirements of this Rule.

5.6 *45 CSR 10 – TO PREVENT AND CONTROL AIR POLLUTION FROM THE EMISSION OF SULFUR OXIDES*

This rule controls air pollution from the emission of sulfur oxides through the regulation of fuel burning units and manufacturing process source operations. Roxul will operate numerous fuel burning units which will operate as direct-fired units and, therefore, does not meet the definition of fuel burning unit in 45 CSR 10-2.8. The Melting Furnace (IMF01), Curing Oven (part of HE01), Product Marking (P_MARK), various drying ovens (RFNE4, RFN3, RFNE6, and RFNE9), and Coal Mill Burner (IMF05) operate as direct-fired units and do not meet the definition of an indirect heat exchanger. Direct-fired units are not subject to the requirements of this Rule.

Roxul will operate a number of indirect heat exchangers, including the Natural Gas-Fired Boilers (CM03, CM04), Rockfon Building Heat (RFN10), and the Pre-heat Burner (IMF24). Each of these units will qualify for the exemption noted in 45 CSR 2 Section 11, as they will have a heat input rating less than 10 MMBtu/hr (2,930 kW).

Section 4 of Rule 10 places an in-stack sulfur dioxide concentration limit of 2,000 ppm_v on existing source operations. As a newly proposed facility, Roxul will not be subject to this standard, although it is noted that the concentration of sulfur dioxides from the proposed facility are well below the thresholds established by the rule.

5.7 45 CSR 11 – PREVENTION OF AIR POLLUTION EMERGENCY EPISODES

The Roxul facility will be located in Jefferson County and will be subject to the emission reduction plans of this rule when an Air Pollution Alert, Warning, or Emergency is announced by the Director of the WVDEP for Air Quality Control Region 10.

5.8 45 CSR 14 – PERMITS FOR CONSTRUCTION AND MAJOR MODIFICATION OF MAJOR STATIONARY SOURCES OF AIR POLLUTION FOR THE PREVENTION OF SIGNIFICANT DETERIORATION

Federal construction permitting programs regulate new and modified sources of attainment pollutants under Prevention of Significant Deterioration. The requirements of this rule apply to the construction of any new major stationary source. The Roxul facility is classified as a major stationary source under this rule because of the potential to emit (PTE) at least two hundred fifty (250) tons per year of VOC. Further, emissions of NO_x, CO, SO_2, PM, PM_{10}, $PM_{2.5}$, H_2SO_4 Mist, and CO_2e are also subject to PSD review due to potential emissions greater than the PSD significant emission rate (SER) for each pollutant. Therefore, the facility is subject to this rule.

In order to comply with this regulation, this permit application contains the following information:

- Construction schedule for the facility;
- Description of the systems for continuous emission reduction planned to be implemented at the facility; and
- An air quality impact assessment of the facility and discussion on the nature of the effect the facility will have on the commercial, residential, and industrial growth of the area.

Roxul will apply BACT for each regulated NSR pollutant. Please refer to the BACT discussion, included as Appendix D of this permit application, for a detailed BACT assessment.

5.9 45 CSR 16 - STANDARDS OF PERFORMANCE FOR NEW STATIONARY SOURCES (NSPS)

45 CSR 16 applies to registrants that are subject to 40 CFR 60 Standards of Performance for New Source Stationary Sources (NSPS).

Roxul will be subject to the following NSPS subparts because of processes and equipment used at the facility:

- NSPS Subpart OOO – Standards of Performance for Nonmetallic Mineral Processing Plants; and
- NSPS Subpart IIII – Standards of Performance for Stationary Compression Ignition Internal Combustion Engines.

No additional NSPS are applicable for this facility. Additional descriptions of these regulations are provided in the Federal Regulations section of this regulatory discussion.

5.10 45 CSR 17 – TO PREVENT AND CONTROL PARTICULATE MATTER AIR POLLUTION FROM MATERIALS HANDLING, PREPARATION, STORAGE, AND OTHER SOURCES OF FUGITIVE PARTICULATE MATTER

The facility will not be subject to this rule because sources that are subject to the fugitive PM emission requirements of WV 45 CSR 7 are exempt from the provisions of WV 45 CSR 17.

5.11 45 CSR 19 – PERMITS FOR CONSTRUCTION AND MAJOR MODIFICATION OF MAJOR STATIONARY SOURCES OF AIR POLLUTION WHICH CAUSE OR CONTRIBUTED TO NON-ATTAINMENT

The preconstruction permit program requirements of this rule do not apply to the facility because it will be a new stationary source in Jefferson County, an area designated as attainment for each NAAQS pollutant.

5.12 45 CSR 21 – TO PREVENT AND CONTROL AIR POLLUTION FROM THE EMISSIONS OF VOLATILE ORGANIC COMPOUNDS

45 CSR 21 applies to sources located in Putnam County, Kanawha County, Cabell County, Wayne County, and Wood County for control of the emission of VOCs through the application of reasonably available control technology. The facility will be located in Jefferson County and, therefore, will not be subject to the rule.

5.13 *45 CSR 29 – RULES REQUIRING THE SUBMISSION OF EMISSION STATEMENTS FOR VOLATILE ORGANIC COMPOUND (VOC) EMISSIONS AND OXIDES OF NITROGEN (NO_x) EMISSIONS*

45 CSR 29 requires the submission of an emission statement from stationary sources located in Putnam County, Kanawha County, Cabell County, Wayne County, Wood County, and Greenbrier County which have plant-wide VOC and/or NO_x emissions of greater than or equal to 25 tpy (22.7 MT/year). The facility will be located in Jefferson County and, therefore, will not be subject to the rule.

5.14 *45 CSR 30 – REQUIREMENTS FOR OPERATING PERMITS*

45 CSR 30 applies to the requirements of the federal Title V operating permit program (40 CFR 70). The major source thresholds with respect to the West Virginia Title V operating permit program regulations are 10 tpy (9.07 MT/year) of a single HAP, 25 tpy (22.7 MT/year) of any combination of HAP, and 100 tpy (90.7 MT/year) of other regulated pollutants.

Roxul will require a Title V Operating Permit. Pursuant to 45 CSR 30-4.1.a.2., Roxul must file a complete application to obtain the Title V operating permit within 12 months after the facility commences operation.

5.15 *45 CSR 33 – ACID RAIN PROVISIONS AND PERMITS*

The facility is not subject to 45 CSR 33 because the facility does not meet the definition of an affected source (power plants) under the Acid Rain Program under Title IV of the Clean Air Act.

5.16 *45 CSR 34 – NATIONAL EMISSION STANDARDS FOR HAZARDOUS AIR POLLUTANTS (NESHAP)*

45 CSR 34 applies to registrants that are subject to NESHAP requirements. The RAN facility will be subject to the following NESHAP subparts because of processes and equipment used at the facility:

- NESHAP Subpart DDD – Mineral Wool Production;
- NESHAP Subpart JJJJ – Paper or Other Web Coating;
- NESHAP Subpart ZZZZ – Stationary Reciprocating Internal Combustion Engines (RICE); and
- NESHAP Subpart DDDDD – Industrial, Commercial, and Institutional Boilers and Process Heaters.

These NESHAP requirements are described in more detail in the Federal Regulations section of this regulatory discussion.

5.17 *45 CSR 40 – CONTROL OF OZONE SEASON NITROGEN OXIDES EMISSIONS*

Roxul will not be subject to this regulation because the facility will not operate a unit with a maximum design heat input capacity greater than 250 MMBtu/hr (73,270 kW), a large NO_x SIP Call engine, or a kiln.

Figures

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Project No. 0408003

Environmental Resources Management
204 Chase Drive
Hurricane, West Virginia 25526
304-757-4777

Figure 1-1
Facility Site Map

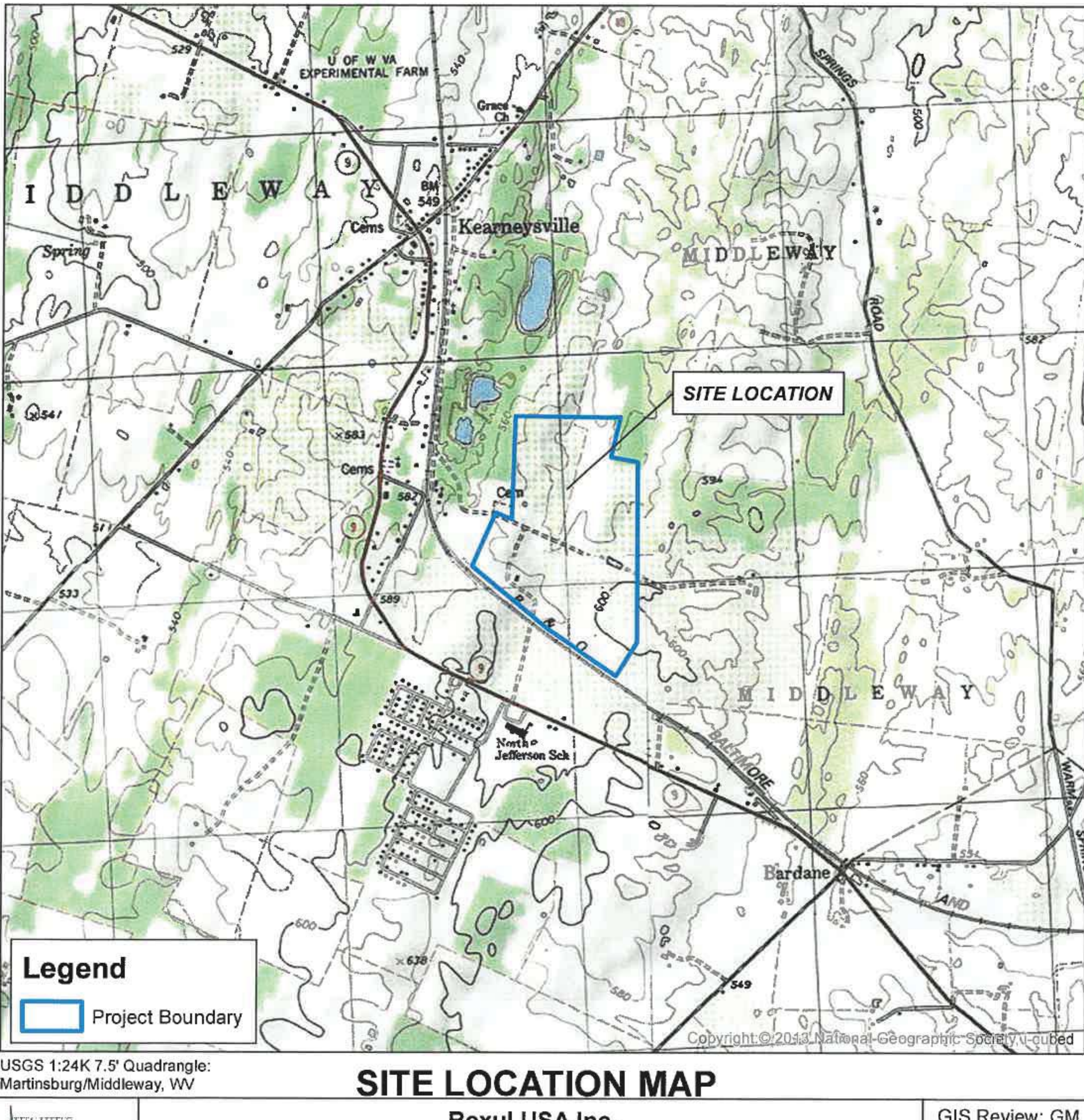
November 2017
Project No. 0408003

Environmental Resources Management
204 Chase Drive
Hurricane, West Virginia 25526
304-757-4777

0 1,000 2,000 4,000 Feet

N

LAT. 39.376 LON. -77.879
JEFFERSON COUNTY
WEST VIRGINIA



USGS 1:24K 7.5' Quadrangle:
Martinsburg/Middleway, WV

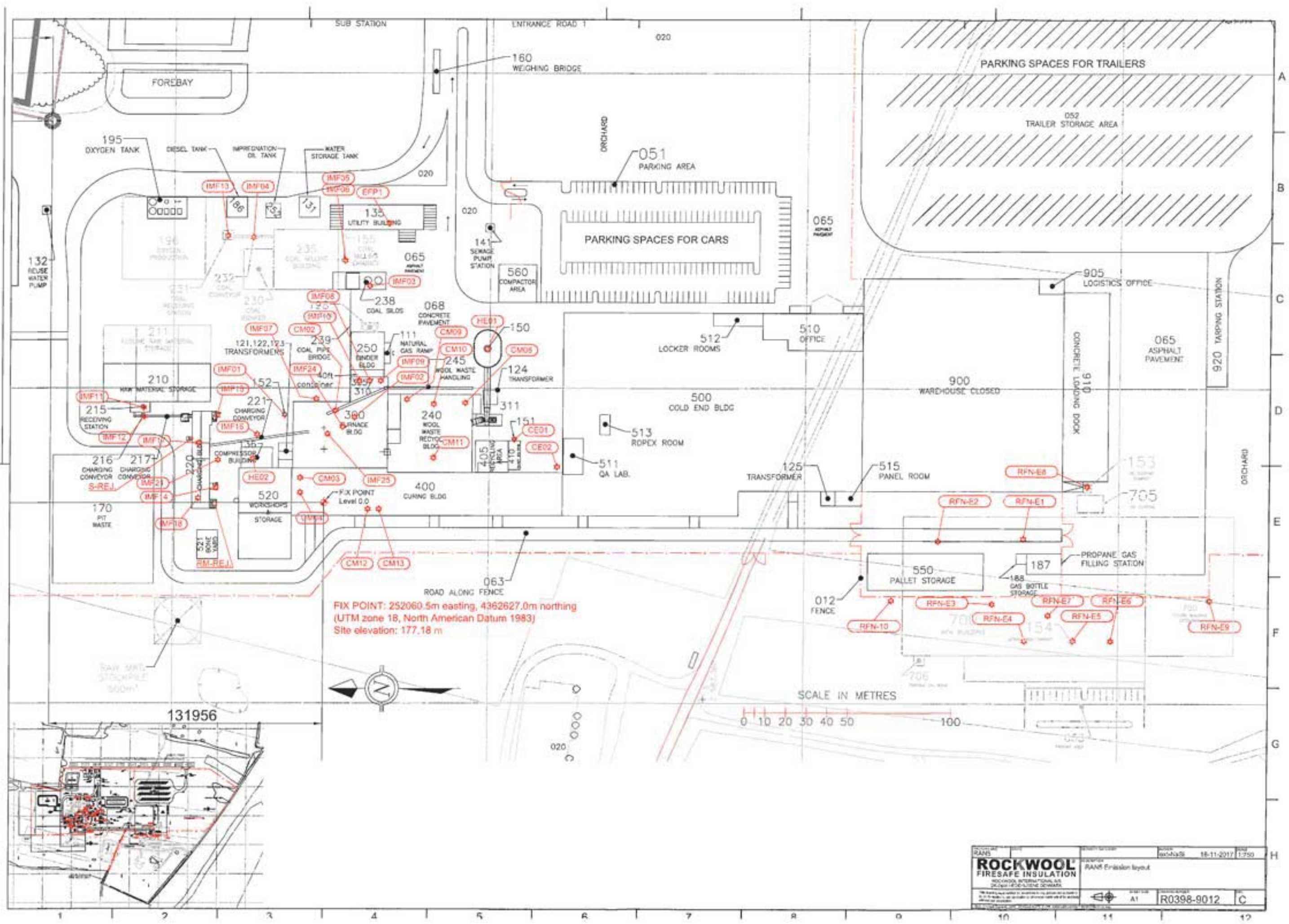
SITE LOCATION MAP

ERM	**Roxul USA Inc.** RAN Facility Jefferson County West Virginia	GIS Review: GM CHK'D: GM 0408003
Drawn By: SRV-10/4/17	**Environmental Resources Management**	Figure 1-1

Figure 2-1
Facility Plot Plan with Emission Points

November 2017
Project No. 0408003

Environmental Resources Management
204 Chase Drive
Hurricane, West Virginia 25526
304-757-4777



SUB STATION
ENTRANCE ROAD 1
020
160 WEIGHING BRIDGE
FOREBAY
PARKING SPACES FOR TRAILERS
052 TRAILER STORAGE AREA
ORCHARD
051 PARKING AREA
195 OXYGEN TANK
DIESEL TANK
IMPREGNATION OIL TANK
WATER STORAGE TANK
135 UTILITY BUILDING
141 SEWAGE PUMP STATION
PARKING SPACES FOR CARS
065
560 COMPACTOR AREA
132 REUSE WATER PUMP
238 COAL SILOS
068 CONCRETE PAVEMENT
150
905 LOGISTICS OFFICE
065 ASPHALT PAVEMENT
920 TARPING STATION
512 LOCKER ROOMS
510 OFFICE
CONCRETE LOADING DOCK
910
121,122,123 TRANSFORMERS
239 COAL PIPE BRIDGE
250 BINDER BLDG
111 NATURAL GAS RAMP
245 WOOL WASTE HANDLING
124 TRANSFORMER
900 WAREHOUSE CLOSED
210 RAW MATERIAL STORAGE
152
500 COLD END BLDG
215 RECEIVING STATION
221 CHARGING CONVEYOR
300 FURNACE BLDG
311
240 WOOL WASTE RECYCL. BLDG
151
513 ROPEX ROOM
511 QA LAB.
216 CHARGING CONVEYOR
217 CHARGING CONVEYOR
220 CHARGING BLDG
COMPRESSOR BUILDING
405
125 TRANSFORMER
515 PANEL ROOM
153
705
170 PIT WASTE
520 WORKSHOPS
STORAGE
FIX POINT Level 0.0
400 CURING BLDG
521 BONE YARD
063 ROAD ALONG FENCE
550 PALLET STORAGE
187 PROPANE GAS FILLING STATION
188 GAS BOTTLE STORAGE
012 FENCE
FIX POINT: 252060.5m easting, 4362627.0m northing
(UTM zone 18, North American Datum 1983)
Site elevation: 177.18 m
RAW MAT. STOCKPILE
131956
SCALE IN METRES
0 10 20 30 40 50 100
020
IMF13 IMF04 IMF05 IMF06 EFP1 IMF03 IMF08 IMF10 IMF07 CM02 CM09 HE01 CM10 CM08 IMF01 IMF24 IMF09 IMF02 IMF11 IMF15 IMF16 IMF12 CM11 CE01 CE02 IMF23 HE02 CM03 IMF25 IMF14 IMF18 CM12 CM13 S-REJ. RM-REJ.
RFN-E8 RFN-E2 RFN-E1 RFN-E3 RFN-E7 RFN-E6 RFN-E4 RFN-E5 RFN-10 RFN-E9
A B C D E F G H
1 2 3 4 5 6 7 8 9 10 11 12
RANS
ROCKWOOL FIRESAFE INSULATION
ROCKWOOL INTERNATIONAL A/S
RAN5 Emission layout
18-11-2017 1:750
A1
R0398-9012 C

Figure 2-2
Facility Plot Plan with Facility Boundary

November 2017
Project No. 0408003

Environmental Resources Management
204 Chase Drive
Hurricane, West Virginia 25526
304-757-4777

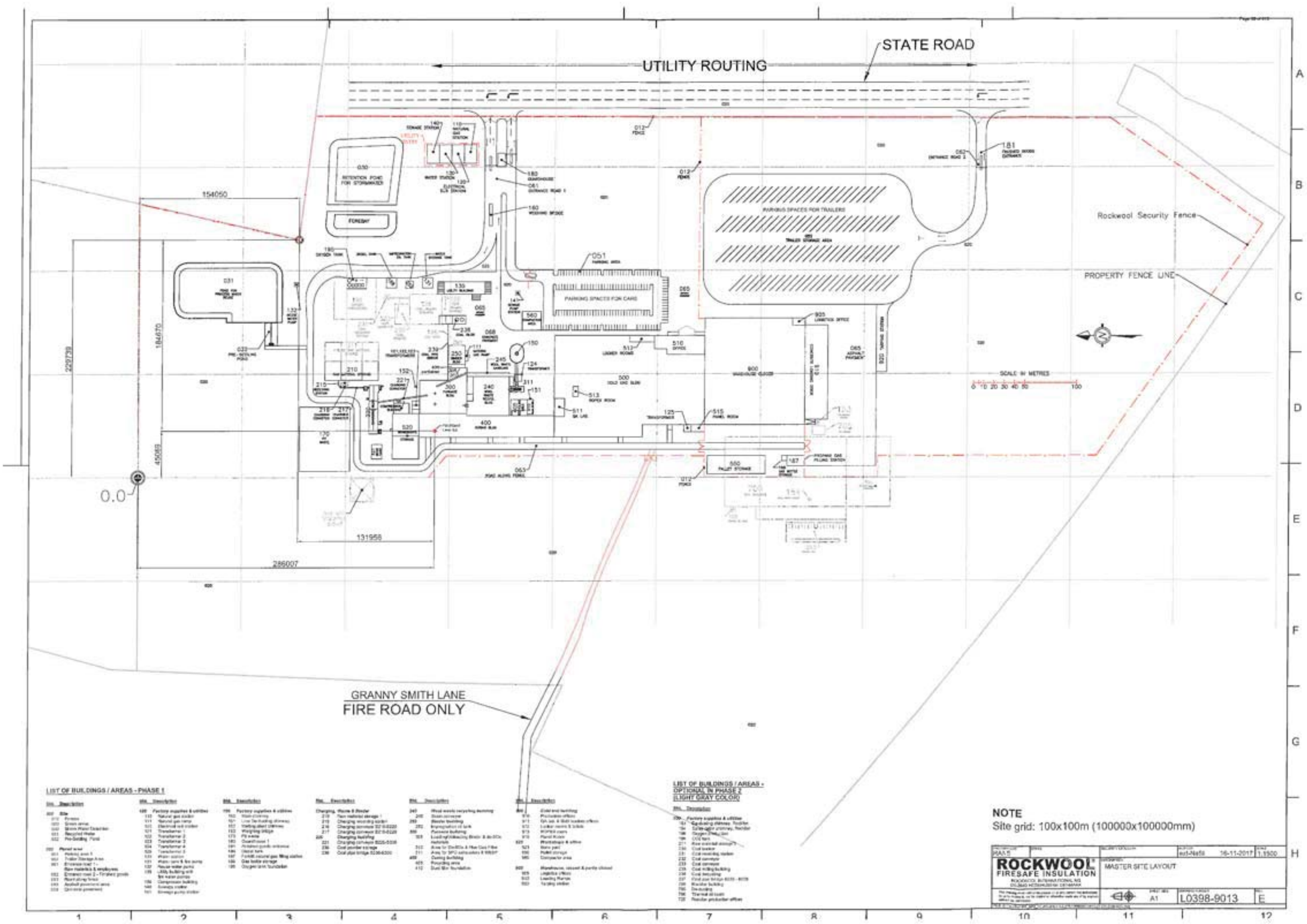
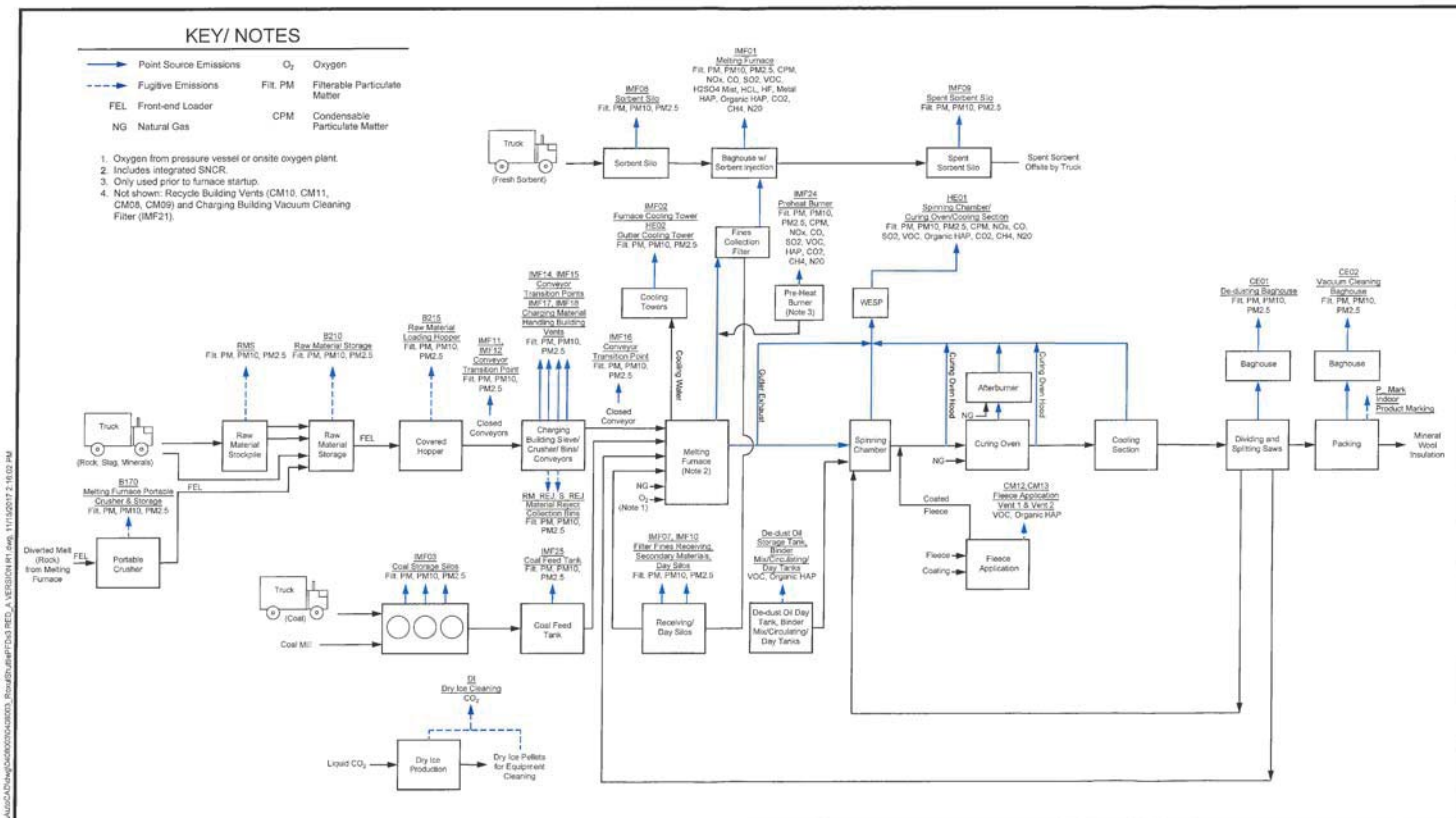

STATE ROAD
UTILITY ROUTING
Rockwool Security Fence
PROPERTY FENCE LINE
PARKING SPACES FOR TRAILERS
PARKING SPACES FOR CARS
SCALE IN METRES
154050
184670
229739
45085
131958
286007
0.0
GRANNY SMITH LANE
FIRE ROAD ONLY
LIST OF BUILDINGS / AREAS - PHASE 1
LIST OF BUILDINGS / AREAS - OPTIONAL IN PHASE 2 (LIGHT GRAY COLOR)
NOTE
Site grid: 100x100m (100000x100000mm)
ROCKWOOL
FIRESAFE INSULATION
MASTER SITE LAYOUT
16-11-2017
1:1500
A1
L0398-9013
E

Figure 3-1
Mineral Wool Line Process Flow Diagram

November 2017
Project No. 0408003

Environmental Resources Management
204 Chase Drive
Hurricane, West Virginia 25526
304-757-4777



ERM Environmental Resources Management

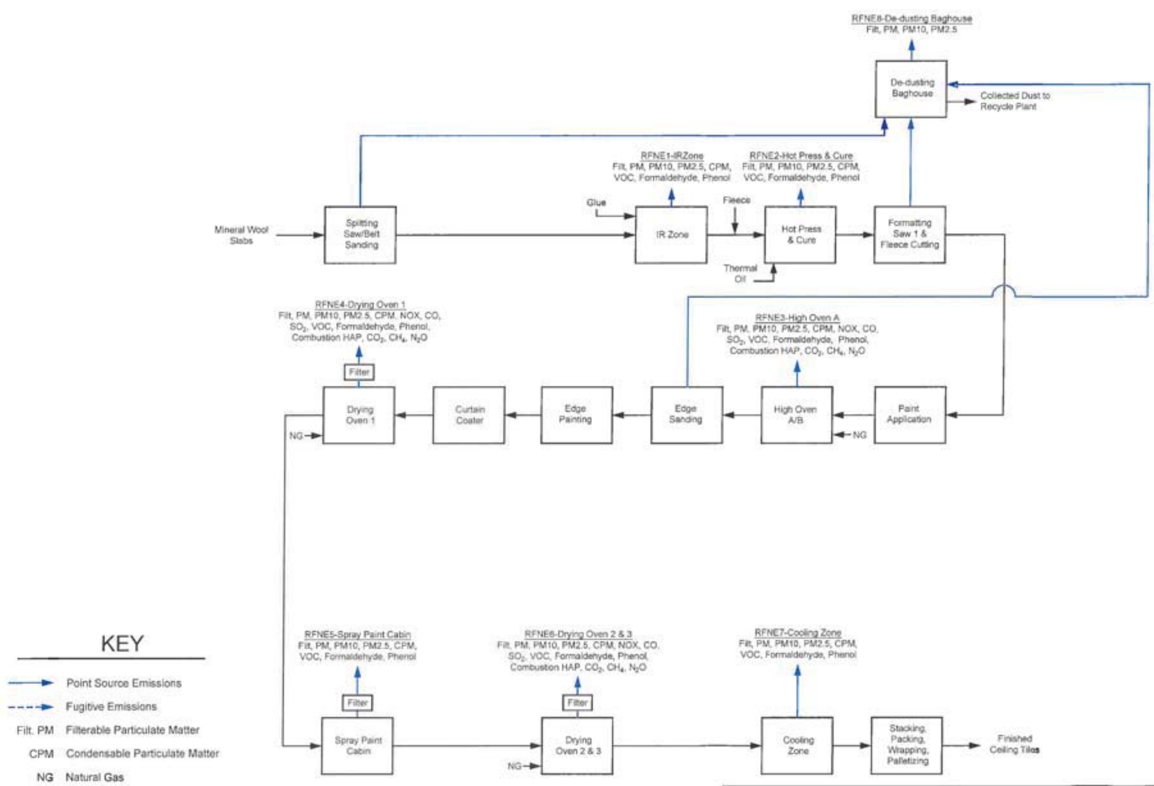
MINERAL WOOL LINE
PROCESS FLOW DIAGRAM
ROXUL USA INC.
RANSON, WEST VIRGINIA

FIGURE 3-1

Figure 3-2
Rockfon Line Process Flow Diagram

November 2017
Project No. 0408003

Environmental Resources Management
204 Chase Drive
Hurricane, West Virginia 25526
304-757-4777



ERM Environmental Resources Management

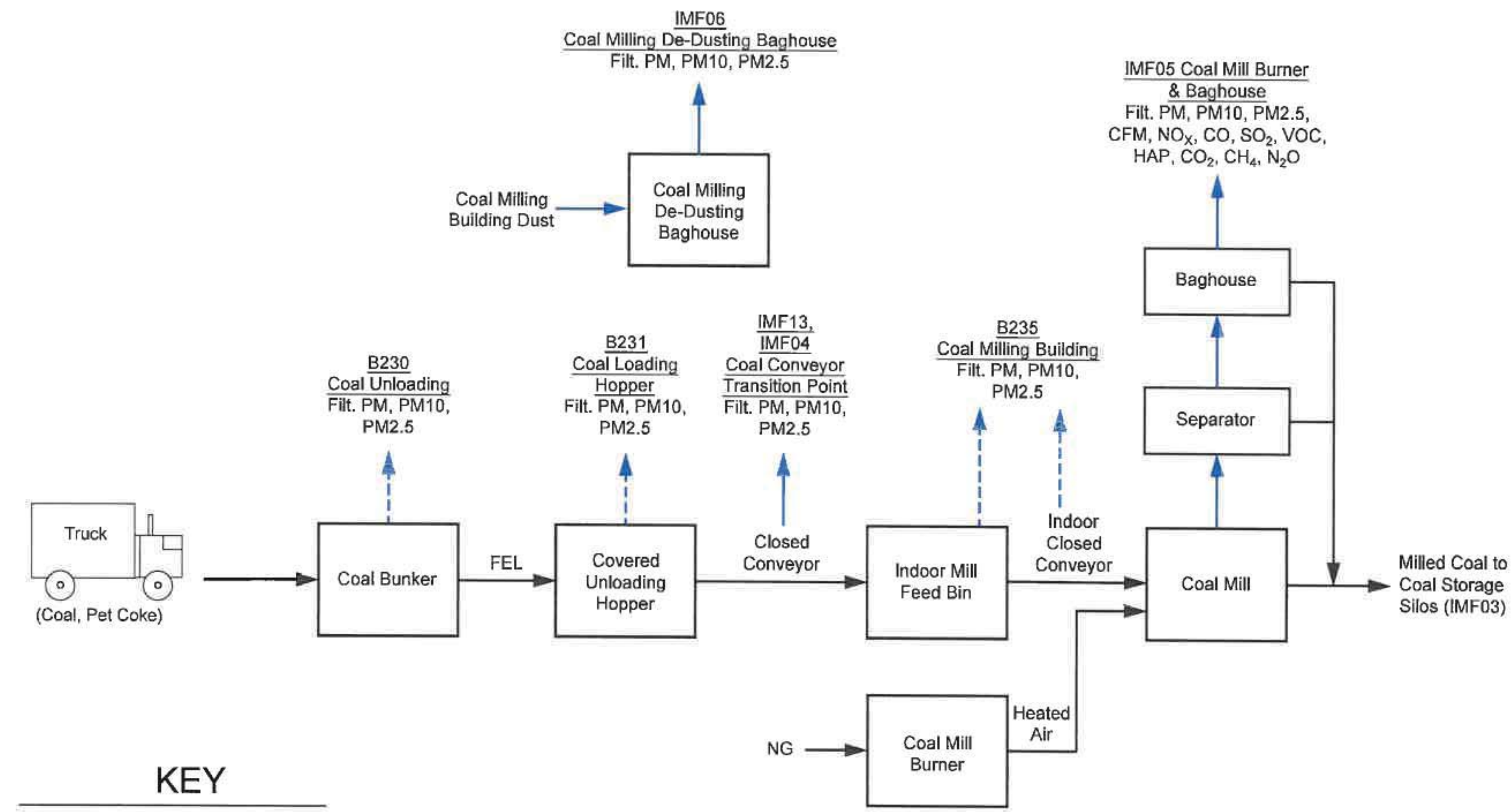
ROCKFON LINE
PROCESS FLOW DIAGRAM
ROXUL USA INC.
RANSON, WEST VIRGINIA

FIGURE 3-2

Figure 3-3
Coal Milling Process Flow Diagram

November 2017
Project No. 0408003

Environmental Resources Management
204 Chase Drive
Hurricane, West Virginia 25526
304-757-4777



KEY

- Point Source Emissions
- Fugitive Emissions

Filt. PM Filterable Particulate Matter

CPM Condensable Particulate Matter

NG Natural Gas

FEL Front End Loader

ERM Environmental Resources Management

COAL MILLING
PROCESS FLOW DIAGRAM
ROXUL USA INC.
RANSON, WEST VIRGINIA

FIGURE 3-3

(SDBNADC02) T:\DWG\AutoCAD\dwg\0408003\0408003_RoxulShuttlePFDs3 RED_A VERSION R1.dwg, 11/14/2017 4:03:10 PM

Emission Calculations

Appendix A

November 2017

Project No. 0408003

Environmental Resources Management
204 Chase Drive
Hurricane, West Virginia 25526
304-757-4777

Roxul USA Inc.
Ranson, West Virginia
Summary of Facility Emissions

Source ID	Source Description	US											METRIC										
		NOx (ton/yr)	SO2 (ton/yr)	CO (ton/yr)	VOC (ton/yr)	Filt. PM (ton/yr)	PM10 (ton/yr)	PM2.5 (ton/yr)	CO2e (ton/yr)	H2SO4 (ton/yr)	Lead (ton/yr)	Total HAP (ton/yr)	NOx (tonne/yr)	SO2 (tonne/yr)	CO (tonne/yr)	VOC (tonne/yr)	Filt. PM (tonne/yr)	PM10 (tonne/yr)	PM2.5 (tonne/yr)	CO2e (tonne/yr)	H2SO4 (tonne/yr)	Lead (tonne/yr)	Total HAP (tonne/yr)
Minwool Line																							
B210	Raw Material Storage (B210)	--	--	--	--	0.28	0.13	0.02	--	--	--	--	--	--	--	--	0.26	0.12	0.02	--	--	--	--
B215	Raw Material Loading Hopper (B215)	--	--	--	--	5.62E-02	2.66E-02	4.03E-03	--	--	--	--	--	--	--	--	5.10E-02	2.41E-02	3.65E-03	--	--	--	--
IMF11	Conveyor Transition Point (B215 to B220)	--	--	--	--	0.09	0.09	0.04	--	--	--	--	--	--	--	--	0.08	0.08	0.04	--	--	--	--
IMF12	Conveyor Transition Point (B210 to B220)	--	--	--	--	0.09	0.09	0.04	--	--	--	--	--	--	--	--	0.08	0.08	0.04	--	--	--	--
IMF14	Conveyor Transition Point (B220 No. 1)	--	--	--	--	0.09	0.09	0.04	--	--	--	--	--	--	--	--	0.08	0.08	0.04	--	--	--	--
IMF15	Conveyor Transition Point (B220 No. 2)	--	--	--	--	0.09	0.09	0.04	--	--	--	--	--	--	--	--	0.08	0.08	0.04	--	--	--	--
IMF16	Conveyor Transition Point (B220 to B300)	--	--	--	--	0.09	0.09	0.04	--	--	--	--	--	--	--	--	0.08	0.08	0.04	--	--	--	--
IMF17	Charging Material Handling Building Vent 1	--	--	--	--	0.08	0.08	0.04	--	--	--	--	--	--	--	--	0.08	0.08	0.04	--	--	--	--
IMF18	Charging Material Handling Building Vent 2	--	--	--	--	0.08	0.08	0.04	--	--	--	--	--	--	--	--	0.08	0.08	0.04	--	--	--	--
RM_REJ	Raw Material Reject Collection Bin	--	--	--	--	1.12E-03	5.32E-04	8.05E-05	--	--	--	--	--	--	--	--	1.02E-03	4.83E-04	7.31E-05	--	--	--	--
S_REJ	Sieve Reject Collection Bin	--	--	--	--	1.12E-03	5.32E-04	8.05E-05	--	--	--	--	--	--	--	--	1.02E-03	4.83E-04	7.31E-05	--	--	--	--
IMF71	Charging Building Vacuum Cleaning Filter	--	--	--	--	0.02	0.02	0.01	--	--	--	--	--	--	--	--	0.02	0.02	0.01	--	--	--	--
IMF03	Three (3) Coal Storage Silos	--	--	--	--	0.17	0.17	0.09	--	--	--	--	--	--	--	--	0.16	0.16	0.08	--	--	--	--
IMF25	Coal Feed Tank	--	--	--	--	0.06	0.06	0.03	--	--	--	--	--	--	--	--	5.26E-02	5.26E-02	2.63E-02	--	--	--	--
IMF24	Pre-heat Burner	1.58	0.01	1.84	0.12	0.04	0.17	0.17	2,627.41	--	1.09E-05	0.04	1.44	0.01	1.67	0.11	0.04	0.15	0.15	2,383.55	--	9.92E-06	0.04
IMF01	Melting Furnace	163.67	147.31	49.10	51.08	10.15	36.01	32.73	95,546.59	16.37	1.64E-04	15.04	148.48	133.63	44.54	46.34	9.21	32.67	29.70	86,678.51	14.85	1.49E-04	13.64
IMF07	Two (2) Storage Silos (Filter Fines Day/ Secondary E	--	--	--	--	0.12	0.12	0.06	--	--	--	--	--	--	--	--	0.11	0.11	0.05	--	--	--	--
IMF10	Filter Fines Recieving Silo	--	--	--	--	0.06	0.06	0.03	--	--	--	--	--	--	--	--	0.05	0.05	0.03	--	--	--	--
IMF08	Sorbent Silo	--	--	--	--	0.06	0.06	0.03	--	--	--	--	--	--	--	--	0.05	0.05	0.03	--	--	--	--
IMF09	Spent Sorbent Silo	--	--	--	--	0.06	0.06	0.03	--	--	--	--	--	--	--	--	0.05	0.05	0.03	--	--	--	--
IMF02	Melting Furnace Cooling Tower	--	--	--	--	0.04	0.04	0.02	--	--	--	--	--	--	--	--	0.04	0.04	0.02	--	--	--	--
HE02	Gutter Cooling Tower	--	--	--	--	0.01	0.01	0.01	--	--	--	--	--	--	--	--	0.01	0.01	0.00	--	--	--	--
DI	Dry Ice Cleaning	--	--	--	--	--	--	--	1,593.28	--	--	--	--	--	--	--	--	--	--	1,445.40	--	--	--
CM12	Fleece Application Vent 1	--	--	--	28.58	--	--	--	--	--	--	28.58	--	--	--	25.93	--	--	--	--	--	--	25.93
CM13	Fleece Application Vent 2	--	--	--		--	--	--	--	--	--		--	--	--		--	--	--	--	--	--	
HE01	WESP	63.73	0.05	7.97	341.71	92.89	92.89	84.20	35,644.45	--	--	337.56	57.82	0.04	7.23	309.99	84.27	84.27	76.39	32,336.14	--	--	306.23
CE01	De-dusting Baghouse	--	--	--	--	6.76	3.38	3.38	--	--	--	3.38	--	--	--	--	6.13	3.07	3.07	--	--	--	3.07
CE02	Vacuum Cleaning Baghouse	--	--	--	--	1.93	0.97	0.97	--	--	--	0.97	--	--	--	--	1.75	0.88	0.88	--	--	--	0.88
P_MARK	Product Marking	0.17	1.02E-03	0.14	9.49	3.24E-03	0.01	0.01	205.16	--	8.54E-07	3.22E-03	0.15	9.29E-04	0.13	8.61	2.94E-03	0.01	0.01	186.11	--	7.75E-07	2.93E-03
CM10	Recycle Plant Building Vent 1	--	--	--	--	2.90	2.90	1.45	--	--	--	--	--	--	--	--	2.63	2.63	1.31	--	--	--	--
CM11	Recycle Plant Building Vent 2	--	--	--	--	2.90	2.90	1.45	--	--	--	--	--	--	--	--	2.63	2.63	1.31	--	--	--	--
CM08	Recycle Plant Building Vent 3	--	--	--	--	0.24	0.24	0.12	--	--	--	--	--	--	--	--	0.22	0.22	0.11	--	--	--	--
CM09	Recycle Plant Building Vent 4	--	--	--	--	0.24	0.24	0.12	--	--	--	--	--	--	--	--	0.22	0.22	0.11	--	--	--	--
RMS	Raw Material Outdoor Stockpile	--	--	--	--	0.11	0.09	7.87E-03	--	--	--	--	--	--	--	--	0.10	0.08	7.14E-03	--	--	--	--
B170	Melting Furnace Portable Crusher & Storage	--	--	--	--	0.59	0.27	0.06	--	--	--	--	--	--	--	--	0.53	0.25	0.05	--	--	--	--
Rockfon Line																							
RFNE1	IR Zone	--	--	--	7.46	0.04	0.08	0.06	--	--	--	0.10	--	--	--	6.78	0.04	0.07	0.06	--	--	--	0.09
RFNE2	Hot Press and Cure	--	--	--		0.04	0.08	0.06	--	--	--	0.10	--	--	--		0.04	0.07	0.06	--	--	--	0.09
RFNE3	High Oven A	1.17	0.01	0.98	30.69	0.25	0.51	0.38	1,400.04	--	5.83E-06	0.43	1.06	0.01	0.89	27.84	0.23	0.46	0.35	1,270.09	--	5.29E-06	0.39
RFNE9	High Oven B	1.17	0.01	0.98		0.25	0.51	0.38	1,400.04	--	5.83E-06	0.43	1.06	0.01	0.89		0.23	0.46	0.35	1,270.09	--	5.29E-06	0.39
RFNE4	Drying Oven 1	0.87	0.01	0.73		0.18	0.36	0.27	1,050.03	--	4.37E-06	0.34	0.79	0.00	0.67		0.16	0.32	0.24	952.57	--	3.96E-06	0.31
RFNE6	Drying Oven 2 & 3	2.04	0.01	1.71		0.28	0.55	0.41	2,450.07	--	1.02E-05	0.66	1.85	0.01	1.55		0.25	0.50	0.38	2,222.67	--	9.25E-06	0.60
RFNE5	Spray Paint Cabin	--	--	--		1.93	3.86	2.90	--	--	--	2.27	--	--	--		1.75	3.50	2.63	--	--	--	2.06
RFNE7	Cooling Zone	--	--	--		0.42	0.84	0.63	--	--	--	0.91	--	--	--		0.38	0.77	0.57	--	--	--	0.82
RFNE8	De-dusting Baghouse	--	--	--	--	1.49	1.49	0.75	--	--	--	1.49	--	--	--	--	1.35	1.35	0.68	--	--	--	1.35
Other Facility-wide Sources																							
CM03	Natural Gas Boiler 1	0.79	0.01	1.84	0.12	0.04	0.17	0.17	2,627.41	--	1.09E-05	0.04	0.72	0.01	1.67	0.11	0.04	0.15	0.15	2,383.55	--	9.92E-06	0.04
CM04	Natural Gas Boiler 2	0.79	0.01	1.84	0.12	0.04	0.17	0.17	2,627.41	--	1.09E-05	0.04	0.72	0.01	1.67	0.11	0.04	0.15	0.15	2,383.55	--	9.92E-06	0.04
RFN10	RFN Building Heat	0.79	0.01	1.84	0.12	0.04	0.17	0.17	2,627.41	--	1.09E-05	0.04	0.72	0.01	1.67	0.11	0.04	0.15	0.15	2,383.55	--	9.92E-06	0.04
EFP1	Emergency Fire Pump Engine	0.32	5.36E-04	0.28	0.05	0.02	0.02	0.02	56.36	--	--	1.34E-03	0.29	4.86E-04	0.26	0.04	0.01	0.02	0.02	51.12	--	--	1.21E-03
Rd_RM	Raw Material Paved Haul Roads	--	--	--	--	2.10	0.42	0.10	--	--	--	--	--	--	--	--	1.90	0.38	0.09	--	--	--	--
Rd_FP	Finished Product Paved Haul Road	--	--	--	--	0.07	0.01	0.00	--	--	--	--	--	--	--	--	0.06	0.01	0.00	--	--	--	--
Rd_CM	FEL - Coal/PET Coke from Bunker to Feed Hopper (fo	--	--	--	--	1.48E-02	2.96E-03	7.26E-04	--	--	--	--	--	--	--	--	1.34E-02	2.68E-03	6.59E-04	--	--	--	--
TKS	Facility Storage Tanks	--	--	--	0.19	--	--	--	--	--	--	0.12	--	--	--	0.17	--	--	--	--	--	--	0.12
Coal Milling																							
IMF35	Coal Mill Burner & Baghouse	1.86	0.02	2.15	1.95	0.54	1.33	1.06	3,079.17	--	1.28E-05	0.05	1.68	0.01	1.95	1.50	0.49	1.20	0.96	2,793.37	--	1.16E-05	0.04
IMF06	Coal Milling De-Dusting Baghouse	--	--	--	--	0.97	0.97	0.48	--	--	--	--	--	--	--	--	0.88	0.88	0.44	--	--	--	--
IMF04	Coal Conveyor Transition Point (B231 to B230)	--	--	--	--	0.09	0.09	0.04	--	--	--	--	--	--	--	--	0.08	0.08	0.04	--	--	--	--
B231	Coal Loading Hopper	--	--	--	--	7.67E-04	3.63E-04	5.49E-05	--	--	--	--	--	--	--	--	6.96E-04	3.29E-04	4.98E-05	--	--	--	--
IMF53	Coal Conveyor Transition Point (B231 to B235)	--	--	--	--	0.09	0.09	0.04	--	--	--	--	--	--	--	--	0.08	0.08	0.04	--	--	--	--
B235	Coal Milling Building	--	--	--	--	0.04	0.04	0.02	--	--	--	--	--	--	--	--	0.04	0.04	0.02	--	--	--	--
B230	Coal Unloading	--	--	--	--	7.67E-04	3.63E-04	5.49E-05	--	--	--	--	--	--	--	--	6.96E-04	3.29E-04	4.98E-05	--	--	--	--
	Totals	238.96	147.45	71.40	471.41	129.23	153.19	133.41	152,935	16.37	0.0002	392.59	216.78	133.77	64.77	427.66	117.24	138.93	121.03	138,740	14.85	0.0002	356.16

Roxul USA Inc.
Ranson, West Virginia
Source ID: Mineral Wool Line (L1) Emissions

Stack ID(s)	Source Description	Concentration		Flow Rate		METRIC Hourly Emissions	METRIC Annual Emissions	US Hourly Emissions	US Annual Emissions	Modeled Emission Rate		Notes	Control Device
-	Pollutants	(mg/Nm^3)	(gr/scf)	(Nm^3/h)	(scfm)	(kg/hr)	(tonne/yr)	(lb/hr)	(ton/year)	(g/s)	Averaging Period	-	-
IMF01	Melting Furnace	-	-	-	-	-	-	-	-	-	-	-	-
	Filterable PM	31	0.013	33,900	21,414	1.05	9.21	2.32	10.15	-	-	Claimed CBI	Baghouse
	Total PM_{10}	110	-	33,900	21,414	3.73	32.67	8.22	36.01	1.04E+00	24-hr, Annual	Note 2 (1)	Baghouse
	Total $PM_{2.5}$	100	-	33,900	21,414	3.39	29.70	7.47	32.73	9.42E-01	24-hr, Annual	Note 2 (1)	Baghouse
	NOx	500	-	33,900	21,414	16.95	148.48	37.37	163.67	4.71E+00	1-hr (base), Annual	Note 2 (1)	SNCR and Oxy-fuel burners
	CO	150	-	33,900	21,414	5.09	44.54	11.21	49.10	1.41E+00	1-hr (base), 8-hr	Note 2 (1)	-
	SO_2	450	-	33,900	21,414	15.26	133.63	33.63	147.31	4.24E+00	1-hr (base), 3-hr, 24-hr, Annual	Note 2 (1)	Sorbent Injection System
	Non-HAP VOC	150	-	33,900	21,414	5.08	44.54	11.21	49.10	-	-	Note 2 (1)	-
	Total VOC	-	-	33,900	21,414	5.29	46.34	11.66	51.08	-	-	Note 2 (1)	-
	HF	4.9	-	33,900	21,414	0.17	1.47	0.37	1.62	-	-	Claimed CBI	Sorbent Injection System
	HCl	3.9	-	33,900	21,414	0.13	1.17	0.29	1.29	-	-	Claimed CBI	Sorbent Injection System
	COS	5	-	33,900	21,414	0.17	1.49	0.37	1.64	-	-	Note 2 (1-MAR)	-
	Formaldehyde	0.05	-	33,900	21,414	1.70E-03	0.01	3.74E-03	0.02	-	-	Note 2 (1-TOR)	-
	H_2SO_4 Mist	50	-	33,900	21,414	1.70	14.85	3.74	16.37	-	-	Note 2 (1-MAR)	Sorbent Injection System
	Fluorides	0.1	-	33,900	21,414	3.39E-03	0.03	0.01	0.03	-	-	Note 2 (1-TOR)	Baghouse
	Arsenic	0.0012	-	33,900	21,414	4.07E-05	3.56E-04	8.97E-05	3.93E-04	-	-	Note 2 (1-DOE10)	Baghouse
	Lead	0.0005	-	33,900	21,414	1.70E-05	1.48E-04	3.74E-05	1.64E-04	-	-	Note 2 (1-DOE10)	Baghouse
	Mercury	0.0078	-	33,900	21,414	2.64E-04	2.32E-03	5.83E-04	2.55E-03	-	-	Note 2 (1-DOE10)	Baghouse
	Phenol	1	-	33,900	21,414	0.03	0.30	0.07	0.33	-	-	Note 2 (1-TOR)	-
	Mineral Fiber	-	-	33,900	21,414	1.05	9.21	2.32	10.15	-	-	Note 4	Baghouse
	Total HAPs	-	-	33,900	21,414	1.56	13.64	3.43	15.04	-	-	-	Sorbent Injection System
	CO_2	290,150	-	33,900	21,414	9,836.28	86,165.80	21,685.26	94,961.42	-	-	Claimed CBI	-
	CH_4	25	-	33,900	21,414	0.86	7.54	1.90	8.31	-	-	Claimed CBI	-
	N_2O	4	-	33,900	21,414	0.12	1.09	0.27	1.20	-	-	Claimed CBI	-
	CO_2e	-	-	33,900	21,414	9,894.81	86,678.51	21,814.29	95,546.59	-	-	-	-
part of HE01	Spinning Chamber	-	-	-	-	-	-	-	-	-	-	-	-
	Filterable PM	-	-	410,000	258,986	4.92	43.10	10.85	47.51	-	-	-	WESP
	Total PM_{10}	12	-	410,000	258,986	4.92	43.10	10.85	47.51	-	-	Note 1, Note 2 (1)	WESP
	Total $PM_{2.5}$	12	-	410,000	258,986	4.92	43.10	10.85	47.51	-	-	Note 1, Note 2 (1)	WESP
	Non-HAP VOC	15	-	410,000	258,986	6.15	53.87	13.56	59.39	-	-	Note 2 (1)	-
	Phenol	[redacted]	-	410,000	258,986	Combined Collection/Curing		Combined Collection/Curing		-	-	-	-
	Formaldehyde		-	410,000	258,986	Combined Collection/Curing		Combined Collection/Curing		-	-	-	-
	Methanol		-	410,000	258,986	Combined Collection/Curing		Combined Collection/Curing		-	-	-	-
part of HE01	Curing Oven	-	-	-	-	-	-	-	-	-	-	-	-
	Filterable PM	-	-	30,000	18,950	1.50	13.14	3.31	14.48	-	-	-	WESP
	Total PM_{10}	50	-	30,000	18,950	1.50	13.14	3.31	14.48	-	-	Note 1, Note 2 (1)	WESP
	Total $PM_{2.5}$	20	-	30,000	18,950	0.60	5.26	1.32	5.79	-	-	Note 1, Note 2 (1)	WESP
	NO_x	200	-	30,000	18,950	6.00	52.56	13.23	57.94	-	-	Note 2 (1)	-
	CO	25	-	30,000	18,950	0.75	6.57	1.65	7.24	-	-	Note 2 (1)	Afterburner
	SO_2	0.16	-	30,000	18,950	4.89E-03	0.04	0.01	0.05	-	-	Claimed CBI	-
	Non-HAP VOC	50	-	30,000	18,950	1.50	13.14	3.31	14.48	-	-	Note 2 (1)	Afterburner
	Phenol	[redacted]	-	30,000	18,950	Combined Collection/Curing		Combined Collection/Curing		-	-	-	Afterburner
	Formaldehyde		-	30,000	18,950	Combined Collection/Curing		Combined Collection/Curing		-	-	-	Afterburner
	Methanol		-	30,000	18,950	Combined Collection/Curing		Combined Collection/Curing		-	-	-	Afterburner
	CO_2	32,618	-	30,000	18,950	978.53	8,571.92	2,157.29	9,448.91	-	-	Claimed CBI	-
	CH_4	0.6	-	30,000	18,950	0.02	0.16	0.04	0.18	-	-	Claimed CBI	-
	N_2O	303	-	30,000	18,950	9.10	79.73	20.07	87.89	-	-	Claimed CBI	-
	CO_2e	-	-	30,000	18,950	3,691.34	32,336.14	8,138.00	35,644.45	-	-	-	-
part of HE01	Curing Oven Hoods	-	-	40,000	25,267	Part of HE01		Part of HE01		-	-	-	WESP
part of HE01	Gutter Exhaust	-	-	25,000	15,792	Part of HE01		Part of HE01		-	-	-	WESP
part of HE01	Cooling Section	-	-	-	-	-	-	-	-	-	-	-	-
	Filterable PM	-	-	80,000	50,534	3.20	28.03	7.05	30.90	-	-	Note 1	WESP
	Total PM_{10}	40	-	80,000	50,534	3.20	28.03	7.05	30.90	-	-	Note 1, Note 2 (1)	WESP
	Total $PM_{2.5}$	40	-	80,000	50,534	3.20	28.03	7.05	30.90	-	-	Note 1, Note 2 (1)	WESP
	NOx	-	-	80,000	50,534	0.60	5.26	1.32	5.79	-	-	Note 2 (4-10%Curing)	-
	CO	-	-	80,000	50,534	0.07	0.66	0.17	0.72	-	-	Note 2 (4-10%Curing)	-
	Non-HAP VOC	30	-	80,000	50,534	2.40	21.02	5.29	23.17	-	-	Note 2 (1)	-
	Phenol	10	-	80,000	50,534	0.80	7.01	1.76	7.72	-	-	Note 2 (1)	-
	Formaldehyde	5	-	80,000	50,534	0.40	3.50	0.88	3.86	-	-	Note 2 (1)	-
	Methanol	5	-	80,000	50,534	0.40	3.50	0.88	3.86	-	-	Note 2 (1)	-
HE01	WESP	-	-	-	-	-	-	-	-	-	-	-	-
	Filterable PM	-	-	585,000	369,529	9.62	84.27	21.21	92.89	-	-	-	WESP
	Total PM_{10}	-	-	585,000	369,529	9.62	84.27	21.21	92.89	2.67E+00	24-hr, Annual	-	WESP
	Total $PM_{2.5}$	-	-	585,000	369,529	8.72	76.39	19.22	84.20	2.42E+00	24-hr, Annual	-	WESP
	NOx	-	-	585,000	369,529	6.60	57.82	14.55	63.73	1.83E+00	1-hr, Annual	-	-
	CO	-	-	585,000	369,529	0.82	7.23	1.82	7.97	2.29E-01	1-hr, 8-hr	-	-
	SO_2	-	-	585,000	369,529	4.89E-03	0.04	0.01	0.05	1.36E-03	1-hr, 3-hr, 24-hr, Annual	-	-
	VOC	-	-	585,000	369,529	35.39	309.99	78.02	341.71	-	-	-	-
	Phenol	-	-	585,000	369,529	8.79	76.98	19.37	84.85	-	-	-	-
	Formaldehyde	-	-	585,000	369,529	5.80	50.81	12.79	56.01	-	-	-	-
	Methanol	-	-	585,000	369,529	10.75	94.17	23.70	103.80	-	-	-	-
	Mineral Fiber	-	-	585,000	369,529	9.62	84.27	21.21	92.89	-	-	-	WESP
	Total HAPs	-	-	585,000	369,529	34.96	306.23	77.07	337.56	-	-	-	-
	CO_2	-	-	585,000	369,529	978.53	8,571.92	2,157.29	9448.91	-	-	-	-
	CH_4	-	-	585,000	369,529	0.02	0.16	0.04	0.18	-	-	-	-
	N_2O	-	-	585,000	369,529	9.10	79.73	20.07	87.89	-	-	-	-
	CO_2e	-	-	585,000	369,529	3,691.34	32,336.14	8,138.00	35,644.45	-	-	-	-
CE01	De-dusting Baghouse	-	-	-	-	-	-	-	-	-	-	-	-
	Filterable PM	10	0.0041	70,000	44,217	0.70	6.13	1.54	6.76	-	-	Note 1	Baghouse
	Filterable PM_{10}	5	0.0020	70,000	44,217	0.35	3.07	0.77	3.38	9.72E-02	24-hr, Annual	Note 2 (1)	Baghouse
	Filterable $PM_{2.5}$	5	0.0020	70,000	44,217	0.35	3.07	0.77	3.38	9.72E-02	24-hr, Annual	Note 2 (1)	Baghouse
	Mineral Fiber	-	-	70,000	44,217	0.35	3.07	0.77	3.38	-	-	Note 4	Baghouse
	Total HAPs	-	-	70,000	44,217	0.35	3.07	0.77	3.38	-	-	-	-
CE02	Vacuum Cleaning Baghouse	-	-	-	-	-	-	-	-	-	-	-	-
	Filterable PM	10	0.0041	20,000	12,633	0.20	1.75	0.44	1.93	-	-	Note 1	Baghouse
	Filterable PM_{10}	5	0.0020	20,000	12,633	0.10	0.88	0.22	0.97	2.78E-02	24-hr, Annual	Note 2 (1)	Baghouse
	Filterable $PM_{2.5}$	5	0.0020	20,000	12,633	0.10	0.88	0.22	0.97	2.78E-02	24-hr, Annual	Note 2 (1)	Baghouse
	Mineral Fiber	-	-	20,000	12,633	0.10	0.88	0.22	0.97	-	-	Note 4	Baghouse
	Total HAPs	-	-	20,000	12,633	0.10	0.88	0.22	0.97	-	-	-	-

Notes:
1. Where data was not available, Filterable PM was conservatively assumed to be equal to Total PM10. For CE01 and CE02, Filterable PM assumed double Filterable PM10. For clarity,
   Total PM10 = Filterable PM10 + Condensable PM.
   Total PM2.5 = Filterable PM2.5 + Condensable PM
2. Calculation Method References:
   1 - Stack Testing from similar facility, scaled as appropriate to RAN process.
   Claimed CBI

   4-Assumed 10% of the mass emissions of the Curing Oven for Cooling.
3. Proposed NESHAP Subpart DDD combines emission limits for formaldehyde, methanol, and phenol from spinning (collection) and curing.
4. Mineral Fiber emissions were conservatively assumed equal to Filterable PM emissions for sources that may contain rock wool fibers. The listed HAP, fine mineral fibers includes mineral fiber emissions from facilities manufacturing or processing glass, rock, or slag fibers (or other mineral derived fibers) of average diameter 1 micrometer or less.
5. Maximum g/s emissions do not vary based on model averaging period (i.e., source permitted to operate at maximum capacity 24 hr/day, 365 day/year).

Sample Calculations:
Hourly Emissions (kg/hr) = Fan Flow Rate (Nm3/hr) * Exhaust Concentration (mg/Nm3) * 1,000,000 (mg/kg)
Hourly Emission Rate Filterable PM = Concentration PM (gr/scf)*(1 lb/7,000 grains)*Flow Rate (scfm)* (60 min/hr)
Annual Emissions (ton/yr) = Hourly Emission Rate (lb/hr)*8,760 (hr/yr) / 2,000 (lb/ton)
Annual Emissions (tonne/yr) = Hourly Emissions (kg/hr) * 8,760 (hr/yr) / 1,000 (kg/tonne)
CO2 Equivalent (CO2e) = CO2 + [GWP_{CH4} * CH4)] + [GWP_{N2O} * N2O]
Modeled Emission Rate (g/s) [for all Averaging Periods] = Hourly Emissions (lb/hr) * 453.59 (g/lb) / 3,600 (sec/hr)

Roxul USA Inc.
Ranson, West Virginia
Source ID: Mineral Wool Line (L1) Emissions

Stack ID(s)	Source Description	Concentration		Flow Rate		METRIC Hourly Emissions	METRIC Annual Emissions	US Hourly Emissions	US Annual Emissions	Modeled Emission Rate		Notes	Control Device
-	Pollutants	(mg/Nm^3)	(gr/scf)	(Nm^3/h)	(scfm)	(kg/hr)	(tonne/yr)	(lb/hr)	(ton/year)	(g/s)	Averaging Period	-	-
IMF01	Melting Furnace	-	-	-	-	-	-	-	-	-	-	-	-
	Filterable PM	31	0.013	33,900	21,414	1.05	9.21	2.32	10.15	-	-	Claimed CBI	Baghouse
	Total PM_{10}	110	-	33,900	21,414	3.73	32.67	8.22	36.01	1.04E+00	24-hr, Annual	Note 2 (1)	Baghouse
	Total $PM_{2.5}$	100	-	33,900	21,414	3.39	29.70	7.47	32.73	9.42E-01	24-hr, Annual	Note 2 (1)	Baghouse
	NOx	500	-	33,900	21,414	16.95	148.48	37.37	163.67	4.71E+00	1-hr (base), Annual	Note 2 (1)	SNCR and Oxy-fuel burners
	CO	150	-	33,900	21,414	5.09	44.54	11.21	49.10	1.41E+00	1-hr (base), 8-hr	Note 2 (1)	-
	SO_2	450	-	33,900	21,414	15.26	133.63	33.63	147.31	4.24E+00	1-hr (base), 3-hr, 24-hr, Annual	Note 2 (1)	Sorbent Injection System
	Non-HAP VOC	150	-	33,900	21,414	5.09	44.54	11.21	49.10	-	-	Note 2 (1)	-
	Total VOC	-	-	33,900	21,414	5.29	46.34	11.66	51.08	-	-	Note 2 (1)	-
	HF	4.9	-	33,900	21,414	0.17	1.47	0.37	1.62	-	-	Claimed CBI	Sorbent Injection System
	HCl	3.9	-	33,900	21,414	0.13	1.17	0.29	1.29	-	-	Claimed CBI	Sorbent Injection System
	COS	5	-	33,900	21,414	0.17	1.48	0.37	1.64	-	-	Note 2 (1-MAR)	-
	Formaldehyde	0.05	-	33,900	21,414	1.70E-03	0.01	3.74E-03	0.02	-	-	Note 2 (1-TOR)	-
	H_2SO_4 Mist	50	-	33,900	21,414	1.70	14.85	3.74	16.37	-	-	Note 2 (1-MAR)	Sorbent Injection System
	Fluorides	0.1	-	33,900	21,414	3.39E-03	0.03	0.01	0.03	-	-	Note 2 (1-TOR)	Baghouse
	Arsenic	0.0012	-	33,900	21,414	4.07E-05	3.56E-04	8.97E-05	3.93E-04	-	-	Note 2 (1-DOE10)	Baghouse
	Lead	0.0005	-	33,900	21,414	1.70E-05	1.48E-04	3.74E-05	1.64E-04	-	-	Note 2 (1-DOE10)	Baghouse
	Mercury	0.0078	-	33,900	21,414	2.64E-04	2.32E-03	5.83E-04	2.55E-03	-	-	Note 2 (1-DOE10)	Baghouse
	Phenol	1	-	33,900	21,414	0.03	0.30	0.07	0.33	-	-	Note 2 (1-TOR)	-
	Mineral Fiber	-	-	33,900	21,414	1.05	9.21	2.32	10.15	-	-	Note 4	Baghouse
	Total HAPs	-	-	33,900	21,414	1.56	13.64	3.43	15.04	-	-	-	Sorbent Injection System
	CO_2	290,156	-	33,900	21,414	9,836.28	86,165.80	21,685.26	94,981.42	-	-	Claimed CBI	-
	CH_4	25	-	33,900	21,414	0.86	7.54	1.90	8.31	-	-	Claimed CBI	-
	N_2O	4	-	33,900	21,414	0.12	1.09	0.27	1.20	-	-	Claimed CBI	-

1 - Stack Testing from similar facility, scaled as appropriate to RAN process.
Claimed CBI

4-Assumed 10% of the mass emissions of the Curing Oven for Cooling.
3. Proposed NESHAP Subpart DDD combines emission limits for formaldehyde, methanol, and phenol from spinning (collection) and curing.
4. Mineral Fiber emissions were conservatively assumed equal to Filterable PM emissions for sources that may contain rock wool fibers. The listed HAP, fine mineral fibers includes mineral fiber emissions from facilities manufacturing or processing glass, rock, or slag fibers (or other mineral derived fibers) of average diameter 1 micrometer or less.
5. Maximum g/s emissions do not vary based on model averaging period (i.e., source permitted to operate at maximum capacity 24 hr/day, 365 day/year).

Sample Calculations:
Hourly Emissions (kg/hr) = Fan Flow Rate (Nm3/hr) * Exhaust Concentration (mg/Nm3) * 1,000,000 (mg/kg)
Hourly Emission Rate Filterable PM = Concentration PM (gr/scf)*(1 lb/7,000 grains)*Flow Rate (scfm)* (60 min/hr)
Annual Emissions (ton/yr) = Hourly Emission Rate (lb/hr)*8,760 (hr/yr) / 2,000 (lb/ton)
Annual Emissions (tonne/yr) = Hourly Emissions (kg/hr) * 8,760 (hr/yr) / 1,000 (kg/tonne)
CO2 Equivalent (CO2e) = CO2 + [GWP_{CH4} * CH4)] + [GWP_{N2O} * N2O]
Modeled Emission Rate (g/s) [for all Averaging Periods] = Hourly Emissions (lb/hr) * 453.59 (g/lb) / 3,600 (sec/hr)

Roxul USA Inc.
Ranson, West Virginia
Source ID: Pre-heat Burner (IMF24)

Operating Parameters, PER BOILER

Maximum Heat	1,500	kw
Input Capacity	5.12	MMBtu/hr
Operating Hours	8,760	hr/yr
Fuel Type	Natural Gas	
Fuel HHV	1,026	MMbtu/MMscf

Maximum Potential Emissions[1,2]

Pollutant	Emission Factor		US Hourly Emissions	US Annual Emissions	METRIC Hourly Emissions	METRIC Annual Emissions	Modeled Emission Rate[4]	
	(lb/MMscf)	(lb/MMbtu)	(lb/hr)	(ton/yr)	(kg/hr)	(tonne/yr)	(g/s)	Averaging Period
NO_x	72.42	0.0706	0.36	1.58	0.16	1.44	4.56E-02	1-hr, Annual
SO_2	0.6	0.0006	3.00E-03	0.01	1.36E-03	0.01	3.77E-04	1-hr, 3-hr, 24-hr, Annual
$PM/PM_{10F}/PM_{2.5F}$	1.9	0.0019	0.01	0.04	4.30E-03	0.04	-	-
$PM_{10T}/PM_{2.5T}$	7.6	0.0074	0.04	0.17	0.02	0.15	4.78E-03	24-hr, Annual
Condensable PM	5.7	0.0056	0.03	0.12	0.01	0.11	-	-
CO	84	0.0819	0.42	1.84	0.19	1.67	5.28E-02	1-hr, 8-hr
VOC	5.5	0.0054	0.03	0.12	0.01	0.11	-	-
Lead	0.0005	4.87E-07	2.50E-06	1.09E-05	1.13E-06	9.92E-06	-	-
Hexane	1.8	0.0018	0.01	0.04	0.00	0.04	-	-
Total HAPs	1.89	0.0018	0.01	0.04	4.28E-03	0.04	-	-
CO_2	-	116.98	599.25	2624.70	271.81	2,381.09	-	-
CH_4	-	2.20E-03	0.01	0.05	5.12E-03	0.04	-	-
N_2O	-	2.20E-04	1.13E-03	4.95E-03	5.12E-04	4.49E-03	-	-
CO_2e[3]	-	-	599.87	2,627.41	272.09	2,383.55	-	-

Notes:
ton = short tons
tonne = metric tons
1. Natural Gas emission factor source AP-42 Table 1.4-1, 1.4-2, 1.4-3, and 1.4-4 for SO_2, PM_{10T}, $PM_{2.5T}$, CO, VOC, Lead, Hexane, Total HAPs. GHG emission factors per 40 CFR Part 98, Table C-1 and C-2. GWPs per 40 CFR 98, Table A-1. NO_X emission factor based on 60 ppmvd @ 3% O2 per manufacturer specification.

2. PM_{10T} and $PM_{2.5T}$ emission factors include filterable and condensable particulate matter (e.g., Total PM_{10}, $PM_{2.5}$).

3. CO_2 Equivalent (CO_2e) lb/hr, ton/yr = CO_2 + [GWP_{CH4} * CH_4)] + [GWP_{N2O} * N_2O].

4. Maximum g/s emissions do not vary based on model averaging period (i.e., a source permitted to operate at maximum capacity 24 hr/day, 365 day/year).

Sample Calculations:
Hourly Emissions (lb/hr) = Emission Factor (lb/MMBtu) * Maximum Heat Input Capacity (MMBtu/hr)
Annual Emissions (ton/yr) = Hourly Emissions (lb/hr) * 8,760 (hr/yr) / 2,000 (lb/ton)
Hourly Emissions (kg/hr) = Hourly Emissions (lb/hr) /2.2046 (lb/kg)
Annual Emissions (tonne/yr) = Hourly Emissions (kg/hr) * 8,760 (hr/yr) / 1,000 (kg/tonne)
Modeled Emission Rate (g/s) [for all Averaging Periods] = Hourly Emissions (lb/hr) * 453.59 (g/lb) / 3,600 (sec/hr)

Roxul USA, Inc.
Ranson, West Virginia
Material Handling Fugitives

Material Properties & Calculation Inputs

Raw Material	M-Moisture content[1] %
Rock/Slag/Minerals	Claimed Confidential
Reject Raw Material	
Melting Furnace Diverted Melt	

Pollutant	k-Particle Size Multiplier	E-Emission Factor[3] Rock/Slag/Minerals (lb/ton)	Reject Raw Material (lb/ton)	Diverted Melt (lb/ton)
PM	0.74	Claimed Confidential	Claimed Confidential	Claimed Confidential
PM10	0.35			
PM2.5	0.053			

Location	U-Wind Speed[2] (mph)	(m/s)
Outdoor	6.51	2.91

Notes:
1. Moisture content chosen as worst case among various materials handled.
2. Outdoor wind speed was set at 6.51 mph based on 2011-2015 average wind speed data from station ID 13734.
3. Material drops emission factor equation per AP-42 Section 13.2.4.

Sample Calculations:
E (lb/ton) = k (0.0032)[(U/5)^1.3] / [(M/2)^1.4] , where
k=Particle Size Multiplier,
U = wind speed, meters per second [miles per hour (mph)],
M = material moisture content (%)

1 **Material Delivery and Front-end Loader Fugitive Emissions[3]**

Roxul Source ID	Raw Material	Source Description	Loading Rate[1]	Enclosure Description	Control Efficiency[2] (%)	Pollutant	METRIC UNCONTROLLED Emissions (tonne/day)	METRIC UNCONTROLLED Emissions (tonne/year)	METRIC CONTROLLED Emissions (tonne/day)	METRIC CONTROLLED Emissions (tonne/year)	US UNCONTROLLED Emissions (ton/day)	US UNCONTROLLED Emissions (ton/year)	US CONTROLLED Emissions (ton/day)	US CONTROLLED Emissions (ton/year)	Modeled Emission Rate[4] 24-hr (g/s)	Modeled Emission Rate[4] Annual (g/s)	Class I AQRV Analysis (Q/d) ton/yr
RMS	Rock/Slag/Minerals	Raw Material Stockpile - Delivery to Stockpile [from offsite (by truck)]	Claimed Confidential	3-sided	50%	PM	7.56E-04	0.03	3.78E-04	0.01	8.34E-04	0.03	4.17E-04	0.02	-	-	-
						PM10	3.58E-04	0.01	1.79E-04	6.46E-03	3.94E-04	0.01	1.97E-04	7.14E-03	3.07E-03	2.06E-04	0.07
						PM2.5	5.42E-05	1.96E-03	2.71E-05	9.81E-04	5.97E-05	2.16E-03	2.99E-05	1.08E-03	3.13E-04	3.11E-05	-
B210	Rock/Slag/Minerals	Raw Material Storage - Delivery to 210 (from offsite (by truck) or from stockpile (by FEL))		none	0%	PM	7.13E-04	0.20	7.13E-04	0.20	7.86E-04	0.22	7.86E-04	0.22	-	-	-
						PM10	3.37E-04	0.10	3.37E-04	0.10	3.71E-04	0.11	3.71E-04	0.11	-	-	-
						PM2.5	5.10E-05	0.01	5.10E-05	0.01	5.63E-05	0.02	5.63E-05	0.02	-	-	-
	Rock/Slag/Minerals	Raw Material Storage - Delivery into 210 enclosure		3-sided w/ cover	75%	PM	7.13E-04	0.20	1.78E-04	0.05	7.86E-04	0.22	1.96E-04	0.06	-	-	-
						PM10	3.37E-04	0.10	8.42E-05	0.02	3.71E-04	0.11	9.29E-05	0.03	-	-	-
						PM2.5	5.10E-05	0.01	1.28E-05	3.65E-03	5.63E-05	0.02	1.41E-05	4.03E-03	-	-	-
	Total			-	-	PM	1.43E-03	0.41	8.91E-04	0.26	1.57E-03	0.45	9.82E-04	0.28	-	-	-
						PM10	6.74E-04	0.19	4.21E-04	0.12	7.43E-04	0.21	4.64E-04	0.13	4.88E-03	3.83E-03	0.17
						PM2.5	1.02E-04	0.03	6.38E-05	0.02	1.13E-04	0.03	7.03E-05	0.02	7.38E-04	5.79E-04	-
B215	Rock/Slag/Minerals	Raw Material Loading Hopper		3-sided w/ cover	75%	PM	5.59E-04	0.20	1.40E-04	0.05	6.16E-04	0.22	1.54E-04	0.06	-	-	-
						PM10	2.64E-04	0.10	6.61E-05	0.02	2.91E-04	0.11	7.29E-05	0.03	7.65E-04	7.65E-04	0.03
						PM2.5	4.00E-05	0.01	1.00E-05	3.65E-03	4.41E-05	0.02	1.10E-05	4.03E-03	1.16E-04	1.16E-04	-
RM_REJ	Reject Raw Material	Raw Material Reject Collection Bin		4-sided rubber drop guards	75%	PM	5.48E-06	4.08E-03	1.37E-06	1.02E-03	6.04E-06	4.50E-03	1.51E-06	1.12E-03	-	-	-
						PM10	2.59E-06	1.93E-03	6.48E-07	4.83E-04	2.86E-06	2.13E-03	7.14E-07	5.32E-04	7.50E-06	1.53E-05	5.32E-04
						PM2.5	3.93E-07	2.92E-04	9.81E-08	7.31E-05	4.33E-07	3.22E-04	1.08E-07	8.05E-05	1.14E-06	2.32E-06	-
S_REJ	Reject Raw Material	Sieve Reject Collection Bin		4-sided rubber drop guards	75%	PM	5.48E-06	4.08E-03	1.37E-06	1.02E-03	6.04E-06	4.50E-03	1.51E-06	1.12E-03	-	-	-
						PM10	2.59E-06	1.93E-03	6.48E-07	4.83E-04	2.86E-06	2.13E-03	7.14E-07	5.32E-04	7.50E-06	1.53E-05	5.32E-04
						PM2.5	3.93E-07	2.92E-04	9.81E-08	7.31E-05	4.33E-07	3.22E-04	1.08E-07	8.05E-05	1.14E-06	2.32E-06	-
B170	Melting Furnace Diverted Melt	Melting Furnace Portable Crusher & Storage - Drop to Pit Waste (170) (from portable crusher)		3-sided	50%	PM	1.79E-03	0.08	8.95E-04	0.04	1.97E-03	0.09	9.87E-04	0.04	-	-	-
						PM10	8.47E-04	0.04	4.23E-04	0.02	9.33E-04	0.04	4.67E-04	0.02	4.90E-03	6.04E-04	0.02
						PM2.5	1.28E-04	5.77E-03	6.41E-05	2.88E-03	1.41E-04	6.36E-03	7.07E-05	3.18E-03	7.42E-04	9.15E-05	-

Notes:
FEL = Front End Loader
ton = short tons
tonne = metric tons
1. Loading rate for material storage operations is based on the maximum quantity delivered per day or per year.
2. Assumed a control efficiency of 50% due to offloading locations having 3-sided concrete enclosures and 75% efficiency for 4-sided enclosures (hopper) or 3-sided enclosures with roof.
3. Large rocks are delivered to the pit waste area by FEL (before crushing), therefore the emissions from this drop are negligible due to size.
4. Modeled emission rates in gray are not modeled individually, but are added as a total source emission rate.
5. For Q/d screening tool, the annual steady-state-equivalent emission rate (Q) was determined based on maximum daily emissions. For example QPM10 (tpy) = PM10 (ton/day) * 365 (day/yr).

Sample Calculations:
Uncontrolled Emissions (ton/day; ton/year) = E (lb/ton) * Loading Rate (ton/day; ton/year) / 2000 (lb/ton)
Controlled Emissions = Uncontrolled Emissions (ton/day; ton/year) * (1 - Control Efficiency (%))
Uncontrolled/Controlled Emissions (tonne/day; tonne/year) = Uncontrolled/Controlled Emissions (ton/day; ton/year) * 0.9071847 tonne/ton
Modeled 24-hr Emission Rate (g/s) = Daily Emissions (ton/day) / 24 (hr/day) [for 24-hr model averaging period] * 2,000 (lb/ton) * 453.59 (g/lb) / 3,600 (sec/hr)
Modeled Annual Emission Rate (g/s) = Annual Emissions (ton/yr) / 8,760 (hr/yr) [for annual model averaging period] * 2,000 (lb/ton) * 453.59 (g/lb) / 3,600 (sec/hr)

Roxul USA, Inc.
Ranson, West Virginia
Material Handling Fugitives

2 **Crusher Fugitive Emissions**

Roxul Source ID	Source Description	Pollutant	Emission Factor (lb/ton)	METRIC Processing Rate (tonne/hr)	METRIC Processing Rate (tonne/yr)	US Processing Rate (ton/hr)	US Processing Rate (ton/yr)	Hours of Operation (hrs/day)	Hours of Operation (hrs/yr)	METRIC Hourly (kg/hr)	METRIC Annual (tonne/yr)	US Hourly (lb/hr)	US Annual (ton/yr)	Modeled Emission Rate 24-hr (g/s)	Modeled Emission Rate Annual (g/s)	Class I AQRV Analysis (Q/d) ton/yr
B170	Melting Furnace Diverted Melt Portable Crusher	PM	0.0054	136.1	73,467	150.0	81,000	12	540	0.37	0.20	0.81	0.22	—	-	-
		PM_{10}	0.0024							0.16	0.09	0.36	0.10	2.27E-02	2.80E-03	1.58
		$PM_{2.5}$	0.0008							0.05	0.03	0.12	0.03	7.56E-03	9.32E-04	-

Notes:
1. PM2.5 is 15% of PM per AP-42 Appendix B, Table B.2.2 for material handling and processing of aggregate and unprocessed ore.
2. Emission factor for crushing of melting furnace diverted melt assumed to be similar to crushing of stones in AP-42 Table 11.19.2-2. Uncontrolled PM emission factor of 0.0054 lb/ton and Uncontrolled PM10 emission factor of 0.0024 lb/ton for tertiary crushing were conservatively used due to lack of emission factors for primary or secondary crushing.
3. Modeled emission rates in gray are not modeled individually, but are added as a total source emission rate.
4. For Q/d screening tool, the annual steady-state-equivalent emission rate (Q) was determined. For example QPM10 (tpy) = PM10 @ 540 hr/yr (tpy) * [8,760 (hr/yr) / 540 (hr/yr)]

Sample Calculations:
Houly Emissions (lb/hr) = Emission Factor (lb/ton) * Processing Rate (ton/hr)
Annual Emissions (ton/yr) = Hourly Emissions (lb/hr) * Hours of Operation (hrs/yr) / 2000 (lb/ton)
Hourly Emissions (kg/hr) = Hourly Emissions (lb/hr) * 0.4535924 kg/lb
Annual Emissions (tonne/yr) = Annual Emissions (ton/yr) * 0.9071847 tonne/ton
Modeled 24-hr Emission Rate (g/s) = Daily Emissions (lb/hr) * 12 (hr/day) / 24 (hr/day) [for 24-hr model averaging period] * 453.59 (g/lb) / 3,600 (sec/hr).
Modeled Annual Emission Rate (g/s) = Annual Emissions (ton/yr) / 8,760 (hr/yr) [for annual model averaging period] * 2,000 (lb/ton) * 453.59 (g/lb) / 3,600 (sec/hr)

3 **Wind Erosion Emission from Outdoor Stockpiles**

p	number of days per year with precipitation >0.01 inch	148
I	percentage of time that the unobstructed wind speed exceeds 12 mph at the mean pile height	9.06

Stockpile Description	S- Silt content (%)
Raw Material Stockpile	12.7
Pit Waste (B170)	12.7

Pollutant	Emission Factor: Raw Material Stockpile lb/day/acre	Emission Factor: Pit Waste (170) Stockpile lb/day/acre
PM	8.03	8.03
PM10	3.77	3.77
PM2.5	0.60	0.60

Notes:
1. Silt content chosen as worst case among various materials in stockpile.
2. Number of days per year with precipitation greater than 0.01 inch based on Table B - Precipitation Zones in West Virginia in Application Instructions and Forms for General Permit G40-C by West Virginia Department of Environmental Protection.
3. Percentage of time that the unobstructed wind speed exceeds 12 mph at the mean pile height based on AP 42 Ch. 13.2.5.2 Equation (1) and MRBIAD Aermap processed data 2012-2016.
4. Outdoor stockpile emission factor equation per WVDAQ G40-B (Nonmetallic Mineral Processing) Calculation Workbook: Stockpiles.
5. PM2.5 particle size multiplier of 0.075 per AP-42 Section 13.2.5-2 for Industrial Wind Erosion.

Sample Calculations:
E (lb PM /day/acre) = 1.7*[s/1.5]*[(365-p)/235]*[I/15]
E (lb PM10/day/acre) = (0.47)*1.7*[s/1.5]*[(365-p)/235]*[I/15]
E (lb PM2.5/day/acre) = (0.075)*1.7*[s/1.5]*[(365-p)/235]*[I/15], where
s=silt content of material,
p=number of days with >0.01 inch of precipitation per year,
I=percentage of time that the unobstructed wind speed exceeds 12 mph at mean pile height

Stockpile Description	Stockpile Base Area: Max sq. m	Stockpile Base Area: acre	Enclosure Description	Control Efficiency (%)	Pollutant	METRIC UNCONTROLLED Emissions (kg/hr)	METRIC UNCONTROLLED Emissions (tonne/year)	METRIC CONTROLLED Emissions (kg/hr)	METRIC CONTROLLED Emissions (tonne/year)	US UNCONTROLLED Emissions (lb/hr)	US UNCONTROLLED Emissions (ton/year)	US CONTROLLED Emissions (lb/hr)	US CONTROLLED Emissions (ton/year)	Modeled Emission Rate 24-hr, Annual (g/s)
Raw Material Stockpile (RMS)	500	0.12	3-sided	50%	PM	0.02	0.16	0.01	0.08	0.04	0.18	0.02	0.09	-
					PM10	0.01	0.08	4.40E-03	0.04	0.02	0.09	0.01	0.04	1.22E-03
					PM2.5	1.41E-03	0.01	7.03E-04	0.01	3.10E-03	0.01	1.55E-03	0.01	1.95E-04
Melting Furnace Portable Crusher & Storage - Pit Waste (B170) Stockpile	1800	0.44	3-sided	50%	PM	0.07	0.59	0.03	0.30	0.15	0.65	0.07	0.33	-
					PM10	0.03	0.28	0.02	0.14	0.07	0.31	0.03	0.15	4.46E-03
					PM2.5	0.01	0.04	2.53E-03	0.02	0.01	0.05	0.01	0.02	7.03E-04

Notes:
1. Assumed a control efficiency of 50% due to offloading locations having 3-sided concrete enclosures.
2. One half of the pit waste stockpile area occupied by large rocks, therefore wind erosion emissions are negligible due to size.
3. For wind erosion calculation methods, maximum g/s emissions do not vary based on model averaging period (i.e., a source permitted to operate at maximum capacity 24 hr/day, 365 day/year).
4. Modeled emission rates in gray are not modeled individually, but are added as a total source emission rate.

Sample Calculations:
Uncontrolled Hourly Emissions (lb/hr) = E (lb/day/acre) * day/24 hr * Base area of pile (acres)
Uncontrolled Annual Emissions (ton/year) = E (lb/day/acre) * 365 days/yr * ton/2000 lb * Base area of pile (acres)
Controlled Emissions = Uncontrolled Emissions (ton/day, ton/year) * (1 - Control Efficiency (%))
Uncontrolled/Controlled Hourly Emissions (lb/hour) = Uncontrolled/Controlled Emissions (lb/hr) * 0.4535924 kg/lb
Uncontrolled/Controlled Annual Emissions (ton/year) = Uncontrolled/Controlled Emissions (ton/yr) * 0.9071847 tonne/ton
Modeled Emission Rate (g/s) [for all Averaging Periods] = Hourly Emissions (lb/hr) * 453.59 (g/lb) / 3,600 (sec/hr)

Roxul USA, Inc.
Ranson, West Virginia
Material Handling Fugitives

Total Fugitive Emissions Summary

		PM		PM_{10}				$PM_{2.5}$				PM10
		CONTROLLED Total Annual Emissions		CONTROLLED Total Annual Emissions		Modeled Emission Rate		CONTROLLED Total Annual Emissions		Modeled Emission Rate		Class I AQRV Analysis (Q/d)[a]
Source ID	Source Description	(short tons/yr)	(tonne/year)	(short tons/yr)	(tonne/year)	(24-hr g/s)	(Annual g/s)	(short tons/yr)	(tonne/year)	(24-hr g/s)	(Annual g/s)	ton/yr
B210	Raw Material Storage - Delivery to 210 [from offsite (by truck) or from stockpile (by FEL)]	0.28	0.26	0.13	0.12	4.88E-03	3.83E-03	0.02	0.02	7.38E-04	5.79E-04	0.17
B170	Melting Furnace Portable Crusher & Storage -Melting Furnace Slag Portable Crusher + Drop to Pit Waste (170) (from portable crusher) + Wind Erosion from Pit Waste (170) Stockpile	0.59	0.53	0.27	0.25	0.03	7.80E-03	0.06	0.05	9.00E-03	1.73E-03	1.75
RMS	Raw Material Stockpile - Delivery to Stockpile [from offsite (by truck)] + Wind Erosion from Raw Material Stockpile	0.11	0.10	0.09	0.05	3.29E-03	1.43E-03	7.87E-03	7.14E-03	5.09E-04	2.26E-04	0.11

Roxul USA, Inc.
Ranson, West Virginia
Material Handling Vents

Roxul Source ID	Source Description[2]	Fan Flow Rate		Exhaust Concentration		PM, PM_{10} METRIC Hourly Emissions	PM, PM_{10} METRIC Annual Emissions	PM, PM_{10} US Hourly Emissions	PM, PM_{10} US Annual Emissions	Modeled Emission Rate[3] 24-hr, Annual	$PM_{2.5}$[1] Exhaust Concentration		$PM_{2.5}$ METRIC Hourly Emissions	$PM_{2.5}$ METRIC Annual Emissions	$PM_{2.5}$ US Hourly Emissions	$PM_{2.5}$ US Annual Emissions	Modeled Emission Rate[3] 24-hr, Annual
		(Nm3/h)	(scfm)	(mg/Nm3)	(gr/scf)	(kg/hr)	(tonne/yr)	(lb/hr)	(ton/yr)	(g/s)	(mg/Nm3)	(gr/scf)	(kg/hr)	(tonne/yr)	(lb/hr)	(ton/yr)	(g/s)
IMF03	Coal Storage Silo No. 1	1,200	758	5	0.002	6.00E-03	0.05	0.01	0.06	1.67E-03	2.5	0.001	3.00E-03	0.03	0.01	0.03	8.33E-04
	Coal Storage Silo No. 2	1,200	758	5	0.002	6.00E-03	0.05	0.01	0.06	1.67E-03	2.5	0.001	3.00E-03	0.03	0.01	0.03	8.33E-04
	Coal Storage Silo No. 3	1,200	758	5	0.002	6.00E-03	0.05	0.01	0.06	1.67E-03	2.5	0.001	3.00E-03	0.03	0.01	0.03	8.33E-04
	Total	-	-	-	-	0.02	0.16	0.04	0.17	5.00E-03	-	-	0.01	0.08	0.02	0.09	2.50E-03
IMF25	Coal Feed Tank	1,200	758	5	0.002	6.00E-03	0.05	0.01	0.06	1.67E-03	2.5	0.001	3.00E-03	0.03	6.61E-03	0.03	8.33E-04
IMF21	Charging Building Vacuum Cleaning Filter	500	316	5	0.002	2.50E-03	0.02	5.51E-03	0.02	6.94E-04	2.5	0.001	1.25E-03	0.01	2.76E-03	0.01	3.47E-04
IMF08	Sorbent Silo	1,200	758	5	0.002	6.00E-03	0.05	0.01	0.06	1.67E-03	2.5	0.001	3.00E-03	0.03	6.61E-03	0.03	8.33E-04
IMF07	Filter Fines Day Silo	1,250	790	5	0.002	6.25E-03	0.05	0.01	0.06	1.74E-03	2.5	0.001	3.13E-03	0.03	6.89E-03	0.03	8.68E-04
	Secondary Energy Materials Silo	1,250	790	5	0.002	6.25E-03	0.05	0.01	0.06	1.74E-03	2.5	0.001	3.13E-03	0.03	6.89E-03	0.03	8.68E-04
	Total	-	-	-	-	0.01	0.11	0.03	0.12	3.47E-03	-	-	6.25E-03	0.05	0.01	0.06	1.74E-03
IMF09	Spent Sorbent Silo	1,200	758	5	0.002	6.00E-03	0.05	0.01	0.06	1.67E-03	2.5	0.001	3.00E-03	0.03	6.61E-03	0.03	8.33E-04
IMF10	Filter Fines Receiving Silo	1,200	758	5	0.002	6.00E-03	0.05	0.01	0.06	1.67E-03	2.5	0.001	3.00E-03	0.03	6.61E-03	0.03	8.33E-04
IMF11	Conveyor Transition Point (B215 to B220)	1,800	1,137	5	0.002	0.01	0.08	0.02	0.09	2.50E-03	2.5	0.001	4.50E-03	0.04	0.01	0.04	1.25E-03
IMF12	Conveyor Transition Point (B210 to B220)	1,800	1,137	5	0.002	0.01	0.08	0.02	0.09	2.50E-03	2.5	0.001	4.50E-03	0.04	0.01	0.04	1.25E-03
IMF14	Conveyor Transition Point (B220 No. 1)	1,800	1,137	5	0.002	0.01	0.08	0.02	0.09	2.50E-03	2.5	0.001	4.50E-03	0.04	0.01	0.04	1.25E-03
IMF15	Conveyor Transition Point (B220 No. 2)	1,800	1,137	5	0.002	0.01	0.08	0.02	0.09	2.50E-03	2.5	0.001	4.50E-03	0.04	0.01	0.04	1.25E-03
IMF16	Conveyor Transition Point (B220 to B300)	1,800	1,137	5	0.002	0.01	0.08	0.02	0.09	2.50E-03	2.5	0.001	4.50E-03	0.04	0.01	0.04	1.25E-03
Indoor Charging Building (emitted from IMF17, IMF18)	Mixer	3,500	2,211	5	0.002	0.02	0.15	0.04	0.17	4.86E-03	2.5	0.001	0.01	0.08	0.02	0.08	2.43E-03
	Crusher	3,500	2,211	5	0.002	0.02	0.15	0.04	0.17	4.86E-03	2.5	0.001	0.01	0.08	0.02	0.08	2.43E-03
	Total Indoor with Settling Factor (50%)	-	-	-	-	0.02	0.15	0.04	0.17	4.86E-03	-	-	8.75E-03	0.08	0.02	0.08	2.43E-03
	Total IMF17	-	-	-	-	0.01	0.08	0.02	0.08	2.43E-03	-	-	4.38E-03	0.04	0.01	0.04	1.22E-03
	Total IMF18	-	-	-	-	0.01	0.08	0.02	0.08	2.43E-03	-	-	4.38E-03	0.04	0.01	0.04	1.22E-03
CM10	Recycle Building Vent 1	30,000	18,950	10	0.004	0.30	2.63	0.66	2.90	8.33E-02	5	0.002	0.15	1.31	0.33	1.45	4.17E-02
CM11	Recycle Building Vent 2	30,000	18,950	10	0.004	0.30	2.63	0.66	2.90	8.33E-02	5	0.002	0.15	1.31	0.33	1.45	4.17E-02
CM08	Recycle Building Vent 3	2,500	1,579	10	0.004	0.03	0.22	0.06	0.24	6.94E-03	5	0.002	0.01	0.11	0.03	0.12	3.47E-03
CM09	Recycle Building Vent 4	2,500	1,579	10	0.004	0.03	0.22	0.06	0.24	6.94E-03	5	0.002	0.01	0.11	0.03	0.12	3.47E-03

Notes:
ton = short tons
tonne = metric tons
1. PM2.5 is conservatively assumed to be 50% of PM for material handling.

2. With the exception of IMF17 and IMF18, material handling vents are equipped with fabric filters or bin vent filters. The indoor charging building sources (mixer, crusher) are equipped with fabric filters that vent inside the charging building and a 50% settling factor is applied for building control. These emissions are modeled as emitting from the Charging Building Vents IMF17 and IMF18.
3. Maximum g/s emissions do not vary based on model averaging period (i.e., a source permitted to operate at maximum capacity 24 hr/day, 365 day/year).

Sample Calculations
Hourly Emissions (kg/hr) = Fan Flow Rate (Nm3/hr) * Exhaust Concentration (mg/Nm3) * 1,000,000 (mg/kg)
Annual Emissions (tonne/yr) = Hourly Emissions (kg/hr) * 8,760 (hr/yr) / 1,000 (kg/tonne)
Hourly Emissions (lb/hr) = Fan Flow Rate (scfm) * Exhaust Concentration (gr/scf) * 7,000 (gr/lb) * 60 (min/hr)
Annual Emissions (ton/yr) = Hourly Emissions (lb/hr) * 8,760 (hr/yr) / 2,000 (lb/ton)
Modeled Emission Rate (g/s) [for all Averaging Periods] = Hourly Emissions (lb/hr) * 453.59 (g/lb) / 3,600 (sec/hr)

Roxul USA, Inc.
Ranson, West Virginia
Source ID: Fleece Application (CM12, CM13)

Operating Parameters, per Source

Binder Applied to Fleece	185	kg/hr
Operating Hours[1]	8,760	hr/yr
Annual Binder Usage at Fleece Station	1,620,600	kg/yr
Organic HAP Emission Limit[2]	0.016	kg OHAP/kg binder

Emission Calculations[3]

Pollutant	US		METRIC	
	Maximum Emission Rate		Maximum Emission Rate	
	(lb/hr)	(ton/yr)	(kg/hr)	(tonne/yr)
VOC	6.53	28.58	2.96	25.93
Total HAP	6.53	28.58	2.96	25.93

Notes:
ton = short tons
tonne = metric tons
1. For conservatism, emissions from the fleece application station are based on 8,760 hours per year.
2. The coating material, or in this case binder, regulated by NESHAP Subpart JJJJ is a compliant coating by formulation. The limit of 0.016 kg OHAP/kg coating material is stated in 40 CFR §63.3370(a)(2)(i) for the use of "as-applied" compliant coating materials from new affected sources (per §63.3320(b)(2) which states that HAP emissions must be limited to "no more than 1.6 percent of the mass of coating materials applied for each month at new affected sources"). Roxul may choose to comply with this limit using VOC as a surrogate for organic HAP as allowed by §63.3370(c)(1)(i) and §63.3360(c)(2). Therefore VOC emissions are shown as equal to organic HAP (Total HAP) emissions.
3. The fleece application equipment will be placed just prior to the entrance of the Curing Oven. While a majority of fleece application equipment emissions will be controlled by the Curing Oven afterburner as the fleece is cured onto the wet mineral wool in the Curing Oven, no credit is taken for VOC/organic HAP emission control in this calculation.

Sample Calculations:

Maximum Hourly Emission Rate (lb/hr) = Binder Applied to Fleece (kg/hr) * 0.016 (kg VOC/HAP / kg binder) * 2.2046 (lb/kg)
Maximum Annual Emission Rate (ton/yr) = Maximum Hourly Emission Rate (lb/hr) * 8,760 (hr/yr) / 2,000 (lb/ton)
Maximum Hourly Emission Rate (kg/hr) = Maximum Hourly Emission Rate (lb/hr) * 0.4535924 (kg/lb)
Maximum Annual Emission Rate (tonne/yr) = Maximum Annual Emission Rate (ton/yr) * 0.9071847 (tonne/ton)

Roxul USA, Inc.
Ranson, West Virginia
Source ID: Dry Ice Cleaning

Operating Parameters, per Source

Dry Ice Production[1]	75	kg/hr
Annual Dry Ice Production	657,000	kg/yr
Operating Hours[2]	8,760	hr/yr
CO_2 Consumed	2.2	(loss factor)

Emission Calculations[4]

Source	US		METRIC	
	Hourly (lb/hr)	Annual (ton/yr)	Hourly (kg/hr)	Annual (tonne/yr)
CO_2 Emitted	363.76	1,593.28	165.00	1,445.40

Notes:
ton = short tons
tonne = metric tons
1. CO_2 consumption rate for dry ice production per manufacturer data sheet. The CO_2 factor represents the total quantity of CO_2 required to produce 1 kg CO_2 (accounts for CO_2 system loss).

2. For conservatism, emissions from dry ice cleaning station are based on 8,760 hours per year; however, the equipment will traverse from one end of the equipment to the other when cleaning and dry ice pellets are used only when in forward movement.

Sample Calculations:
Dry Ice Production Rate (kg/yr) = Hourly Dry Ice Production Rate (kg/hr) * 8,760 (hrs/yr)
CO_2 Hourly Emission Rate (lb/hr) = Hourly Dry Ice Production Rate (kg/hr) * CO_2 Loss Factor * 2.2046 (lbs/kg)
CO_2 Annual Emission Rate (ton/yr) = CO2 Emission Rate (lb/hr) * 8,760 (hr/yr) / 2,000 (lb/ton)
CO2 Hourly Emission Rate (kg/hr) = Hourly Emission Rate (lb/hr) * 0.45359 (kg/lb)
CO_2 Annual Emission Rate (tonne/yr) = Annual Emission Rate (ton/yr) * 0.90718 (tonne/ton)

Roxul USA Inc.
Ranson, West Virginia
Source ID: Product Marking

Operating Parameters

Maximum Heat Input	11	kw
Capacity	0.04	MMBtu/hr
No. of Branding Wheels	8	
Total Maximum Heat Input	88	kw
Capacity	0.40	MMBtu/hr
Operating hours	8,760	hr/yr
Fuel Type	Natural Gas	
Natural Gas HHV	1,026	Btu/scf

Combustion Emission Calculations (Total for all burners)

Maximum Potential Emissions[1,2]

Pollutant	Emission Factor		US		METRIC		Modeled Emission Rate[4]	
			Hourly Emissions	Annual Emissions	Hourly Emissions	Annual Emissions		
	(lb/MMscf)	(lb/MMbtu)	(lb/hr)	(ton/yr)	(kg/hr)	(tonne/yr)	(g/s)	Averaging Period
$PM/PM_{10F}/PM_{2.5F}$	1.9	0.0019	7.41E-04	3.24E-03	3.36E-04	2.94E-03	-	-
$PM_{10T}/PM_{2.5T}$	7.6	0.0074	2.96E-03	1.30E-02	1.34E-03	1.18E-02	3.73E-04	24-hr, Annual
Nitrogen Oxides (NO_x)	100	0.097	0.04	0.17	0.02	0.15	4.91E-03	1-hr, Annual
Carbon Monoxide	84	0.0819	0.03	0.14	0.01	0.13	4.13E-03	1-hr, 8-hr
Sulfur Dioxide (SO_2)	0.6	0.0006	2.34E-04	1.02E-03	1.06E-04	9.29E-04	2.95E-05	1-hr, 3-hr, 24-hr, Annual
VOC	5.5	0.0054	2.14E-03	9.39E-03	9.73E-04	8.52E-03	-	-
Lead	5.00E-04	4.87E-07	1.95E-07	8.54E-07	8.84E-08	7.75E-07	-	-
Hexane	1.80E+00	0.0018	7.02E-04	3.07E-03	3.18E-04	2.79E-03	-	-
Carbon Dioxide (CO_2)	-	116.98	46.79	204.94	21.22	185.92	-	-
Methane (CH_4)	-	0.0022	8.82E-04	3.86E-03	4.00E-04	3.50E-03	-	-
Nitrous Oxide (N_2O)	-	0.0002	8.82E-05	3.86E-04	4.00E-05	3.50E-04	-	-
CO_2 Equivalent (CO_2eq)[3]	-	-	46.84	205.16	21.25	186.11	-	-
Total HAP	1.89	1.84E-03	7.36E-04	3.22E-03	3.34E-04	2.93E-03	-	-

Notes:
ton = short tons
tonne = metric tons
1. Natural Gas emission factor source AP-42 Table 1.4-1, 1.4-2, 1.4-3, and 1.4-4 for SO_2, PM_{10T}, $PM_{2.5T}$, CO, VOC, NOx, Lead, Hexane, Total HAPs. GHG emission factors per 40 CFR Part 98, Table C-1 and C-2. GWPs per 40 CFR 98, Table A-1.
2. PM_{10T} and $PM_{2.5T}$ emission factors include filterable and condensable particulate matter (e.g., Total PM_{10}, $PM_{2.5}$).
3. CO_2 Equivalent (CO_2e) lb/hr, ton/yr = CO_2 + [GWP_{CH4} * CH_4)] + [GWP_{N2O} * N_2O].
4. Maximum g/s emissions do not vary based on model averaging period (i.e., a source permitted to operate at maximum capacity 24 hr/day, 365 day/year).

Sample Calculations:
Hourly Emissions (lb/hr) = Emission Factor (lb/MMBtu) * Maximum Heat Input Capacity (MMBtu/hr)
Annual Emissions (ton/yr) = Hourly Emissions (lb/hr) * 8,760 (hr/yr) / 2,000 (lb/ton)
Hourly Emissions (kg/hr) = Hourly Emissions (lb/hr) /2.2046 (lb/kg)
Annual Emissions (tonne/yr) = Hourly Emissions (kg/hr) * 8,760 (hr/yr) / 1,000 (kg/tonne)
Modeled Emission Rate (g/s) [for all Averaging Periods] = Hourly Emissions (lb/hr) * 453.59 (g/lb) / 3,600 (sec/hr)

Ink VOC Emission Calculations [1]

Material	Percent Volatile (%)	VOC Content (%)	HAP Content (%)	US			METRIC			Material
				Density (lb/gal)	Usage (gal)	Annual Emission Rate (ton/yr)	Density (g/L)	Usage (liters)	Annual Emission Rate (tonne/yr)	
Ink	100%	100%	0	7.58	2400	9.10	910	9200	8.25	DPI-411 VL
Cleaner	100%	100%	0	7.51	100	0.38	902	400	0.34	JAM7500 Cleaner
					Totals	9.47			8.59	

Notes:
1. Material specifications for both solutions based on data presented in SDS. Conservatively assumed all material is VOC.

Sample Calculations:
Annual Emissions (ton/yr) = VOC Content (%) * Volatile Content (%) * Usage (gal) * Density (lb/gal) / 2,000 (lb/ton)
Annual Emissions (tonne/yr) = Annual Emissions (ton/yr) * 0.9071847 (tonne/ton)

Total VOC Emissions (Ink & Combustion)

Pollutant	US	METRIC
	Maximum Emission Rate	Maximum Emission Rate
	(ton/yr)	(tonne/yr)
VOC	9.48	8.60

Roxul USA Inc.
Ranson, West Virginia
Source ID: Melting Furnace Cooling Tower (IMF02), Gutter Cooling Tower (HE02)

Operating Parameters

Roxul Source ID	No. of Towers	Circulating Cooling Water Flow Rate (m3/hr)	Circulating Cooling Water Flow Rate (gpm)
IMF02	1	300	1,321
HE02	1	70	308

Drift Losses	0.001	% of Circulating Cooling Water	
TDS[1]	1,500	ppmw	Recommended Max Level
Operating Schedule	8,760	hr/yr	

Emission Calculations

IMF02 6.6 lb/hr drift, per tower

	US		METRIC			
	Hourly Emissions	Annual Emissions	Hourly Emissions	Annual Emissions	Modeled Emission Rate[2]	
	(lb/hr)	(ton/yr)	(kg/hr)	(tonne/yr)	(g/s)	Averaging Period
PM, PM_{10}	0.01	0.04	4.50E-03	0.04	1.25E-03	24-hr, Annual
$PM_{2.5}$	4.96E-03	0.02	2.25E-03	0.02	6.25E-04	24-hr, Annual

HE02 1.5 lb/hr drift, per tower

	US		METRIC			
	Hourly Emissions	Annual Emissions	Hourly Emissions	Annual Emissions	Modeled Emission Rate[2]	
	(lb/hr)	(ton/yr)	(kg/hr)	(tonne/yr)	(g/s)	Averaging Period
PM, PM_{10}	2.31E-03	0.01	1.05E-03	9.19E-03	2.91E-04	24-hr, Annual
$PM_{2.5}$	1.16E-03	0.01	5.25E-04	4.60E-03	1.46E-04	24-hr, Annual

Notes:
ton = short tons
tonne = metric tons
1. Assume all TDS drift is emitted as PM/$PM_{10.}$ $PM_{2.5}$ is assumed to be 50% of PM/PM10.
2. Maximum g/s emissions do not vary based on model averaging period (i.e., a source permitted to operate at maximum capacity 24 hr/day, 365 day/year).

Sample Calculations:
Drift Loss (lb/hr) = Circulating Flow (gpm) x 8.34 lb/gal * 60 mins/hr x % drift
Hourly Emissions (lb/hr) = Drift Loss (lb/hr)* TDS concentration (ppmw / 10^6)
Annual Emissions (ton/yr) = Hourly (lb/hr) *8,760 (hr/yr) / 2,000 (lb/ton)
Hourly Emissions (kg/hr) = Hourly Emissions (lb/hr) * 0.4535924 (kg/lb)
Annual Emissions (tonne/yr) = Hourly (lb/hr) *8,760 (hr/yr) / 1,000 (kg/tonne)

Roxul USA, Inc.
Ranson, West Virginia
Source ID: Coal Mill Burner with Baghouse (IMF05)

Coal Mill Natural Gas Burner Emission Calculations

Operating Parameters

Maximum Heat Input	1758	kW
Capacity	6.00	MMBtu/hr
Operating Hours	8,760	hr/yr
HHV	1,028	Btu/scf
Fuel Type	Natural Gas	

Maximum Potential Emissions[1,2]

				US		METRIC		Modeled Emission Rate[4]	
Pollutant	Emission Factor (lb/MMscf)	Emission Factor (lb/MMbtu)	Max. Annual Operating Rate (MMBtu/yr)	Hourly Emissions (lb/hr)	Annual Emissions (ton/yr)	Hourly Emissions (kg/hr)	Annual Emissions (tonne/yr)	(g/s)	Averaging Period
NO_x	72	0.0706	52,591	0.42	1.86	0.19	1.68	5.34E-02	1-hr, Annual
SO_2	0.6	0.0006	52,591	3.51E-03	0.02	1.59E-03	0.01	4.42E-04	1-hr, 3-hr, 24-hr, Annual
Condensable PM	5.7	0.0056	52,591	0.03	0.15	0.02	0.13	See Total Table	-
CO	84	0.0819	52,591	0.49	2.15	0.22	1.95	6.19E-02	24-hr, Annual
VOC	5.5	0.0054	52,591	0.03	0.14	0.01	0.13	-	-
Lead	0.0005	4.87E-07	52,581	2.93E-06	1.28E-05	1.33E-06	1.16E-05	-	-
Hexane	1.8	0.0018	52,591	0.01	0.05	4.78E-03	0.04	-	-
Total HAPs	1.888	0.0018	52,591	0.01	0.05	0.01	0.04	-	-
CO_2	-	116.98	52,591	702.28	3,075.99	318.55	2,790.49	-	-
CH_4	-	2.20E-03	52,591	0.01	0.06	0.01	0.05	-	-
N_2O	-	2.20E-04	52,591	0.00	0.01	6.00E-04	0.01	-	-
CO_2e[3]	-	-	52,591	703.01	3,079.17	318.88	2,793.37	-	-

Notes:
ton = short tons
tonne = metric tons
1. Natural Gas emission factor source AP-42 Table 1.4-1, 1.4-2, 1.4-3, and 1.4-4 for SO_2, PM_{10T}, $PM_{2.5T}$, CO, VOC, Lead, Hexane, Total HAPs, Chromium. GHG emission factors per 40 CFR Part 98, Table C-1 and C-2. GWPs per 40 CFR 98, Table A-1. NO_X emission factor based on 60 ppmvd @ 3% O2 per manufacturer specification.

2. PM_{10T} and $PM_{2.5T}$ emission factors include filterable and condensable particulate matter (e.g., Total PM_{10}, $PM_{2.5}$).
3. CO_2 Equivalent (CO_2e) lb/hr, ton/yr = CO_2 + [GWP_{CH4} * CH_4)] + [GWP_{N2O} * N_2O]
4. Maximum g/s emissions do not vary based on model averaging period (i.e., a source permitted to operate at maximum capacity 24 hr/day, 365 day/year).

Sample Calculations:
Hourly Emissions (lb/hr) = Emission Factor (lb/MMBtu) * Maximum Heat Input Capacity (MMBtu/hr)
Annual Emissions (ton/yr) = Hourly Emissions (lb/hr) * 8,760 (hr/yr) / 2,000 (lb/ton)
Hourly Emissions (kg/hr) = Hourly Emissions (lb/hr) /2.2046 (lb/kg)
Annual Emissions (tonne/yr) = Hourly Emissions (kg/hr) * 8,760 (hr/yr) / 1,000 (kg/tonne)
Modeled Emission Rate (g/s) [for all Averaging Periods] = Hourly Emissions (lb/hr) * 453.59 (g/lb) / 3,600 (sec/hr)

Coal Mill Fluidized Bed Dryer - Coal Drying Emission Calculations[1,2]

			US		METRIC	
Pollutant	Emission Factor (lb pollutant/ton coal)	Max. Coal Feed Operating Rate[3]	Potential Hourly Emissions (lb/hr)	Potential Annual Emissions (ton/yr)	Potential Hourly Emissions (kg/hr)	Potential Annual Emissions (tonne/yr)
VOC	Claimed Confidential	Claimed Confidential	0.38	1.51	0.17	1.37
CPM			0.16	0.64	0.07	0.58

Note:

1. Claimed confidential.

2. CO, CO_2, and NO_x emissions are not expected because the coal is dried at 82°C which is not a high enough temperature to undergo combustion.
3. Operating rate for coal mill fluidized bed dryer is based on the maximum quantity delivered per day or per year.

Sample Calculations:
Hourly emissions (lb/hr) = E (lb pollutant/ton coal) * Operating Rate (ton/hr)
Annual Emissions (ton/yr) = E (lb pollutant/ton coal) * Operating Rate (ton/yr) / (1 ton/ 2000 lb)
Hourly emissions (kg/hr) = Hourly emissions (lb/hr) * 0.4535924 kg/lb
Annual Emissions (tonne/yr) = Annual emissions (ton/yr) * 0.9071847 tonne/ton

Coal Milling Baghouse Emission Calculations[1]

			Particulate Outlet Loading		Fan Flow Rate		US		METRIC		Modeled Emission Rate	
Roxul Source ID	Source Description	Pollutant	(gr/scf)	(mg/Nm3)	(Nm3/h)	(scfm)	Hourly Emissions (lbs/hr)	Annual Emissions (tons/yr)	Hourly Emissions (kg/hr)	Annual Emissions (tonne/yr)	g/s	Averaging Period
IMF05	Coal Milling Baghouse	PM_{FILT}, PM_{10FILT}	0.005	12.3	4,547	2,673	0.12	0.54	0.06	0.49	*See Total Table*	-
		$PM_{2.5FILT}$	0.0025	6.1			0.06	0.27	0.03	0.24	*See Total Table*	-

Notes:
1. PM2.5 is conservatively assumed to be 50% of PM/PM10.

Sample Calculations:
Hourly Emissions (lb/hr) = Fan Flow Rate (scfm) * Exhaust Concentration (gr/scf) * 7,000 (gr/lb) * 60 (min/hr)
Annual Emissions (ton/yr) = Hourly Emissions (lb/hr) * 8,760 (hr/yr) / 2,000 (lb/ton)
Hourly Emissions (kg/hr) = Hourly Emissions (lb/hr) * 0.4535924 kg/lb
Annual Emissions (tonne/yr) = Annual Emissions (ton/yr) * 0.9071847 tonne/ton

Total Coal Milling Vent Emissions

	US		METRIC		Modeled Emission Rate[1]	
Pollutant	Hourly Emissions (lb/hr)	Annual Emissions (short ton/yr)	Hourly Emissions (kg/hr)	Annual Emissions (tonne/yr)	g/s	Averaging Period
NO_x	0.42	1.86	0.19	1.68	5.34E-02	1-hr, Annual
SO_2	3.51E-03	0.02	1.59E-03	0.01	4.42E-04	1-hr, 3-hr, 24-hr, Annual
PM_{FILT}	0.12	0.54	0.06	0.49	-	-
Total PM_{10}	0.32	1.33	0.14	1.20	3.99E-02	24-hr, Annual
Total $PM_{2.5}$	0.26	1.06	0.12	0.96	3.22E-02	24-hr, Annual
CO	0.49	2.15	0.22	1.95	6.19E-02	1-hr, 8-hr
VOC	0.41	1.65	0.19	1.50	-	-
Lead	2.93E-06	1.28E-05	1.33E-06	1.16E-05	-	-
Hexane	0.01	0.05	0.00	0.04	-	-
Total HAPs	0.01	0.05	0.01	0.04	-	-
CO_2e	703.01	3,079.17	318.88	2,793.37	-	-

Notes:
1. Maximum g/s emissions do not vary based on model averaging period (i.e., a source permitted to operate at maximum capacity 24 hr/day, 365 day/year).

Sample Calculations:
Modeled Emission Rate (g/s) [for all Averaging Periods] = Hourly Emissions (lb/hr) * 453.59 (g/lb) / 3,600 (sec/hr)

Roxul USA, Inc.
Ranson, West Virginia
Coal Milling Material Handling

1 Coal Milling Material Handling Vents

						METRIC		US						METRIC		US		
						PM, PM_{10}					$PM_{2.5}$[1]							
Roxul Source ID	Source Description	Fan Flow Rate		Exhaust Concentration		Hourly Emissions	Annual Emissions	Hourly Emissions	Annual Emissions	Modeled Emission Rate 24-hr, Annual	Exhaust Concentration		Hourly Emissions	Annual Emissions	Hourly Emissions	Annual Emissions	Modeled Emission Rate[2,3] 24-hr, Annual	
		(Nm3/h)	(scfm)	(mg/Nm3)	(gr/scf)	(kg/hr)	(tonne/yr)	(lb/hr)	(ton/yr)	(g/s)	(mg/Nm3)	(gr/scf)	(kg/hr)	(tonne/yr)	(lb/hr)	(ton/yr)	(g/s)	
MF04	Coal Conveyor Transition Point (B231 to B235)	1,800	1,137	5	0.002	0.01	0.08	0.02	0.09	2.50E-03	2.5	0.001	4.50E-03	0.04	0.01	0.04	1.25E-03	
MF13	Coal Conveyor Transition Point (B231 to B235)	1,800	1,137	5	0.002	0.01	0.08	0.02	0.09	2.50E-03	2.5	0.001	4.50E-03	0.04	0.01	0.04	1.25E-03	
B235	Coal Milling Building - Indoor Conveyor Transition Point	1,800	1,137	5	0.002	4.50E-03	0.04	0.01	0.04	1.25E-03	2.5	0.001	2.25E-03	0.02	4.96E-03	0.02	6.25E-04	
MF06	Coal De-dusting Baghouse	10,000	6,317	10	0.004	0.10	0.88	0.22	0.97	2.78E-02	5	0.002	0.05	0.44	0.11	0.48	1.39E-02	

Notes:
ton = short tons
tonne = metric tone
1. PM2.5 is conservatively assumed to be 50% of PM for material handling.
2. Maximum g/s emissions do not vary based on model averaging period (i.e., a source permitted to operate at maximum capacity 24 hr/day, 365 day/year).
3. Modeled emission rates in gray are not modeled individually, but are added as a total source emission rate.

Sample Calculations:
Hourly Emissions (kg/hr) = Fan Flow Rate (Nm3/hr) * Exhaust Concentration (mg/Nm3) * 1,000,000 (mg/kg);
Annual Emissions (tonne/yr) = Hourly Emissions (kg/hr) * 8,760 (hr/yr) / 1,000 (kg/tonne)
Hourly Emissions (lb/hr) = Fan Flow Rate (scfm) * Exhaust Concentration (gr/scf) * 7,000 (gr/lb) * 60 (min/hr);
Annual Emissions (ton/yr) = Hourly Emissions (lb/hr) * 8,760 (hr/yr) / 2,000 (lb/ton);
Modeled Emission Rate (g/s) [for all Averaging Periods] = Hourly Emissions (lb/hr) * 453.59 (g/lb) / 3,600 (sec/hr)

2 Coal Milling Delivery and Front-end Loader Fugitive Emissions

Raw Material	M-Moisture content[1]
	%
Lump Coal/Pet Coke	Claimed Confidential

Location	U-Wind Speed[2]	
	(mph)	(m/s)
Outdoor	6.51	2.91
Indoor	2.2	0.98

Pollutant	k-Particle Size Multiplier	E-Emission Factor[3] Indoor Lump Coal/Pet Coke (lb/ton)	E-Emission Factor[3] Outdoor Lump Coal/Pet Coke (lb/ton)
PM	0.74	Claimed Confidential	Claimed Confidential
PM10	0.35		
PM2.5	0.053		

Notes:
1. Moisture content based on supplier specifications.
2. Outdoor wind speed was set at 6.51 mph based on 2011-2015 average wind speed data from station ID 13734, while inside wind speed was conservatively assumed at 0.98 m/s.
3. Material drops emission factor equation per AP-42 Section 13.2.4.

Sample Calculations:
E (lb/ton) = k (0.0032)[(U/5)^1.3] / [(M/2)^1.4] , where
k=Particle Size Multiplier,
U = wind speed, meters per second (miles per hour (mph)),
M = material moisture content (%)

							METRIC				US						
Roxul Source ID	Raw Material	Source Description	Loading Rate[1]	Enclosure Description	Control Efficiency[2] (%)	Pollutant	UNCONTROLLED Emissions (tonne/day)	UNCONTROLLED Emissions (tonne/year)	CONTROLLED Emissions (tonne/day)	CONTROLLED Emissions (tonne/year)	UNCONTROLLED Emissions (ton/day)	UNCONTROLLED Emissions (ton/year)	CONTROLLED Emissions (ton/day)	CONTROLLED Emissions (ton/year)	Modeled Emission Rate[3] 24-hr (g/s)	Modeled Emission Rate[3] Annual (g/s)	Class I AQRV Analysis (Q/d)[4] ton/yr
B230	Lump Coal/Pet Coke	Coal Unloading - Delivery Truck to Bunker	Claimed Confidential	3-sided with cover	75%	PM	8.36E-06	2.78E-03	2.09E-06	6.96E-04	9.21E-06	3.07E-03	2.30E-06	7.67E-04	-	-	-
						PM10	3.95E-06	1.32E-03	9.88E-07	3.29E-04	4.36E-06	1.45E-03	1.09E-06	3.63E-04	1.14E-05	1.04E-05	3.98E-04
						PM2.5	5.98E-07	1.99E-04	1.50E-07	4.98E-05	6.60E-07	2.20E-04	1.65E-07	5.49E-05	1.73E-06	1.58E-06	-
B231	Lump Coal/Pet Coke	Coal Loading Hopper		3-sided with cover	75%	PM	8.36E-06	2.78E-03	2.09E-06	6.96E-04	9.21E-06	3.07E-03	2.30E-06	7.67E-04	-	-	-
						PM10	3.95E-06	1.32E-03	9.88E-07	3.29E-04	4.36E-06	1.45E-03	1.09E-06	3.63E-04	1.14E-05	1.04E-05	3.98E-04
						PM2.5	5.98E-07	1.99E-04	1.50E-07	4.98E-05	6.60E-07	2.20E-04	1.65E-07	5.49E-05	1.73E-06	1.58E-06	-
B235	Lump Coal/Pet Coke	Coal Milling Building - Indoor Conveyor to Indoor Mill Feeding Bin		Indoor open bin	75%	PM	5.10E-07	1.70E-04	6.38E-08	2.12E-05	1.12E-06	3.74E-04	1.41E-07	4.68E-05	-	-	-
						PM10	2.41E-07	8.05E-05	3.02E-08	1.00E-05	5.32E-07	1.77E-04	6.65E-08	2.21E-05	3.49E-07	3.18E-07	2.43E-06
						PM2.5	3.65E-08	1.22E-05	4.57E-09	1.52E-06	8.05E-08	2.68E-05	1.01E-08	3.35E-06	5.28E-08	4.82E-08	-

Notes:
FEL = Front End Loader
1. Loading rate for material storage operations is based on the maximum quantity delivered per day or per year.
2. Assumed a control efficiency of 50% due to offloading locations having 3-sided concrete enclosures and 75% efficiency for 4-sided enclosures (hopper) or 3-sided enclosures with roof.
3. Modeled emission rates in gray are not modeled individually, but are added as a total source emission rate.
4. For Q/d screening tool, the annual steady-state-equivalent emission rate (Q) was determined based on maximum daily emissions. For example QPM10 (tpy) = PM10 (ton/day) * 365 day/yr).

Sample Calculations:
Uncontrolled Emissions (ton/day; ton/year) = E (lb/ton) * Loading Rate (ton/day; ton/year) / 2000 (lb/ton)
Controlled Emissions = Uncontrolled Emissions (ton/day; ton/year) * (1 - Control Efficiency (%))
Uncontrolled/Controlled Emissions (tonne/day; tonne/year) = Uncontrolled/Controlled Emissions (ton/day; ton/year) * 0.9071847 tonne/ton
Modeled 24-hr Emission Rate (g/s) = Daily Emissions (ton/day) / 24 (hr/day) [for 24-hr model averaging period] * 2,000 (lb/ton) * 453.59 (g/lb) / 3,600 (sec/hr)
Modeled Annual Emission Rate (g/s) = Annual Emissions (ton/yr) / 8,760 (hr/yr) [for annual model averaging period] * 2,000 (lb/ton) * 453.59 (g/lb) / 3,600 (sec/hr)

3 Total Coal Milling Fugitive Building Emissions Summary

		PM		PM_{10}				$PM_{2.5}$				PM10
		CONTROLLED Total Annual Emissions		CONTROLLED Total Annual Emissions		Modeled Emission Rate		CONTROLLED Total Annual Emissions		Modeled Emission Rate		Class I AQRV Analysis (Q/d)[4]
Roxul Source ID	Source Description	ton/year	tonne/year	ton/year	tonne/year	24-hr g/s	Annual g/s	ton/year	tonne/year	24-hr g/s	Annual g/s	ton/yr
B235	Coal Milling Building - Indoor Conveyor Transfer Point + Indoor Conveyor to Indoor Mill Feeding Bin	0.04	0.04	0.04	0.04	1.25E-03	1.25E-03	0.02	0.02	6.25E-04	6.25E-04	0.04

Roxul USA Inc.
Ranson, West Virginia
Source ID: Rockfon Line (RFN1) Emissions

Roxul Source ID	Source Description	Concentration		Flow Rate		METRIC Hourly Emissions	METRIC Annual Emissions	US Hourly Emissions	US Annual Emissions	Modeled Emission Rate[4]		Notes	Control Device
-	Pollutants	(mg/Nm³)	(gr/scf)	(Nm³/h)	(scfm)	(kg/hr)	(tonne/yr)	(lb/hr)	(ton/year)	(g/s)	Averaging Period	-	-
RFN-E1	Rockfon - IR Zone	-	-	-	-	-	-	-	-	-	-	-	-
	Filterable PM	1.4	0.001	3,000	1,895	4.20E-03	0.04	0.01	0.04	-	-	Note 1, Note 2 (1)	-
	Filterable PM_{10}	1.4	0.001	3,000	1,895	4.20E-03	0.04	0.01	0.04	-	-	Note 1	-
	Filterable $PM_{2.5}$	0.7	0.0003	3,000	1,895	2.10E-03	0.02	4.63E-03	0.02	-	-	Note 1	-
	Condensable PM	-	-	3,000	1,895	4.20E-03	0.04	0.01	0.04	-	-	Note 1	-
	Total PM_{10}	-	-	3,000	1,895	0.01	0.07	0.02	0.08	2.33E-03	24-hr, Annual	Note 1	-
	Total $PM_{2.5}$	-	-	3,000	1,895	6.30E-03	0.06	0.01	0.06	1.75E-03	24-hr, Annual	Note 1	-
	VOC	-	-	3,000	1,895	See combined limit		See combined limit		-	-	-	-
	Formaldehyde	1	-	3,000	1,895	3.00E-03	0.03	0.01	0.03	-	-	Note 2 (1)	-
	Mineral Fiber	-	-	3,000	1,895	4.20E-03	0.04	0.01	0.04	-	-	Note 3	-
	Phenol	1	-	3,000	1,895	3.00E-03	0.03	0.01	0.03	-	-	Note 2 (1)	-
	Total HAPs	-	-	3,000	1,895	0.01	0.09	0.02	0.10	-	-	-	-
RFN-E2	Rockfon - Hot Press & Cure	-	-	-	-	-	-	-	-	-	-	-	-
	Filterable PM	1.4	0.0006	3,000	1,895	4.20E-03	0.04	0.01	0.04	-	-	Note 1, Note 2 (1)	-
	Filterable PM_{10}	1.4	0.0006	3,000	1,895	4.20E-03	0.04	0.01	0.04	-	-	Note 1	-
	Filterable $PM_{2.5}$	0.7	0.0003	3,000	1,895	2.10E-03	0.02	4.63E-03	0.02	-	-	Note 1	-
	Condensable PM	-	-	3,000	1,895	4.20E-03	0.04	0.01	0.04	-	-	Note 1	-
	Total PM_{10}	-	-	3,000	1,895	0.01	0.07	0.02	0.08	2.33E-03	24-hr, Annual	Note 1	-
	Total $PM_{2.5}$	-	-	3,000	1,895	6.30E-03	0.06	0.01	0.06	1.75E-03	24-hr, Annual	Note 1	-
	VOC	-	-	3,000	1,895	See combined limit		See combined limit		-	-		-
	Formaldehyde	1	-	3,000	1,895	3.00E-03	0.03	0.01	0.03	-	-	Note 2 (1)	-
	Mineral Fiber	-	-	3,000	1,895	4.20E-03	0.04	0.01	0.04	-	-	Note 3	-
	Phenol	1	-	3,000	1,895	3.00E-03	0.03	0.01	0.03	-	-	Note 2 (1)	-
	Total HAPs	-	-	3,000	1,895	0.01	0.09	0.02	0.10	-	-	-	-
RFN-E8	Rockfon - De-dusting Baghouse (WORST CASE EMISSIONS)	-	-	-	-	-	-	-	-	-	-	-	-
	Filterable PM	1.3	0.00053	117,812	74,419	0.15	1.35	0.34	1.49	-	-	Note 1, Note 2 (1)	Baghouse
	Filterable PM_{10}	1.3	0.00053	117,812	74,419	0.15	1.35	0.34	1.49	4.29E-02	24-hr, Annual	Note 1	Baghouse
	Filterable $PM_{2.5}$	0.68	0.00027	117,812	74,419	0.08	0.68	0.17	0.75	2.14E-02	24-hr, Annual	Note 1	Baghouse
	Mineral Fiber	-	-	117,812	74,419	0.15	1.35	0.34	1.49	-	-	Note 3	Baghouse
	Total HAPs	-	-	117,812	74,419	0.15	1.35	0.34	1.49	-	-	-	Baghouse
	Rockfon - De-dusting Baghouse (OPTIONAL to ROCKFON BUILDING)	-	-	-	-	-	-	-	-	-	-	-	-
	Filterable PM	0.3	0.0001	117,812	74,419	0.02	0.14	0.03	0.15	-	-	Note 1, Note 2 (1)	Baghouse, HEPA, Bldg
	Filterable PM_{10}	0.3	0.0001	117,812	74,419	0.02	0.14	0.03	0.15	7.15E-04	24-hr, Annual	Note 1	Baghouse, HEPA, Bldg
	Filterable $PM_{2.5}$	0.13	0.00005	117,812	74,419	0.01	0.07	0.02	0.07	3.57E-04	24-hr, Annual	Note 1	Baghouse, HEPA, Bldg
	Mineral Fiber	-	-	117,812	74,419	0.02	0.14	0.03	0.15	-	-	Note 3	Baghouse, HEPA, Bldg
	Total HAPs	-	-	117,812	74,419	0.02	0.14	0.03	0.15	-	-	-	Baghouse, HEPA, Bldg
RFN-E3	Rockfon - High Oven A	-	-	-	-	-	-	-	-	-	-	-	-
	Filterable PM	3.3	0.0013	8,000	5,053	0.03	0.23	0.06	0.25	-	-	Note 1, Note 2 (1)	-
	Filterable PM_{10}	3.3	0.0013	8,000	5,053	0.03	0.23	0.06	0.25	-	-	Note 1	-
	Filterable $PM_{2.5}$	1.65	0.0007	8,000	5,053	0.01	0.12	0.03	0.13	-	-	Note 1	-
	Condensable PM	-	-	8,000	5,053	0.03	0.23	0.06	0.25	-	-	Note 1	-
	Total PM_{10}	-	-	8,000	5,053	0.05	0.46	0.12	0.51	1.47E-02	24-hr, Annual	Note 1	-
	Total $PM_{2.5}$	-	-	8,000	5,053	0.04	0.35	0.09	0.38	1.10E-02	24-hr, Annual	Note 1	-
	NO_X	15.1	-	8,000	5,053	0.12	1.06	0.27	1.17	3.35E-02	1-hr, Annual	Claimed CBI	-
	CO	12.7	-	8,000	5,053	0.10	0.89	0.22	0.98	2.82E-02	1-hr, 8-hr	Claimed CBI	-
	SO_2	0.09	-	8,000	5,053	7.24E-04	0.01	1.60E-03	0.01	2.01E-04	1-hr, 3-hr, 24-hr, Annual	Claimed CBI	-
	VOC	-	-	8,000	5,053	See combined limit		See combined limit		-	-	-	-
	Formaldehyde	1	-	8,000	5,053	0.01	0.07	0.02	0.08	-	-	Note 2 (1)	-
	Hexane	0.3	-	8,000	5,053	2.17E-03	0.02	4.79E-03	0.02	-	-	Claimed CBI	-
	Lead	7.54E-05	-	8,000	5,053	6.03E-07	5.29E-06	1.33E-06	5.83E-06	-	-	Claimed CBI	-
	Mineral Fiber	-	-	8,000	5,053	0.03	0.23	0.06	0.25	-	-	Note 3	-
	Phenol	1	-	8,000	5,053	0.01	0.07	0.02	0.08	-	-	Note 2 (1)	-
	Total HAPs	5.6	-	8,000	5,053	0.04	0.39	0.10	0.43	-	-	Claimed CBI	-
	CO_2	18,105	-	8,000	5,053	144.84	1,268.78	319.31	1,398.60	-	-	Claimed CBI	-
	CH_4	0.3	-	8,000	5,053	2.73E-03	0.02	0.01	0.03	-	-	Claimed CBI	-
	N_2O	0.03	-	8,000	5,053	2.73E-04	0.00	6.02E-04	2.64E-03	-	-	Claimed CBI	-
	CO_2e	-	-	8,000	5,053	144.99	1,270.09	319.64	1,400.04	-	-	-	-
RFN-E9	Rockfon - High Oven B	-	-	-	-	-	-	-	-	-	-	-	-
	Filterable PM	3.3	0.0013	8,000	5,053	0.03	0.23	0.06	0.25	-	-	Note 1, Note 2 (1)	-
	Filterable PM_{10}	3.3	0.0013	8,000	5,053	0.03	0.23	0.06	0.25	-	-	Note 1	-
	Filterable $PM_{2.5}$	1.65	0.0007	8,000	5,053	0.01	0.12	0.03	0.13	-	-	Note 1	-
	Condensable PM	-	-	8,000	5,053	0.03	0.23	0.06	0.25	-	-	Note 1	-
	Total PM_{10}	-	-	8,000	5,053	0.05	0.46	0.12	0.51	1.47E-02	24-hr, Annual	Note 1	-
	Total $PM_{2.5}$	-	-	8,000	5,053	0.04	0.35	0.09	0.38	1.10E-02	24-hr, Annual	Note 1	-
	NO_X	15.1	-	8,000	5,053	0.12	1.06	0.27	1.17	3.35E-02	1-hr, Annual	Claimed CBI	-
	CO	12.7	-	8,000	5,053	0.10	0.89	0.22	0.98	2.82E-02	1-hr, 8-hr	Claimed CBI	-
	SO_2	0.1	-	8,000	5,053	7.24E-04	0.01	1.60E-03	0.01	2.01E-04	1-hr, 3-hr, 24-hr, Annual	Claimed CBI	-
	VOC	-	-	8,000	5,053	See combined limit		See combined limit		-	-	-	-
	Formaldehyde	1	-	8,000	5,053	0.01	0.07	0.02	0.08	-	-	Note 2 (1)	-
	Hexane	0.3	-	8,000	5,053	2.17E-03	0.02	4.79E-03	0.02	-	-	Claimed CBI	-
	Lead	7.54E-05	-	8,000	5,053	6.03E-07	5.29E-06	1.33E-06	5.83E-06	-	-	Claimed CBI	-
	Mineral Fiber	-	-	8,000	5,053	0.03	0.23	0.06	0.25	-	-	Note 3	-
	Phenol	1	-	8,000	5,053	0.01	0.07	0.02	0.08	-	-	Note 2 (1)	-
	Total HAPs	5.6	-	8,000	5,053	0.04	0.39	0.10	0.43	-	-	Claimed CBI	-
	CO_2	18,105	-	8,000	5,053	144.84	1,268.78	319.31	1,398.60	-	-	Claimed CBI	-
	CH_4	0.3	-	8,000	5,053	2.73E-03	0.02	0.01	0.03	-	-	Claimed CBI	-
	N_2O	0.03	-	8,000	5,053	2.73E-04	2.39E-03	6.02E-04	2.64E-03	-	-	Claimed CBI	-
	CO_2e	-	-	8,000	5,053	144.99	1,270.09	319.64	1,400.04	-	-	-	-
RFN-E4	Rockfon - Drying Oven 1	-	-	-	-	-	-	-	-	-	-	-	-
	Filterable PM	3.70	0.0015	5,000	3,158	0.02	0.16	0.04	0.18	-	-	Note 1, Note 2 (1)	Particulate Filter
	Filterable PM_{10}	3.70	0.0015	5,000	3,158	0.02	0.16	0.04	0.18	-	-	Note 1	Particulate Filter
	Filterable $PM_{2.5}$	1.65	0.0008	5,000	3,158	0.01	0.08	0.02	0.09	-	-	Note 1	Particulate Filter
	Condensable PM	-	-	5,000	3,158	0.02	0.16	0.04	0.18	-	-	Note 1	-
	Total PM_{10}	-	-	5,000	3,158	0.04	0.32	0.08	0.36	1.03E-02	24-hr, Annual	Note 1	Particulate Filter
	Total $PM_{2.5}$	-	-	5,000	3,158	0.03	0.24	0.06	0.27	7.71E-03	24-hr, Annual	Note 1	Particulate Filter
	NO_X	18.1	-	5,000	3,158	0.09	0.79	0.20	0.87	2.51E-02	1-hr, Annual	Claimed CBI	-
	CO	15.2	-	5,000	3,158	0.08	0.67	0.17	0.73	2.11E-02	1-hr, 8-hr	Claimed CBI	-
	SO_2	0.1	-	5,000	3,158	5.43E-04	4.76E-03	1.20E-03	0.01	1.51E-04	1-hr, 3-hr, 24-hr, Annual	Claimed CBI	-
	VOC	-	-	5,000	3,158	See combined limit		See combined limit		-	-	-	-
	Formaldehyde	2	-	5,000	3,158	0.01	0.09	0.02	0.10	-	-	Note 2 (1)	-
	Hexane	0.3	-	5,000	3,158	1.63E-03	0.01	3.59E-03	0.02	-	-	Claimed CBI	-
	Lead	9.06E-05	-	5,000	3,158	4.53E-07	3.96E-06	9.98E-07	4.37E-06	-	-	Claimed CBI	-
	Mineral Fiber	-	-	5,000	3,158	0.02	0.16	0.04	0.18	-	-	Note 3	Particulate Filter
	Phenol	1	-	5,000	3,158	5.00E-03	0.04	0.01	0.05	-	-	Note 2 (1)	-
	Total HAPs	7.0	-	5,000	3,158	0.04	0.31	0.08	0.34	-	-	Claimed CBI	-
	CO_2	21,726	-	5,000	3,158	108.63	951.59	239.49	1,048.95	-	-	Claimed CBI	-
	CH_4	0.4	-	5,000	3,158	2.05E-03	0.02	4.51E-03	0.02	-	-	Claimed CBI	-
	N_2O	0.04	-	5,000	3,158	2.05E-04	1.79E-03	4.51E-04	1.96E-03	-	-	Claimed CBI	-
	CO_2e	-	-	5,000	3,158	108.74	952.57	239.73	1,050.03	-	-	-	-

Roxul USA Inc.
Ranson, West Virginia
Source ID: Rockfon Line (RFN1) Emissions

						METRIC		US					
Roxul Source ID	**Source Description**	**Concentration**		**Flow Rate**		**Hourly Emission**	**Annual Emission**	**Hourly Emission**	**Annual Emission**	**Modeled Emission Rate[4]**		**Notes**	**Control Device**
-	**Pollutants**	(mg/Nm³)	(gr/scf)	(Nm³/h)	(scfm)	(kg/hr)	(tonne/yr)	(lb/hr)	(ton/year)	(g/s)	Averaging Period	-	-
RFN-E5	Rockfon - Spray Paint Cabin	-	-	-	-	-	-	-	-	-	-	-	-
	Filterable PM	20	0.0081	10,000	6,317	0.20	1.75	0.44	1.93	-	-	Note 1, Note 2 (1)	Particulate Filter
	Filterable PM_{10}	20	0.0081	10,000	6,317	0.20	1.75	0.44	1.93	-	-	Note 1	Particulate Filter
	Filterable $PM_{2.5}$	10	0.0041	10,000	6,317	0.10	0.88	0.22	0.97	-	-	Note 1	Particulate Filter
	Condensable PM	-	-	10,000	6,317	0.20	1.75	0.44	1.93	-	-	Note 1	-
	Total PM_{10}	-	-	10,000	6,317	0.40	3.50	0.88	3.86	1.11E-01	24-hr, Annual	Note 1	Particulate Filter
	Total $PM_{2.5}$	-	-	10,000	6,317	0.30	2.63	0.66	2.90	8.33E-02	24-hr, Annual	Note 1	Particulate Filter
	VOC	-	-	10,000	6,317	*See combined limit*		*See combined limit*		-	-	-	-
	Formaldehyde	1	-	10,000	6,317	0.01	0.09	0.02	0.10	-	-	Note 2 (1)	-
	Mineral Fiber	-	-	10,000	6,317	0.20	1.75	0.44	1.93	-	-	Note 3	Particulate Filter
	Phenol	1	-	10,000	6,317	0.03	0.22	0.06	0.24	-	-	Note 2 (1)	-
	Total HAPs	-	-	10,000	6,317	0.23	2.06	0.52	2.27	-	-	-	-
RFN-E6	Rockfon - Drying Oven 2 & 3	-	-	-	-	-	-	-	-	-	-	-	-
	Filterable PM	2.38	0.0010	12,000	7,580	0.03	0.25	0.06	0.28	-	-	Note 1, Note 2 (1)	Particulate Filter
	Filterable PM_{10}	2.38	0.0010	12,000	7,580	0.03	0.25	0.06	0.28	-	-	Note 1	Particulate Filter
	Filterable $PM_{2.5}$	1.19	0.0005	12,000	7,580	0.01	0.13	0.03	0.14	-	-	Note 1	Particulate Filter
	Condensable PM	-	-	12,000	7,580	0.03	0.25	0.06	0.28	-	-	Note 1	-
	Total PM_{10}	-	-	12,000	7,580	0.06	0.50	0.13	0.55	1.59E-02	24-hr, Annual	Note 1	Particulate Filter
	Total $PM_{2.5}$	-	-	12,000	7,580	0.04	0.38	0.09	0.41	1.19E-02	24-hr, Annual	Note 1	Particulate Filter
	NO_x	17.6	-	12,000	7,580	0.21	1.85	0.47	2.04	5.87E-02	1-hr, Annual	Claimed CBI	-
	CO	14.8	-	12,000	7,580	0.18	1.55	0.39	1.71	4.93E-02	1-hr, 8-hr	Claimed CBI	-
	SO_2	0.1	-	12,000	7,580	1.27E-03	0.01	2.79E-03	0.01	3.52E-04	1-hr, 3-hr, 24-hr, Annual	Claimed CBI	-
	VOC	-	-	12,000	7,580	*See combined limit*		*See combined limit*		-	-	-	-
	Formaldehyde	2	-	12,000	7,580	0.02	0.21	0.05	0.23	-	-	Note 2 (1)	-
	Hexane	0.3	-	12,000	7,580	3.80E-03	0.03	0.01	0.04	-	-	Claimed CBI	-
	Lead	8.80E-05	-	12,000	7,580	1.06E-06	9.25E-06	2.33E-06	1.02E-05	-	-	Claimed CBI	-
	Mineral Fiber	-	-	12,000	7,580	0.03	0.25	0.06	0.28	-	-	Note 3	Particulate Filter
	Phenol	1	-	12,000	7,580	0.01	0.11	0.03	0.12	-	-	Note 2 (1)	-
	Total HAPs	5.7	-	12,000	7,580	0.07	0.60	0.15	0.66	-	-	Claimed CBI	-
	CO_2	21,122	-	12,000	7,580	253.47	2,220.37	558.80	2,447.54	-	-	Claimed CBI	-
	CH_4	0.4	-	12,000	7,580	4.78E-03	0.04	0.01	0.05	-	-	Claimed CBI	-
	N_2O	0.04	-	12,000	7,580	4.78E-04	4.18E-03	1.05E-03	4.61E-03	-	-	Claimed CBI	-
	CO_2e	-	-	12,000	7,580	253.73	2,222.67	559.36	2,450.07	-	-	-	-
RFN-E7	Rockfon - Cooling Zone	-	-	-	-	-	-	-	-	-	-	-	-
	Filterable PM	1.75	0.0007	25,000	15,792	0.04	0.38	0.10	0.42		-	Note 1, Note 2 (1)	-
	Filterable PM_{10}	1.75	0.0007	25,000	15,792	0.04	0.38	0.10	0.42	-	-	Note 1	-
	Filterable $PM_{2.5}$	0.875	0.0004	25,000	15,792	0.02	0.19	0.05	0.21	-	-	Note 1	-
	Condensable PM	-	-	25,000	15,792	0.04	0.38	0.10	0.42	-	-	Note 1	-
	Total PM_{10}	-	-	25,000	15,792	0.09	0.77	0.19	0.84	2.43E-02	24-hr, Annual	Note 1	-
	Total $PM_{2.5}$	-	-	25,000	15,792	0.07	0.57	0.14	0.63	1.82E-02	24-hr, Annual	Note 1	-
	VOC	-	-	25,000	15,792	*See combined limit*		*See combined limit*		-	-	-	-
	Formaldehyde	1	-	25,000	15,792	0.03	0.22	0.06	0.24	-	-	Note 2 (1)	-
	Mineral Fiber	-	-	25,000	15,792	0.04	0.38	0.10	0.42	-	-	Note 3	-
	Phenol	1	-	25,000	15,792	0.03	0.22	0.06	0.24	-	-	Note 2 (1)	-
	Total HAPs	-	-	25,000	15,792	0.09	0.82	0.21	0.91	-	-	-	-
RFN-E1 RFN-E2	IR Zone Hot Press & Cure	-	-	-	-	-	-	-	-	-	-	-	-
	VOC	-	-	-	-	0.77	6.78	1.71	7.48	-	-	Claimed CBI	-
RFN-E4 RFN-E3 RFN-E8 RFN-E6 RFN-E7 RFN-E5	Drying Oven 1 High Oven A High Oven B Drying Oven 2 & 3 Cooling Zone Spray Paint Cabin	-	-	-	-	-	-	-	-	-	-	-	-
	VOC	-	-	-	-	3.18	27.84	7.01	30.69	-	-	Claimed CBI	-

Notes:

1. Filterable PM_{10} is conservatively assumed to be equal to PM, Filterable $PM_{2.5}$ is assumed to equal 50% of PM. Condensable PM is equal to Filterable PM. For clarity,
   Total PM10 = Filterable PM10 + Condensable PM.
   Total PM2.5 = Filterable PM2.5 + Condensable PM
2. Calculation Method References/ Example Calculations:
   1 - Stack Testing from similar facility, scaled as appropriate to RAN process.
   Claimed Confidential

   4-Sum of organic HAP
3. Mineral Fiber emissions were conservatively assumed equal to Filterable PM_{10} emissions for sources that may contain rock wool fibers. The listed HAP, fine mineral fibers includes mineral fiber emissions from facilities manufacturing or processing glass, rock, or slag fibers (or other mineral derived fibers) of average diameter 1 micrometer or less.
4. Maximum g/s emissions do not vary based on model averaging period (i.e., a source permitted to operate at maximum capacity 24 hr/day, 365 day/year).

Sample Calculations:
Hourly Emissions (kg/hr) = Fan Flow Rate (Nm3/hr) * Exhaust Concentration (mg/Nm3) * 1,000,000 (mg/kg)^-1
Hourly Emission Rate Filterable PM = Concentration PM (gr/scf)*(1 lb/7,000 grains)*Flow Rate (scfm)* (60 min/hr)
Hourly Emissions (lb/hr) = Hourly Emissions (kg/hr) *2.20462 (lb/kg)
Annual Emissions (ton/yr) = Hourly Emission Rate (lb/hr)*8,760 (hr/yr) / 2,000 (lb/ton)
Annual Emissions (tonne/yr) = Hourly Emissions (kg/hr) * 8,760 (hr/yr) / 1,000 (kg/tonne)
CO2 Equivalent (CO2e) = CO2 + [GWP_{CH4} * CH4)] + [GWP_{N2O} * N2O]
Modeled Emission Rate (g/s) (for all Averaging Periods) = Hourly Emissions (lb/hr) * 453.59 (g/lb) / 3,600 (sec/hr)

Roxul USA Inc.
Ranson, West Virginia
Source ID: Natural Gas Boilers (CM03, CM04) & Rockfon Building Heat (RFN10)

Operating Parameters, PER BOILER

Maximum Heat Input	1,500	kw
Capacity	5.12	MMBtu/hr
Operating Hours	8,760	hr/yr
Fuel Type	Natural Gas	
Fuel HHV	1,026	MMbtu/MMscf

EMISSIONS SHOWN FOR AN INDIVIDUAL EMISSION POINT (PER BOILER)

Maximum Potential Emissions[1,2]

Pollutant	Emission Factor		US Hourly Emissions Per Source	US Annual Emissions Per Source	METRIC Hourly Emissions Per Source	METRIC Annual Emissions Per Source	Modeled Emission Rate[4]	
	(lb/MMscf)	(lb/MMbtu)	(lb/hr)	(ton/yr)	(kg/hr)	(tonne/yr)	(g/s)	Averaging Period
NO_x	36.21	0.0353	0.18	0.79	0.08	0.72	2.28E-02	1-hr, Annual
SO_2	0.6	0.0006	3.00E-03	0.01	1.36E-03	0.01	3.77E-04	1-hr, 3-hr, 24-hr, Annual
$PM/PM_{10F}/PM_{2.5F}$	1.9	0.0019	0.01	0.04	4.30E-03	0.04	-	-
$PM_{10T}/PM_{2.5T}$	7.6	0.0074	0.04	0.17	0.02	0.15	4.78E-03	24-hr, Annual
Condensable PM	5.7	0.0056	0.03	0.12	0.01	0.11	-	-
CO	84	0.0819	0.42	1.84	0.19	1.67	5.28E-02	1-hr, 8-hr
VOC	5.5	0.0054	0.03	0.12	0.01	0.11	-	-
Lead	0.0005	4.87E-07	2.50E-06	1.09E-05	1.13E-06	9.92E-06	-	-
Hexane	1.8	0.0018	0.01	0.04	0.00	0.04	-	-
Total HAPs	1.89	0.0018	0.01	0.04	4.28E-03	0.04	-	-
CO_2	-	116.98	599.25	2624.70	271.81	2,381.09	-	-
CH_4	-	2.20E-03	0.01	0.05	5.12E-03	0.04	-	-
N_2O	-	2.20E-04	1.13E-03	4.95E-03	5.12E-04	4.49E-03	-	-
CO_2e[3]	-	-	599.87	2,627.41	272.09	2,383.55	-	-

Notes:
ton = short tons
tonne = metric tons
1. Natural Gas emission factor source AP-42 Table 1.4-1, 1.4-2, 1.4-3, and 1.4-4 for SO_2, PM_{10T}, $PM_{2.5T}$, CO, VOC, Lead, Hexane, Total HAPs, Chromium. GHG emission factors per 40 CFR Part 98, Table C-1 and C-2. GWPs per 40 CFR 98, Table A-1. NO_X emission factor based on 30 ppmvd @ 3% O2 per manufacturer specification.
2. PM_{10T} and $PM_{2.5T}$ emission factors include filterable and condensable particulate matter.
3. CO_2 Equivalent (CO_2e) lb/hr, ton/yr = CO_2 + [GWP_{CH4} * CH_4)] + [GWP_{N2O} * N_2O].
4. Maximum g/s emissions do not vary based on model averaging period (i.e., a source permitted to operate at maximum capacity 24 hr/day, 365 day/yea

Sample Calculations:
Hourly Emissions (lb/hr) = Emission Factor (lb/MMBtu) * Maximum Heat Input Capacity (MMBtu/hr)
Annual Emissions (ton/yr) = Hourly Emissions (lb/hr) * 8,760 (hr/yr) / 2,000 (lb/ton)
Hourly Emissions (kg/hr) = Hourly Emissions (lb/hr) * 0.4535924 kg/lb
Annual Emissions (tonne/yr) = Hourly Emissions (kg/hr) * 8,760 (hr/yr) / 1,000 (kg/tonne)
Modeled Emission Rate (g/s) [for all Averaging Periods] = Hourly Emissions (lb/hr) * 453.59 (g/lb) / 3,600 (sec/hr)

Roxul USA Inc.
Ranson, West Virginia
Source ID: Emergency Fire Pump Engine (EFP1)

Operating Parameters, per fire pump engine

Fuel type	Diesel		0.0015% Sulfur
	197	hp	
Maximum Firing Rate	147	kw	
	1.38	MMBtu/hr	
Operating hours	500	hr/yr	

Maximum Potential Emissions

Pollutant	Emission Factor			US		METRIC		Modeled Emission Rate[5]		Class I AQRV Analysis (Q/d)[6]
				Hourly Emissions	Annual Emissions	Hourly Emissions	Annual Emissions			
	g/kw-hr	lb/hp-hr	Source	(lb/hr)	(ton/yr)	(kg/hr)	(tonne/yr)	(g/s)	Averaging Period	ton/yr
Filterable PM/PM_{10}/$PM_{2.5}$[1]	0.2	3.29E-04	NSPS IIII, Table 4 (0.20 g/kw-hr)	0.06	0.02	0.03	0.01	-	-	-
PM_{10T}	-	3.83E-04	Filterable + Condensable	0.08	0.02	0.03	0.02	5.42E-04 1.98E-04	Annual 24-hr	0.33
$PM_{2.5T}$	-	3.83E-04	Filterable + Condensable	0.08	0.02	0.03	0.02	5.42E-04 1.98E-04	Annual 24-hr	-
Condensable PM[2]	-	5.39E-05	AP-42, Tbl. 3.4-2	0.01	2.65E-03	4.82E-03	2.41E-03	-	-	-
NO_x[4]	4.0	6.576E-03	NSPS IIII, Table 4 (4.0 g/kw-hr NOx+NMHC)	1.30	0.32	0.59	0.29	8.32E-03 intermittent excluded	Annual 1-hr	5.67
CO	3.5	5.754E-03	NSPS IIII, Table 4 (3.5 g/kw-hr)	1.13	0.28	0.51	0.26	7.14E-02	1-hr, 8-hr	-
SO_2	-	1.09E-05	Mass Balance	2.14E-03	5.36E-04	9.72E-04	4.86E-04	4.50E-05 intermittent excluded	3-hr, 24-hr, Annual 1-hr	0.01
Combustion VOC	0.6	9.86E-04	15% of NSPS IIII, Table 4 (4.0 g/kw-hr NOx + NMHC)	0.19	0.05	0.09	0.04	-	-	-
Total HAPs[2]	-	2.71E-05	AP-42, ($3.87x10^{-3}$ lb/MMBtu)	5.34E-03	1.34E-03	2.42E-03	1.21E-03	-	-	-
CO_2	-	1.14	40 CFR 98, Tbl C-1 (73.96 kg/MMBtu)	224.65	56.16	101.90	50.95	-	-	-
CH_4	-	4.63E-05	40 CFR 98, Tbl C-2 (3.0x10-3 kg/MMBtu)	9.11E-03	2.28E-03	4.13E-03	2.07E-03	-	-	-
N_2O	-	9.25E-06	40 CFR 98, Tbl C-2 (6.0x10-4 kg/MMBtu)	1.82E-03	4.56E-04	8.27E-04	4.13E-04	-	-	-
CO_2e[3]	-	-	-	225.42	56.36	102.25	51.12	-	-	-

Notes:
ton = short tons
tonne = metric tons
1. Conservatively assuming PM= PM_{10}, $PM_{2.5}$
2. Per AP-42, used average brake specific fuel consumption of 7,000 Btu/hp-hr to convert lb/MMBtu emission factors to lb/hp-hr.
3. CO_2 Equivalent (CO_2e) lb/hr, ton/yr = CO_2 + [GWP_{CH4} * CH_4)] + [GWP_{N2O} * N_2O]. GWPs per 40 CFR 98, Table A-1 [CO_2 = 1, CH_4 = 25, N_2O = 298].
4. Conservatively assumed all NSPS NOx + NMHC limit emitted as NO_X.
5. The Emergency Fire Pump will assume 100 hours of operation per year for testing and readiness purposes. As an intermittant source it would not be included in the 1-hr NO_x and SO_2 analyses as recommended by EPA (EPA Memorandum March 16, 2011). For the 1-hr and 8-hr CO, 24-hr PM_{10}/$PM_{2.5}$, and 3-hr and 24-hr SO_2 analyses, the Emergency Fire Pump will be modeled assuming emission rates conservatively based on an operation schedule of 1/2 hour per day. Modeled emissions for the 24-hr and annual SO_2 standard were conservatively set equal to the modeled 3-hr SO_2 emissions. Modeled emissions for the 8-hr CO standard were conservatively set equal to the modeled 1-hr CO emissions.

6. For Q/d screening tool, the annual steady-state-equivalent emission rate (Q) was determined. For example Q_{NOX} (tpy) = NOx @ 500 hr/yr (tpy) * [8,760 (hr/yr) / 500 (hr/yr)].
Sample Calculations:
Hourly Emissions (lb/hr) = Emission Factor (lb/hp-hr) * Maximum Firing Rate (hp)
Annual Emissions (ton/yr) = Hourly Emissions (lb/hr) * 500 (hr/yr) / 2,000 (lb/ton)
Hourly Emissions (kg/hr) = Hourly Emissions (lb/hr) * 0.4535924 kg/lb
Annual Emissions (tonne/year) = Annual Emissions (ton/year) * 0.9071847 tonne/ton
SO_2 3-hr, 24-hr, Annual Emission Rate (g/s) = Hourly Emissions (lb/hr) / 2 [per 0.5 hr/day assumption] / 3-hr model averaging period * 453.59 (g/lb) / 3,600 (sec/hr)
CO Modeled 1-hr, 8-hr Emission Rate (g/s) = Hourly Emissions (lb/hr) / 2 [per 0.5 hr/day assumption] * 453.59 (g/lb) / 3,600 (sec/hr)
PM_{10}/$PM_{2.5}$ Modeled 24-hr Emission Rate (g/s) = Daily Emissions (lb/hr) / 2 [per 0.5 hr/day assumption] / 24-hr model averaging period * 2,000 (lb/ton) * 453.59 (g/lb) / 3,600 (sec/hr)
PM_{10}/$PM_{2.5}$/NO_x Modeled Annual Emission Rate (g/s) = Annual Emissions (ton/yr) [based on 500 hr/yr] / 8,760 (hr/yr) * 2,000 (lb/ton) * 453.59 (g/lb) / 3,600 (sec/hr)

Roxul USA Inc.
Ranson, West Virginia
Source ID: Facility-wide Fugitive Emissions from Paved Haul Roads

Emission Estimate For Paved Haulroads[1]

k =	PM particle size multiplier ((lb/VMT))	0.011
k_{10} =	PM10 particle size multiplier ((lb/VMT))	0.0022
$k_{2.5}$ =	PM2.5 particle size multiplier ((lb/VMT))	0.00054
$sL_{finishedprod}$[2] =	Finished product road surface silt loading, (g/m^2)	0.2
sL_{rawmat}[3] =	Raw materials road surface silt loading, (g/m^2)	8.2
W[4] =	Mean Vehicle Weight (tons)	see table
P[4] =	Number of days per year with precipitation >0.01 inch	148
N =	Number of days in averaging period	365
CE[5]	Control Efficiency, %	75%
-	Maximum Weeks of Operation per year:	52
-	Hours of Operation per year:	8,760

US Units

Item No.	Description	Empty Vehicle Weight	Load	PM-2.5						PM10
				controlled Emissions		Controlled Emissions		Total Modeled Emission Rate[1]		Class I AQRV Analysis (Q/d)
		(tons)	(t	day)	(ton/year)	(ton/day)	(ton/year)	24-hr (g/s)	Annual (g/s)	ton/yr
1	Truck - Oil	Claimed Confidential	Claimed Confidential	E-05	9.03E-04	4.34E-06	2.26E-04	4.56E-05	6.50E-06	0.01
2	Truck - Oxygen			E-05	0.01	8.95E-06	2.56E-03	9.40E-05	7.36E-05	0.01
3	Truck - Raw Material (Stone) to 210			E-04	0.13	1.43E-04	0.03	1.50E-03	9.67E-04	0.21
4	Truck - Coal/PET Coke			E-05	0.02	1.56E-05	4.46E-03	1.64E-04	1.28E-04	0.02
5	Truck - DeSOx and Binder			E-05	0.01	1.03E-05	2.94E-03	1.08E-04	8.45E-05	0.02
6	Truck - Waste			E-05	4.52E-03	3.95E-06	1.13E-03	4.15E-05	3.25E-05	0.01
7	Truck - Pallet and Foil			E-06	1.48E-03	1.29E-06	3.69E-04	1.36E-05	1.06E-05	1.92E-03
8	Truck - Finished Goods			E-05	0.01	1.09E-05	3.11E-03	1.14E-04	8.94E-05	0.02
9[4]	FEL - Diverted Melt from Bldg 300 to Pit Waste (170)			[illegible]	0.10	1.41E-04	0.03	[illegible]	[illegible]	0.21
10[4]	FEL - Crushed Melt from 170 to 210			E-04	0.04	5.22E-05	0.01	5.48E-04	2.74E-04	0.08
11[4]	FEL - Coal/PET Coke from Bunker to Feed Hopper (for Milling)			E-06	2.90E-03	2.18E-06	7.28E-04	2.29E-05	2.09E-05	3.24E-03
12[4]	FEL - Raw Material from 210 to Feed Hopper			E-04	0.06	3.97E-05	0.01	4.16E-04	4.16E-04	0.06
13[4]	FEL - Raw Material from Stockpile to 210			E-04	0.02	1.43E-04	0.01	1.50E-03	1.49E-04	0.21
14	Truck - Raw Material from Stockpile to 210 (add'l miles over Item 3)			E-04	0.01	8.89E-05	3.22E-03	9.33E-04	9.26E-05	0.13
				03	0.41	6.50E-04	0.10	6.83E-03	2.96E-03	0.97
				E-06	2.90E-03	2.18E-06	7.28E-04	2.29E-05	2.09E-05	3.24E-03
				E-05	0.01	1.22E-05	3.48E-03	1.28E-04	1.00E-04	0.02

Source	Pollutant	No. of Modeled Segments	PE
Raw Material Paved Haul Roads	PM-10	31	8.9
	PM-2.5		2.2
Finished Products Paved Haul Roads	PM-10	35	1.4
	PM-2.5		3.6

Metric Units

Item No.	Description	Empty Vehicle Weight	Load W	PM-2.5					
				ntrolled Emissions		Controlled Emissions		Total Modeled Emission Rate	
		(tonnes)	(t	day)	(tonne/year)	(tonne/day)	(tonne/year)	24-hr (g/s)	Annual (g/s)
1	Truck - Oil	Claimed Confidential	Claimed Confidential	-05	8.20E-04	3.94E-06	2.05E-04		
2	Truck - Oxygen			-05	0.01	8.12E-06	2.32E-03		
3	Truck - Raw Material (Stone) to 210 or Stockpile			-04	0.12	1.29E-04	0.03		
4	Truck - Coal/PET Coke			-05	0.02	1.42E-05	4.05E-03		
5	Truck - DeSOx and Binder			-05	0.01	9.31E-06	2.66E-03		
6	Truck - Waste			-05	4.10E-03	3.58E-06	1.02E-03		
7	Truck - Pallet and Foil			-06	1.34E-03	1.17E-06	3.35E-04		
8	Truck - Finished Goods			-05	0.01	9.85E-06	2.82E-03		
9	FEL - Diverted Melt from Bldg 300 to Pit Waste (170)			[illegible]	0.09	[illegible]	[illegible]		
10	FEL - Crushed Melt from 170 to 210			-04	0.03	4.73E-05	0.01		
11	FEL - Coal/PET Coke from Bunker to Feed Hopper (for Milling)			-06	2.63E-03	1.98E-06	6.59E-04		
12	FEL - Raw Material from 210 to Feed Hopper			-04	0.05	3.60E-05	0.01		
13	FEL - Raw Material from Stockpile to 210			-04	0.02	1.30E-04	4.70E-03		
14	Truck - Raw Material from Stockpile to 210 (add'l miles over Item 3)			-04	0.01	8.08E-05	2.92E-03		
				2	0.37	5.90E-04	0.09		
				-06	2.63E-03	1.98E-06	6.59E-04		
				-05	0.01	1.10E-05	3.15E-03		

Notes:
ton = short tons
tonne = metric tons
FEL = front end loader
1. Modeled emission rates in gray are not modeled as a total, but divided out among the number of segme
2. Maximum Trips per Day, Maximum Trips per Year, and Load Carried Weight by truck are based on dat
3. Loaded vehicle weight is a sum of empty vehicle weight and load carried weight, unless the sum is grea
4. FEL empty vehicle weight based on operating weight of a Cat 930K Wheel Loader Standard Lift. FEL l
5. For Q/d screening tool, the annual steady-state-equivalent emission rate (Q) was determined based on
Sample Calculations:
Uncontrolled Daily Emissions (ton/day) = E (lb/VMT) * Miles per trip * Max trips per day / 2000 (lb/ton)
Uncontrolled Yearly Emissions (ton/year) = E (lb/VMT) * Miles per trip * Max trips per year / 2000 (lb/ton)
Controlled Daily/Yearly Emissions (ton/day, ton/year) = Uncontrolled Daily/Yearly Emissions (ton/day, ton/
Uncontrolled/Controlled Daily/Yearly Emissions (ton/day, ton/year) = Uncontrolled/Controlled Daily/Yearly
Modeled 24-hr Emission Rate (g/s) = Daily Emissions (ton/day) / 24 (hr/day) [for 24-hr model averaging pe
Modeled Annual Emission Rate (g/s) = Annual Emissions (ton/yr) / 8,760 (hr/yr) [for annual model averagi

Rosul USA Inc.
Ranson, West Virginia
Source ID: Facility-wide Fugitive Emissions from Paved Haul Roads

Emission Estimate For Paved Haulroads[1]

k =	PM particle size multiplier (lb/VMT)	0.011
k_{10} =	PM10 particle size multiplier (lb/VMT)	0.0022
$k_{2.5}$ =	PM2.5 particle size multiplier (lb/VMT)	0.00054
$sL_{finished\ goods}$[2] =	Finished product road surface silt loading, (g/m^2)	0.7
$sL_{raw\ material}$[3] =	Raw materials road surface silt loading, (g/m^2)	8.2
W[6] =	Mean Vehicle Weight (tons)	see table
P[4] =	Number of days per year with precipitation >0.01 inch	148
N =	Number of days in averaging period	365
CE[5]	Control Efficiency, %	75%
-	Maximum Weeks of Operation per year	52
-	Hours of Operation per year	8,760

Notes:
1. Paved haulroads emission factor equation per AP-42 Ch. 13.2.1.3 Equation 2, January 2011)
2. Finished product road surface silt loading based on AP-42 Table 13.2.1-2 Ubiquitous Silt Loading Default Values with Hot Spot Contributions from Anti-Skid Abrasives, ADT Category 500-5,000.
3. Raw materials road surface silt loading based on AP-42 Table 13.2.1-3 Typical Silt Content and Loading Values for Paved Roads at Industrial Facilities, Quarry Industry.
4. Number of days per year with precipitation greater than 0.01 inch based on Table B - Precipitation Zones in West Virginia in Application Instructions and Forms for General Permit G40-C by West Virginia Department of Environmental Protection.
5. Control Efficiency conservatively estimated due to paved road sweeping.
6. Mean vehicle weight is an average of the empty vehicle weight and loaded vehicle weight.

Sample Calculations
E (lb/vehicle mile traveled (VMT)) = [k * (sL)^0.91 * (W)^1.02] * (1 - (P/4N))

US Units

Item No.	Description	Empty Vehicle Weight (tons)	Load Carried Weight[2] (tons)	Loaded Vehicle Weight[3] (tons)	W, Mean Vehicle Weight (tons)	Miles per Trip	Maximum Trips Per Day, Per Year[2]	PM Uncontrolled Emission Factor (lb/VMT)	PM Uncontrolled Emissions (ton/day)	PM Uncontrolled Emissions (ton/year)	PM Controlled Emissions (ton/day)	PM Controlled Emissions (ton/year)	PM-10 Uncontrolled Emission Factor (lb/VMT)	PM-10 Uncontrolled Emissions (ton/day)	PM-10 Uncontrolled Emissions (ton/year)	PM-10 Controlled Emissions (ton/day)	PM-10 Controlled Emissions (ton/year)	PM-10 Total Modeled Emission Rate[1] 24-hr (g/s)	PM-10 Total Modeled Emission Rate[1] Annual (g/s)	PM-2.5 Uncontrolled Emission Factor (lb/VMT)	PM-2.5 Uncontrolled Emissions (ton/day)	PM-2.5 Uncontrolled Emissions (ton/year)	PM-2.5 Controlled Emissions (ton/day)	PM-2.5 Controlled Emissions (ton/year)	PM-2.5 Total Modeled Emission Rate 24-hr (g/s)	PM-2.5 Total Modeled Emission Rate Annual (g/s)	PM10 Class I AQRV Analysis (Q/d) (ton/yr)
1	Truck - Oil	Claimed Confidential	Claimed Confidential	Claimed Confidential	Claimed Confidential	0.46	Claimed Confidential	Claimed Confidential	[illegible]	[illegible]	[illegible]	[illegible]	Claimed Confidential	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Claimed Confidential	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
2	Truck - Oxygen					0.46			[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
3	Truck - Raw Material (Stone) to 210					0.46			[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
4	Truck - Coal/PET Coke					0.46			[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
5	Truck - DeSOx and Binder					0.46			[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
6	Truck - Waste					0.46			[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7	Truck - Pallet and Foil					0.76			[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
8	Truck - Finished Goods					0.76			[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
9[4]	FEL - Diverted Melt from Bldg 300 to Pit Waste (170)					[illegible]			[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
10[4]	FEL - Crushed Melt from 170 to 210					0.1			[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
11[4]	FEL - Coal/PET Coke from Bunker to Feed Hopper (for Milling)					0.02			[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
12[4]	FEL - Raw Material from 210 to Feed Hopper					0.06			[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
13[4]	FEL - Raw Material from Stockpile to 210					0.16			[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
14	Truck - Raw Material from Stockpile to 210 (add'l miles over Item 3)					0.27			[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	TOTAL Raw Material (Item 1-6, 9-10, 12-14)								[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	TOTAL FEL - Coal/PET Coke from Bunker to Feed Hopper (for Milling) (Item 11)								[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	TOTAL Finished Products (Items 7-8)								[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Source	Pollutant	No. of Modeled Segments	PER SEGMENT Modeled Emission Rates[1] 24-hr (g/s)	PER SEGMENT Modeled Emission Rates[1] Annual (g/s)
Raw Material Paved Haul Roads	PM-10	31	8.98E-04	3.90E-04
	PM-2.5		2.20E-04	9.56E-05
Finished Products Paved Haul Roads	PM-10	30	1.40E-05	1.16E-05
	PM-2.5		3.50E-06	2.86E-06

Metric Units

Item No.	Description	Empty Vehicle Weight (tonnes)	Load Carried Weight (tonnes)	Loaded Vehicle Weight (tonnes)	W, Mean Vehicle Weight (tonnes)	km per Trip	Maximum Trips Per Day, Per Year	PM Uncontrolled Emission Factor (kg/VMT)	PM Uncontrolled Emissions (tonne/day)	PM Uncontrolled Emissions (tonne/year)	PM Controlled Emissions (tonne/day)	PM Controlled Emissions (tonne/year)	PM-10 Uncontrolled Emission Factor (kg/VMT)	PM-10 Uncontrolled Emissions (tonne/day)	PM-10 Uncontrolled Emissions (tonne/year)	PM-10 Controlled Emissions (tonne/day)	PM-10 Controlled Emissions (tonne/year)	PM-10 Total Modeled Emission Rate 24-hr (g/s)	PM-10 Total Modeled Emission Rate Annual (g/s)	PM-2.5 Uncontrolled Emission Factor (kg/VMT)	PM-2.5 Uncontrolled Emissions (tonne/day)	PM-2.5 Uncontrolled Emissions (tonne/year)	PM-2.5 Controlled Emissions (tonne/day)	PM-2.5 Controlled Emissions (tonne/year)	PM-2.5 Total Modeled Emission Rate 24-hr (g/s)	PM-2.5 Total Modeled Emission Rate Annual (g/s)
1	Truck - Oil	Claimed Confidential	Claimed Confidential	Claimed Confidential	Claimed Confidential	0.74	Claimed Confidential	Claimed Confidential	[illegible]	[illegible]	[illegible]	[illegible]	Claimed Confidential	[illegible]	[illegible]	[illegible]	[illegible]			Claimed Confidential	[illegible]	[illegible]	[illegible]	[illegible]		
2	Truck - Oxygen					0.74			[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]				[illegible]	[illegible]	[illegible]	[illegible]		
3	Truck - Raw Material (Stone) to 210 or Stockpile					0.74			[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]				[illegible]	[illegible]	[illegible]	[illegible]		
4	Truck - Coal/PET Coke					0.74			1.15E-03	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]				[illegible]	[illegible]	[illegible]	[illegible]		
5	Truck - DeSOx and Binder					0.74			7.59E-04	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]				[illegible]	[illegible]	[illegible]	[illegible]		
6	Truck - Waste					0.74			2.92E-04	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]				[illegible]	[illegible]	[illegible]	[illegible]		
7	Truck - Pallet and Foil					1.22			[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]				[illegible]	[illegible]	[illegible]	[illegible]		
8	Truck - Finished Goods					1.22			[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]				[illegible]	[illegible]	[illegible]	[illegible]		
9	FEL - Diverted Melt from Bldg 300 to Pit Waste (170)					[illegible]			[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]				[illegible]	[illegible]	[illegible]	[illegible]		
10	FEL - Crushed Melt from 170 to 210					0.16			[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]				[illegible]	[illegible]	[illegible]	[illegible]		
11	FEL - Coal/PET Coke from Bunker to Feed Hopper (for Milling)					0.03			[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]				[illegible]	[illegible]	[illegible]	[illegible]		
12	FEL - Raw Material from 210 to Feed Hopper					0.10			[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]				[illegible]	[illegible]	[illegible]	[illegible]		
13	FEL - Raw Material from Stockpile to 210					0.26			0.01	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]				[illegible]	[illegible]	[illegible]	[illegible]		
14	Truck - Raw Material from Stockpile to 210 (add'l miles over Item 3)					0.43			[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]				[illegible]	[illegible]	[illegible]	[illegible]		
	TOTAL Raw Material (Item 1-6, 9-10, 12-14)								0.06	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]				[illegible]	[illegible]	[illegible]	[illegible]		
	TOTAL FEL - Coal/PET Coke from Bunker to Feed Hopper (for Milling) (Item 11)								[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]				[illegible]	[illegible]	[illegible]	[illegible]		
	TOTAL Finished Goods (Items 7-8)								[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]				[illegible]	[illegible]	[illegible]	[illegible]		

Notes:
ton = short tons
tonne = metric tons
FEL = front end loader
1. Modeled emission rates in gray are not modeled as a total, but divided out among the number of segments modeled.
2. Maximum Trips per Day, Maximum Trips per Year, and Load Carried Weight by truck are based on data from a similar Rockwool facility.
3. Loaded vehicle weight is a sum of empty vehicle weight and load carried weight, unless the sum is greater than 40 tons, which is the maximum loaded vehicle weight per the Department of Transportation (23 CFR 658.17).
4. FEL empty vehicle weight based on operating weight of a Cat 930K Wheel Loader Standard Lift. FEL load carried weight based on Cat 930K Wheel Loader General Purpose bucket capacity, throughput from a similar Rockwool facility, and the approximate weight of basalt rock per cubic yard by Pacific Mountain Masonry.
5. For Q/d screening tool, the annual steady-state equivalent emission rate (Q) was determined based on maximum daily emissions. For example Q PM10 (tpy) = PM10 (ton/day) * 365 (day/yr)
Sample Calculations
Uncontrolled Daily Emissions (ton/day) = E (lb/VMT) * Miles per trip * Max trips per day / 2000 (lb/ton)
Uncontrolled Yearly Emissions (ton/year) = E (lb/VMT) * Miles per trip * Max trips per year / 2000 (lb/ton)
Controlled Daily/Yearly Emissions (ton/day, ton/year) = Uncontrolled Daily/Yearly Emissions (ton/day, ton/year) * (1 - Control Efficiency (%))
Uncontrolled/Controlled Daily/Yearly Emissions (tonne/day, tonne/year) = Uncontrolled/Controlled Daily/Yearly Emissions (ton/day, ton/year) * 0.9071847 tonne/ton
Modeled 24-hr Emission Rate (g/s) = Daily Emissions (ton/day) / 24 (hr/day) [for 24-hr model averaging period] * 2,000 (lb/ton) * 453.59 (g/lb) / 3,600 (sec/hr)
Modeled Annual Emission Rate (g/s) = Annual Emissions (ton/yr) / 8,760 (hr/yr) [for annual model averaging period] * 2,000 (lb/ton) * 453.59 (g/lb) / 3,600 (sec/hr)

Roxul USA Inc.
Ranson, West Virginia
Source ID: Facility-wide Storage Tanks

Roxul Source ID	Description	Material Stored	Tank Orientation	Capacity (m³)	Capacity (gal)	Height (m)	Height (ft)	Diameter (m)	Diameter (ft)	Throughput (tons/yr)	Throughput (gal/yr)	Fill Method	Roof Type	Temp Controlled[2]	Storage Temperature (deg C)	Storage Temperature (deg F)	Pressurized? (Y, N)
TK-DF	One (1) Diesel Fuel Horizontal Storage Tank (10 m3, 2,642 gal)	Diesel Fuel	Horizontal	10	2,642	2.9	9.4	2.0	6.5	Claimed Confidential		Splash Pump	Flat	No	Ambient	Ambient	No
TK-UO	One (1) Used Oil Horizontal Storage Tank (5 m3, 1,321 gal)	Used Motor & Gear Oil	Horizontal	5	1,321	2.4	7.7	1.6	5.4			Splash	Flat	No	Ambient	Ambient	No
TK-TO1	One (1) Thermal Oil Horizontal Expansion Tank (0.8 m3, 212 gal)	Thermal Oil	Horizontal	0.8	212	2.0	6.5	0.9	3.2			Splash Pump	Flat	Yes	300	572[1]	No
TK-TO2	One (1) Thermal Oil Horizontal Drain Tank (0.6 m3, 159 gal)	Thermal Oil	Horizontal	0.6	159	2.2	6.5	0.9	3.0			Splash Pump	Flat	Yes	300	572[1]	No
TK-TO3	One (1) Thermal Oil Horizontal Tank (10 m3, 2,642 gal)	Thermal Oil	Horizontal	10	2,642	2.9	9.4	2.1	6.9			Splash Pump	Flat	Yes	200	392	No
TK-TO4	One (1) Thermal Oil Horizontal Expansion Tank (5 m3, 1321 gal)	Thermal Oil	Horizontal	5	1,321	2.4	7.7	1.6	5.4			Splash Pump	Flat	Yes	200	392	No
TK-DO	One (1) De-dust Oil Vertical Storage Tank (60 m3, 15,850 gal)	De-dust Oil	Vertical	60	15,850	6.4	21.0	4.2	13.8			Splash Air Off at Pump	Cone	Yes	50	122	No
TK-RS1	No. 1 of Seven (7) Resin Vertical Storage Tanks (ea. 60 m3, 15,850 gal)	Resin	Vertical	60	15,850	6.4	21.0	4.21	13.8			Splash Air Off at Pump	Cone	Yes	20	68	No
TK-RS2	No. 2 of Seven (7) Resin Vertical Storage Tanks (ea. 60 m3, 15,850 gal)	Resin	Vertical	60	15,850	6.4	21.0	4.21	13.8			Splash Air Off at Pump	Cone	Yes	20	68	No
TK-RS3	No. 3 of Seven (7) Resin Vertical Storage Tanks (ea. 60 m3, 15,850 gal)	Resin	Vertical	60	15,850	6.4	21.0	4.2	13.8			Splash Air Off at Pump	Cone	Yes	20	68	No
TK-RS4	No. 4 of Seven (7) Resin Vertical Storage Tanks (ea. 60 m3, 15,850 gal)	Resin	Vertical	60	15,850	6.4	21.0	4.2	13.8			Splash Air Off at Pump	Cone	Yes	20	68	No
TK-RS5	No. 5 of Seven (7) Resin Vertical Storage Tanks (ea. 60 m3, 15,850 gal)	Resin	Vertical	60	15,850	6.4	21.0	4.2	13.8			Splash Air Off at Pump	Cone	Yes	20	68	No
TK-RS6	No. 6 of Seven (7) Resin Vertical Storage Tanks (ea. 60 m3, 15,850 gal)	Resin	Vertical	60	15,850	6.4	21.0	4.2	13.8			Splash Air Off at Pump	Cone	Yes	20	68	No
TK-RS7	No. 7 of Seven (7) Resin Vertical Storage Tanks (ea. 60 m3, 15,850 gal)	Resin	Vertical	60	15,850	6.4	21.0	4.2	13.8			Splash Air Off at Pump	Cone	Yes	20	68	No
TK-CA	One (1) Coupling Agent Vertical Storage Tank (1 m3, 264 gal)	Coupling Agent Solution	Vertical	1.0	264	2.4	7.8	1.1	3.6			Splash Pump	Cone	No	Ambient	Ambient	No
TK-AD	One (1) Additive Vertical Storage Tank (0.2 m3, 53 gal)	Binder Additive	Vertical	0.2	53	1.5	5.0	0.5	1.7			Splash Pump	Cone	No	Ambient	Ambient	No
TK-BM	One (1) Vertical Binder Mix Tank (10 m3, 2,642 gal)	Binder Solution	Vertical	10	2,642	3.2	10.5	2.0	6.6			Splash Pump	Cone	No	Ambient	Ambient	No
TK-BC	One (1) Vertical Binder Circulating Tank (16 m3, 4,227 gal)	Binder Solution	Vertical	16	4,227	3.2	10.5	2.5	8.2			Splash Pump	Cone	No	Ambient	Ambient	No
TK-SD	One (1) Binder Vertical Day Tank (3 m3, 793 gal), and	Binder Solution	Vertical	3	793	1.9	6.2	1.4	4.7			Splash Pump	Cone	No	Ambient	Ambient	No
TK-BS1	No. 1 of Three (3) Binder Storage Containers (ea. 1 m3, 264 gal)	Plenco Coating	Vertical	1	264	2.4	7.8	1.1	3.6			Splash Pump	Flat	No	Ambient	Ambient	No
TK-BS2	No. 2 of Three (3) Binder Storage Containers (ea. 1 m3, 264 gal)	Plenco Coating	Vertical	1	264	2.4	7.8	1.1	3.6			Splash Pump	Flat	No	Ambient	Ambient	No
TK-BS3	No. 3 of Three (3) Binder Storage Containers (ea. 1 m3, 264 gal)	Plenco Coating	Vertical	1	264	2.4	7.8	1.1	3.6			Splash Pump	Flat	No	Ambient	Ambient	No
TK-DOD	One (1) De-dust Oil Vertical Day Tank (1 m3, 264 gal)	De-dust Oil	Vertical	1	264	1.5	5.0	0.9	3.0			Splash Pump	Cone	No	Ambient	Ambient	No
TK-PD	One (1) Paint Diluter Storage Tank (3 m3, 793 gal)	Diluted Water-based Paint	Vertical	3	793	2.0	6.6	1.2	4.0			Splash Pump	Flat	No	Ambient	Ambient	No
TK-PDD	One (1) Paint Diluter Day Tank (1.5 m3, 397 gal)	Diluted Water-based Paint	Vertical	1.5	397	1.3	4.3	1.3	4.2			Splash Pump	Flat	No	Ambient	Ambient	No

Roxul Source ID	US VOC Emissions: Breathing Loss[2] (tons/yr)	US VOC Emissions: Working Loss (tons/yr)	US VOC Emissions: Total Loss[3] (tons/yr)	US Speciated HAP Emissions: Total Formaldehyde (tons/yr)	US Speciated HAP Emissions: Total Methanol (tons/yr)	US Speciated HAP Emissions: Total Phenol (tons/yr)	METRIC VOC Emissions: Breathing Loss[2] (tonne/yr)	METRIC VOC Emissions: Working Loss (tonne/yr)	METRIC VOC Emissions: Total Loss[3] (tonne/yr)	METRIC Speciated HAP Emissions: Total Formaldehyde (tonne/yr)	METRIC Speciated HAP Emissions: Total Methanol (tonne/yr)	METRIC Speciated HAP Emissions: Total Phenol (tonne/yr)
TK-DF	1.70E-04	4.40E-04	6.10E-04	-	-	-	1.54E-04	3.99E-04	5.53E-04	-	-	-
TK-UO	8.50E-05	3.50E-05	1.20E-04	-	-	-	7.71E-05	3.18E-05	1.09E-04	-	-	-
TK-TO1	-	4.66E-04	4.66E-04	-	-	-	-	4.23E-04	4.23E-04	-	-	-
TK-TO2	-	4.65E-04	4.65E-04	-	-	-	-	4.23E-04	4.23E-04	-	-	-
TK-TO3	-	4.00E-05	4.00E-05	-	-	-	-	3.63E-05	3.63E-05	-	-	-
TK-TO4	-	4.00E-05	4.00E-05	-	-	-	-	3.63E-05	3.63E-05	-	-	-
TK-DO	-	1.80E-03	1.80E-03	-	-	-	-	1.63E-03	1.63E-03	-	-	-
TK-RS1	-	0.01	0.01	0.01	8.50E-05	-	-	0.01	0.01	0.01	7.71E-05	-
TK-RS2	-	0.01	0.01	0.01	8.50E-05	-	-	0.01	0.01	0.01	7.71E-05	-
TK-RS3	-	0.01	0.01	0.01	8.50E-05	-	-	0.01	0.01	0.01	7.71E-05	-
TK-RS4	-	0.01	0.01	0.01	8.50E-05	-	-	0.01	0.01	0.01	7.71E-05	-
TK-RS5	-	0.01	0.01	0.01	8.50E-05	-	-	0.01	0.01	0.01	7.71E-05	-
TK-RS6	-	0.01	0.01	0.01	8.50E-05	-	-	0.01	0.01	0.01	7.71E-05	-
TK-RS7	-	0.01	0.01	0.01	8.50E-05	-	-	0.01	0.01	0.01	7.71E-05	-
TK-CA	3.00E-05	2.50E-05	5.50E-05	-	-	-	2.72E-05	2.27E-05	4.99E-05	-	-	-
TK-AD	2.00E-05	2.50E-05	4.50E-05	-	-	-	1.81E-05	2.27E-05	4.08E-05	-	-	-
TK-BM	9.00E-05	0.01	0.01	0.01	8.00E-05	-	8.16E-05	0.01	0.01	0.01	7.26E-05	-
TK-BC	8.00E-05	0.01	0.01	0.01	8.00E-05	-	7.26E-05	0.01	0.01	0.01	7.26E-05	-
TK-SD	1.00E-05	0.01	0.01	0.01	7.50E-05	-	9.07E-06	0.01	0.01	0.01	0.01	-
TK-BS1	5.50E-05	3.40E-04	3.95E-04	3.95E-04	-	-	4.99E-05	3.08E-04	3.58E-04	3.58E-04	-	-
TK-BS2	5.50E-05	3.40E-04	3.95E-04	3.95E-04	-	-	4.99E-05	3.08E-04	3.58E-04	3.58E-04	-	-
TK-BS3	5.50E-05	3.40E-04	3.95E-04	3.95E-04	-	-	4.99E-05	3.08E-04	3.58E-04	3.58E-04	-	-
TK-DOD	5.00E-05	1.40E-04	1.90E-04	-	-	-	4.54E-05	1.27E-04	1.72E-04	-	-	-
TK-PD	-	-	0.05	-	-	-	-	-	0.05	-	-	-
TK-PDD	-	-	0.03	-	-	-	-	-	0.03	-	-	-
			0.19	0.12	8.50E-04	-			0.17	0.11	0.01	-

Note:
1. Temperature representative of max system operating temperature, these tanks operate at ambient temperature (i.e., max system operating temperature represents worst case emissions).
2. There are no breathing losses for temperature controlled tanks.
3. Formaldehyde, Methanol, and Phenol emissions are included in Total VOC emissions.
4. The following storage containers are either filled with container contents prior to delivery to the site and maintained closed or do not have quantifiable emissions. The number of containers is approximate.
Ten (10) Coupling Agent Storage Containers (ea. 1 m3, 264 gal)
Fifty (50) Coupling Agent Storage Drums (ea. 0.2 m3, 53 gal)
Thirty (30) De-dust Oil Storage Containers (ea. 1 m3, 264 gal)
Forty (40) Silicone Oil/Resin Storage Containers (ea. 1 m3, 264 gal)
Rockfon Feed Storage Totes (No. varies)
Rockfon Paint Waste Storage Totes (No. varies)
Thermal Oil Storage Containers (No. varies)
Product Marking Ink Containers, Number Varies (ea. 0.02 m3, 5 gal)
Product Marking Ink Cleaner Containers, Number Varies (ea. 1 L, 0.26 gal)

West Virginia Department of Air Quality Application Forms

Appendix B

November 2017
Project No. 0408003

Environmental Resources Management
204 Chase Drive
Hurricane, West Virginia 25526
304-757-4777

WEST VIRGINIA DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF AIR QUALITY
601 57th Street, SE
Charleston, WV 25304
(304) 926-0475
www.dep.wv.gov/daq

APPLICATION FOR NSR PERMIT AND TITLE V PERMIT REVISION (OPTIONAL)

PLEASE CHECK ALL THAT APPLY TO **NSR (45CSR13)** (IF KNOWN):

☒ **CONSTRUCTION** ☐ **MODIFICATION** ☐ **RELOCATION**
☐ **CLASS I ADMINISTRATIVE UPDATE** ☐ **TEMPORARY**
☐ **CLASS II ADMINISTRATIVE UPDATE** ☐ **AFTER-THE-FACT**

PLEASE CHECK TYPE OF **45CSR30 (TITLE V)** REVISION (IF ANY):

☐ **ADMINISTRATIVE AMENDMENT** ☐ **MINOR MODIFICATION**
☐ **SIGNIFICANT MODIFICATION**

IF ANY BOX ABOVE IS CHECKED, INCLUDE TITLE V REVISION INFORMATION AS **ATTACHMENT S** TO THIS APPLICATION

FOR TITLE V FACILITIES ONLY: Please refer to "Title V Revision Guidance" in order to determine your Title V Revision options (Appendix A, "Title V Permit Revision Flowchart") and ability to operate with the changes requested in this Permit Application.

Section I. General

1. Name of applicant *(as registered with the WV Secretary of State's Office)*:
Roxul USA Inc.

2. Federal Employer ID No. ***(FEIN):***
99 - 0378111

3. Name of facility *(if different from above)*:
RAN Facility

4. The applicant is the:
☐ **OWNER** ☐ **OPERATOR** ☒ **BOTH**

5A. Applicant's mailing address:
71 Edmond Road, Suite 6
Kearneysville, WV 25430

5B. Facility's present physical address:
N/A

6. **West Virginia Business Registration.** Is the applicant a resident of the State of West Virginia? ☐ **YES** ☒ **NO**
- If **YES,** provide a copy of the **Certificate of Incorporation/Organization/Limited Partnership** (one page) including any name change amendments or other Business Registration Certificate as **Attachment A.**
- If **NO**, provide a copy of the **Certificate of Authority/Authority of L.L.C./Registration** (one page) including any name change amendments or other Business Certificate as **Attachment A.**

7. If applicant is a subsidiary corporation, please provide the name of parent corporation: **Rockwool Group**

8. Does the applicant own, lease, have an option to buy or otherwise have control of the *proposed site?* ☒ **YES** ☐ **NO**
- If **YES,** please explain: **Roxul will own the proposed site.**
- If **NO,** you are not eligible for a permit for this source.

9. Type of plant or facility (stationary source) to be **constructed, modified, relocated, administratively updated** or **temporarily permitted** (e.g., coal preparation plant, primary crusher, etc.):
Mineral Wool Insulation Manufacturing Facility

10. North American Industry Classification System **(NAICS)** code for the facility:
327993

11A. DAQ Plant ID No. (for existing facilities only):
N/A

11B. List all current 45CSR13 and 45CSR30 (Title V) permit numbers associated with this process (for existing facilities only):
N/A

All of the required forms and additional information can be found under the Permitting Section of DAQ's website, or requested by phone.

12A.

- For **Modifications, Administrative Updates** or **Temporary permits** at an existing facility, please provide directions to the *present location* of the facility from the nearest state road;
- For **Construction** or **Relocation permits,** please provide directions to the *proposed new site location* from the nearest state road. Include a **MAP** as **Attachment B**.

From WV-9 E, take the County Route 1 exit toward WV-480/Kearneysville/Leetown. Turn right onto Leetown Road and travel 0.4 miles. Turn left onto WV 115 and travel for 1.4 miles. Turn left onto Northport Avenue. Take a left onto Granny Smith Lane after traveling 0.4 mile to enter the facility.

12.B. New site address (if applicable):	12C. Nearest city or town:	12D. County:
365 Granny Smith Lane **Kearneysville, WV 25340**	**Kearneysville**	**Jefferson**
12.E. UTM Northing (KM): **4362.62**	12F. UTM Easting (KM): **252.06**	12G. UTM Zone: **18**

13. Briefly describe the proposed change(s) at the facility:
New construction of facility.

14A. Provide the date of anticipated installation or change: **April 2018**
- If this is an **After-The-Fact** permit application, provide the date upon which the proposed change did happen: / /

14B. Date of anticipated Start-Up if a permit is granted: **October 2019**

14C. Provide a **Schedule** of the planned **Installation** of/**Change** to and **Start-Up** of each of the units proposed in this permit application as **Attachment C** (if more than one unit is involved).

15. Provide maximum projected **Operating Schedule** of activity/activities outlined in this application:
Hours Per Day **24** Days Per Week **7** Weeks Per Year **52**

16. Is demolition or physical renovation at an existing facility involved? ☐ **YES** ☒ **NO**

17. **Risk Management Plans.** If this facility is subject to 112(r) of the 1990 CAAA, or will become subject due to proposed changes (for applicability help see www.epa.gov/ceppo), submit your **Risk Management Plan (RMP)** to U. S. EPA Region III.

18. **Regulatory Discussion.** List all Federal and State air pollution control regulations that you believe are applicable to the proposed process *(if known)*. A list of possible applicable requirements is also included in Attachment S of this application (Title V Permit Revision Information). Discuss applicability and proposed demonstration(s) of compliance *(if known)*. Provide this information as **Attachment D.**

Section II. Additional attachments and supporting documents.

19. Include a check payable to WVDEP – Division of Air Quality with the appropriate **application fee** (per 45CSR22 and 45CSR13).

20. Include a **Table of Contents** as the first page of your application package.

21. Provide a **Plot Plan,** e.g. scaled map(s) and/or sketch(es) showing the location of the property on which the stationary source(s) is or is to be located as **Attachment E** (Refer to ***Plot Plan Guidance***) .
- Indicate the location of the nearest occupied structure (e.g. church, school, business, residence).

22. Provide a **Detailed Process Flow Diagram(s)** showing each proposed or modified emissions unit, emission point and control device as **Attachment F.**

23. Provide a **Process Description** as **Attachment G.**
   – Also describe and quantify to the extent possible all changes made to the facility since the last permit review (if applicable).

All of the required forms and additional information can be found under the Permitting Section of DAQ's website, or requested by phone.

24. Provide **Material Safety Data Sheets (MSDS)** for all materials processed, used or produced as **Attachment H.**
   – For chemical processes, provide a MSDS for each compound emitted to the air.

25. Fill out the **Emission Units Table** and provide it as **Attachment I.**

26. Fill out the **Emission Points Data Summary Sheet (Table 1 and Table 2)** and provide it as **Attachment J.**

27. Fill out the **Fugitive Emissions Data Summary Sheet** and provide it as **Attachment K.**

28. Check all applicable **Emissions Unit Data Sheets** listed below:

☐ Bulk Liquid Transfer Operations	☒ Haul Road Emissions	☐ Quarry
☐ Chemical Processes	☐ Hot Mix Asphalt Plant	☒ Solid Materials Sizing, Handling and Storage Facilities
☐ Concrete Batch Plant	☐ Incinerator	☒ Storage Tanks
☐ Grey Iron and Steel Foundry	☒ Indirect Heat Exchanger	

☒ General Emission Unit, specify:

Mineral Wool Line – Melting Furnace, Spinning Chamber, Cooling Section, Curing Vents, Charging Material Handling Building Vents, and Dry Ice Cleaning

Rockfon Line - IR Zone, Hot Press, Cooling Zone, and Spray Paint Cabin

Fill out and provide the **Emissions Unit Data Sheet(s)** as **Attachment L.**

29. Check all applicable **Air Pollution Control Device Sheets** listed below:

☐ Absorption Systems	☒ Baghouse	☐ Flare
☐ Adsorption Systems	☐ Condenser	☐ Mechanical Collector
☒ Afterburner	☒ Electrostatic Precipitator	☐ Wet Collecting System

☒ Other Collectors, specify

Fabric Filters

Fill out and provide the **Air Pollution Control Device Sheet(s)** as **Attachment M.**

30. Provide all **Supporting Emissions Calculations** as **Attachment N,** or attach the calculations directly to the forms listed in Items 28 through 31.

31. **Monitoring, Recordkeeping, Reporting and Testing Plans**. Attach proposed monitoring, recordkeeping, reporting and testing plans in order to demonstrate compliance with the proposed emissions limits and operating parameters in this permit application. Provide this information as **Attachment O.**

➢ Please be aware that all permits must be practically enforceable whether or not the applicant chooses to propose such measures. Additionally, the DAQ may not be able to accept all measures proposed by the applicant. If none of these plans are proposed by the applicant, DAQ will develop such plans and include them in the permit.

32. **Public Notice.** At the time that the application is submitted, place a **Class I Legal Advertisement** in a newspaper of general circulation in the area where the source is or will be located (See 45CSR§13-8.3 through 45CSR§13-8.5 and ***Example Legal Advertisement*** for details). Please submit the **Affidavit of Publication** as **Attachment P** immediately upon receipt.

33. **Business Confidentiality Claims.** Does this application include confidential information (per 45CSR31)?

☒ **YES** ☐ **NO**

➢ If **YES,** identify each segment of information on each page that is submitted as confidential and provide justification for each segment claimed confidential, including the criteria under 45CSR§31-4.1, and in accordance with the DAQ's ***"Precautionary Notice – Claims of Confidentiality"*** guidance found in the ***General Instructions*** as **Attachment Q.**

Section III. Certification of Information

34. **Authority/Delegation of Authority.** Only required when someone other than the responsible official signs the application. Check applicable **Authority Form** below:

☐ Authority of Corporation or Other Business Entity ☐ Authority of Partnership

☐ Authority of Governmental Agency ☐ Authority of Limited Partnership

Submit completed and signed **Authority Form** as **Attachment R.**

All of the required forms and additional information can be found under the Permitting Section of DAQ's website, or requested by phone.

35A. **Certification of Information.** To certify this permit application, a Responsible Official (per 45CSR§13-2.22 and 45CSR§30-2.28) or Authorized Representative shall check the appropriate box and sign below.

Certification of Truth, Accuracy, and Completeness

I, the undersigned ☒ **Responsible Official** / ☐ **Authorized Representative,** hereby certify that all information contained in this application and any supporting documents appended hereto, is true, accurate, and complete based on information and belief after reasonable inquiry I further agree to assume responsibility for the construction, modification and/or relocation and operation of the stationary source described herein in accordance with this application and any amendments thereto, as well as the Department of Environmental Protection, Division of Air Quality permit issued in accordance with this application, along with all applicable rules and regulations of the West Virginia Division of Air Quality and W.Va. Code § 22-5-1 et seq. (State Air Pollution Control Act). If the business or agency changes its Responsible Official or Authorized Representative, the Director of the Division of Air Quality will be notified in writing within 30 days of the official change.

Compliance Certification

Except for requirements identified in the Title V Application for which compliance is not achieved, I, the undersigned hereby certify that, based on information and belief formed after reasonable inquiry, all air contaminant sources identified in this application are in compliance with all applicable requirements.

SIGNATURE [signature] *(Please use blue ink)* DATE: November 20, 2017 *(Please use blue ink)*

35B. Printed name of signee: **Ken Cammarato**		35C. Title: **Vice President and General Legal Counsel**
35D. E-mail: **Ken.Cammarato@roxul.com**	36E. Phone:	36F. FAX:
36A. Printed name of contact person (if different from above): **Mette Drejstel**		36B. Title: **Group Environmental Manager**
36C. E-mail: **mette.drejstel@rockwool.com**	36D. Phone:	36E. FAX:

PLEASE CHECK ALL APPLICABLE ATTACHMENTS INCLUDED WITH THIS PERMIT APPLICATION:

- ☒ **Attachment A: Business Certificate**
- ☒ **Attachment B: Map(s)**
- ☒ **Attachment C: Installation and Start Up Schedule**
- ☒ **Attachment D: Regulatory Discussion**
- ☒ **Attachment E: Plot Plan**
- ☒ **Attachment F: Detailed Process Flow Diagram(s)**
- ☒ **Attachment G: Process Description**
- ☒ **Attachment H: Material Safety Data Sheets (MSDS)**
- ☒ **Attachment I: Emission Units Table**
- ☒ **Attachment J: Emission Points Data Summary Sheet**
- ☒ **Attachment K: Fugitive Emissions Data Summary Sheet**
- ☒ **Attachment L: Emissions Unit Data Sheet(s)**
- ☒ **Attachment M: Air Pollution Control Device Sheet(s)**
- ☒ **Attachment N: Supporting Emissions Calculations**
- ☒ **Attachment O: Monitoring/Recordkeeping/Reporting/Testing Plans**
- ☒ **Attachment P: Public Notice**
- ☒ **Attachment Q: Business Confidential Claims**
- ☐ **Attachment R: Authority Forms**
- ☐ **Attachment S: Title V Permit Revision Information**
- ☒ **Application Fee**

Please mail an original and three (3) copies of the complete permit application with the signature(s) to the DAQ, Permitting Section, at the address listed on the first page of this application. Please DO NOT fax permit applications.

RECEIVED
NOV 21 2017
WV DEP / DIV OF AIR QUALITY

FOR AGENCY USE ONLY – IF THIS IS A TITLE V SOURCE:

- ☐ ***Forward 1 copy of the application to the Title V Permitting Group and:***
- ☐ ***For Title V Administrative Amendments:***
  - ☐ ***NSR permit writer should notify Title V permit writer of draft permit,***
- ☐ ***For Title V Minor Modifications:***
  - ☐ ***Title V permit writer should send appropriate notification to EPA and affected states within 5 days of receipt,***
  - ☐ ***NSR permit writer should notify Title V permit writer of draft permit.***
- ☐ ***For Title V Significant Modifications processed in parallel with NSR Permit revision:***
  - ☐ ***NSR permit writer should notify a Title V permit writer of draft permit,***
  - ☐ ***Public notice should reference both 45CSR13 and Title V permits,***
  - ☐ ***EPA has 45 day review period of a draft permit.***

All of the required forms and additional information can be found under the Permitting Section of DAQ's website, or requested by phone.

Table of Contents

Attachment A

WEST VIRGINIA
STATE TAX DEPARTMENT
BUSINESS REGISTRATION CERTIFICATE

ISSUED TO:
ROXUL USA INC.
DBA ROCKWOOL
71 EDMOND RD 6
KEARNEYSVILLE, WV 25430-2781

BUSINESS REGISTRATION ACCOUNT NUMBER: **2348-4027**

This certificate is issued on: **10/25/2017**

This certificate is issued by the West Virginia State Tax Commissioner in accordance with Chapter 11, Article 12, of the West Virginia Code

The person or organization identified on this certificate is registered to conduct business in the State of West Virginia at the location above.

This certificate is not transferrable and must be displayed at the location for which issued

This certificate shall be permanent until cessation of the business for which the certificate of registration was granted or until it is suspended, revoked or cancelled by the Tax Commissioner.

Change in name or change of location shall be considered a cessation of the business and a new certificate shall be required.

TRAVELING/STREET VENDORS: Must carry a copy of this certificate in every vehicle operated by them.
CONTRACTORS, DRILLING OPERATORS, TIMBER/LOGGING OPERATIONS: Must have a copy of this certificate displayed at every job site within West Virginia.

atL006 v.4
L0875932352

Attachment B

Attachment B

Site Map

Please see the site map for the RAN facility as Figure 1-1 in the Introduction of this permit application.

Attachment C

Attachment C

Construction Schedule

Construction is expected to start on the RAN facility in April 2018. RAN facility operations are expected to start in October 2019.

Attachment D

Attachment D

Regulation Discussion

Please see the regulatory discussion in Section 4 and Section 5 of the Introduction of this permit application for the federal and state regulatory discussions, respectively.

Attachment E

Attachment E

Plot Plan

Please see the plot plans for the RAN facility as Figure 2-1 and Figure 2-2 in the Introduction of this permit application.

Attachment F

Attachment F

Process Flow Diagrams

Please see redacted process flow diagrams for the RAN facility as Figure 3-1, Figure 3-2, and Figure 3-3 in the Introduction of this permit application. A confidential process flow diagram is submitted here in Attachment F.

Attachment G

Attachment G

Process Description

Please see the process description for the RAN facility as Section 2.0 in the Introduction of this permit application.

Attachment H

Attachment H

Safety Data Sheets

Please see the confidential safety data sheets submitted on CD-ROM as a part of this permit application. Justification for claiming this information confidential is provided in Attachment Q: Business Confidential Claims.

Attachment I

Attachment I

Emission Units Table

(includes all emission units and air pollution control devices that will be part of this permit application review, regardless of permitting status)

Emission Unit ID[1]	Emission Point ID[2]	Emission Unit Description	Year Installed/ Modified	Design Capacity	Type[3] and Date of Change	Control Device[4]
Mineral Wool Line						
IMF01	IMF01	Melting Furnace	2018	Claimed Confidential	New	IMF01-BH De-NOx De-SOx
IMF02	IMF02	Furnace Cooling Tower	2018	1,321 gpm (300 m^3/hr)	New	None
IMF03A	IMF03A	Coal Storage Silo A	2018	TBD	New	IMF03A-FF
IMF03B	IMF03B	Coal Storage Silo B	2018	TBD	New	IMF03B-FF
IMF03C	IMF03C	Coal Storage Silo C	2018	TBD	New	IMF03C-FF
IMF07A	IMF07A	Filter Fines Day Silo	2018	TBD	New	IMF07A-FF
IMF07B	IMF07B	Secondary Energy Materials Silo	2018	TBD	New	IMF07B-FF
IMF08	IMF08	Sorbent Silo	2018	TBD	New	IMF08-FF
IMF09	IMF09	Spent Sorbent Silo	2018	TBD	New	IMF09-FF
IMF10	IMF10	Filter Fines Receiving Silo	2018	TBD	New	IMF10-FF
IMF11	IMF11	Conveyor Transition Point (B215 to B220)	2018	Claimed Confidential	New	IMF11-FF
B215	B215	Raw Material Loading Hopper	2018	Claimed Confidential	New	3-sided enclosure with cover
IMF12	IMF12	Conveyor Transition Point (B210 to B220)	2018	Claimed Confidential	New	IMF12-FF
IMF14	IMF14	Conveyor Transition Point (B220-1)	2018	Claimed Confidential	New	IMF14-FF
IMF15	IMF15	Conveyor Transition Point (B220-2)	2018	Claimed Confidential	New	IMF15-FF
IMF16	IMF16	Conveyor Transition Point (B220 to B300)	2018	Claimed Confidential	New	IMF16-FF
IMF21	IMF21	Charging Building Vacuum Cleaning Filter	2018	316 scfm (500 Nm3/hr)	New	IMF21-FF

RM_REJ	RM_REJ	Raw Material Reject Collection Bin	2018	Claimed Confidential	New	4-sided rubber drop guard
S_REJ	S_REJ	Sieve Reject Collection Bin	2018	Claimed Confidential	New	4-sided rubber drop guard
B170	B170	Melting Furnace Portable Crusher & Storage	2018	< 150 tph	New	None
B210	B210	Raw Material Storage - Loading	2018	Claimed Confidential	New	3-sided enclosure with cover
IMF24	IMF24	Preheat Burner	2018	5.1 MMBtu/hr	New	None
IMF25	IMF25	Coal Feed Tank	2018	Claimed Confidential	New	IMF25-FF
CO	HE01	Curing Oven	2018	Claimed Confidential	New	HE01 CO-AB
CO-HD	HE01	Curing Oven Hoods	2018	Claimed Confidential	New	HE01
GUT-EX	HE01	Gutter Exhaust	2018	Claimed Confidential	New	HE01
SPN	HE01	Spinning Chamber	2018	Claimed Confidential	New	HE01
CS	HE01	Cooling Section	2018	Claimed Confidential	New	HE01
HE02	HE02	Gutter Cooling Tower	2018	308 gpm (70 m^3/hr)	New	None
CM12	CM12	Fleece Application Vent 1	2018	185 kg/hr	New	None
CM13	CM13	Fleece Application Vent 2	2018		New	None
CE01	CE01	De-dusting Baghouse	2018	44,217 scfm (70,000 Nm^3/hr)	New	CE01-BH
CE02	CE02	Vacuum Cleaning Baghouse	2018	12,633 scfm (20,000 Nm^3/hr)	New	CE02-BH
P_MARK	P_MARK	Product Marking	2018	0.04 MMBtu/hr (11 kW)	New	None

CM10	CM10	Recycle Plant Building Vent 1	2018	18,950 scfm (30,000 Nm^3/hr)	New	CM10-FF
CM11	CM11	Recycle Plant Building Vent 2	2018	18,950 scfm (30,000 Nm^3/hr)	New	CM11-FF
CM08	CM08	Recycle Plant Building Vent 3	2018	1,579 scfm (2,500 Nm^3/hr)	New	CM08-FF
CM09	CM09	Recycle Plant Building Vent 4	2018	1,579 scfm (2,500 Nm^3/hr)	New	CM09-FF
RMS	RMS	Raw Material Storage	2018	0.12 acres 500 m^2	New	3-sided enclosure with cover
IMF17	IMF17 / IMF18	Charging Material Handling Vent 1	2018	Claimed Confidential	New	Enclosed Indoors
IMF18	IMF17 / IMF18	Charging Material Handling Vent 2	2018	Claimed Confidential	New	Enclosed Indoors
DI	DI	Dry Ice Cleaning	2018	165.3 lb/hr 75 kg/hr	New	NA
Rockfon Line						
RFNE1	RFNE1	IR Zone	2018	Claimed Confidential	New	None
RFNE2	RFNE2	Hot Press	2018	Claimed Confidential	New	None
RFN3	RFN3	High Oven A	2018	Claimed Confidential	New	None
RFNE4	RFNE4	Drying Oven 1	2018	Claimed Confidential	New	RFNE4-FF
RFNE5	RFNE5	Spraying Cabin	2018	Claimed Confidential	New	RFNE5-FF
RFNE6	RFNE6	Drying Oven 2&3	2018	Claimed Confidential	New	RRNE6-FF
RFNE7	RFNE7	Cooling Zone	2018	Claimed Confidential	New	None
RFNE8	RFNE8	Rockfon De-Dusting Baghouse	2018	74,419 scfm (117,812 Nm3/hr)	New	RFNE8-BH
RFN9	RFN9	High Oven B	2018	Claimed Confidential	New	None

Coal Milling						
IMF04	IMF04	Coal Conveyor Transition Point (B213 to B215)	2018	Claimed Confidential	New	IMF04-FF
IMF05	IMF05	Coal Milling Burner & Baghouse	2018	Claimed Confidential	New	IMF05-BH
IMF06	IMF06	Coal Milling De-Dusting Baghouse	2018	Claimed Confidential	New	IMF06-BH
IMF13	IMF13	Coal Conveyor Transition Point (B213 to B215)	2018	Claimed Confidential	New	IMF13-FF
B235	B235	Coal Milling Building	2018	Claimed Confidential	New	Enclosed Indoors
B230	B230	Coal Unloading	2018	Claimed Confidential	New	3-sided enclosure with cover
B231	B231	Coal Unloading Hopper	2018	Claimed Confidential	New	3-sided enclosure with cover
Other RAN Facility Wide Sources						
CM03	CM03	Natural Gas Boiler 1	2018	5.1 MMBtu/hr (1.5 MW)	New	None
CM04	CM04	Natural Gas Boiler 2	2018	5.1 MMBtu/hr (1.5 MW)	New	None
EFP1	EFP1	Emergency Fire Pump Engine	2018	197 hp (147 kW)	New	None
RFN10	RFN10	Rockfon Building Heater	2018	5.1 MMBtu/hr (1.50 MW)	New	None
RAN Facility Storage Tanks						
TK-DF	TK-DF	Diesel Fuel Tank	2018	2,642 gal 10 m^3	New	None
TK-UO	TK-UO	Used Oil Tank	2018	581 gal 2.2 m^3	New	None
TK-TO1	TK-TO1	Thermal Oil Expansion Tank - Rockfon	2018	212 gal 0.8 m^3	New	None

TK-TO2	TK-TO2	Thermal Oil Drain Tank – Rockfon	2018	159 gal 0.6 m^3	New	None
TK-TO3	TK-TO3	Thermal Oil Tank - IMF	2018	2,642 gal 10 m^3	New	None
TK-TO4	TK-TO4	Thermal Oil Expansion Tank - IMF	2018	1,321 gal 5 m^3	New	None
TK-DO	TK-DO	De-dust Oil Storage Tank	2018	15,850 gal 60 m^3	New	None
TK-RS1	TK-RS1	Resin Storage Tank	2018	15,850 gal 60 m^3	New	None
TK-RS2	TK-RS2	Resin Storage Tank	2018	15,850 gal 60 m^3	New	None
TK-RS3	TK-RS3	Resin Storage Tank	2018	15,850 gal 60 m^3	New	None
TK-RS4	TK-RS4	Resin Storage Tank	2018	15,850 gal 60 m^3	New	None
TK-RS5	TK-RS5	Resin Storage Tank	2018	15,850 gal 60 m^3	New	None
TK-RS6	TK-RS6	Resin Storage Tank	2018	15,850 gal 60 m^3	New	None
TK-RS7	TK-RS7	Resin Storage Tank	2018	15,850 gal 60 m^3	New	None
TK-CA	TK-CA	Coupling Agent Storage Tank	2018	264 gal 1 m^3	New	None
TK-AD	TK-AD	Additive Storage Tank	2018	53 gal 0.2 m^3	New	None
TK-BM	TK-BM	Binder Mix Tank	2018	2,642 gal 10 m^3	New	None
TK-BC	TK-BC	Binder Circulation Tank	2018	4,227 gal 16 m^3	New	None
TK-BD	TK-BD	Binder Day Tank	2018	793 gal 3 m^3	New	None

TK-BS1	TK-BS1	Binder Storage Container	2018	264 gal 1 m^3	New	None
TK-BS2	TK-BS2	Binder Storage Container	2018	264 gal 1 m^3	New	None
TK-BS3	TK-BS3	Binder Storage Container	2018	264 gal 1 m^3	New	None
TK-DOD	TK-DOD	De-dust Oil Day Tank	2018	264 gal 1 m^3	New	None
TK-PD	TK-PD	Paint Dilution Storage Tank	2018	793 gal 3 m^3	New	None
TK-PDD	TK-PDD	Paint Dilution Day Tank	2018	397 gal 1.5 m^3	New	None

[1] For Emission Units (or Sources) use the following numbering system:1S, 2S, 3S,... or other appropriate designation.
[2] For Emission Points use the following numbering system:1E, 2E, 3E, ... or other appropriate designation.
[3] New, modification, removal
[4] For Control Devices use the following numbering system: 1C, 2C, 3C,... or other appropriate designation.

Attachment J

Attachment J
EMISSION POINTS DATA SUMMARY SHEET

Table 1: Emissions Data

Emission Point ID No. *(Must match Emission Units Table & Plot Plan)*	Emission Point Type[1]	Emission Unit Vented Through This Point *(Must match Emission Units Table & Plot Plan)*		Air Pollution Control Device *(Must match Emission Units Table & Plot Plan)*		Vent Time for Emission Unit *(chemical processes only)*		All Regulated Pollutants - Chemical Name/CAS[3] *(Speciate VOCs & HAPS)*	Maximum Potential Uncontrolled Emissions[4]		Maximum Potential Controlled Emissions[5]		Emission Form or Phase *(At exit conditions, Solid, Liquid or Gas/Vapor)*	Est. Method Used[6]	Emission Conc (ppmv or mg/m[4])
		ID No.	Source	ID No.	Device Type	Short Term[2]	Max (hr/yr)		lb/hr	ton/yr	lb/hr	ton/yr			
Mineral Wool Line															
IMF01	Upward Vertical Stack	IMF01	Point	IMF01-BH	BH SNCR SIS	C	8760	NO_x			37.37	163.67	Gas/ Vapor	EE	
								SO_2			33.63	147.31			
								CO			11.21	49.10			
								VOCs			11.66	51.08			
								PM_{10}			8.22	36.01			
								$PM_{2.5}$			7.47	32.73			
								CO_2e			21,814.29	94,981.42			
								H_2SO_4			3.74	16.37			
								Lead			<0.01	<0.01			
								Total HAPs			3.43	15.04			
IMF02	Upward Vertical Stack	IMF02	Point			C	8760	PM_{10}			0.01	0.04	Solid	EE	
								$PM_{2.5}$			<0.01	0.02			

IMF03A	Upward Vertical Stack	IMF03A	Point	IMF03A -FF	FF	C	8760	PM_{10}			0.01	0.06	Solid	EE	
								$PM_{2.5}$			<0.01	0.03			
IMF03B	Upward Vertical Stack	IMF03B	Point	IMF03B -FF	FF	C	8760	PM_{10}			0.01	0.06	Solid	EE	
								$PM_{2.5}$			<0.01	0.03			
IMF03C	Upward Vertical Stack	IMF03C	Point	IMF03C -FF	FF	C	8760	PM_{10}			0.01	0.06	Solid	EE	
								$PM_{2.5}$			<0.01	0.03			
IMF07A	Upward Vertical Stack	IMF07A	Point	IMF07A -FF	FF	C	8760	PM_{10}			0.01	0.06	Solid	EE	
								$PM_{2.5}$			<0.01	0.03			
IMF07B	Upward Vertical Stack	IMF07B	Point	IMF07B -FF	FF	C	8760	PM_{10}			0.01	0.06	Solid	EE	
								$PM_{2.5}$			<0.01	0.03			
IMF08	Upward Vertical Stack	IMF08	Point	IMF08-FF	FF	C	8760	PM_{10}			0.01	0.06	Solid	EE	
								$PM_{2.5}$			<0.01	0.03			
IMF09	Upward Vertical Stack	IMF09	Point	IMF09-FF	FF	C	8760	PM_{10}			0.01	0.06	Solid	EE	
								$PM_{2.5}$			<0.01	0.03			
IMF10	Upward Vertical Stack	IMF10	Point	IMF10-FF	FF	C	8760	PM_{10}			0.01	0.06	Solid	EE	
								$PM_{2.5}$			<0.01	0.03			
IMF11	Upward Vertical Stack	IMF11	Point	IMF11-FF	FF	C	8760	PM_{10}			0.02	0.09	Solid	EE	
								$PM_{2.5}$			<0.01	0.04			
IMF12	Upward Vertical Stack	IMF12	Point	IMF12-FF	FF	C	8760	PM_{10}			0.02	0.09	Solid	EE	
								$PM_{2.5}$			<0.01	0.04			

IMF14	Upward Vertical Stack	IMF14	Point	IMF14-FF	FF	C	8760	PM_{10}			0.02	0.09	Solid	EE	
								$PM_{2.5}$			<0.01	0.04			
IMF15	Upward Vertical Stack	IMF15	Point	IMF15-FF	FF	C	8760	PM_{10}			0.02	0.09	Solid	EE	
								$PM_{2.5}$			<0.01	0.04			
IMF16	Upward Vertical Stack	IMF16	Point	IMF16-FF	FF	C	8760	PM_{10}			0.02	0.09	Solid	EE	
								$PM_{2.5}$			<0.01	0.04			
IMF17	Upward Vertical Stack	IMF17	Point			C	8760	PM_{10}			0.02	0.08	Solid	EE	
								$PM_{2.5}$			<0.01	0.04			
IMF18	Upward Vertical Stack	IMF18	Point			C	8760	PM_{10}			0.02	0.08	Solid	EE	
								$PM_{2.5}$			<0.01	0.04			
IMF24	Upward Vertical Stack	IMF24	Point			C	8760	NO_X			0.36	1.58	Gas/ Vapor, Solid	EE	
								SO_2			<0.01	0.01			
								CO			0.42	1.84			
								VOC			0.03	0.12			
								PM_{10}			0.04	0.17			
								$PM_{2.5}$			0.04	0.17			
								CO_2e			599.87	2,627.41			
								Lead			<0.01	<0.01			
								Total HAPs			<0.01	0.04			
IMF25	Upward	IMF25	Point	IMF25-	FF	C	8760	PM_{10}			0.01	0.06	Solid	EE	

	Vertical Stack			FF				$PM_{2.5}$			<0.01	0.03			
IMF21	Upward Vertical Stack	IMF21	Point	IMF21-FF	FF	C	8760	PM_{10}			<0.01	0.02	Solid	EE	
								$PM_{2.5}$			<0.01	0.01			
HE01	Upward Vertical Stack	HE01	Point			C	8760	NO_x			14.55	63.73	Gas/ Vapor, Solid	EE	
								SO_2			0.01	0.05			
								CO			1.82	7.97			
								VOC			78.02	341.71			
								PM_{10}			21.21	92.89			
								$PM_{2.5}$			19.22	84.20			
								CO_2e			8,138.00	36,644.45			
								Phenol			19.37	84.85			
								Formalde -hyde			12.79	56.01			
								Methanol			23.70	103.80			
								Total HAPs			77.07	337.56			
HE02	Upward Vertical Stack	HE02	Point			C	8760	PM_{10}			<0.01	0.01	Solid	EE	
								$PM_{2.5}$			<0.01	0.01			
CE01	Upward Vertical Stack	CE01	Point	CE01-BH	BH	C	8760	PM_{10}			0.77	3.38	Solid	EE	
								$PM_{2.5}$			0.77	3.38			
								Total HAPs			0.77	3.38			
CE02	Upward	CE02	Point	CE02-	BH	C	8760	PM_{10}			0.22	0.97	Solid	EE	

	Vertical Stack			BH				$PM_{2.5}$			0.22	0.97			
								Total HAPs			0.22	0.97			
CM12	Vent	CM12	Point			C	8760	VOC			3.27	14.29	Gas/Vapor	EE	
								HAPs			3.27	14.29			
CM13	Vent	CM13	Point			C	8760	VOC			3.27	14.29	Gas/Vapor	EE	
								HAPs			3.27	14.29			
P_MARK	Vent	P_MARK	Volume			C	8760	NO_X			0.04	0.17	Gas/ Vapor, Solid	EE	
								SO_2			<0.01	<0.01			
								CO			0.03	0.14			
								VOC			<0.01	<0.01			
								PM_{10}			<0.01	0.01			
								$PM_{2.5}$			<0.01	0.01			
								CO_2e			46.84	205.16			
								Lead			<0.01	<0.01			
								Total HAPs			<0.01	<0.01			
CM10	Upward Vertical Stack	CM10	Point	CM10-FF	FF	C	8760	PM_{10}			0.66	2.90	Solid	EE	
								$PM_{2.5}$			0.33	1.45			
CM11	Upward Vertical Stack	CM11	Point	CM11-FF	FF	C	8760	PM_{10}			0.66	2.90	Solid	EE	
								$PM_{2.5}$			0.33	1.45			
CM08	Upward	CM08	Point	CM08-	FF	C	8760	PM_{10}			0.06	0.24	Solid	EE	

	Vertical Stack			FF				$PM_{2.5}$			0.03	0.12		
CM09	Upward Vertical Stack	CM09	Point	CM09-FF	FF	C	8760	PM_{10}			0.06	0.24	Solid	EE
								$PM_{2.5}$			0.03	0.12		
Rockfon Line														
RFNE1	Upward Vertical Stack	RFNE1	Point			C	8760	PM_{10}			<0.01	0.04	Gas/ Vapor, Solid	EE
								$PM_{2.5}$			<0.01	0.02		
								Formalde-hyde			<0.01	0.03		
								Phenol			<0.01	0.03		
								Total HAPs			0.02	0.10		
RFNE2	Upward Vertical Stack	RFNE2	Point			C	8760	PM_{10}			<0.01	0.04	Gas/ Vapor, Solid	EE
								$PM_{2.5}$			<0.01	0.02		
								VOCs			1.71	7.48		
								Formalde-hyde			<0.01	0.03		
								Phenol			<0.01	0.03		
								Total HAPs			0.02	0.10		
RFNE3	Upward Vertical Stack	RFNE3	Point			C	8760	NO_X			0.27	1.17	Gas/ Vapor, Solid	EE
								SO_2			<0.01	<0.01		
								CO			0.22	0.98		
								PM_{10}			0.06	0.25		

								$PM_{2.5}$			0.03	0.13			
								CO_2e			319.64	1,400.04			
								Lead			<0.01	<0.01			
								VOC			2.45	10.75			
								Formalde-hyde			0.02	0.08			
								Hexane			<0.01	0.02			
								Phenol			0.02	0.08			
								Total HAPs			0.10	0.43			
RFNE4	Upward Vertical Stack	RFNE4	Point	RFNE4-FF	FF	C	8760	NO_X			0.20	0.87	Gas/ Vapor, Solid	EE	
								SO_2			<0.01	0.01			
								CO			0.17	0.73			
								PM_{10}			0.04	0.18			
								$PM_{2.5}$			0.02	0.09			
								CO_2e			239.73	1,050.03			
								Lead			<0.01	<0.01			
								VOC			0.76	3.31			
								Formalde-hyde			0.02	0.10			
								Hexane			<0.01	0.02			
								Phenol			0.01	0.05			
								Total HAPs			0.08	0.34			

RFNE5	Upward Vertical Stack	RFNE5	Point	RFNE5-FF	FF	C	8760	PM_{10}			0.44	1.93	Gas/ Vapor, Solid	EE	
								$PM_{2.5}$			0.22	0.97			
								VOC			0.09	0.39			
								Formalde -hyde			0.02	0.10			
								Phenol			0.06	0.24			
								Total HAPs			0.52	2.27			
RFNE6	Upward Vertical Stack	RFNE6	Point	RFNE6-FF	FF	C	8760	NO_x			0.47	2.04	Gas/ Vapor, Solid	EE	
								SO_2			<0.01	0.01			
								CO			0.39	1.71			
								PM_{10}			0.13	0.55			
								$PM_{2.5}$			0.09	0.41			
								CO_2e			559.38	2,450.07			
								Lead			<0.01	<0.01			
								VOC			0.35	1.55			
								Hexane			<0.01	0.04			
								Formalde -hyde			0.05	0.23			
								Phenol			0.03	0.12			
								Total HAPs			0.15	0.66			
RFNE7	Upward Vertical Stack	RFNE7	Point			C	8760	PM_{10}			0.10	0.42	Gas/ Vapor, Solid	EE	
								$PM_{2.5}$			0.05	0.21			

								VOC			0.15	0.66			
								Formalde-hyde			0.06	0.24			
								Phenol			0.06	0.24			
								Total HAPs			0.21	0.91			
RFNE8	Upward Vertical Stack	RFNE8	Point	RFNE8-BH	BH	C	8760	PM_{10}			0.34	1.49	Solid	EE	
								$PM_{2.5}$			0.17	0.75			
								Total HAPs			0.34	1.49			
RFNE9	Upward Vertical Stack	RFNE9	Point			C	8760	NO_X			0.27	1.17	Gas/ Vapor, Solid	EE	
								SO_2			<0.01	0.01			
								CO			0.22	0.98			
								PM_{10}			0.06	0.25			
								$PM_{2.5}$			0.03	0.13			
								CO_2e			319.64	1,400.04			
								Lead			<0.01	<0.01			
								VOC			2.77	12.13			
								Hexane			<0.01	0.02			
								Formalde-hyde			0.02	0.08			
								Phenol			0.02	0.08			
								Total HAPs			0.10	0.43			

RFN10	Upward Vertical Stack	RFN10	Point			C	8760	NO_X			0.18	0.79	Gas/ Vapor, Solid	EE	
								SO_2			<0.01	0.01			
								CO			0.42	1.84			
								VOC			0.03	0.12			
								PM_{10}			0.04	0.17			
								$PM_{2.5}$			0.04	0.17			
								CO_2e			599.87	2,627.41			
								Lead			<0.01	<0.01			
								Hexane			<0.01	0.04			
								Total HAPs			<0.01	0.04			
Coal Milling															
IMF04	Upward Vertical Stack	IMF04	Point	IMF04-FF	FF	C	8760	PM_{10}			0.02	0.09	Solid	EE	
								$PM_{2.5}$			<0.01	0.04			
IMF05	Upward Vertical Stack	IMF05	Point	IMF05-BH	BH	C	8760	NO_X			0.42	1.86	Gas/ Vapor, Solid	EE	
								SO_2			<0.01	0.02			
								CO			0.49	2.15			
								VOCs			0.41	1.65			
								PM_{10}			0.32	1.33			
								$PM_{2.5}$			0.26	1.06			
								CO_2e			703.01	3,079.17			
								Lead			<0.01	<0.01			
								Total HAPs			0.01	0.05			

IMF06	Upward Vertical Stack	IMF06	Point	IMF06-FF	FF	C	8760	PM_{10}			0.22	0.97	Solid	EE	
								$PM_{2.5}$			0.11	0.48			
IMF13	Upward Vertical Stack	IMF13	Point	IMF13-FF	FF	C	8760	PM_{10}			0.02	0.09	Solid	EE	
								$PM_{2.5}$			<0.01	0.04			
Other RAN Facility Wide Sources															
CM03	Upward Vertical Stack	CM03	Point			C	8760	NO_X			0.18	0.79	Gas/ Vapor, Solid	EE	
								SO_2			<0.01	0.01			
								CO			0.42	1.84			
								VOC			0.03	0.12			
								PM_{10}			0.04	0.17			
								$PM_{2.5}$			0.04	0.17			
								CO_2e			599.87	2,627.41			
								Lead			<0.01	<0.01			
								Hexane			<0.01	0.04			
								Total HAPs			<0.01	0.04			
CM04	Upward Vertical Stack	CM04	Point			C	8760	NO_X			0.18	0.79	Gas/ Vapor, Solid	EE	
								SO_2			<0.01	0.01			
								CO			0.42	1.84			
								VOC			0.03	0.12			
								PM_{10}			0.04	0.17			
								$PM_{2.5}$			0.04	0.17			

								CO_2e			599.87	2,627.41		
								Lead			<0.01	<0.01		
								Hexane			<0.01	0.04		
								Total HAPs			<0.01	0.04		
EFP1	Upward Vertical Stack	EFP1	Point			EM	500	NO_x			1.30	0.32	Gas/ Vapor	EE
								SO_2			<0.01	<0.01		
								CO			1.13	0.28		
								VOC			0.19	0.05		
								PM_{10}			0.08	0.02		
								$PM_{2.5}$			0.08	0.02		
								CO_2e			225.42	56.36		
								Total HAPs			<0.01	<0.01		
RAN Facility Storage Tanks														
TK-DF	Vent	TK-DF	Point			C	8760	Distillate fuel oil 2	<0.01	<0.01	<0.01	<0.01	Gas/Vapor	O – EPA Tanks
								VOC	<0.01	<0.01	<0.01	<0.01		
TK-UO	Vent	TK-UO	Point			C	8760	Distillate fuel oil 2	<0.01	<0.01	<0.01	<0.01	Gas/Vapor	O – EPA Tanks
								VOC	<0.01	<0.01	<0.01	<0.01		
TK-TO1	Vent	TK-TO1	Point			C	8760	Jet Naphtha	<0.01	<0.01	<0.01	<0.01	Gas/Vapor	O – EPA Tanks
								VOC	<0.01	<0.01	<0.01	<0.01		

TK-TO2	Vent	TK-TO2	Point			C	8760	Jet Naphtha	<0.01	<0.01	<0.01	<0.01	Gas/Vapor	O – EPA Tanks	
								VOC	<0.01	<0.01	<0.01	<0.01			
TK-TO3	Vent	TK-TO3	Point			C	8760	Power Steering Fluid	<0.01	<0.01	<0.01	<0.01	Gas/Vapor	O – EPA Tanks	
								VOC	<0.01	<0.01	<0.01	<0.01			
TK-TO4	Vent	TK-TO4	Point			C	8760	Power Steering Fluid	<0.01	<0.01	<0.01	<0.01	Gas/Vapor	O – EPA Tanks	
								VOC	<0.01	<0.01	<0.01	<0.01			
TK-DO	Vent	TK-DO	Point			C	8760	Distillate fuel oil 2	<0.01	<0.01	<0.01	<0.01	Gas/Vapor	O – EPA Tanks	
								VOC	<0.01	<0.01	<0.01	<0.01			
TK-RS1	Vent	TK-RS1	Point			C	8760	Formaldehyde	<0.01	0.01	<0.01	0.01	Gas/Vapor	O – EPA Tanks	
								Methanol	<0.01	<0.01	<0.01	<0.01			
								VOC	<0.01	0.01	<0.01	0.01			
								HAP	<0.01	<0.01	<0.01	<0.01			
TK-RS2	Vent	TK-RS2	Point			C	8760	Formaldehyde	<0.01	0.01	<0.01	0.01	Gas/Vapor	O – EPA Tanks	
								Methanol	<0.01	<0.01	<0.01	<0.01			
								VOC	<0.01	0.01	<0.01	0.01			
								HAP	<0.01	<0.01	<0.01	<0.01			
TK-RS3	Vent	TK-RS3	Point			C	8760	Formaldehyde	<0.01	0.01	<0.01	0.01	Gas/Vapor	O – EPA Tanks	
								Methanol	<0.01	<0.01	<0.01	<0.01			

								VOC	<0.01	0.01	<0.01	0.01			
								HAP	<0.01	<0.01	<0.01	<0.01			
TK-RS4	Vent	TK-RS4	Point			C	8760	Formaldehyde	<0.01	0.01	<0.01	0.01	Gas/Vapor	O – EPA Tanks	
								Methanol	<0.01	<0.01	<0.01	<0.01			
								VOC	<0.01	0.01	<0.01	0.01			
								HAP	<0.01	<0.01	<0.01	<0.01			
TK-RS5	Vent	TK-RS5	Point			C	8760	Formaldehyde	<0.01	0.01	<0.01	0.01	Gas/Vapor	O – EPA Tanks	
								Methanol	<0.01	<0.01	<0.01	<0.01			
								VOC	<0.01	0.01	<0.01	0.01			
								HAP	<0.01	<0.01	<0.01	<0.01			
TK-RS6	Vent	TK-RS6	Point			C	8760	Formaldehyde	<0.01	0.01	<0.01	0.01	Gas/Vapor	O – EPA Tanks	
								Methanol	<0.01	<0.01	<0.01	<0.01			
								VOC	<0.01	0.01	<0.01	0.01			
								HAP	<0.01	<0.01	<0.01	<0.01			
TK-RS7	Vent	TK-RS7	Point			C	8760	Formaldehyde	<0.01	0.01	<0.01	0.01	Gas/Vapor	O – EPA Tanks	
								Methanol	<0.01	<0.01	<0.01	<0.01			
								VOC	<0.01	0.01	<0.01	0.01			
								HAP	<0.01	<0.01	<0.01	<0.01			
TK-CA	Vent	TK-CA	Point			C	8760	Ethyl Alcohol	<0.01	<0.01	<0.01	<0.01	Gas/Vapor	O – EPA Tanks	
								VOC	<0.01	<0.01	<0.01	<0.01			

TK-BA	Vent	TK-BA	Point			C	8760	-	-	-	-	-	NA	NA	
TK-AD	Vent	TK-AD	Point			C	8760	Ethyl Alcohol	<0.01	<0.01	<0.01	<0.01	Gas/Vapor	O – EPA Tanks	
								VOC	<0.01	<0.01	<0.01	<0.01			
TK-BM	Vent	TK-BM	Point			C	8760	Formaldehyde	<0.01	0.01	<0.01	0.01	Gas/Vapor	O – EPA Tanks	
								Methanol	<0.01	<0.01	<0.01	<0.01			
								VOC	<0.01	0.01	<0.01	0.01			
								HAP	<0.01	<0.01	<0.01	<0.01			
TK-BC	Vent	TK-BC	Point			C	8760	Formaldehyde	<0.01	0.01	<0.01	0.01	Gas/Vapor	O – EPA Tanks	
								Methanol	<0.01	<0.01	<0.01	<0.01			
								VOC	<0.01	0.01	<0.01	0.01			
								HAP	<0.01	<0.01	<0.01	<0.01			
TK-BD	Vent	TK-BD	Point			C	8760	Formaldehyde	<0.01	0.01	<0.01	0.01	Gas/Vapor	O – EPA Tanks	
								Methanol	<0.01	<0.01	<0.01	<0.01			
								VOC	<0.01	0.01	<0.01	0.01			
								HAP	<0.01	<0.01	<0.01	<0.01			
TK-BS1	Vent	TK-BS1	Point			C	8760	Formaldehyde	<0.01	<0.01	<0.01	<0.01	Gas/Vapor	O – EPA Tanks	
								VOC	<0.01	<0.01	<0.01	<0.01			
								HAP	<0.01	<0.01	<0.01	<0.01			
TK-BS2	Vent	TK-BS2	Point			C	8760	Formaldehyde	<0.01	<0.01	<0.01	<0.01	Gas/Vapor	O – EPA	

								VOC	<0.01	<0.01	<0.01	<0.01		Tanks	
								HAP	<0.01	<0.01	<0.01	<0.01			
TK-BS3	Vent	TK-BS3	Point			C	8760	Formaldehyde	<0.01	<0.01	<0.01	<0.01	Gas/Vapor	O – EPA Tanks	
								VOC	<0.01	<0.01	<0.01	<0.01			
								HAP	<0.01	<0.01	<0.01	<0.01			
TK-DOD	Vent	TK-DOD	Point			C	8760	Distillate Fuel Oil 2	<0.01	<0.01	<0.01	<0.01	Gas/Vapor	O – EPA Tanks	
								VOC	<0.01	<0.01	<0.01	<0.01			
TK-PD	Vent	TK-PD	Point			C	8760	VOC	0.01	0.03	0.01	0.03	Gas/Vapor	O – EPA Tanks	
TK-PDD	Vent	TK-PDD	Point			C	8760	VOC	0.01	0.03	0.01	0.03	Gas/Vapor	O – EPA Tanks	

The EMISSION POINTS DATA SUMMARY SHEET provides a summation of emissions by emission unit. Note that uncaptured process emission unit emissions are not typically considered to be fugitive and must be accounted for on the appropriate EMISSIONS UNIT DATA SHEET and on the EMISSION POINTS DATA SUMMARY SHEET. Please note that total emissions from the source are equal to all vented emissions, all fugitive emissions, plus all other emissions (e.g. uncaptured emissions). Please complete the FUGITIVE EMISSIONS DATA SUMMARY SHEET for fugitive emission activities.

[1] Please add descriptors such as upward vertical stack, downward vertical stack, horizontal stack, relief vent, rain cap, etc.

[2] Indicate by "C" if venting is continuous. Otherwise, specify the average short-term venting rate with units, for intermittent venting (ie., 15 min/hr). Indicate as many rates as needed to clarify frequency of venting (e.g., 5 min/day, 2 days/wk).

[3] List all regulated air pollutants. Speciate VOCs, including all HAPs. Follow chemical name with Chemical Abstracts Service (CAS) number. **LIST** Acids, CO, CS_2, VOCs, H_2S, Inorganics, Lead, Organics, O_3, NO, NO_2, SO_2, SO_3, all applicable Greenhouse Gases (including CO_2 and methane), etc. **DO NOT LIST** H_2, H_2O, N_2, O_2, and Noble Gases.

[4] Give maximum potential emission rate with no control equipment operating. If emissions occur for less than 1 hr, then record emissions per batch in minutes (e.g. 5 lb VOC/20 minute batch).

[5] Give maximum potential emission rate with proposed control equipment operating. If emissions occur for less than 1 hr, then record emissions per batch in minutes (e.g. 5 lb VOC/20 minute batch).

[6] Indicate method used to determine emission rate as follows: MB = material balance; ST = stack test (give date of test); EE = engineering estimate; O = other (specify).

[7] Provide for all pollutant emissions. Typically, the units of parts per million by volume (ppmv) are used. If the emission is a mineral acid (sulfuric, nitric, hydrochloric or phosphoric) use units of milligram per dry cubic meter (mg/m^3) at standard conditions (68 °F and 29.92 inches Hg) (see 45CSR7). If the pollutant is SO_2, use units of ppmv (See 45CSR10).

Control Device Type Key:
BH – Baghouse
FF – Fabric Filter
SNCR – Selective Non-Catalytic Reduction
SIS – Sorbent Injection System

Attachment J
EMISSION POINTS DATA SUMMARY SHEET

Table 2: Release Parameter Data

Emission Point ID No. *(Must match Emission Units Table)*	Inner Diameter (ft.)	Exit Gas			Emission Point Elevation (ft)		UTM Coordinates (km)	
		Temp. (°F)	Volumetric Flow [1] (acfm) *at operating conditions*	Velocity (fps)	Ground Level *(Height above mean sea level)*	Stack Height [2] *(Release height of emissions above ground level)*	Northing	Easting
Mineral Wool Line								
IMF01	3.12	301.73	21,413.73	67.55	581.30	213.25	4362644.53	252093.48
IMF02	1.31	68	0.00	0.00	581.30	82.02	4362611.06	252090.68
IMF03	1.31	67.73	758.86	9.35	581.30	72.18	4362600.99	252153.8
IMF07	1.31	67.73	790.81	9.74	581.30	72.18	4362629.04	252100.67
IMF08	1.31	67.73	758.86	9.35	581.30	72.18	4362603.14	252107.95
IMF09	1.31	67.73	758.86	9.35	581.30	72.18	4362597.72	252107.68
IMF10	1.31	67.73	758.86	9.35	581.30	72.18	4362608.04	252108.17
IMF11	0.59	67.73	1,037.01	69.23	581.30	16.40	4362712.34	252100.41
IMF12	0.59	67.73	1,037.01	69.23	581.30	49.21	4362712.26	252096.06
IMF14	0.59	67.73	1,037.01	69.23	581.30	49.21	4362679.2	252060.05
IMF15	0.59	67.73	1,037.01	69.23	581.30	26.25	4362677.13	252094.8
IMF16	0.59	67.73	1,037.01	69.23	581.30	78.74	4362658.26	252084.71

IMF17	0.82	67.73	2,210.86	69.77	581.30	88.19	4362686.65	252081.92
IMF18	0.82	67.73	2,210.86	69.77	581.30	59.05	4362688.04	252055.29
IMF21	0.49	103.73	336.99	29.52	581.30	9.84	4362677.7	252073.32
IMF24	1.15	135	3,059.94	49.24	581.30	121.39	4362617.97	252086.77
IMF25	0.49	67.73	758.23	66.44	581.30	72.18	4362624.4	252083.22
HE01	12.96	103.73	369,528.94	56.89	581.30	213.25	4362545.58	252120.56
HE02	1.31	68	0.00	0.00	581.30	82.02	4362660.76	252073.05
CE01	3.77	103.73	44,217.14	70.44	581.30	114.83	4362534.51	252076.15
CE02	2.30	103.73	12,633.47	54.33	581.30	98.42	4362514.57	252061.87
CM10	3.28	103.73	18,950.20	39.93	581.30	49.21	4362572.56	252095.09
CM11	3.28	103.73	18,950.20	39.93	581.30	49.21	4362573.83	252069.22
CM08	0.82	103.73	1,597.18	53.25	581.30	49.21	4362557.26	252095.17
CM09	0.82	103.73	1,597.18	53.25	581.30	49.21	4362585.52	252098.26
Rockfon Line								
RFNE1	1.03	130.73	2,189.77	42.16	581.30	42.65	4362290.6	252016.04
RFNE2	1.03	103.73	2,090.93	40.26	581.30	42.65	4362332.12	252016.9
RFNE3	1.64	211.73	6,436.15	50.75	581.30	39.37	4362307.25	251985.27
RFNE4	1.64	319.73	4,667.98	36.81	581.30	39.37	4362292.23	251966.75
RFNE5	1.64	103.73	6,752.34	53.25	581.30	98.42	4362268.75	251965.62
RFNE6	2.62	319.73	11,204.48	34.51	581.30	49.21	4362250.44	251964.58

RFNE7	2.62	103.73	16,881.27	52.00	581.30	45.93	4362280.32	251978.47
RFNE8	5.12	103.73	74,418.90	64.44	581.30	98.42	4362258.51	252039.94
RFNE9	1.64	211.73	6,436.15	50.75	581.30	39.37	4362202.03	251981.62
RFN10	1.15	134.60	3,059.94	49.25	581.30	49.21	4362356	251989.27
Coal Milling								
IMF04	0.62	68.0	1,037.01	62.14	581.30	39.37	4362655.88	252180.06
IMF05	1.05	180.27	2,872.65	67.09	581.30	65.62	4362612.09	252166.68
IMF06	1.44	68.0	6,316.73	64.37	581.30	65.62	4362612.54	252166.66
IMF13	0.62	68.0	1,037.01	62.14	581.30	6.56	4362668.13	252181.48
Other RAN5 Facility Wide Sources								
CM03	1.15	134.60	3,059.94	49.25	581.30	49.21	4362638.42	252062.66
CM04	1.15	134.60	3,059.94	49.25	581.30	49.21	4362638.77	252055.49
EFP1	0.40	401.00	1,155.78	158.37	581.30	23.62	4362590.4	252183.52

[1] Give at operating conditions. Include inerts.
[2] Release height of emissions above ground level.

Attachment K

Attachment K

FUGITIVE EMISSIONS DATA SUMMARY SHEET

The FUGITIVE EMISSIONS SUMMARY SHEET provides a summation of fugitive emissions. Fugitive emissions are those emissions which could not reasonably pass through a stack, chimney, vent or other functionally equivalent opening. Note that uncaptured process emissions are not typically considered to be fugitive, and must be accounted for on the appropriate EMISSIONS UNIT DATA SHEET and on the EMISSION POINTS DATA SUMMARY SHEET.

Please note that total emissions from the source are equal to all vented emissions, all fugitive emissions, plus all other emissions (e.g. uncaptured emissions).

APPLICATION FORMS CHECKLIST - FUGITIVE EMISSIONS
1.) Will there be haul road activities? ☒ Yes ☐ No ☒ If YES, then complete the HAUL ROAD EMISSIONS UNIT DATA SHEET.
2.) Will there be Storage Piles? ☒ Yes ☐ No ☒ If YES, complete Table 1 of the NONMETALLIC MINERALS PROCESSING EMISSIONS UNIT DATA SHEET.
3.) Will there be Liquid Loading/Unloading Operations? ☐ Yes ☒ No ☐ If YES, complete the BULK LIQUID TRANSFER OPERATIONS EMISSIONS UNIT DATA SHEET.
4.) Will there be emissions of air pollutants from Wastewater Treatment Evaporation? ☐ Yes ☒ No ☐ If YES, complete the GENERAL EMISSIONS UNIT DATA SHEET.
5.) Will there be Equipment Leaks (e.g. leaks from pumps, compressors, in-line process valves, pressure relief devices, open-ended valves, sampling connections, flanges, agitators, cooling towers, etc.)? ☐ Yes ☒ No ☐ If YES, complete the LEAK SOURCE DATA SHEET section of the CHEMICAL PROCESSES EMISSIONS UNIT DATA SHEET.
6.) Will there be General Clean-up VOC Operations? ☐ Yes ☒ No ☐ If YES, complete the GENERAL EMISSIONS UNIT DATA SHEET.
7.) Will there be any other activities that generate fugitive emissions? ☒ Yes ☐ No ☒ If YES, complete the GENERAL EMISSIONS UNIT DATA SHEET or the most appropriate form.
If you answered "NO" to all of the items above, it is not necessary to complete the following table, "Fugitive Emissions Summary."

FUGITIVE EMISSIONS SUMMARY	All Regulated Pollutants Chemical Name/CAS [1]	Maximum Potential Uncontrolled Emissions [2]		Maximum Potential Controlled Emissions [3]		Est. Method Used [4]
		lb/hr	ton/yr	lb/hr	ton/yr	
Haul Road/Road Dust Emissions Paved Haul Roads	PM_{10}	<0.01	1.68	<0.01	0.41	O – AP-42
	$PM_{2.5}$	<0.01	0.41	<0.01	0.10	
Unpaved Haul Roads		--	--	--	--	--
Storage Pile Emissions – **Raw Material Outdoor Stockpile (RMS)**	PM_{10}	0.02	0.09	0.01	0.04	EE
	$PM_{2.5}$	<0.01	0.01	<0.01	<0.01	
Storage Pile Emissions – **Portable Crusher/Pit Waste Stockpile (B170)**	PM_{10}	0.07	0.31	0.03	0.15	EE
	$PM_{2.5}$	0.01	0.05	<0.01	0.02	
Loading/Unloading Operations		--	--	--	--	--
Wastewater Treatment Evaporation & Operations		--	--	--	--	--
Equipment Leaks		Does not apply	--	Does not apply	--	--
General Clean-up VOC Emissions		--	--	--	--	--
Other – **Dry Ice Cleaning (DI)**	CO_2	363.76	1593.28	363.75	1593.28	EE
Other – **Charging Material Handling Building Vent 1 (IMF 17)**	PM_{10}	0.02	0.08	0.02	0.08	EE
	$PM_{2.5}$	<0.01	0.04	<0.01	0.04	
Other – **Charging Material Handling Building Vent 2 (IMF 18)**	PM_{10}	0.02	0.08	0.02	0.08	EE
	$PM_{2.5}$	<0.01	0.04	<0.01	0.04	
Other – **Coal Milling Unloading (B230)**	PM_{10}	<0.01	<0.01	<0.01	<0.01	EE
	$PM_{2.5}$	<0.01	<0.01	<0.01	<0.01	
Other – **Coal Loading Hopper (B231)**	PM_{10}	<0.01	<0.01	<0.01	<0.01	EE
	$PM_{2.5}$	<0.01	<0.01	<0.01	<0.01	
Other – **Raw Material Reject Collection Bin (RM_REJ)**	PM_{10}	<0.01	<0.01	<0.01	<0.01	EE
	$PM_{2.5}$	<0.01	<0.01	<0.01	<0.01	
Other – **Sieve Reject Collection Bin (S_REJ)**	PM_{10}	<0.01	<0.01	<0.01	<0.01	EE
	$PM_{2.5}$	<0.01	<0.01	<0.01	<0.01	
Other – **Raw Material Loading Hopper (B215)**	PM_{10}	<0.01	0.11	<0.01	0.03	EE

	$PM_{2.5}$	<0.01	0.02	<0.01	<0.01	
Other – **Melting Furnace Portable Crusher (B170)**	PM_{10}	<0.01	0.04	<0.01	0.02	EE
	$PM_{2.5}$	<0.01	<0.01	<0.01	<0.01	
Other – **Raw Material Storage (B210)**	PM_{10}	<0.01	0.21	<0.01	0.13	EE
	$PM_{2.5}$	<0.01	0.03	<0.01	0.02	
Other – **Coal Milling Building (B235)**	PM_{10}	<0.01	0.04	<0.01	0.04	EE
	$PM_{2.5}$	<0.01	0.02	<0.01	0.02	
Other – **Product Marking Ink and Cleaner**	VOC	2.16	9.47	2.16	9.47	EE

[1] List all regulated air pollutants. Speciate VOCs, including all HAPs. Follow chemical name with Chemical Abstracts Service (CAS) number. LIST Acids, CO, CS_2, VOCs, H_2S, Inorganics, Lead, Organics, O_3, NO, NO_2, SO_2, SO_3, all applicable Greenhouse Gases (including CO_2 and methane), etc. DO NOT LIST H_2, H_2O, N_2, O_2, and Noble Gases.

[2] Give rate with no control equipment operating. If emissions occur for less than 1 hr, then record emissions per batch in minutes (e.g. 5 lb VOC/20 minute batch).

[3] Give rate with proposed control equipment operating. If emissions occur for less than 1 hr, then record emissions per batch in minutes (e.g. 5 lb VOC/20 minute batch).

[4] Indicate method used to determine emission rate as follows: MB = material balance; ST = stack test (give date of test); EE = engineering estimate; O = other (specify)

Attachment L

Attachment L
EMISSIONS UNIT DATA SHEET
GENERAL

To be used for affected sources other than asphalt plants, foundries, incinerators, indirect heat exchangers, and quarries.

Identification Number (as assigned on *Equipment List Form*): **IMF01**

1. Name or type and model of proposed affected source: **Melting Furnace**
2. On a separate sheet(s), furnish a sketch(es) of this affected source. If a modification is to be made to this source, clearly indicated the change(s). Provide a narrative description of all features of the affected source which may affect the production of air pollutants.
3. Name(s) and maximum amount of proposed process material(s) charged per hour: **Mineral Inputs (Claimed Confidential) – Charge Rate Claimed Confidential**
4. Name(s) and maximum amount of proposed material(s) produced per hour: **Melted Mineral – Melt Rate Claimed Confidential**
5. Give chemical reactions, if applicable, that will be involved in the generation of air pollutants: **The chemical reactions from the Melting Furnace are caused by the combustion of the raw material inputs. These combustion reactions are generally considered well known and for this reason are not included.**

* The identification number which appears here must correspond to the air pollution control device identification number appearing on the *List Form*.

6. Combustion Data (if applicable):

(a) Type and amount in appropriate units of fuel(s) to be burned:

(b) Chemical analysis of proposed fuel(s), excluding coal, including maximum percent sulfur and ash:

NA

(c) Theoretical combustion air requirement (ACF/unit of fuel):

21,414 scfm (33,900 Nm^3/hr)	@	**3,000**	°F and	**14.7**	psia.

(d) Percent excess air:

(e) Type and BTU/hr of burners and all other firing equipment planned to be used:

(f) If coal is proposed as a source of fuel, identify supplier and seams and give sizing of the coal as it will be fired:

TBD

(g) Proposed maximum design heat input: **Claimed Confidential** × 10^6 BTU/hr.

7. Projected operating schedule:

Hours/Day	**24**	Days/Week	**7**	Weeks/Year	**52**

8. Projected amount of pollutants that would be emitted from this affected source if no control devices were used:				
@ 301.73 °F and 14.7 psia				
a. NO_X	37.37	lb/hr		grains/ACF
b. SO_2	33.63	lb/hr		grains/ACF
c. CO	11.21	lb/hr		grains/ACF
d. PM_{10}	8.22	lb/hr		grains/ACF
e. Hydrocarbons	--	lb/hr		grains/ACF
f. VOCs	11.66	lb/hr		grains/ACF
g. Pb	<0.01	lb/hr		grains/ACF
h. Specify other(s)				
Total HAPs	3.43	lb/hr		grains/ACF
		lb/hr		grains/ACF
		lb/hr		grains/ACF
		lb/hr		grains/ACF

NOTE: (1) An Air Pollution Control Device Sheet must be completed for any air pollution device(s) used to control emissions from this affected source.

(2) Complete the Emission Points Data Sheet.

9. Proposed Monitoring, Recordkeeping, Reporting, and Testing
Please propose monitoring, recordkeeping, and reporting in order to demonstrate compliance with the proposed operating parameters. Please propose testing in order to demonstrate compliance with the proposed emissions limits.

MONITORING	RECORDKEEPING
See proposed monitoring in Attachment O.	**See proposed recordkeeping in Attachment O.**
REPORTING	TESTING
See proposed reporting in Attachment O.	**See proposed testing in Attachment O.**

MONITORING. PLEASE LIST AND DESCRIBE THE PROCESS PARAMETERS AND RANGES THAT ARE PROPOSED TO BE MONITORED IN ORDER TO DEMONSTRATE COMPLIANCE WITH THE OPERATION OF THIS PROCESS EQUIPMENT OPERATION/AIR POLLUTION CONTROL DEVICE.

RECORDKEEPING. PLEASE DESCRIBE THE PROPOSED RECORDKEEPING THAT WILL ACCOMPANY THE MONITORING.

REPORTING. PLEASE DESCRIBE THE PROPOSED FREQUENCY OF REPORTING OF THE RECORDKEEPING.

TESTING. PLEASE DESCRIBE ANY PROPOSED EMISSIONS TESTING FOR THIS PROCESS EQUIPMENT/AIR POLLUTION CONTROL DEVICE.

10. Describe all operating ranges and maintenance procedures required by Manufacturer to maintain warranty

NA

Attachment L
Emission Unit Data Sheet
(INDIRECT HEAT EXCHANGER)

Emission Unit ID No. must match List Form): **IMF24**

Control Device ID No. (must match List Form):

Equipment Information

1. Manufacturer: **TBD**	2. Model No. **Custom** Serial No.
3. Number of units: **1**	4. Use: **Warm the Melting Furnace baghouses to prevent condensation.**
5. Rated Boiler Horsepower: hp	6. Boiler Serial No.:
7. Date constructed: **2018**	8. Date of last modification and explain: **NA**
9. Maximum design heat input per unit: **5.12** $\times 10^6$ BTU/hr	10. Peak heat input per unit: **5.12** $\times 10^6$ BTU/hr
11. Steam produced at maximum design output: **NA** LB/hr psig	12. Projected Operating Schedule: Hours/Day **24** Days/Week **7** Weeks/Year **52**
13. Type of firing equipment to be used: ☐ Pulverized coal ☐ Spreader stoker ☐ Oil burners ☒ Natural Gas Burner ☐ Others, specify	14. Proposed type of burners and orientation: ☐ Vertical ☐ Front Wall ☐ Opposed ☐ Tangential ☐ Others, specify
15. Type of draft: ☐ Forced ☐ Induced	16. Percent of ash retained in furnace: %
17. Will flyash be reinjected? ☐ Yes ☐ No	18. Percent of carbon in flyash: %

Stack or Vent Data

19. Inside diameter or dimensions: **1.15** ft.	20. Gas exit temperature: **134.33** °F
21. Height: **121.39** ft.	22. Stack serves: ☒ This equipment only ☐ Other equipment also (submit type and rating of all other equipment exhausted through this stack or vent)
23. Gas flow rate: **3,059.94** ft^3/min	
24. Estimated percent of moisture: %	

Fuel Requirements

25. Type	Fuel Oil No.	Natural Gas	Gas (other, specify)	Coal, Type:	Other:
Quantity (at Design Output)	gph@60°F	**Claimed Confidential** ft^3/hr	ft^3/hr	TPH	
Annually	×10^3 gal	**Claimed Confidential** ×10^6 ft^3/hr	×10^6 ft^3/hr	tons	
Sulfur	Maximum: wt. % Average: wt. %	gr/100 ft^3	gr/100 ft^3	Maximum: wt. %	
Ash (%)				Maximum	
BTU Content	BTU/Gal. Lbs/Gal.@60°F	**1026** BTU/ft^3	BTU/ft^3	BTU/lb	
Source					
Supplier					
Halogens (Yes/No)					
List and Identify Metals					

26. Gas burner mode of control:
☐ Manual ☐ Automatic hi-low
☐ Automatic full modulation ☐ Automatic on-off

27. Gas burner manufacture: **TBD**

28. Oil burner manufacture: **NA**

29. If fuel oil is used, how is it atomized? ☐ Oil Pressure ☐ Steam Pressure ☐ Compressed Air ☐ Rotary Cup ☐ Other, specify

30. Fuel oil preheated: ☐ Yes ☐ No

31. If yes, indicate temperature: °F

32. Specify the calculated theoretical air requirements for combustion of the fuel or mixture of fuels described above actual cubic feet (ACF) per unit of fuel:
@ °F, PSIA, % moisture

33. Emission rate at rated capacity: lb/hr

34. Percent excess air actually required for combustion of the fuel described: %

Coal Characteristics

35. Seams: **NA**

36. Proximate analysis (dry basis): % of Fixed Carbon: % of Sulfur:
% of Moisture: % of Volatile Matter:
% of Ash:

Emissions Stream

37. What quantities of pollutants will be emitted from the boiler before controls?

Pollutant	Pounds per Hour lb/hr	grain/ACF	@ °F	PSIA
CO	**No Controls – See Below**			
Hydrocarbons				
NO_x				
Pb				
PM_{10}				
SO_2				
VOCs				
Other (specify)				

38. What quantities of pollutants will be emitted from the boiler after controls?

Pollutant	Pounds per Hour lb/hr	grain/ACF	@ °F	PSIA
CO	**0.42**			
Hydrocarbons				
NO_x	**0.36**			
Pb				
PM_{10}				
SO_2				
VOCs				
Other (specify)				

39. How will waste material from the process and control equipment be disposed of?

Wastes are not expected from a natural gas-fired unit.

40. Have you completed an *Air Pollution Control Device Sheet(s)* for the control(s) used on this Emission Unit.

41. Have you included the ***air pollution rates*** on the Emissions Points Data Summary Sheet? **Yes**

42. **Proposed Monitoring, Recordkeeping, Reporting, and Testing**
Please propose monitoring, recordkeeping, and reporting in order to demonstrate compliance with the proposed operating parameters. Please propose testing in order to demonstrate compliance with the proposed emissions limits.

MONITORING PLAN: Please list (1) describe the process parameters and how they were chosen (2) the ranges and how they were established for monitoring to demonstrate compliance with the operation of this process equipment operation or air pollution control device.

See proposed monitoring plan in Attachment O.

TESTING PLAN: Please describe any proposed emissions testing for this process equipment or air pollution control device.

See proposed testing plan in Attachment O.

RECORDKEEPING: Please describe the proposed recordkeeping that will accompany the monitoring.

See proposed recordkeeping plan in Attachment O.

REPORTING: Please describe the proposed frequency of reporting of the recordkeeping.

See proposed reporting plan in Attachment O.

43. Describe all operating ranges and maintenance procedures required by Manufacturer to maintain warranty.
NA

Attachment L
Emission Unit Data Sheet
(INDIRECT HEAT EXCHANGER)

Emission Unit ID No. must match List Form): **CO**

Control Device ID No. (must match List Form): **CO-AB, HE01**

Equipment Information

1. Manufacturer: **TBD**	2. Model No. **Custom** Serial No.
3. Number of units: **Claimed Confidential**	4. Use: **Direct-fired unit - Provide heat for the curing process.**
5. Rated Boiler Horsepower: **NA** hp	6. Boiler Serial No.: **NA**
7. Date constructed: **2018**	8. Date of last modification and explain: **NA**
9. Maximum design heat input per unit: **Claimed Confidential** $\times 10^6$ BTU/hr	10. Peak heat input per unit: **Claimed Confidential** $\times 10^6$ BTU/hr
11. Steam produced at maximum design output: **NA** LB/hr psig	12. Projected Operating Schedule: Hours/Day **24** Days/Week **7** Weeks/Year **52**
13. Type of firing equipment to be used: ☐ Pulverized coal ☐ Spreader stoker ☐ Oil burners ☒ Natural Gas Burner ☐ Others, specify	14. Proposed type of burners and orientation: ☐ Vertical ☐ Front Wall ☐ Opposed ☐ Tangential ☐ Others, specify
15. Type of draft: ☐ Forced ☐ Induced	16. Percent of ash retained in furnace: %
17. Will flyash be reinjected? ☐ Yes ☐ No	18. Percent of carbon in flyash: %

Stack or Vent Data

19. Inside diameter or dimensions: **12.96** ft.	20. Gas exit temperature: **104** °F
21. Height: **213.25** ft.	22. Stack serves: ☐ This equipment only ☒ Other equipment also (submit type and rating of all other equipment exhausted through this stack or vent) **HE01, CO-AB, CO, SPN, and CS**
23. Gas flow rate: **369,528.94** ft^3/min	
24. Estimated percent of moisture: %	

Fuel Requirements

25. Type	Fuel Oil No.	Natural Gas	Gas (other, specify)	Coal, Type:	Other:
Quantity (at Design Output)	gph@60°F	**Claimed Confidential** ft^3/hr	ft^3/hr	TPH	
Annually	$\times 10^3$ gal	**Claimed Confidential** $\times 10^6$ ft^3/hr	$\times 10^6$ ft^3/hr	tons	
Sulfur	Maximum: wt. % Average: wt. %	gr/100 ft^3	gr/100 ft^3	Maximum: wt. %	
Ash (%)				Maximum	
BTU Content	BTU/Gal. Lbs/Gal.@60°F	**1026** BTU/ft^3	BTU/ft^3	BTU/lb	
Source					
Supplier					
Halogens (Yes/No)					
List and Identify Metals					

26. Gas burner mode of control:
☐ Manual ☐ Automatic hi-low
☐ Automatic full modulation ☐ Automatic on-off

27. Gas burner manufacture: **TBD**

28. Oil burner manufacture: **NA**

29. If fuel oil is used, how is it atomized? ☐ Oil Pressure ☐ Steam Pressure ☐ Compressed Air ☐ Rotary Cup ☐ Other, specify

30. Fuel oil preheated: ☐ Yes ☐ No

31. If yes, indicate temperature: °F

32. Specify the calculated theoretical air requirements for combustion of the fuel or mixture of fuels described above actual cubic feet (ACF) per unit of fuel:
@ °F, PSIA, % moisture

33. Emission rate at rated capacity: lb/hr

34. Percent excess air actually required for combustion of the fuel described: %

Coal Characteristics

35. Seams: **NA**

36. Proximate analysis (dry basis): % of Fixed Carbon: % of Sulfur:
% of Moisture: % of Volatile Matter:
% of Ash:

Emissions Stream

37. What quantities of pollutants will be emitted from the boiler before controls?

Pollutant	Pounds per Hour lb/hr	grain/ACF	@ °F	PSIA
CO	**No Controls – See Below**			
Hydrocarbons				
NO_x				
Pb				
PM_{10}				
SO_2				
VOCs				
Other (specify)				

38. What quantities of pollutants will be emitted from the boiler after controls?

Pollutant	Pounds per Hour lb/hr	grain/ACF	@ °F	PSIA
CO	**1.65**			
Hydrocarbons				
NO_x	**13.23**			
Pb				
PM_{Fil}	**1.50**			
PM_{10}	**1.50**			
$PM_{2.5}$	**0.6**			
SO_2	**<0.01**			
VOCs	**1.50***			
Other (specify)				

*Includes non-HAP VOCs only – Organic HAP emissions are quantified as a combined limit – See Appendix A

39. How will waste material from the process and control equipment be disposed of?

Wastes are not expected from a natural gas-fired unit.

40. Have you completed an *Air Pollution Control Device Sheet(s)* for the control(s) used on this Emission Unit.

41. Have you included the ***air pollution rates*** on the Emissions Points Data Summary Sheet? **Yes**

42. **Proposed Monitoring, Recordkeeping, Reporting, and Testing** Please propose monitoring, recordkeeping, and reporting in order to demonstrate compliance with the proposed operating parameters. Please propose testing in order to demonstrate compliance with the proposed emissions limits.
MONITORING PLAN: Please list (1) describe the process parameters and how they were chosen (2) the ranges and how they were established for monitoring to demonstrate compliance with the operation of this process equipment operation or air pollution control device. **See proposed monitoring plan in Attachment O.**
TESTING PLAN: Please describe any proposed emissions testing for this process equipment or air pollution control device. **See proposed testing plan in Attachment O.**
RECORDKEEPING: Please describe the proposed recordkeeping that will accompany the monitoring. **See proposed recordkeeping plan in Attachment O.**
REPORTING: Please describe the proposed frequency of reporting of the recordkeeping. **See proposed reporting plan in Attachment O.**
43. Describe all operating ranges and maintenance procedures required by Manufacturer to maintain warranty. **NA**

Attachment L
EMISSIONS UNIT DATA SHEET
GENERAL

To be used for affected sources other than asphalt plants, foundries, incinerators, indirect heat exchangers, and quarries.

Identification Number (as assigned on *Equipment List Form*): **SPN**

1. Name or type and model of proposed affected source: **Spinning Chamber**
2. On a separate sheet(s), furnish a sketch(es) of this affected source. If a modification is to be made to this source, clearly indicated the change(s). Provide a narrative description of all features of the affected source which may affect the production of air pollutants.
3. Name(s) and maximum amount of proposed process material(s) charged per hour: **Mineral Wool – Rate Claimed Confidential**
4. Name(s) and maximum amount of proposed material(s) produced per hour: **Mineral Wool – Rate Claimed Confidential**
5. Give chemical reactions, if applicable, that will be involved in the generation of air pollutants: **NA**

* The identification number which appears here must correspond to the air pollution control device identification number appearing on the *List Form*.

6. Combustion Data (if applicable): **NA**

(a) Type and amount in appropriate units of fuel(s) to be burned:

(b) Chemical analysis of proposed fuel(s), excluding coal, including maximum percent sulfur and ash:

(c) Theoretical combustion air requirement (ACF/unit of fuel):

@ °F and psia.

(d) Percent excess air:

(e) Type and BTU/hr of burners and all other firing equipment planned to be used:

(f) If coal is proposed as a source of fuel, identify supplier and seams and give sizing of the coal as it will be fired:

(g) Proposed maximum design heat input: $\times 10^6$ BTU/hr.

7. Projected operating schedule:

Hours/Day	**24**	Days/Week	**7**	Weeks/Year	**52**

8. Projected amount of pollutants that would be emitted from this affected source if no control devices were used:

@ **104** °F and **14.7** psia

a. NO_X		lb/hr	grains/ACF
b. SO_2		lb/hr	grains/ACF
c. CO		lb/hr	grains/ACF
d. PM_{10}	**10.85**	lb/hr	grains/ACF
e. Hydrocarbons		lb/hr	grains/ACF
f. VOCs (Non-HAP)	**13.56**	lb/hr	grains/ACF
g. Pb		lb/hr	grains/ACF
h. Specify other(s)			
$PM_{2.5}$	**10.85**	lb/hr	grains/ACF
		lb/hr	grains/ACF
		lb/hr	grains/ACF
		lb/hr	grains/ACF

NOTE: (1) An Air Pollution Control Device Sheet must be completed for any air pollution device(s) used to control emissions from this affected source.

(2) Complete the Emission Points Data Sheet.

9. Proposed Monitoring, Recordkeeping, Reporting, and Testing
Please propose monitoring, recordkeeping, and reporting in order to demonstrate compliance with the proposed operating parameters. Please propose testing in order to demonstrate compliance with the proposed emissions limits.

MONITORING	RECORDKEEPING
See proposed monitoring plan in Attachment O.	**See proposed recordkeeping plan in Attachment O.**
REPORTING	TESTING
See proposed reporting plan in Attachment O.	**See proposed testing plan in Attachment O.**

MONITORING. PLEASE LIST AND DESCRIBE THE PROCESS PARAMETERS AND RANGES THAT ARE PROPOSED TO BE MONITORED IN ORDER TO DEMONSTRATE COMPLIANCE WITH THE OPERATION OF THIS PROCESS EQUIPMENT OPERATION/AIR POLLUTION CONTROL DEVICE.

RECORDKEEPING. PLEASE DESCRIBE THE PROPOSED RECORDKEEPING THAT WILL ACCOMPANY THE MONITORING.

REPORTING. PLEASE DESCRIBE THE PROPOSED FREQUENCY OF REPORTING OF THE RECORDKEEPING.

TESTING. PLEASE DESCRIBE ANY PROPOSED EMISSIONS TESTING FOR THIS PROCESS EQUIPMENT/AIR POLLUTION CONTROL DEVICE.

10. Describe all operating ranges and maintenance procedures required by Manufacturer to maintain warranty

NA

Attachment L
EMISSIONS UNIT DATA SHEET
GENERAL

To be used for affected sources other than asphalt plants, foundries, incinerators, indirect heat exchangers, and quarries.

Identification Number (as assigned on *Equipment List Form*): **CS**

1. Name or type and model of proposed affected source: **Cooling Section**
2. On a separate sheet(s), furnish a sketch(es) of this affected source. If a modification is to be made to this source, clearly indicated the change(s). Provide a narrative description of all features of the affected source which may affect the production of air pollutants.
3. Name(s) and maximum amount of proposed process material(s) charged per hour: **Mineral Wool – Throughput Claimed Confidential**
4. Name(s) and maximum amount of proposed material(s) produced per hour: **Mineral Wool – Throughput Claimed Confidential**
5. Give chemical reactions, if applicable, that will be involved in the generation of air pollutants: **NA**

* The identification number which appears here must correspond to the air pollution control device identification number appearing on the *List Form*.

6. Combustion Data (if applicable): **NA**					
(a) Type and amount in appropriate units of fuel(s) to be burned:					
(b) Chemical analysis of proposed fuel(s), excluding coal, including maximum percent sulfur and ash:					
(c) Theoretical combustion air requirement (ACF/unit of fuel): @ °F and psia.					
(d) Percent excess air:					
(e) Type and BTU/hr of burners and all other firing equipment planned to be used:					
(f) If coal is proposed as a source of fuel, identify supplier and seams and give sizing of the coal as it will be fired:					
(g) Proposed maximum design heat input: × 10^6 BTU/hr.					
7. Projected operating schedule:					
Hours/Day	**24**	Days/Week	**7**	Weeks/Year	**52**

8. Projected amount of pollutants that would be emitted from this affected source if no control devices were used:		
@ **104** °F and	**14.7** psia	
a. NO_X	**1.32** lb/hr	grains/ACF
b. SO_2	lb/hr	grains/ACF
c. CO	**0.17** lb/hr	grains/ACF
d. PM_{10}	**7.05** lb/hr	grains/ACF
e. Hydrocarbons	lb/hr	grains/ACF
f. VOCs (Non-HAP)	**5.29** lb/hr	grains/ACF
g. Pb	lb/hr	grains/ACF
h. Specify other(s)		
$PM_{2.5}$	**7.05** lb/hr	grains/ACF
	lb/hr	grains/ACF
	lb/hr	grains/ACF
	lb/hr	grains/ACF

NOTE: (1) An Air Pollution Control Device Sheet must be completed for any air pollution device(s) used to control emissions from this affected source.

(2) Complete the Emission Points Data Sheet.

9. Proposed Monitoring, Recordkeeping, Reporting, and Testing
Please propose monitoring, recordkeeping, and reporting in order to demonstrate compliance with the proposed operating parameters. Please propose testing in order to demonstrate compliance with the proposed emissions limits.

MONITORING	RECORDKEEPING
See proposed monitoring plan in Attachment O.	**See proposed recordkeeping plan in Attachment O.**

REPORTING	TESTING
See proposed reporting plan in Attachment O.	**See proposed testing plan in Attachment O.**

MONITORING. PLEASE LIST AND DESCRIBE THE PROCESS PARAMETERS AND RANGES THAT ARE PROPOSED TO BE MONITORED IN ORDER TO DEMONSTRATE COMPLIANCE WITH THE OPERATION OF THIS PROCESS EQUIPMENT OPERATION/AIR POLLUTION CONTROL DEVICE.

RECORDKEEPING. PLEASE DESCRIBE THE PROPOSED RECORDKEEPING THAT WILL ACCOMPANY THE MONITORING.

REPORTING. PLEASE DESCRIBE THE PROPOSED FREQUENCY OF REPORTING OF THE RECORDKEEPING.

TESTING. PLEASE DESCRIBE ANY PROPOSED EMISSIONS TESTING FOR THIS PROCESS EQUIPMENT/AIR POLLUTION CONTROL DEVICE.

10. Describe all operating ranges and maintenance procedures required by Manufacturer to maintain warranty

NA

Attachment L
EMISSIONS UNIT DATA SHEET
GENERAL

To be used for affected sources other than asphalt plants, foundries, incinerators, indirect heat exchangers, and quarries.

Identification Number (as assigned on *Equipment List Form*): **CM12 and CM13**

1. Name or type and model of proposed affected source: **Fleece Application Vents**
2. On a separate sheet(s), furnish a sketch(es) of this affected source. If a modification is to be made to this source, clearly indicated the change(s). Provide a narrative description of all features of the affected source which may affect the production of air pollutants.
3. Name(s) and maximum amount of proposed process material(s) charged per hour: **Binder Application Rate – 407.9 lb/hr (185 kg/hr)**
4. Name(s) and maximum amount of proposed material(s) produced per hour: **Mineral Wool – Claimed Confidential**
5. Give chemical reactions, if applicable, that will be involved in the generation of air pollutants: **NA**

* The identification number which appears here must correspond to the air pollution control device identification number appearing on the *List Form*.

6. Combustion Data (if applicable): **NA**

(a) Type and amount in appropriate units of fuel(s) to be burned:

(b) Chemical analysis of proposed fuel(s), excluding coal, including maximum percent sulfur and ash:

(c) Theoretical combustion air requirement (ACF/unit of fuel):

@ °F and psia.

(d) Percent excess air:

(e) Type and BTU/hr of burners and all other firing equipment planned to be used:

(f) If coal is proposed as a source of fuel, identify supplier and seams and give sizing of the coal as it will be fired:

(g) Proposed maximum design heat input: $\times 10^6$ BTU/hr.

7. Projected operating schedule:

Hours/Day	24	Days/Week	7	Weeks/Year	52

8. Projected amount of pollutants that would be emitted from this affected source if no control devices were used:

@ °F and psia

a. NO_X	lb/hr	grains/ACF
b. SO_2	lb/hr	grains/ACF
c. CO	lb/hr	grains/ACF
d. PM_{10}	lb/hr	grains/ACF
e. Hydrocarbons	lb/hr	grains/ACF
f. VOCs	**5.82** lb/hr	grains/ACF
g. Pb	lb/hr	grains/ACF
h. Specify other(s)		
Total HAPs	**5.82** lb/hr	grains/ACF
	lb/hr	grains/ACF
	lb/hr	grains/ACF
	lb/hr	grains/ACF

NOTE: (1) An Air Pollution Control Device Sheet must be completed for any air pollution device(s) used to control emissions from this affected source.

(2) Complete the Emission Points Data Sheet.

9. Proposed Monitoring, Recordkeeping, Reporting, and Testing
Please propose monitoring, recordkeeping, and reporting in order to demonstrate compliance with the proposed operating parameters. Please propose testing in order to demonstrate compliance with the proposed emissions limits.

MONITORING	RECORDKEEPING
See proposed monitoring plan in Attachment O.	**See proposed recordkeeping plan in Attachment O.**
REPORTING	TESTING
See proposed reporting plan in Attachment O.	**See proposed testing plan in Attachment O.**

MONITORING. PLEASE LIST AND DESCRIBE THE PROCESS PARAMETERS AND RANGES THAT ARE PROPOSED TO BE MONITORED IN ORDER TO DEMONSTRATE COMPLIANCE WITH THE OPERATION OF THIS PROCESS EQUIPMENT OPERATION/AIR POLLUTION CONTROL DEVICE.

RECORDKEEPING. PLEASE DESCRIBE THE PROPOSED RECORDKEEPING THAT WILL ACCOMPANY THE MONITORING.

REPORTING. PLEASE DESCRIBE THE PROPOSED FREQUENCY OF REPORTING OF THE RECORDKEEPING.

TESTING. PLEASE DESCRIBE ANY PROPOSED EMISSIONS TESTING FOR THIS PROCESS EQUIPMENT/AIR POLLUTION CONTROL DEVICE.

10. Describe all operating ranges and maintenance procedures required by Manufacturer to maintain warranty

NA

Attachment L
EMISSIONS UNIT DATA SHEET
GENERAL

To be used for affected sources other than asphalt plants, foundries, incinerators, indirect heat exchangers, and quarries.

Identification Number (as assigned on *Equipment List Form*): **CM08, CM09**

1. Name or type and model of proposed affected source: **Recycle Plant Building Vents 3 - 4**
2. On a separate sheet(s), furnish a sketch(es) of this affected source. If a modification is to be made to this source, clearly indicated the change(s). Provide a narrative description of all features of the affected source which may affect the production of air pollutants.
3. Name(s) and maximum amount of proposed process material(s) charged per hour: **Recycled Material – Claimed Confidential**
4. Name(s) and maximum amount of proposed material(s) produced per hour: **Mineral Wool – Claimed Confidential**
5. Give chemical reactions, if applicable, that will be involved in the generation of air pollutants: **NA**

* The identification number which appears here must correspond to the air pollution control device identification number appearing on the *List Form*.

6. Combustion Data (if applicable): **NA** (a) Type and amount in appropriate units of fuel(s) to be burned:
(b) Chemical analysis of proposed fuel(s), excluding coal, including maximum percent sulfur and ash:
(c) Theoretical combustion air requirement (ACF/unit of fuel): @ °F and psia.
(d) Percent excess air:
(e) Type and BTU/hr of burners and all other firing equipment planned to be used:
(f) If coal is proposed as a source of fuel, identify supplier and seams and give sizing of the coal as it will be fired:
(g) Proposed maximum design heat input: $\times 10^6$ BTU/hr.

7. Projected operating schedule:

Hours/Day	**24**	Days/Week	**7**	Weeks/Year	**52**

8. Projected amount of pollutants that would be emitted from this affected source if no control devices were used: @ °F and psia		
a. NO_X	lb/hr	grains/ACF
b. SO_2	lb/hr	grains/ACF
c. CO	lb/hr	grains/ACF
d. PM_{10}	**0.05** lb/hr	grains/ACF
e. Hydrocarbons	lb/hr	grains/ACF
f. VOCs	lb/hr	grains/ACF
g. Pb	lb/hr	grains/ACF
h. Specify other(s)		
$PM_{2.5}$	**0.03** lb/hr	grains/ACF
	lb/hr	grains/ACF
	lb/hr	grains/ACF
	lb/hr	grains/ACF

NOTE: (1) An Air Pollution Control Device Sheet must be completed for any air pollution device(s) used to control emissions from this affected source.

(2) Complete the Emission Points Data Sheet.

9. Proposed Monitoring, Recordkeeping, Reporting, and Testing Please propose monitoring, recordkeeping, and reporting in order to demonstrate compliance with the proposed operating parameters. Please propose testing in order to demonstrate compliance with the proposed emissions limits.	
MONITORING **See Attachment O**	RECORDKEEPING **See Attachment O**
REPORTING **See Attachment O**	TESTING **See Attachment O**
MONITORING. PLEASE LIST AND DESCRIBE THE PROCESS PARAMETERS AND RANGES THAT ARE PROPOSED TO BE MONITORED IN ORDER TO DEMONSTRATE COMPLIANCE WITH THE OPERATION OF THIS PROCESS EQUIPMENT OPERATION/AIR POLLUTION CONTROL DEVICE.	
RECORDKEEPING. PLEASE DESCRIBE THE PROPOSED RECORDKEEPING THAT WILL ACCOMPANY THE MONITORING.	
REPORTING. PLEASE DESCRIBE THE PROPOSED FREQUENCY OF REPORTING OF THE RECORDKEEPING.	
TESTING. PLEASE DESCRIBE ANY PROPOSED EMISSIONS TESTING FOR THIS PROCESS EQUIPMENT/AIR POLLUTION CONTROL DEVICE.	
10. Describe all operating ranges and maintenance procedures required by Manufacturer to maintain warranty	

Attachment L
EMISSIONS UNIT DATA SHEET
GENERAL

To be used for affected sources other than asphalt plants, foundries, incinerators, indirect heat exchangers, and quarries.

Identification Number (as assigned on *Equipment List Form*): **DI**

1. Name or type and model of proposed affected source: **Dry Ice Cleaning – Fugitive Source**
2. On a separate sheet(s), furnish a sketch(es) of this affected source. If a modification is to be made to this source, clearly indicated the change(s). Provide a narrative description of all features of the affected source which may affect the production of air pollutants.
3. Name(s) and maximum amount of proposed process material(s) charged per hour:
4. Name(s) and maximum amount of proposed material(s) produced per hour: **Dry Ice Production Rate – 165.35 lb/hr (75 kg/hr)**
5. Give chemical reactions, if applicable, that will be involved in the generation of air pollutants: **CO_2 (s) + Ambient Air → CO_2 (g)**

* The identification number which appears here must correspond to the air pollution control device identification number appearing on the *List Form*.

6. Combustion Data (if applicable): **NA**		
(a) Type and amount in appropriate units of fuel(s) to be burned:		
(b) Chemical analysis of proposed fuel(s), excluding coal, including maximum percent sulfur and ash:		
(c) Theoretical combustion air requirement (ACF/unit of fuel): @ °F and psia.		
(d) Percent excess air:		
(e) Type and BTU/hr of burners and all other firing equipment planned to be used:		
(f) If coal is proposed as a source of fuel, identify supplier and seams and give sizing of the coal as it will be fired:		
(g) Proposed maximum design heat input: $\times 10^6$ BTU/hr.		
7. Projected operating schedule:		
Hours/Day **24**	Days/Week **7**	Weeks/Year **52**

8. Projected amount of pollutants that would be emitted from this affected source if no control devices were used: @ °F and psia		
a. NO_X	lb/hr	grains/ACF
b. SO_2	lb/hr	grains/ACF
c. CO	lb/hr	grains/ACF
d. PM_{10}	lb/hr	grains/ACF
e. Hydrocarbons	lb/hr	grains/ACF
f. VOCs	lb/hr	grains/ACF
g. Pb	lb/hr	grains/ACF
h. Specify other(s)		
CO_2	**363.76** lb/hr	grains/ACF
	lb/hr	grains/ACF
	lb/hr	grains/ACF
	lb/hr	grains/ACF

NOTE: (1) An Air Pollution Control Device Sheet must be completed for any air pollution device(s) used to control emissions from this affected source.

(2) Complete the Emission Points Data Sheet.

9. Proposed Monitoring, Recordkeeping, Reporting, and Testing Please propose monitoring, recordkeeping, and reporting in order to demonstrate compliance with the proposed operating parameters. Please propose testing in order to demonstrate compliance with the proposed emissions limits.	
MONITORING **See proposed monitoring plan in Attachment O.**	RECORDKEEPING **See proposed recordkeeping plan in Attachment O.**
REPORTING **See proposed reporting plan in Attachment O.**	TESTING **See proposed testing plan in Attachment O.**
MONITORING. PLEASE LIST AND DESCRIBE THE PROCESS PARAMETERS AND RANGES THAT ARE PROPOSED TO BE MONITORED IN ORDER TO DEMONSTRATE COMPLIANCE WITH THE OPERATION OF THIS PROCESS EQUIPMENT OPERATION/AIR POLLUTION CONTROL DEVICE.	
RECORDKEEPING. PLEASE DESCRIBE THE PROPOSED RECORDKEEPING THAT WILL ACCOMPANY THE MONITORING.	
REPORTING. PLEASE DESCRIBE THE PROPOSED FREQUENCY OF REPORTING OF THE RECORDKEEPING.	
TESTING. PLEASE DESCRIBE ANY PROPOSED EMISSIONS TESTING FOR THIS PROCESS EQUIPMENT/AIR POLLUTION CONTROL DEVICE.	

10. Describe all operating ranges and maintenance procedures required by Manufacturer to maintain warranty

NA

Attachment L
EMISSIONS UNIT DATA SHEET
GENERAL

To be used for affected sources other than asphalt plants, foundries, incinerators, indirect heat exchangers, and quarries.

Identification Number (as assigned on *Equipment List Form*): **RFNE1**

1. Name or type and model of proposed affected source: **IR Zone**
2. On a separate sheet(s), furnish a sketch(es) of this affected source. If a modification is to be made to this source, clearly indicated the change(s). Provide a narrative description of all features of the affected source which may affect the production of air pollutants.
3. Name(s) and maximum amount of proposed process material(s) charged per hour: **Rockfon – Rate Claimed Confidential**
4. Name(s) and maximum amount of proposed material(s) produced per hour: **Rockfon – Rate Claimed Confidential**
5. Give chemical reactions, if applicable, that will be involved in the generation of air pollutants: **NA**

* The identification number which appears here must correspond to the air pollution control device identification number appearing on the *List Form*.

6. Combustion Data (if applicable): **NA**

(a) Type and amount in appropriate units of fuel(s) to be burned:

(b) Chemical analysis of proposed fuel(s), excluding coal, including maximum percent sulfur and ash:

(c) Theoretical combustion air requirement (ACF/unit of fuel):

@ °F and psia.

(d) Percent excess air:

(e) Type and BTU/hr of burners and all other firing equipment planned to be used:

(f) If coal is proposed as a source of fuel, identify supplier and seams and give sizing of the coal as it will be fired:

(g) Proposed maximum design heat input: $\times 10^6$ BTU/hr.

7. Projected operating schedule:

Hours/Day	**24**	Days/Week	**7**	Weeks/Year	**52**

8. Projected amount of pollutants that would be emitted from this affected source if no control devices were used:

@	**131**	°F and	**14.7**	psia

a.	NO_X		lb/hr	grains/ACF
b.	SO_2		lb/hr	grains/ACF
c.	CO		lb/hr	grains/ACF
d.	PM_{10}	**0.02**	lb/hr	grains/ACF
e.	Hydrocarbons		lb/hr	grains/ACF
f.	VOCs	**Combined Limit**	lb/hr	grains/ACF
g.	Pb		lb/hr	grains/ACF
h.	Specify other(s)			
	$PM_{2.5}$	**0.01**	lb/hr	grains/ACF
			lb/hr	grains/ACF
			lb/hr	grains/ACF
			lb/hr	grains/ACF

NOTE: (1) An Air Pollution Control Device Sheet must be completed for any air pollution device(s) used to control emissions from this affected source.

(2) Complete the Emission Points Data Sheet.

9. Proposed Monitoring, Recordkeeping, Reporting, and Testing Please propose monitoring, recordkeeping, and reporting in order to demonstrate compliance with the proposed operating parameters. Please propose testing in order to demonstrate compliance with the proposed emissions limits.	
MONITORING **See proposed monitoring plan in Attachment O.**	RECORDKEEPING **See proposed recordkeeping plan in Attachment O.**
REPORTING **See proposed reporting plan in Attachment O.**	TESTING **See proposed testing plan in Attachment O.**
MONITORING. PLEASE LIST AND DESCRIBE THE PROCESS PARAMETERS AND RANGES THAT ARE PROPOSED TO BE MONITORED IN ORDER TO DEMONSTRATE COMPLIANCE WITH THE OPERATION OF THIS PROCESS EQUIPMENT OPERATION/AIR POLLUTION CONTROL DEVICE.	
RECORDKEEPING. PLEASE DESCRIBE THE PROPOSED RECORDKEEPING THAT WILL ACCOMPANY THE MONITORING.	
REPORTING. PLEASE DESCRIBE THE PROPOSED FREQUENCY OF REPORTING OF THE RECORDKEEPING.	
TESTING. PLEASE DESCRIBE ANY PROPOSED EMISSIONS TESTING FOR THIS PROCESS EQUIPMENT/AIR POLLUTION CONTROL DEVICE.	
10. Describe all operating ranges and maintenance procedures required by Manufacturer to maintain warranty **NA**	

Attachment L
EMISSIONS UNIT DATA SHEET
GENERAL

To be used for affected sources other than asphalt plants, foundries, incinerators, indirect heat exchangers, and quarries.

Identification Number (as assigned on *Equipment List Form*): **RFNE2**

1. Name or type and model of proposed affected source: **Hot Press**
2. On a separate sheet(s), furnish a sketch(es) of this affected source. If a modification is to be made to this source, clearly indicated the change(s). Provide a narrative description of all features of the affected source which may affect the production of air pollutants.
3. Name(s) and maximum amount of proposed process material(s) charged per hour: **Rockfon – Charge Rate Claimed Confidential**
4. Name(s) and maximum amount of proposed material(s) produced per hour: **Rockfon – Production Rate Claimed Confidential**
5. Give chemical reactions, if applicable, that will be involved in the generation of air pollutants: **NA**

* The identification number which appears here must correspond to the air pollution control device identification number appearing on the *List Form*.

6. Combustion Data (if applicable): **NA**

(a) Type and amount in appropriate units of fuel(s) to be burned:

(b) Chemical analysis of proposed fuel(s), excluding coal, including maximum percent sulfur and ash:

(c) Theoretical combustion air requirement (ACF/unit of fuel):

@ °F and psia.

(d) Percent excess air:

(e) Type and BTU/hr of burners and all other firing equipment planned to be used:

(f) If coal is proposed as a source of fuel, identify supplier and seams and give sizing of the coal as it will be fired:

(g) Proposed maximum design heat input: $\times 10^6$ BTU/hr.

7. Projected operating schedule:

Hours/Day	**24**	Days/Week	**7**	Weeks/Year	**52**

8. Projected amount of pollutants that would be emitted from this affected source if no control devices were used:

@ **104** °F and **14.7** psia

a. NO_X	lb/hr	grains/ACF
b. SO_2	lb/hr	grains/ACF
c. CO	lb/hr	grains/ACF
d. PM_{10}	**0.02** lb/hr	grains/ACF
e. Hydrocarbons	lb/hr	grains/ACF
f. VOCs	**Combined Limit** lb/hr	grains/ACF
g. Pb	lb/hr	grains/ACF
h. Specify other(s)		
$PM_{2.5}$	**0.01** lb/hr	grains/ACF
	lb/hr	grains/ACF
	lb/hr	grains/ACF
	lb/hr	grains/ACF

NOTE: (1) An Air Pollution Control Device Sheet must be completed for any air pollution device(s) used to control emissions from this affected source.

(2) Complete the Emission Points Data Sheet.

9. Proposed Monitoring, Recordkeeping, Reporting, and Testing
Please propose monitoring, recordkeeping, and reporting in order to demonstrate compliance with the proposed operating parameters. Please propose testing in order to demonstrate compliance with the proposed emissions limits.

MONITORING	RECORDKEEPING
See proposed monitoring plan in Attachment O.	**See proposed recordkeeping plan in Attachment O.**
REPORTING	TESTING
See proposed reporting plan in Attachment O.	**See proposed testing plan in Attachment O.**

MONITORING. PLEASE LIST AND DESCRIBE THE PROCESS PARAMETERS AND RANGES THAT ARE PROPOSED TO BE MONITORED IN ORDER TO DEMONSTRATE COMPLIANCE WITH THE OPERATION OF THIS PROCESS EQUIPMENT OPERATION/AIR POLLUTION CONTROL DEVICE.

RECORDKEEPING. PLEASE DESCRIBE THE PROPOSED RECORDKEEPING THAT WILL ACCOMPANY THE MONITORING.

REPORTING. PLEASE DESCRIBE THE PROPOSED FREQUENCY OF REPORTING OF THE RECORDKEEPING.

TESTING. PLEASE DESCRIBE ANY PROPOSED EMISSIONS TESTING FOR THIS PROCESS EQUIPMENT/AIR POLLUTION CONTROL DEVICE.

10. Describe all operating ranges and maintenance procedures required by Manufacturer to maintain warranty

NA

Attachment L
Emission Unit Data Sheet
(INDIRECT HEAT EXCHANGER)

Emission Unit ID No. must match List Form): **RFN3**

Control Device ID No. (must match List Form):

Equipment Information

1. Manufacturer: **TBD**	2. Model No. **Custom** Serial No.
3. Number of units: **Claimed Confidential**	4. Use **Direct-fired unit - Curing of paint during the Rockfon process.**
5. Rated Boiler Horsepower: hp	6. Boiler Serial No.:
7. Date constructed: **2018**	8. Date of last modification and explain: **NA**
9. Maximum design heat input per unit: **Claimed Confidential** $\times 10^6$ BTU/hr	10. Peak heat input per unit: **Claimed Confidential** $\times 10^6$ BTU/hr
11. Steam produced at maximum design output: **NA** LB/hr psig	12. Projected Operating Schedule: Hours/Day **24** Days/Week **7** Weeks/Year **52**
13. Type of firing equipment to be used: ☐ Pulverized coal ☐ Spreader stoker ☐ Oil burners ☒ Natural Gas Burner ☐ Others, specify	14. Proposed type of burners and orientation: ☒ Vertical ☐ Front Wall ☐ Opposed ☐ Tangential ☐ Others, specify
15. Type of draft: ☐ Forced ☐ Induced	16. Percent of ash retained in furnace: %
17. Will flyash be reinjected? ☐ Yes ☐ No	18. Percent of carbon in flyash: %

Stack or Vent Data

19. Inside diameter or dimensions: **1.64** ft.	20. Gas exit temperature: **211.73** °F
21. Height: **39.37** ft.	22. Stack serves: ☒ This equipment only ☐ Other equipment also (submit type and rating of all other equipment exhausted through this stack or vent)
23. Gas flow rate: **6,436.15** ft^3/min	
24. Estimated percent of moisture: %	

Fuel Requirements

25. Type	Fuel Oil No.	Natural Gas	Gas (other, specify)	Coal, Type:	Other:
Quantity (at Design Output)	gph@60°F	**Claimed Confidential** ft^3/hr	ft^3/hr	TPH	
Annually	×10^3 gal	**Claimed Confidential** ×10^6 ft^3/hr	×10^6 ft^3/hr	tons	
Sulfur	Maximum: wt. % Average: wt. %	gr/100 ft^3	gr/100 ft^3	Maximum: wt. %	
Ash (%)				Maximum	
BTU Content	BTU/Gal. Lbs/Gal.@60°F	**1026** BTU/ft^3	BTU/ft^3	BTU/lb	
Source					
Supplier					
Halogens (Yes/No)					
List and Identify Metals					

26. Gas burner mode of control:
☐ Manual ☐ Automatic hi-low
☐ Automatic full modulation ☐ Automatic on-off

27. Gas burner manufacture: **TBD**

28. Oil burner manufacture: **NA**

29. If fuel oil is used, how is it atomized? ☐ Oil Pressure ☐ Steam Pressure ☐ Compressed Air ☐ Rotary Cup ☐ Other, specify

30. Fuel oil preheated: ☐ Yes ☐ No

31. If yes, indicate temperature: °F

32. Specify the calculated theoretical air requirements for combustion of the fuel or mixture of fuels described above actual cubic feet (ACF) per unit of fuel:
@ °F, PSIA, % moisture

33. Emission rate at rated capacity: lb/hr

34. Percent excess air actually required for combustion of the fuel described: %

Coal Characteristics

35. Seams: **NA**

36. Proximate analysis (dry basis): % of Fixed Carbon: % of Sulfur:
% of Moisture: % of Volatile Matter:
% of Ash:

Emissions Stream

37. What quantities of pollutants will be emitted from the boiler before controls?

Pollutant	Pounds per Hour lb/hr	grain/ACF	@ °F	PSIA
CO	**No Controls – See Below**			
Hydrocarbons				
NO_x				
Pb				
PM_{10}				
SO_2				
VOCs				
Other (specify)				
Total HAPs				
CO_2				
CH_4				

38. What quantities of pollutants will be emitted from the boiler after controls?

Pollutant	Pounds per Hour lb/hr	grain/ACF	@ °F	PSIA
CO	**0.22**			
Hydrocarbons				
NO_x	**0.27**			
Pb				
SO_2				
VOCs	**Combined Limit – See Appendix A**			
Other (specify)				
PM_{Fil}	**0.06**			
PM_{10}	**0.12**			
$PM_{2.5}$	**0.09**			

39. How will waste material from the process and control equipment be disposed of?

Wastes are not expected from a natural gas-fired unit.

40. Have you completed an *Air Pollution Control Device Sheet(s)* for the control(s) used on this Emission Unit.

41. Have you included the ***air pollution rates*** on the Emissions Points Data Summary Sheet? **Yes**

42. **Proposed Monitoring, Recordkeeping, Reporting, and Testing**
Please propose monitoring, recordkeeping, and reporting in order to demonstrate compliance with the proposed operating parameters. Please propose testing in order to demonstrate compliance with the proposed emissions limits.

MONITORING PLAN: Please list (1) describe the process parameters and how they were chosen (2) the ranges and how they were established for monitoring to demonstrate compliance with the operation of this process equipment operation or air pollution control device.

See proposed monitoring plan in Attachment O.

TESTING PLAN: Please describe any proposed emissions testing for this process equipment or air pollution control device.

See proposed testing plan in Attachment O.

RECORDKEEPING: Please describe the proposed recordkeeping that will accompany the monitoring.

See proposed recordkeeping plan in Attachment O.

REPORTING: Please describe the proposed frequency of reporting of the recordkeeping.

See proposed reporting plan in Attachment O.

43. Describe all operating ranges and maintenance procedures required by Manufacturer to maintain warranty.
NA

Attachment L
Emission Unit Data Sheet
(INDIRECT HEAT EXCHANGER)

Emission Unit ID No. must match List Form): **RFNE4**

Control Device ID No. (must match List Form): **RFNE4-FF**

Equipment Information

1. Manufacturer: **TBD**	2. Model No. **TBD** Serial No.
3. Number of units: **Claimed Confidential**	4. Use: **Direct-fired unit - The drying oven is fired to dry the paint during the Rockfon process.**
5. Rated Boiler Horsepower: **NA** hp	6. Boiler Serial No.: **NA**
7. Date constructed: **2018**	8. Date of last modification and explain: **N/A**
9. Maximum design heat input per unit: **Claimed Confidential** $\times 10^6$ BTU/hr	10. Peak heat input per unit: **Claimed Confidential** $\times 10^6$ BTU/hr
11. Steam produced at maximum design output: **NA** LB/hr psig	12. Projected Operating Schedule: Hours/Day **24** Days/Week **7** Weeks/Year **52**
13. Type of firing equipment to be used: ☐ Pulverized coal ☐ Spreader stoker ☐ Oil burners ☒ Natural Gas Burner ☐ Others, specify	14. Proposed type of burners and orientation: ☒ Vertical ☐ Front Wall ☐ Opposed ☐ Tangential ☐ Others, specify
15. Type of draft: ☐ Forced ☐ Induced	16. Percent of ash retained in furnace: %
17. Will flyash be reinjected? ☐ Yes ☐ No	18. Percent of carbon in flyash: %

Stack or Vent Data

19. Inside diameter or dimensions: **1.64** ft.	20. Gas exit temperature: **319.73** °F
21. Height: **39.37** ft.	22. Stack serves: ☒ This equipment only ☐ Other equipment also (submit type and rating of all other equipment exhausted through this stack or vent)
23. Gas flow rate: **4,667.98** ft^3/min	
24. Estimated percent of moisture: %	

Fuel Requirements

25. Type	Fuel Oil No.	Natural Gas	Gas (other, specify)	Coal, Type:	Other:
Quantity (at Design Output)	gph@60°F	**Claimed Confidential** ft^3/hr	ft^3/hr	TPH	
Annually	×10^3 gal	**Claimed Confidential** ×10^6 ft^3/hr	×10^6 ft^3/hr	tons	
Sulfur	Maximum: wt. % Average: wt. %	gr/100 ft^3	gr/100 ft^3	Maximum: wt. %	
Ash (%)				Maximum	
BTU Content	BTU/Gal. Lbs/Gal.@60°F	**1026** BTU/ft^3	BTU/ft^3	BTU/lb	
Source					
Supplier					
Halogens (Yes/No)					
List and Identify Metals					

26. Gas burner mode of control:
☐ Manual ☐ Automatic hi-low
☐ Automatic full modulation ☐ Automatic on-off

27. Gas burner manufacture: **TBD**

28. Oil burner manufacture: **NA**

29. If fuel oil is used, how is it atomized? ☐ Oil Pressure ☐ Steam Pressure ☐ Compressed Air ☐ Rotary Cup ☐ Other, specify

30. Fuel oil preheated: ☐ Yes ☐ No

31. If yes, indicate temperature: °F

32. Specify the calculated theoretical air requirements for combustion of the fuel or mixture of fuels described above actual cubic feet (ACF) per unit of fuel:
@ °F, PSIA, % moisture

33. Emission rate at rated capacity: lb/hr

34. Percent excess air actually required for combustion of the fuel described: %

Coal Characteristics

35. Seams: **NA**

36. Proximate analysis (dry basis): % of Fixed Carbon: % of Sulfur:
% of Moisture: % of Volatile Matter:
% of Ash:

Emissions Stream

37. What quantities of pollutants will be emitted from the boiler before controls?

Pollutant	Pounds per Hour lb/hr	grain/ACF	@ °F	PSIA
CO	**No Controls – See Below**			
Hydrocarbons				
NO_x				
Pb				
PM_{10}				
SO_2				
VOCs				
Other (specify)				

38. What quantities of pollutants will be emitted from the boiler after controls?

Pollutant	Pounds per Hour lb/hr	grain/ACF	@ °F	PSIA
CO	**0.17**			
Hydrocarbons				
NO_x	**0.20**			
Pb				
SO_2				
VOCs	**Combined Limit – See Appendix A**			
Other (specify)				
PM_{Fil}	**0.04**			
PM_{10}	**0.08**			
$PM_{2.5}$	**0.06**			

39. How will waste material from the process and control equipment be disposed of?
Wastes are not expected from a natural gas-fired unit.

40. Have you completed an *Air Pollution Control Device Sheet(s)* for the control(s) used on this Emission Unit.

41. Have you included the ***air pollution rates*** on the Emissions Points Data Summary Sheet? **Yes**

42. **Proposed Monitoring, Recordkeeping, Reporting, and Testing** Please propose monitoring, recordkeeping, and reporting in order to demonstrate compliance with the proposed operating parameters. Please propose testing in order to demonstrate compliance with the proposed emissions limits.
MONITORING PLAN: Please list (1) describe the process parameters and how they were chosen (2) the ranges and how they were established for monitoring to demonstrate compliance with the operation of this process equipment operation or air pollution control device. **See proposed monitoring plan in Attachment O.**
TESTING PLAN: Please describe any proposed emissions testing for this process equipment or air pollution control device. **See proposed testing plan in Attachment O.**
RECORDKEEPING: Please describe the proposed recordkeeping that will accompany the monitoring. **See proposed recordkeeping plan in Attachment O.**
REPORTING: Please describe the proposed frequency of reporting of the recordkeeping. **See proposed reporting plan in Attachment O.**
43. Describe all operating ranges and maintenance procedures required by Manufacturer to maintain warranty. **NA**

Attachment L
EMISSIONS UNIT DATA SHEET
GENERAL

To be used for affected sources other than asphalt plants, foundries, incinerators, indirect heat exchangers, and quarries.

Identification Number (as assigned on *Equipment List Form*): **RFNE5**

1. Name or type and model of proposed affected source: **Spray Paint Cabin**
2. On a separate sheet(s), furnish a sketch(es) of this affected source. If a modification is to be made to this source, clearly indicated the change(s). Provide a narrative description of all features of the affected source which may affect the production of air pollutants.
3. Name(s) and maximum amount of proposed process material(s) charged per hour: **Rockfon – Charge Rate Claimed Confidential**
4. Name(s) and maximum amount of proposed material(s) produced per hour: **Rockfon – Production Rate Claimed Confidential**
5. Give chemical reactions, if applicable, that will be involved in the generation of air pollutants: **NA**

* The identification number which appears here must correspond to the air pollution control device identification number appearing on the *List Form*.

6. Combustion Data (if applicable): **NA**

(a) Type and amount in appropriate units of fuel(s) to be burned:

(b) Chemical analysis of proposed fuel(s), excluding coal, including maximum percent sulfur and ash:

(c) Theoretical combustion air requirement (ACF/unit of fuel):

@ °F and psia.

(d) Percent excess air:

(e) Type and BTU/hr of burners and all other firing equipment planned to be used:

(f) If coal is proposed as a source of fuel, identify supplier and seams and give sizing of the coal as it will be fired:

(g) Proposed maximum design heat input: $\times 10^6$ BTU/hr.

7. Projected operating schedule:

Hours/Day	**24**	Days/Week	**7**	Weeks/Year	**52**

8. Projected amount of pollutants that would be emitted from this affected source if no control devices were used:

@ °F and psia

a. NO_X		lb/hr	grains/ACF
b. SO_2		lb/hr	grains/ACF
c. CO		lb/hr	grains/ACF
d. PM_{10}	**0.44**	lb/hr	grains/ACF
e. Hydrocarbons		lb/hr	grains/ACF
f. VOCs	**Combined Limit**	lb/hr	grains/ACF
g. Pb		lb/hr	grains/ACF
h. Specify other(s)			
$PM_{2.5}$	**0.22**	lb/hr	grains/ACF
Total HAPs	**0.52**	lb/hr	grains/ACF
		lb/hr	grains/ACF
		lb/hr	grains/ACF

NOTE: (1) An Air Pollution Control Device Sheet must be completed for any air pollution device(s) used to control emissions from this affected source.

(2) Complete the Emission Points Data Sheet.

9. Proposed Monitoring, Recordkeeping, Reporting, and Testing
Please propose monitoring, recordkeeping, and reporting in order to demonstrate compliance with the proposed operating parameters. Please propose testing in order to demonstrate compliance with the proposed emissions limits.

MONITORING	RECORDKEEPING
See proposed monitoring plan in Attachment O.	**See proposed recordkeeping plan in Attachment O.**
REPORTING	TESTING
See proposed reporting plan in Attachment O.	**See proposed testing plan in Attachment O.**

MONITORING. PLEASE LIST AND DESCRIBE THE PROCESS PARAMETERS AND RANGES THAT ARE PROPOSED TO BE MONITORED IN ORDER TO DEMONSTRATE COMPLIANCE WITH THE OPERATION OF THIS PROCESS EQUIPMENT OPERATION/AIR POLLUTION CONTROL DEVICE.

RECORDKEEPING. PLEASE DESCRIBE THE PROPOSED RECORDKEEPING THAT WILL ACCOMPANY THE MONITORING.

REPORTING. PLEASE DESCRIBE THE PROPOSED FREQUENCY OF REPORTING OF THE RECORDKEEPING.

TESTING. PLEASE DESCRIBE ANY PROPOSED EMISSIONS TESTING FOR THIS PROCESS EQUIPMENT/AIR POLLUTION CONTROL DEVICE.

10. Describe all operating ranges and maintenance procedures required by Manufacturer to maintain warranty

NA

Attachment L
Emission Unit Data Sheet
(INDIRECT HEAT EXCHANGER)

Emission Unit ID No. must match List Form): **RFNE6**

Control Device ID No. (must match List Form): **RFNE6-FF**

Equipment Information

1. Manufacturer: **TBD**	2. Model No. **TBD** Serial No.
3. Number of units: **Claimed Confidential**	4. Use **Direct-fired unit - The drying oven is fired to dry the paint during the Rockfon process.**
5. Rated Boiler Horsepower: **NA** hp	6. Boiler Serial No.: **NA**
7. Date constructed: **2018**	8. Date of last modification and explain: **NA**
9. Maximum design heat input per unit: **Claimed Confidential** $\times 10^6$ BTU/hr	10. Peak heat input per unit: **Claimed Confidential** $\times 10^6$ BTU/hr
11. Steam produced at maximum design output: **NA** LB/hr psig	12. Projected Operating Schedule: Hours/Day **24** Days/Week **7** Weeks/Year **52**
13. Type of firing equipment to be used: ☐ Pulverized coal ☐ Spreader stoker ☐ Oil burners ☒ Natural Gas Burner ☐ Others, specify	14. Proposed type of burners and orientation: ☒ Vertical ☐ Front Wall ☐ Opposed ☐ Tangential ☐ Others, specify
15. Type of draft: ☐ Forced ☐ Induced	16. Percent of ash retained in furnace: %
17. Will flyash be reinjected? ☐ Yes ☐ No	18. Percent of carbon in flyash: %

Stack or Vent Data

19. Inside diameter or dimensions: **2.62** ft.	20. Gas exit temperature: **319.73** °F
21. Height: **49.21** ft.	22. Stack serves: ☒ This equipment only ☐ Other equipment also (submit type and rating of all other equipment exhausted through this stack or vent)
23. Gas flow rate: **11,204.48** ft^3/min	
24. Estimated percent of moisture: %	

Fuel Requirements

25. **Type**	Fuel Oil No.	Natural Gas	Gas (other, specify)	Coal, Type:	Other:
Quantity (at Design Output)	gph@60°F	**Claimed Confidential** ft^3/hr	ft^3/hr	TPH	
Annually	$\times 10^3$ gal	**Claimed Confidential** $\times 10^6$ ft^3/hr	$\times 10^6$ ft^3/hr	tons	
Sulfur	Maximum: wt. % Average: wt. %	gr/100 ft^3	gr/100 ft^3	Maximum: wt. %	
Ash (%)				Maximum	
BTU Content	BTU/Gal. Lbs/Gal.@60°F	**1026** BTU/ft^3	BTU/ft^3	BTU/lb	
Source					
Supplier					
Halogens (Yes/No)					
List and Identify Metals					

26. Gas burner mode of control:
☐ Manual ☐ Automatic hi-low
☐ Automatic full modulation ☐ Automatic on-off

27. Gas burner manufacture: **TBD**

28. Oil burner manufacture: **NA**

29. If fuel oil is used, how is it atomized? ☐ Oil Pressure ☐ Steam Pressure ☐ Compressed Air ☐ Rotary Cup ☐ Other, specify

30. Fuel oil preheated: ☐ Yes ☐ No

31. If yes, indicate temperature: °F

32. Specify the calculated theoretical air requirements for combustion of the fuel or mixture of fuels described above actual cubic feet (ACF) per unit of fuel:
@ °F, PSIA, % moisture

33. Emission rate at rated capacity: lb/hr

34. Percent excess air actually required for combustion of the fuel described: %

Coal Characteristics

35. Seams: **NA**

36. Proximate analysis (dry basis): % of Fixed Carbon: % of Sulfur:
% of Moisture: % of Volatile Matter:
% of Ash:

Emissions Stream

37. What quantities of pollutants will be emitted from the boiler before controls?

Pollutant	Pounds per Hour lb/hr	grain/ACF	@ °F	PSIA
CO	**No Controls – See Below**			
Hydrocarbons				
NO_x				
Pb				
PM_{10}				
SO_2				
VOCs				
Other (specify)				

38. What quantities of pollutants will be emitted from the boiler after controls?

Pollutant	Pounds per Hour lb/hr	grain/ACF	@ °F	PSIA
CO	**0.39**			
Hydrocarbons				
NO_x	**0.47**			
Pb				
SO_2				
VOCs	**Combined Limit – See Appendix A**			
Other (specify)				
PM_{Fil}	**0.06**			
PM_{10}	**0.13**			
$PM_{2.5}$	**0.09**			

39. How will waste material from the process and control equipment be disposed of?
Wastes are not expected from a natural gas-fired unit.

40. Have you completed an *Air Pollution Control Device Sheet(s)* for the control(s) used on this Emission Unit.

41. Have you included the ***air pollution rates*** on the Emissions Points Data Summary Sheet? **Yes**

42. **Proposed Monitoring, Recordkeeping, Reporting, and Testing** Please propose monitoring, recordkeeping, and reporting in order to demonstrate compliance with the proposed operating parameters. Please propose testing in order to demonstrate compliance with the proposed emissions limits.
MONITORING PLAN: Please list (1) describe the process parameters and how they were chosen (2) the ranges and how they were established for monitoring to demonstrate compliance with the operation of this process equipment operation or air pollution control device. **See proposed monitoring plan in Attachment O.**
TESTING PLAN: Please describe any proposed emissions testing for this process equipment or air pollution control device. **See proposed testing plan in Attachment O.**
RECORDKEEPING: Please describe the proposed recordkeeping that will accompany the monitoring. **See proposed recordkeeping plan in Attachment O.**
REPORTING: Please describe the proposed frequency of reporting of the recordkeeping. **See proposed reporting plan in Attachment O.**
43. Describe all operating ranges and maintenance procedures required by Manufacturer to maintain warranty. **NA**

Attachment L
EMISSIONS UNIT DATA SHEET
GENERAL

To be used for affected sources other than asphalt plants, foundries, incinerators, indirect heat exchangers, and quarries.

Identification Number (as assigned on *Equipment List Form*): **RFNE7**

1. Name or type and model of proposed affected source: **Cooling Zone**
2. On a separate sheet(s), furnish a sketch(es) of this affected source. If a modification is to be made to this source, clearly indicated the change(s). Provide a narrative description of all features of the affected source which may affect the production of air pollutants.
3. Name(s) and maximum amount of proposed process material(s) charged per hour: **Rockfon – Rate Claimed Confidential**
4. Name(s) and maximum amount of proposed material(s) produced per hour: **Rockfon – Rate Claimed Confidential**
5. Give chemical reactions, if applicable, that will be involved in the generation of air pollutants: **NA**

* The identification number which appears here must correspond to the air pollution control device identification number appearing on the *List Form*.

6. Combustion Data (if applicable): **NA**

(a) Type and amount in appropriate units of fuel(s) to be burned:

(b) Chemical analysis of proposed fuel(s), excluding coal, including maximum percent sulfur and ash:

(c) Theoretical combustion air requirement (ACF/unit of fuel):

@ °F and psia.

(d) Percent excess air:

(e) Type and BTU/hr of burners and all other firing equipment planned to be used:

(f) If coal is proposed as a source of fuel, identify supplier and seams and give sizing of the coal as it will be fired:

(g) Proposed maximum design heat input: $\times 10^6$ BTU/hr.

7. Projected operating schedule:

Hours/Day	**24**	Days/Week	**7**	Weeks/Year	**52**

8. Projected amount of pollutants that would be emitted from this affected source if no control devices were used:				
@	**104**	°F and	**14.7**	psia
a. NO_X		lb/hr		grains/ACF
b. SO_2		lb/hr		grains/ACF
c. CO		lb/hr		grains/ACF
d. PM_{10}	**0.19**	lb/hr		grains/ACF
e. Hydrocarbons		lb/hr		grains/ACF
f. VOCs	**Combined Limit**	lb/hr		grains/ACF
g. Pb		lb/hr		grains/ACF
h. Specify other(s)				
$PM_{2.5}$	**0.14**	lb/hr		grains/ACF
		lb/hr		grains/ACF
		lb/hr		grains/ACF
		lb/hr		grains/ACF

NOTE: (1) An Air Pollution Control Device Sheet must be completed for any air pollution device(s) used to control emissions from this affected source.

(2) Complete the Emission Points Data Sheet.

9. Proposed Monitoring, Recordkeeping, Reporting, and Testing
Please propose monitoring, recordkeeping, and reporting in order to demonstrate compliance with the proposed operating parameters. Please propose testing in order to demonstrate compliance with the proposed emissions limits.

MONITORING	RECORDKEEPING
See proposed monitoring plan in Attachment O.	**See proposed recordkeeping plan in Attachment O.**
REPORTING	TESTING
See proposed reporting plan in Attachment O.	**See proposed testing plan in Attachment O.**

MONITORING. PLEASE LIST AND DESCRIBE THE PROCESS PARAMETERS AND RANGES THAT ARE PROPOSED TO BE MONITORED IN ORDER TO DEMONSTRATE COMPLIANCE WITH THE OPERATION OF THIS PROCESS EQUIPMENT OPERATION/AIR POLLUTION CONTROL DEVICE.

RECORDKEEPING. PLEASE DESCRIBE THE PROPOSED RECORDKEEPING THAT WILL ACCOMPANY THE MONITORING.

REPORTING. PLEASE DESCRIBE THE PROPOSED FREQUENCY OF REPORTING OF THE RECORDKEEPING.

TESTING. PLEASE DESCRIBE ANY PROPOSED EMISSIONS TESTING FOR THIS PROCESS EQUIPMENT/AIR POLLUTION CONTROL DEVICE.

10. Describe all operating ranges and maintenance procedures required by Manufacturer to maintain warranty

NA

Attachment L

Emission Unit Data Sheet

(INDIRECT HEAT EXCHANGER)

Emission Unit ID No. must match List Form): **RFN9**

Control Device ID No. (must match List Form):

Equipment Information

1. Manufacturer: **TBD**	2. Model No. **Custom** Serial No.
3. Number of units: **Claimed Confidential**	4. Use **Direct-fired Unit - Curing of paint during the Rockfon process.**
5. Rated Boiler Horsepower: hp	6. Boiler Serial No.:
7. Date constructed: **2018**	8. Date of last modification and explain: **NA**
9. Maximum design heat input per unit: **Claimed Confidential** $\times 10^6$ BTU/hr	10. Peak heat input per unit: **Claimed Confidential** $\times 10^6$ BTU/hr
11. Steam produced at maximum design output: **NA** LB/hr psig	12. Projected Operating Schedule: Hours/Day **24** Days/Week **7** Weeks/Year **52**
13. Type of firing equipment to be used: ☐ Pulverized coal ☐ Spreader stoker ☐ Oil burners ☒ Natural Gas Burner ☐ Others, specify	14. Proposed type of burners and orientation: ☒ Vertical ☐ Front Wall ☐ Opposed ☐ Tangential ☐ Others, specify
15. Type of draft: ☐ Forced ☐ Induced	16. Percent of ash retained in furnace: %
17. Will flyash be reinjected? ☐ Yes ☐ No	18. Percent of carbon in flyash: %

Stack or Vent Data

19. Inside diameter or dimensions: **1.64** ft.	20. Gas exit temperature: **211.73** °F
21. Height: **39.37** ft.	22. Stack serves: ☒ This equipment only ☐ Other equipment also (submit type and rating of all other equipment exhausted through this stack or vent)
23. Gas flow rate: **6,436.15** ft^3/min	
24. Estimated percent of moisture: %	

Fuel Requirements

25. Type	Fuel Oil No.	Natural Gas	Gas (other, specify)	Coal, Type:	Other:
Quantity (at Design Output)	gph@60°F	**Claimed Confidential** ft^3/hr	ft^3/hr	TPH	
Annually	$\times 10^3$ gal	**Claimed Confidential** $\times 10^6$ ft^3/hr	$\times 10^6$ ft^3/hr	tons	
Sulfur	Maximum: wt. % Average: wt. %	gr/100 ft^3	gr/100 ft^3	Maximum: wt. %	
Ash (%)				Maximum	
BTU Content	BTU/Gal. Lbs/Gal.@60°F	**1026** BTU/ft^3	BTU/ft^3	BTU/lb	
Source					
Supplier					
Halogens (Yes/No)					
List and Identify Metals					

26. Gas burner mode of control:
☐ Manual ☐ Automatic hi-low
☐ Automatic full modulation ☐ Automatic on-off

27. Gas burner manufacture: **TBD**

28. Oil burner manufacture: **NA**

29. If fuel oil is used, how is it atomized? ☐ Oil Pressure ☐ Steam Pressure ☐ Compressed Air ☐ Rotary Cup ☐ Other, specify

30. Fuel oil preheated: ☐ Yes ☐ No

31. If yes, indicate temperature: °F

32. Specify the calculated theoretical air requirements for combustion of the fuel or mixture of fuels described above actual cubic feet (ACF) per unit of fuel:
@ °F, PSIA, % moisture

33. Emission rate at rated capacity: lb/hr

34. Percent excess air actually required for combustion of the fuel described: %

Coal Characteristics

35. Seams: **NA**

36. Proximate analysis (dry basis): % of Fixed Carbon: % of Sulfur:
% of Moisture: % of Volatile Matter:
% of Ash:

Emissions Stream

37. What quantities of pollutants will be emitted from the boiler before controls?

Pollutant	Pounds per Hour lb/hr	grain/ACF	@ °F	PSIA
CO	**No Controls – See Below**			
Hydrocarbons				
NO_x				
Pb				
PM_{10}				
SO_2				
VOCs				
Other (specify)				
Total HAPs				
CO_2				
CH_4				

38. What quantities of pollutants will be emitted from the boiler after controls?

Pollutant	Pounds per Hour lb/hr	grain/ACF	@ °F	PSIA
CO	**0.22**			
Hydrocarbons				
NO_x	**0.27**			
Pb				
SO_2				
VOCs	**Combined Limit – See Appendix A**			
Other (specify)				
PM_{Fil}	**0.06**			
PM_{10}	**0.12**			
$PM_{2.5}$	**0.09**			

39. How will waste material from the process and control equipment be disposed of?

Wastes are not expected from a natural gas-fired unit.

40. Have you completed an *Air Pollution Control Device Sheet(s)* for the control(s) used on this Emission Unit.

41. Have you included the ***air pollution rates*** on the Emissions Points Data Summary Sheet? **Yes**

42. **Proposed Monitoring, Recordkeeping, Reporting, and Testing**
Please propose monitoring, recordkeeping, and reporting in order to demonstrate compliance with the proposed operating parameters. Please propose testing in order to demonstrate compliance with the proposed emissions limits.

MONITORING PLAN: Please list (1) describe the process parameters and how they were chosen (2) the ranges and how they were established for monitoring to demonstrate compliance with the operation of this process equipment operation or air pollution control device.

See proposed monitoring plan in Attachment O.

TESTING PLAN: Please describe any proposed emissions testing for this process equipment or air pollution control device.

See proposed testing plan in Attachment O.

RECORDKEEPING: Please describe the proposed recordkeeping that will accompany the monitoring.

See proposed recordkeeping plan in Attachment O.

REPORTING: Please describe the proposed frequency of reporting of the recordkeeping.

See proposed reporting plan in Attachment O.

43. Describe all operating ranges and maintenance procedures required by Manufacturer to maintain warranty.
NA

Attachment L

Emission Unit Data Sheet

(INDIRECT HEAT EXCHANGER)

Emission Unit ID No. (must match List Form): **IMF05**

Control Device ID No. (must match List Form):

Equipment Information

1. Manufacturer: **TBD**	2. Model No. **TBD** Serial No.
3. Number of units: **Claimed Confidential**	4. Use: **Direct–fired unit - To remove excess moisture from the milled coal.**
5. Rated Boiler Horsepower: **NA** hp	6. Boiler Serial No.: **NA**
7. Date constructed: **2018**	8. Date of last modification and explain: **NA**
9. Maximum design heat input per unit: **Claimed Confidential** $\times 10^6$ BTU/hr	10. Peak heat input per unit: **Claimed Confidential** $\times 10^6$ BTU/hr
11. Steam produced at maximum design output: **NA** LB/hr psig	12. Projected Operating Schedule: Hours/Day **24** Days/Week **7** Weeks/Year **52**
13. Type of firing equipment to be used: ☐ Pulverized coal ☐ Spreader stoker ☐ Oil burners ☒ Natural Gas Burner ☐ Others, specify	14. Proposed type of burners and orientation: ☐ Vertical ☐ Front Wall ☐ Opposed ☐ Tangential ☐ Others, specify
15. Type of draft: ☐ Forced ☐ Induced	16. Percent of ash retained in furnace: %
17. Will flyash be reinjected? ☐ Yes ☐ No	18. Percent of carbon in flyash: %

Stack or Vent Data

19. Inside diameter or dimensions: **1.05** ft.	20. Gas exit temperature: **180.00** °F
21. Height: **65.52** ft.	22. Stack serves: ☒ This equipment only ☐ Other equipment also (submit type and rating of all other equipment exhausted through this stack or vent)
23. Gas flow rate: **2,872.65** ft^3/min	
24. Estimated percent of moisture: %	

Fuel Requirements

25. **Type**	Fuel Oil No.	Natural Gas	Gas (other, specify)	Coal, Type:	Other:
Quantity (at Design Output)	gph@60°F	**Claimed Confidential** ft^3/hr	ft^3/hr	TPH	
Annually	$\times 10^3$ gal	**Claimed Confidential** $\times 10^6\ ft^3/hr$	$\times 10^6\ ft^3/hr$	tons	
Sulfur	Maximum: wt. % Average: wt. %	gr/100 ft^3	gr/100 ft^3	Maximum: wt. %	
Ash (%)				Maximum	
BTU Content	BTU/Gal. Lbs/Gal.@60°F	**1026** BTU/ft^3	BTU/ft^3	BTU/lb	
Source					
Supplier					
Halogens (Yes/No)					
List and Identify Metals					

26. Gas burner mode of control:
☐ Manual ☐ Automatic hi-low
☐ Automatic full modulation ☐ Automatic on-off

27. Gas burner manufacture: **TBD**

28. Oil burner manufacture: **NA**

29. If fuel oil is used, how is it atomized? ☐ Oil Pressure ☐ Steam Pressure ☐ Compressed Air ☐ Rotary Cup ☐ Other, specify

30. Fuel oil preheated: ☐ Yes ☐ No

31. If yes, indicate temperature: °F

32. Specify the calculated theoretical air requirements for combustion of the fuel or mixture of fuels described above actual cubic feet (ACF) per unit of fuel:
@ °F, PSIA, % moisture

33. Emission rate at rated capacity: lb/hr

34. Percent excess air actually required for combustion of the fuel described: %

Coal Characteristics

35. Seams: **NA**

36. Proximate analysis (dry basis): % of Fixed Carbon: % of Sulfur: % of Moisture: % of Volatile Matter: % of Ash:

Emissions Stream

37. What quantities of pollutants will be emitted from the boiler before controls?

Pollutant	Pounds per Hour lb/hr	grain/ACF	@ °F	PSIA
CO				
Hydrocarbons				
NO_x				
Pb				
SO_2				
VOCs	**No Controls – See Below**			
Other (specify)				

38. What quantities of pollutants will be emitted from the boiler after controls?

Pollutant	Pounds per Hour lb/hr	grain/ACF	@ °F	PSIA
CO	**0.49**			
Hydrocarbons				
NO_x	**0.42**			
Pb				
SO_2				
VOCs				
Other (specify)				

39. How will waste material from the process and control equipment be disposed of?
Wastes are not expected from a natural gas-fired unit.

40. Have you completed an *Air Pollution Control Device Sheet(s)* for the control(s) used on this Emission Unit.

41. Have you included the ***air pollution rates*** on the Emissions Points Data Summary Sheet? **Yes**

42. **Proposed Monitoring, Recordkeeping, Reporting, and Testing** Please propose monitoring, recordkeeping, and reporting in order to demonstrate compliance with the proposed operating parameters. Please propose testing in order to demonstrate compliance with the proposed emissions limits.
MONITORING PLAN: Please list (1) describe the process parameters and how they were chosen (2) the ranges and how they were established for monitoring to demonstrate compliance with the operation of this process equipment operation or air pollution control device. **See proposed monitoring plan in Attachment O.**
TESTING PLAN: Please describe any proposed emissions testing for this process equipment or air pollution control device. **See proposed testing plan in Attachment O.**
RECORDKEEPING: Please describe the proposed recordkeeping that will accompany the monitoring. **See proposed recordkeeping plan in Attachment O.**
REPORTING: Please describe the proposed frequency of reporting of the recordkeeping. **See proposed reporting plan in Attachment O.**
43. Describe all operating ranges and maintenance procedures required by Manufacturer to maintain warranty. **NA**

Attachment L
Emission Unit Data Sheet
(INDIRECT HEAT EXCHANGER)

Emission Unit ID No. must match List Form): **CM03**

Control Device ID No. (must match List Form):

Equipment Information

1. Manufacturer: **TBD**	2. Model No. **TBD** Serial No.
3. Number of units: **1**	4. Use **Provide builidng heat.**
5. Rated Boiler Horsepower: **2012** hp	6. Boiler Serial No.:
7. Date constructed: **2018**	8. Date of last modification and explain: **NA**
9. Maximum design heat input per unit: **5.12** $\times 10^6$ BTU/hr	10. Peak heat input per unit: **5.12** $\times 10^6$ BTU/hr
11. Steam produced at maximum design output: **TBD** LB/hr psig	12. Projected Operating Schedule: Hours/Day **24** Days/Week **7** Weeks/Year **52**
13. Type of firing equipment to be used: ☐ Pulverized coal ☐ Spreader stoker ☐ Oil burners ☒ Natural Gas Burner ☐ Others, specify	14. Proposed type of burners and orientation: ☐ Vertical ☐ Front Wall ☐ Opposed ☐ Tangential ☐ Others, specify
15. Type of draft: ☐ Forced ☐ Induced	16. Percent of ash retained in furnace: %
17. Will flyash be reinjected? ☐ Yes ☒ No	18. Percent of carbon in flyash: %

Stack or Vent Data

19. Inside diameter or dimensions: **1.15** ft.	20. Gas exit temperature: **134.33** °F
21. Height: **49.21** ft.	22. Stack serves: ☒ This equipment only ☐ Other equipment also (submit type and rating of all other equipment exhausted through this stack or vent)
23. Gas flow rate: **3,059.94** ft^3/min	
24. Estimated percent of moisture: %	

Fuel Requirements

25. Type	Fuel Oil No.	Natural Gas	Gas (other, specify)	Coal, Type:	Other:
Quantity (at Design Output)	gph@60°F	**4990** ft^3/hr	ft^3/hr	TPH	
Annually	$\times 10^3$ gal	**43.71** $\times 10^6\ ft^3/yr$	$\times 10^6\ ft^3/hr$	tons	
Sulfur	Maximum: wt. % Average: wt. %	gr/100 ft^3	gr/100 ft^3	Maximum: wt. %	
Ash (%)				Maximum	
BTU Content	BTU/Gal. Lbs/Gal.@60°F	**1026** BTU/ft^3	BTU/ft^3	BTU/lb	
Source					
Supplier					
Halogens (Yes/No)					
List and Identify Metals					

26. Gas burner mode of control:
☐ Manual ☐ Automatic hi-low
☐ Automatic full modulation ☐ Automatic on-off

27. Gas burner manufacture: **TBD**

28. Oil burner manufacture: **NA**

29. If fuel oil is used, how is it atomized? ☐ Oil Pressure ☐ Steam Pressure ☐ Compressed Air ☐ Rotary Cup ☐ Other, specify

30. Fuel oil preheated: ☐ Yes ☐ No

31. If yes, indicate temperature: °F

32. Specify the calculated theoretical air requirements for combustion of the fuel or mixture of fuels described above actual cubic feet (ACF) per unit of fuel:
@ °F, PSIA, % moisture

33. Emission rate at rated capacity: lb/hr

34. Percent excess air actually required for combustion of the fuel described: %

Coal Characteristics

35. Seams: **NA**

36. Proximate analysis (dry basis): % of Fixed Carbon: % of Sulfur:
% of Moisture: % of Volatile Matter:
% of Ash:

Emissions Stream

37. What quantities of pollutants will be emitted from the boiler before controls?

Pollutant	Pounds per Hour lb/hr	grain/ACF	@ °F	PSIA
CO	**No Controls – See Below**			
Hydrocarbons				
NO_x				
Pb				
PM_{10}				
SO_2				
VOCs				
Other (specify)				

38. What quantities of pollutants will be emitted from the boiler after controls?

Pollutant	Pounds per Hour lb/hr	grain/ACF	@ °F	PSIA
CO	**0.41**			
Hydrocarbons				
NO_x	**0.18**			
Pb				
PM_{10}				
SO_2				
VOCs				
Other (specify)				

39. How will waste material from the process and control equipment be disposed of?

Wastes are not expected from a natural gas-fired boiler.

40. Have you completed an *Air Pollution Control Device Sheet(s)* for the control(s) used on this Emission Unit.

41. Have you included the ***air pollution rates*** on the Emissions Points Data Summary Sheet? **Yes**

42. **Proposed Monitoring, Recordkeeping, Reporting, and Testing**
Please propose monitoring, recordkeeping, and reporting in order to demonstrate compliance with the proposed operating parameters. Please propose testing in order to demonstrate compliance with the proposed emissions limits.

MONITORING PLAN: Please list (1) describe the process parameters and how they were chosen (2) the ranges and how they were established for monitoring to demonstrate compliance with the operation of this process equipment operation or air pollution control device.

See proposed monitoring plan in Attachment O.

TESTING PLAN: Please describe any proposed emissions testing for this process equipment or air pollution control device.

See proposed testing plan in Attachment O.

RECORDKEEPING: Please describe the proposed recordkeeping that will accompany the monitoring.

See proposed recordkeeping plan in Attachment O.

REPORTING: Please describe the proposed frequency of reporting of the recordkeeping.

See proposed reporting plan in Attachment O.

43. Describe all operating ranges and maintenance procedures required by Manufacturer to maintain warranty.

Attachment L
Emission Unit Data Sheet
(INDIRECT HEAT EXCHANGER)

Emission Unit ID No. must match List Form): **CM04**

Control Device ID No. (must match List Form):

Equipment Information

1. Manufacturer: **TBD**	2. Model No. **TBD** Serial No.
3. Number of units: 1	4. Use **Provide building heat.**
5. Rated Boiler Horsepower: **212** hp	6. Boiler Serial No.:
7. Date constructed: **2018**	8. Date of last modification and explain: **NA**
9. Maximum design heat input per unit: **5.12** $\times 10^6$ BTU/hr	10. Peak heat input per unit: **5.12** $\times 10^6$ BTU/hr
11. Steam produced at maximum design output: **TBD** LB/hr psig	12. Projected Operating Schedule: Hours/Day **24** Days/Week **7** Weeks/Year **52**
13. Type of firing equipment to be used: ☐ Pulverized coal ☐ Spreader stoker ☐ Oil burners ☒ Natural Gas Burner ☐ Others, specify	14. Proposed type of burners and orientation: ☐ Vertical ☐ Front Wall ☐ Opposed ☐ Tangential ☐ Others, specify
15. Type of draft: ☐ Forced ☐ Induced	16. Percent of ash retained in furnace: %
17. Will flyash be reinjected? ☐ Yes ☒ No	18. Percent of carbon in flyash: %

Stack or Vent Data

19. Inside diameter or dimensions: **1.15** ft.	20. Gas exit temperature: **134.33** °F
21. Height: **49.21** ft.	22. Stack serves: ☒ This equipment only ☐ Other equipment also (submit type and rating of all other equipment exhausted through this stack or vent)
23. Gas flow rate: **3,059.94** ft^3/min	
24. Estimated percent of moisture: %	

Fuel Requirements

25.	Type	Fuel Oil No.	Natural Gas	Gas (other, specify)	Coal, Type:	Other:
	Quantity (at Design Output)	gph@60°F	**4990** ft^3/hr	ft^3/hr	TPH	
	Annually	$\times 10^3$ gal	**43.71** $\times 10^6$ ft^3/yr	$\times 10^6$ ft^3/hr	tons	
	Sulfur	Maximum: wt. % Average: wt. %	gr/100 ft^3	gr/100 ft^3	Maximum: wt. %	
	Ash (%)				Maximum	
	BTU Content	BTU/Gal. Lbs/Gal.@60°F	**1026** BTU/ft^3	BTU/ft^3	BTU/lb	
	Source					
	Supplier					
	Halogens (Yes/No)					
	List and Identify Metals					

26. Gas burner mode of control:
☐ Manual ☐ Automatic hi-low
☐ Automatic full modulation ☐ Automatic on-off

27. Gas burner manufacture: **TBD**

28. Oil burner manufacture: **NA**

29. If fuel oil is used, how is it atomized? ☐ Oil Pressure ☐ Steam Pressure ☐ Compressed Air ☐ Rotary Cup ☐ Other, specify

30. Fuel oil preheated: ☐ Yes ☐ No

31. If yes, indicate temperature: °F

32. Specify the calculated theoretical air requirements for combustion of the fuel or mixture of fuels described above actual cubic feet (ACF) per unit of fuel:
@ °F, PSIA, % moisture

33. Emission rate at rated capacity: lb/hr

34. Percent excess air actually required for combustion of the fuel described: %

Coal Characteristics

35. Seams: **NA**

36. Proximate analysis (dry basis): % of Fixed Carbon: % of Sulfur:
% of Moisture: % of Volatile Matter:
% of Ash:

Emissions Stream

37. What quantities of pollutants will be emitted from the boiler before controls?

Pollutant	Pounds per Hour lb/hr	grain/ACF	@ °F	PSIA
CO	**No Controls – See Below**			
Hydrocarbons				
NO_x				
Pb				
PM_{10}				
SO_2				
VOCs				
Other (specify)				

38. What quantities of pollutants will be emitted from the boiler after controls?

Pollutant	Pounds per Hour lb/hr	grain/ACF	@ °F	PSIA
CO	**0.41**			
Hydrocarbons				
NO_x	**0.18**			
Pb				
PM_{10}				
SO_2				
VOCs				
Other (specify)				

39. How will waste material from the process and control equipment be disposed of?

Wastes are not expected from a natural gas-fired boiler.

40. Have you completed an *Air Pollution Control Device Sheet(s)* for the control(s) used on this Emission Unit.

41. Have you included the ***air pollution rates*** on the Emissions Points Data Summary Sheet? **Yes**

42. **Proposed Monitoring, Recordkeeping, Reporting, and Testing** Please propose monitoring, recordkeeping, and reporting in order to demonstrate compliance with the proposed operating parameters. Please propose testing in order to demonstrate compliance with the proposed emissions limits.
MONITORING PLAN: Please list (1) describe the process parameters and how they were chosen (2) the ranges and how they were established for monitoring to demonstrate compliance with the operation of this process equipment operation or air pollution control device. **See proposed monitoring plan in Attachment O.**
TESTING PLAN: Please describe any proposed emissions testing for this process equipment or air pollution control device. **See proposed testing plan in Attachment O.**
RECORDKEEPING: Please describe the proposed recordkeeping that will accompany the monitoring. **See proposed recordkeeping plan in Attachment O.**
REPORTING: Please describe the proposed frequency of reporting of the recordkeeping. **See proposed reporting plan in Attachment O.**
43. Describe all operating ranges and maintenance procedures required by Manufacturer to maintain warranty. **NA**

Attachment L

Emission Unit Data Sheet

(INDIRECT HEAT EXCHANGER)

Emission Unit ID No. must match List Form): **RFN10**

Control Device ID No. (must match List Form):

Equipment Information

1. Manufacturer: **TBD**	2. Model No. **NA** Serial No.
3. Number of units: **1**	4. Use **Provide building heat.**
5. Rated Boiler Horsepower: **2012** hp	6. Boiler Serial No.:
7. Date constructed: **2018**	8. Date of last modification and explain: **NA**
9. Maximum design heat input per unit: **5.12** $\times 10^6$ BTU/hr	10. Peak heat input per unit: **5.12** $\times 10^6$ BTU/hr
11. Steam produced at maximum design output: **NA** LB/hr psig	12. Projected Operating Schedule: Hours/Day **24** Days/Week **7** Weeks/Year **52**
13. Type of firing equipment to be used: ☐ Pulverized coal ☐ Spreader stoker ☐ Oil burners ☒ Natural Gas Burner ☐ Others, specify	14. Proposed type of burners and orientation: ☐ Vertical ☐ Front Wall ☐ Opposed ☐ Tangential ☐ Others, specify
15. Type of draft: ☐ Forced ☐ Induced	16. Percent of ash retained in furnace: %
17. Will flyash be reinjected? ☐ Yes ☐ No	18. Percent of carbon in flyash: %

Stack or Vent Data

19. Inside diameter or dimensions: **1.15** ft.	20. Gas exit temperature: **134.33** °F
21. Height: **49.21** ft.	22. Stack serves: ☒ This equipment only ☐ Other equipment also (submit type and rating of all other equipment exhausted through this stack or vent)
23. Gas flow rate: **3,059.94** ft^3/min	
24. Estimated percent of moisture: %	

Fuel Requirements

25. Type	Fuel Oil No.	Natural Gas	Gas (other, specify)	Coal, Type:	Other:
Quantity (at Design Output)	gph@60°F	**4990** ft^3/hr	ft^3/hr	TPH	
Annually	×10^3 gal	**43.71** ×10^6 ft^3/yr	×10^6 ft^3/hr	tons	
Sulfur	Maximum: wt. % Average: wt. %	gr/100 ft^3	gr/100 ft^3	Maximum: wt. %	
Ash (%)				Maximum	
BTU Content	BTU/Gal. Lbs/Gal.@60°F	**1026** BTU/ft^3	BTU/ft^3	BTU/lb	
Source					
Supplier					
Halogens (Yes/No)					
List and Identify Metals					

26. Gas burner mode of control:
☐ Manual ☐ Automatic hi-low
☐ Automatic full modulation ☐ Automatic on-off

27. Gas burner manufacture: **TBD**

28. Oil burner manufacture: **NA**

29. If fuel oil is used, how is it atomized? ☐ Oil Pressure ☐ Steam Pressure ☐ Compressed Air ☐ Rotary Cup ☐ Other, specify

30. Fuel oil preheated: ☐ Yes ☐ No

31. If yes, indicate temperature: °F

32. Specify the calculated theoretical air requirements for combustion of the fuel or mixture of fuels described above actual cubic feet (ACF) per unit of fuel:
@ °F, PSIA, % moisture

33. Emission rate at rated capacity: lb/hr

34. Percent excess air actually required for combustion of the fuel described: %

Coal Characteristics

35. Seams: **NA**

36. Proximate analysis (dry basis): % of Fixed Carbon: % of Sulfur:
% of Moisture: % of Volatile Matter:
% of Ash:

Emissions Stream

37. What quantities of pollutants will be emitted from the boiler before controls?

Pollutant	Pounds per Hour lb/hr	grain/ACF	@ °F	PSIA
CO				
Hydrocarbons				
NO_x				
Pb				
PM_{10}	**No Controls – See Below**			
SO_2				
VOCs				
Other (specify)				

38. What quantities of pollutants will be emitted from the boiler after controls?

Pollutant	Pounds per Hour lb/hr	grain/ACF	@ °F	PSIA
CO	**0.41**			
Hydrocarbons				
NO_x	**0.18**			
Pb				
PM_{10}				
SO_2				
VOCs				
Other (specify)				

39. How will waste material from the process and control equipment be disposed of?

Wastes are not expected from a natural gas-fired unit.

40. Have you completed an *Air Pollution Control Device Sheet(s)* for the control(s) used on this Emission Unit.

41. Have you included the ***air pollution rates*** on the Emissions Points Data Summary Sheet? **Yes**

42. **Proposed Monitoring, Recordkeeping, Reporting, and Testing**
Please propose monitoring, recordkeeping, and reporting in order to demonstrate compliance with the proposed operating parameters. Please propose testing in order to demonstrate compliance with the proposed emissions limits.

MONITORING PLAN: Please list (1) describe the process parameters and how they were chosen (2) the ranges and how they were established for monitoring to demonstrate compliance with the operation of this process equipment operation or air pollution control device.

See proposed monitoring plan in Attachment O.

TESTING PLAN: Please describe any proposed emissions testing for this process equipment or air pollution control device.

See proposed testing plan in Attachment O.

RECORDKEEPING: Please describe the proposed recordkeeping that will accompany the monitoring.

See proposed recordkeeping plan in Attachment O.

REPORTING: Please describe the proposed frequency of reporting of the recordkeeping.

See proposed reporting plan in Attachment O.

43. Describe all operating ranges and maintenance procedures required by Manufacturer to maintain warranty.

NA

Attachment L
EMISSIONS UNIT DATA SHEET
GENERAL

To be used for affected sources other than asphalt plants, foundries, incinerators, indirect heat exchangers, and quarries.

Identification Number (as assigned on *Equipment List Form*): **EFP1**

1. Name or type and model of proposed affected source: **Emergency Fire Pump Engine – 197 hp**
2. On a separate sheet(s), furnish a sketch(es) of this affected source. If a modification is to be made to this source, clearly indicated the change(s). Provide a narrative description of all features of the affected source which may affect the production of air pollutants.
3. Name(s) and maximum amount of proposed process material(s) charged per hour:
4. Name(s) and maximum amount of proposed material(s) produced per hour:
5. Give chemical reactions, if applicable, that will be involved in the generation of air pollutants: **NA**

* The identification number which appears here must correspond to the air pollution control device identification number appearing on the *List Form*.

6. Combustion Data (if applicable):

(a) Type and amount in appropriate units of fuel(s) to be burned:

Diesel

(b) Chemical analysis of proposed fuel(s), excluding coal, including maximum percent sulfur and ash:

(c) Theoretical combustion air requirement (ACF/unit of fuel):

@ °F and psia.

(d) Percent excess air:

(e) Type and BTU/hr of burners and all other firing equipment planned to be used:

(f) If coal is proposed as a source of fuel, identify supplier and seams and give sizing of the coal as it will be fired:

(g) Proposed maximum design heat input: **1.38** $\times 10^6$ BTU/hr.

7. Projected operating schedule: **500 hours per year**

Hours/Day	Days/Week	Weeks/Year

8. Projected amount of pollutants that would be emitted from this affected source if no control devices were used: @ °F and psia		
a. NO_X	**1.30** lb/hr	grains/ACF
b. SO_2	**2.14E-03** lb/hr	grains/ACF
c. CO	**1.13** lb/hr	grains/ACF
d. PM_{10}	**0.08** lb/hr	grains/ACF
e. Hydrocarbons	lb/hr	grains/ACF
f. VOCs	**0.19** lb/hr	grains/ACF
g. Pb	lb/hr	grains/ACF
h. Specify other(s)		
$PM_{2.5}$	**0.08** lb/hr	grains/ACF
CO2e	**225.42** lb/hr	grains/ACF
	lb/hr	grains/ACF
	lb/hr	grains/ACF

NOTE: (1) An Air Pollution Control Device Sheet must be completed for any air pollution device(s) used to control emissions from this affected source.

(2) Complete the Emission Points Data Sheet.

9. Proposed Monitoring, Recordkeeping, Reporting, and Testing
Please propose monitoring, recordkeeping, and reporting in order to demonstrate compliance with the proposed operating parameters. Please propose testing in order to demonstrate compliance with the proposed emissions limits.

MONITORING	RECORDKEEPING
See Attachment O	**See Attachment O**
REPORTING	TESTING
See Attachment O	**See Attachment O**

MONITORING. PLEASE LIST AND DESCRIBE THE PROCESS PARAMETERS AND RANGES THAT ARE PROPOSED TO BE MONITORED IN ORDER TO DEMONSTRATE COMPLIANCE WITH THE OPERATION OF THIS PROCESS EQUIPMENT OPERATION/AIR POLLUTION CONTROL DEVICE.

RECORDKEEPING. PLEASE DESCRIBE THE PROPOSED RECORDKEEPING THAT WILL ACCOMPANY THE MONITORING.

REPORTING. PLEASE DESCRIBE THE PROPOSED FREQUENCY OF REPORTING OF THE RECORDKEEPING.

TESTING. PLEASE DESCRIBE ANY PROPOSED EMISSIONS TESTING FOR THIS PROCESS EQUIPMENT/AIR POLLUTION CONTROL DEVICE.

10. Describe all operating ranges and maintenance procedures required by Manufacturer to maintain warranty

Unit will comply with NSPS IIII Requirements.

Attachment L
EMISSIONS UNIT DATA SHEET
STORAGE TANKS

Provide the following information for each new or modified bulk liquid storage tank as shown on the *Equipment List Form* and other parts of this application. A tank is considered modified if the material to be stored in the tank is different from the existing stored liquid.

IF USING US EPA'S TANKS EMISSION ESTIMATION PROGRAM (AVAILABLE AT www.epa.gov/tnn/tanks.html), APPLICANT MAY ATTACH THE SUMMARY SHEETS IN LIEU OF COMPLETING SECTIONS III, IV, & V OF THIS FORM. HOWEVER, SECTIONS I, II, AND VI OF THIS FORM MUST BE COMPLETED. US EPA'S AP-42, SECTION 7.1, "ORGANIC LIQUID STORAGE TANKS," MAY ALSO BE USED TO ESTIMATE VOC AND HAP EMISSIONS (http://www.epa.gov/tnn/chief/).

I. GENERAL INFORMATION (required)

1. Bulk Storage Area Name	2. Tank Name **Additive Storage Tank**
3. Tank Equipment Identification No. (as assigned on *Equipment List Form*) **TK-AD**	4. Emission Point Identification No. (as assigned on *Equipment List Form*) **TK-AD**
5. Date of Commencement of Construction (for existing tanks) **NA**	
6. Type of change ☒ New Construction ☐ New Stored Material ☐ Other Tank Modification	
7. Description of Tank Modification (if applicable) **NA**	
7A. Does the tank have more than one mode of operation? (e.g. Is there more than one product stored in the tank?) ☐ Yes ☒ No	
7B. If YES, explain and identify which mode is covered by this application (Note: A separate form must be completed for each mode). **NA**	
7C. Provide any limitations on source operation affecting emissions, any work practice standards (e.g. production variation, etc.): **NA**	

II. TANK INFORMATION (required) - See Attached EPA TANKs Report for the following information

8. Design Capacity (specify barrels or gallons). Use the internal cross-sectional area multiplied by internal height.	
9A. Tank Internal Diameter (ft)	9B. Tank Internal Height (or Length) (ft)
10A. Maximum Liquid Height (ft)	10B. Average Liquid Height (ft)
11A. Maximum Vapor Space Height (ft)	11B. Average Vapor Space Height (ft)
12. Nominal Capacity (specify barrels or gallons). This is also known as "working volume" and considers design liquid levels and overflow valve heights.	

13A. Maximum annual throughput (gal/yr)	13B. Maximum daily throughput (gal/day)
14. Number of Turnovers per year (annual net throughput/maximum tank liquid volume)	
15. Maximum tank fill rate (gal/min)	
16. Tank fill method ☐ Submerged ☐ Splash ☐ Bottom Loading	
17. Complete 17A and 17B for Variable Vapor Space Tank Systems ☐ Does Not Apply	
17A. Volume Expansion Capacity of System (gal)	17B. Number of transfers into system per year

18. Type of tank (check all that apply):

- ☐ Fixed Roof ___ vertical ___ horizontal ___ flat roof ___ cone roof ___ dome roof ___ other (describe)
- ☐ External Floating Roof ___ pontoon roof ___ double deck roof
- ☐ Domed External (or Covered) Floating Roof
- ☐ Internal Floating Roof ___ vertical column support ___ self-supporting
- ☐ Variable Vapor Space ___ lifter roof ___ diaphragm
- ☐ Pressurized ___ spherical ___ cylindrical
- ☐ Underground
- ☐ Other (describe)

Attachment L
EMISSIONS UNIT DATA SHEET
STORAGE TANKS

Provide the following information for <u>each</u> new or modified bulk liquid storage tank as shown on the *Equipment List Form* and other parts of this application. A tank is considered modified if the material to be stored in the tank is different from the existing stored liquid.

IF USING US EPA'S TANKS EMISSION ESTIMATION PROGRAM (AVAILABLE AT **www.epa.gov/tnn/tanks.html**), APPLICANT MAY ATTACH THE SUMMARY SHEETS IN LIEU OF COMPLETING SECTIONS III, IV, & V OF THIS FORM. HOWEVER, SECTIONS I, II, AND VI OF THIS FORM MUST BE COMPLETED. US EPA'S AP-42, SECTION 7.1, "ORGANIC LIQUID STORAGE TANKS," MAY ALSO BE USED TO ESTIMATE VOC AND HAP EMISSIONS (**http://www.epa.gov/tnn/chief/**).

I. GENERAL INFORMATION (required)

1. Bulk Storage Area Name	2. Tank Name **Binder Circulating Tank**
3. Tank Equipment Identification No. (as assigned on *Equipment List Form*) **TK-BC**	4. Emission Point Identification No. (as assigned on *Equipment List Form*) **TK-BC**
5. Date of Commencement of Construction (for existing tanks) **NA**	
6. Type of change ☒ New Construction ☐ New Stored Material ☐ Other Tank Modification	
7. Description of Tank Modification (if applicable) **NA**	
7A. Does the tank have more than one mode of operation? (e.g. Is there more than one product stored in the tank?) ☐ Yes ☒ No	
7B. If YES, explain and identify which mode is covered by this application (Note: A separate form must be completed for each mode). **NA**	
7C. Provide any limitations on source operation affecting emissions, any work practice standards (e.g. production variation, etc.): **NA**	

II. TANK INFORMATION (required) - See Attached EPA TANKs Report for the following information

8. Design Capacity (specify barrels or gallons). Use the internal cross-sectional area multiplied by internal height.	
9A. Tank Internal Diameter (ft)	9B. Tank Internal Height (or Length) (ft)
10A. Maximum Liquid Height (ft)	10B. Average Liquid Height (ft)
11A. Maximum Vapor Space Height (ft)	11B. Average Vapor Space Height (ft)
12. Nominal Capacity (specify barrels or gallons). This is also known as "working volume" and considers design liquid levels and overflow valve heights.	

13A. Maximum annual throughput (gal/yr)	13B. Maximum daily throughput (gal/day)
14. Number of Turnovers per year (annual net throughput/maximum tank liquid volume)	
15. Maximum tank fill rate (gal/min)	
16. Tank fill method ☐ Submerged ☐ Splash ☐ Bottom Loading	
17. Complete 17A and 17B for Variable Vapor Space Tank Systems ☐ Does Not Apply	
17A. Volume Expansion Capacity of System (gal)	17B. Number of transfers into system per year

18. Type of tank (check all that apply):

- ☐ Fixed Roof ___ vertical ___ horizontal ___ flat roof ___ cone roof ___ dome roof ___ other (describe)
- ☐ External Floating Roof ___ pontoon roof ___ double deck roof
- ☐ Domed External (or Covered) Floating Roof
- ☐ Internal Floating Roof ___ vertical column support ___ self-supporting
- ☐ Variable Vapor Space ___ lifter roof ___ diaphragm
- ☐ Pressurized ___ spherical ___ cylindrical
- ☐ Underground
- ☐ Other (describe)

Attachment L
EMISSIONS UNIT DATA SHEET
STORAGE TANKS

Provide the following information for each new or modified bulk liquid storage tank as shown on the *Equipment List Form* and other parts of this application. A tank is considered modified if the material to be stored in the tank is different from the existing stored liquid.

IF USING US EPA'S TANKS EMISSION ESTIMATION PROGRAM (AVAILABLE AT www.epa.gov/tnn/tanks.html), APPLICANT MAY ATTACH THE SUMMARY SHEETS IN LIEU OF COMPLETING SECTIONS III, IV, & V OF THIS FORM. HOWEVER, SECTIONS I, II, AND VI OF THIS FORM MUST BE COMPLETED. US EPA'S AP-42, SECTION 7.1, "ORGANIC LIQUID STORAGE TANKS," MAY ALSO BE USED TO ESTIMATE VOC AND HAP EMISSIONS (http://www.epa.gov/tnn/chief/).

I. GENERAL INFORMATION (required)

1. Bulk Storage Area Name	2. Tank Name **Binder Day Tank**
3. Tank Equipment Identification No. (as assigned on *Equipment List Form*) **TK-BD**	4. Emission Point Identification No. (as assigned on *Equipment List Form*) **TK-BD**

5. Date of Commencement of Construction (for existing tanks) **NA**

6. Type of change ☒ New Construction ☐ New Stored Material ☐ Other Tank Modification

7. Description of Tank Modification (if applicable)
NA

7A. Does the tank have more than one mode of operation? ☐ Yes ☒ No
(e.g. Is there more than one product stored in the tank?)

7B. If YES, explain and identify which mode is covered by this application (Note: A separate form must be completed for each mode).
NA

7C. Provide any limitations on source operation affecting emissions, any work practice standards (e.g. production variation, etc.):
NA

II. TANK INFORMATION (required) - See Attached EPA TANKs Report for the following information

8. Design Capacity (specify barrels or gallons). Use the internal cross-sectional area multiplied by internal height.
See Emission Calculations and US EPA Tanks Runs

9A. Tank Internal Diameter (ft)	9B. Tank Internal Height (or Length) (ft)
10A. Maximum Liquid Height (ft)	10B. Average Liquid Height (ft)
11A. Maximum Vapor Space Height (ft)	11B. Average Vapor Space Height (ft)

12. Nominal Capacity (specify barrels or gallons). This is also known as "working volume" and considers design liquid levels and overflow valve heights.

13A. Maximum annual throughput (gal/yr)	13B. Maximum daily throughput (gal/day)
14. Number of Turnovers per year (annual net throughput/maximum tank liquid volume)	
15. Maximum tank fill rate (gal/min)	
16. Tank fill method ☐ Submerged ☐ Splash ☐ Bottom Loading	
17. Complete 17A and 17B for Variable Vapor Space Tank Systems ☐ Does Not Apply	
17A. Volume Expansion Capacity of System (gal)	17B. Number of transfers into system per year

18. Type of tank (check all that apply):

- ☐ Fixed Roof ___ vertical ___ horizontal ___ flat roof ___ cone roof ___ dome roof ___ other (describe)
- ☐ External Floating Roof ___ pontoon roof ___ double deck roof
- ☐ Domed External (or Covered) Floating Roof
- ☐ Internal Floating Roof ___ vertical column support ___ self-supporting
- ☐ Variable Vapor Space ___ lifter roof ___ diaphragm
- ☐ Pressurized ___ spherical ___ cylindrical
- ☐ Underground
- ☐ Other (describe)

Attachment L
EMISSIONS UNIT DATA SHEET
STORAGE TANKS

Provide the following information for <u>each</u> new or modified bulk liquid storage tank as shown on the *Equipment List Form* and other parts of this application. A tank is considered modified if the material to be stored in the tank is different from the existing stored liquid.

IF USING US EPA'S TANKS EMISSION ESTIMATION PROGRAM (AVAILABLE AT www.epa.gov/tnn/tanks.html), APPLICANT MAY ATTACH THE SUMMARY SHEETS IN LIEU OF COMPLETING SECTIONS III, IV, & V OF THIS FORM. HOWEVER, SECTIONS I, II, AND VI OF THIS FORM MUST BE COMPLETED. US EPA'S AP-42, SECTION 7.1, "ORGANIC LIQUID STORAGE TANKS," MAY ALSO BE USED TO ESTIMATE VOC AND HAP EMISSIONS (http://www.epa.gov/tnn/chief/).

I. GENERAL INFORMATION (required)

1. Bulk Storage Area Name	2. Tank Name **Binder Mix Tank**
3. Tank Equipment Identification No. (as assigned on *Equipment List Form*) **TK-BM**	4. Emission Point Identification No. (as assigned on *Equipment List Form*) **TK-BM**
5. Date of Commencement of Construction (for existing tanks) **NA**	
6. Type of change ☒ New Construction ☐ New Stored Material ☐ Other Tank Modification	
7. Description of Tank Modification (if applicable) **NA**	
7A. Does the tank have more than one mode of operation? ☐ Yes ☒ No (e.g. Is there more than one product stored in the tank?)	
7B. If YES, explain and identify which mode is covered by this application (Note: A separate form must be completed for each mode). **NA**	
7C. Provide any limitations on source operation affecting emissions, any work practice standards (e.g. production variation, etc.): **NA**	

II. TANK INFORMATION (required) - See Attached EPA TANKs Report for the following information

8. Design Capacity (specify barrels or gallons). Use the internal cross-sectional area multiplied by internal height.	
9A. Tank Internal Diameter (ft)	9B. Tank Internal Height (or Length) (ft)
10A. Maximum Liquid Height (ft)	10B. Average Liquid Height (ft)
11A. Maximum Vapor Space Height (ft)	11B. Average Vapor Space Height (ft)
12. Nominal Capacity (specify barrels or gallons). This is also known as "working volume" and considers design liquid levels and overflow valve heights.	

13A. Maximum annual throughput (gal/yr)	13B. Maximum daily throughput (gal/day)
14. Number of Turnovers per year (annual net throughput/maximum tank liquid volume)	
15. Maximum tank fill rate (gal/min)	
16. Tank fill method ☐ Submerged ☐ Splash ☐ Bottom Loading	
17. Complete 17A and 17B for Variable Vapor Space Tank Systems ☐ Does Not Apply	
17A. Volume Expansion Capacity of System (gal)	17B. Number of transfers into system per year

18. Type of tank (check all that apply):

☐ Fixed Roof ___ vertical ___ horizontal ___ flat roof ___ cone roof ___ dome roof ___ other (describe)

☐ External Floating Roof ___ pontoon roof ___ double deck roof

☐ Domed External (or Covered) Floating Roof

☐ Internal Floating Roof ___ vertical column support ___ self-supporting

☐ Variable Vapor Space ___ lifter roof ___ diaphragm

☐ Pressurized ___ spherical ___ cylindrical

☐ Underground

☐ Other (describe)

Attachment L
EMISSIONS UNIT DATA SHEET
STORAGE TANKS

Provide the following information for each new or modified bulk liquid storage tank as shown on the *Equipment List Form* and other parts of this application. A tank is considered modified if the material to be stored in the tank is different from the existing stored liquid.

IF USING US EPA'S TANKS EMISSION ESTIMATION PROGRAM (AVAILABLE AT **www.epa.gov/tnn/tanks.html**), APPLICANT MAY ATTACH THE SUMMARY SHEETS IN LIEU OF COMPLETING SECTIONS III, IV, & V OF THIS FORM. HOWEVER, SECTIONS I, II, AND VI OF THIS FORM MUST BE COMPLETED. US EPA'S AP-42, SECTION 7.1, "ORGANIC LIQUID STORAGE TANKS," MAY ALSO BE USED TO ESTIMATE VOC AND HAP EMISSIONS (**http://www.epa.gov/tnn/chief/**).

I. GENERAL INFORMATION (required)

1. Bulk Storage Area Name	2. Tank Name **Binder Storage Containers**
3. Tank Equipment Identification No. (as assigned on *Equipment List Form*) **TK-BS1, TK-BS2, and TK-BS3**	4. Emission Point Identification No. (as assigned on *Equipment List Form*) **TK-BS1, TK-BS2, and TK-BS3**
5. Date of Commencement of Construction (for existing tanks) **NA**	
6. Type of change ☒ New Construction ☐ New Stored Material ☐ Other Tank Modification	
7. Description of Tank Modification (if applicable) **NA**	
7A. Does the tank have more than one mode of operation? ☐ Yes ☒ No (e.g. Is there more than one product stored in the tank?)	
7B. If YES, explain and identify which mode is covered by this application (Note: A separate form must be completed for each mode). **NA**	
7C. Provide any limitations on source operation affecting emissions, any work practice standards (e.g. production variation, etc.): **NA**	

II. TANK INFORMATION (required) - See Attached EPA TANKs Report for the following information

8. Design Capacity (specify barrels or gallons). Use the internal cross-sectional area multiplied by internal height.	
9A. Tank Internal Diameter (ft)	9B. Tank Internal Height (or Length) (ft)
10A. Maximum Liquid Height (ft)	10B. Average Liquid Height (ft)
11A. Maximum Vapor Space Height (ft)	11B. Average Vapor Space Height (ft)
12. Nominal Capacity (specify barrels or gallons). This is also known as "working volume" and considers design liquid levels and overflow valve heights.	

13A. Maximum annual throughput (gal/yr)	13B. Maximum daily throughput (gal/day)
14. Number of Turnovers per year (annual net throughput/maximum tank liquid volume)	
15. Maximum tank fill rate (gal/min)	
16. Tank fill method ☐ Submerged ☐ Splash ☐ Bottom Loading	
17. Complete 17A and 17B for Variable Vapor Space Tank Systems ☐ Does Not Apply	
17A. Volume Expansion Capacity of System (gal)	17B. Number of transfers into system per year

18. Type of tank (check all that apply):

☐ Fixed Roof ___ vertical ___ horizontal ___ flat roof ___ cone roof ___ dome roof
___ other (describe)

☐ External Floating Roof ___ pontoon roof ___ double deck roof

☐ Domed External (or Covered) Floating Roof

☐ Internal Floating Roof ___ vertical column support ___ self-supporting

☐ Variable Vapor Space ___ lifter roof ___ diaphragm

☐ Pressurized ___ spherical ___ cylindrical

☐ Underground

☐ Other (describe)

Attachment L
EMISSIONS UNIT DATA SHEET
STORAGE TANKS

Provide the following information for <u>each</u> new or modified bulk liquid storage tank as shown on the *Equipment List Form* and other parts of this application. A tank is considered modified if the material to be stored in the tank is different from the existing stored liquid.

IF USING US EPA'S TANKS EMISSION ESTIMATION PROGRAM (AVAILABLE AT www.epa.gov/tnn/tanks.html), APPLICANT MAY ATTACH THE SUMMARY SHEETS IN LIEU OF COMPLETING SECTIONS III, IV, & V OF THIS FORM. HOWEVER, SECTIONS I, II, AND VI OF THIS FORM MUST BE COMPLETED. US EPA'S AP-42, SECTION 7.1, "ORGANIC LIQUID STORAGE TANKS," MAY ALSO BE USED TO ESTIMATE VOC AND HAP EMISSIONS (http://www.epa.gov/tnn/chief/).

I. GENERAL INFORMATION (required)

1. Bulk Storage Area Name	2. Tank Name **Coupling Agent Storage Tank**
3. Tank Equipment Identification No. (as assigned on *Equipment List Form*) **TK-CA**	4. Emission Point Identification No. (as assigned on *Equipment List Form*) **TK-CA**
5. Date of Commencement of Construction (for existing tanks) **NA**	
6. Type of change ☒ New Construction ☐ New Stored Material ☐ Other Tank Modification	
7. Description of Tank Modification (if applicable) **NA**	
7A. Does the tank have more than one mode of operation? (e.g. Is there more than one product stored in the tank?) ☐ Yes ☒ No	
7B. If YES, explain and identify which mode is covered by this application (Note: A separate form must be completed for each mode). **NA**	
7C. Provide any limitations on source operation affecting emissions, any work practice standards (e.g. production variation, etc.): **NA**	

II. TANK INFORMATION (required) - See Attached EPA TANKs Report for the following information

8. Design Capacity (specify barrels or gallons). Use the internal cross-sectional area multiplied by internal height.	
9A. Tank Internal Diameter (ft)	9B. Tank Internal Height (or Length) (ft)
10A. Maximum Liquid Height (ft)	10B. Average Liquid Height (ft)
11A. Maximum Vapor Space Height (ft)	11B. Average Vapor Space Height (ft)
12. Nominal Capacity (specify barrels or gallons). This is also known as "working volume" and considers design liquid levels and overflow valve heights.	

13A. Maximum annual throughput (gal/yr)	13B. Maximum daily throughput (gal/day)
14. Number of Turnovers per year (annual net throughput/maximum tank liquid volume)	
15. Maximum tank fill rate (gal/min)	
16. Tank fill method ☐ Submerged ☐ Splash ☐ Bottom Loading	
17. Complete 17A and 17B for Variable Vapor Space Tank Systems ☐ Does Not Apply	
17A. Volume Expansion Capacity of System (gal)	17B. Number of transfers into system per year

18. Type of tank (check all that apply):

☐ Fixed Roof ___ vertical ___ horizontal ___ flat roof ___ cone roof ___ dome roof
___ other (describe)
☐ External Floating Roof ___ pontoon roof ___ double deck roof
☐ Domed External (or Covered) Floating Roof
☐ Internal Floating Roof ___ vertical column support ___ self-supporting
☐ Variable Vapor Space ___ lifter roof ___ diaphragm
☐ Pressurized ___ spherical ___ cylindrical
☐ Underground
☐ Other (describe)

Attachment L
EMISSIONS UNIT DATA SHEET
STORAGE TANKS

Provide the following information for <u>each</u> new or modified bulk liquid storage tank as shown on the *Equipment List Form* and other parts of this application. A tank is considered modified if the material to be stored in the tank is different from the existing stored liquid.

IF USING US EPA'S TANKS EMISSION ESTIMATION PROGRAM (AVAILABLE AT www.epa.gov/tnn/tanks.html), APPLICANT MAY ATTACH THE SUMMARY SHEETS IN LIEU OF COMPLETING SECTIONS III, IV, & V OF THIS FORM. HOWEVER, SECTIONS I, II, AND VI OF THIS FORM MUST BE COMPLETED. US EPA'S AP-42, SECTION 7.1, "ORGANIC LIQUID STORAGE TANKS," MAY ALSO BE USED TO ESTIMATE VOC AND HAP EMISSIONS (http://www.epa.gov/tnn/chief/).

I. GENERAL INFORMATION (required)

1. Bulk Storage Area Name	2. Tank Name **Diesel Fuel Tank**
3. Tank Equipment Identification No. (as assigned on *Equipment List Form*) **TK-DF**	4. Emission Point Identification No. (as assigned on *Equipment List Form*) **TK-DF**
5. Date of Commencement of Construction (for existing tanks) **NA**	
6. Type of change ☒ New Construction ☐ New Stored Material ☐ Other Tank Modification	
7. Description of Tank Modification (if applicable) **NA**	
7A. Does the tank have more than one mode of operation? ☐ Yes ☒ No (e.g. Is there more than one product stored in the tank?)	
7B. If YES, explain and identify which mode is covered by this application (Note: A separate form must be completed for each mode). **NA**	
7C. Provide any limitations on source operation affecting emissions, any work practice standards (e.g. production variation, etc.): **NA**	

II. TANK INFORMATION (required) - See Attached EPA TANKs Report for the following information

8. Design Capacity (specify barrels or gallons). Use the internal cross-sectional area multiplied by internal height.	
9A. Tank Internal Diameter (ft)	9B. Tank Internal Height (or Length) (ft)
10A. Maximum Liquid Height (ft)	10B. Average Liquid Height (ft)
11A. Maximum Vapor Space Height (ft)	11B. Average Vapor Space Height (ft)
12. Nominal Capacity (specify barrels or gallons). This is also known as "working volume" and considers design liquid levels and overflow valve heights.	

13A. Maximum annual throughput (gal/yr)	13B. Maximum daily throughput (gal/day)
14. Number of Turnovers per year (annual net throughput/maximum tank liquid volume)	
15. Maximum tank fill rate (gal/min)	
16. Tank fill method ☐ Submerged ☐ Splash ☐ Bottom Loading	
17. Complete 17A and 17B for Variable Vapor Space Tank Systems ☐ Does Not Apply	
17A. Volume Expansion Capacity of System (gal)	17B. Number of transfers into system per year

18. Type of tank (check all that apply):

- ☐ Fixed Roof ___ vertical ___ horizontal ___ flat roof ___ cone roof ___ dome roof ___ other (describe)
- ☐ External Floating Roof ___ pontoon roof ___ double deck roof
- ☐ Domed External (or Covered) Floating Roof
- ☐ Internal Floating Roof ___ vertical column support ___ self-supporting
- ☐ Variable Vapor Space ___ lifter roof ___ diaphragm
- ☐ Pressurized ___ spherical ___ cylindrical
- ☐ Underground
- ☐ Other (describe)

Attachment L
EMISSIONS UNIT DATA SHEET
STORAGE TANKS

Provide the following information for each new or modified bulk liquid storage tank as shown on the *Equipment List Form* and other parts of this application. A tank is considered modified if the material to be stored in the tank is different from the existing stored liquid.

IF USING US EPA'S TANKS EMISSION ESTIMATION PROGRAM (AVAILABLE AT www.epa.gov/tnn/tanks.html), APPLICANT MAY ATTACH THE SUMMARY SHEETS IN LIEU OF COMPLETING SECTIONS III, IV, & V OF THIS FORM. HOWEVER, SECTIONS I, II, AND VI OF THIS FORM MUST BE COMPLETED. US EPA'S AP-42, SECTION 7.1, "ORGANIC LIQUID STORAGE TANKS," MAY ALSO BE USED TO ESTIMATE VOC AND HAP EMISSIONS (http://www.epa.gov/tnn/chief/).

I. GENERAL INFORMATION (required)

1. Bulk Storage Area Name	2. Tank Name **De-dust Oil Storage Tank**
3. Tank Equipment Identification No. (as assigned on *Equipment List Form*) **TK-DO**	4. Emission Point Identification No. (as assigned on *Equipment List Form*) **TK-DO**
5. Date of Commencement of Construction (for existing tanks) **NA**	
6. Type of change ☒ New Construction ☐ New Stored Material ☐ Other Tank Modification	
7. Description of Tank Modification (if applicable) **NA**	
7A. Does the tank have more than one mode of operation? ☐ Yes ☒ No (e.g. Is there more than one product stored in the tank?)	
7B. If YES, explain and identify which mode is covered by this application (Note: A separate form must be completed for each mode). **NA**	
7C. Provide any limitations on source operation affecting emissions, any work practice standards (e.g. production variation, etc.): **NA**	

II. TANK INFORMATION (required) - See Attached EPA TANKs Report for the following information

8. Design Capacity (specify barrels or gallons). Use the internal cross-sectional area multiplied by internal height.	
9A. Tank Internal Diameter (ft)	9B. Tank Internal Height (or Length) (ft)
10A. Maximum Liquid Height (ft)	10B. Average Liquid Height (ft)
11A. Maximum Vapor Space Height (ft)	11B. Average Vapor Space Height (ft)
12. Nominal Capacity (specify barrels or gallons). This is also known as "working volume" and considers design liquid levels and overflow valve heights.	

13A. Maximum annual throughput (gal/yr)	13B. Maximum daily throughput (gal/day)

14. Number of Turnovers per year (annual net throughput/maximum tank liquid volume)

15. Maximum tank fill rate (gal/min)

16. Tank fill method ☐ Submerged ☐ Splash ☐ Bottom Loading

17. Complete 17A and 17B for Variable Vapor Space Tank Systems ☐ Does Not Apply

17A. Volume Expansion Capacity of System (gal)	17B. Number of transfers into system per year

18. Type of tank (check all that apply):

☐ Fixed Roof ___ vertical ___ horizontal ___ flat roof ___ cone roof ___ dome roof ___ other (describe)

☐ External Floating Roof ___ pontoon roof ___ double deck roof

☐ Domed External (or Covered) Floating Roof

☐ Internal Floating Roof ___ vertical column support ___ self-supporting

☐ Variable Vapor Space ___ lifter roof ___ diaphragm

☐ Pressurized ___ spherical ___ cylindrical

☐ Underground

☐ Other (describe)

Attachment L
EMISSIONS UNIT DATA SHEET
STORAGE TANKS

Provide the following information for each new or modified bulk liquid storage tank as shown on the *Equipment List Form* and other parts of this application. A tank is considered modified if the material to be stored in the tank is different from the existing stored liquid.

IF USING US EPA'S TANKS EMISSION ESTIMATION PROGRAM (AVAILABLE AT www.epa.gov/tnn/tanks.html), APPLICANT MAY ATTACH THE SUMMARY SHEETS IN LIEU OF COMPLETING SECTIONS III, IV, & V OF THIS FORM. HOWEVER, SECTIONS I, II, AND VI OF THIS FORM MUST BE COMPLETED. US EPA'S AP-42, SECTION 7.1, "ORGANIC LIQUID STORAGE TANKS," MAY ALSO BE USED TO ESTIMATE VOC AND HAP EMISSIONS (http://www.epa.gov/tnn/chief/).

I. GENERAL INFORMATION (required)

1. Bulk Storage Area Name	2. Tank Name **De-dust Oil Day Tank**
3. Tank Equipment Identification No. (as assigned on *Equipment List Form*) **TK-DOD**	4. Emission Point Identification No. (as assigned on *Equipment List Form*) **TK-DOD**
5. Date of Commencement of Construction (for existing tanks) **NA**	
6. Type of change ☒ New Construction ☐ New Stored Material ☐ Other Tank Modification	
7. Description of Tank Modification (if applicable) **NA**	
7A. Does the tank have more than one mode of operation? (e.g. Is there more than one product stored in the tank?) ☐ Yes ☒ No	
7B. If YES, explain and identify which mode is covered by this application (Note: A separate form must be completed for each mode). **NA**	
7C. Provide any limitations on source operation affecting emissions, any work practice standards (e.g. production variation, etc.): **NA**	

II. TANK INFORMATION (required) - See Attached EPA TANKs Report for the following information

8. Design Capacity (specify barrels or gallons). Use the internal cross-sectional area multiplied by internal height.	
9A. Tank Internal Diameter (ft)	9B. Tank Internal Height (or Length) (ft)
10A. Maximum Liquid Height (ft)	10B. Average Liquid Height (ft)
11A. Maximum Vapor Space Height (ft)	11B. Average Vapor Space Height (ft)
12. Nominal Capacity (specify barrels or gallons). This is also known as "working volume" and considers design liquid levels and overflow valve heights.	

13A. Maximum annual throughput (gal/yr)	13B. Maximum daily throughput (gal/day)
14. Number of Turnovers per year (annual net throughput/maximum tank liquid volume)	
15. Maximum tank fill rate (gal/min)	
16. Tank fill method ☐ Submerged ☐ Splash ☐ Bottom Loading	
17. Complete 17A and 17B for Variable Vapor Space Tank Systems ☐ Does Not Apply	
17A. Volume Expansion Capacity of System (gal)	17B. Number of transfers into system per year

18. Type of tank (check all that apply):

☐ Fixed Roof ___ vertical ___ horizontal ___ flat roof ___ cone roof ___ dome roof ___ other (describe)

☐ External Floating Roof ___ pontoon roof ___ double deck roof

☐ Domed External (or Covered) Floating Roof

☐ Internal Floating Roof ___ vertical column support ___ self-supporting

☐ Variable Vapor Space ___ lifter roof ___ diaphragm

☐ Pressurized ___ spherical ___ cylindrical

☐ Underground

☐ Other (describe)

Attachment L
EMISSIONS UNIT DATA SHEET
STORAGE TANKS

Provide the following information for <u>each</u> new or modified bulk liquid storage tank as shown on the *Equipment List Form* and other parts of this application. A tank is considered modified if the material to be stored in the tank is different from the existing stored liquid.

IF USING US EPA'S TANKS EMISSION ESTIMATION PROGRAM (AVAILABLE AT www.epa.gov/tnn/tanks.html), APPLICANT MAY ATTACH THE SUMMARY SHEETS IN LIEU OF COMPLETING SECTIONS III, IV, & V OF THIS FORM. HOWEVER, SECTIONS I, II, AND VI OF THIS FORM MUST BE COMPLETED. US EPA'S AP-42, SECTION 7.1, "ORGANIC LIQUID STORAGE TANKS," MAY ALSO BE USED TO ESTIMATE VOC AND HAP EMISSIONS (http://www.epa.gov/tnn/chief/).

I. GENERAL INFORMATION (required)

1. Bulk Storage Area Name	2. Tank Name **Resin Storage Tanks**
3. Tank Equipment Identification No. (as assigned on *Equipment List Form*) **TK-RS1 - TK-RS7**	4. Emission Point Identification No. (as assigned on *Equipment List Form*) **TK-RS1 - TK-RS7**
5. Date of Commencement of Construction (for existing tanks) **NA**	
6. Type of change ☒ New Construction ☐ New Stored Material ☐ Other Tank Modification	
7. Description of Tank Modification (if applicable) **NA**	
7A. Does the tank have more than one mode of operation? ☐ Yes ☒ No (e.g. Is there more than one product stored in the tank?)	
7B. If YES, explain and identify which mode is covered by this application (Note: A separate form must be completed for each mode). **NA**	
7C. Provide any limitations on source operation affecting emissions, any work practice standards (e.g. production variation, etc.): **NA**	

II. TANK INFORMATION (required) - See Attached EPA TANKs Report for the following information

8. Design Capacity (specify barrels or gallons). Use the internal cross-sectional area multiplied by internal height.	
9A. Tank Internal Diameter (ft)	9B. Tank Internal Height (or Length) (ft)
10A. Maximum Liquid Height (ft)	10B. Average Liquid Height (ft)
11A. Maximum Vapor Space Height (ft)	11B. Average Vapor Space Height (ft)
12. Nominal Capacity (specify barrels or gallons). This is also known as "working volume" and considers design liquid levels and overflow valve heights.	

13A. Maximum annual throughput (gal/yr)	13B. Maximum daily throughput (gal/day)
14. Number of Turnovers per year (annual net throughput/maximum tank liquid volume)	
15. Maximum tank fill rate (gal/min)	
16. Tank fill method ☐ Submerged ☐ Splash ☐ Bottom Loading	
17. Complete 17A and 17B for Variable Vapor Space Tank Systems ☐ Does Not Apply	
17A. Volume Expansion Capacity of System (gal)	17B. Number of transfers into system per year

18. Type of tank (check all that apply):

☐ Fixed Roof ___ vertical ___ horizontal ___ flat roof ___ cone roof ___ dome roof ___ other (describe)

☐ External Floating Roof ___ pontoon roof ___ double deck roof

☐ Domed External (or Covered) Floating Roof

☐ Internal Floating Roof ___ vertical column support ___ self-supporting

☐ Variable Vapor Space ___ lifter roof ___ diaphragm

☐ Pressurized ___ spherical ___ cylindrical

☐ Underground

☐ Other (describe)

Attachment L
EMISSIONS UNIT DATA SHEET
STORAGE TANKS

Provide the following information for each new or modified bulk liquid storage tank as shown on the *Equipment List Form* and other parts of this application. A tank is considered modified if the material to be stored in the tank is different from the existing stored liquid.

IF USING US EPA'S TANKS EMISSION ESTIMATION PROGRAM (AVAILABLE AT **www.epa.gov/tnn/tanks.html**), APPLICANT MAY ATTACH THE SUMMARY SHEETS IN LIEU OF COMPLETING SECTIONS III, IV, & V OF THIS FORM. HOWEVER, SECTIONS I, II, AND VI OF THIS FORM MUST BE COMPLETED. US EPA'S AP-42, SECTION 7.1, "ORGANIC LIQUID STORAGE TANKS," MAY ALSO BE USED TO ESTIMATE VOC AND HAP EMISSIONS (**http://www.epa.gov/tnn/chief/**).

I. GENERAL INFORMATION (required)

1. Bulk Storage Area Name	2. Tank Name **Thermal Oil Expansion Tank - Rockfon**
3. Tank Equipment Identification No. (as assigned on *Equipment List Form*) **TK-TO1**	4. Emission Point Identification No. (as assigned on *Equipment List Form*) **TK-TO1**
5. Date of Commencement of Construction (for existing tanks) **NA**	
6. Type of change ☒ New Construction ☐ New Stored Material ☐ Other Tank Modification	
7. Description of Tank Modification (if applicable) **NA**	
7A. Does the tank have more than one mode of operation? ☐ Yes ☒ No (e.g. Is there more than one product stored in the tank?)	
7B. If YES, explain and identify which mode is covered by this application (Note: A separate form must be completed for each mode). **NA**	
7C. Provide any limitations on source operation affecting emissions, any work practice standards (e.g. production variation, etc.): **NA**	

II. TANK INFORMATION (required) - See Attached EPA TANKs Report for the following information

8. Design Capacity (specify barrels or gallons). Use the internal cross-sectional area multiplied by internal height.	
9A. Tank Internal Diameter (ft)	9B. Tank Internal Height (or Length) (ft)
10A. Maximum Liquid Height (ft)	10B. Average Liquid Height (ft)
11A. Maximum Vapor Space Height (ft)	11B. Average Vapor Space Height (ft)
12. Nominal Capacity (specify barrels or gallons). This is also known as "working volume" and considers design liquid levels and overflow valve heights.	

13A. Maximum annual throughput (gal/yr)	13B. Maximum daily throughput (gal/day)
14. Number of Turnovers per year (annual net throughput/maximum tank liquid volume)	
15. Maximum tank fill rate (gal/min)	
16. Tank fill method ☐ Submerged ☐ Splash ☐ Bottom Loading	
17. Complete 17A and 17B for Variable Vapor Space Tank Systems ☐ Does Not Apply	
17A. Volume Expansion Capacity of System (gal)	17B. Number of transfers into system per year

18. Type of tank (check all that apply):

- ☐ Fixed Roof ___ vertical ___ horizontal ___ flat roof ___ cone roof ___ dome roof ___ other (describe)
- ☐ External Floating Roof ___ pontoon roof ___ double deck roof
- ☐ Domed External (or Covered) Floating Roof
- ☐ Internal Floating Roof ___ vertical column support ___ self-supporting
- ☐ Variable Vapor Space ___ lifter roof ___ diaphragm
- ☐ Pressurized ___ spherical ___ cylindrical
- ☐ Underground
- ☐ Other (describe)

Attachment L
EMISSIONS UNIT DATA SHEET
STORAGE TANKS

Provide the following information for each new or modified bulk liquid storage tank as shown on the *Equipment List Form* and other parts of this application. A tank is considered modified if the material to be stored in the tank is different from the existing stored liquid.

IF USING US EPA'S TANKS EMISSION ESTIMATION PROGRAM (AVAILABLE AT **www.epa.gov/tnn/tanks.html**), APPLICANT MAY ATTACH THE SUMMARY SHEETS IN LIEU OF COMPLETING SECTIONS III, IV, & V OF THIS FORM. HOWEVER, SECTIONS I, II, AND VI OF THIS FORM MUST BE COMPLETED. US EPA'S AP-42, SECTION 7.1, "ORGANIC LIQUID STORAGE TANKS," MAY ALSO BE USED TO ESTIMATE VOC AND HAP EMISSIONS (**http://www.epa.gov/tnn/chief/**).

I. GENERAL INFORMATION (required)

1. Bulk Storage Area Name	2. Tank Name **Thermal Oil Drain Tank - Rockfon**
3. Tank Equipment Identification No. (as assigned on *Equipment List Form*) **TK-TO2**	4. Emission Point Identification No. (as assigned on *Equipment List Form*) **TK-TO2**
5. Date of Commencement of Construction (for existing tanks) **NA**	
6. Type of change ☒ New Construction ☐ New Stored Material ☐ Other Tank Modification	
7. Description of Tank Modification (if applicable) **NA**	
7A. Does the tank have more than one mode of operation? (e.g. Is there more than one product stored in the tank?) ☐ Yes ☒ No	
7B. If YES, explain and identify which mode is covered by this application (Note: A separate form must be completed for each mode). **NA**	
7C. Provide any limitations on source operation affecting emissions, any work practice standards (e.g. production variation, etc.): **NA**	

II. TANK INFORMATION (required) - See Attached EPA TANKs Report for the following information

8. Design Capacity (specify barrels or gallons). Use the internal cross-sectional area multiplied by internal height.	
9A. Tank Internal Diameter (ft)	9B. Tank Internal Height (or Length) (ft)
10A. Maximum Liquid Height (ft)	10B. Average Liquid Height (ft)
11A. Maximum Vapor Space Height (ft)	11B. Average Vapor Space Height (ft)
12. Nominal Capacity (specify barrels or gallons). This is also known as "working volume" and considers design liquid levels and overflow valve heights.	

13A. Maximum annual throughput (gal/yr)	13B. Maximum daily throughput (gal/day)
14. Number of Turnovers per year (annual net throughput/maximum tank liquid volume)	
15. Maximum tank fill rate (gal/min)	
16. Tank fill method ☐ Submerged ☐ Splash ☐ Bottom Loading	
17. Complete 17A and 17B for Variable Vapor Space Tank Systems ☐ Does Not Apply	
17A. Volume Expansion Capacity of System (gal)	17B. Number of transfers into system per year

18. Type of tank (check all that apply):

- ☐ Fixed Roof ___ vertical ___ horizontal ___ flat roof ___ cone roof ___ dome roof ___ other (describe)
- ☐ External Floating Roof ___ pontoon roof ___ double deck roof
- ☐ Domed External (or Covered) Floating Roof
- ☐ Internal Floating Roof ___ vertical column support ___ self-supporting
- ☐ Variable Vapor Space ___ lifter roof ___ diaphragm
- ☐ Pressurized ___ spherical ___ cylindrical
- ☐ Underground
- ☐ Other (describe)

Attachment L
EMISSIONS UNIT DATA SHEET
STORAGE TANKS

Provide the following information for each new or modified bulk liquid storage tank as shown on the *Equipment List Form* and other parts of this application. A tank is considered modified if the material to be stored in the tank is different from the existing stored liquid.

IF USING US EPA'S TANKS EMISSION ESTIMATION PROGRAM (AVAILABLE AT **www.epa.gov/tnn/tanks.html**), APPLICANT MAY ATTACH THE SUMMARY SHEETS IN LIEU OF COMPLETING SECTIONS III, IV, & V OF THIS FORM. HOWEVER, SECTIONS I, II, AND VI OF THIS FORM MUST BE COMPLETED. US EPA'S AP-42, SECTION 7.1, "ORGANIC LIQUID STORAGE TANKS," MAY ALSO BE USED TO ESTIMATE VOC AND HAP EMISSIONS (**http://www.epa.gov/tnn/chief/**).

I. GENERAL INFORMATION (required)

1. Bulk Storage Area Name	2. Tank Name **Thermal Oil Tank - IMF**
3. Tank Equipment Identification No. (as assigned on *Equipment List Form*) **TK-TO3**	4. Emission Point Identification No. (as assigned on *Equipment List Form*) **TK-TO3**
5. Date of Commencement of Construction (for existing tanks) **N/A**	
6. Type of change ☒ New Construction ☐ New Stored Material ☐ Other Tank Modification	
7. Description of Tank Modification (if applicable) **N/A**	
7A. Does the tank have more than one mode of operation? (e.g. Is there more than one product stored in the tank?) ☐ Yes ☒ No	
7B. If YES, explain and identify which mode is covered by this application (Note: A separate form must be completed for each mode). **N/A**	
7C. Provide any limitations on source operation affecting emissions, any work practice standards (e.g. production variation, etc.): **N/A**	

II. TANK INFORMATION (required) - See Attached EPA TANKs Report for the following information

8. Design Capacity (specify barrels or gallons). Use the internal cross-sectional area multiplied by internal height.	
9A. Tank Internal Diameter (ft)	9B. Tank Internal Height (or Length) (ft)
10A. Maximum Liquid Height (ft)	10B. Average Liquid Height (ft)
11A. Maximum Vapor Space Height (ft)	11B. Average Vapor Space Height (ft)
12. Nominal Capacity (specify barrels or gallons). This is also known as "working volume" and considers design liquid levels and overflow valve heights.	

13A. Maximum annual throughput (gal/yr)	13B. Maximum daily throughput (gal/day)
14. Number of Turnovers per year (annual net throughput/maximum tank liquid volume)	
15. Maximum tank fill rate (gal/min)	
16. Tank fill method ☐ Submerged ☐ Splash ☐ Bottom Loading	
17. Complete 17A and 17B for Variable Vapor Space Tank Systems ☐ Does Not Apply	
17A. Volume Expansion Capacity of System (gal)	17B. Number of transfers into system per year

18. Type of tank (check all that apply):

- ☐ Fixed Roof ___ vertical ___ horizontal ___ flat roof ___ cone roof ___ dome roof ___ other (describe)
- ☐ External Floating Roof ___ pontoon roof ___ double deck roof
- ☐ Domed External (or Covered) Floating Roof
- ☐ Internal Floating Roof ___ vertical column support ___ self-supporting
- ☐ Variable Vapor Space ___ lifter roof ___ diaphragm
- ☐ Pressurized ___ spherical ___ cylindrical
- ☐ Underground
- ☐ Other (describe)

Attachment L
EMISSIONS UNIT DATA SHEET
STORAGE TANKS

Provide the following information for <u>each</u> new or modified bulk liquid storage tank as shown on the *Equipment List Form* and other parts of this application. A tank is considered modified if the material to be stored in the tank is different from the existing stored liquid.

IF USING US EPA'S TANKS EMISSION ESTIMATION PROGRAM (AVAILABLE AT **www.epa.gov/tnn/tanks.html**), APPLICANT MAY ATTACH THE SUMMARY SHEETS IN LIEU OF COMPLETING SECTIONS III, IV, & V OF THIS FORM. HOWEVER, SECTIONS I, II, AND VI OF THIS FORM MUST BE COMPLETED. US EPA'S AP-42, SECTION 7.1, "ORGANIC LIQUID STORAGE TANKS," MAY ALSO BE USED TO ESTIMATE VOC AND HAP EMISSIONS (**http://www.epa.gov/tnn/chief/**).

I. GENERAL INFORMATION (required)

1. Bulk S	2. Tank Name **Thermal Oil Expansion Tank - IMF**
3. Tank Equipment Identification No. (as assigned on *Equipment List Form*) **TK-TO4**	4. Emission Point Identification No. (as assigned on *Equipment List Form*) **TK-TO4**
5. Date of Commencement of Construction (for existing tanks) **NA**	
6. Type of change ☒ New Construction ☐ New Stored Material ☐ Other Tank Modification	
7. Description of Tank Modification (if applicable) **NA**	
7A. Does the tank have more than one mode of operation? (e.g. Is there more than one product stored in the tank?) ☐ Yes ☒ No	
7B. If YES, explain and identify which mode is covered by this application (Note: A separate form must be completed for each mode). **NA**	
7C. Provide any limitations on source operation affecting emissions, any work practice standards (e.g. production variation, etc.): **NA**	

II. TANK INFORMATION (required) - See Attached EPA TANKs Report for the following information

8. Design Capacity (specify barrels or gallons). Use the internal cross-sectional area multiplied by internal height.	
9A. Tank Internal Diameter (ft)	9B. Tank Internal Height (or Length) (ft)
10A. Maximum Liquid Height (ft)	10B. Average Liquid Height (ft)
11A. Maximum Vapor Space Height (ft)	11B. Average Vapor Space Height (ft)
12. Nominal Capacity (specify barrels or gallons). This is also known as "working volume" and considers design liquid levels and overflow valve heights.	

13A. Maximum annual throughput (gal/yr)	13B. Maximum daily throughput (gal/day)
14. Number of Turnovers per year (annual net throughput/maximum tank liquid volume)	
15. Maximum tank fill rate (gal/min)	
16. Tank fill method ☐ Submerged ☐ Splash ☐ Bottom Loading	
17. Complete 17A and 17B for Variable Vapor Space Tank Systems ☐ Does Not Apply	
17A. Volume Expansion Capacity of System (gal)	17B. Number of transfers into system per year

18. Type of tank (check all that apply):

☐ Fixed Roof ___ vertical ___ horizontal ___ flat roof ___ cone roof ___ dome roof ___ other (describe)

☐ External Floating Roof ___ pontoon roof ___ double deck roof

☐ Domed External (or Covered) Floating Roof

☐ Internal Floating Roof ___ vertical column support ___ self-supporting

☐ Variable Vapor Space ___ lifter roof ___ diaphragm

☐ Pressurized ___ spherical ___ cylindrical

☐ Underground

☐ Other (describe)

Attachment L
EMISSIONS UNIT DATA SHEET
STORAGE TANKS

Provide the following information for each new or modified bulk liquid storage tank as shown on the *Equipment List Form* and other parts of this application. A tank is considered modified if the material to be stored in the tank is different from the existing stored liquid.

IF USING US EPA'S TANKS EMISSION ESTIMATION PROGRAM (AVAILABLE AT www.epa.gov/tnn/tanks.html), APPLICANT MAY ATTACH THE SUMMARY SHEETS IN LIEU OF COMPLETING SECTIONS III, IV, & V OF THIS FORM. HOWEVER, SECTIONS I, II, AND VI OF THIS FORM MUST BE COMPLETED. US EPA'S AP-42, SECTION 7.1, "ORGANIC LIQUID STORAGE TANKS," MAY ALSO BE USED TO ESTIMATE VOC AND HAP EMISSIONS (http://www.epa.gov/tnn/chief/).

I. GENERAL INFORMATION (required)

1. Bulk Storage Area Name	2. Tank Name **Used Oil Tank**
3. Tank Equipment Identification No. (as assigned on *Equipment List Form*) **TK-UO**	4. Emission Point Identification No. (as assigned on *Equipment List Form*) **TK-UO**
5. Date of Commencement of Construction (for existing tanks) **NA**	
6. Type of change ☒ New Construction ☐ New Stored Material ☐ Other Tank Modification	
7. Description of Tank Modification (if applicable) **NA**	
7A. Does the tank have more than one mode of operation? ☐ Yes ☒ No (e.g. Is there more than one product stored in the tank?)	
7B. If YES, explain and identify which mode is covered by this application (Note: A separate form must be completed for each mode). **NA**	
7C. Provide any limitations on source operation affecting emissions, any work practice standards (e.g. production variation, etc.): **NA**	

II. TANK INFORMATION (required) - See Attached EPA TANKs Report for the following information

8. Design Capacity (specify barrels or gallons). Use the internal cross-sectional area multiplied by internal height.	
9A. Tank Internal Diameter (ft)	9B. Tank Internal Height (or Length) (ft)
10A. Maximum Liquid Height (ft)	10B. Average Liquid Height (ft)
11A. Maximum Vapor Space Height (ft)	11B. Average Vapor Space Height (ft)
12. Nominal Capacity (specify barrels or gallons). This is also known as "working volume" and considers design liquid levels and overflow valve heights.	

13A. Maximum annual throughput (gal/yr)	13B. Maximum daily throughput (gal/day)
14. Number of Turnovers per year (annual net throughput/maximum tank liquid volume)	
15. Maximum tank fill rate (gal/min)	
16. Tank fill method ☐ Submerged ☐ Splash ☐ Bottom Loading	
17. Complete 17A and 17B for Variable Vapor Space Tank Systems ☐ Does Not Apply	
17A. Volume Expansion Capacity of System (gal)	17B. Number of transfers into system per year

18. Type of tank (check all that apply):

☐ Fixed Roof ___ vertical ___ horizontal ___ flat roof ___ cone roof ___ dome roof ___ other (describe)

☐ External Floating Roof ___ pontoon roof ___ double deck roof

☐ Domed External (or Covered) Floating Roof

☐ Internal Floating Roof ___ vertical column support ___ self-supporting

☐ Variable Vapor Space ___ lifter roof ___ diaphragm

☐ Pressurized ___ spherical ___ cylindrical

☐ Underground

☐ Other (describe)

Attachment L
EMISSIONS UNIT DATA SHEET
STORAGE TANKS

Provide the following information for each new or modified bulk liquid storage tank as shown on the *Equipment List Form* and other parts of this application. A tank is considered modified if the material to be stored in the tank is different from the existing stored liquid.

IF USING US EPA'S TANKS EMISSION ESTIMATION PROGRAM (AVAILABLE AT www.epa.gov/tnn/tanks.html), APPLICANT MAY ATTACH THE SUMMARY SHEETS IN LIEU OF COMPLETING SECTIONS III, IV, & V OF THIS FORM. HOWEVER, SECTIONS I, II, AND VI OF THIS FORM MUST BE COMPLETED. US EPA'S AP-42, SECTION 7.1, "ORGANIC LIQUID STORAGE TANKS," MAY ALSO BE USED TO ESTIMATE VOC AND HAP EMISSIONS (http://www.epa.gov/tnn/chief/).

I. GENERAL INFORMATION (required)

1. Bulk Storage Area Name	2. Tank Name **Paint Dilution Tank**
3. Tank Equipment Identification No. (as assigned on *Equipment List Form*) **TK-PD**	4. Emission Point Identification No. (as assigned on *Equipment List Form*) **TK-PD**
5. Date of Commencement of Construction (for existing tanks) **NA**	
6. Type of change ☒ New Construction ☐ New Stored Material ☐ Other Tank Modification	
7. Description of Tank Modification (if applicable) **NA**	
7A. Does the tank have more than one mode of operation? (e.g. Is there more than one product stored in the tank?) ☐ Yes ☒ No	
7B. If YES, explain and identify which mode is covered by this application (Note: A separate form must be completed for each mode). **NA**	
7C. Provide any limitations on source operation affecting emissions, any work practice standards (e.g. production variation, etc.): **NA**	

II. TANK INFORMATION (required)

8. Design Capacity (specify barrels or gallons). Use the internal cross-sectional area multiplied by internal height. **793 gal**	
9A. Tank Internal Diameter (ft) **4.0**	9B. Tank Internal Height (or Length) (ft) **8.6**
10A. Maximum Liquid Height (ft) **8.0**	10B. Average Liquid Height (ft) **4.3**
11A. Maximum Vapor Space Height (ft) **8.6**	11B. Average Vapor Space Height (ft) **4.3**
12. Nominal Capacity (specify barrels or gallons). This is also known as "working volume" and considers design liquid levels and overflow valve heights. **793 gal**	

13A. Maximum annual throughput (gal/yr) **Claimed Confidential**	13B. Maximum daily throughput (gal/day) **Claimed Confidential**
14. Number of Turnovers per year (annual net throughput/maximum tank liquid volume) **Claimed Confidential**	
15. Maximum tank fill rate (gal/min) **Claimed Confidential**	
16. Tank fill method ☐ Submerged ☒ Splash ☐ Bottom Loading	
17. Complete 17A and 17B for Variable Vapor Space Tank Systems ☐ Does Not Apply	
17A. Volume Expansion Capacity of System (gal)	17B. Number of transfers into system per year

18. Type of tank (check all that apply):

☒ Fixed Roof ___ vertical ___ horizontal X flat roof ___ cone roof ___ dome roof ___ other (describe)

☐ External Floating Roof ___ pontoon roof ___ double deck roof

☐ Domed External (or Covered) Floating Roof

☐ Internal Floating Roof ___ vertical column support ___ self-supporting

☐ Variable Vapor Space ___ lifter roof ___ diaphragm

☐ Pressurized ___ spherical ___ cylindrical

☐ Underground

☐ Other (describe)

III. TANK CONSTRUCTION & OPERATION INFORMATION (optional if providing TANKS Summary Sheets)

19. Tank Shell Construction: ☒ Riveted ☐ Gunite lined ☐ Epoxy-coated rivets ☐ Other (describe)		
20A. Shell Color	20B. Roof Color	20C. Year Last Painted
21. Shell Condition (if metal and unlined): ☒ No Rust ☐ Light Rust ☐ Dense Rust ☐ Not applicable		
22A. Is the tank heated? ☐ YES ☒ NO		
22B. If YES, provide the operating temperature (°F)		
22C. If YES, please describe how heat is provided to tank.		
23. Operating Pressure Range (psig): **0** to **0**		
24. Complete the following section for **Vertical Fixed Roof Tanks** ☒ Does Not Apply		
24A. For dome roof, provide roof radius (ft)		
24B. For cone roof, provide slope (ft/ft)		
25. Complete the following section for **Floating Roof Tanks** ☒ Does Not Apply		
25A. Year Internal Floaters Installed:		
25B. Primary Seal Type: (check one) ☐ Metallic (Mechanical) Shoe Seal ☐ Liquid Mounted Resilient Seal ☐ Vapor Mounted Resilient Seal ☐ Other (describe):		
25C. Is the Floating Roof equipped with a Secondary Seal? ☐ YES ☐ NO		
25D. If YES, how is the secondary seal mounted? (check one) ☐ Shoe ☐ Rim ☐ Other (describe):		
25E. Is the Floating Roof equipped with a weather shield? ☐ YES ☐ NO		

25F. Describe deck fittings; indicate the number of each type of fitting:		
ACCESS HATCH		
BOLT COVER, GASKETED:	UNBOLTED COVER, GASKETED:	UNBOLTED COVER, UNGASKETED:
AUTOMATIC GAUGE FLOAT WELL		
BOLT COVER, GASKETED:	UNBOLTED COVER, GASKETED:	UNBOLTED COVER, UNGASKETED:
COLUMN WELL		
BUILT-UP COLUMN – SLIDING COVER, GASKETED:	BUILT-UP COLUMN – SLIDING COVER, UNGASKETED:	PIPE COLUMN – FLEXIBLE FABRIC SLEEVE SEAL:
LADDER WELL		
PIP COLUMN – SLIDING COVER, GASKETED:	PIPE COLUMN – SLIDING COVER, UNGASKETED:	
GAUGE-HATCH/SAMPLE PORT		
SLIDING COVER, GASKETED:	SLIDING COVER, UNGASKETED:	
ROOF LEG OR HANGER WELL		
WEIGHTED MECHANICAL ACTUATION, GASKETED:	WEIGHTED MECHANICAL ACTUATION, UNGASKETED:	SAMPLE WELL-SLIT FABRIC SEAL (10% OPEN AREA)
VACUUM BREAKER		
WEIGHTED MECHANICAL ACTUATION, GASKETED:	WEIGHTED MECHANICAL ACTUATION, UNGASKETED:	
RIM VENT		
WEIGHTED MECHANICAL ACTUATION GASKETED:	WEIGHTED MECHANICAL ACTUATION, UNGASKETED:	
DECK DRAIN (3-INCH DIAMETER)		
OPEN:	90% CLOSED:	
STUB DRAIN		
1-INCH DIAMETER:		
OTHER (DESCRIBE, ATTACH ADDITIONAL PAGES IF NECESSARY)		

26. Complete the following section for Internal Floating Roof Tanks	☒ Does Not Apply
26A. Deck Type: ☐ Bolted ☐ Welded	
26B. For Bolted decks, provide deck construction:	
26C. Deck seam: ☐ Continuous sheet construction 5 feet wide ☐ Continuous sheet construction 6 feet wide ☐ Continuous sheet construction 7 feet wide ☐ Continuous sheet construction 5 × 7.5 feet wide ☐ Continuous sheet construction 5 × 12 feet wide ☐ Other (describe)	
26D. Deck seam length (ft)	26E. Area of deck (ft^2)
For column supported tanks: 26F. Number of columns:	26G. Diameter of each column:

IV. SITE INFORMANTION (optional if providing TANKS Summary Sheets)

27. Provide the city and state on which the data in this section are based. **Harrisburg, Pennsylvania**
28. Daily Average Ambient Temperature (°F) **52.83**
29. Annual Average Maximum Temperature (°F) **62.08**
30. Annual Average Minimum Temperature (°F) **43.59**
31. Average Wind Speed (miles/hr) **7.66**
32. Annual Average Solar Insulation Factor (BTU/(ft^2·day)) **1,247.82**
33. Atmospheric Pressure (psia) **14.57**

V. LIQUID INFORMATION (optional if providing TANKS Summary Sheets)

34. Average daily temperature range of bulk liquid: **49.71 - 59.33**	
34A. Minimum (°F) **49.71**	34B. Maximum (°F) **59.33**
35. Average operating pressure range of tank: **0 - 0**	
35A. Minimum (psig) **0**	35B. Maximum (psig) **0**
36A. Minimum Liquid Surface Temperature (°F) **49.71**	36B. Corresponding Vapor Pressure (psia) **0.18**
37A. Average Liquid Surface Temperature (°F) **54.52**	37B. Corresponding Vapor Pressure (psia) **0.21**
38A. Maximum Liquid Surface Temperature (°F) **59.33**	38B. Corresponding Vapor Pressure (psia) **0.26**

39. Provide the following for each liquid or gas to be stored in tank. Add additional pages if necessary.			
39A. Material Name or Composition	**VOC**		
39B. CAS Number			
39C. Liquid Density (lb/gal)			
39D. Liquid Molecular Weight (lb/lb-mole)			
39E. Vapor Molecular Weight (lb/lb-mole)			

Maximum Vapor Pressure 39F. True (psia) 39G. Reid (psia)			
Months Storage per Year 39H. From 39I. To			

VI. EMISSIONS AND CONTROL DEVICE DATA (required)

40. Emission Control Devices (check as many as apply): ☒ Does Not Apply

- ☐ Carbon Adsorption[1]
- ☐ Condenser[1]
- ☐ Conservation Vent (psig)
  Vacuum Setting Pressure Setting
- ☐ Emergency Relief Valve (psig)
- ☐ Inert Gas Blanket of
- ☐ Insulation of Tank with
- ☐ Liquid Absorption (scrubber)[1]
- ☐ Refrigeration of Tank
- ☐ Rupture Disc (psig)
- ☐ Vent to Incinerator[1]
- ☐ Other[1] (describe):

[1] Complete appropriate Air Pollution Control Device Sheet.

41. Expected Emission Rate (submit Test Data or Calculations here or elsewhere in the application).

Material Name & CAS No.	Breathing Loss (lb/hr)	Working Loss		Annual Loss (lb/yr)	Estimation Method[1]
		Amount	Units		
VOC	-	-	-	60	

[1] EPA = EPA Emission Factor, MB = Material Balance, SS = Similar Source, ST = Similar Source Test, Throughput Data, O = Other (specify)

☐ Remember to attach emissions calculations, including TANKS Summary Sheets if applicable.

Attachment L
EMISSIONS UNIT DATA SHEET
STORAGE TANKS

Provide the following information for each new or modified bulk liquid storage tank as shown on the *Equipment List Form* and other parts of this application. A tank is considered modified if the material to be stored in the tank is different from the existing stored liquid.

IF USING US EPA'S TANKS EMISSION ESTIMATION PROGRAM (AVAILABLE AT www.epa.gov/tnn/tanks.html), APPLICANT MAY ATTACH THE SUMMARY SHEETS IN LIEU OF COMPLETING SECTIONS III, IV, & V OF THIS FORM. HOWEVER, SECTIONS I, II, AND VI OF THIS FORM MUST BE COMPLETED. US EPA'S AP-42, SECTION 7.1, "ORGANIC LIQUID STORAGE TANKS," MAY ALSO BE USED TO ESTIMATE VOC AND HAP EMISSIONS (http://www.epa.gov/tnn/chief/).

I. GENERAL INFORMATION (required)

1. Bulk Storage Area Name	2. Tank Name **Paint Dilution Day Tank**
3. Tank Equipment Identification No. (as assigned on *Equipment List Form*) **TK-PDD**	4. Emission Point Identification No. (as assigned on *Equipment List Form*) **TK-PDD**
5. Date of Commencement of Construction (for existing tanks) **NA**	
6. Type of change ☒ New Construction ☐ New Stored Material ☐ Other Tank Modification	
7. Description of Tank Modification (if applicable) **NA**	
7A. Does the tank have more than one mode of operation? ☐ Yes ☒ No (e.g. Is there more than one product stored in the tank?)	
7B. If YES, explain and identify which mode is covered by this application (Note: A separate form must be completed for each mode). **NA**	
7C. Provide any limitations on source operation affecting emissions, any work practice standards (e.g. production variation, etc.): **NA**	

II. TANK INFORMATION (required)

8. Design Capacity (specify barrels or gallons). Use the internal cross-sectional area multiplied by internal height. **397 gal**	
9A. Tank Internal Diameter (ft) **4.2**	9B. Tank Internal Height (or Length) (ft) **5.0**
10A. Maximum Liquid Height (ft) **4.5**	10B. Average Liquid Height (ft) **2.5**
11A. Maximum Vapor Space Height (ft) **5.0**	11B. Average Vapor Space Height (ft) **2.5**
12. Nominal Capacity (specify barrels or gallons). This is also known as "working volume" and considers design liquid levels and overflow valve heights. **397 gal**	

13A. Maximum annual throughput (gal/yr) **Claimed Confidential**	13B. Maximum daily throughput (gal/day) **Claimed Confidential**
14. Number of Turnovers per year (annual net throughput/maximum tank liquid volume) **Claimed Confidential**	
15. Maximum tank fill rate (gal/min) **Claimed Confidential**	
16. Tank fill method ☐ Submerged ☒ Splash ☐ Bottom Loading	
17. Complete 17A and 17B for Variable Vapor Space Tank Systems ☒ Does Not Apply	
17A. Volume Expansion Capacity of System (gal)	17B. Number of transfers into system per year

18. Type of tank (check all that apply):

☒ Fixed Roof ___ vertical ___ horizontal X flat roof ___ cone roof ___ dome roof ___ other (describe)

☐ External Floating Roof ___ pontoon roof ___ double deck roof

☐ Domed External (or Covered) Floating Roof

☐ Internal Floating Roof ___ vertical column support ___ self-supporting

☐ Variable Vapor Space ___ lifter roof ___ diaphragm

☐ Pressurized ___ spherical ___ cylindrical

☐ Underground

☐ Other (describe)

III. TANK CONSTRUCTION & OPERATION INFORMATION (optional if providing TANKS Summary Sheets)

19. Tank Shell Construction: ☒ Riveted ☐ Gunite lined ☐ Epoxy-coated rivets ☐ Other (describe)		
20A. Shell Color	20B. Roof Color	20C. Year Last Painted
21. Shell Condition (if metal and unlined): ☒ No Rust ☐ Light Rust ☐ Dense Rust ☐ Not applicable		
22A. Is the tank heated? ☐ YES ☒ NO		
22B. If YES, provide the operating temperature (°F)		
22C. If YES, please describe how heat is provided to tank.		
23. Operating Pressure Range (psig): **0** to **0**		
24. Complete the following section for **Vertical Fixed Roof Tanks** ☒ Does Not Apply		
24A. For dome roof, provide roof radius (ft)		
24B. For cone roof, provide slope (ft/ft)		
25. Complete the following section for **Floating Roof Tanks** ☒ Does Not Apply		
25A. Year Internal Floaters Installed:		
25B. Primary Seal Type: (check one) ☐ Metallic (Mechanical) Shoe Seal ☐ Liquid Mounted Resilient Seal ☐ Vapor Mounted Resilient Seal ☐ Other (describe):		
25C. Is the Floating Roof equipped with a Secondary Seal? ☐ YES ☐ NO		
25D. If YES, how is the secondary seal mounted? (check one) ☐ Shoe ☐ Rim ☐ Other (describe):		
25E. Is the Floating Roof equipped with a weather shield? ☐ YES ☐ NO		

25F. Describe deck fittings; indicate the number of each type of fitting:		
ACCESS HATCH		
BOLT COVER, GASKETED:	UNBOLTED COVER, GASKETED:	UNBOLTED COVER, UNGASKETED:
AUTOMATIC GAUGE FLOAT WELL		
BOLT COVER, GASKETED:	UNBOLTED COVER, GASKETED:	UNBOLTED COVER, UNGASKETED:
COLUMN WELL		
BUILT-UP COLUMN – SLIDING COVER, GASKETED:	BUILT-UP COLUMN – SLIDING COVER, UNGASKETED:	PIPE COLUMN – FLEXIBLE FABRIC SLEEVE SEAL:
LADDER WELL		
PIP COLUMN – SLIDING COVER, GASKETED:	PIPE COLUMN – SLIDING COVER, UNGASKETED:	
GAUGE-HATCH/SAMPLE PORT		
SLIDING COVER, GASKETED:	SLIDING COVER, UNGASKETED:	
ROOF LEG OR HANGER WELL		
WEIGHTED MECHANICAL ACTUATION, GASKETED:	WEIGHTED MECHANICAL ACTUATION, UNGASKETED:	SAMPLE WELL-SLIT FABRIC SEAL (10% OPEN AREA)
VACUUM BREAKER		
WEIGHTED MECHANICAL ACTUATION, GASKETED:	WEIGHTED MECHANICAL ACTUATION, UNGASKETED:	
RIM VENT		
WEIGHTED MECHANICAL ACTUATION GASKETED:	WEIGHTED MECHANICAL ACTUATION, UNGASKETED:	
DECK DRAIN (3-INCH DIAMETER)		
OPEN:	90% CLOSED:	
STUB DRAIN		
1-INCH DIAMETER:		
OTHER (DESCRIBE, ATTACH ADDITIONAL PAGES IF NECESSARY)		

26. Complete the following section for Internal Floating Roof Tanks	☒ Does Not Apply
26A. Deck Type: ☐ Bolted ☐ Welded	
26B. For Bolted decks, provide deck construction:	
26C. Deck seam: ☐ Continuous sheet construction 5 feet wide ☐ Continuous sheet construction 6 feet wide ☐ Continuous sheet construction 7 feet wide ☐ Continuous sheet construction 5 × 7.5 feet wide ☐ Continuous sheet construction 5 × 12 feet wide ☐ Other (describe)	
26D. Deck seam length (ft)	26E. Area of deck (ft^2)
For column supported tanks: 26F. Number of columns:	26G. Diameter of each column:

IV. SITE INFORMANTION (optional if providing TANKS Summary Sheets)

27. Provide the city and state on which the data in this section are based. **Harrisburg, Pennsylvania**
28. Daily Average Ambient Temperature (°F) **52.83**
29. Annual Average Maximum Temperature (°F) **62.08**
30. Annual Average Minimum Temperature (°F) **43.59**
31. Average Wind Speed (miles/hr) **7.66**
32. Annual Average Solar Insulation Factor (BTU/(ft^2·day)) **1,247.82**
33. Atmospheric Pressure (psia) **14.57**

V. LIQUID INFORMATION (optional if providing TANKS Summary Sheets)

34. Average daily temperature range of bulk liquid: **49.71 - 59.33**	
34A. Minimum (°F) **49.71**	34B. Maximum (°F) **59.33**
35. Average operating pressure range of tank: **0 - 0**	
35A. Minimum (psig) **0**	35B. Maximum (psig) **0**
36A. Minimum Liquid Surface Temperature (°F) **49.71**	36B. Corresponding Vapor Pressure (psia) **0.18**
37A. Average Liquid Surface Temperature (°F) **54.52**	37B. Corresponding Vapor Pressure (psia) **0.21**
38A. Maximum Liquid Surface Temperature (°F) **59.33**	38B. Corresponding Vapor Pressure (psia) **0.26**

39. Provide the following for each liquid or gas to be stored in tank. Add additional pages if necessary.

39A. Material Name or Composition	**VOC**		
39B. CAS Number			
39C. Liquid Density (lb/gal)			
39D. Liquid Molecular Weight (lb/lb-mole)			
39E. Vapor Molecular Weight (lb/lb-mole)			

Maximum Vapor Pressure 39F. True (psia) 39G. Reid (psia)			
Months Storage per Year 39H. From 39I. To			

VI. EMISSIONS AND CONTROL DEVICE DATA (required)

40. Emission Control Devices (check as many as apply): ☒ Does Not Apply

- ☐ Carbon Adsorption[1]
- ☐ Condenser[1]
- ☐ Conservation Vent (psig)
  Vacuum Setting   Pressure Setting
- ☐ Emergency Relief Valve (psig)
- ☐ Inert Gas Blanket of
- ☐ Insulation of Tank with
- ☐ Liquid Absorption (scrubber)[1]
- ☐ Refrigeration of Tank
- ☐ Rupture Disc (psig)
- ☐ Vent to Incinerator[1]
- ☐ Other[1] (describe):

[1] Complete appropriate Air Pollution Control Device Sheet.

41. Expected Emission Rate (submit Test Data or Calculations here or elsewhere in the application).

Material Name & CAS No.	Breathing Loss (lb/hr)	Working Loss		Annual Loss (lb/yr)	Estimation Method[1]
		Amount	Units		
VOC	-	-	-	60	

[1] EPA = EPA Emission Factor, MB = Material Balance, SS = Similar Source, ST = Similar Source Test, Throughput Data, O = Other (specify)

☐ Remember to attach emissions calculations, including TANKS Summary Sheets if applicable.

TANKS 4.0.9d
Emissions Report - Summary Format
Tank Indentification and Physical Characteristics

Identification		
User Identification:	TK-AD Additive Storage Tank	
City:	Ranson	
State:	West Virginia	
Company:	Roxul USA Inc.	
Type of Tank:	Vertical Fixed Roof Tank	
Description:	Additive Vertical Storage Tank	
Tank Dimensions		
Shell Height (ft):		5.00
Diameter (ft):		3.00
Liquid Height (ft) :		1.00
Avg. Liquid Height (ft):		1.00
Volume (gallons):		53.00
Turnovers:		
Net Throughput(gal/yr):		
Is Tank Heated (y/n):	N	
Paint Characteristics		
Shell Color/Shade:	White/White	
Shell Condition	Good	
Roof Color/Shade:	White/White	
Roof Condition:	Good	
Roof Characteristics		
Type:	Cone	
Height (ft)		1.00
Slope (ft/ft) (Cone Roof)		0.67
Breather Vent Settings		
Vacuum Settings (psig):		-0.03
Pressure Settings (psig)		0.03

Meterological Data used in Emissions Calculations: Harrisburg, Pennsylvania (Avg Atmospheric Pressure = 14.57 psia)

TANKS 4.0.9d
Emissions Report - Summary Format
Liquid Contents of Storage Tank

TK-AD Additive Storage Tank - Vertical Fixed Roof Tank
Ranson , West Virginia

Mixture/Component	Month	Daily Liquid Surf. Temperature (deg F) Avg.	Min.	Max.	Liquid Bulk Temp (deg F)	Vapor Pressure (psia) Avg.	Min.	Max.	Vapor Mol. Weight.	Liquid Mass Fract.	Vapor Mass Fract.	Mol. Weight	Basis for Vapor Pressure Calculations
Coupling Agent	All	54.52	49.71	59.33	52.85	0.2138	0.1780	0.2555	19.4545			18.58	
						0.5438	0.4583	0.6428	46.0700			46.07	Option 2: A=8.321, B=1718.21, C=237.52
Water						0.2070	0.1723	0.2475	18.0153			18.02	Option 2: A=7.5294, B=1435.264, C=208.302

TANKS 4.0.9d
Emissions Report - Summary Format
Individual Tank Emission Totals

Emissions Report for: Annual

TK-AD Additive Storage Tank - Vertical Fixed Roof Tank
Ranson , West Virginia

	Losses(lbs)		
Components	Working Loss	Breathing Loss	Total Emissions
Coupling Agent	0.44	0.31	0.75
Water	0.39	0.27	0.66
	0.05	0.04	0.09

TANKS 4.0.9d
Emissions Report - Summary Format
Tank Indentification and Physical Characteristics

Identification		
User Identification:	TK-BC Binder Circulating Tank	
City:	Ranson	
State:	West Virginia	
Company:	Roxul USA Inc.	
Type of Tank:	Vertical Fixed Roof Tank	
Description:	Vertical Binder Circulating Tank	
Tank Dimensions		
Shell Height (ft):		10.00
Diameter (ft):		8.50
Liquid Height (ft) :		9.18
Avg. Liquid Height (ft):		9.18
Volume (gallons):		4,227.00
Turnovers:		
Net Throughput(gal/yr):		
Is Tank Heated (y/n):	N	
Paint Characteristics		
Shell Color/Shade:	White/White	
Shell Condition	Good	
Roof Color/Shade:	White/White	
Roof Condition:	Good	
Roof Characteristics		
Type:	Cone	
Height (ft)		1.00
Slope (ft/ft) (Cone Roof)		0.25
Breather Vent Settings		
Vacuum Settings (psig):		-0.03
Pressure Settings (psig)		0.03

Meterological Data used in Emissions Calculations: Harrisburg, Pennsylvania (Avg Atmospheric Pressure = 14.57 psia)

TANKS 4.0.9d
Emissions Report - Summary Format
Liquid Contents of Storage Tank

TK-BC Binder Circulating Tank - Vertical Fixed Roof Tank
Ranson , West Virginia

Mixture/Component	Month	Daily Liquid Surf. Temperature (deg F) Avg.	Min.	Max.	Liquid Bulk Temp (deg F)	Vapor Pressure (psia) Avg.	Min.	Max.	Vapor Mol. Weight.	Liquid Mass Fract.	Vapor Mass Fract.	Mol. Weight	Basis for Vapor Pressure Calculations
Binder	All	54.52	49.71	59.33	52.85	0.2389	0.2014	0.2824	19.6324			18.04	
						0.5438	0.4583	0.6428	46.0700			46.07	Option 2: A=8.321, B=1718.21, C=237.52
Formaldehyde						49.4375	45.1312	54.0526	30.0300			30.03	Option 2: A=7.15686, B=959.43, C=243.392
Methanol						1.2429	1.0647	1.4461	32.0400			32.04	Option 2: A=8.07919, B=1581.341, C=239.65
Phenol						0.0021	0.0016	0.0027	94.1112			94.11	Option 2: A=7.12198, B=1509.677, C=174.201
Water						0.2070	0.1723	0.2475	18.0153			18.02	Option 2: A=7.5294, B=1435.264, C=208.302

TANKS 4.0.9d
Emissions Report - Summary Format
Individual Tank Emission Totals

Emissions Report for: Annual

TK-BC Binder Circulating Tank - Vertical Fixed Roof Tank
Ranson , West Virginia

	Losses(lbs)		
Components	Working Loss	Breathing Loss	Total Emissions
Binder	132.14	0.78	132.92
Formaldehyde	27.02	0.16	27.18
Methanol	0.16	0.00	0.17
Water	104.95	0.62	105.57
Phenol	0.00	0.00	0.00
	0.00	0.00	0.00

TANKS 4.0.9d
Emissions Report - Summary Format
Tank Indentification and Physical Characteristics

Identification		
User Identification:	TK-BD Binder Day Tank	
City:	Ranson	
State:	West Virginia	
Company:	Roxul USA Inc.	
Type of Tank:	Vertical Fixed Roof Tank	
Description:	Binder Vertical Day Tank	
Tank Dimensions		
Shell Height (ft):		6.20
Diameter (ft):		4.70
Liquid Height (ft) :		6.11
Avg. Liquid Height (ft):		6.11
Volume (gallons):		793.00
Turnovers:		
Net Throughput(gal/yr):		
Is Tank Heated (y/n):	N	
Paint Characteristics		
Shell Color/Shade:	White/White	
Shell Condition	Good	
Roof Color/Shade:	White/White	
Roof Condition:	Good	
Roof Characteristics		
Type:	Cone	
Height (ft)		1.00
Slope (ft/ft) (Cone Roof)		0.43
Breather Vent Settings		
Vacuum Settings (psig):		-0.03
Pressure Settings (psig)		0.03

Meterological Data used in Emissions Calculations: Harrisburg, Pennsylvania (Avg Atmospheric Pressure = 14.57 psia)

TANKS 4.0.9d
Emissions Report - Summary Format
Liquid Contents of Storage Tank

TK-BD Binder Day Tank - Vertical Fixed Roof Tank
Ranson, West Virginia

Mixture/Component	Month	Daily Liquid Surf. Temperature (deg F) Avg.	Min.	Max.	Liquid Bulk Temp (deg F)	Vapor Pressure (psia) Avg.	Min.	Max.	Vapor Mol. Weight.	Liquid Mass Fract.	Vapor Mass Fract.	Mol. Weight	Basis for Vapor Pressure Calculations
Binder	All	54.52	49.71	59.33	52.85	0.2389	0.2014	0.2824	19.6324			18.04	
						0.5438	0.4583	0.6428	46.0700			46.07	Option 2: A=8.321, B=1718.21, C=237.52
Formaldehyde						49.4375	45.1312	54.0526	30.0300			30.03	Option 2: A=7.15686, B=959.43, C=243.392
Methanol						1.2429	1.0647	1.4461	32.0400			32.04	Option 2: A=8.07919, B=1581.341, C=239.65
Phenol						0.0021	0.0016	0.0027	94.1112			94.11	Option 2: A=7.12198, B=1509.677, C=174.201
Water						0.2070	0.1723	0.2475	18.0153			18.02	Option 2: A=7.5294, B=1435.264, C=208.302

TANKS 4.0.9d
Emissions Report - Summary Format
Individual Tank Emission Totals

Emissions Report for: Annual

TK-BD Binder Day Tank - Vertical Fixed Roof Tank
Ranson, West Virginia

	Losses(lbs)		
Components	Working Loss	Breathing Loss	Total Emissions
Binder	120.64	0.09	120.73
Formaldehyde	24.67	0.02	24.69
Methanol	0.15	0.00	0.15
Water	95.82	0.07	95.89
Phenol	0.00	0.00	0.00
	0.00	0.00	0.00

TANKS 4.0.9d
Emissions Report - Summary Format
Tank Indentification and Physical Characteristics

Identification		
User Identification:	TK-BM Binder Mix Tank	
City:	Ranson	
State:	West Virginia	
Company:	Roxul USA Inc.	
Type of Tank:	Vertical Fixed Roof Tank	
Description:	Vertical Binder Mix Tank	
Tank Dimensions		
Shell Height (ft):		10.50
Diameter (ft):		6.60
Liquid Height (ft) :		10.00
Avg. Liquid Height (ft):		10.00
Volume (gallons):		2,642.00
Turnovers:		
Net Throughput(gal/yr):		
Is Tank Heated (y/n):	N	
Paint Characteristics		
Shell Color/Shade:	White/White	
Shell Condition	Good	
Roof Color/Shade:	White/White	
Roof Condition:	Good	
Roof Characteristics		
Type:	Cone	
Height (ft)		1.00
Slope (ft/ft) (Cone Roof)		0.43
Breather Vent Settings		
Vacuum Settings (psig):		-0.03
Pressure Settings (psig)		0.03

Meterological Data used in Emissions Calculations: Harrisburg, Pennsylvania (Avg Atmospheric Pressure = 14.57 psia)

TANKS 4.0.9d
Emissions Report - Summary Format
Liquid Contents of Storage Tank

TK-BM Binder Mix Tank - Vertical Fixed Roof Tank
Ranson , West Virginia

Mixture/Component	Month	Daily Liquid Surf. Temperature (deg F) Avg.	Min.	Max.	Liquid Bulk Temp (deg F)	Vapor Pressure (psia) Avg.	Min.	Max.	Vapor Mol. Weight.	Liquid Mass Fract.	Vapor Mass Fract.	Mol. Weight	Basis for Vapor Pressure Calculations
Binder	All	54.52	49.71	59.33	52.85	0.2389	0.2014	0.2824	19.6324			18.04	
						0.5438	0.4583	0.6428	46.0700			46.07	Option 2: A=8.321, B=1718.21, C=237.52
Formaldehyde						49.4375	45.1312	54.0526	30.0300			30.03	Option 2: A=7.15686, B=959.43, C=243.392
Methanol						1.2429	1.0647	1.4461	32.0400			32.04	Option 2: A=8.07919, B=1581.341, C=239.65
Phenol						0.0021	0.0016	0.0027	94.1112			94.11	Option 2: A=7.12198, B=1509.677, C=174.201
Water						0.2070	0.1723	0.2475	18.0153			18.02	Option 2: A=7.5294, B=1435.264, C=208.302

TANKS 4.0.9d
Emissions Report - Summary Format
Individual Tank Emission Totals

Emissions Report for: Annual

TK-BM Binder Mix Tank - Vertical Fixed Roof Tank
Ranson , West Virginia

	Losses(lbs)		
Components	Working Loss	Breathing Loss	Total Emissions
Binder	126.83	0.34	127.17
Formaldehyde	25.94	0.07	26.01
Methanol	0.16	0.00	0.16
Water	100.74	0.27	101.01
Phenol	0.00	0.00	0.00
	0.00	0.00	0.00

TANKS 4.0.9d
Emissions Report - Summary Format
Tank Indentification and Physical Characteristics

Identification	
User Identification:	TK-BS(1-3) Binder Storage Container
City:	Ranson
State:	West Virginia
Company:	Roxul USA Inc.
Type of Tank:	Vertical Fixed Roof Tank
Description:	Binder Storage Container
Tank Dimensions	
Shell Height (ft):	7.80
Diameter (ft):	3.60
Liquid Height (ft) :	3.47
Avg. Liquid Height (ft):	3.47
Volume (gallons):	264.00
Turnovers:	
Net Throughput(gal/yr):	
Is Tank Heated (y/n):	N
Paint Characteristics	
Shell Color/Shade:	White/White
Shell Condition	Good
Roof Color/Shade:	White/White
Roof Condition:	Good
Roof Characteristics	
Type:	Dome
Height (ft)	0.00
Radius (ft) (Dome Roof)	0.00
Breather Vent Settings	
Vacuum Settings (psig):	-0.03
Pressure Settings (psig)	0.03

Meterological Data used in Emissions Calculations: Harrisburg, Pennsylvania (Avg Atmospheric Pressure = 14.57 psia)

TANKS 4.0.9d
Emissions Report - Summary Format
Liquid Contents of Storage Tank

TK-BS(1-3) Binder Storage Container - Vertical Fixed Roof Tank
Ranson , West Virginia

Mixture/Component	Month	Daily Liquid Surf. Temperature (deg F) Avg.	Min.	Max.	Liquid Bulk Temp (deg F)	Vapor Pressure (psia) Avg.	Min.	Max.	Vapor Mol. Weight.	Liquid Mass Fract.	Vapor Mass Fract.	Mol. Weight	Basis for Vapor Pressure Calculations
Binder	All	54.52	49.71	59.33	52.85	0.2389	0.2014	0.2824	19.6324			18.04	
						0.5438	0.4583	0.6428	46.0700			46.07	Option 2: A=8.321, B=1718.21, C=237.52
Formaldehyde						49.4375	45.1312	54.0526	30.0300			30.03	Option 2: A=7.15686, B=959.43, C=243.392
Methanol						1.2429	1.0647	1.4461	32.0400			32.04	Option 2: A=8.07919, B=1581.341, C=239.65
Phenol						0.0021	0.0016	0.0027	94.1112			94.11	Option 2: A=7.12198, B=1509.677, C=174.201
Water						0.2070	0.1723	0.2475	18.0153			18.02	Option 2: A=7.5294, B=1435.264, C=208.302

TANKS 4.0.9d
Emissions Report - Summary Format
Individual Tank Emission Totals

Emissions Report for: Annual

TK-BS(1-3) Binder Storage Container - Vertical Fixed Roof Tank
Ranson , West Virginia

	Losses(lbs)		
Components	Working Loss	Breathing Loss	Total Emissions
Binder	3.31	0.53	3.84
Formaldehyde	0.68	0.11	0.79
Methanol	0.00	0.00	0.00
Phenol	0.00	0.00	0.00
Water	2.63	0.42	3.05
	0.00	0.00	0.00

TANKS 4.0.9d
Emissions Report - Summary Format
Tank Indentification and Physical Characteristics

Identification	
User Identification:	TK-CA Coupling Agent Storage Tank
City:	Ranson
State:	West Virginia
Company:	Roxul USA, Inc.
Type of Tank:	Vertical Fixed Roof Tank
Description:	Coupling Agent Vertical Storage Tank
Tank Dimensions	
Shell Height (ft):	7.80
Diameter (ft):	3.60
Liquid Height (ft) :	3.47
Avg. Liquid Height (ft):	3.47
Volume (gallons):	264.00
Turnovers:	
Net Throughput(gal/yr):	
Is Tank Heated (y/n):	N
Paint Characteristics	
Shell Color/Shade:	White/White
Shell Condition	Good
Roof Color/Shade:	White/White
Roof Condition:	Good
Roof Characteristics	
Type:	Cone
Height (ft)	1.00
Slope (ft/ft) (Cone Roof)	0.56
Breather Vent Settings	
Vacuum Settings (psig):	-0.03
Pressure Settings (psig)	0.03

Meterological Data used in Emissions Calculations: Harrisburg, Pennsylvania (Avg Atmospheric Pressure = 14.57 psia)

TANKS 4.0.9d
Emissions Report - Summary Format
Liquid Contents of Storage Tank

TK-CA Coupling Agent Storage Tank - Vertical Fixed Roof Tank
Ranson, West Virginia

Mixture/Component	Month	Daily Liquid Surf. Temperature (deg F) Avg.	Min.	Max.	Liquid Bulk Temp (deg F)	Vapor Pressure (psia) Avg.	Min.	Max.	Vapor Mol. Weight.	Liquid Mass Fract.	Vapor Mass Fract.	Mol. Weight	Basis for Vapor Pressure Calculations
Coupling Agent	All	54.52	49.71	59.33	52.85	0.2138	0.1780	0.2555	19.4545			18.58	
						0.5438	0.4583	0.6428	46.0700			46.07	Option 2: A=8.321, B=1718.21, C=237.52
Water						0.2070	0.1723	0.2475	18.0153			18.02	Option 2: A=7.5294, B=1435.264, C=208.302

TANKS 4.0.9d
Emissions Report - Summary Format
Individual Tank Emission Totals

Emissions Report for: Annual

TK-CA Coupling Agent Storage Tank - Vertical Fixed Roof Tank
Ranson, West Virginia

	Losses(lbs)		
Components	Working Loss	Breathing Loss	Total Emissions
Coupling Agent	0.42	0.48	0.90
	0.05	0.06	0.11
Water	0.37	0.42	0.79

TANKS 4.0.9d
Emissions Report - Summary Format
Tank Indentification and Physical Characteristics

Identification	
User Identification:	TK-DF Diesel Fuel Tank
City:	Ranson
State:	West Virginia
Company:	Roxul USA Inc.
Type of Tank:	Horizontal Tank
Description:	Diesel Fuel Horizontal Storage Tank
Tank Dimensions	
Shell Length (ft):	9.40
Diameter (ft):	6.90
Volume (gallons):	2,642.00
Turnovers:	
Net Throughput(gal/yr):	
Is Tank Heated (y/n):	N
Is Tank Underground (y/n):	N
Paint Characteristics	
Shell Color/Shade:	White/White
Shell Condition	Good
Breather Vent Settings	
Vacuum Settings (psig):	-0.03
Pressure Settings (psig)	0.03

Meterological Data used in Emissions Calculations: Harrisburg, Pennsylvania (Avg Atmospheric Pressure = 14.57 psia)

TANKS 4.0.9d
Emissions Report - Summary Format
Liquid Contents of Storage Tank

TK-DF Diesel Fuel Tank - Horizontal Tank
Ranson, West Virginia

Mixture/Component	Month	Daily Liquid Surf. Temperature (deg F) Avg.	Min.	Max.	Liquid Bulk Temp (deg F)	Vapor Pressure (psia) Avg.	Min.	Max.	Vapor Mol. Weight.	Liquid Mass Fract.	Vapor Mass Fract.	Mol. Weight	Basis for Vapor Pressure Calculations
Distillate fuel oil no. 2	All	54.52	49.71	59.33	52.85	0.0054	0.0045	0.0064	130.0000			188.00	Option 1: VP50 = .0045 VP60 = .0065

TANKS 4.0.9d
Emissions Report - Summary Format
Individual Tank Emission Totals

Emissions Report for: Annual

TK-DF Diesel Fuel Tank - Horizontal Tank
Ranson, West Virginia

	Losses(lbs)		
Components	Working Loss	Breathing Loss	Total Emissions
Distillate fuel oil no. 2	0.88	0.35	1.23

TANKS 4.0.9d
Emissions Report - Summary Format
Tank Indentification and Physical Characteristics

Identification		
User Identification:	TK-DO De-dust Oil Tank	
City:	Ranson	
State:	West Virginia	
Company:	Roxul USA Inc.	
Type of Tank:	Vertical Fixed Roof Tank	
Description:	De-dust Oil Vertical Storage Tank	
Tank Dimensions		
Shell Height (ft):		21.00
Diameter (ft):		13.80
Liquid Height (ft) :		14.17
Avg. Liquid Height (ft):		14.17
Volume (gallons):		15,850.00
Turnovers:		
Net Throughput(gal/yr):		
Is Tank Heated (y/n):	Y	
Paint Characteristics		
Shell Color/Shade:	White/White	
Shell Condition	Good	
Roof Color/Shade:	White/White	
Roof Condition:	Good	
Roof Characteristics		
Type:	Cone	
Height (ft)		1.00
Slope (ft/ft) (Cone Roof)		0.14
Breather Vent Settings		
Vacuum Settings (psig):		0.00
Pressure Settings (psig)		0.00

Meterological Data used in Emissions Calculations: Harrisburg, Pennsylvania (Avg Atmospheric Pressure = 14.57 psia)

TANKS 4.0.9d
Emissions Report - Summary Format
Liquid Contents of Storage Tank

TK-DO De-dust Oil Tank - Vertical Fixed Roof Tank
Ranson, West Virginia

Mixture/Component	Month	Daily Liquid Surf. Temperature (deg F) Avg.	Min.	Max.	Liquid Bulk Temp (deg F)	Vapor Pressure (psia) Avg.	Min.	Max.	Vapor Mol. Weight.	Liquid Mass Fract.	Vapor Mass Fract.	Mol. Weight	Basis for Vapor Pressure Calculations
Distillate fuel oil no. 2	All	122.00	122.00	122.00	122.00	0.0220	0.0220	0.0220	130.0000			188.00	

TANKS 4.0.9d
Emissions Report - Summary Format
Individual Tank Emission Totals

Emissions Report for: Annual

TK-DO De-dust Oil Tank - Vertical Fixed Roof Tank
Ranson, West Virginia

	Losses(lbs)		
Components	Working Loss	Breathing Loss	Total Emissions
Distillate fuel oil no. 2	3.60	0.00	3.60

TANKS 4.0.9d
Emissions Report - Summary Format
Tank Indentification and Physical Characteristics

Identification	
User Identification:	TK-DOD De-dust Oil Day Tank
City:	Ranson
State:	West Virginia
Company:	Roxul USA, Inc.
Type of Tank:	Vertical Fixed Roof Tank
Description:	De-dust Oil Vertical Day Tank
Tank Dimensions	
Shell Height (ft):	5.00
Diameter (ft):	3.00
Liquid Height (ft) :	4.80
Avg. Liquid Height (ft):	4.80
Volume (gallons):	264.00
Turnovers:	
Net Throughput(gal/yr):	
Is Tank Heated (y/n):	N
Paint Characteristics	
Shell Color/Shade:	White/White
Shell Condition	Good
Roof Color/Shade:	White/White
Roof Condition:	Good
Roof Characteristics	
Type:	Cone
Height (ft)	1.00
Slope (ft/ft) (Cone Roof)	0.67
Breather Vent Settings	
Vacuum Settings (psig):	-0.03
Pressure Settings (psig)	0.03

Meterological Data used in Emissions Calculations: Harrisburg, Pennsylvania (Avg Atmospheric Pressure = 14.57 psia)

TANKS 4.0.9d
Emissions Report - Summary Format
Liquid Contents of Storage Tank

TK-DOD De-dust Oil Day Tank - Vertical Fixed Roof Tank
Ranson, West Virginia

Mixture/Component	Month	Daily Liquid Surf. Temperature (deg F)			Liquid Bulk Temp	Vapor Pressure (psia)			Vapor Mol.	Liquid Mass	Vapor Mass	Mol.	Basis for Vapor Pressure
		Avg.	Min.	Max.	(deg F)	Avg.	Min.	Max.	Weight.	Fract.	Fract.	Weight	Calculations
Distillate fuel oil no. 2	All	54.52	49.71	59.33	52.85	0.0054	0.0045	0.0064	130.0000			188.00	Option 1: VP50 = .0045 VP60 = .0065

TANKS 4.0.9d
Emissions Report - Summary Format
Individual Tank Emission Totals

Emissions Report for: Annual

TK-DOD De-dust Oil Day Tank - Vertical Fixed Roof Tank
Ranson, West Virginia

	Losses(lbs)		
Components	Working Loss	Breathing Loss	Total Emissions
Distillate fuel oil no. 2	0.28	0.01	0.29

TANKS 4.0.9d
Emissions Report - Summary Format
Tank Indentification and Physical Characteristics

Identification

User Identification:	TK-RS(1-7) Resin Tank
City:	Ranson
State:	West Virginia
Company:	Roxul USA Inc.
Type of Tank:	Vertical Fixed Roof Tank
Description:	Resin Vertical Storage Tank

Tank Dimensions

Shell Height (ft):		21.00
Diameter (ft):		13.80
Liquid Height (ft) :		15.00
Avg. Liquid Height (ft):		15.00
Volume (gallons):		15,850.00
Turnovers:		
Net Throughput(gal/yr):		
Is Tank Heated (y/n):	Y	

Paint Characteristics

Shell Color/Shade:	White/White
Shell Condition	Good
Roof Color/Shade:	White/White
Roof Condition:	Good

Roof Characteristics

Type:	Cone	
Height (ft)		1.00
Slope (ft/ft) (Cone Roof)		0.14

Breather Vent Settings

Vacuum Settings (psig):	0.00
Pressure Settings (psig)	0.00

Meterological Data used in Emissions Calculations: Harrisburg, Pennsylvania (Avg Atmospheric Pressure = 14.57 psia)

TANKS 4.0.9d
Emissions Report - Summary Format
Liquid Contents of Storage Tank

TK-RS(1-7) Resin Tank - Vertical Fixed Roof Tank
Ranson , West Virginia

Mixture/Component	Month	Daily Liquid Surf. Temperature (deg F) Avg.	Min.	Max.	Liquid Bulk Temp (deg F)	Vapor Pressure (psia) Avg.	Min.	Max.	Vapor Mol. Weight.	Liquid Mass Fract.	Vapor Mass Fract.	Mol. Weight	Basis for Vapor Pressure Calculations
Resin	All	68.00	68.00	68.00	68.00	0.4403	0.4403	0.4403	20.8314			18.09	
Formaldehyde						63.1905	63.1905	63.1905	30.0300			30.03	Option 2: A=7.15686, B=959.43, C=243.392
Methanol						1.8849	1.8849	1.8849	32.0400			32.04	Option 2: A=8.07919, B=1581.341, C=239.65
Phenol						0.0043	0.0043	0.0043	94.1112			94.11	Option 2: A=7.12198, B=1509.677, C=174.201
Water						0.3381	0.3381	0.3381	18.0153			18.02	Option 2: A=7.5294, B=1435.264, C=208.302

TANKS 4.0.9d
Emissions Report - Summary Format
Individual Tank Emission Totals

Emissions Report for: Annual

TK-RS(1-7) Resin Tank - Vertical Fixed Roof Tank
Ranson , West Virginia

	Losses(lbs)		
	Working Loss	Breathing Loss	Total Emissions
Components	69.23	0.00	69.23
Resin	23.21	0.00	23.21
Formaldehyde	0.17	0.00	0.17
Methanol	45.86	0.00	45.86
Water	0.00	0.00	0.00
Phenol			

TANKS 4.0.9d

Emissions Report - Summary Format

Tank Indentification and Physical Characteristics

Identification	
User Identification:	TK-TO1 Thermal Oil Expansion Tank
City:	Ranson
State:	West Virginia
Company:	Roxul USA Inc.
Type of Tank:	Horizontal Tank
Description:	Thermal Oil Horizontal Expansion Tank
Tank Dimensions	6.50
Shell Length (ft):	3.00
Diameter (ft):	212.00
Volume (gallons):	
Turnovers:	
Net Throughput(gal/yr):	Y
Is Tank Heated (y/n):	N
Is Tank Underground (y/n):	
Paint Characteristics	
Shell Color/Shade:	White/White
Shell Condition	Good
Breather Vent Settings	0.00
Vacuum Settings (psig):	0.00
Pressure Settings (psig)	

Meterological Data used in Emissions Calculations: Harrisburg, Pennsylvania (Avg Atmospheric Pressure = 14.57 psia)

TANKS 4.0.9d
Emissions Report - Summary Format
Liquid Contents of Storage Tank

TK-TO1 Thermal Oil Expansion Tank - Horizontal Tank
Ranson, West Virginia

Mixture/Component	Month	Daily Liquid Surf. Temperature (deg F) Avg.	Min.	Max.	Liquid Bulk Temp (deg F)	Vapor Pressure (psia) Avg.	Min.	Max.	Vapor Mol. Weight.	Liquid Mass Fract.	Vapor Mass Fract.	Mol. Weight	Basis for Vapor Pressure Calculations
Jet naphtha (JP-4)	All	572.00	572.00	572.00	572.00	2.7000	2.7000	2.7000	80.0000			120.00	

TANKS 4.0.9d
Emissions Report - Summary Format
Individual Tank Emission Totals

Emissions Report for: Annual

TK-TO1 Thermal Oil Expansion Tank - Horizontal Tank
Ranson, West Virginia

	Losses(lbs)		
Components	Working Loss	Breathing Loss	Total Emissions
Jet naphtha (JP-4)	0.93	0.00	0.93

TANKS 4.0.9d
Emissions Report - Summary Format
Tank Indentification and Physical Characteristics

Identification	TK-TO2 Thermal Oil Drain Tank
User Identification:	Ranson
City:	West Virginia
State:	Roxul USA Inc.
Company:	Horizontal Tank
Type of Tank:	Thermal Oil Horizontal Drain Tank
Description:	

Tank Dimensions		6.50
Shell Length (ft):		3.00
Diameter (ft):		159.00
Volume (gallons):		
Turnovers:		
Net Throughput(gal/yr):	Y	
Is Tank Heated (y/n):	N	
Is Tank Underground (y/n):		

Paint Characteristics	
Shell Color/Shade:	White/White
Shell Condition	Good

Breather Vent Settings	0.00
Vacuum Settings (psig):	0.00
Pressure Settings (psig)	

Meterological Data used in Emissions Calculations: Harrisburg, Pennsylvania (Avg Atmospheric Pressure = 14.57 psia)

TANKS 4.0.9d
Emissions Report - Summary Format
Liquid Contents of Storage Tank

TK-TO2 Thermal Oil Drain Tank - Horizontal Tank
Ranson, West Virginia

Mixture/Component	Month	Daily Liquid Surf. Temperature (deg F)			Liquid Bulk Temp (deg F)	Vapor Pressure (psia)			Vapor Mol. Weight.	Liquid Mass Fract.	Vapor Mass Fract.	Mol. Weight	Basis for Vapor Pressure Calculations
		Avg.	Min.	Max.		Avg.	Min.	Max.					
Jet naphtha (JP-4)	All	572.00	572.00	572.00	572.00	2.7000	2.7000	2.7000	80.0000			120.00	

TANKS 4.0.9d
Emissions Report - Summary Format
Individual Tank Emission Totals

Emissions Report for: Annual

TK-TO2 Thermal Oil Drain Tank - Horizontal Tank
Ranson, West Virginia

	Losses(lbs)		
Components	Working Loss	Breathing Loss	Total Emissions
Jet naphtha (JP-4)	0.93	0.00	0.93

TANKS 4.0.9d
Emissions Report - Summary Format
Tank Indentification and Physical Characteristics

Identification	
User Identification:	TK-TO3 Thermal Oil Tank
City:	Ranson
State:	West Virginia
Company:	Roxul USA Inc.
Type of Tank:	Horizontal Tank
Description:	Thermal Oil Horizontal Tank
Tank Dimensions	
Shell Length (ft):	9.40
Diameter (ft):	6.90
Volume (gallons):	2,642.00
Turnovers:	
Net Throughput(gal/yr):	
Is Tank Heated (y/n):	Y
Is Tank Underground (y/n):	N
Paint Characteristics	
Shell Color/Shade:	White/White
Shell Condition	Good
Breather Vent Settings	
Vacuum Settings (psig):	0.00
Pressure Settings (psig)	0.00

Meterological Data used in Emissions Calculations: Harrisburg, Pennsylvania (Avg Atmospheric Pressure = 14.57 psia)

TANKS 4.0.9d
Emissions Report - Summary Format
Liquid Contents of Storage Tank

TK-TO3 Thermal Oil Tank - Horizontal Tank
Ranson, West Virginia

Mixture/Component	Month	Daily Liquid Surf. Temperature (deg F) Avg.	Min.	Max.	Liquid Bulk Temp (deg F)	Vapor Pressure (psia) Avg.	Min.	Max.	Vapor Mol. Weight.	Liquid Mass Fract.	Vapor Mass Fract.	Mol. Weight	Basis for Vapor Pressure Calculations
Power Steering Fluid	All	392.00	392.00	392.00	392.00	0.0123	0.0123	0.0123	390.0000			390.00	

TANKS 4.0.9d
Emissions Report - Summary Format
Individual Tank Emission Totals

Emissions Report for: Annual

TK-TO3 Thermal Oil Tank - Horizontal Tank
Ranson, West Virginia

	Losses(lbs)		
Components	Working Loss	Breathing Loss	Total Emissions
Power Steering Fluid	0.08	0.00	0.08

TANKS 4.0.9d
Emissions Report - Summary Format
Tank Indentification and Physical Characteristics

Identification		
User Identification:	TK-TO4 Thermal Oil Expansion Tank	
City:	Ranson	
State:	West Virginia	
Company:	Roxul USA Inc.	
Type of Tank:	Horizontal Tank	
Description:	Thermal Oil Horizontal Expansion Tank	
Tank Dimensions		
Shell Length (ft):		7.70
Diameter (ft):		5.40
Volume (gallons):		1,321.00
Turnovers:		
Net Throughput(gal/yr):		
Is Tank Heated (y/n):	Y	
Is Tank Underground (y/n):	N	
Paint Characteristics		
Shell Color/Shade:	White/White	
Shell Condition	Good	
Breather Vent Settings		
Vacuum Settings (psig):		0.00
Pressure Settings (psig)		0.00

Meterological Data used in Emissions Calculations: Harrisburg, Pennsylvania (Avg Atmospheric Pressure = 14.57 psia)

TANKS 4.0.9d
Emissions Report - Summary Format
Liquid Contents of Storage Tank

TK-TO4 Thermal Oil Expansion Tank - Horizontal Tank
Ranson, West Virginia

Mixture/Component	Month	Daily Liquid Surf. Temperature (deg F) Avg.	Min.	Max.	Liquid Bulk Temp (deg F)	Vapor Pressure (psia) Avg.	Min.	Max.	Vapor Mol. Weight.	Liquid Mass Fract.	Vapor Mass Fract.	Mol. Weight	Basis for Vapor Pressure Calculations
Power Steering Fluid	All	392.00	392.00	392.00	392.00	0.0123	0.0123	0.0123	390.0000			390.00	

TANKS 4.0.9d
Emissions Report - Summary Format
Individual Tank Emission Totals

Emissions Report for: Annual

TK-TO4 Thermal Oil Expansion Tank - Horizontal Tank
Ranson, West Virginia

	Losses(lbs)		
Components	Working Loss	Breathing Loss	Total Emissions
Power Steering Fluid	0.08	0.00	0.08

TANKS 4.0.9d
Emissions Report - Summary Format
Tank Indentification and Physical Characteristics

Identification

User Identification:	TK-UO Used Oil Tank
City:	Ranson
State:	West Virginia
Company:	Roxul USA Inc.
Type of Tank:	Horizontal Tank
Description:	Used Oil Horizontal Storage Tank

Tank Dimensions

Shell Length (ft):	7.70
Diameter (ft):	5.40
Volume (gallons):	1,321.00
Turnovers:	
Net Throughput(gal/yr):	
Is Tank Heated (y/n):	N
Is Tank Underground (y/n):	N

Paint Characteristics

Shell Color/Shade:	White/White
Shell Condition	Good

Breather Vent Settings

Vacuum Settings (psig):	-0.03
Pressure Settings (psig)	0.03

Meterological Data used in Emissions Calculations: Harrisburg, Pennsylvania (Avg Atmospheric Pressure = 14.57 psia)

TANKS 4.0.9d
Emissions Report - Summary Format
Liquid Contents of Storage Tank

TK-UO Used Oil Tank - Horizontal Tank
Ranson, West Virginia

Mixture/Component	Month	Daily Liquid Surf. Temperature (deg F) Avg.	Min.	Max.	Liquid Bulk Temp (deg F)	Vapor Pressure (psia) Avg.	Min.	Max.	Vapor Mol. Weight.	Liquid Mass Fract.	Vapor Mass Fract.	Mol. Weight	Basis for Vapor Pressure Calculations
Distillate fuel oil no. 2	All	54.52	49.71	59.33	52.85	0.0054	0.0045	0.0064	130.0000			188.00	Option 1: VP50 = .0045 VP60 = .0065

TANKS 4.0.9d
Emissions Report - Summary Format
Individual Tank Emission Totals

Emissions Report for: Annual

TK-UO Used Oil Tank - Horizontal Tank
Ranson, West Virginia

	Losses(lbs)		
Components	Working Loss	Breathing Loss	Total Emissions
Distillate fuel oil no. 2	0.07	0.17	0.24

TANKS 4.0.9d
Emissions Report - Summary Format
Total Emissions Summaries - All Tanks in Report

Emissions Report for: Annual

Tank Identification				Losses (lbs)
TK-AD Additive Storage Tank	Roxul USA Inc.	Vertical Fixed Roof Tank	Ranson , West Virginia	0.75
TK-BC Binder Circulating Tank	Roxul USA Inc.	Vertical Fixed Roof Tank	Ranson , West Virginia	132.92
TK-BD Binder Day Tank	Roxul USA Inc.	Vertical Fixed Roof Tank	Ranson, West Virginia	120.73
TK-BM Binder Mix Tank	Roxul USA Inc.	Vertical Fixed Roof Tank	Ranson , West Virginia	127.17
TK-BS(1-3) Binder Storage Container	Roxul USA Inc.	Vertical Fixed Roof Tank	Ranson , West Virginia	3.84
TK-CA Coupling Agent Storage Tank	Roxul USA, Inc.	Vertical Fixed Roof Tank	Ranson, West Virginia	0.90
TK-DF Diesel Fuel Tank	Roxul USA Inc.	Horizontal Tank	Ranson, West Virginia	1.23
TK-DO De-dust Oil Tank	Roxul USA Inc.	Vertical Fixed Roof Tank	Ranson, West Virginia	3.60
TK-DOD De-dust Oil Day Tank	Roxul USA, Inc.	Vertical Fixed Roof Tank	Ranson, West Virginia	0.28
TK-RS(1-7) Resin Tank	Roxul USA Inc.	Vertical Fixed Roof Tank	Ranson , West Virginia	69.23
TK-TO1 Thermal Oil Expansion Tank	Roxul USA Inc.	Horizontal Tank	Ranson, West Virginia	0.93
TK-TO2 Thermal Oil Drain Tank	Roxul USA Inc.	Horizontal Tank	Ranson, West Virginia	0.93
TK-TO3 Thermal Oil Tank	Roxul USA Inc.	Horizontal Tank	Ranson, West Virginia	0.08
TK-TO4 Thermal Oil Expansion Tank	Roxul USA Inc.	Horizontal Tank	Ranson, West Virginia	0.08
TK-UO Used Oil Tank	Roxul USA Inc.	Horizontal Tank	Ranson, West Virginia	0.24
Total Emissions for all Tanks:				462.91

Attachment L

FUGITIVE EMISSIONS FROM PAVED HAULROADS

INDUSTRIAL PAVED HAULROADS (including all equipment traffic involved in process, haul trucks, endloaders, etc.)

Item Number	Description	Mean Vehicle Weight (tons)	Miles per Trip	Maximum Trips per Day	Maximum Trips per Year	Control Device ID Number	Control Efficiency (%)
1	Truck - Binder Oil		0.46				
2	Truck - Oxygen		0.46				
3	Truck - Raw Material to 210		0.46				
4	Truck - Coal/PET Coke		0.46				
5	Truck - DeSOx and Binder		0.46				
6	Truck - Waste		0.46				
7	Truck – Pallet and Foil		0.76				
8	Truck – Finished Goods		0.76				
9	FEL – Diverted Melt from Bldg 300 to Pit Waste (170)	Claimed Confidential	0.27	Claimed Confidential		All roads at the RAN5 facility will be paved. Roxul will operate a street sweeper on an as needed basis to minimize the generation of dusts from road traffic.	75%
10	FEL – Crushed Melt from 170 to 210		0.10				
11	FEL – Coal/PET Coke from Bunker to feed Hopper (for Milling)		0.02				
12	FEL – Raw Material from 210 to Feed Hopper		0.06				
13	FEL – Raw Material from Stockpile to 210		0.16				
14	Truck – Raw Material from Stockpile to 210		0.27				

Source: *AP-42 Fifth Edition – 11.2.6 Industrial Paved Roads*

E = $[k \times (sL)^{0.91} \times (W)^{1.02}] \times [1 - P/(4N)]$ = lb/Vehicle Mile Traveled (VMT)

Where:

k =	Particle size multiplier (lb/VMT)	**PM – 0.011** **PM_{10} – 0.0022** **$PM_{2.5}$ – 0.00054**
sL =	Road surface silt loading (g/m^2)	**Finished product road surface silt loading – 0.2** **Raw materials road surface silt loading – 8.2**
P =	Number of “wet” days with at least 0.01 in of precipitation during the averaging period	**148**
N =	Number of days in the averaging period	**365**
W =	Average vehicle weight traveling the road (tons)	**See table above**

For lb/hr: [lb ÷ VMT] × [VMT ÷ trip] × [Trips ÷ Hour] = lb/hr

For TPY: [lb ÷ VMT] × [VMT ÷ trip] × [Trips ÷ Hour] × [Ton ÷ 2000 lb] = Tons/year

SUMMARY OF PAVED HAULROAD EMISSIONS

Item No.	Uncontrolled PM_{10}		Controlled PM_{10}	
	lb/hr	ton/yr	lb/hr	ton/yr
1	<0.01	<0.01	<0.01	<0.01
2	<0.01	0.04	<0.01	0.01
3	<0.01	0.55	<0.01	0.14
4	<0.01	0.07	<0.01	0.02
5	<0.01	0.05	<0.01	0.01
6	<0.01	0.02	<0.01	<0.01
7	<0.01	0.01	<0.01	<0.01
8	<0.01	0.05	<0.01	0.01
9	<0.01	0.42	<0.01	0.10
10	<0.01	0.16	<0.01	0.04
11	<0.01	0.01	<0.01	<0.01
12	<0.01	0.24	<0.01	0.06
13	<0.01	0.08	<0.01	0.02
14	<0.01	0.05	<0.01	0.01
TOTALS	**0.01**	**1.68**	**<0.01**	**0.42**

Item No.	Uncontrolled $PM_{2.5}$		Controlled $PM_{2.5}$	
	lb/hr	ton/yr	lb/hr	ton/yr
1	<0.01	<0.01	<0.01	<0.01
2	<0.01	0.01	<0.01	<0.01
3	<0.01	0.13	<0.01	0.03
4	<0.01	0.02	<0.01	<0.01
5	<0.01	0.01	<0.01	<0.01
6	<0.01	<0.01	<0.01	<0.01
7	<0.01	<0.01	<0.01	<0.01
8	<0.01	0.01	<0.01	<0.01
9	<0.01	0.10	<0.01	0.03
10	<0.01	0.04	<0.01	0.01
11	<0.01	<0.01	<0.01	<0.01
12	<0.01	0.06	<0.01	0.01
13	<0.01	0.02	<0.01	0.01
14	<0.01	0.01	<0.01	<0.01
TOTALS	**<0.01**	**0.41**	**<0.01**	**0.10**

Attachment L
Emission Unit Data Sheet
(NONMETALLIC MINERALS PROCESSING)

Control Device ID No. (must match List Form):

Equipment Information

1. Plant Type:
   - ☐ Hot-mix asphalt facility that reduces the size of nonmetallic minerals embedded in recycled asphalt pavement
   - ☐ Plant without crushers or grinding mills and containing a stand-alone screening operation
   - ☐ Sand and gravel plant ☐ Common clay plant
   - ☐ Crushed stone plant ☐ Pumice plant
   - ☒ Other, specify **Mineral Wool Insulation Production Facility**

2. Plant Style: ☒ Fixed Plant ☒ Portable Plant (Recycle Crusher)

3. Plant Capacity: **Claimed Confidential** tons/hr

4. Underground mine: ☐ Yes ☒ No

5. Storage: ☒ Open ☒ Enclosed

6.

Emission Facility Type	Equipment Type Used	ID Number of Emission Unit	Manufacturer	Model Number/ Serial Number	Date of Manufacture
Conveyors	Transfer Point with Fabric Filter	IMF04* IMF12 IMF13* IMF14 IMF15 IMF16 IMF11	TBD		
Crusher	Portable Fixed	B170 IMF17/18	TBD		
Secondary Crushers					
Tertiary Crushers					
Grinder					
Hoppers	Loading Hopper	B215 B231*	TBD		
Rock Drills					
Screens					
Enclosed Storage	3–sided with cover / Building	RM_REJ S_REJ B235*	NA		
Outdoor Storage	Stockpile	B210 B170 RMS	NA		
Other	Storage Silos	IMF03A-C, IM07A-B, IMF08 IMF09 IMF10	NA		

Emission Facility Type	Operation Rate Design Ton/hr	Annual Production Tons/year	Number of Units	Air Pollution Control Device Used
Conveyors	Claimed Confidential	Claimed Confidential	6	Fabric Filters
Crusher	Claimed Confidential	Claimed Confidential	1	Fabric Filter Vents Indoors
Crusher Portable	< 150 tons/hr	81,000	1	Indoor Settling / None
Secondary Crushers				
Tertiary Crushers				
Grinder				
Hoppers	Claimed Confidential	Claimed Confidential	2	Fabric Filters
Rock Drills				
Screens				
Enclosed Storage	Claimed Confidential	Claimed Confidential	4 Areas	Fabric Filters / None
Outdoor Storage	Claimed Confidential	Claimed Confidential	2 Areas	None
Other				
Other				

7. Provide a diagram and/or schematic that shows the proposed process of the operation or plant. The diagram and/or schematic is to show all sources, components and facets of the operation or plant in an understandable line sequence of the operation. The diagram should include all the equipment involved in the operation; such as conveyors, transfer points, stockpiles, crushers, facilities, vents, screens, truck dump bins, truck, barge and railcar loading and unloading, etc. Appropriate sizing and specifications of equipment should be included in the diagram. The diagram shall logical follow the entire process load-in to load-out.

8. Roads	Paved Miles of Road	Unpaved Miles of Road	Watered		Other Control (Specify)
			Miles	Frequency	
Plant Yard	See Haul Roads Emission Unit Data Sheet				
Access Roads					

9. Vehicle Type

Vehicle Type	Mean Vehicle Speed in mph	Mean Vehicle Weight in Tons		Number of Wheels	Distance Traveled per Round Trip	
		Empty	Full		Paved Feet or Miles	Unpaved Feet or Miles
Raw Aggregate	See Haul Roads Emission Unit Data Sheet					
Loaders						
Product Trucks						

10. Describe all proposed materials storage facilities associated with the **Emission Units** listed.

Roxul will operate raw material storage bunkers with 3-sided enclosures and a roof. Roxul will operate a lime storage silo, three (3) milled coal storage silos, a raw sorbent storage silo, spent sorbent storage silo, filter fines receiving storage silo, filter fines day silo, and a secondary materials silo. Pit waste will be stored in an outside stockpile.

Storage Activity					
ID of Emission Unit	B210	B170	B230*	RMS	
Type Storage	3-sided	3-sided	3-sided	3-sided	
Material Stored	Rock/Slag/ Minerals	Pit Waste	Coal*	Rock/Slag/ Minerals	
Typical Moisture Content (%)	Claimed Confidential	Claimed Confidential	Claimed Confidential	Claimed Confidential	
Avg % of material passing through 200 mesh sieve					
Maximum Total Yearly Throughput in storage (tons)	Claimed Confidential	Claimed Confidential	Claimed Confidential	Claimed Confidential	
Maximum Stockpile Base Area (ft^2)	5,227.2	19,166.4	TBD	500	
Maximum Stockpile height (ft)	TBD	TBD	TBD	TBD	
Dust control method applied to storage	3-sided	3-sided	3-sided	3-sided	
Method of material load-in to bin or stockpile	FEL	FEL	Truck	Truck	
Dust control method applied during load-in	3-sided	3-sided	Fabric Filter	3-sided	
Method of material load-out to bin or stockpile	FEL	FEL	FEL	FEL	
Dust control method applied during load-out	3-sided	3-sided	3-sided	3-sided	

Storagepiles	**Estimated Annual Tons**	**Turnover Rate (Ton/Month)**	**Wetted as Piled**	**Number of Sides Enclosed**	**Other Dust Control**	**Loading Method** (Loader, Conveyor) **IN/OUT**
Coarse: over 1"						
Fine: 1" to ¼"						
¼" and less						
MFG. Sand						

Other, specify						

Conveying and Transfer
Describe the conveying system including transfer points associated with proposed Emission Units (crushers, etc…).
Describe any methods of emission control to be used with these proposed conveying systems: **Fabric filters on individual conveyor vents**

ID of Emission Unit	Type Conveyor or Transfer Point	Material Handled [Note nominal size of material transferred (e.g. ¾" × 0)]	Material Conveying or Transfer Rate		Dust Control Measures Applied	Approximate Material Moisture Content (%)
			Max. TPH	Maximum TPY		
IMF04*	BC		Claimed Confidential	Claimed Confidential	Fabric Filter	
IMF12	BC		Claimed Confidential	Claimed Confidential	Fabric Filter	
IMF14	BC		Claimed Confidential	Claimed Confidential	Fabric Filter	
IMF15	BC		Claimed Confidential	Claimed Confidential	Fabric Filter	
IMF16	BC		Claimed Confidential	Claimed Confidential	Fabric Filter	
IMF11	BC		Claimed Confidential	Claimed Confidential	Fabric Filter	
IMF13*	TP		Claimed Confidential	Claimed Confidential	Fabric Filter	
B210	TP – Delivery to Stockpile		Claimed Confidential	Claimed Confidential	3 Sided Enclosure with Cover	
B230*	TP – Coal Milling Unloading to Bunker		Claimed Confidential	Claimed Confidential	3 Sided Enclosure with Cover	
B215	TP		Claimed Confidential	Claimed Confidential	3 Sided Enclosure with Cover	
B231*	TP		Claimed Confidential	Claimed Confidential	3 Sided Enclosure with Cover	
RM_REJ	TP		Claimed Confidential	Claimed Confidential	4 Sided Rubber Drop Guards	
S-REJ	TP		Claimed Confidential	Claimed Confidential	4 Sided Rubber Drop Guards	
B170	TP – Drop to Pit Waste from Portable Crusher		Claimed Confidential	Claimed Confidential	3 Sided Enclosure	
B235*	BC – To Coal Mill TP – Hopper to Feed Bin		Claimed Confidential	Claimed Confidential	Enclosed Building/ Fabric Filter	

Crushing and Screening						
ID of Emission Unit	B170	IMF17/IMF18 Crusher				
Type Crusher or Screen						
Material Sized						
Material Sized Throughput:						
Tons/hr	Claimed Confidential	Claimed Confidential				
Tons/yr	Claimed Confidential	Claimed Confidential				
Material sized from/to						
Typical moisture content as crushed or screened (%)	Claimed Confidential	Claimed Confidential				
Dust control methods applied						
Stack Parameters:						
Height (ft)						
Diameter (ft)						
Volume (ACFM)						
Temp (°F)	Ambient					
Maximum operating schedule:						
Hour/day	12	24				
Day/year	45	365				
Hour/year	540	8760				
Approximate Percentage of Operation from:						
Jan – Mar	25	25				
April – June	25	25				
July – Sept	25	25				
Oct – Dec	25	25				
Maximum Particulate (PM_{10}) Emissions:						
LB/HR	0.36	0.04				
Ton/Year	0.10	0.17				

List emission sources with request information:

ID of Emission Unit	Type of Emission Unit and Use	Operating Schedule Actual (hrs/yr)	Operating Schedule Design (hrs/yr)	Max. Amount of Stone Input to Emission (lb/hr)	Crushed or Screened From/To (size)	Date of Emission Unit was Manufacture

List emission sources with request information:

ID of Emission Unit	Maximum expected emissions from Emission Unit without Air Pollution Control Equipment				
	PM_{10} (lbs/hr)	SO_2 (lbs/hr)	CO (lbs/hr)	NO_x (lbs/hr)	VOC (lbs/hr)

ID of Emission Unit	Maximum expected emissions from Emission Unit without Air Pollution Control Equipment				
	PM_{10} (tons/yr)	SO_2 (tons/yr)	CO (tons/yr)	NO_x (tons/yr)	VOC (tons/yr)

Please fill out a separate Air Pollution Control Device Sheet for each Emission Unit equipped with an air pollution control system.
What type of stone will be quarried at this site? **NA**
How will it be quarried? ☐ Sawing ☐ Blasting ☐ Other, Specify:
If blasting is checked, complete the following: ☐ Frequency of blasting: ☐ What method of air pollution control will be employed during drilling and blasting?
*Denotes a source that does not meet the definition of nonmetallic mineral. Information provided for the coal material process to support the application review process.

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Attachment M

Attachment M
Air Pollution Control Device Sheet
(AFTERBURNER SYSTEM)

Control Device ID No. (must match Emission Units Table): **CO-AB – The afterburner is routed through HE01.**

Equipment Information

1. Manufacturer: **TBD** Model No.	2. ☐ Thermal Energy Recovery ☒ Recuperative (Conventional) ☐ Catalytic
3. Provide diagram(s) of unit describing capture system with duct arrangement and size of duct, air volume, capacity, horsepower of movers. If applicable, state hood face velocity and hood collection efficiency.	
4. Combustion chamber dimensions: Length: **TBD** ft Diameter: **TBD** ft Cross-sectional area: **TBD** ft^2	5. Stack Dimensions: Height: **213.25** ft Diameter: **12.96** ft
6. Combustion (destruction) efficiency: Estimated: **95** % Minimum guaranteed: **95** %	7. Retention or residence time of materials in combustion chamber: Maximum: **TBD** sec Minimum: **TBD** sec
8. Throat diameter: **TBD** ft	9. Combustion Chamber Volume: **TBD** ft^3
10. Fuel used in burners: ☒ Natural Gas ☐ Fuel Oil, Number: ☐ Other, specify:	11. Burners per afterburner: Number of burners: **Claimed Confidential** BTU/hr for burner: **Claimed Confidential**
12. Fuel heating value of natural gas: **1026** BTU/scf	13. Flow rate of natural gas: **Claimed Confidential** ft^3/min
14. Is a catalyst material used?: ☐ Yes ☒ No If yes, catalyst material used:	15. Expected frequency of catalyst replacement: yr(s) 16. Date catalyst was last replaced: Month/Year:
17. Space Velocity of the catalyst material used: 1/hour	18. Catalyst area: ft^2 19. Volume of catalyst bed: ft^3
20. Minimum loading: Maximum loading:	21. Temperature catalyst bed inlet: °F Temperature catalyst bed outlet: °F
22. Explain degradation or performance indicator criteria determining catalyst replacement:	
23. Heat exchanger used? ☐ Yes ☐ No Describe heat exchanger:	24. Heat exchanger surface area? ft^2 25. Average thermal efficiency: %
26. Temperature of gases: After preheat: °F	Before preheat: °F
27. Dilution air flow rate: ft^3/minute	

28. Describe method of gas mixing used:

Waste Gas (Emission Stream) to be Burned

29. Name	Quantity Grains of $H_2S/100\ ft^2$	Quantity-Density (LB/hr, ft^3/hr, etc)	Source of Material

30. Estimate total combustibles to afterburner **Claimed Confidential** **lb/hr** or ACF/hr

31. Estimated total flow rate to afterburner or catalyst including materials to be burned, carrier gases, auxiliary fuel, etc.: lb/hr, ACF/hr, or scfm

Total flow rate = Flue gas flow rate

32. Afterburner operating parameters:	**During maximum operation of feeding unit(s)**	**During typical operation of feeding unit(s)**	**During minimum operation of feeding unit(s)**
Combustion chamber temperature in °F		**1472**	
Emission stream gas temperature in °F		**482**	
Combined gas stream entering catalyst bed in			
Flue stream leaving the catalyst bed			
Emission stream flow rate (scfm)		**Claimed Confidential**	
Efficiency (VOC Reduction)	%	**95 %**	%
Efficiency (Other; specify contaminant)	%	%	%

33. Inlet Emission stream parameters:

	Maximum	**Typical**
Pressure (mmHg):		
Heat Content (BTU/scf):		
Oxygen Content (%):		
Moisture Content (%):		

Are halogenated organics present? ☐ Yes ☒ No
Are particulates present? ☒ Yes ☐ No
Are metals present? ☐ Yes ☒ No

34. For thermal afterburners, is the combustion chamber temperature continuously monitored and recorded?
☒ Yes ☐ No

35. For catalytic afterburners, is the temperature rise across the catalyst bed continuously monitored and recorded? ☐ Yes ☐ No

36. Is the VOC concentration of exhaust monitored and recorded? ☐ Yes ☒ No

37. Describe any air pollution control device inlet and outlet gas conditioning processes (e.g., gas cooling, gas reheating, gas humidification):

38. Describe the collection material disposal system:

39. Have you included ***Afterburner Control Device*** in the Emissions Points Data Summary Sheet?

40. **Proposed Monitoring, Recordkeeping, Reporting, and Testing**
Please propose monitoring, recordkeeping, and reporting in order to demonstrate compliance with the proposed operating parameters. Please propose testing in order to demonstrate compliance with the proposed emissions limits.

MONITORING: **See proposed monitoring plan in Attachment O.**	RECORDKEEPING: **See proposed recordkeeping plan in Attachment O.**
REPORTING: **See proposed reporting plan in Attachment O.**	TESTING: **See proposed testing plan in Attachment O.**

MONITORING:	Please list and describe the process parameters and ranges that are proposed to be monitored in order to demonstrate compliance with the operation of this process equipment or air control device.
RECORDKEEPING:	Please describe the proposed recordkeeping that will accompany the monitoring.
REPORTING:	Please describe any proposed emissions testing for this process equipment on air pollution control device.
TESTING:	Please describe any proposed emissions testing for this process equipment on air pollution control device.

41. Manufacturer's Guaranteed Capture Efficiency for each air pollutant.

42. Manufacturer's Guaranteed Control Efficiency for each air pollutant.

95% minimum control efficiency

43. Describe all operating ranges and maintenance procedures required by Manufacturer to maintain warranty.

Attachment M
Air Pollution Control Device Sheet
(OTHER COLLECTORS)

Control Device ID No. (must match Emission Units Table): **De-NOx**

Equipment Information

1. Manufacturer: Model No.	2. Control Device Name: **De-NOx System associated with Melting Furnace (IMF01)** Type: **Selective Non-Catalytic Reduction (SNCR) by Ammonia Injection**
3. Provide diagram(s) of unit describing capture system with duct arrangement and size of duct, air volume, capacity, horsepower of movers. If applicable, state hood face velocity and hood collection efficiency.	
4. On a separate sheet(s) supply all data and calculations used in selecting or designing this collection device.	
5. Provide a scale diagram of the control device showing internal construction.	
6. Submit a schematic and diagram with dimensions and flow rates.	
7. Guaranteed minimum collection efficiency for each pollutant collected:	
8. Attached efficiency curve and/or other efficiency information.	
9. Design inlet volume: SCFM	10. Capacity:
11. Indicate the liquid flow rate and describe equipment provided to measure pressure drop and flow rate, if any.	
12. Attach any additional data including auxiliary equipment and operation details to thoroughly evaluate the control equipment.	
13. Description of method of handling the collected material(s) for reuse of disposal.	

Gas Stream Characteristics

14. Are halogenated organics present? ☐ Yes ☒ No
Are particulates present? ☒ Yes ☐ No
Are metals present? ☐ Yes ☒ No

15. Inlet Emission stream parameters:	Maximum	Typical
Pressure (mmHg):		
Heat Content (BTU/scf):		
Oxygen Content (%):		
Moisture Content (%):		
Relative Humidity (%):		

16. Type of pollutant(s) controlled: ☐ Particulate (type):	☐ SO_x	☐ Odor ☒ Other - **NOx**
17. Inlet gas velocity: ft/sec		18. Pollutant specific gravity:
19. Gas flow into the collector: ACF @ °F and PSIA		20. Gas stream temperature: Inlet: °F Outlet: °F
21. Gas flow rate: Design Maximum: ACFM Average Expected: ACFM		22. Particulate Grain Loading in grains/scf: Inlet: Outlet:

23. Emission rate of each pollutant (specify) into and out of collector:

Pollutant	IN Pollutant		Emission Capture Efficiency %	OUT Pollutant		Control Efficiency %
	lb/hr	grains/acf		lb/hr	grains/acf	
NOx				**37.37**		**50%**

24. Dimensions of stack: Height **213.25** ft. Diameter **3.12** ft.

25. Supply a curve showing proposed collection efficiency versus gas volume from 25 to 130 percent of design rating of collector.

Particulate Distribution

26. Complete the table:	Particle Size Distribution at Inlet to Collector	Fraction Efficiency of Collector
Particulate Size Range (microns)	**Weight % for Size Range**	**Weight % for Size Range**
0 – 2		
2 – 4		
4 – 6		
6 – 8		
8 – 10		
10 – 12		
12 – 16		
16 – 20		
20 – 30		
30 – 40		
40 – 50		
50 – 60		
60 – 70		
70 – 80		
80 – 90		
90 – 100		
>100		

27. Describe any air pollution control device inlet and outlet gas conditioning processes (e.g., gas cooling, gas reheating, gas humidification):

28. Describe the collection material disposal system:

29. Have you included ***Other Collectores Control Device*** in the Emissions Points Data Summary Sheet?

30. **Proposed Monitoring, Recordkeeping, Reporting, and Testing**
Please propose monitoring, recordkeeping, and reporting in order to demonstrate compliance with the proposed operating parameters. Please propose testing in order to demonstrate compliance with the proposed emissions limits.

MONITORING: **See proposed monitoring plan in Attachment O.**	RECORDKEEPING: **See proposed recordkeeping plan in Attachment O.**
REPORTING: **See proposed reporting plan in Attachment O.**	TESTING: **See proposed testing plan in Attachment O.**

MONITORING:	Please list and describe the process parameters and ranges that are proposed to be monitored in order to demonstrate compliance with the operation of this process equipment or air control device.
RECORDKEEPING:	Please describe the proposed recordkeeping that will accompany the monitoring.
REPORTING:	Please describe any proposed emissions testing for this process equipment on air pollution control device.
TESTING:	Please describe any proposed emissions testing for this process equipment on air pollution control device.

31. Manufacturer's Guaranteed Control Efficiency for each air pollutant.

32. Manufacturer's Guaranteed Control Efficiency for each air pollutant.

33. Describe all operating ranges and maintenance procedures required by Manufacturer to maintain warranty.

Attachment M
Air Pollution Control Device Sheet
(OTHER COLLECTORS)

Control Device ID No. (must match Emission Units Table): **De-SOx**

Equipment Information

1. Manufacturer: **TBD** Model No.	2. Control Device Name: **De-SOx Unit associated with Melting Furnace Baghouse (IMF01-BH)** Type: **Sorbent Injection System**
3. Provide diagram(s) of unit describing capture system with duct arrangement and size of duct, air volume, capacity, horsepower of movers. If applicable, state hood face velocity and hood collection efficiency.	
4. On a separate sheet(s) supply all data and calculations used in selecting or designing this collection device.	
5. Provide a scale diagram of the control device showing internal construction.	
6. Submit a schematic and diagram with dimensions and flow rates.	
7. Guaranteed minimum collection efficiency for each pollutant collected:	
8. Attached efficiency curve and/or other efficiency information.	
9. Design inlet volume: **21,413.73** SCFM	10. Capacity:
11. Indicate the liquid flow rate and describe equipment provided to measure pressure drop and flow rate, if any.	
12. Attach any additional data including auxiliary equipment and operation details to thoroughly evaluate the control equipment.	
13. Description of method of handling the collected material(s) for reuse of disposal.	

Gas Stream Characteristics

14. Are halogenated organics present?	☐ Yes	☒ No
Are particulates present?	☒ Yes	☐ No
Are metals present?	☐ Yes	☒ No

15. Inlet Emission stream parameters:	**Maximum**	**Typical**
Pressure (mmHg):		
Heat Content (BTU/scf):		
Oxygen Content (%):		
Moisture Content (%):		
Relative Humidity (%):		

16. Type of pollutant(s) controlled: ☐ Particulate (type):	☒ SO_x	☐ Odor ☒ Other – **H_2SO_4, HF, HCl**
17. Inlet gas velocity: ft/sec		18. Pollutant specific gravity:
19. Gas flow into the collector: **21,413.73** ACF @ **301.73 °F** and PSIA		20. Gas stream temperature: Inlet: **301.73** °F Outlet: **301.73** °F
21. Gas flow rate: Design Maximum: **21,413.73** ACFM Average Expected: ACFM		22. Particulate Grain Loading in grains/scf: Inlet: Outlet:

23. Emission rate of each pollutant (specify) into and out of collector:

Pollutant	IN Pollutant		Emission Capture Efficiency %	OUT Pollutant		Control Efficiency %
	lb/hr	grains/acf		lb/hr	grains/acf	
SO_2				33.63		>80%
H_2SO_4				3.74		>80%
HF				0.37		>80%
HCl				0.29		>80%

24. Dimensions of stack: Height **213.25** ft. Diameter **3.12** ft.

25. Supply a curve showing proposed collection efficiency versus gas volume from 25 to 130 percent of design rating of collector.

Particulate Distribution

26. Complete the table:	Particle Size Distribution at Inlet to Collector	Fraction Efficiency of Collector
Particulate Size Range (microns)	**Weight % for Size Range**	**Weight % for Size Range**
0 – 2		
2 – 4		
4 – 6		
6 – 8		
8 – 10		
10 – 12		
12 – 16		
16 – 20		
20 – 30		
30 – 40		
40 – 50		
50 – 60		
60 – 70		
70 – 80		
80 – 90		
90 – 100		
>100		

27. Describe any air pollution control device inlet and outlet gas conditioning processes (e.g., gas cooling, gas reheating, gas humidification):

28. Describe the collection material disposal system:

Spent sorbent is sent to the Spent Sorbent Silo (IMF09) before being trucked off-site for disposal.

29. Have you included ***Other Collectors Control Device*** in the Emissions Points Data Summary Sheet? **Yes**

30. **Proposed Monitoring, Recordkeeping, Reporting, and Testing**
Please propose monitoring, recordkeeping, and reporting in order to demonstrate compliance with the proposed operating parameters. Please propose testing in order to demonstrate compliance with the proposed emissions limits.

MONITORING: **See proposed monitoring plan in Attachment O.**	RECORDKEEPING: **See proposed recordkeeping plan in Attachment O.**
REPORTING: **See proposed reporting plan in Attachment O.**	TESTING: **See proposed testing plan in Attachment O.**

MONITORING:	Please list and describe the process parameters and ranges that are proposed to be monitored in order to demonstrate compliance with the operation of this process equipment or air control device.
RECORDKEEPING:	Please describe the proposed recordkeeping that will accompany the monitoring.
REPORTING:	Please describe any proposed emissions testing for this process equipment on air pollution control device.
TESTING:	Please describe any proposed emissions testing for this process equipment on air pollution control device.

31. Manufacturer's Guaranteed Control Efficiency for each air pollutant.

SO_2 – >80% efficiency, meets BACT of 33.63 lb/hr
H_2SO_4 – >80% efficiency, meets BACT of 3.74 lb/hr

32. Manufacturer's Guaranteed Control Efficiency for each air pollutant.

33. Describe all operating ranges and maintenance procedures required by Manufacturer to maintain warranty.

Attachment M
Air Pollution Control Device Sheet
(ELECTROSTATIC PRECIPITATOR)

Control Device ID No. (must match Emission Units Table): **HE01**

Equipment Information

1. Manufacturer: **TBD** Model No.	2. Type: ☒ Wet ☐ Dry ☐ Single-stage ☐ Two-stage
3. Provide diagram(s) of unit describing capture system with duct arrangement and size of duct, air volume, capacity, horsepower of movers. If applicable, state hood face velocity and hood collection efficiency.	
4. Guaranteed collection efficiency: Minimum:	5. Type of particulate controlled: **PM_{10} and $PM_{2.5}$**

Gas Stream Characteristics

6. Particulate which will be emitted from outlet of precipitator: **Total PM_{10} – 21.21 lb/hr** **Total $PM_{2.5}$ – 19.22 lb/hr**	
7. Gas flow rate into collector: Design maximum: **459,222 acfm at 183.2 °F** Average expected: **369,529 acfm at 183.2 °F**	8. Gas Stream Temperature: Inlet: **183.2** °F Outlet: **98.6** °F
9. Pressure Drop: **3 in. H_2O (750 Pa)**	10. Particulate Grain Loading in grains/scf.: Inlet: °F Outlet: °F
11. Gas velocity through precipitator: **49.90** ft/sec	
12. Percent moisture of gas stream: Maximum: % Typical: %	13. Water vapor content of effluent stream: **0.09** lb water/lb dry air
14. Density of gas stream: lb/ACF	15. Viscosity of gas stream: lb/sec-ft
16. Fan requirements: **TBD** HP ft^3/min	17. Gas stream residence time or treatment time: sec.
18. Particulate to be collected: Type: Resistivity: ohm-cm Specific Gravity:	19. Value of drift velocity, w, used for a particle with a diameter of one micron: ft/sec
20. What equation was used to determine theoretical efficiency? Write the equation below:	
21. Dimensions of stack: Diameter **12.96** ft Height **213.25** ft	

Precipitator Characteristics

22. Collecting electrodes:
    Type of collecting electrodes:
    - ☐ Vee plate
    - ☐ Opzel plate
    - ☐ Other, specify

    Number:
    Vertical height: ft
    Total area of active collecting surface: ft^2

23. Discharge electrodes:
    Type of discharge electrodes:
    Number:
    Effective length of each electrode: ft
    Wire spacing in direction of gas flow: ft

24. Spacing between collecting and discharge electrodes: ft

25. Collecting rappers:
    Type of rappers:
    Number of rappers:
    Time interval between raps of the same rappers: sec
    Total time for one complete rapping cycle: sec

26. Discharge rappers:
    Type of rappers:
    Number of rappers:
    Time interval between raps of the same rappers: sec
    Total time for one complete rapping cycle: sec

27. Plate cleaning system: ☐ Rapping ☐ Water spray washing ☐ Other, specify

28. Sectionalization and power requirements:

Number of fields:
Number of bus sections:
Total:
In series:
In parallel:
Number of gas passages:
Cross-sectional area per gas passages: ft^2
Applied voltage (peak): volts

Current density on wires: mA/ft
Total power requirements: kW
Field strengths:
Charging: KV/in
Collecting: KV/in
Sparking Voltage: volts
Sparking rate (optimum): no./sec
Proposed power supply:
Type rectifiers:
Number of Transformers:

How would the loss of one field affect the performance of the precipitator?

Particle Distribution

29. Complete the table:	Particle Size Distribution at Inlet to Collector	Fraction Efficiency of Collector
Particulate Size Range (microns)	**Weight % for Size Range**	**Weight % for Size Range**
0 – 2		
2 – 4		
4 – 6		
6 – 8		
8 – 10		
10 – 12		
12 – 16		
16 – 20		

20 – 30		
30 – 40		
40 – 50		
50 – 60		
60 – 70		
70 – 80		
80 – 90		
90 – 100		
>100		

30. Supply curve showing the expected collection efficiency versus content of coal burned over a range of 0.4% to 5% sulfur (if applicable).

31. Supply curve showing the collection efficiency versus gas volume from 90 to 130 percent of design rating of precipitator.

32. Describe any air pollution control device inlet and outlet gas conditioning processes (e.g., gas cooling, gas reheating, gas humidification):

33. Describe the collection material disposal system:

34. Have you included ***Electrostatic Precipitator Control Device*** in the Emissions Points Data Summary Sheet? **Yes**

35. **Proposed Monitoring, Recordkeeping, Reporting, and Testing**
Please propose monitoring, recordkeeping, and reporting in order to demonstrate compliance with the proposed operating parameters. Please propose testing in order to demonstrate compliance with the proposed emissions limits.

MONITORING: **See proposed monitoring plan in Attachment O.**	RECORDKEEPING: **See proposed recordkeeping plan in Attachment O.**
REPORTING: **See proposed reporting plan in Attachment O.**	TESTING: **See proposed testing plan in Attachment O.**

MONITORING:	Please list and describe the process parameters and ranges that are proposed to be monitored in order to demonstrate compliance with the operation of this process equipment or air control device.
RECORDKEEPING:	Please describe the proposed recordkeeping that will accompany the monitoring.
REPORTING:	Please describe any proposed emissions testing for this process equipment on air pollution control device.
TESTING:	Please describe any proposed emissions testing for this process equipment on air pollution control device.

36. Manufacturer's Guaranteed Capture Efficiency for each air pollutant.

37. Manufacturer's Guaranteed Control Efficiency for each air pollutant. **PM_{10} – 90% efficiency** **$PM_{2.5}$ – 90% efficiency**
38. Describe all operating ranges and maintenance procedures required by Manufacturer to maintain warranty.

Attachment M
Air Pollution Control Device Sheet
(OTHER COLLECTORS)

Control Device ID No. (must match Emission Units Table): **IMF21-FF**

Equipment Information

1. Manufacturer: **TBD** Model No.	2. Control Device Name: **Charging Building Vacuum Cleaning Filter** Type: **Fabric Filter**
3. Provide diagram(s) of unit describing capture system with duct arrangement and size of duct, air volume, capacity, horsepower of movers. If applicable, state hood face velocity and hood collection efficiency.	
4. On a separate sheet(s) supply all data and calculations used in selecting or designing this collection device.	
5. Provide a scale diagram of the control device showing internal construction.	
6. Submit a schematic and diagram with dimensions and flow rates.	
7. Guaranteed minimum collection efficiency for each pollutant collected:	
8. Attached efficiency curve and/or other efficiency information.	
9. Design inlet volume: **315.8** SCFM	10. Capacity: **TBD**
11. Indicate the liquid flow rate and describe equipment provided to measure pressure drop and flow rate, if any. **N/A**	
12. Attach any additional data including auxiliary equipment and operation details to thoroughly evaluate the control equipment.	
13. Description of method of handling the collected material(s) for reuse of disposal. **N/A**	

Gas Stream Characteristics

14. Are halogenated organics present? ☐ Yes ☒ No
Are particulates present? ☒ Yes ☐ No
Are metals present? ☐ Yes ☒ No

15. Inlet Emission stream parameters:	**Maximum**	**Typical**
Pressure (mmHg):		
Heat Content (BTU/scf):		
Oxygen Content (%):		
Moisture Content (%):		
Relative Humidity (%):		

16. Type of pollutant(s) controlled: ☐ SO_x ☒ Particulate (type): **PM_{10} and $PM_{2.5}$**	☐ Odor ☐ Other
17. Inlet gas velocity: **29.52** ft/sec	18. Pollutant specific gravity:
19. Gas flow into the collector: **315.8** ACF @ **103.73** °F and PSIA	20. Gas stream temperature: Inlet: **103.73** °F Outlet: **103.73** °F
21. Gas flow rate: Design Maximum: **315.8** ACFM Average Expected: ACFM	22. Particulate Grain Loading in grains/scf: Inlet: Outlet: **PM_{10} – 0.002 gr/scf** **$PM_{2.5}$ – 0.001 gr/scf**

23. Emission rate of each pollutant (specify) into and out of collector:

Pollutant	IN Pollutant lb/hr	IN Pollutant grains/acf	Emission Capture Efficiency %	OUT Pollutant lb/hr	OUT Pollutant grains/acf	Control Efficiency %
PM_{10}				**0.01**		**>99%**
$PM_{2.5}$				**<0.01**		**>99%**

24. Dimensions of stack: Height **9.84** ft. Diameter **0.49** ft.

25. Supply a curve showing proposed collection efficiency versus gas volume from 25 to 130 percent of design rating of collector.

Particulate Distribution

26. Complete the table:

Particulate Size Range (microns)	**Particle Size Distribution at Inlet to Collector** – **Weight % for Size Range**	**Fraction Efficiency of Collector** – **Weight % for Size Range**
0 – 2		
2 – 4		
4 – 6		
6 – 8		
8 – 10		
10 – 12		
12 – 16		
16 – 20		
20 – 30		
30 – 40		
40 – 50		
50 – 60		
60 – 70		
70 – 80		
80 – 90		
90 – 100		
>100		

27. Describe any air pollution control device inlet and outlet gas conditioning processes (e.g., gas cooling, gas reheating, gas humidification):

28. Describe the collection material disposal system:

29. Have you included ***Other Collectors Control Device*** in the Emissions Points Data Summary Sheet? **Yes**

30. **Proposed Monitoring, Recordkeeping, Reporting, and Testing**
Please propose monitoring, recordkeeping, and reporting in order to demonstrate compliance with the proposed operating parameters. Please propose testing in order to demonstrate compliance with the proposed emissions limits.

MONITORING:	RECORDKEEPING:
See proposed monitoring plan in Attachment O.	**See proposed recordkeeping plan in Attachment O.**
REPORTING:	TESTING:
See proposed reporting plan in Attachment O.	**See proposed testing plan in Attachment O.**

MONITORING:	Please list and describe the process parameters and ranges that are proposed to be monitored in order to demonstrate compliance with the operation of this process equipment or air control device.
RECORDKEEPING:	Please describe the proposed recordkeeping that will accompany the monitoring.
REPORTING:	Please describe any proposed emissions testing for this process equipment on air pollution control device.
TESTING:	Please describe any proposed emissions testing for this process equipment on air pollution control device.

31. Manufacturer's Guaranteed Control Efficiency for each air pollutant.

PM_{10} – > 99% efficiency typical
$PM_{2.5}$ – >99% efficiency typical

32. Manufacturer's Guaranteed Control Efficiency for each air pollutant.

33. Describe all operating ranges and maintenance procedures required by Manufacturer to maintain warranty.

Attachment M
Air Pollution Control Device Sheet
(OTHER COLLECTORS)

Control Device ID No. (must match Emission Units Table): **IMF04-FF**

Equipment Information

1. Manufacturer: **TBD** Model No.	2. Control Device Name: **Coal Conveyor Transition Point Filter (B231 to B235)** Type: **Fabric Filter**
3. Provide diagram(s) of unit describing capture system with duct arrangement and size of duct, air volume, capacity, horsepower of movers. If applicable, state hood face velocity and hood collection efficiency.	
4. On a separate sheet(s) supply all data and calculations used in selecting or designing this collection device.	
5. Provide a scale diagram of the control device showing internal construction.	
6. Submit a schematic and diagram with dimensions and flow rates.	
7. Guaranteed minimum collection efficiency for each pollutant collected:	
8. Attached efficiency curve and/or other efficiency information.	
9. Design inlet volume: **1,137.0** SCFM	10. Capacity: **TBD**
11. Indicate the liquid flow rate and describe equipment provided to measure pressure drop and flow rate, if any. **NA**	
12. Attach any additional data including auxiliary equipment and operation details to thoroughly evaluate the control equipment.	
13. Description of method of handling the collected material(s) for reuse of disposal.	

Gas Stream Characteristics

14. Are halogenated organics present? ☐ Yes ☒ No
Are particulates present? ☒ Yes ☐ No
Are metals present? ☐ Yes ☒ No

15. Inlet Emission stream parameters:	Maximum	Typical
Pressure (mmHg):		
Heat Content (BTU/scf):		
Oxygen Content (%):		
Moisture Content (%):		
Relative Humidity (%):		

16. Type of pollutant(s) controlled: ☒ Particulate (type): **PM_{10} and $PM_{2.5}$**	☐ SO_x	☐ Odor ☐ Other
17. Inlet gas velocity: **59.06** ft/sec		18. Pollutant specific gravity:
19. Gas flow into the collector: **1,137.0** ACF @ **67.73** °F and PSIA		20. Gas stream temperature: Inlet: **67.73** °F Outlet: **67.73** °F
21. Gas flow rate: Design Maximum: **1,137.0** ACFM Average Expected: ACFM		22. Particulate Grain Loading in grains/scf: Inlet: Outlet: **PM_{10} – 0.002 gr/scf** **$PM_{2.5}$ – 0.001 gr/scf**

23. Emission rate of each pollutant (specify) into and out of collector:

Pollutant	IN Pollutant		Emission Capture Efficiency %	OUT Pollutant		Control Efficiency %
	lb/hr	grains/acf		lb/hr	grains/acf	
PM_{10}				**0.02**		**> 99%**
$PM_{2.5}$				**<0.01**		**> 99%**

24. Dimensions of stack: Height **39.37** ft. Diameter **0.62** ft.

25. Supply a curve showing proposed collection efficiency versus gas volume from 25 to 130 percent of design rating of collector.

Particulate Distribution

26. Complete the table:	**Particle Size Distribution at Inlet to Collector**	**Fraction Efficiency of Collector**
Particulate Size Range (microns)	**Weight % for Size Range**	**Weight % for Size Range**
0 – 2		
2 – 4		
4 – 6		
6 – 8		
8 – 10		
10 – 12		
12 – 16		
16 – 20		
20 – 30		
30 – 40		
40 – 50		
50 – 60		
60 – 70		
70 – 80		
80 – 90		
90 – 100		
>100		

27. Describe any air pollution control device inlet and outlet gas conditioning processes (e.g., gas cooling, gas reheating, gas humidification):

NA

28. Describe the collection material disposal system:

29. Have you included ***Other Collectors Control Device*** in the Emissions Points Data Summary Sheet? **Yes**

30. **Proposed Monitoring, Recordkeeping, Reporting, and Testing**
Please propose monitoring, recordkeeping, and reporting in order to demonstrate compliance with the proposed operating parameters. Please propose testing in order to demonstrate compliance with the proposed emissions limits.

MONITORING:	RECORDKEEPING:
See proposed monitoring plan in Attachment O.	**See proposed recordkeeping plan in Attachment O.**
REPORTING:	TESTING:
See proposed reporting plan in Attachment O.	**See proposed testing plan in Attachment O.**

MONITORING:	Please list and describe the process parameters and ranges that are proposed to be monitored in order to demonstrate compliance with the operation of this process equipment or air control device.
RECORDKEEPING:	Please describe the proposed recordkeeping that will accompany the monitoring.
REPORTING:	Please describe any proposed emissions testing for this process equipment on air pollution control device.
TESTING:	Please describe any proposed emissions testing for this process equipment on air pollution control device.

31. Manufacturer's Guaranteed Control Efficiency for each air pollutant.

PM_{10} – > 99% efficiency typical
$PM_{2.5}$ – > 99% efficiency typical

32. Manufacturer's Guaranteed Control Efficiency for each air pollutant.

33. Describe all operating ranges and maintenance procedures required by Manufacturer to maintain warranty.

Attachment M
Air Pollution Control Device Sheet
(OTHER COLLECTORS)

Control Device ID No. (must match Emission Units Table): **IMF25-FF**

Equipment Information

1. Manufacturer: **TBD** Model No.	2. Control Device Name: **Coal Feed Tank Filter** Type: **Fabric Filter**
3. Provide diagram(s) of unit describing capture system with duct arrangement and size of duct, air volume, capacity, horsepower of movers. If applicable, state hood face velocity and hood collection efficiency.	
4. On a separate sheet(s) supply all data and calculations used in selecting or designing this collection device.	
5. Provide a scale diagram of the control device showing internal construction.	
6. Submit a schematic and diagram with dimensions and flow rates.	
7. Guaranteed minimum collection efficiency for each pollutant collected:	
8. Attached efficiency curve and/or other efficiency information.	
9. Design inlet volume: **758.23** SCFM	10. Capacity: **TBD**
11. Indicate the liquid flow rate and describe equipment provided to measure pressure drop and flow rate, if any. **N/A**	
12. Attach any additional data including auxiliary equipment and operation details to thoroughly evaluate the control equipment.	
13. Description of method of handling the collected material(s) for reuse of disposal. **N/A**	

Gas Stream Characteristics

14. Are halogenated organics present? ☐ Yes ☒ No
Are particulates present? ☒ Yes ☐ No
Are metals present? ☐ Yes ☒ No

15. Inlet Emission stream parameters:	Maximum	Typical
Pressure (mmHg):		
Heat Content (BTU/scf):		
Oxygen Content (%):		
Moisture Content (%):		
Relative Humidity (%):		

16. Type of pollutant(s) controlled: ☐ SO_x ☒ Particulate (type): **PM_{10} and $PM_{2.5}$**	☐ Odor ☐ Other	
17. Inlet gas velocity: **66.44** ft/sec	18. Pollutant specific gravity:	
19. Gas flow into the collector: **758.23** ACF @ **67.73** °F and PSIA	20. Gas stream temperature: Inlet: **67.73** °F Outlet: **67.73** °F	
21. Gas flow rate: Design Maximum: **758.23** ACFM Average Expected: ACFM	22. Particulate Grain Loading in grains/scf: Inlet: Outlet: **PM_{10} – 0.002 gr/scf** **$PM_{2.5}$ – 0.001 gr/scf**	

23. Emission rate of each pollutant (specify) into and out of collector:

Pollutant	IN Pollutant		Emission Capture Efficiency %	OUT Pollutant		Control Efficiency %
	lb/hr	grains/acf		lb/hr	grains/acf	
PM_{10}				**0.01**		**>99%**
$PM_{2.5}$				**<0.01**		**>99%**

24. Dimensions of stack: Height **72.18** ft. Diameter **0.49** ft.

25. Supply a curve showing proposed collection efficiency versus gas volume from 25 to 130 percent of design rating of collector.

Particulate Distribution

26. Complete the table:

Particulate Size Range (microns)	Particle Size Distribution at Inlet to Collector Weight % for Size Range	Fraction Efficiency of Collector Weight % for Size Range
0 – 2		
2 – 4		
4 – 6		
6 – 8		
8 – 10		
10 – 12		
12 – 16		
16 – 20		
20 – 30		
30 – 40		
40 – 50		
50 – 60		
60 – 70		
70 – 80		
80 – 90		
90 – 100		
>100		

27. Describe any air pollution control device inlet and outlet gas conditioning processes (e.g., gas cooling, gas reheating, gas humidification):

28. Describe the collection material disposal system:

29. Have you included ***Other Collectors Control Device*** in the Emissions Points Data Summary Sheet? **Yes**

30. **Proposed Monitoring, Recordkeeping, Reporting, and Testing**
Please propose monitoring, recordkeeping, and reporting in order to demonstrate compliance with the proposed operating parameters. Please propose testing in order to demonstrate compliance with the proposed emissions limits.

MONITORING: **See proposed monitoring plan in Attachment O.**	RECORDKEEPING: **See proposed recordkeeping plan in Attachment O.**
REPORTING: **See proposed reporting plan in Attachment O.**	TESTING: **See proposed testing plan in Attachment O.**

MONITORING:	Please list and describe the process parameters and ranges that are proposed to be monitored in order to demonstrate compliance with the operation of this process equipment or air control device.
RECORDKEEPING:	Please describe the proposed recordkeeping that will accompany the monitoring.
REPORTING:	Please describe any proposed emissions testing for this process equipment on air pollution control device.
TESTING:	Please describe any proposed emissions testing for this process equipment on air pollution control device.

31. Manufacturer's Guaranteed Control Efficiency for each air pollutant.

PM_{10} – >99% efficiency typical
$PM_{2.5}$ – >99% efficiency typical

32. Manufacturer's Guaranteed Control Efficiency for each air pollutant.

33. Describe all operating ranges and maintenance procedures required by Manufacturer to maintain warranty.

Attachment M
Air Pollution Control Device Sheet
(OTHER COLLECTORS)

Control Device ID No. (must match Emission Units Table): **IMF13-FF**

Equipment Information

1. Manufacturer: **TBD** Model No.	2. Control Device Name: **Coal Conveyor Transition Point (B231 to B235)** Type: **Fabric Filter**
3. Provide diagram(s) of unit describing capture system with duct arrangement and size of duct, air volume, capacity, horsepower of movers. If applicable, state hood face velocity and hood collection efficiency.	
4. On a separate sheet(s) supply all data and calculations used in selecting or designing this collection device.	
5. Provide a scale diagram of the control device showing internal construction.	
6. Submit a schematic and diagram with dimensions and flow rates.	
7. Guaranteed minimum collection efficiency for each pollutant collected:	
8. Attached efficiency curve and/or other efficiency information.	
9. Design inlet volume: **1,137.0** SCFM	10. Capacity: **TBD**
11. Indicate the liquid flow rate and describe equipment provided to measure pressure drop and flow rate, if any. **NA**	
12. Attach any additional data including auxiliary equipment and operation details to thoroughly evaluate the control equipment.	
13. Description of method of handling the collected material(s) for reuse of disposal. **NA**	

Gas Stream Characteristics

14. Are halogenated organics present? ☐ Yes ☒ No
Are particulates present? ☒ Yes ☐ No
Are metals present? ☐ Yes ☒ No

15. Inlet Emission stream parameters:	**Maximum**	**Typical**
Pressure (mmHg):		
Heat Content (BTU/scf):		
Oxygen Content (%):		
Moisture Content (%):		
Relative Humidity (%):		

16. Type of pollutant(s) controlled: ☐ SO_x ☒ Particulate (type): **PM_{10} and $PM_{2.5}$**	☐ Odor ☐ Other	
17. Inlet gas velocity: **59.06** ft/sec	18. Pollutant specific gravity:	
19. Gas flow into the collector: **1,137.0** ACF @ **67.73** °F and PSIA	20. Gas stream temperature: Inlet: **67.73** °F Outlet: **67.73** °F	
21. Gas flow rate: Design Maximum: **1,137.0** ACFM Average Expected: ACFM	22. Particulate Grain Loading in grains/scf: Inlet: Outlet: **PM_{10} – 0.002 gr/scf** **$PM_{2.5}$ – 0.001 gr/scf**	

23. Emission rate of each pollutant (specify) into and out of collector:

Pollutant	IN Pollutant lb/hr	IN Pollutant grains/acf	Emission Capture Efficiency %	OUT Pollutant lb/hr	OUT Pollutant grains/acf	Control Efficiency %
PM_{10}				**0.02**		**> 99%**
$PM_{2.5}$				**<0.01**		**> 99%**

24. Dimensions of stack: Height **6.56** ft. Diameter **0.62** ft.

25. Supply a curve showing proposed collection efficiency versus gas volume from 25 to 130 percent of design rating of collector.

Particulate Distribution

26. Complete the table:

Particulate Size Range (microns)	**Particle Size Distribution at Inlet to Collector** Weight % for Size Range	**Fraction Efficiency of Collector** Weight % for Size Range
0 – 2		
2 – 4		
4 – 6		
6 – 8		
8 – 10		
10 – 12		
12 – 16		
16 – 20		
20 – 30		
30 – 40		
40 – 50		
50 – 60		
60 – 70		
70 – 80		
80 – 90		
90 – 100		
>100		

27. Describe any air pollution control device inlet and outlet gas conditioning processes (e.g., gas cooling, gas reheating, gas humidification): **NA**	
28. Describe the collection material disposal system:	
29. Have you included ***Other Collectors Control Device*** in the Emissions Points Data Summary Sheet? **Yes**	
30. **Proposed Monitoring, Recordkeeping, Reporting, and Testing** Please propose monitoring, recordkeeping, and reporting in order to demonstrate compliance with the proposed operating parameters. Please propose testing in order to demonstrate compliance with the proposed emissions limits.	
MONITORING: **See proposed monitoring plan in Attachment O.**	RECORDKEEPING: **See proposed recordkeeping plan in Attachment O.**
REPORTING: **See proposed reporting plan in Attachment O.**	TESTING: **See proposed testing plan in Attachment O.**
MONITORING:	Please list and describe the process parameters and ranges that are proposed to be monitored in order to demonstrate compliance with the operation of this process equipment or air control device.
RECORDKEEPING:	Please describe the proposed recordkeeping that will accompany the monitoring.
REPORTING:	Please describe any proposed emissions testing for this process equipment on air pollution control device.
TESTING:	Please describe any proposed emissions testing for this process equipment on air pollution control device.
31. Manufacturer's Guaranteed Control Efficiency for each air pollutant. **PM_{10} – > 99% efficiency typical** **$PM_{2.5}$ – > 99% efficiency typical**	
32. Manufacturer's Guaranteed Control Efficiency for each air pollutant.	
33. Describe all operating ranges and maintenance procedures required by Manufacturer to maintain warranty.	

Attachment M
Air Pollution Control Device Sheet
(OTHER COLLECTORS)

Control Device ID No. (must match Emission Units Table): **IMF06-FF**

Equipment Information

1. Manufacturer: Model No.	2. Control Device Name: **Coal Milling De-dusting Filter** Type: **Fabric Filter**
3. Provide diagram(s) of unit describing capture system with duct arrangement and size of duct, air volume, capacity, horsepower of movers. If applicable, state hood face velocity and hood collection efficiency.	
4. On a separate sheet(s) supply all data and calculations used in selecting or designing this collection device.	
5. Provide a scale diagram of the control device showing internal construction.	
6. Submit a schematic and diagram with dimensions and flow rates.	
7. Guaranteed minimum collection efficiency for each pollutant collected:	
8. Attached efficiency curve and/or other efficiency information.	
9. Design inlet volume: **6,316.73** SCFM	10. Capacity: **TBD**
11. Indicate the liquid flow rate and describe equipment provided to measure pressure drop and flow rate, if any. **N/A**	
12. Attach any additional data including auxiliary equipment and operation details to thoroughly evaluate the control equipment.	
13. Description of method of handling the collected material(s) for reuse of disposal. **N/A**	

Gas Stream Characteristics

14. Are halogenated organics present?	☐ Yes	☒ No
Are particulates present?	☒ Yes	☐ No
Are metals present?	☐ Yes	☒ No

15. Inlet Emission stream parameters:	**Maximum**	**Typical**
Pressure (mmHg):		
Heat Content (BTU/scf):		
Oxygen Content (%):		
Moisture Content (%):		
Relative Humidity (%):		

16. Type of pollutant(s) controlled: ☐ SO_x ☒ Particulate (type): **PM_{10} and $PM_{2.5}$**	☐ Odor ☐ Other
17. Inlet gas velocity: **65.62** ft/sec	18. Pollutant specific gravity:
19. Gas flow into the collector: **6,316.73** ACF @ **67.73** °F and PSIA	20. Gas stream temperature: Inlet: **67.73** °F Outlet: **67.73** °F
21. Gas flow rate: Design Maximum: **6,316.73** ACFM Average Expected: ACFM	22. Particulate Grain Loading in grains/scf: Inlet: Outlet: **PM_{10} – 0.004 gr/scf** **$PM_{2.5}$ – 0.002 gr/scf**

23. Emission rate of each pollutant (specify) into and out of collector:

Pollutant	IN Pollutant		Emission Capture Efficiency %	OUT Pollutant		Control Efficiency %
	lb/hr	grains/acf		lb/hr	grains/acf	
PM_{10}				**0.22**		**>99%**
$PM_{2.5}$				**0.11**		**>99%**

24. Dimensions of stack: Height **65.62** ft. Diameter **1.44** ft.

25. Supply a curve showing proposed collection efficiency versus gas volume from 25 to 130 percent of design rating of collector.

Particulate Distribution

26. Complete the table:	**Particle Size Distribution at Inlet to Collector**	**Fraction Efficiency of Collector**
Particulate Size Range (microns)	**Weight % for Size Range**	**Weight % for Size Range**
0 – 2		
2 – 4		
4 – 6		
6 – 8		
8 – 10		
10 – 12		
12 – 16		
16 – 20		
20 – 30		
30 – 40		
40 – 50		
50 – 60		
60 – 70		
70 – 80		
80 – 90		
90 – 100		
>100		

27. Describe any air pollution control device inlet and outlet gas conditioning processes (e.g., gas cooling, gas reheating, gas humidification):

28. Describe the collection material disposal system:

29. Have you included ***Other Collectors Control Device*** in the Emissions Points Data Summary Sheet? **Yes**

30. **Proposed Monitoring, Recordkeeping, Reporting, and Testing**
Please propose monitoring, recordkeeping, and reporting in order to demonstrate compliance with the proposed operating parameters. Please propose testing in order to demonstrate compliance with the proposed emissions limits.

MONITORING: **See proposed monitoring plan in Attachment O.**	RECORDKEEPING: **See proposed recordkeeping plan in Attachment O.**
REPORTING: **See proposed reporting plan in Attachment O.**	TESTING: **See proposed testing plan in Attachment O.**

MONITORING:	Please list and describe the process parameters and ranges that are proposed to be monitored in order to demonstrate compliance with the operation of this process equipment or air control device.
RECORDKEEPING:	Please describe the proposed recordkeeping that will accompany the monitoring.
REPORTING:	Please describe any proposed emissions testing for this process equipment on air pollution control device.
TESTING:	Please describe any proposed emissions testing for this process equipment on air pollution control device.

31. Manufacturer's Guaranteed Control Efficiency for each air pollutant.

PM_{10} – >99% efficiency typical
$PM_{2.5}$ – >99% efficiency typical

32. Manufacturer's Guaranteed Control Efficiency for each air pollutant.

33. Describe all operating ranges and maintenance procedures required by Manufacturer to maintain warranty.

Attachment M
Air Pollution Control Device Sheet
(OTHER COLLECTORS)

Control Device ID No. (must match Emission Units Table): **IMF03A-FF, IMF03B-FF, and IMF03C-FF**

Equipment Information

1. Manufacturer: **TBD** Model No.	2. Control Device Name: **Coal Storage Silo Filters** Type: **Fabric Filters**
3. Provide diagram(s) of unit describing capture system with duct arrangement and size of duct, air volume, capacity, horsepower of movers. If applicable, state hood face velocity and hood collection efficiency.	
4. On a separate sheet(s) supply all data and calculations used in selecting or designing this collection device.	
5. Provide a scale diagram of the control device showing internal construction.	
6. Submit a schematic and diagram with dimensions and flow rates.	
7. Guaranteed minimum collection efficiency for each pollutant collected:	
8. Attached efficiency curve and/or other efficiency information.	
9. Design inlet volume: **758.0** SCFM	10. Capacity: **TBD**
11. Indicate the liquid flow rate and describe equipment provided to measure pressure drop and flow rate, if any. **NA**	
12. Attach any additional data including auxiliary equipment and operation details to thoroughly evaluate the control equipment.	
13. Description of method of handling the collected material(s) for reuse of disposal. **NA**	

Gas Stream Characteristics

14. Are halogenated organics present?	☐ Yes	☒ No
Are particulates present?	☒ Yes	☐ No
Are metals present?	☐ Yes	☒ No

15. Inlet Emission stream parameters:	**Maximum**	**Typical**
Pressure (mmHg):		
Heat Content (BTU/scf):		
Oxygen Content (%):		
Moisture Content (%):		
Relative Humidity (%):		

16. Type of pollutant(s) controlled: ☐ SO_x ☐ Odor ☒ Particulate (type): **PM_{10} and $PM_{2.5}$** ☐ Other		
17. Inlet gas velocity: **9.35** ft/sec		18. Pollutant specific gravity:
19. Gas flow into the collector: **758.0** ACF @ **67.73** °F and PSIA		20. Gas stream temperature: Inlet: **67.73** °F Outlet: **67.73** °F
21. Gas flow rate: Design Maximum: **758.0** ACFM Average Expected: ACFM		22. Particulate Grain Loading in grains/scf: Inlet: Outlet: **PM_{10} – 0.002 gr/scf** **$PM_{2.5}$ – 0.001 gr/scf**

23. Emission rate of each pollutant (specify) into and out of collector:

Pollutant	**IN Pollutant**		**Emission Capture Efficiency %**	**OUT Pollutant**		**Control Efficiency %**
	lb/hr	**grains/acf**		**lb/hr**	**grains/acf**	
PM_{10}				**0.01**		**> 99%**
$PM_{2.5}$				**0.01**		**> 99%**

24. Dimensions of stack: Height **72.18** ft. Diameter **1.31** ft.

25. Supply a curve showing proposed collection efficiency versus gas volume from 25 to 130 percent of design rating of collector.

Particulate Distribution

26. Complete the table:	**Particle Size Distribution at Inlet to Collector**	**Fraction Efficiency of Collector**
Particulate Size Range (microns)	**Weight % for Size Range**	**Weight % for Size Range**
0 – 2		
2 – 4		
4 – 6		
6 – 8		
8 – 10		
10 – 12		
12 – 16		
16 – 20		
20 – 30		
30 – 40		
40 – 50		
50 – 60		
60 – 70		
70 – 80		
80 – 90		
90 – 100		
>100		

27. Describe any air pollution control device inlet and outlet gas conditioning processes (e.g., gas cooling, gas reheating, gas humidification): **NA**
28. Describe the collection material disposal system:
29. Have you included ***Other Collectors Control Device*** in the Emissions Points Data Summary Sheet? **Yes**
30. **Proposed Monitoring, Recordkeeping, Reporting, and Testing** Please propose monitoring, recordkeeping, and reporting in order to demonstrate compliance with the proposed operating parameters. Please propose testing in order to demonstrate compliance with the proposed emissions limits.

MONITORING: **See proposed monitoring plan in Attachment O.**	RECORDKEEPING: **See proposed recordkeeping plan in Attachment O.**
REPORTING: **See proposed reporting plan in Attachment O.**	TESTING: **See proposed testing plan in Attachment O.**

MONITORING:	Please list and describe the process parameters and ranges that are proposed to be monitored in order to demonstrate compliance with the operation of this process equipment or air control device.
RECORDKEEPING:	Please describe the proposed recordkeeping that will accompany the monitoring.
REPORTING:	Please describe any proposed emissions testing for this process equipment on air pollution control device.
TESTING:	Please describe any proposed emissions testing for this process equipment on air pollution control device.

31. Manufacturer's Guaranteed Control Efficiency for each air pollutant. **PM_{10} – > 99% efficiency typical** **$PM_{2.5}$ – > 99% efficiency typical**
32. Manufacturer's Guaranteed Control Efficiency for each air pollutant.
33. Describe all operating ranges and maintenance procedures required by Manufacturer to maintain warranty.

Attachment M
Air Pollution Control Device Sheet
(OTHER COLLECTORS)

Control Device ID No. (must match Emission Units Table): **RNFE4-FF**

Equipment Information

1. Manufacturer: **TBD** Model No.	2. Control Device Name: **Drying Oven 1 Filter** Type: **Fabric Filter**
3. Provide diagram(s) of unit describing capture system with duct arrangement and size of duct, air volume, capacity, horsepower of movers. If applicable, state hood face velocity and hood collection efficiency.	
4. On a separate sheet(s) supply all data and calculations used in selecting or designing this collection device.	
5. Provide a scale diagram of the control device showing internal construction.	
6. Submit a schematic and diagram with dimensions and flow rates.	
7. Guaranteed minimum collection efficiency for each pollutant collected:	
8. Attached efficiency curve and/or other efficiency information.	
9. Design inlet volume: **3,158.4** SCFM	10. Capacity: **TBD**
11. Indicate the liquid flow rate and describe equipment provided to measure pressure drop and flow rate, if any.	
12. Attach any additional data including auxiliary equipment and operation details to thoroughly evaluate the control equipment.	
13. Description of method of handling the collected material(s) for reuse of disposal.	

Gas Stream Characteristics

14. Are halogenated organics present? ☐ Yes ☒ No
Are particulates present? ☒ Yes ☐ No
Are metals present? ☐ Yes ☒ No

15. Inlet Emission stream parameters:	Maximum	Typical
Pressure (mmHg):		
Heat Content (BTU/scf):		
Oxygen Content (%):		
Moisture Content (%):		
Relative Humidity (%):		

16. Type of pollutant(s) controlled: ☐ SO_x ☒ Particulate (type): **PM_{10} and $PM_{2.5}$**	☐ Odor ☐ Other	
17. Inlet gas velocity: ft/sec	18. Pollutant specific gravity:	
19. Gas flow into the collector: **3,158.4** ACF @ °F and PSIA	20. Gas stream temperature: Inlet: **319.73** °F Outlet: **319.73** °F	
21. Gas flow rate: Design Maximum: **3,158.4** ACFM Average Expected: ACFM	22. Particulate Grain Loading in grains/scf: Inlet: Outlet: **PM_{10} – 0.0015 gr/scf** **$PM_{2.5}$ – 0.0008 gr/scf**	

23. Emission rate of each pollutant (specify) into and out of collector:

Pollutant	IN Pollutant		Emission Capture Efficiency %	OUT Pollutant		Control Efficiency %
	lb/hr	grains/acf		lb/hr	grains/acf	
PM_{10}				**0.04**		**> 99%**
$PM_{2.5}$				**0.02**		**> 99%**

24. Dimensions of stack: Height **39.37** ft. Diameter **1.64** ft.

25. Supply a curve showing proposed collection efficiency versus gas volume from 25 to 130 percent of design rating of collector.

Particulate Distribution

26. Complete the table:

Particulate Size Range (microns)	Particle Size Distribution at Inlet to Collector Weight % for Size Range	Fraction Efficiency of Collector Weight % for Size Range
0 – 2		
2 – 4		
4 – 6		
6 – 8		
8 – 10		
10 – 12		
12 – 16		
16 – 20		
20 – 30		
30 – 40		
40 – 50		
50 – 60		
60 – 70		
70 – 80		
80 – 90		
90 – 100		
>100		

27. Describe any air pollution control device inlet and outlet gas conditioning processes (e.g., gas cooling, gas reheating, gas humidification):

NA

28. Describe the collection material disposal system:

29. Have you included ***Other Collectors Control Device*** in the Emissions Points Data Summary Sheet? **Yes**

30. **Proposed Monitoring, Recordkeeping, Reporting, and Testing**
Please propose monitoring, recordkeeping, and reporting in order to demonstrate compliance with the proposed operating parameters. Please propose testing in order to demonstrate compliance with the proposed emissions limits.

MONITORING:	RECORDKEEPING:
See proposed monitoring plan in Attachment O.	**See proposed recordkeeping plan in Attachment O.**
REPORTING:	TESTING:
See proposed reporting plan in Attachment O.	**See proposed testing plan in Attachment O.**

MONITORING:	Please list and describe the process parameters and ranges that are proposed to be monitored in order to demonstrate compliance with the operation of this process equipment or air control device.
RECORDKEEPING:	Please describe the proposed recordkeeping that will accompany the monitoring.
REPORTING:	Please describe any proposed emissions testing for this process equipment on air pollution control device.
TESTING:	Please describe any proposed emissions testing for this process equipment on air pollution control device.

31. Manufacturer's Guaranteed Control Efficiency for each air pollutant.

PM_{10} – >99% efficiency typical
$PM_{2.5}$ – >99% efficiency typical

32. Manufacturer's Guaranteed Control Efficiency for each air pollutant.

33. Describe all operating ranges and maintenance procedures required by Manufacturer to maintain warranty.

Attachment M
Air Pollution Control Device Sheet
(OTHER COLLECTORS)

Control Device ID No. (must match Emission Units Table): **RNFE6-FF**

Equipment Information

1. Manufacturer: **TBD** Model No.	2. Control Device Name: **Drying Oven 2&3 Filter** Type: **Fabric Filter**
3. Provide diagram(s) of unit describing capture system with duct arrangement and size of duct, air volume, capacity, horsepower of movers. If applicable, state hood face velocity and hood collection efficiency.	
4. On a separate sheet(s) supply all data and calculations used in selecting or designing this collection device.	
5. Provide a scale diagram of the control device showing internal construction.	
6. Submit a schematic and diagram with dimensions and flow rates.	
7. Guaranteed minimum collection efficiency for each pollutant collected:	
8. Attached efficiency curve and/or other efficiency information.	
9. Design inlet volume: **7,580.1** SCFM	10. Capacity: **TBD**
11. Indicate the liquid flow rate and describe equipment provided to measure pressure drop and flow rate, if any.	
12. Attach any additional data including auxiliary equipment and operation details to thoroughly evaluate the control equipment.	
13. Description of method of handling the collected material(s) for reuse of disposal.	

Gas Stream Characteristics

14. Are halogenated organics present? ☐ Yes ☒ No
Are particulates present? ☒ Yes ☐ No
Are metals present? ☐ Yes ☒ No

15. Inlet Emission stream parameters:	Maximum	Typical
Pressure (mmHg):		
Heat Content (BTU/scf):		
Oxygen Content (%):		
Moisture Content (%):		
Relative Humidity (%):		

16. Type of pollutant(s) controlled: ☐ SO_x ☒ Particulate (type): **PM_{10} and $PM_{2.5}$**		☐ Odor ☐ Other
17. Inlet gas velocity: ft/sec		18. Pollutant specific gravity:
19. Gas flow into the collector: **7,580.1** ACF @ °F and PSIA		20. Gas stream temperature: Inlet: **319.73** °F; Outlet: **319.73** °F
21. Gas flow rate: Design Maximum: **7,580.1** ACFM; Average Expected: ACFM		22. Particulate Grain Loading in grains/scf: Inlet: ; Outlet: **PM_{10} – 0.001 gr/scf**; **$PM_{2.5}$ – 0.0005 gr/scf**

23. Emission rate of each pollutant (specify) into and out of collector:

Pollutant	IN Pollutant		Emission Capture Efficiency %	OUT Pollutant		Control Efficiency %
	lb/hr	grains/acf		lb/hr	grains/acf	
PM_{10}				**0.06**		**> 99%**
$PM_{2.5}$				**0.03**		**> 99%**

24. Dimensions of stack: Height **49.21** ft. Diameter **2.62** ft.

25. Supply a curve showing proposed collection efficiency versus gas volume from 25 to 130 percent of design rating of collector.

Particulate Distribution

26. Complete the table:	Particle Size Distribution at Inlet to Collector	Fraction Efficiency of Collector
Particulate Size Range (microns)	**Weight % for Size Range**	**Weight % for Size Range**
0 – 2		
2 – 4		
4 – 6		
6 – 8		
8 – 10		
10 – 12		
12 – 16		
16 – 20		
20 – 30		
30 – 40		
40 – 50		
50 – 60		
60 – 70		
70 – 80		
80 – 90		
90 – 100		
>100		

27. Describe any air pollution control device inlet and outlet gas conditioning processes (e.g., gas cooling, gas reheating, gas humidification):

NA

28. Describe the collection material disposal system:

29. Have you included ***Other Collectors Control Device*** in the Emissions Points Data Summary Sheet? **Yes**

30. **Proposed Monitoring, Recordkeeping, Reporting, and Testing**
Please propose monitoring, recordkeeping, and reporting in order to demonstrate compliance with the proposed operating parameters. Please propose testing in order to demonstrate compliance with the proposed emissions limits.

MONITORING: **See proposed monitoring plan in Attachment O.**	RECORDKEEPING: **See proposed recordkeeping plan in Attachment O.**
REPORTING: **See proposed reporting plan in Attachment O.**	TESTING: **See proposed testing plan in Attachment O.**

MONITORING:	Please list and describe the process parameters and ranges that are proposed to be monitored in order to demonstrate compliance with the operation of this process equipment or air control device.
RECORDKEEPING:	Please describe the proposed recordkeeping that will accompany the monitoring.
REPORTING:	Please describe any proposed emissions testing for this process equipment on air pollution control device.
TESTING:	Please describe any proposed emissions testing for this process equipment on air pollution control device.

31. Manufacturer's Guaranteed Control Efficiency for each air pollutant.

PM_{10} – >99% efficiency typical
$PM_{2.5}$ – >99% efficiency typical

32. Manufacturer's Guaranteed Control Efficiency for each air pollutant.

33. Describe all operating ranges and maintenance procedures required by Manufacturer to maintain warranty.

Attachment M
Air Pollution Control Device Sheet
(OTHER COLLECTORS)

Control Device ID No. (must match Emission Units Table): **IMF07A-FF**

Equipment Information

1. Manufacturer: **TBD** Model No.	2. Control Device Name: **Filter Fines Day Silo Filter** Type: **Fabric Filter**
3. Provide diagram(s) of unit describing capture system with duct arrangement and size of duct, air volume, capacity, horsepower of movers. If applicable, state hood face velocity and hood collection efficiency.	
4. On a separate sheet(s) supply all data and calculations used in selecting or designing this collection device.	
5. Provide a scale diagram of the control device showing internal construction.	
6. Submit a schematic and diagram with dimensions and flow rates.	
7. Guaranteed minimum collection efficiency for each pollutant collected:	
8. Attached efficiency curve and/or other efficiency information.	
9. Design inlet volume: **790.0** SCFM	10. Capacity: **TBD**
11. Indicate the liquid flow rate and describe equipment provided to measure pressure drop and flow rate, if any. **N/A**	
12. Attach any additional data including auxiliary equipment and operation details to thoroughly evaluate the control equipment.	
13. Description of method of handling the collected material(s) for reuse of disposal. **N/A**	

Gas Stream Characteristics

14. Are halogenated organics present? ☐ Yes ☒ No
Are particulates present? ☒ Yes ☐ No
Are metals present? ☐ Yes ☒ No

15. Inlet Emission stream parameters:	Maximum	Typical
Pressure (mmHg):		
Heat Content (BTU/scf):		
Oxygen Content (%):		
Moisture Content (%):		
Relative Humidity (%):		

16. Type of pollutant(s) controlled: ☐ SO_x ☐ Odor
☒ Particulate (type): **PM_{10} and $PM_{2.5}$** ☐ Other

17. Inlet gas velocity: **9.74** ft/sec

18. Pollutant specific gravity:

19. Gas flow into the collector:
790.0 ACF @ **67.73** °F and PSIA

20. Gas stream temperature:
Inlet: **67.73** °F
Outlet: **67.73** °F

21. Gas flow rate:
Design Maximum: **790.0** ACFM
Average Expected: ACFM

22. Particulate Grain Loading in grains/scf:
Inlet:
Outlet: **PM_{10} – 0.002 gr/scf**
$PM_{2.5}$ – 0.001 gr/scf

23. Emission rate of each pollutant (specify) into and out of collector:

Pollutant	**IN Pollutant**		**Emission Capture Efficiency %**	**OUT Pollutant**		**Control Efficiency %**
	lb/hr	**grains/acf**		**lb/hr**	**grains/acf**	
PM_{10}				**0.01**		**>99%**
$PM_{2.5}$				**<0.01**		**>99%**

24. Dimensions of stack: Height **72.18** ft. Diameter **1.31** ft.

25. Supply a curve showing proposed collection efficiency versus gas volume from 25 to 130 percent of design rating of collector.

Particulate Distribution

26. Complete the table:	**Particle Size Distribution at Inlet to Collector**	**Fraction Efficiency of Collector**
Particulate Size Range (microns)	**Weight % for Size Range**	**Weight % for Size Range**
0 – 2		
2 – 4		
4 – 6		
6 – 8		
8 – 10		
10 – 12		
12 – 16		
16 – 20		
20 – 30		
30 – 40		
40 – 50		
50 – 60		
60 – 70		
70 – 80		
80 – 90		
90 – 100		
>100		

27. Describe any air pollution control device inlet and outlet gas conditioning processes (e.g., gas cooling, gas reheating, gas humidification):

28. Describe the collection material disposal system:

29. Have you included ***Other Collectors Control Device*** in the Emissions Points Data Summary Sheet? **Yes**

30. **Proposed Monitoring, Recordkeeping, Reporting, and Testing**
Please propose monitoring, recordkeeping, and reporting in order to demonstrate compliance with the proposed operating parameters. Please propose testing in order to demonstrate compliance with the proposed emissions limits.

MONITORING:	RECORDKEEPING:
See proposed monitoring plan in Attachment O.	**See proposed recordkeeping plan in Attachment O.**
REPORTING:	TESTING:
See proposed reporting plan in Attachment O.	**See proposed testing plan in Attachment O.**

MONITORING:	Please list and describe the process parameters and ranges that are proposed to be monitored in order to demonstrate compliance with the operation of this process equipment or air control device.
RECORDKEEPING:	Please describe the proposed recordkeeping that will accompany the monitoring.
REPORTING:	Please describe any proposed emissions testing for this process equipment on air pollution control device.
TESTING:	Please describe any proposed emissions testing for this process equipment on air pollution control device.

31. Manufacturer's Guaranteed Control Efficiency for each air pollutant.

PM_{10} – >99% efficiency typical
$PM_{2.5}$ – >99% efficiency typical

32. Manufacturer's Guaranteed Control Efficiency for each air pollutant.

33. Describe all operating ranges and maintenance procedures required by Manufacturer to maintain warranty.

Attachment M
Air Pollution Control Device Sheet
(OTHER COLLECTORS)

Control Device ID No. (must match Emission Units Table): **IMF10-FF**

Equipment Information

1. Manufacturer: Model No.	2. Control Device Name: **Filter Fines Receiving Silo Filter** Type: **Fabric Filter**
3. Provide diagram(s) of unit describing capture system with duct arrangement and size of duct, air volume, capacity, horsepower of movers. If applicable, state hood face velocity and hood collection efficiency.	
4. On a separate sheet(s) supply all data and calculations used in selecting or designing this collection device.	
5. Provide a scale diagram of the control device showing internal construction.	
6. Submit a schematic and diagram with dimensions and flow rates.	
7. Guaranteed minimum collection efficiency for each pollutant collected:	
8. Attached efficiency curve and/or other efficiency information.	
9. Design inlet volume: **758.0** SCFM	10. Capacity: **TBD**
11. Indicate the liquid flow rate and describe equipment provided to measure pressure drop and flow rate, if any. **N/A**	
12. Attach any additional data including auxiliary equipment and operation details to thoroughly evaluate the control equipment.	
13. Description of method of handling the collected material(s) for reuse of disposal. **N/A**	

Gas Stream Characteristics

14. Are halogenated organics present? ☐ Yes ☒ No
Are particulates present? ☒ Yes ☐ No
Are metals present? ☐ Yes ☒ No

15. Inlet Emission stream parameters:	Maximum	Typical
Pressure (mmHg):		
Heat Content (BTU/scf):		
Oxygen Content (%):		
Moisture Content (%):		
Relative Humidity (%):		

16. Type of pollutant(s) controlled: ☐ SO_x ☒ Particulate (type): **PM_{10} and $PM_{2.5}$**	☐ Odor ☐ Other	
17. Inlet gas velocity: **9.35** ft/sec	18. Pollutant specific gravity:	
19. Gas flow into the collector: **758.0** ACF @ **67.73** °F and PSIA	20. Gas stream temperature: Inlet: **67.73** °F Outlet: **67.73** °F	
21. Gas flow rate: Design Maximum: **758.0** ACFM Average Expected: ACFM	22. Particulate Grain Loading in grains/scf: Inlet: Outlet: **PM_{10} – 0.002 gr/scf** **$PM_{2.5}$ – 0.001 gr/scf**	

23. Emission rate of each pollutant (specify) into and out of collector:

Pollutant	IN Pollutant		Emission Capture Efficiency %	OUT Pollutant		Control Efficiency %
	lb/hr	grains/acf		lb/hr	grains/acf	
PM_{10}				**0.01**		**>99%**
$PM_{2.5}$				**<0.01**		**>99%**

24. Dimensions of stack: Height **72.18** ft. Diameter **1.31** ft.

25. Supply a curve showing proposed collection efficiency versus gas volume from 25 to 130 percent of design rating of collector.

Particulate Distribution

26. Complete the table:	**Particle Size Distribution at Inlet to Collector**	**Fraction Efficiency of Collector**
Particulate Size Range (microns)	**Weight % for Size Range**	**Weight % for Size Range**
0 – 2		
2 – 4		
4 – 6		
6 – 8		
8 – 10		
10 – 12		
12 – 16		
16 – 20		
20 – 30		
30 – 40		
40 – 50		
50 – 60		
60 – 70		
70 – 80		
80 – 90		
90 – 100		
>100		

27. Describe any air pollution control device inlet and outlet gas conditioning processes (e.g., gas cooling, gas reheating, gas humidification):
28. Describe the collection material disposal system:
29. Have you included ***Other Collectors Control Device*** in the Emissions Points Data Summary Sheet? **Yes**
30. **Proposed Monitoring, Recordkeeping, Reporting, and Testing** Please propose monitoring, recordkeeping, and reporting in order to demonstrate compliance with the proposed operating parameters. Please propose testing in order to demonstrate compliance with the proposed emissions limits.

MONITORING:	RECORDKEEPING:
See proposed monitoring plan in Attachment O.	**See proposed recordkeeping plan in Attachment O.**
REPORTING:	TESTING:
See proposed reporting plan in Attachment O.	**See proposed testing plan in Attachment O.**

MONITORING:	Please list and describe the process parameters and ranges that are proposed to be monitored in order to demonstrate compliance with the operation of this process equipment or air control device.
RECORDKEEPING:	Please describe the proposed recordkeeping that will accompany the monitoring.
REPORTING:	Please describe any proposed emissions testing for this process equipment on air pollution control device.
TESTING:	Please describe any proposed emissions testing for this process equipment on air pollution control device.

31. Manufacturer's Guaranteed Control Efficiency for each air pollutant.

PM_{10} – >99% efficiency typical
$PM_{2.5}$ – >99% efficiency typical

32. Manufacturer's Guaranteed Control Efficiency for each air pollutant.

33. Describe all operating ranges and maintenance procedures required by Manufacturer to maintain warranty.

Attachment M
Air Pollution Control Device Sheet
(OTHER COLLECTORS)

Control Device ID No. (must match Emission Units Table): **IMF12-FF, IMF14-FF, IMF15-FF, IMF11-FF and IMF16-FF**

Equipment Information

1. Manufacturer: **TBD** Model No.	2. Control Device Name: **Conveyor Transition Point Filters** Type: **Fabric Filters**
3. Provide diagram(s) of unit describing capture system with duct arrangement and size of duct, air volume, capacity, horsepower of movers. If applicable, state hood face velocity and hood collection efficiency.	
4. On a separate sheet(s) supply all data and calculations used in selecting or designing this collection device.	
5. Provide a scale diagram of the control device showing internal construction.	
6. Submit a schematic and diagram with dimensions and flow rates.	
7. Guaranteed minimum collection efficiency for each pollutant collected:	
8. Attached efficiency curve and/or other efficiency information.	
9. Design inlet volume: **1,037.0** SCFM	10. Capacity: **TBD**
11. Indicate the liquid flow rate and describe equipment provided to measure pressure drop and flow rate, if any. **NA**	
12. Attach any additional data including auxiliary equipment and operation details to thoroughly evaluate the control equipment.	
13. Description of method of handling the collected material(s) for reuse of disposal. **N/A**	

Gas Stream Characteristics

14. Are halogenated organics present? ☐ Yes ☒ No
Are particulates present? ☒ Yes ☐ No
Are metals present? ☐ Yes ☒ No

15. Inlet Emission stream parameters:	Maximum	Typical
Pressure (mmHg):		
Heat Content (BTU/scf):		
Oxygen Content (%):		
Moisture Content (%):		
Relative Humidity (%):		

16. Type of pollutant(s) controlled: ☐ SO_x ☒ Particulate (type): **PM_{10} and $PM_{2.5}$**	☐ Odor ☐ Other
17. Inlet gas velocity: **69.23** ft/sec	18. Pollutant specific gravity:
19. Gas flow into the collector: **1,037.0** ACF @ **67.73** °F and PSIA	20. Gas stream temperature: Inlet: **67.73** °F Outlet: **67.73** °F
21. Gas flow rate: Design Maximum: **1,037.0** ACFM Average Expected: ACFM	22. Particulate Grain Loading in grains/scf: Inlet: Outlet: **PM_{10} – 0.002 gr/scf** **$PM_{2.5}$ – 0.001 gr/scf**

23. Emission rate of each pollutant (specify) into and out of collector:

Pollutant	**IN Pollutant**		**Emission Capture Efficiency %**	**OUT Pollutant**		**Control Efficiency %**
	lb/hr	**grains/acf**		**lb/hr**	**grains/acf**	
PM_{10}				**0.02**		**>99%**
$PM_{2.5}$				**<0.01**		**>99%**

24. Dimensions of stack: Height **Varies** ft. Diameter **0.59** ft.

25. Supply a curve showing proposed collection efficiency versus gas volume from 25 to 130 percent of design rating of collector.

Particulate Distribution

26. Complete the table:	**Particle Size Distribution at Inlet to Collector**	**Fraction Efficiency of Collector**
Particulate Size Range (microns)	**Weight % for Size Range**	**Weight % for Size Range**
0 – 2		
2 – 4		
4 – 6		
6 – 8		
8 – 10		
10 – 12		
12 – 16		
16 – 20		
20 – 30		
30 – 40		
40 – 50		
50 – 60		
60 – 70		
70 – 80		
80 – 90		
90 – 100		
>100		

27. Describe any air pollution control device inlet and outlet gas conditioning processes (e.g., gas cooling, gas reheating, gas humidification):

28. Describe the collection material disposal system:

29. Have you included ***Other Collectors Control Device*** in the Emissions Points Data Summary Sheet? **Yes**

30. **Proposed Monitoring, Recordkeeping, Reporting, and Testing**
Please propose monitoring, recordkeeping, and reporting in order to demonstrate compliance with the proposed operating parameters. Please propose testing in order to demonstrate compliance with the proposed emissions limits.

MONITORING:	RECORDKEEPING:
See proposed monitoring plan in Attachment O.	**See proposed recordkeeping plan in Attachment O.**

REPORTING:	TESTING:
See proposed reporting plan in Attachment O.	**See proposed testing plan in Attachment O.**

MONITORING:	Please list and describe the process parameters and ranges that are proposed to be monitored in order to demonstrate compliance with the operation of this process equipment or air control device.
RECORDKEEPING:	Please describe the proposed recordkeeping that will accompany the monitoring.
REPORTING:	Please describe any proposed emissions testing for this process equipment on air pollution control device.
TESTING:	Please describe any proposed emissions testing for this process equipment on air pollution control device.

31. Manufacturer's Guaranteed Control Efficiency for each air pollutant.

PM_{10} – >99% efficiency typical
$PM_{2.5}$ – >99% efficiency typical

32. Manufacturer's Guaranteed Control Efficiency for each air pollutant.

33. Describe all operating ranges and maintenance procedures required by Manufacturer to maintain warranty.

Attachment M
Air Pollution Control Device Sheet
(OTHER COLLECTORS)

Control Device ID No. (must match Emission Units Table): **CM10-FF and CM11-FF**

Equipment Information

1. Manufacturer: **TBD** Model No.	2. Control Device Name: **Recycle Plant Building Vent 1 and 2 Filters** Type: **Fabric Filters**
3. Provide diagram(s) of unit describing capture system with duct arrangement and size of duct, air volume, capacity, horsepower of movers. If applicable, state hood face velocity and hood collection efficiency.	
4. On a separate sheet(s) supply all data and calculations used in selecting or designing this collection device.	
5. Provide a scale diagram of the control device showing internal construction.	
6. Submit a schematic and diagram with dimensions and flow rates.	
7. Guaranteed minimum collection efficiency for each pollutant collected:	
8. Attached efficiency curve and/or other efficiency information.	
9. Design inlet volume: **18,950.20** SCFM	10. Capacity: **TBD**
11. Indicate the liquid flow rate and describe equipment provided to measure pressure drop and flow rate, if any. **NA**	
12. Attach any additional data including auxiliary equipment and operation details to thoroughly evaluate the control equipment.	
13. Description of method of handling the collected material(s) for reuse of disposal. **NA**	

Gas Stream Characteristics

14. Are halogenated organics present?	☐ Yes	☒ No
Are particulates present?	☒ Yes	☐ No
Are metals present?	☐ Yes	☒ No

15. Inlet Emission stream parameters:	**Maximum**	**Typical**
Pressure (mmHg):		
Heat Content (BTU/scf):		
Oxygen Content (%):		
Moisture Content (%):		
Relative Humidity (%):		

16. Type of pollutant(s) controlled: ☐ SO_x ☒ Particulate (type): **PM_{10} and $PM_{2.5}$**	☐ Odor ☐ Other
17. Inlet gas velocity: **39.93** ft/sec	18. Pollutant specific gravity:
19. Gas flow into the collector: **18,950.20** ACF @ **103.73** °F and PSIA	20. Gas stream temperature: Inlet: **103.73** °F Outlet: **103.73** °F
21. Gas flow rate: Design Maximum: **18,950.20** ACFM Average Expected: ACFM	22. Particulate Grain Loading in grains/scf: Inlet: Outlet: **PM_{10} – 0.004 gr/scf** **$PM_{2.5}$ – 0.002 gr/scf**

23. Emission rate of each pollutant (specify) into and out of collector:

Pollutant	**IN Pollutant**		**Emission Capture Efficiency %**	**OUT Pollutant**		**Control Efficiency %**
	lb/hr	**grains/acf**		**lb/hr**	**grains/acf**	
PM_{10}				**0.66**		**>99%**
$PM_{2.5}$				**0.33**		**>99%**

24. Dimensions of stack: Height **49.21** ft. Diameter **3.28** ft.

25. Supply a curve showing proposed collection efficiency versus gas volume from 25 to 130 percent of design rating of collector.

Particulate Distribution

26. Complete the table:	**Particle Size Distribution at Inlet to Collector**	**Fraction Efficiency of Collector**
Particulate Size Range (microns)	**Weight % for Size Range**	**Weight % for Size Range**
0 – 2		
2 – 4		
4 – 6		
6 – 8		
8 – 10		
10 – 12		
12 – 16		
16 – 20		
20 – 30		
30 – 40		
40 – 50		
50 – 60		
60 – 70		
70 – 80		
80 – 90		
90 – 100		
>100		

27. Describe any air pollution control device inlet and outlet gas conditioning processes (e.g., gas cooling, gas reheating, gas humidification): **NA**
28. Describe the collection material disposal system: **NA**
29. Have you included ***Other Collectors Control Device*** in the Emissions Points Data Summary Sheet? **Yes**
30. **Proposed Monitoring, Recordkeeping, Reporting, and Testing** Please propose monitoring, recordkeeping, and reporting in order to demonstrate compliance with the proposed operating parameters. Please propose testing in order to demonstrate compliance with the proposed emissions limits.

MONITORING: **See proposed monitoring plan in Attachment O.**	RECORDKEEPING: **See proposed recordkeeping plan in Attachment O.**
REPORTING: **See proposed reporting plan in Attachment O.**	TESTING: **See proposed testing plan in Attachment O.**

MONITORING:	Please list and describe the process parameters and ranges that are proposed to be monitored in order to demonstrate compliance with the operation of this process equipment or air control device.
RECORDKEEPING:	Please describe the proposed recordkeeping that will accompany the monitoring.
REPORTING:	Please describe any proposed emissions testing for this process equipment on air pollution control device.
TESTING:	Please describe any proposed emissions testing for this process equipment on air pollution control device.

31. Manufacturer's Guaranteed Control Efficiency for each air pollutant. **PM_{10} – >99% efficiency typical** **$PM_{2.5}$ – >99% efficiency typical**
32. Manufacturer's Guaranteed Control Efficiency for each air pollutant.
33. Describe all operating ranges and maintenance procedures required by Manufacturer to maintain warranty.

Attachment M
Air Pollution Control Device Sheet
(OTHER COLLECTORS)

Control Device ID No. (must match Emission Units Table): **CM08-FF and CM09-FF**

Equipment Information

1. Manufacturer: **TBD** Model No.	2. Control Device Name: **Recycle Plant Building Vent 3 and 4 Filters** Type: **Fabric Filters**
3. Provide diagram(s) of unit describing capture system with duct arrangement and size of duct, air volume, capacity, horsepower of movers. If applicable, state hood face velocity and hood collection efficiency.	
4. On a separate sheet(s) supply all data and calculations used in selecting or designing this collection device.	
5. Provide a scale diagram of the control device showing internal construction.	
6. Submit a schematic and diagram with dimensions and flow rates.	
7. Guaranteed minimum collection efficiency for each pollutant collected:	
8. Attached efficiency curve and/or other efficiency information.	
9. Design inlet volume: **1,597.18** SCFM	10. Capacity: **TBD**
11. Indicate the liquid flow rate and describe equipment provided to measure pressure drop and flow rate, if any. **NA**	
12. Attach any additional data including auxiliary equipment and operation details to thoroughly evaluate the control equipment.	
13. Description of method of handling the collected material(s) for reuse of disposal. **NA**	

Gas Stream Characteristics

14. Are halogenated organics present? ☐ Yes ☒ No
Are particulates present? ☒ Yes ☐ No
Are metals present? ☐ Yes ☒ No

15. Inlet Emission stream parameters:	**Maximum**	**Typical**
Pressure (mmHg):		
Heat Content (BTU/scf):		
Oxygen Content (%):		
Moisture Content (%):		
Relative Humidity (%):		

16. Type of pollutant(s) controlled: ☐ SO_x ☒ Particulate (type): **PM_{10} and $PM_{2.5}$**	☐ Odor ☐ Other	
17. Inlet gas velocity: **53.25** ft/sec	18. Pollutant specific gravity:	
19. Gas flow into the collector: **1,579.18** ACF @ **103.73** °F and PSIA	20. Gas stream temperature: Inlet: **103.73** °F; Outlet: **103.73** °F	
21. Gas flow rate: Design Maximum: **1,597.18** ACFM; Average Expected: ACFM	22. Particulate Grain Loading in grains/scf: Inlet: ; Outlet: **PM_{10} – 0.004 gr/scf**, **$PM_{2.5}$ – 0.002 gr/scf**	

23. Emission rate of each pollutant (specify) into and out of collector:

Pollutant	IN Pollutant		Emission Capture Efficiency %	OUT Pollutant		Control Efficiency %
	lb/hr	grains/acf		lb/hr	grains/acf	
PM_{10}				**0.06**		**>99%**
$PM_{2.5}$				**0.03**		**>99%**

24. Dimensions of stack: Height **49.21** ft. Diameter **0.82** ft.

25. Supply a curve showing proposed collection efficiency versus gas volume from 25 to 130 percent of design rating of collector.

Particulate Distribution

26. Complete the table:	Particle Size Distribution at Inlet to Collector	Fraction Efficiency of Collector
Particulate Size Range (microns)	**Weight % for Size Range**	**Weight % for Size Range**
0 – 2		
2 – 4		
4 – 6		
6 – 8		
8 – 10		
10 – 12		
12 – 16		
16 – 20		
20 – 30		
30 – 40		
40 – 50		
50 – 60		
60 – 70		
70 – 80		
80 – 90		
90 – 100		
>100		

27. Describe any air pollution control device inlet and outlet gas conditioning processes (e.g., gas cooling, gas reheating, gas humidification):	
28. Describe the collection material disposal system:	
29. Have you included ***Other Collectors Control Device*** in the Emissions Points Data Summary Sheet? **Yes**	
30. **Proposed Monitoring, Recordkeeping, Reporting, and Testing** Please propose monitoring, recordkeeping, and reporting in order to demonstrate compliance with the proposed operating parameters. Please propose testing in order to demonstrate compliance with the proposed emissions limits.	
MONITORING: **See proposed monitoring plan in Attachment O.**	RECORDKEEPING: **See proposed recordkeeping plan in Attachment O.**
REPORTING: **See proposed reporting plan in Attachment O.**	TESTING: **See proposed testing plan in Attachment O.**

MONITORING:	Please list and describe the process parameters and ranges that are proposed to be monitored in order to demonstrate compliance with the operation of this process equipment or air control device.
RECORDKEEPING:	Please describe the proposed recordkeeping that will accompany the monitoring.
REPORTING:	Please describe any proposed emissions testing for this process equipment on air pollution control device.
TESTING:	Please describe any proposed emissions testing for this process equipment on air pollution control device.

31. Manufacturer's Guaranteed Control Efficiency for each air pollutant.

PM_{10} – >99% efficiency typical
$PM_{2.5}$ – >99% efficiency typical

32. Manufacturer's Guaranteed Control Efficiency for each air pollutant.

33. Describe all operating ranges and maintenance procedures required by Manufacturer to maintain warranty.

Attachment M
Air Pollution Control Device Sheet
(OTHER COLLECTORS)

Control Device ID No. (must match Emission Units Table): **IMF07B-FF**

Equipment Information

1. Manufacturer: **TBD** Model No.	2. Control Device Name: **Second Energy Materials Silo Filter** Type: **Fabric Filter**
3. Provide diagram(s) of unit describing capture system with duct arrangement and size of duct, air volume, capacity, horsepower of movers. If applicable, state hood face velocity and hood collection efficiency.	
4. On a separate sheet(s) supply all data and calculations used in selecting or designing this collection device.	
5. Provide a scale diagram of the control device showing internal construction.	
6. Submit a schematic and diagram with dimensions and flow rates.	
7. Guaranteed minimum collection efficiency for each pollutant collected:	
8. Attached efficiency curve and/or other efficiency information.	
9. Design inlet volume: **790.0** SCFM	10. Capacity: **TBD**
11. Indicate the liquid flow rate and describe equipment provided to measure pressure drop and flow rate, if any. **N/A**	
12. Attach any additional data including auxiliary equipment and operation details to thoroughly evaluate the control equipment.	
13. Description of method of handling the collected material(s) for reuse of disposal. **N/A**	

Gas Stream Characteristics

14. Are halogenated organics present? ☐ Yes ☒ No
Are particulates present? ☒ Yes ☐ No
Are metals present? ☐ Yes ☒ No

15. Inlet Emission stream parameters:	**Maximum**	**Typical**
Pressure (mmHg):		
Heat Content (BTU/scf):		
Oxygen Content (%):		
Moisture Content (%):		
Relative Humidity (%):		

16. Type of pollutant(s) controlled: ☐ SO_x ☒ Particulate (type): **PM_{10} and $PM_{2.5}$**		☐ Odor ☐ Other	
17. Inlet gas velocity: **9.74** ft/sec		18. Pollutant specific gravity:	
19. Gas flow into the collector: **790.0** ACF @ **67.73** °F and PSIA		20. Gas stream temperature: Inlet: **67.73** °F; Outlet: **67.73** °F	
21. Gas flow rate: Design Maximum: **790.0** ACFM; Average Expected: ACFM		22. Particulate Grain Loading in grains/scf: Inlet: ; Outlet: **PM_{10} – 0.002 gr/scf**, **$PM_{2.5}$ – 0.001 gr/scf**	

23. Emission rate of each pollutant (specify) into and out of collector:

Pollutant	IN Pollutant		Emission Capture Efficiency %	OUT Pollutant		Control Efficiency %
	lb/hr	grains/acf		lb/hr	grains/acf	
PM_{10}				**0.01**		**>99%**
$PM_{2.5}$				**<0.01**		**>99%**

24. Dimensions of stack: Height **72.18** ft. Diameter **1.31** ft.

25. Supply a curve showing proposed collection efficiency versus gas volume from 25 to 130 percent of design rating of collector.

Particulate Distribution

26. Complete the table: Particulate Size Range (microns)	Particle Size Distribution at Inlet to Collector — Weight % for Size Range	Fraction Efficiency of Collector — Weight % for Size Range
0 – 2		
2 – 4		
4 – 6		
6 – 8		
8 – 10		
10 – 12		
12 – 16		
16 – 20		
20 – 30		
30 – 40		
40 – 50		
50 – 60		
60 – 70		
70 – 80		
80 – 90		
90 – 100		
>100		

27. Describe any air pollution control device inlet and outlet gas conditioning processes (e.g., gas cooling, gas reheating, gas humidification):
28. Describe the collection material disposal system:
29. Have you included ***Other Collectors Control Device*** in the Emissions Points Data Summary Sheet? **Yes**
30. **Proposed Monitoring, Recordkeeping, Reporting, and Testing** Please propose monitoring, recordkeeping, and reporting in order to demonstrate compliance with the proposed operating parameters. Please propose testing in order to demonstrate compliance with the proposed emissions limits.

MONITORING: **See proposed monitoring plan in Attachment O.**	RECORDKEEPING: **See proposed recordkeeping plan in Attachment O.**
REPORTING: **See proposed reporting plan in Attachment O.**	TESTING: **See proposed testing plan in Attachment O.**

MONITORING:	Please list and describe the process parameters and ranges that are proposed to be monitored in order to demonstrate compliance with the operation of this process equipment or air control device.
RECORDKEEPING:	Please describe the proposed recordkeeping that will accompany the monitoring.
REPORTING:	Please describe any proposed emissions testing for this process equipment on air pollution control device.
TESTING:	Please describe any proposed emissions testing for this process equipment on air pollution control device.

31. Manufacturer's Guaranteed Control Efficiency for each air pollutant. **PM_{10} – >99% efficiency typical** **$PM_{2.5}$ – >99% efficiency typical**
32. Manufacturer's Guaranteed Control Efficiency for each air pollutant.
33. Describe all operating ranges and maintenance procedures required by Manufacturer to maintain warranty.

Attachment M
Air Pollution Control Device Sheet
(OTHER COLLECTORS)

Control Device ID No. (must match Emission Units Table): **IMF08-FF**

Equipment Information

1. Manufacturer: **TBD** Model No.	2. Control Device Name: **Sorbent Silo Filter** Type: **Fabric Filter**
3. Provide diagram(s) of unit describing capture system with duct arrangement and size of duct, air volume, capacity, horsepower of movers. If applicable, state hood face velocity and hood collection efficiency.	
4. On a separate sheet(s) supply all data and calculations used in selecting or designing this collection device.	
5. Provide a scale diagram of the control device showing internal construction.	
6. Submit a schematic and diagram with dimensions and flow rates.	
7. Guaranteed minimum collection efficiency for each pollutant collected:	
8. Attached efficiency curve and/or other efficiency information.	
9. Design inlet volume: **758.0** SCFM	10. Capacity: **TBD**
11. Indicate the liquid flow rate and describe equipment provided to measure pressure drop and flow rate, if any. **N/A**	
12. Attach any additional data including auxiliary equipment and operation details to thoroughly evaluate the control equipment.	
13. Description of method of handling the collected material(s) for reuse of disposal. **N/A**	

Gas Stream Characteristics

14. Are halogenated organics present? ☐ Yes ☒ No
Are particulates present? ☒ Yes ☐ No
Are metals present? ☐ Yes ☒ No

15. Inlet Emission stream parameters:	**Maximum**	**Typical**
Pressure (mmHg):		
Heat Content (BTU/scf):		
Oxygen Content (%):		
Moisture Content (%):		
Relative Humidity (%):		

16. Type of pollutant(s) controlled: ☐ SO_x ☒ Particulate (type): **PM_{10} and $PM_{2.5}$**	☐ Odor ☐ Other	
17. Inlet gas velocity: **9.35** ft/sec	18. Pollutant specific gravity:	
19. Gas flow into the collector: **758.0** ACF @ **67.73** °F and PSIA	20. Gas stream temperature: Inlet: **67.73** °F Outlet: **67.73** °F	
21. Gas flow rate: Design Maximum: **758.0** ACFM Average Expected: ACFM	22. Particulate Grain Loading in grains/scf: Inlet: Outlet: **PM_{10} – 0.002 gr/scf** **$PM_{2.5}$ – 0.001 gr/scf**	

23. Emission rate of each pollutant (specify) into and out of collector:

Pollutant	**IN Pollutant**		**Emission Capture Efficiency %**	**OUT Pollutant**		**Control Efficiency %**
	lb/hr	**grains/acf**		**lb/hr**	**grains/acf**	
PM_{10}				**0.01**		**>99%**
$PM_{2.5}$				**<0.01**		**>99%**

24. Dimensions of stack: Height **72.18** ft. Diameter **1.31** ft.

25. Supply a curve showing proposed collection efficiency versus gas volume from 25 to 130 percent of design rating of collector.

Particulate Distribution

26. Complete the table:

Particulate Size Range (microns)	**Particle Size Distribution at Inlet to Collector** **Weight % for Size Range**	**Fraction Efficiency of Collector** **Weight % for Size Range**
0 – 2		
2 – 4		
4 – 6		
6 – 8		
8 – 10		
10 – 12		
12 – 16		
16 – 20		
20 – 30		
30 – 40		
40 – 50		
50 – 60		
60 – 70		
70 – 80		
80 – 90		
90 – 100		
>100		

27. Describe any air pollution control device inlet and outlet gas conditioning processes (e.g., gas cooling, gas reheating, gas humidification):	
28. Describe the collection material disposal system:	
29. Have you included ***Other Collectors Control Device*** in the Emissions Points Data Summary Sheet? **Yes**	
30. **Proposed Monitoring, Recordkeeping, Reporting, and Testing** Please propose monitoring, recordkeeping, and reporting in order to demonstrate compliance with the proposed operating parameters. Please propose testing in order to demonstrate compliance with the proposed emissions limits.	
MONITORING: **See proposed monitoring plan in Attachment O.**	RECORDKEEPING: **See proposed recordkeeping plan in Attachment O.**
REPORTING: **See proposed reporting plan in Attachment O.**	TESTING: **See proposed testing plan in Attachment O.**
MONITORING:	Please list and describe the process parameters and ranges that are proposed to be monitored in order to demonstrate compliance with the operation of this process equipment or air control device.
RECORDKEEPING:	Please describe the proposed recordkeeping that will accompany the monitoring.
REPORTING:	Please describe any proposed emissions testing for this process equipment on air pollution control device.
TESTING:	Please describe any proposed emissions testing for this process equipment on air pollution control device.
31. Manufacturer's Guaranteed Control Efficiency for each air pollutant. **PM_{10} – >99% efficiency typical** **$PM_{2.5}$ – >99% efficiency typical**	
32. Manufacturer's Guaranteed Control Efficiency for each air pollutant.	
33. Describe all operating ranges and maintenance procedures required by Manufacturer to maintain warranty.	

Attachment M
Air Pollution Control Device Sheet
(OTHER COLLECTORS)

Control Device ID No. (must match Emission Units Table): **IMF09-FF**

Equipment Information

1. Manufacturer: **TBD** Model No.	2. Control Device Name: **Spent Sorbent Silo Filter** Type: **Fabric Filter**
3. Provide diagram(s) of unit describing capture system with duct arrangement and size of duct, air volume, capacity, horsepower of movers. If applicable, state hood face velocity and hood collection efficiency.	
4. On a separate sheet(s) supply all data and calculations used in selecting or designing this collection device.	
5. Provide a scale diagram of the control device showing internal construction.	
6. Submit a schematic and diagram with dimensions and flow rates.	
7. Guaranteed minimum collection efficiency for each pollutant collected:	
8. Attached efficiency curve and/or other efficiency information.	
9. Design inlet volume: **758.0** SCFM	10. Capacity: **TBD**
11. Indicate the liquid flow rate and describe equipment provided to measure pressure drop and flow rate, if any. **N/A**	
12. Attach any additional data including auxiliary equipment and operation details to thoroughly evaluate the control equipment.	
13. Description of method of handling the collected material(s) for reuse of disposal. **N/A**	

Gas Stream Characteristics

14. Are halogenated organics present?	☐ Yes	☒ No
Are particulates present?	☒ Yes	☐ No
Are metals present?	☐ Yes	☒ No

15. Inlet Emission stream parameters:	**Maximum**	**Typical**
Pressure (mmHg):		
Heat Content (BTU/scf):		
Oxygen Content (%):		
Moisture Content (%):		
Relative Humidity (%):		

16. Type of pollutant(s) controlled: ☒ Particulate (type): **PM_{10} and $PM_{2.5}$**	☐ SO_x	☐ Odor ☐ Other
17. Inlet gas velocity: **9.35** ft/sec		18. Pollutant specific gravity:
19. Gas flow into the collector: **758.0** ACF @ **67.73** °F and PSIA		20. Gas stream temperature: Inlet: **67.73** °F; Outlet: **67.73** °F
21. Gas flow rate: Design Maximum: **758.0** ACFM; Average Expected: ACFM		22. Particulate Grain Loading in grains/scf: Inlet: ; Outlet: **PM_{10} – 0.002 gr/scf**; **$PM_{2.5}$ – 0.001 gr/scf**

23. Emission rate of each pollutant (specify) into and out of collector:

Pollutant	IN Pollutant		Emission Capture Efficiency %	OUT Pollutant		Control Efficiency %
	lb/hr	grains/acf		lb/hr	grains/acf	
PM_{10}				**0.01**		**>99%**
$PM_{2.5}$				**<0.01**		**>99%**

24. Dimensions of stack: Height **72.18** ft. Diameter **1.31** ft.

25. Supply a curve showing proposed collection efficiency versus gas volume from 25 to 130 percent of design rating of collector.

Particulate Distribution

26. Complete the table:	**Particle Size Distribution at Inlet to Collector**	**Fraction Efficiency of Collector**
Particulate Size Range (microns)	**Weight % for Size Range**	**Weight % for Size Range**
0 – 2		
2 – 4		
4 – 6		
6 – 8		
8 – 10		
10 – 12		
12 – 16		
16 – 20		
20 – 30		
30 – 40		
40 – 50		
50 – 60		
60 – 70		
70 – 80		
80 – 90		
90 – 100		
>100		

27. Describe any air pollution control device inlet and outlet gas conditioning processes (e.g., gas cooling, gas reheating, gas humidification):
28. Describe the collection material disposal system:
29. Have you included ***Other Collectors Control Device*** in the Emissions Points Data Summary Sheet? **Yes**
30. **Proposed Monitoring, Recordkeeping, Reporting, and Testing** Please propose monitoring, recordkeeping, and reporting in order to demonstrate compliance with the proposed operating parameters. Please propose testing in order to demonstrate compliance with the proposed emissions limits.

MONITORING: **See proposed monitoring plan in Attachment O.**	RECORDKEEPING: **See proposed recordkeeping plan in Attachment O.**
REPORTING: **See proposed reporting plan in Attachment O.**	TESTING: **See proposed testing plan in Attachment O.**

MONITORING:	Please list and describe the process parameters and ranges that are proposed to be monitored in order to demonstrate compliance with the operation of this process equipment or air control device.
RECORDKEEPING:	Please describe the proposed recordkeeping that will accompany the monitoring.
REPORTING:	Please describe any proposed emissions testing for this process equipment on air pollution control device.
TESTING:	Please describe any proposed emissions testing for this process equipment on air pollution control device.

31. Manufacturer's Guaranteed Control Efficiency for each air pollutant. **PM_{10} – >99% efficiency, meets BACT of 0.002 gr/scf** **$PM_{2.5}$ – >99% efficiency, meets BACT of 0.001 gr/scf**
32. Manufacturer's Guaranteed Control Efficiency for each air pollutant.
33. Describe all operating ranges and maintenance procedures required by Manufacturer to maintain warranty.

Attachment M
Air Pollution Control Device Sheet
(OTHER COLLECTORS)

Control Device ID No. (must match Emission Units Table): **IMF09-FF**

Equipment Information

1. Manufacturer: **TBD** Model No.	2. Control Device Name: **Spent Sorbent Silo Filter** Type: **Fabric Filter**
3. Provide diagram(s) of unit describing capture system with duct arrangement and size of duct, air volume, capacity, horsepower of movers. If applicable, state hood face velocity and hood collection efficiency.	
4. On a separate sheet(s) supply all data and calculations used in selecting or designing this collection device.	
5. Provide a scale diagram of the control device showing internal construction.	
6. Submit a schematic and diagram with dimensions and flow rates.	
7. Guaranteed minimum collection efficiency for each pollutant collected:	
8. Attached efficiency curve and/or other efficiency information.	
9. Design inlet volume: **758.0** SCFM	10. Capacity: **TBD**
11. Indicate the liquid flow rate and describe equipment provided to measure pressure drop and flow rate, if any. **N/A**	
12. Attach any additional data including auxiliary equipment and operation details to thoroughly evaluate the control equipment.	
13. Description of method of handling the collected material(s) for reuse of disposal. **N/A**	

Gas Stream Characteristics

14. Are halogenated organics present? ☐ Yes ☒ No
Are particulates present? ☒ Yes ☐ No
Are metals present? ☐ Yes ☒ No

15. Inlet Emission stream parameters:	**Maximum**	**Typical**
Pressure (mmHg):		
Heat Content (BTU/scf):		
Oxygen Content (%):		
Moisture Content (%):		
Relative Humidity (%):		

16. Type of pollutant(s) controlled: ☐ SO_x ☒ Particulate (type): **PM_{10} and $PM_{2.5}$**	☐ Odor ☐ Other
17. Inlet gas velocity: **9.35** ft/sec	18. Pollutant specific gravity:
19. Gas flow into the collector: **758.0** ACF @ **67.73** °F and PSIA	20. Gas stream temperature: Inlet: **67.73** °F Outlet: **67.73** °F
21. Gas flow rate: Design Maximum: **758.0** ACFM Average Expected: ACFM	22. Particulate Grain Loading in grains/scf: Inlet: Outlet: **PM_{10} – 0.002 gr/scf** **$PM_{2.5}$ – 0.001 gr/scf**

23. Emission rate of each pollutant (specify) into and out of collector:

Pollutant	**IN Pollutant**		**Emission Capture Efficiency %**	**OUT Pollutant**		**Control Efficiency %**
	lb/hr	**grains/acf**		**lb/hr**	**grains/acf**	
PM_{10}				**0.01**		**>99%**
$PM_{2.5}$				**<0.01**		**>99%**

24. Dimensions of stack: Height **72.18** ft. Diameter **1.31** ft.

25. Supply a curve showing proposed collection efficiency versus gas volume from 25 to 130 percent of design rating of collector.

Particulate Distribution

26. Complete the table:	**Particle Size Distribution at Inlet to Collector**	**Fraction Efficiency of Collector**
Particulate Size Range (microns)	**Weight % for Size Range**	**Weight % for Size Range**
0 – 2		
2 – 4		
4 – 6		
6 – 8		
8 – 10		
10 – 12		
12 – 16		
16 – 20		
20 – 30		
30 – 40		
40 – 50		
50 – 60		
60 – 70		
70 – 80		
80 – 90		
90 – 100		
>100		

27. Describe any air pollution control device inlet and outlet gas conditioning processes (e.g., gas cooling, gas reheating, gas humidification):	
28. Describe the collection material disposal system:	
29. Have you included ***Other Collectors Control Device*** in the Emissions Points Data Summary Sheet? **Yes**	
30. **Proposed Monitoring, Recordkeeping, Reporting, and Testing** Please propose monitoring, recordkeeping, and reporting in order to demonstrate compliance with the proposed operating parameters. Please propose testing in order to demonstrate compliance with the proposed emissions limits.	
MONITORING: **See proposed monitoring plan in Attachment O.**	RECORDKEEPING: **See proposed recordkeeping plan in Attachment O.**
REPORTING: **See proposed reporting plan in Attachment O.**	TESTING: **See proposed testing plan in Attachment O.**
MONITORING:	Please list and describe the process parameters and ranges that are proposed to be monitored in order to demonstrate compliance with the operation of this process equipment or air control device.
RECORDKEEPING:	Please describe the proposed recordkeeping that will accompany the monitoring.
REPORTING:	Please describe any proposed emissions testing for this process equipment on air pollution control device.
TESTING:	Please describe any proposed emissions testing for this process equipment on air pollution control device.
31. Manufacturer's Guaranteed Control Efficiency for each air pollutant. **PM_{10} – >99% efficiency typical** **$PM_{2.5}$ – >99% efficiency typical**	
32. Manufacturer's Guaranteed Control Efficiency for each air pollutant.	
33. Describe all operating ranges and maintenance procedures required by Manufacturer to maintain warranty.	

Attachment M
Air Pollution Control Device Sheet
(OTHER COLLECTORS)

Control Device ID No. (must match Emission Units Table): **RNFE5-FF**

Equipment Information

1. Manufacturer: **TBD** Model No.	2. Control Device Name: **Spraying Cabin Filter** Type: **Fabric Filter**
3. Provide diagram(s) of unit describing capture system with duct arrangement and size of duct, air volume, capacity, horsepower of movers. If applicable, state hood face velocity and hood collection efficiency.	
4. On a separate sheet(s) supply all data and calculations used in selecting or designing this collection device.	
5. Provide a scale diagram of the control device showing internal construction.	
6. Submit a schematic and diagram with dimensions and flow rates.	
7. Guaranteed minimum collection efficiency for each pollutant collected:	
8. Attached efficiency curve and/or other efficiency information.	
9. Design inlet volume: **6,316.7** SCFM	10. Capacity: **TBD**
11. Indicate the liquid flow rate and describe equipment provided to measure pressure drop and flow rate, if any.	
12. Attach any additional data including auxiliary equipment and operation details to thoroughly evaluate the control equipment.	
13. Description of method of handling the collected material(s) for reuse of disposal.	

Gas Stream Characteristics

14. Are halogenated organics present?	☐ Yes	☒ No
Are particulates present?	☒ Yes	☐ No
Are metals present?	☐ Yes	☒ No

15. Inlet Emission stream parameters:	**Maximum**	**Typical**
Pressure (mmHg):		
Heat Content (BTU/scf):		
Oxygen Content (%):		
Moisture Content (%):		
Relative Humidity (%):		

16. Type of pollutant(s) controlled: ☒ Particulate (type): **PM_{10} and $PM_{2.5}$**	☐ SO_x	☐ Odor ☐ Other
17. Inlet gas velocity: ft/sec		18. Pollutant specific gravity:
19. Gas flow into the collector: **6,316.7** ACF @ °F and PSIA		20. Gas stream temperature: Inlet: **103.73** °F Outlet: **103.73** °F
21. Gas flow rate: Design Maximum: **6,316.7** ACFM Average Expected: ACFM		22. Particulate Grain Loading in grains/scf: Inlet: Outlet: **PM_{10} – 0.0081 gr/scf** **$PM_{2.5}$ – 0.0041 gr/scf**

23. Emission rate of each pollutant (specify) into and out of collector:

Pollutant	IN Pollutant		Emission Capture Efficiency %	OUT Pollutant		Control Efficiency %
	lb/hr	grains/acf		lb/hr	grains/acf	
PM_{10}				**0.44**		**> 99%**
$PM_{2.5}$				**0.22**		**> 99%**

24. Dimensions of stack: Height **98.42** ft. Diameter **1.64** ft.

25. Supply a curve showing proposed collection efficiency versus gas volume from 25 to 130 percent of design rating of collector.

Particulate Distribution

26. Complete the table: Particulate Size Range (microns)	Particle Size Distribution at Inlet to Collector Weight % for Size Range	Fraction Efficiency of Collector Weight % for Size Range
0 – 2		
2 – 4		
4 – 6		
6 – 8		
8 – 10		
10 – 12		
12 – 16		
16 – 20		
20 – 30		
30 – 40		
40 – 50		
50 – 60		
60 – 70		
70 – 80		
80 – 90		
90 – 100		
>100		

27. Describe any air pollution control device inlet and outlet gas conditioning processes (e.g., gas cooling, gas reheating, gas humidification):

NA

28. Describe the collection material disposal system:

29. Have you included ***Other Collectors Control Device*** in the Emissions Points Data Summary Sheet? **Yes**

30. **Proposed Monitoring, Recordkeeping, Reporting, and Testing**
Please propose monitoring, recordkeeping, and reporting in order to demonstrate compliance with the proposed operating parameters. Please propose testing in order to demonstrate compliance with the proposed emissions limits.

MONITORING:	RECORDKEEPING:
See proposed monitoring plan in Attachment O.	**See proposed recordkeeping plan in Attachment O.**
REPORTING:	TESTING:
See proposed reporting plan in Attachment O.	**See proposed testing plan in Attachment O.**

MONITORING:	Please list and describe the process parameters and ranges that are proposed to be monitored in order to demonstrate compliance with the operation of this process equipment or air control device.
RECORDKEEPING:	Please describe the proposed recordkeeping that will accompany the monitoring.
REPORTING:	Please describe any proposed emissions testing for this process equipment on air pollution control device.
TESTING:	Please describe any proposed emissions testing for this process equipment on air pollution control device.

31. Manufacturer's Guaranteed Control Efficiency for each air pollutant.

PM_{10} – >99% efficiency typical
$PM_{2.5}$ – >99% efficiency typical

32. Manufacturer's Guaranteed Control Efficiency for each air pollutant.

33. Describe all operating ranges and maintenance procedures required by Manufacturer to maintain warranty.

Attachment M
Air Pollution Control Device Sheet
(BAGHOUSE)

Control Device ID No. (must match Emission Units Table): **IMF05-BH**

Equipment Information and Filter Characteristics

1. Manufacturer: **TBD** Model No.	2. Total number of compartments: **TBD** 3. Number of compartment online for normal operation: **TBD**
4. Provide diagram(s) of unit describing capture system with duct arrangement and size of duct, air volume, capacity, horsepower of movers. If applicable, state hood face velocity and hood collection efficiency.	
5. Baghouse Configuration: (check one) ☐ Open Pressure ☐ Closed Pressure ☐ Closed Suction ☐ Electrostatically Enhanced Fabric ☐ Other, Specify	
6. Filter Fabric Bag Material: ☐ Nomex nylon ☐ Wool ☐ Polyester ☐ Polypropylene ☐ Acrylics ☐ Ceramics ☐ Fiber Glass ☐ Cotton Weight oz./sq.yd ☐ Teflon Thickness in ☐ Others, specify	7. Bag Dimension: Diameter **TBD** in. Length **TBD** ft. 8. Total cloth area: **TBD** ft^2 9. Number of bags: **TBD** 10. Operating air to cloth ratio: ft/min
11. Baghouse Operation: ☒ Continuous ☐ Automatic ☐ Intermittent	
12. Method used to clean bags: ☐ Mechanical Shaker ☐ Sonic Cleaning ☐ Reverse Air Jet ☐ Pneumatic Shaker ☐ Reverse Air Flow ☐ Other: ☐ Bag Collapse ☐ Pulse Jet ☐ Manual Cleaning ☐ Reverse Jet	
13. Cleaning initiated by: ☐ Timer ☐ Frequency if timer actuated ☐ Expected pressure drop range in. of water ☐ Other	
14. Operation Hours: Max. per day: **24** Max. per yr: **8760**	15. Collection efficiency: Rating: % Guaranteed minimum: %

Gas Stream Characteristics

16. Gas flow rate into the collector: **2,872.65** ACFM at **180.0** °F and PSIA ACFM: Design: PSIA Maximum: PSIA Average Expected: PSIA	
17. Water Vapor Content of Effluent Stream: lb. Water/lb. Dry Air	
18. Gas Stream Temperature: **180.0** °F	19. Fan Requirements: hp OR ft^3/min
20. Stabilized static pressure loss across baghouse. Pressure Drop: High in. H_2O Low in. H_2O	
21. Particulate Loading: Inlet: grain/scf Outlet: **PM_{10} – 0.005** grain/scf **$PM_{2.5}$ – 0.0025** grain/scf	

22. Type of Pollutant(s) to be collected (if particulate give specific type):

Filterable PM_{10} and $PM_{2.5}$

23. Is there any SO_3 in the emission stream? ☒ No ☐ Yes SO_3 content: ppmv

24. Emission rate of pollutant (specify) into and out of collector at maximum design operating conditions:

Pollutant	IN		OUT	
	lb/hr	grains/acf	lb/hr	grains/acf
Filterable PM_{10}			**0.12**	
Filterable $PM_{2.5}$			**0.06**	

25. Complete the table:

Particulate Size Range (microns)	**Particle Size Distribution at Inlet to Collector** Weight % for Size Range	**Fraction Efficiency of Collector** Weight % for Size Range
0 – 2		
2 – 4		
4 – 6		
6 – 8		
8 – 10		
10 – 12		
12 – 16		
16 – 20		
20 – 30		
30 – 40		
40 – 50		
50 – 60		
60 – 70		
70 – 80		
80 – 90		
90 – 100		
>100		

26. How is filter monitored for indications of deterioration (e.g., broken bags)? ☐ Continuous Opacity ☒ Pressure Drop ☒ Alarms-Audible to Process Operator ☐ Visual opacity readings, Frequency: ☐ Other, specify:	
27. Describe any recording device and frequency of log entries:	
28. Describe any filter seeding being performed:	
29. Describe any air pollution control device inlet and outlet gas conditioning processes (e.g., gas cooling, gas reheating, gas humidification):	
30. Describe the collection material disposal system:	
31. Have you included ***Baghouse Control Device*** in the Emissions Points Data Summary Sheet? **Yes**	

32. Proposed Monitoring, Recordkeeping, Reporting, and Testing
Please propose monitoring, recordkeeping, and reporting in order to demonstrate compliance with the proposed operating parameters. Please propose testing in order to demonstrate compliance with the proposed emissions limits.

MONITORING:	RECORDKEEPING:
See proposed monitoring plan in Attachment O.	**See proposed recordkeeping plan in Attachment O.**
REPORTING:	TESTING:
See proposed reporting plan in Attachment O.	**See proposed testing plan in Attachment O.**

MONITORING:	Please list and describe the process parameters and ranges that are proposed to be monitored in order to demonstrate compliance with the operation of this process equipment or air control device.
RECORDKEEPING:	Please describe the proposed recordkeeping that will accompany the monitoring.
REPORTING:	Please describe any proposed emissions testing for this process equipment on air pollution control device.
TESTING:	Please describe any proposed emissions testing for this process equipment on air pollution control device.

33. Manufacturer's Guaranteed Capture Efficiency for each air pollutant.

34. Manufacturer's Guaranteed Control Efficiency for each air pollutant.

PM_{10} – >99% efficiency typical
$PM_{2.5}$ – >99% efficiency typical

35. Describe all operating ranges and maintenance procedures required by Manufacturer to maintain warranty.

Attachment M
Air Pollution Control Device Sheet
(BAGHOUSE)

Control Device ID No. (must match Emission Units Table): **RFNE8-BH**

Equipment Information and Filter Characteristics

1. Manufacturer: **TBD** Model No.	2. Total number of compartments: **12** 3. Number of compartment online for normal operation: **12**
4. Provide diagram(s) of unit describing capture system with duct arrangement and size of duct, air volume, capacity, horsepower of movers. If applicable, state hood face velocity and hood collection efficiency.	
5. Baghouse Configuration: (check one) ☐ Open Pressure ☒ Closed Pressure ☐ Closed Suction ☐ Electrostatically Enhanced Fabric ☐ Other, Specify	
6. Filter Fabric Bag Material: ☐ Nomex nylon ☐ Wool ☐ Polyester ☒ Polypropylene ☐ Acrylics ☐ Ceramics ☐ Fiber Glass ☐ Cotton Weight oz./sq.yd ☐ Teflon Thickness in ☐ Others, specify	7. Bag Dimension: Diameter **TBD** in. Length **TBD** ft. 8. Total cloth area: **TBD** ft^2 9. Number of bags: **TBD** 10. Operating air to cloth ratio: ft/min
11. Baghouse Operation: ☒ Continuous ☐ Automatic ☐ Intermittent	
12. Method used to clean bags: ☐ Mechanical Shaker ☐ Sonic Cleaning ☐ Reverse Air Jet ☐ Pneumatic Shaker ☐ Reverse Air Flow ☐ Other: ☐ Bag Collapse ☒ Pulse Jet ☐ Manual Cleaning ☐ Reverse Jet	
13. Cleaning initiated by: ☐ Timer ☐ Frequency if timer actuated ☒ Expected pressure drop range in. of water ☐ Other	
14. Operation Hours: Max. per day: **24** Max. per yr: **8760**	15. Collection efficiency: Rating: % Guaranteed minimum: %

Gas Stream Characteristics

16. Gas flow rate into the collector: **85,275** ACFM at **67** °F and PSIA ACFM: Design: PSIA Maximum: PSIA Average Expected: PSIA	
17. Water Vapor Content of Effluent Stream: lb. Water/lb. Dry Air	
18. Gas Stream Temperature: **67** °F	19. Fan Requirements: hp OR ft^3/min
20. Stabilized static pressure loss across baghouse. Pressure Drop: High in. H_2O Low in. H_2O	
21. Particulate Loading: Inlet: grain/scf Outlet: **PM_{10} – 0.00053** grain/scf **$PM_{2.5}$ – 0.00027** grain/scf	

22. Type of Pollutant(s) to be collected (if particulate give specific type):

Filterable PM, PM_{10}, $PM_{2.5}$

23. Is there any SO_3 in the emission stream? ☒ No ☐ Yes SO_3 content: ppmv

24. Emission rate of pollutant (specify) into and out of collector at maximum design operating conditions:

Pollutant	IN		OUT	
	lb/hr	grains/acf	lb/hr	grains/acf
Filterable PM_{10}			**0.34**	
Filterable $PM_{2.5}$			**0.17**	
PM_{HAPs}			**0.34**	

25. Complete the table:

Particulate Size Range (microns)	Particle Size Distribution at Inlet to Collector Weight % for Size Range	Fraction Efficiency of Collector Weight % for Size Range
0 – 2		
2 – 4		
4 – 6		
6 – 8		
8 – 10		
10 – 12		
12 – 16		
16 – 20		
20 – 30		
30 – 40		
40 – 50		
50 – 60		
60 – 70		
70 – 80		
80 – 90		
90 – 100		
>100		

26. How is filter monitored for indications of deterioration (e.g., broken bags)? ☐ Continuous Opacity ☒ Pressure Drop ☒ Alarms-Audible to Process Operator ☐ Visual opacity readings, Frequency: ☐ Other, specify:
27. Describe any recording device and frequency of log entries:
28. Describe any filter seeding being performed:
29. Describe any air pollution control device inlet and outlet gas conditioning processes (e.g., gas cooling, gas reheating, gas humidification):
30. Describe the collection material disposal system:
31. Have you included ***Baghouse Control Device*** in the Emissions Points Data Summary Sheet? **Yes**

32. **Proposed Monitoring, Recordkeeping, Reporting, and Testing** Please propose monitoring, recordkeeping, and reporting in order to demonstrate compliance with the proposed operating parameters. Please propose testing in order to demonstrate compliance with the proposed emissions limits.	
MONITORING: **See proposed monitoring plan in Attachment O.**	RECORDKEEPING: **See proposed recordkeeping plan in Attachment O.**
REPORTING: **See proposed reporting plan in Attachment O.**	TESTING: **See proposed testing plan in Attachment O.**

MONITORING:	Please list and describe the process parameters and ranges that are proposed to be monitored in order to demonstrate compliance with the operation of this process equipment or air control device.
RECORDKEEPING:	Please describe the proposed recordkeeping that will accompany the monitoring.
REPORTING:	Please describe any proposed emissions testing for this process equipment on air pollution control device.
TESTING:	Please describe any proposed emissions testing for this process equipment on air pollution control device.

33. Manufacturer's Guaranteed Capture Efficiency for each air pollutant.

34. Manufacturer's Guaranteed Control Efficiency for each air pollutant.

PM_{10} – >99% efficiency typical
$PM_{2.5}$ – >99% efficiency typical

35. Describe all operating ranges and maintenance procedures required by Manufacturer to maintain warranty.

Attachment M
Air Pollution Control Device Sheet
(BAGHOUSE)

Control Device ID No. (must match Emission Units Table): **CE01-BH**

Equipment Information and Filter Characteristics

1. Manufacturer: **TBD**
   Model No.

2. Total number of compartments: **8**

3. Number of compartment online for normal operation: **8**

4. Provide diagram(s) of unit describing capture system with duct arrangement and size of duct, air volume, capacity, horsepower of movers. If applicable, state hood face velocity and hood collection efficiency.

5. Baghouse Configuration: (check one)
   - ☐ Open Pressure
   - ☒ Closed Pressure
   - ☐ Closed Suction
   - ☐ Electrostatically Enhanced Fabric
   - ☐ Other, Specify

6. Filter Fabric Bag Material:
   - ☐ Nomex nylon
   - ☐ Wool
   - ☐ Polyester
   - ☒ Polypropylene
   - ☐ Acrylics
   - ☐ Ceramics
   - ☐ Fiber Glass
   - ☐ Cotton Weight oz./sq.yd
   - ☐ Teflon Thickness in
   - ☐ Others, specify

7. Bag Dimension:
   Diameter **6.30** in.
   Length **12.55** ft.

8. Total cloth area: **7363** ft^2

9. Number of bags:

10. Operating air to cloth ratio: ft/min

11. Baghouse Operation: ☒ Continuous ☐ Automatic ☐ Intermittent

12. Method used to clean bags:
    - ☐ Mechanical Shaker
    - ☐ Sonic Cleaning
    - ☐ Reverse Air Jet
    - ☐ Pneumatic Shaker
    - ☐ Reverse Air Flow
    - ☐ Other:
    - ☐ Bag Collapse
    - ☒ Pulse Jet
    - ☐ Manual Cleaning
    - ☐ Reverse Jet

13. Cleaning initiated by:
    - ☐ Timer
    - ☐ Frequency if timer actuated
    - ☒ Expected pressure drop range in. of water
    - ☐ Other

14. Operation Hours: Max. per day: **24** Max. per yr: **8760**

15. Collection efficiency: Rating: %
    Guaranteed minimum: %

Gas Stream Characteristics

16. Gas flow rate into the collector: **44,217.14** ACFM at **103.73** °F and PSIA
    ACFM: Design: PSIA Maximum: PSIA Average Expected: PSIA

17. Water Vapor Content of Effluent Stream: lb. Water/lb. Dry Air

18. Gas Stream Temperature: **103.73** °F

19. Fan Requirements: hp
    OR ft^3/min

20. Stabilized static pressure loss across baghouse. Pressure Drop: High in. H_2O
    Low in. H_2O

21. Particulate Loading: Inlet: grain/scf Outlet: **PM_{10} – 0.002** grain/scf
    $PM_{2.5}$ – 0.002 grain/scf

22. Type of Pollutant(s) to be collected (if particulate give specific type):
PM_{10}, $PM_{2.5}$, and PM_{HAPs}

23. Is there any SO_3 in the emission stream? ☒ No ☐ Yes SO_3 content: ppmv

24. Emission rate of pollutant (specify) into and out of collector at maximum design operating conditions:

Pollutant	IN		OUT	
	lb/hr	grains/acf	lb/hr	grains/acf
Filterable PM_{10}			**0.77**	
Filterable $PM_{2.5}$			**0.77**	
PM_{HAPs}			**0.77**	

25. Complete the table:

Particulate Size Range (microns)	**Particle Size Distribution at Inlet to Collector** **Weight % for Size Range**	**Fraction Efficiency of Collector** **Weight % for Size Range**
0 – 2		
2 – 4		
4 – 6		
6 – 8		
8 – 10		
10 – 12		
12 – 16		
16 – 20		
20 – 30		
30 – 40		
40 – 50		
50 – 60		
60 – 70		
70 – 80		
80 – 90		
90 – 100		
>100		

26. How is filter monitored for indications of deterioration (e.g., broken bags)? ☐ Continuous Opacity ☒ Pressure Drop ☒ Alarms-Audible to Process Operator ☐ Visual opacity readings, Frequency: ☐ Other, specify:
27. Describe any recording device and frequency of log entries:
28. Describe any filter seeding being performed:
29. Describe any air pollution control device inlet and outlet gas conditioning processes (e.g., gas cooling, gas reheating, gas humidification):
30. Describe the collection material disposal system:
31. Have you included ***Baghouse Control Device*** in the Emissions Points Data Summary Sheet? **Yes**

32. **Proposed Monitoring, Recordkeeping, Reporting, and Testing**
Please propose monitoring, recordkeeping, and reporting in order to demonstrate compliance with the proposed operating parameters. Please propose testing in order to demonstrate compliance with the proposed emissions limits.

MONITORING:	RECORDKEEPING:
See proposed monitoring plan in Attachment O.	**See proposed recordkeeping plan in Attachment O.**
REPORTING:	TESTING:
See proposed reporting plan in Attachment O.	**See proposed testing plan in Attachment O.**

MONITORING:	Please list and describe the process parameters and ranges that are proposed to be monitored in order to demonstrate compliance with the operation of this process equipment or air control device.
RECORDKEEPING:	Please describe the proposed recordkeeping that will accompany the monitoring.
REPORTING:	Please describe any proposed emissions testing for this process equipment on air pollution control device.
TESTING:	Please describe any proposed emissions testing for this process equipment on air pollution control device.

33. Manufacturer's Guaranteed Capture Efficiency for each air pollutant.

34. Manufacturer's Guaranteed Control Efficiency for each air pollutant.

PM_{10} – >99% efficiency typical
$PM_{2.5}$ – >99% efficiency typical

35. Describe all operating ranges and maintenance procedures required by Manufacturer to maintain warranty.

Attachment M
Air Pollution Control Device Sheet
(BAGHOUSE)

Control Device ID No. (must match Emission Units Table): **IMF01-BH**

Equipment Information and Filter Characteristics

1. Manufacturer: **TBD**

   Model No.

2. Total number of compartments: **TBD**

3. Number of compartment online for normal operation: **TBD**

4. Provide diagram(s) of unit describing capture system with duct arrangement and size of duct, air volume, capacity, horsepower of movers. If applicable, state hood face velocity and hood collection efficiency.

5. Baghouse Configuration: (check one)
   - ☐ Open Pressure
   - ☐ Closed Pressure
   - ☐ Closed Suction
   - ☐ Electrostatically Enhanced Fabric
   - ☐ Other, Specify

6. Filter Fabric Bag Material:
   - ☐ Nomex nylon
   - ☐ Wool
   - ☐ Polyester
   - ☐ Polypropylene
   - ☐ Acrylics
   - ☐ Ceramics
   - ☐ Fiber Glass
   - ☐ Cotton Weight oz./sq.yd
   - ☐ Teflon Thickness in
   - ☐ Others, specify

7. Bag Dimension:
   Diameter **TBD** in.
   Length **TBD** ft.

8. Total cloth area: **10,549** ft^2

9. Number of bags: **TBD**

10. Operating air to cloth ratio: ft/min

11. Baghouse Operation: ☒ Continuous ☐ Automatic ☐ Intermittent

12. Method used to clean bags:
    - ☐ Mechanical Shaker
    - ☐ Sonic Cleaning
    - ☐ Reverse Air Jet
    - ☐ Pneumatic Shaker
    - ☐ Reverse Air Flow
    - ☐ Other:
    - ☐ Bag Collapse
    - ☐ Pulse Jet
    - ☐ Manual Cleaning
    - ☐ Reverse Jet

13. Cleaning initiated by:
    - ☐ Timer
    - ☐ Frequency if timer actuated
    - ☐ Expected pressure drop range in. of water
    - ☐ Other

14. Operation Hours: Max. per day: **24**
    Max. per yr: **8760**

15. Collection efficiency: Rating: %
    Guaranteed minimum: %

Gas Stream Characteristics

16. Gas flow rate into the collector: **21,413.73** ACFM at **185** °F and PSIA
    ACFM: Design: PSIA Maximum: PSIA Average Expected: PSIA

17. Water Vapor Content of Effluent Stream: lb. Water/lb. Dry Air

18. Gas Stream Temperature: **185** °F

19. Fan Requirements: hp
    OR ft^3/min

20. Stabilized static pressure loss across baghouse. Pressure Drop: High in. H_2O
    Low in. H_2O

21. Particulate Loading: Inlet: grain/scf Outlet: **PM_{10} – 0.014** grain/scf
    $PM_{2.5}$ – 0.002 grain/scf

22. Type of Pollutant(s) to be collected (if particulate give specific type):

Filterable PM_{10}, Filterable $PM_{2.5}$, PM_{HAPS}

23. Is there any SO_3 in the emission stream? ☐ No ☒ Yes SO_3 content: ppmv

24. Emission rate of pollutant (specify) into and out of collector at maximum design operating conditions:

Pollutant	IN		OUT	
	lb/hr	grains/acf	lb/hr	grains/acf
Filterable PM_{10}			**8.22**	
Filterable $PM_{2.5}$			**7.47**	

25. Complete the table:

Particulate Size Range (microns)	Particle Size Distribution at Inlet to Collector Weight % for Size Range	Fraction Efficiency of Collector Weight % for Size Range
0 – 2		
2 – 4		
4 – 6		
6 – 8		
8 – 10		
10 – 12		
12 – 16		
16 – 20		
20 – 30		
30 – 40		
40 – 50		
50 – 60		
60 – 70		
70 – 80		
80 – 90		
90 – 100		
>100		

26. How is filter monitored for indications of deterioration (e.g., broken bags)? ☐ Continuous Opacity ☒ Pressure Drop ☒ Alarms-Audible to Process Operator –Required by MACT ☐ Visual opacity readings, Frequency: ☐ Other, specify:	
27. Describe any recording device and frequency of log entries:	
28. Describe any filter seeding being performed:	
29. Describe any air pollution control device inlet and outlet gas conditioning processes (e.g., gas cooling, gas reheating, gas humidification):	
30. Describe the collection material disposal system:	
31. Have you included ***Baghouse Control Device*** in the Emissions Points Data Summary Sheet? **Yes**	

32. **Proposed Monitoring, Recordkeeping, Reporting, and Testing**
Please propose monitoring, recordkeeping, and reporting in order to demonstrate compliance with the proposed operating parameters. Please propose testing in order to demonstrate compliance with the proposed emissions limits.

MONITORING:	RECORDKEEPING:
See proposed monitoring plan in Attachment O.	**See proposed recordkeeping plan in Attachment O.**
REPORTING:	TESTING:
See proposed reporting plan in Attachment O.	**See proposed testing plan in Attachment O.**

MONITORING:	Please list and describe the process parameters and ranges that are proposed to be monitored in order to demonstrate compliance with the operation of this process equipment or air control device.
RECORDKEEPING:	Please describe the proposed recordkeeping that will accompany the monitoring.
REPORTING:	Please describe any proposed emissions testing for this process equipment on air pollution control device.
TESTING:	Please describe any proposed emissions testing for this process equipment on air pollution control device.

33. Manufacturer's Guaranteed Capture Efficiency for each air pollutant.

34. Manufacturer's Guaranteed Control Efficiency for each air pollutant.

PM_{10} – >99% efficiency typical
$PM_{2.5}$ – >99% efficiency typical

35. Describe all operating ranges and maintenance procedures required by Manufacturer to maintain warranty.

Attachment M
Air Pollution Control Device Sheet
(BAGHOUSE)

Control Device ID No. (must match Emission Units Table): **CE02-BH**

Equipment Information and Filter Characteristics

1. Manufacturer: **TBD** Model No.	2. Total number of compartments: **TBD** 3. Number of compartment online for normal operation: **TBD**
4. Provide diagram(s) of unit describing capture system with duct arrangement and size of duct, air volume, capacity, horsepower of movers. If applicable, state hood face velocity and hood collection efficiency.	
5. Baghouse Configuration: (check one) ☐ Open Pressure ☐ Closed Pressure ☐ Closed Suction ☐ Electrostatically Enhanced Fabric ☐ Other, Specify	
6. Filter Fabric Bag Material: ☐ Nomex nylon ☐ Wool ☐ Polyester ☐ Polypropylene ☐ Acrylics ☐ Ceramics ☐ Fiber Glass ☐ Cotton Weight oz./sq.yd ☐ Teflon Thickness in ☐ Others, specify	7. Bag Dimension: Diameter **TBD** in. Length **TBD** ft. 8. Total cloth area: **TBD** ft^2 9. Number of bags: **TBD** 10. Operating air to cloth ratio: ft/min
11. Baghouse Operation: ☐ Continuous ☐ Automatic ☒ Intermittent	
12. Method used to clean bags: ☐ Mechanical Shaker ☐ Sonic Cleaning ☐ Reverse Air Jet ☐ Pneumatic Shaker ☐ Reverse Air Flow ☐ Other: ☐ Bag Collapse ☐ Pulse Jet ☐ Manual Cleaning ☐ Reverse Jet	
13. Cleaning initiated by: ☐ Timer ☐ Frequency if timer actuated ☐ Expected pressure drop range in. of water ☐ Other	
14. Operation Hours: Max. per day: **24** Max. per yr: **8760**	15. Collection efficiency: Rating: % Guaranteed minimum: %

Gas Stream Characteristics

16. Gas flow rate into the collector: **12,633.47** ACFM at **103.73** °F and PSIA ACFM: Design: PSIA Maximum: PSIA Average Expected: PSIA	
17. Water Vapor Content of Effluent Stream: lb. Water/lb. Dry Air	
18. Gas Stream Temperature: **103.73** °F	19. Fan Requirements: hp OR ft^3/min
20. Stabilized static pressure loss across baghouse. Pressure Drop: High in. H_2O Low in. H_2O	
21. Particulate Loading: Inlet: grain/scf Outlet: **PM_{10} – 0.0041** grain/scf **$PM_{2.5}$ – 0.0026** grain/scf	

22. Type of Pollutant(s) to be collected (if particulate give specific type):

Filterable PM_{10}, $PM_{2.5}$, and PM_{HAPs}

23. Is there any SO_3 in the emission stream? ☒ No ☐ Yes SO_3 content: ppmv

24. Emission rate of pollutant (specify) into and out of collector at maximum design operating conditions:

	IN		OUT	
Pollutant	**lb/hr**	**grains/acf**	**lb/hr**	**grains/acf**
Filterable PM_{10}			**0.22**	
Filterable $PM_{2.5}$			**0.22**	
PM_{HAPs}			**0.22**	

25. Complete the table:

	Particle Size Distribution at Inlet to Collector	**Fraction Efficiency of Collector**
Particulate Size Range (microns)	**Weight % for Size Range**	**Weight % for Size Range**
0 – 2		
2 – 4		
4 – 6		
6 – 8		
8 – 10		
10 – 12		
12 – 16		
16 – 20		
20 – 30		
30 – 40		
40 – 50		
50 – 60		
60 – 70		
70 – 80		
80 – 90		
90 – 100		
>100		

26. How is filter monitored for indications of deterioration (e.g., broken bags)? ☐ Continuous Opacity ☒ Pressure Drop ☒ Alarms-Audible to Process Operator ☐ Visual opacity readings, Frequency: ☐ Other, specify:
27. Describe any recording device and frequency of log entries:
28. Describe any filter seeding being performed:
29. Describe any air pollution control device inlet and outlet gas conditioning processes (e.g., gas cooling, gas reheating, gas humidification):
30. Describe the collection material disposal system:
31. Have you included ***Baghouse Control Device*** in the Emissions Points Data Summary Sheet? **Yes**

32. **Proposed Monitoring, Recordkeeping, Reporting, and Testing** Please propose monitoring, recordkeeping, and reporting in order to demonstrate compliance with the proposed operating parameters. Please propose testing in order to demonstrate compliance with the proposed emissions limits.	
MONITORING: **See proposed monitoring plan in Attachment O.**	RECORDKEEPING: **See proposed recordkeeping plan in Attachment O.**
REPORTING: **See proposed reporting plan in Attachment O.**	TESTING: **See proposed testing plan in Attachment O.**

MONITORING:	Please list and describe the process parameters and ranges that are proposed to be monitored in order to demonstrate compliance with the operation of this process equipment or air control device.
RECORDKEEPING:	Please describe the proposed recordkeeping that will accompany the monitoring.
REPORTING:	Please describe any proposed emissions testing for this process equipment on air pollution control device.
TESTING:	Please describe any proposed emissions testing for this process equipment on air pollution control device.

33. Manufacturer's Guaranteed Capture Efficiency for each air pollutant.

The vacuum cleaning baghouse is a maintenance source that is not capturing emissions from an emission unit. Capture is not applicable to this source.

34. Manufacturer's Guaranteed Control Efficiency for each air pollutant.

PM_{10} – >99% efficiency typical
$PM_{2.5}$ – >99% efficiency typical

35. Describe all operating ranges and maintenance procedures required by Manufacturer to maintain warranty.

Attachment M
Air Pollution Control Device Sheet
(BAGHOUSE)

Control Device ID No. (must match Emission Units Table): **IMF06-BH**

Equipment Information and Filter Characteristics

1. Manufacturer: **TBD**
   Model No.

2. Total number of compartments: **TBD**

3. Number of compartment online for normal operation: **TBD**

4. Provide diagram(s) of unit describing capture system with duct arrangement and size of duct, air volume, capacity, horsepower of movers. If applicable, state hood face velocity and hood collection efficiency.

5. Baghouse Configuration: (check one)
   ☐ Open Pressure ☒ Closed Pressure ☐ Closed Suction
   ☐ Electrostatically Enhanced Fabric
   ☐ Other, Specify

6. Filter Fabric Bag Material:
   ☐ Nomex nylon ☐ Wool
   ☐ Polyester ☐ Polypropylene
   ☐ Acrylics ☐ Ceramics
   ☐ Fiber Glass
   ☐ Cotton Weight oz./sq.yd
   ☐ Teflon Thickness in
   ☐ Others, specify **TBD**

7. Bag Dimension:
   Diameter **TBD** in.
   Length **TBD** ft.

8. Total cloth area: **TBD** ft^2

9. Number of bags: **TBD**

10. Operating air to cloth ratio: **TBD** ft/min

11. Baghouse Operation: ☒ Continuous ☐ Automatic ☐ Intermittent

12. Method used to clean bags:
   ☐ Mechanical Shaker ☐ Sonic Cleaning ☐ Reverse Air Jet
   ☐ Pneumatic Shaker ☐ Reverse Air Flow ☐ Other: **TBD**
   ☐ Bag Collapse ☐ Pulse Jet
   ☐ Manual Cleaning ☐ Reverse Jet

13. Cleaning initiated by:
   ☐ Timer ☐ Frequency if timer actuated
   ☐ Expected pressure drop range in. of water ☐ Other

14. Operation Hours: Max. per day: **24**
   Max. per yr: **8760**

15. Collection efficiency: Rating: %
   Guaranteed minimum: %

Gas Stream Characteristics

16. Gas flow rate into the collector: **6,316.7** ACFM at **68.0** °F and PSIA
   ACFM: Design: PSIA Maximum: PSIA Average Expected: PSIA

17. Water Vapor Content of Effluent Stream: lb. Water/lb. Dry Air

18. Gas Stream Temperature: **68.0** °F

19. Fan Requirements: hp
   OR ft^3/min

20. Stabilized static pressure loss across baghouse. Pressure Drop: High in. H_2O
   Low in. H_2O

21. Particulate Loading: Inlet: grain/scf Outlet: **PM_{10} – 0.004** grain/scf
   $PM_{2.5}$ – 0.002 grain/scf

22. Type of Pollutant(s) to be collected (if particulate give specific type):

Filterable PM_{10} and $PM_{2.5}$

23. Is there any SO_3 in the emission stream? ☒ No ☐ Yes SO_3 content: ppmv

24. Emission rate of pollutant (specify) into and out of collector at maximum design operating conditions:

Pollutant	IN		OUT	
	lb/hr	grains/acf	lb/hr	grains/acf
Filterable PM_{10}			**0.22**	
Filterable $PM_{2.5}$			**0.11**	

25. Complete the table:

Particulate Size Range (microns)	Particle Size Distribution at Inlet to Collector Weight % for Size Range	Fraction Efficiency of Collector Weight % for Size Range
0 – 2		
2 – 4		
4 – 6		
6 – 8		
8 – 10		
10 – 12		
12 – 16		
16 – 20		
20 – 30		
30 – 40		
40 – 50		
50 – 60		
60 – 70		
70 – 80		
80 – 90		
90 – 100		
>100		

26. How is filter monitored for indications of deterioration (e.g., broken bags)? ☐ Continuous Opacity ☒ Pressure Drop ☒ Alarms-Audible to Process Operator ☐ Visual opacity readings, Frequency: ☐ Other, specify:
27. Describe any recording device and frequency of log entries:
28. Describe any filter seeding being performed:
29. Describe any air pollution control device inlet and outlet gas conditioning processes (e.g., gas cooling, gas reheating, gas humidification):
30. Describe the collection material disposal system:
31. Have you included ***Baghouse Control Device*** in the Emissions Points Data Summary Sheet? **Yes**

32. **Proposed Monitoring, Recordkeeping, Reporting, and Testing** Please propose monitoring, recordkeeping, and reporting in order to demonstrate compliance with the proposed operating parameters. Please propose testing in order to demonstrate compliance with the proposed emissions limits.	
MONITORING: **See proposed monitoring plan in Attachment O.**	RECORDKEEPING: **See proposed recordkeeping plan in Attachment O.**
REPORTING: **See proposed reporting plan in Attachment O.**	TESTING: **See proposed testing plan in Attachment O.**

MONITORING:	Please list and describe the process parameters and ranges that are proposed to be monitored in order to demonstrate compliance with the operation of this process equipment or air control device.
RECORDKEEPING:	Please describe the proposed recordkeeping that will accompany the monitoring.
REPORTING:	Please describe any proposed emissions testing for this process equipment on air pollution control device.
TESTING:	Please describe any proposed emissions testing for this process equipment on air pollution control device.

33. Manufacturer's Guaranteed Capture Efficiency for each air pollutant.

34. Manufacturer's Guaranteed Control Efficiency for each air pollutant.

PM_{10} – >99% efficiency
$PM_{2.5}$ – >99% efficiency

35. Describe all operating ranges and maintenance procedures required by Manufacturer to maintain warranty.

Attachment N

Attachment N

Emission Calculations

Please see the emission calculations for the RAN facility as *Appendix A* of this permit application submittal.

Attachment O

Roxul USA Inc.
Ranson, West Virginia
BACT Summary, Proposed Compliance Demonstration, & Federal State/ Regulatory Limits

Unit Process	Source ID	Source Description	Pollutant	US: Proposed BACT Emission Limit		METRIC: Proposed BACT Emission Limit		Proposed BACT Control Type	Proposed Compliance Demonstration	Federal/State Regulatory Emission Standard		
				Limit	UOM	Limit	UOM			Standard	Limit	UOM
Facility Wide			CO2e	152,935	ton/12-month rolling total	138,740	tonne/12-month rolling total	Good operation & maintenance for energy efficiency	Recordkeeping	--	--	--
Minwool Line												
Mineral Wool Line			CO2e	135,617	ton/yr 12-month rolling total	123,030	tonne/yr 12-month rolling total	Good operation & maintenance for energy efficiency	Recordkeeping	--	--	--
Material Handling Fugitives	RMS	Raw Material Stockpile	PM/PM10/ PM2.5 (filterable)	--	--	--	--	Partial Enclosures & Good Housekeeping Practices	Recordkeeping	--	--	--
	B215	Raw Material Loading Hopper (B215)						Partial Enclosures & Good Housekeeping Practices	Recordkeeping	--	--	--
	RM_REJ	Raw Material Reject Collection Bin						No add-on controls	Initial and 1/5 yr VE	NSPS OOO	7%	opacity
	S_REJ	Sieve Reject Collection Bin						No add-on controls	Initial and 1/5 yr VE	NSPS OOO	7%	opacity
	B170	Melting Furnace Portable Crusher & Storage						Operational limit and good housekeeping practices	Recordkeeping	45CSR7	20%	opacity
	Rd_RM	Raw Material Paved Haul Roads						Good housekeeping practices	Recordkeeping	45CSR7	--	--
	Rd_CM	FEL - Coal/PET Coke from Bunker to Feed Hopper (for Milling)										
	Rd_FP	Finished Product Paved Haul Road										
	B210	Raw Material Storage (B210)						Partial Enclosures & Good Housekeeping Practices	Recordkeeping	--	--	--

Roxul USA Inc.
Ranson, West Virginia
BACT Summary, Proposed Compliance Demonstration, & Federal State/ Regulatory Limits

Unit Process	Source ID	Source Description	Pollutant	US Proposed BACT Emission Limit		METRIC Proposed BACT Emission Limit		Proposed BACT Control Type	Proposed Compliance Demonstration	Federal/State Regulatory Emission Standard		
				Limit	UOM	Limit	UOM			Standard	Limit	UOM
Material Handling Vents	IMF03	Three (3) Coal Storage Silos	PM/PM_{10} (filterable)	0.04	lb/hr	0.02	kg/hr	Bin Vent Filter	Recordkeeping	45CSR7	N/A	opacity
			$PM_{2.5}$ (filterable)	0.02		0.01						
	IMF07	Two (2) Storage Silos (Filter Fines Day/ Secondary Energy Materials)	PM/PM_{10} (filterable)	0.03	lb/hr	0.01	kg/hr	Bin Vent Filter	Initial and 1/5 yr VE	NSPS OOO	7%	opacity
			$PM_{2.5}$ (filterable)	0.01		6.25E-03						
	IMF08	Sorbent Silo	PM/PM_{10} (filterable)	0.01	lb/hr	6.00E-03	kg/hr	Bin Vent Filter	Recordkeeping	45CSR7	N/A	opacity
			$PM_{2.5}$ (filterable)	6.61E-03		3.00E-03						
	IMF09	Spent Sorbent Silo	PM/PM_{10} (filterable)	0.01	lb/hr	6.00E-03	kg/hr	Bin Vent Filter	Recordkeeping	45CSR7	N/A	opacity
			$PM_{2.5}$ (filterable)	6.61E-03		3.00E-03						
	IMF10	Filter Fines Recieving Silo	PM/PM_{10} (filterable)	0.01	lb/hr	6.00E-03	kg/hr	Bin Vent Filter	Initial and 1/5 yr VE	NSPS OOO	7%	opacity
			$PM_{2.5}$ (filterable)	6.61E-03		3.00E-03						
	IMF11	Conveyor Transition Point (B215 to B220)	PM/PM_{10} (filterable)	0.02	lb/hr	0.01	kg/hr	Fabric Filter	Initial Stack Test (M5) and NSPS Monitoring (e.g., quarterly 30-minute VE)	NSPS OOO	0.014	gr/dscf
			$PM_{2.5}$ (filterable)	0.01		4.50E-03						
	IMF12	Conveyor Transition Point (B210 to B220)	PM/PM_{10} (filterable)	0.02	lb/hr	0.01	kg/hr	Fabric Filter	Initial Stack Test (M5) and NSPS Monitoring (e.g., quarterly 30-minute VE)	NSPS OOO	0.014	gr/dscf
			$PM_{2.5}$ (filterable)	0.01		4.50E-03						
	IMF14	Conveyor Transition Point (B220 No. 1)	PM/PM_{10} (filterable)	0.02	lb/hr	0.01	kg/hr	Fabric Filter	Initial Stack Test (M5) and NSPS Monitoring (e.g., quarterly 30-minute VE)	NSPS OOO	0.014	gr/dscf
			$PM_{2.5}$ (filterable)	0.01		4.50E-03						
	IMF15	Conveyor Transition Point (B220 No. 2)	PM/PM_{10} (filterable)	0.02	lb/hr	0.01	kg/hr	Fabric Filter	Initial Stack Test (M5) and NSPS Monitoring (e.g., quarterly 30-minute VE)	NSPS OOO	0.014	gr/dscf
			$PM_{2.5}$ (filterable)	0.01		4.50E-03						
	IMF16	Conveyor Transition Point (B220 to B300)	PM/PM_{10} (filterable)	0.02	lb/hr	0.01	kg/hr	Fabric Filter	Initial Stack Test (M5) and NSPS Monitoring (e.g., quarterly 30-minute VE)	NSPS OOO	0.014	gr/dscf
			$PM_{2.5}$ (filterable)	0.01		4.50E-03						
	IMF17	Charging Material Handling Building Vent 1	PM/PM_{10} (filterable)	0.02	lb/hr	0.01	kg/hr	No add-on controls	Initial VE and NSPS Monitoring (e.g., quarterly 30-minute VE)	NSPS OOO	7%	opacity
			$PM_{2.5}$ (filterable)	0.01		4.38E-03						
	IMF18	Charging Material Handling Building Vent 2	PM/PM_{10} (filterable)	0.02	lb/hr	0.01	kg/hr	No add-on controls	Initial VE and NSPS Monitoring (e.g., quarterly 30-minute VE)	NSPS OOO	7%	opacity
			$PM_{2.5}$ (filterable)	0.01		4.38E-03						
	IMF25	Coal Feed Tank	PM/PM_{10} (filterable)	0.01	lb/hr	6.00E-03	kg/hr	Bin Vent Filter	Recordkeeping	45CSR7	20%	opacity
			$PM_{2.5}$ (filterable)	6.61E-03		3.00E-03						
	IMF21	Charging Building Vacuum Cleaning Filter	PM/PM_{10} (filterable)	5.51E-03	lb/hr	2.50E-03	kg/hr	Fabric Filter	Recordkeeping	45CSR7	20%	opacity
			$PM_{2.5}$ (filterable)	2.76E-03		1.25E-03						
	CM10	Recycle Plant Building Vent 1	PM/PM_{10} (filterable)	0.66	lb/hr	0.30	kg/hr	Fabric Filter	Recordkeeping	45CSR7	20%	opacity
			$PM_{2.5}$ (filterable)	0.33		0.15						
	CM11	Recycle Plant Building Vent 2	PM/PM_{10} (filterable)	0.66	lb/hr	0.30	kg/hr	Fabric Filter	Recordkeeping	45CSR7	20%	opacity
			$PM_{2.5}$ (filterable)	0.33		0.15						
	CM08	Recycle Plant Building Vent 3	PM/PM_{10} (filterable)	0.06	lb/hr	0.03	kg/hr	Fabric Filter	Recordkeeping	45CSR7	20%	opacity
			$PM_{2.5}$ (filterable)	0.03		0.01						
	CM09	Recycle Plant Building Vent 4	PM/PM_{10} (filterable)	0.06	lb/hr	0.03	kg/hr	Fabric Filter	Recordkeeping	45CSR7	20%	opacity
			$PM_{2.5}$ (filterable)	0.03		0.01						

Roxul USA Inc.
Ranson, West Virginia
BACT Summary, Proposed Compliance Demonstration, & Federal State/ Regulatory Limits

Unit Process	Source ID	Source Description	Pollutant	US: Proposed BACT Emission Limit		METRIC: Proposed BACT Emission Limit		Proposed BACT Control Type	Proposed Compliance Demonstration	Federal/State Regulatory Emission Standard		
				Limit	UOM	Limit	UOM			Standard	Limit	UOM
Melting	IMF24	Pre-heat Burner	$PM_{10}/PM_{2.5}$ (filterable and condensable)	--	--	--	--	Good combustion practices, use of natural gas, low-NOx burner	Recordkeeping, Compliance with NESHAP DDDDD (biennial tune-up)	--	--	--
			PM (filterable)	--	--	--	--					
			VOC	--	--	--	--					
			CO	84	lb/MMscf	1,346	$kg/MMsm^3$					
			SO_2	--	--	--	--					
			NOx	60	ppmvd @ 3% O2	60	ppmvd @ 3% O2					
			HAP	N/A	N/A	N/A	N/A	N/A		NESHAP DDDDD	N/A	N/A
	IMF01	Melting Furnace	PM (filterable)	2.32	lb/hr	1.05	kg/hr	Baghouse	Initial Stack Testing and Operation of Bag Leak Detection System (NESHAP DDD)	NESHAP DDD	0.10	lb PM (filterable)/short ton melt
			PM_{10} (filterable and condensable)	8.22	lb/hr	3.73	kg/hr			--	--	--
			$PM_{2.5}$ (filterable and condensable)	7.47	lb/hr	3.39	kg/hr			--	--	--
			VOC	51.08	ton/yr	46.34	tonne/yr	Maintain oxidizing atmosphere for good combustion	Compliance with NESHAP DDD (Monitoring related to excess oxygen)	--	--	--
			CO	11.21	lb/hr based on 30-day rolling average	5.09	kg/hr based on 30-day rolling average		Operation of CEM	--	--	--
			SO_2	33.63	lb/hr based on 30-day rolling average	15.26	kg/hr based on 30-day rolling average	Sorbent Injection System	Operation of CEM	--	--	--
			H_2SO_4	3.74	lb/hr	1.70	kg/hr		Initial Stack Testing	--	--	--
			NO_x	37.37	lb/hr based on 30-day rolling average	16.95	kg/hr based on 30-day rolling average	SNCR and Oxy-fuel burners	Operation of CEM	--	--	--
			COS	N/A	N/A	N/A	N/A	N/A	Compliance with NESHAP DDD (Initial Stack Testing, Monitoring related to Excess Oxygen, Recordkeeping)	NESHAP DDD	3.2	lb/short ton melt
			HF							NESHAP DDD	0.015	lb/short ton melt
			HCl							NESHAP DDD	0.012	lb/short ton melt
Cooling Towers	IMF02	Melting Furnace Cooling Tower	$PM/PM_{10}/PM_{2.5}$ (filterable)	0.001	% drift loss	0.001	% drift loss	High-efficiency Drift Eliminators	Recordkeeping of Design Specification	--	--	--
	HE02	Gutter Cooling Tower	$PM/PM_{10}/PM_{2.5}$ (filterable)	0.001	% drift loss	0.001	% drift loss	High-efficiency Drift Eliminators	Recordkeeping of Design Specification	--	--	--
Fleece Application	CM12	Fleece Application Vent 1	VOC	28.58	ton/yr 12-month rolling total	25.93	tonne/yr 12-month rolling total	Good work practices and Compliance with NESHAP JJJJ (e.g., use of compliant coating)	Compliance with NESHAP JJJJ (Recordkeeping)	--	--	--
	CM13	Fleece Application Vent 2	HAP	N/A	N/A	N/A	N/A	N/A		NESHAP JJJJ	0.016 kg OHAP/kg coating; OR 0.08 kg/kg coating solids	

Roxul USA Inc.
Ranson, West Virginia
BACT Summary, Proposed Compliance Demonstration, & Federal State/ Regulatory Limits

Unit Process	Source ID	Source Description	Pollutant	US Proposed BACT Emission Limit		METRIC Proposed BACT Emission Limit		Proposed BACT Control Type	Proposed Compliance Demonstration	Federal/State Regulatory Emission Standard		
				Limit	UOM	Limit	UOM			Standard	Limit	UOM
WESP	HE01	Gutter Exhaust, Spinning Chamber, Curing Oven, Curing Oven Hoods, Cooling Zone	PM (filterable)	21.21	lb/hr	9.62	kg/hr	Wet Electrostatic Precipitator	Initial Stack Testing	45CSR7	20%	opacity
			PM_{10} (filterable and condensable)	21.21	lb/hr	9.62	kg/hr					
			$PM_{2.5}$ (filterable and condensable)	19.22	lb/hr	8.72	kg/hr					
			VOC	78.02	lb/hr	35.39	kg/hr	Afterburner (Curing Oven); No add-on control for Spinning Chamber/Cooling Zone	Spinning Chamber/Curing Oven: Compliance with NESHAP DDD (Initial Stack Testing, Monitoring of Afterburner Temperature, Recordkeeping)	--	--	--
			CO	1.82	lb/hr	0.82	kg/hr					
			SO_2	--	--	--	--	No add-on controls	N/A	--	--	--
			NO_x	14.55	lb/hr	6.60	kg/hr	Good combustion practices and low-NOx burners based on vendor data (Curing Oven and Afterburner Burners); No add-on control for Spinning Chamber/Cooling Zone	Recordkeeping (Curing Oven and Curing Oven Afterburner)	--	--	--
Part of WESP	Part of HE01	Combined Collection/Curing Operations	Formaldehyde	N/A	N/A	N/A	N/A	N/A	Compliance with NESHAP DDD (Initial Stack Testing, Monitoring of Afterburner Temperature, Recordkeeping)	NESHAP DDD	2.4	lb/short ton melt
			Phenol							NESHAP DDD	0.71	lb/short ton melt
			Methanol							NESHAP DDD	0.92	lb/short ton melt
	CE01	De-dusting Baghouse	PM (filterable)	1.54	lb/hr	0.70	kg/hr	Baghouse	Initial Stack Testing	45CSR7	20%	opacity
			$PM_{10}/PM_{2.5}$ (filterable)	0.77		0.35						
	CE02	Vacuum Cleaning Baghouse	PM (filterable)	0.44	lb/hr	0.20	kg/hr	Baghouse	Recordkeeping	45CSR7	20%	opacity
			$PM_{10}/PM_{2.5}$ (filterable)	0.22		0.10						
Product Marking	P_MARK	Branding	$PM_{10}/PM_{2.5}$ (filterable and condensable)	--	--	--	--	Use of natural gas	Recordkeeping of Design Specification	--	--	--
			PM (filterable)	--	--	--	--					
			VOC	--	--	--	--					
			CO	--	--	--	--					
			SO_2	--	--	--	--					
			NOx	--	--	--	--					
		inking	VOC	9.48	ton/yr 12-month rolling total	8.60	tonne/yr 12-month rolling total	Good work practices	Recordkeeping	--	--	--

Roxul USA Inc.
Ranson, West Virginia
BACT Summary, Proposed Compliance Demonstration, & Federal State/ Regulatory Limits

Unit Process	Source ID	Source Description	Pollutant	US Proposed BACT Emission Limit: Limit	US Proposed BACT Emission Limit: UOM	METRIC Proposed BACT Emission Limit: Limit	METRIC Proposed BACT Emission Limit: UOM	Proposed BACT Control Type	Proposed Compliance Demonstration	Federal/State Regulatory Emission Standard: Standard	Federal/State Regulatory Emission Standard: Limit	Federal/State Regulatory Emission Standard: UOM
Rockfon Line												
Rockfon Line			CO_2e	14,239	ton/yr 12-month rolling total	12,917	tonne/yr 12-month rolling total	Good operation & maintenance for energy efficiency	Recordkeeping	--	--	--
	RFNE1	IR Zone	PM (filterable)	0.01	lb/hr	4.20E-03	kg/hr	No add-on controls	Recordkeeping	45CSR7	20%	opacity
			PM_{10} (filterable and condensable)	0.02	lb/hr	0.01	kg/hr					
			$PM_{2.5}$ (filterable and condensable)	0.01	lb/hr	6.30E-03	kg/hr					
	RFNE2	Hot Press and Cure	PM (filterable)	0.01	lb/hr	4.20E-03	kg/hr	No add-on controls	Recordkeeping	45CSR7	20%	opacity
			PM_{10} (filterable and condensable)	0.02	lb/hr	0.01	kg/hr					
			$PM_{2.5}$ (filterable and condensable)	0.01	lb/hr	6.30E-03	kg/hr					
	RFNE1 RFNE2	IR Zone Hot Press and Cure	VOC	7.48	ton/yr 12-month rolling total	6.78	tonne/yr 12-month rolling total	Maximum VOC Content	Recordkeeping	--	--	--
				53	g/kg	53	g/kg					
	RFNE3 RFNE9 RFNE5 RFNE4 RFNE6 RFNE7	High Oven A High Oven B Spray Paint Cabin Drying Oven 1 Drying Oven 2 & 3 Cooling Zone	VOC	30.69	ton/yr 12-month rolling total	27.84	tonne/yr 12-month rolling total	Maximum VOC Content	Recordkeeping	--	--	--
				0.67	lb/gal	80	g/L					
	RFNE3	High Oven A	PM (filterable)	0.06	lb/hr	0.03	kg/hr	Good combustion practices and use of natural gas	Recordkeeping	45CSR7	20%	Opacity
			PM_{10} (filterable and condensable)	0.12	lb/hr	0.05	kg/hr					
			$PM_{2.5}$ (filterable and condensable)	0.09	lb/hr	0.04	kg/hr					
			CO	84	lb/MMscf	1,346	$kg/MMsm^3$			--	--	--
			SO_2	--	--	--	--					
			NOx	100	lb/MMscf	1,602	$kg/MMsm^3$					
	RFNE9	High Oven B	PM (filterable)	0.06	lb/hr	0.03	kg/hr	Good combustion practices and use of natural gas	Recordkeeping	45CSR7	20%	Opacity
			PM_{10} (filterable and condensable)	0.12	lb/hr	0.05	kg/hr					
			$PM_{2.5}$ (filterable and condensable)	0.09	lb/hr	0.04	kg/hr					
			CO	84	lb/MMscf	1,346	$kg/MMsm^3$			--	--	--
			SO_2	--	--	--	--					
			NOx	100	lb/MMscf	1,602	$kg/MMsm^3$					
	RFNE4	Drying Oven 1	PM (filterable)	0.04	lb/hr	0.02	kg/hr	Particulate filter, good combustion practices, and use of natural gas	Recordkeeping	45CSR7	20%	opacity
			PM_{10} (filterable and condensable)	0.08	lb/hr	0.04	kg/hr					
			$PM_{2.5}$ (filterable and condensable)	0.06	lb/hr	0.03	kg/hr					
			CO	84	lb/MMscf	1,346	$kg/MMsm^3$	Good combustion practices and use of natural gas		--	--	--
			SO_2	-	--	--	--					
			NOx	100	lb/MMscf	1,602	$kg/MMsm^3$					

Roxul USA Inc.

Ranson, West Virginia

BACT Summary, Proposed Compliance Demonstration, & Federal State/ Regulatory Limits

Unit Process	Source ID	Source Description	Pollutant	US Proposed BACT Emission Limit		METRIC Proposed BACT Emission Limit		Proposed BACT Control Type	Proposed Compliance Demonstration	Federal/State Regulatory Emission Standard		
				Limit	UOM	Limit	UOM			Standard	Limit	UOM
	RFNE6	Drying Oven 2 & 3	PM (filterable)	0.06	lb/hr	0.03	kg/hr	Particulate filter, good combustion practices, and use of natural gas	Recordkeeping	45CSR7	20%	opacity
			PM_{10} (filterable and condensable)	0.13	lb/hr	0.06	kg/hr					
			$PM_{2.5}$ (filterable and condensable)	0.09	lb/hr	0.04	kg/hr					
			CO	84	lb/MMscf	1,346	$kg/MMsm^3$	Good combustion practices and use of natural gas		--	--	--
			SO_2	--	--	--	--					
			NOx	100	lb/MMscf	1,602	$kg/MMsm^3$					
	RFNE5	Spray Paint Cabin	PM (filterable)	0.44	lb/hr	0.20	kg/hr	Particulate Filter	Recordkeeping	45CSR7	20%	opacity
			PM_{10} (filterable and condensable)	0.88	lb/hr	0.40	kg/hr					
			$PM_{2.5}$ (filterable and condensable)	0.66	lb/hr	0.30	kg/hr					
	RFNE7	Cooling Zone	PM (filterable)	0.10	lb/hr	0.04	kg/hr	No add-on controls	N/A	--	--	--
			PM_{10} (filterable and condensable)	0.19	lb/hr	0.09	kg/hr					
			$PM_{2.5}$ (filterable and condensable)	0.14	lb/hr	0.07	kg/hr					
	RFNE8	De-dusting Baghouse	PM/PM_{10} (filterable)	0.34	lb/hr	0.15	kg/hr	Baghouse	Recordkeeping	45CSR7	20%	opacity
			$PM_{2.5}$ (filterable)	0.17	lb/hr	0.08	kg/hr					
Other Facility-wide Sources												
	CM03	Natural Gas Boiler 1	$PM_{10}/PM_{2.5}$ (filterable and condensable)	--	--	--	--	Good combustion practices, use of natural gas, low-NOx burner	Recordkeeping, Compliance with NESHAP DDDDD (biennial tune-up)	--	--	--
			PM (filterable)	--	--	--	--					
			VOC	--	--	--	--					
			CO	84	lb/MMscf	1,346	$kg/MMsm^3$					
			SO_2	--	--	--	--					
			NOx	30	ppmvd @ 3% O2	30	ppmvd @ 3% O2					
			HAP	N/A	N/A	N/A	N/A	N/A		NESHAP DDDDD	N/A	N/A
	CM04	Natural Gas Boiler 2	$PM_{10}/PM_{2.5}$ (filterable and condensable)	--	--	--	--	Good combustion practices, use of natural gas, low-NOx burner	Recordkeeping, Compliance with NESHAP DDDDD (biennial tune-up)	--	--	--
			PM (filterable)	--	--	--	--					
			VOC	--	--	--	--					
			CO	84	lb/MMscf	1,346	$kg/MMsm^3$					
			SO_2	--	--	--	--					
			NOx	30	ppmvd @ 3% O2	30	ppmvd @ 3% O2					
			HAP	N/A	N/A	N/A	N/A	N/A		NESHAP DDDDD	N/A	N/A
	RFN10	RFN Building Heat	$PM_{10}/PM_{2.5}$ (filterable and condensable)	--	--	--	--	Good combustion practices, use of natural gas, low-NOx burner	Recordkeeping, Compliance with NESHAP DDDDD (biennial tune-up)	--	--	--
			PM (filterable)	--	--	--	--					
			VOC	--	--	--	--					
			CO	84	lb/MMscf	1,346	$kg/MMsm^3$					
			SO_2	--	--	--	--					
			NOx	30	ppmvd @ 3% O2	30	ppmvd @ 3% O2					
			HAP	N/A	N/A	N/A	N/A	N/A		NESHAP DDDDD	N/A	N/A
	EFP1	Emergency Fire Pump Engine	PM (filterable)	0.20	g/kw-hr	0.20	g/kw-hr	Compliance with NSPS Subpart IIII, purchase of certified engine, use of ultra-low sulfur diesel	Compliance with NSPS Subpart IIII (Recordkeeping)	NSPS IIII	0.20	g/kw-hr
			$PM_{10}/PM_{2.5}$ (filterable and condensable)	--	--	--	--			--	--	--
			VOC	--	--	--	--			--	--	--
			CO	3.5	g/kw-hr	3.5	g/kw-hr			NSPS IIII	3.5	g/kw-hr
			SO_2	--	--	--	--			NSPS IIII	15	ppm sulfur
			NOx +NMHC	4.0	g/kw-hr	4.0	g/kw-hr			NSPS IIII	4.0	g/kw-hr
			HAP	N/A	N/A	N/A	N/A	N/A		NESHAP ZZZZ	N/A	N/A
	TKS	Facility-wide Tanks	VOC	--	--	--	--	Good operating practices	Recordkeeping	--	--	--

Roxul USA Inc.

Ranson, West Virginia

BACT Summary, Proposed Compliance Demonstration, & Federal State/ Regulatory Limits

Unit Process	Source ID	Source Description	Pollutant	US Proposed BACT Emission Limit		METRIC Proposed BACT Emission Limit		Proposed BACT Control Type	Proposed Compliance Demonstration	Federal/State Regulatory Emission Standard		
				Limit	UOM	Limit	UOM			Standard	Limit	UOM
Coal Milling												
	IMF05	Coal Mill Burner & Baghouse	PM (filterable)	0.12	lb/hr	0.06	kg/hr	Fabric Filter, good combustion practices, and use of natural gas	Recordkeeping	45CSR7	20%	opacity
			PM_{10} (filterable and condensable)	0.32	lb/hr	0.14	kg/hr					
			$PM_{2.5}$ (filterable and condensable)	0.26	lb/hr	0.12	kg/hr					
			VOC	0.41	lb/hr	0.19	kg/hr	Good combustion practices, use of natural gas, low-NOx burner		--	--	--
			CO	84	lb/MMscf	1,346	kg/MMsm^3					
			SO_2	--	--	--	--					
			NOx	60	ppmvd @ 3% O2	60	ppmvd @ 3% O2					
	IMF06	Coal Milling De-Dusting Baghouse	PM/PM_{10} (filterable)	0.22	lb/hr	0.10	kg/hr	Fabric filter	Recordkeeping	45CSR7	20%	opacity
			$PM_{2.5}$ (filterable)	0.11		0.05						
Coal Milling Material Handling Fug.	B231	Coal Loading Hopper	$PM/PM_{10}/PM_{2.5}$ (filterable)	--	--	--	--	Partial Enclosures & Good Housekeeping Practices	Recordkeeping	--	--	--
	B235	Coal Milling Building										
	B230	Coal Unloading										
	IMF04	Coal Conveyor Transition Point (B231 to B235)	PM/PM_{10} (filterable)	0.02	lb/hr	0.01	kg/hr	Fabric filter	Recordkeeping	45CSR7	20%	opacity
			$PM_{2.5}$ (filterable)	0.01		4.50E-03						
	IMF13	Coal Conveyor Transition Point (B231 to B235)	PM/PM_{10} (filterable)	0.02	lb/hr	0.01	kg/hr	Fabric filter	Recordkeeping	45CSR7	20%	opacity
			$PM_{2.5}$ (filterable)	0.01		4.50E-03						

Attachment P

AIR QUALITY PERMIT NOTICE
Notice of Application

Notice is given that Roxul USA, Inc. has applied to the West Virginia Department of Environmental Protection, Division of Air Quality, for a PSD Construction Permit for a mineral wool insulation manufacturing facility to be located at 365 Granny Smith Lane, Kearneysville, WV 25430. The latitude and longitude coordinates are: 39.37754, -77.87844.

The applicant estimates the potential to discharge the following Regulated Air Pollutants will be:

Nitrogen Oxides (NOx): 239 tons per year
Sulfur Dioxide (SO2): 148 tons per year
Carbon Monoxide (CO): 74.1 tons per year
Volatile Organic Compounds (VOCs): 472 tons per year
Filterable Particulate Matter (PMFil): 130 tons per year
Particulate Matter <10 microns (PM10): 154 tons per year
Particulate Matter <2.5 microns (PM2.5): 134 tons per year
Carbon Dioxide Equivalents (CO2e): 153,000 tons per year
Sulfuric Acid Mist (H_2SO_4): 16.4 tons per year
Lead (Pb): <0.01 tons per year
Total Hazardous Air Pollutants (HAPs): 393 tons per year
Mineral Fiber HAPs: 113 tons per year
Methanol (CH_4O): 104 tons per year
Phenol (C_6H_5O): 98.9 tons per year
Formaldehyde (HCHO): 67.6 tons per year
Carbonyl Sulfide (COS): 1.7 tons per year
Hydrogen Fluoride (HF): 1.7 tons per year
Hydrochloric Acid (HCL): 1.3 tons per year
Hexane (C_6H_{14}): 0.3 tons per year
Benzene (C_6H_6): 0.1 tons per year

Startup of operation is planned to begin on or about October 2019. Written comments will be received by the West Virginia Department of Environmental Protection, Division of Air Quality, 601 57th Street, SE, Charleston, WV 25304, for at least 30 calendar days from the date of publication of this notice.

Any questions regarding this permit application should be directed to the DAQ at (304) 926-0499, extension 1250, during normal business hours.

Dated this the 22th day of November, 2017.

By: Roxul USA, Inc.
Ken Cammarato
Vice President and General Legal Counsel
4594 Cayce Road
Byhalia, MS 38611

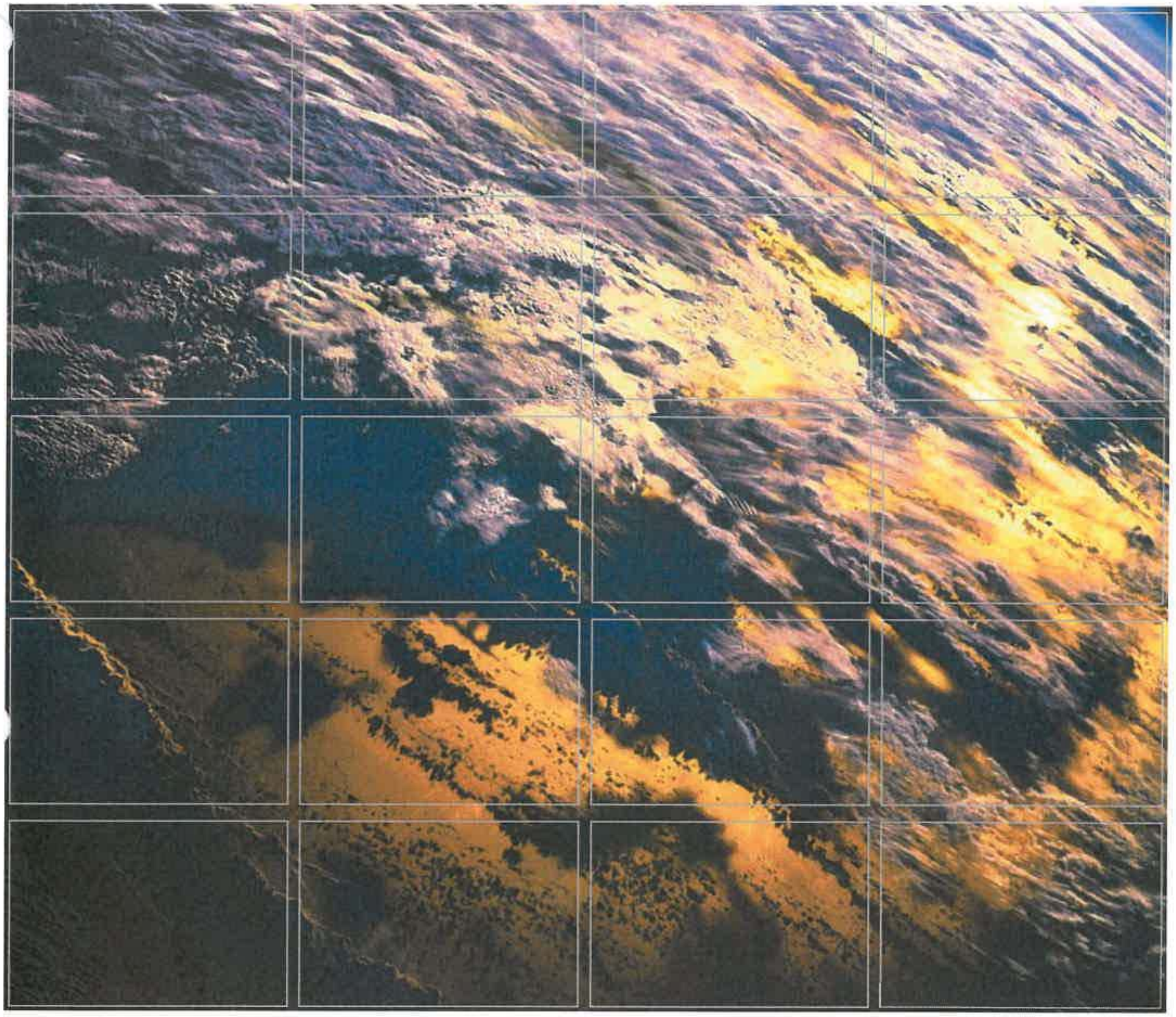
Attachment Q

Air Modeling Results and Protocols

Appendix C

November 2017
Project No. 0408003

Environmental Resources Management
204 Chase Drive
Hurricane, West Virginia 25526
304-757-4777



ROXUL USA, Inc.

New Source Review
Air Quality Modeling Protocol

Jefferson County, West Virginia

November 2017

Environmental Resources Management
204 Chase Drive
Hurricane, WV 25526
www.erm.com

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1.0 INTRODUCTION

ROXUL USA Inc., (Roxul) submits this air quality modeling protocol to support an air quality permit to construct application that is being submitted to the West Virginia Department of Environmental Protection (WVDEP), Division of Air Quality (WVDAQ, or The Department). The application is being submitted to authorize the development of a new mineral wool production facility in Jefferson County, West Virginia. A general area map showing the proposed location of the facility is provided in Figure 1-1 of this protocol.

1.1 PROJECT OVERVIEW

Roxul proposes to construct, install, and operate a new mineral wool insulation manufacturing facility (Project). The Project will consist of a 460,000-square-foot manufacturing facility on an estimated 130 acres site in the city of Ranson in Jefferson County, West Virginia. The plant will produce stone wool insulation for building insulation, customized solutions for industrial applications, acoustic ceilings and other applications.

1.2 OVERVIEW OF METHODOLOGY

Table 1-1 provides a summary of the attainment status of Jefferson County, WV with respect to the National Ambient Air Quality Standards (NAAQS). The attainment status determines which regulatory programs new major sources or modifications to existing sources must address in the process of obtaining an air quality construction permit. Table 1-2 provides a summary of the regulatory program(s) that must be addressed for each regulated compound that will be emitted by the Project. It should be noted that these are preliminary emissions estimates only. Compounds with emission levels that trigger Non-attainment New Source Review (NNSR) requirements are subject to additional control (Lowest Achievable Emission Rate, LAER) and emissions offset requirements but do not require air quality dispersion modeling to assess compliance with the NAAQS. Requirements of the Prevention of Significant Deterioration (PSD) program must be addressed for major sources locating in attainment areas, for each compound having emissions greater than the significant emission rate (SER).

Table 1-1 Attainment Status of Jefferson County, West Virginia

Compound	Attainment Status
SO_2 (annual)	Attainment
SO_2 (1-hr)	Attainment
CO	Attainment
Pb	Attainment
O_3 (1-hr)	Attainment
PM_{10}	Attainment
NO_2 (annual)	Attainment
NO_2 (1-hr)	Attainment
O_3 (8-hr)	Attainment
$PM_{2.5}$ (annual)	Attainment
$PM_{2.5}$ (24-hr)	Attainment

- Data obtained from EPA *Green Book* https://www3.epa.gov/airquality/greenbook/anayo_wv.html

Applicability of the PSD program for the proposed Project is determined by evaluating whether potential emissions exceed new major source thresholds and SERs for each PSD regulated compound. The proposed project will be a new major source due to potential VOC emissions in excess of 250 tons per year.

Table 1-2 Applicability of Regulatory Air Programs to the Project

Compound	Preliminary Project Potential Emissions (tons/year)	PSD SER (tons/year)	NNSR Threshold	PSD Review Req'd?	NNSR Req'd?
NO_x	241	40	NA	Yes	No
CO	153	100	NA	Yes	No
SO_2	163	40	100	Yes	No
PM_{10}	156	15	NA	Yes	No
$PM_{2.5}$	111	Primary $PM_{2.5}$: 10 NO_X: 40 SO_2: 40	NA	Yes	No
O_3	NO_X: 241 VOC: 580	NO_X: 40 VOC: 40	NA	Yes	No
Lead	0.004	0.6	NA	No	No
H_2SO_4	17	7	NA	Yes	NA

NNSR does not apply, because Jefferson County, WV is in attainment for all regulated pollutants. Therefore, dispersion modeling will be performed for the compounds above that are subject to PSD review to assess the ambient air impacts resulting from the emissions of these compounds due to the Project, with the exception of VOC, which is a precursor to ozone formation and is not modeled. The modeling analysis will address compliance with the NAAQS and PSD Increments, as applicable. The modeling analyses described in this protocol will conform to Appendix W of 40 CFR Part 51 (Guideline on Air Quality Models). The key elements of the modeling analysis will include:

- Use of the latest version of the regulatory dispersion model and supporting programs: AERMOD (version 16216r), AERMET (version 16216), AERMINUTE (version 15272), AERMAP (version 11103), AERSURFACE (version 13016), and BPIPRM (version 04274);
- Use of input meteorological data from EMV Regional Airport, Shepherd Field (KMRB, WBAN: 13734), located approximately 10 kilometers (km) to the west of the Project;
- Use of upper air data from Dulles Airport, MD (WBAN: 93734);
- Application of the latest version of AERSURFACE as recommended in the EPA AERMOD Implementation Guidance (EPA 2016);
- Utilize the surface friction velocity adjustment (ADJ_U*) option in AERMET;
- Develop a comprehensive receptor grid designed to identify maximum modeled concentrations;
- Utilize the Ambient Ratio Method 2 (ARM2) option in AERMOD to characterize NO_2 from modeled concentrations of NO_X;
- Utilize the Tier III NO_2 modeling method PVMRM in AERMOD, if necessary;
- In accordance with PSD requirements, determine whether emissions from the Project that are subject to PSD will have an effect on growth, soils, vegetation, and visibility in the vicinity of the Project;
- Compare maximum predicted impacts to relevant Significant Impact Levels (SILs) and Significant Monitoring Concentrations (SMCs) to determine if additional modeling or monitoring could be required;
- Demonstrate that allowable emissions from the proposed facility would not cause or contribute to air pollution in violation of any National Ambient Air Quality Standard (NAAQS) or PSD increment.

2.0 PROJECT EMISSIONS AND SOURCE CHARACTERIZATION

2.1 PROJECT DESCRIPTION

Roxul proposes to construct, install, and operate a new mineral wool insulation facility (Project). The Project site is located in Jefferson County, WV. The general location of the facility is provided on the regional map shown in Figure 1-1. A preliminary plot plan of the proposed Project is presented in Figure 1-2.

Figure 1-1 Roxul, Jefferson County, WV – Regional Map

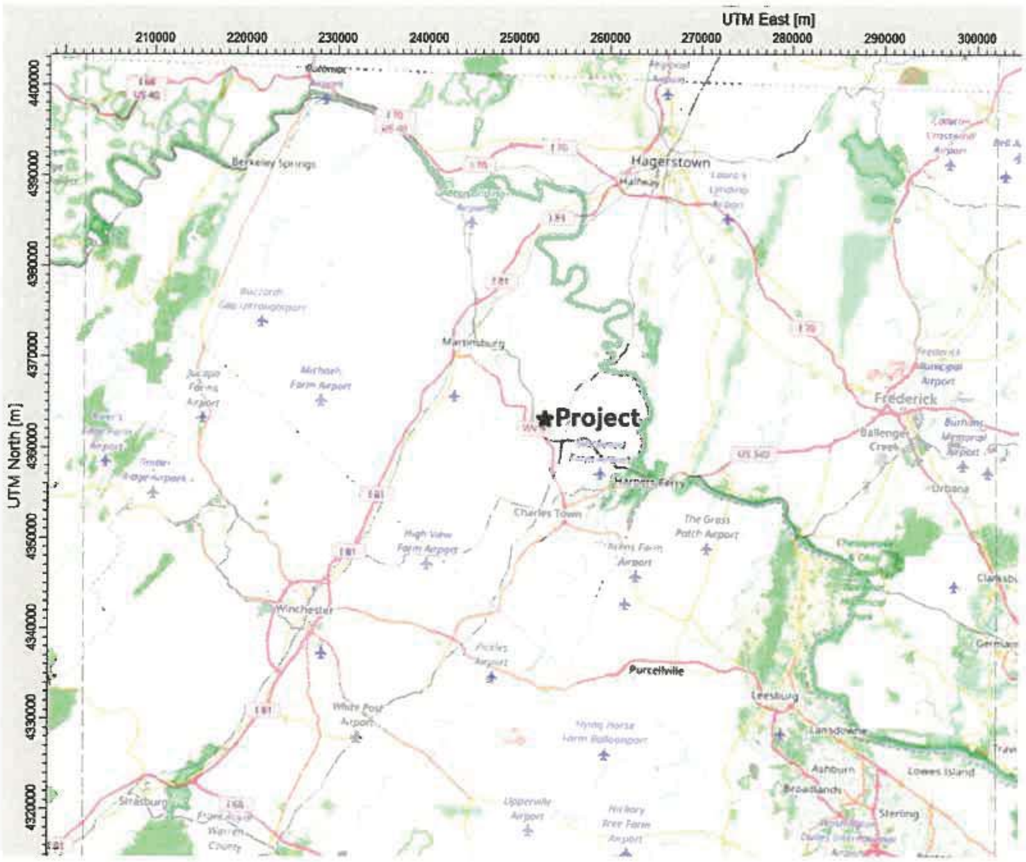
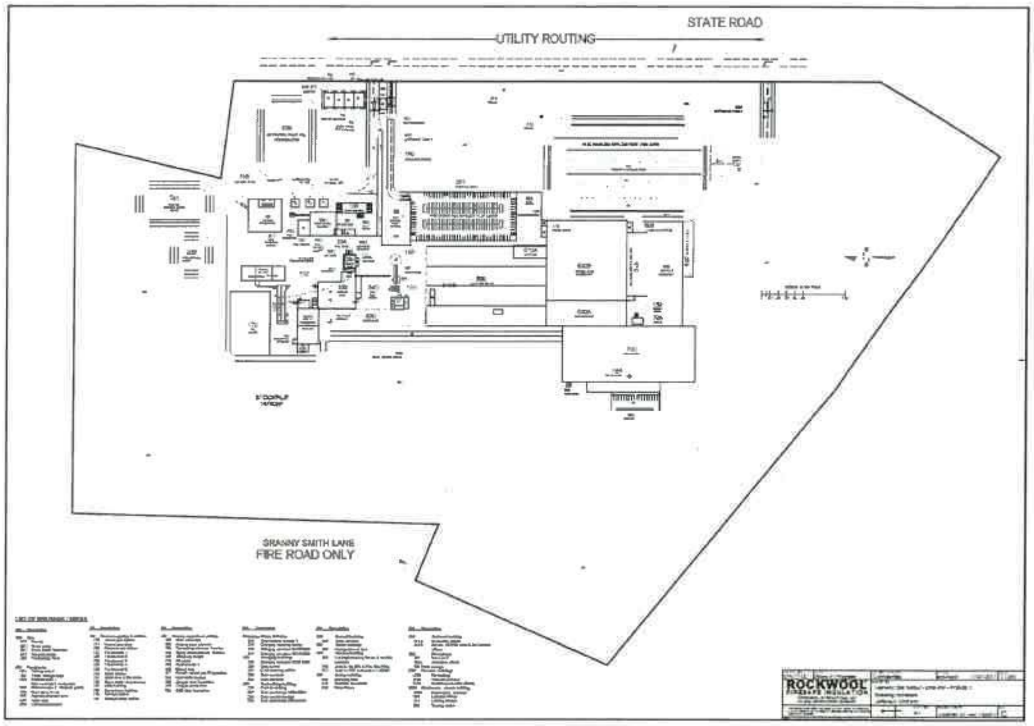


Figure 1-2 *Preliminary Facility Layout*



2.2 *PROJECT SOURCES*

A detailed list of emission rates and source parameters would be provided in the air quality modeling report supporting the new source application. An overview of the emission sources associated with the Project are as follows:

- One Mineral Wool Line including,
  - Raw Material Handling Sources (e.g., material unloading, storage silos, conveyor transfer points, portable crusher),
  - One (1) Melting Furnace, Spinning Chamber, Curing Oven, and Cooling Zone,
  - Dust control baghouses, and
  - Storage tanks,
- Coal Milling operations;
- One Rockfon Line including paint application, drying ovens, and dust control baghouse;

- Miscellaneous utilities or other facility-wide sources (boilers, heaters, cooling towers, portable crusher, fire pump, fuel storage, etc.); and
- Paved Haul Roads.

Mineral wool production technology uses processes which can be described with a linear relationship between the amount of processed material and the mass of generated pollutants. This linear mass-based relationship can be expressed with proportionality between operational loads and pollutant emission rates, i.e., higher loads generate higher emission rates. For the exhaust (emission point) from the furnace some pollutants are related to a constant air flow and as such independent of load. Roxul conservatively assumes in the emission calculations that the facility would operate on 100% load at all times.

The second aspect of the variable load conditions is related to the provisions for dispersion of the emitted gasses. The flow rate of gasses passing through the furnace is governed by fans with specific air flow requirements due to the nature of production. In order to achieve the required product characteristics, constant airflow and temperature are needed. Therefore during the steady-state operations, stack exhaust flow rates and temperature are maintained approximately constant. Therefore, Roxul is not proposing to model varying load conditions since maximum emissions occur at maximum load conditions and stack parameters are maintained at consistent levels.

Transient operations, such as startup and shutdown, related to scheduled maintenance occur once a week. Furthermore, when transient operations do occur, the emission profile of pollutants is only significantly impacted for a short period of time. Given that these events are infrequent in nature, Roxul is not proposing to separately model transient operations.

2.3 *BUILDING WAKE EFFECTS*

The EPA's Building Profile Input Program (BPIP), Version 04274 will be used to calculate downwash effects for the modeled emission sources. Building, structure, and tank configurations and locations relative to the modeled sources will be obtained from engineering drawings of the planned facility and input into BPIP. Construction of facility stacks will not exceed the greater of the GEP formula height calculated by BPIP or 65 m (213 feet).

3.0 MODELING METHODOLOGY

3.1 MODEL SELECTION AND APPLICATION

The latest version of EPA's AERMOD model (version 16216r) will be used for predicting ambient impacts for each modeled compound. Regulatory default options will be used in the analysis, except as specified in this protocol. An overview of the various air quality modeling analyses that will utilize AERMOD are described in the following sections.

3.1.1 *Project Only Modeling Analysis*

This section summarizes the model inputs and procedures to be used to conduct the Project-only air quality impact analysis for the Project. Specifically, the following analyses are addressed in this section:

- Refined single-source modeling to compare maximum predicted impacts to EPA SILs; and
- Comparison of refined single-source impacts to EPA SMCs to determine if a preconstruction monitoring waiver request is justified.

As discussed in section 3.1.3, for those pollutant impacts that are demonstrated to be less than applicable SILs, no further analysis will be required because these pollutants impacts will be presumed to not cause or contribute significantly to any modeled violations of a NAAQS or PSD Increment. Where impacts are predicted to exceed SILs, additional refined modeling is required to demonstrate that the cumulative impact of the Project and other potentially interacting sources plus background will not cause or contribute to any violation of any NAAQS and PSD Increment.

Section 3.1.3 addresses the cumulative (multi-source) impact analysis procedures to be used, if necessary, to demonstrate that the combined impacts of pollutants from Project and nearby sources will not cause or contribute to air pollution in violation of any NAAQS or PSD Increment. The Class I Area impact analysis is addressed in Section 3.11 and the other air quality analyses (visibility impairment, soils and vegetation impacts, and associated growth analysis) are summarized in Section 3.7.3.

For purposes of presentation of all modeling results, it should be noted that all modeled concentrations will not be rounded or truncated, in accordance with EPA policy, when compared to applicable SILs, NAAQS, or PSD Increments.

3.1.2 *Significant Impact Analysis*

3.1.2.1 *Justification of the Use of Significant Impact Levels (SILs)*

The EPA has historically cautioned states that the use of a SIL may not be appropriate when a substantial portion of any NAAQS or PSD Increment is known to be consumed. Therefore, justification of the use of SILs is recommended in support of the PSD review record. Based on preliminary modeling, it is expected that cumulative impact modeling involving nearby sources will be required. However, it may be necessary to demonstrate that the Project is not contributing significantly to any modeled violations of NAAQS or PSD Increments. To provide justification with respect to the use of SILs in the NAAQS analysis, the differences between the NAAQS and background concentrations determined to be representative of the Project impact area (see Section 3.5 of this protocol) for applicable pollutants and averaging periods were compared to the applicable SIL values. The comparison summarized in Table 3-1 shows that the differences in this case between the NAAQS and background concentrations are much higher than the corresponding SILs. Therefore, these differences are sufficient for WVDAQ to conclude that a modeled impact less than the SIL for each of the applicable pollutants will not cause or contribute to a violation of the NAAQS.

Table 3-1 Comparison of NAAQS, Representative Background Concentrations, and SILs ($\mu g/m^3$)

Pollutant	Averaging Period	NAAQS	Representative Background/Design Concentration	Difference Between NAAQS and Design Concentration	SIL
PM_{10}	24-Hour	150	24	126	5
$PM_{2.5}$	24-Hour	35	14.3	20.7	1.2
	Annual	12	5.7	6.3	0.2
NO_2	1-Hour	188	33.2	154.8	7.5
	Annual	100	9.4	90.6	1
SO_2	1-Hour	196	39.5	156.5	7.8
	3-Hour	1,300	39.5	1,260	25
	24-Hour	365	17.5	347.5	5
	Annual	80	3.2	76.8	1
CO	1-Hour	40,000	458	39,542	2,000
	8-Hour	10,000	344	9,656	500

3.1.2.2 *Significant Impact Analysis Modeling Procedures*

The significance analysis involves refined modeling to determine maximum ambient impacts from the Project in comparison to pollutant-specific SILs. The results of the significance analysis determine the need for further modeling including nearby sources to evaluate compliance with NAAQS and PSD Increments. All Project sources listed in Section 2.2 will be included in the refined modeling

The Emergency Fire Pump will assume 100 hour of operation per year for testing and readiness purposes. As an intermittent source it would not be included in the 1-hour NO_2 and SO_2 analyses as recommended by EPA (EPA Memorandum March 16, 2011).

For the 8-hr CO and 24-hr $PM_{10}/PM_{2.5}$ analyses, the Emergency Fire Pump will be modeled assuming emission rates conservatively based on an operational schedule of 1/2 hour per day.

The results of the refined modeling of Project sources will be compared to the SILs in order to conservatively estimate the significant impact area for each pollutant and averaging period. It should be noted that highest first-highest (H1H) model design concentrations for all short term averages will be compared to the applicable SILs. Additionally, it should be noted that for 1-hr NO_2, 24-hr $PM_{2.5}$, and annual $PM_{2.5}$ pollutant and averaging period combinations, the relevant model design value is the H1H value averaged over five (5) years per receptor. The applicable Class II Area SILs used for this analysis are summarized in Table 3-1 and Table 3-2 in Sections 3.1.2.1 and 3.2, respectively.

A pre-construction ambient air monitoring waiver must be requested in order for a facility subject to PSD review to be exempt from preconstruction ambient air monitoring requirements. A waiver may be considered based on the modeled impacts of the Project when compared to the SMCs in 40 CFR Part 52.21. The applicable SMCs are summarized in Table 3-2 in Section 3.2. If a project cannot be exempted from preconstruction monitoring based on modeling results, then the applicant may propose for the reviewing authority's consideration for the use of existing monitoring data if appropriate justification is provided.

Roxul proposes the use of representative regional background data to satisfy this requirement as necessary. Justification of the representativeness of existing regional background data for use in the modeling analysis is provided in Section 3.3.1 for $PM_{2.5}$ and Section 3.5 for all other applicable criteria pollutants.

3.1.3 *Cumulative Modeling Analysis*

For those pollutant impacts due to Project sources alone that are demonstrated to be less than applicable SILs, no further analysis is required and the Project impacts are presumed not to cause or contribute significantly to violation of the NAAQS or PSD Increments. Where the Project's impacts are determined to exceed SILs, additional refined modeling is required to demonstrate that the cumulative impact of the Project and nearby sources will not cause or contribute to air pollution in violation of any NAAQS and PSD Increment, shown in Table 3-2 of Section 3.2.

The cumulative modeling will be performed for all receptors where the proposed Project had a significant impact, as determined by the significance modeling analysis. The cumulative analyses will include background concentrations of pollutants as discussed in Section 3.5 and contributions from nearby off-site sources as discussed in Section 3.10.

In the event that the NO_2 and/or SO_2 1-hour and/or $PM_{2.5}$ 24-hour modeling predicts exceeds the applicable NAAQS, the MAXDCONT post processor to AERMOD will be used to assess whether the Project's contribution to the predicted violations, paired in time and space, is insignificant at all receptors in consideration.

In addition, in accordance with EPA guidance[1], the significant contribution analysis will examine every multi-year average of the daily maximum 1-hour values for NO_2, beginning with the 8th-highest and for SO2 beginning with the 4th-highest, continuing down the ranked distribution until all cumulative impacts are below the NAAQS. For the 24-hour $PM_{2.5}$ analysis, the significant contribution analysis will examine every multi-year average of the maximum 24-hour average values, beginning with the 8th-highest, continuing down the ranked distribution until all cumulative impacts are below the NAAQS.

3.2 *AMBIENT AIR QUALITY STANDARDS*

Table 3-2 presents a summary of the air quality standards that will be addressed for NO_2, SO_2, PM_{10}, $PM_{2.5}$, and CO. The SILs are presented, along with the SMCs, PSD Increments, and NAAQS. If Project impacts are shown to be less than the SILs and SMCs, then no further analysis is required. If the SILs are exceeded, additional analyses will be necessary including the development of a background source inventory and background monitored concentrations. It should be noted that the 1-hr SIL for NO_2 is an interim SIL based on EPA guidance, and has been adopted by WVDEP based on WVDEP's concurrence with EPA that modeled concentrations less than the 1-hr SIL for NO_2 represent a de-minimis level of concentration and would not be expected to contribute to violations of the 1-hr NO_2 NAAQS.

Table 3-2 Ambient Air Quality Standards

Pollutant	Averaging Period	NAAQS [a]	Class II Increment Standards	Class II SIL	SMC
SO_2	1- Hour	196 [b,q]	-	7.8 [c,n]	-
	3-Hour	1,300 [d,e]	512 [d]	25 [g]	-
	24-Hour	365 [d,h]	91 [d]	5 [g]	13
	Annual	80 [u,h]	20 [u]	1 [g,u]	-
PM_{10}	24-Hour	150 [i,s]	30 [d]	5 [g]	10
	Annual	50 [j,r]	17 [u]	1 [g,u]	-
$PM_{2.5}$	24-Hour	35 [k,f]	9[d]	1.2 [f]	t

[1] EPA Memorandum, dated March 1, 2011, from Tyler Fox, "Additional Clarification Regarding Application of Appendix W Modeling Guidance for the 1-hour NO_2 National Ambient Air Quality Standard."

Pollutant	Averaging Period	NAAQS [a]	Class II Increment Standards	Class II SIL	SMC
	Annual	12 [i,o]/15[e, j]	4[u]	0.3 [o], 0.2 [v]	-
NO_2	1-Hour	188 [l,p]	-	7.5 [c,n]	-
	Annual	100 [u]	25 [u]	1 [g,u]	14
CO	1-Hour	40,000 [d]	-	2,000 [g]	-
	8-Hour	10,000 [d]	-	500 [g]	575
Pb	Rolling 3-Month	0.15 [m]	-	-	-
Ozone	8-hour	70 ppb	-	1 ppb[v]	<100 tons per year (tons/yr) VOC

a) Primary standard unless otherwise noted.

b) The 3-year average of the 99th-percentile of the annual distribution of daily maximum 1-hour concentrations must not exceed standard.

c) EPA Interim SIL adopted by WVDEP on December 1, 2010.

d) One exceedance allowed per year.

e) Secondary standard.

f) For the $PM_{2.5}$ 24-hour SIL analysis, modeled concentration is the highest of the 5-year averages of the maximum modeled 24-hour average $PM_{2.5}$ concentrations predicted each year at each receptor, based on 5 years of National Weather Service (NWS) data. Use of the SIL is subject to evaluation depending on the approach taken to address $PM_{2.5}$ secondary impacts. For the $PM_{2.5}$ 24-hr NAAQS analysis, the modeled concentration is the 98th percentile of the 5-year averages of the maximum modeled 24-hour average $PM_{2.5}$ concentrations (EPA memorandum, dated March 20, 2014, from S. Page, "Guidance for $PM_{2.5}$ Permit Modeling").

g) For determining compliance with the SIL, no exceedances allowed.

h) The 24-hour and annual SO_2 NAAQS were revoked, but are in effect until the SO_2 1-hour designations are finalized. However, the increment standards and related SILs remain in effect.

i) Expected number of days per calendar year, on average, with arithmetic time-averaged concentration above standard is equal to or less than one. For modeling analyses, compliance is evaluated by comparing the high, 6th-high modeled concentration over five years (plus an appropriate background concentration) to the NAAQS.

j) Based on 3-year average of the annual mean concentrations.

k) The 3-year average of the 98th percentile of 24-hour concentrations must not exceed standard. The NAAQS was revised effective December 18, 2006.

l) The 3-year average of the 98th-percentile of the annual distribution of daily maximum 1-hour concentrations must not exceed standard.

m) Rolling 3-month average, no exceedances allowed.

n) Highest of the 5-year averages of the maximum modeled 1-hour NO_2 and 1-hour SO_2 concentrations at each receptor, based on 5 years of meteorological data, must not exceed the 1-hr NO_2 and SO_2 SIL, respectively, in order to demonstrate insignificant impacts. (EPA memorandum, dated March 1, 2011, from T. Fox, "Additional Clarification Regarding Application of Appendix W Modeling Guidance for the 1-hour NO2 National Ambient Air Quality Standard" and memorandum dated June 29, 2010, from S. Page, "Guidance Concerning the Implementation of the 1-hour NO_2 NAAQS for the Prevention of Significant Deterioration Program" and WVDEP memorandum, dated December 1, 2010, from Andrew Fleck, "Interim 1-Hour Significant Impact Levels for Nitrogen Dioxide and Sulfur Dioxide").

o) The highest average of the modeled annual averages across 5 years of NWS meteorological data is compared to the $PM_{2.5}$ annual average SIL and AAQS. Use of the SIL is subject to evaluation depending on the approach taken to address $PM_{2.5}$ secondary impacts. (EPA memorandum, dated March 20, 2014, from S. Page, "Guidance for $PM_{2.5}$ Permit Modeling").

p) For NO_2 1-hour NAAQS analysis, modeled concentration is the 98th percentile (H8H) of the annual distribution of daily maximum 1-hour concentrations averaged across 5 years of NWS data (EPA memorandum, dated June 28, 2010, from T. Fox, "Applicability of Appendix W Modeling Guidance for the 1-hour NO2 National Ambient Air Quality Standard").

q) For SO_2 1-hour NAAQS analysis, modeled concentration is the 99th percentile of the annual distribution of daily maximum 1-hour concentrations averaged across 5 years of NWS data (EPA memorandum dated August 23, 2010, from S. Page, "Guidance Concerning the Implementation of the 1-hour SO_2 NAAQS for the Prevention of Significant Deterioration Program").

r) AAQS REVOKED.

s) For PM_{10} 24-hour average NAAQS analysis, modeled concentration is the highest 6th highest concentration over 5 years of NWS data.

t) On January 22, 2013, the U.S. Court of Appeals for the District of Columbia Circuit vacated the parts of two PSD rules establishing a $PM_{2.5}$ SMC, finding that the EPA was precluded from using the $PM_{2.5}$ SMCs to exempt permit applicants from the statutory requirement to compile preconstruction monitoring data.

u) No exceedances are allowed for annual averages to determine compliance with the NAAQS and to determine whether impacts are significant compared to the SIL.

v) On August 1, 2016 USEPA published draft guidance on SILs for $PM_{2.5}$ and ozone. USEPA proposed no change to the 24-hr $PM_{2.5}$ SIL of 1.2 $\mu g/m^3$; however, an annual $PM_{2.5}$ SIL of 0.2 $\mu g/m^3$ is recommended in this draft guidance. An 8-hour ozone SIL of 1 ppb was also proposed.

3.3 $PM_{2.5}$ CONSIDERATIONS

In January 2013, the SMCs for $PM_{2.5}$ were vacated by the DC Circuit Court. The SMCs are concentrations that are used to determine if a project subject to PSD regulations needs to compile preconstruction ambient monitoring to determine if existing air quality conditions are representative of the project site. Preconstruction monitoring is typically required when a project's modeled impacts exceed the SMCs and the existing air quality monitoring network in the region is inadequate to characterize existing air quality.

The Project is located approximately 11 km southeast of an existing ambient monitor that measures $PM_{2.5}$. This monitor in Martinsburg, WV (Site ID 54-003-0003) has been collecting $PM_{2.5}$ data since 1999. Due to the monitor's proximity, Roxul asserts that this monitor is suitable to represent the state of the air quality near the Project site during the pre-construction stage. Therefore, additional preconstruction monitoring should not be required for the Project, due to the existence of representative $PM_{2.5}$ ambient air quality data.

In addition to the SMC vacature in January 2013, EPA also remanded the SIL for $PM_{2.5}$. EPA intends to revise the approach to how the SIL is implemented. In the interim, widely accepted practice for PSD permitting is to continue to use the $PM_{2.5}$ SILs as benchmarks to determine a project's de-minimis standing with respect to the $PM_{2.5}$ NAAQS, but also to ensure that a project's modeled impacts do not exceed the NAAQS (despite being less than the SIL) when added to an existing representative background value of $PM_{2.5}$. Roxul intends to employ this practice as part of the air quality modeling analysis, specifically, that the Project's modeled concentrations of directly emitted $PM_{2.5}$ are both less than the levels of the SIL, but also less than the NAAQS when added to a representative background $PM_{2.5}$ concentration, obtained from the Piney Run, Garrett County, MD $PM_{2.5}$ monitor.

3.3.1 *Representative Background Concentrations of $PM_{2.5}$*

There are total of five $PM_{2.5}$ ambient air monitoring stations in the greater vicinity of the project site. The monitors are of different types, serving specific regional screening, and are spread over the states of WV, MD, and VA. Monitors' distance to project, measurement scale, sampling rate, and data coverage are listed in Table 3-3.

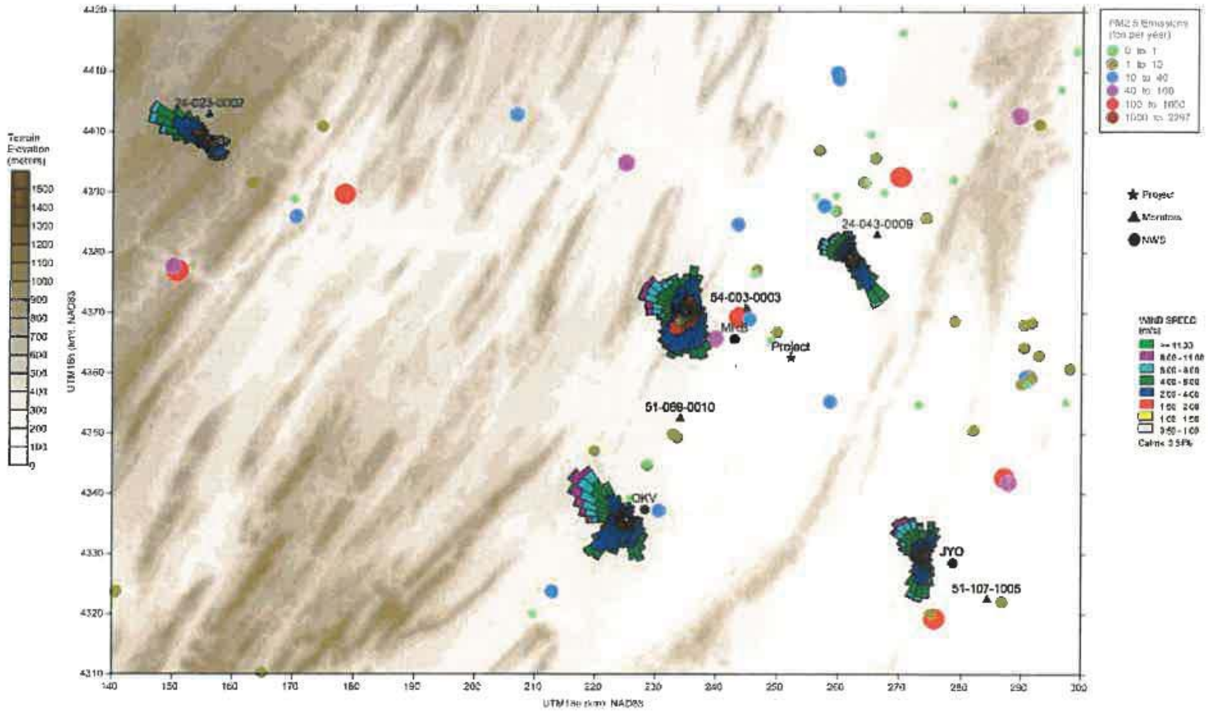
Table 3-3 List of $PM_{2.5}$ Ambient Monitor Station in the Vicinity of the Project Site

$PM_{2.5}$ Monitor Location	$PM_{2.5}$ Monitor ID	Distance to Project (km)	Measurement Scale	Sampling Rate	Data Coverage 2013-15	Design Conc. (µg/m³) 24hr, Annual
Martinsburg, Berkeley Co., WV	54-003-0003	11	Urban (4-50km)	24-hour, every 3rd day	333 obs., 91%	26.6, 9.9*
Piney Run, Garrett Co., MD	24-023-0002	105	Regional Scale (50 - 100s km)	1-hour, every day	924 obs., 84%	15.9, 6.6
Hagerstown, Washington Co., MD	24-043-0009	25	Urban (4-50km)	1-hour, every day	1014 obs., 93%	25.7, 9.4
Ashburn, Loudoun Co. VA	51-107-1005	51	Neighborhood (400m – 4km)	24-hour, every 3rd days	338 obs., 93%	20.3, 8.7
Rte 669, Frederick Co. VA	51-069-0010	21	Neighborhood (400m – 4km)	24-hour, every 3rd days	361 obs., 99%	23.7, 8.9

* Berkeley Co. design values are based on 2014-2016 observations provided by WVDAQ

In addition proximity to large industrial sources, prevailing winds were taken in consideration. The locations of the industrial facilities throughout the region were obtained from the National Emission Inventory (NEI) 2014. Wind roses were constructed with local monitor observations, when available (Piney Run and Hagerstown, MD) or observations from the nearest NWS station were used. Martinsburg airport was considered representative of the Berkeley Co. monitor location; Leesburg Municipal (JYO) airport represents the winds at Loudoun Co. monitor; and the winds captured at Winchester Regional (OKV) airport are considered representative for the Frederick Co. monitor. The Berkeley Co, Garret Co, Hagerstown Frederick Co monitors are located in the foot hills of the Allegheny Plateau and west of the Blue Ridge Mountains; the Loudoun Co monitor is located just east of the Blue Ridge mountains. The wind roses summarize the wind conditions at the representative locations for the period of interest - 2013-2015. Monitor and weather station locations together with the regional $PM_{2.5}$ sources are presented in Figure 2-1 over terrain elevation background.

Figure 2-1 *Location of $PM_{2.5}$ Ambient Monitor Stations in Relation to Project and NEI 2014 Industrial Sources*



The Garret County, MD monitor is a regional transport monitor collecting hourly samples every day. It is located approximately 105 km west-northwest of the Project in rural setting similar to the project site. The 3-year data capture rate was estimated as 84.4% for the 2013-2015 period. There are no large sources in the immediate vicinity of the monitor and the prevailing northwesterly winds indicate that the monitor is likely influenced by larger scale transport events, and therefore suitable for representation of background $PM_{2.5}$ levels.

Frederick Co., VA monitor is a neighborhood scale monitor located 21 km southwest of the Project site. In addition of the monitor being representative of local scale events, it is also placed approximately 3 km northeast of limestone processing facility, and provided the local wind patterns is very likely highly influenced by these operations. Therefore the observations at this monitor are not considered as a representative background for the Project site.

Loudoun Co., VA monitor is a neighborhood scale monitor located 51 km southeast of the Project site and placed in a suburban setting. The monitor is representative of local scale events, and therefore the observations at this monitor are not considered as a representative background for the Project site.

Hagerstown, MD monitor is an urban scale monitor located 25 km northeast of the Project site in an industrial area, less than 1 kilometer south of a scrap metal processing facility. Provided the local wind patterns it is very likely that the monitor is highly influenced by these operations. In addition, when evaluating the Hagerstown, MD monitor it should be noted that an urban scale monitor is operated in Berkeley Co., WV and would be closer to the Project site. Therefore the observations at this monitor are not considered as a representative background for the Project site.

Berkeley Co., WV monitor is located approximately 11 km northwest of the Project. This is an urban scale monitor and is situated in a more urban environment compared to the site. The data capture rate is once every 3 days. Additionally the monitor is located 1.5 km north of a cement plant with extensive quarrying operations. It is likely that the monitor is highly influenced by this source. Moreover the industrial sites in the vicinity of the monitor will be included explicitly in the NAAQS and increment modeling.

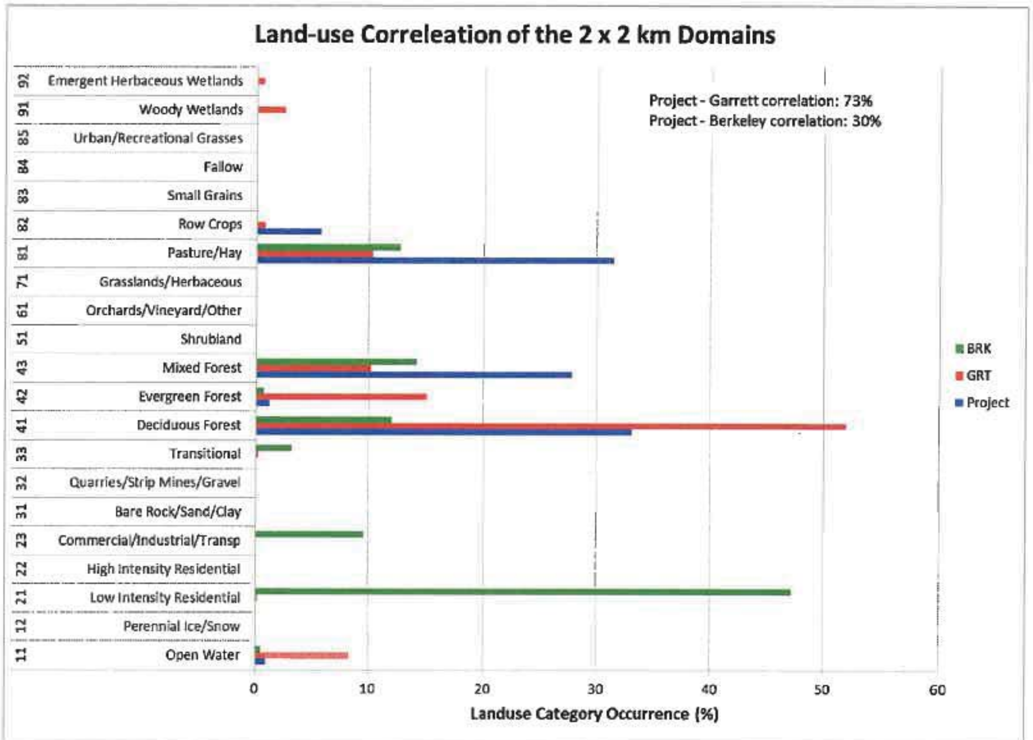
The initial review of the five available monitors indicates that the preferred sites for this project are the Berkeley Co. and the Garret Co. monitors. Further detailed evaluation of the land-use characteristics of these locations and comparison to the Project site are used to support the final monitor selection.

The land-use characteristics of the project site were compared to the same for the two monitors. For this purpose, AERSURFACE was used to extract the land features included within an area of 1-km radius. The domain size was selected to simulate the modeling requirement for surface roughness, a characteristic that AERMOD is found very sensitive. Further calculations show that the correlation between the land characteristics of the Project and the two monitor domains is as follows:

- Project to Garrett Co. monitor (GRT) correlation = 73%
- Project to Berkeley Co. monitor (BRK) correlation = 30%

Figure 2-2 shows the comparison between the land-use features of the Project and two monitor sites based on the 1992 National Land Cover Data archive, provided by the USGS.

Figure 2-2 *Comparison of Land-use Features Between the Martinsburg (BRK) and Garrett Co, (GRT) Monitors and Project*



Based on the above arguments, ERM proposes to use the Garrett County monitor as representative of the regional concentrations in the $PM_{2.5}$ NAAQS analysis for this PSD application. The cumulative modeling will include explicitly the regional sources in the vicinity of the Project, therefore the use of the Garrett County monitor observations can be considered realistic representation of the regional background values without introducing double counting of the concentrations.

3.4 *OZONE ANALYSIS AND SECONDARY FORMATION OF $PM_{2.5}$*

In December 2016, EPA released a guidance memorandum (EPA 2016a) for review and comment that described how Modeled Emission Rates of Precursors (MERPs) could be calculated as part of a Tier I ozone and secondary $PM_{2.5}$ formation analysis to assess a project's emissions of precursor pollutants as they would relate to the ozone and $PM_{2.5}$ "critical air quality thresholds". Roxul will utilize the MERPs guidance to assess the projects impacts on ozone secondary $PM_{2.5}$ formation as described in the paragraphs below.

3.4.1 *Calculation of MERPs for Ozone*

As specified in Table 1-2, the potential emissions of NO_X from the proposed project are 241 tpy and the potential emissions of VOC are 580 tons per year. The MERPs guidance provides modeling results representing the maximum downwind ozone concentrations due NO_X and VOC emissions of hypothetical sources. EPA conducted photochemical modeling of hypothetical sources using emission rates of 500 tpy, 1,000 tpy, and 3,000 tpy of both NO_X and VOC for various locations throughout the US. Figure A-1 of the MERPs guidance presents the locations of the sources modeled in the Eastern US. The EPA Source 8 was located in Southern Pennsylvania, in Adams County and was fond to be located approximately 75 km northeast of the project. Due to the close regional proximity of EPA Source 8, Roxul asserts that this source is most suitable to develop the appropriate MERP levels with which to assess the Project's emissions of precursors against the appropriate "critical air quality threshold". For the purpose of this analysis, the critical air quality threshold for ozone will be considered to be equivalent to the proposed ozone SIL of 1 ppb. It should be noted that most current monitor design values shown in Table 3-4 for the region are all below the ozone NAAQS of 70 ppb.

Table 3-4 Monitor Values at the Berkeley, WV

Monitor ID	County, State	Observed 2014 8hr Design Value (ppb)	Observed 2015 8hr Design Value (ppb)	Observed 2016 8hr Design Value (ppb)
540030003	Berkeley, WV	60.0	66.0	64.0

Also, for the purpose of this analysis, Roxul will consider MERP values derived from the model results for EPA Source 8 based on the 500 tpy cases for both NO_X and VOC, as these are the closest approximations of the project emission rates. Table 3-5 presents modeled ozone concentrations from Table A-1 of the MERPs guidance for the 500 tpy case for Source 8.

Table 3-5 EPA Hypothetical Source Ozone Modeling Results – Source 8 (Pennsylvania)

Precursor	Emissions (tpy)	Stack Height	Maximum Modeled Ozone Concentration (ppb)
NO_X	500	Low (1 m)	1.67
NO_X	500	High (90 m)	1.66
VOC	500	Low (1 m)	0.16
VOC	500	High (90 m)	0.16

The results of EPA's hypothetical source modeling presented in Table 3-5 can be used to derive appropriate MERP values for NO_X and VOC. The MERPs guidance specifies the following equation to derive a MERP:

MERP = Critical Air Quality Threshold * (Modeled emission rate from hypothetical source/ Modeled air quality impact from hypothetical source)

As stated previously, Roxul will use the proposed ozone SIL of 1 ppb to represent the critical air quality threshold. The SIL represents a de-minimis impact level, that is, if the maximum concentration of ozone due to a single source is less than the SIL, then it can be concluded that the source has an insignificant contribution to ozone formation. If the low stack height case for both NO_X and VOC is conservatively chosen along with the ozone SIL, the resulting MERPs values are the following:

NOX MERP = 1ppb * 500 tpy / 1.67 ppb = 299 tpy
VOC MERP = 1ppb * 500 tpy / 0.16 ppb = 3125 tpy

The potential emissions of NO_X (241 tpy) and VOC (580 tpy) are below the MERP values calculated above. However, since the emissions of these ozone precursors each exceed the individually applicable PSD SERs, the MERPs guidance suggests that the total emission rate of precursors should be cumulatively evaluated with respect to the MERP levels. The following equation shows the Project's cumulative MERP consumption. A cumulative MERP consumption of less than 100% indicates that a project would not cause ozone concentrations exceeding the ozone SIL.

**(Project NOx emissions (241 tpy)/NOX MERP (299 tpy) +
(Project VOC emissions (580 tpy)/VOC MERP (3125 tpy)) = 99.2%**

The calculated cumulative consumption of the MERPs is 99.2%. Roxul concludes that this analysis utilizing recent EPA guidance demonstrates that the proposed project will result in insignificant ozone impacts.

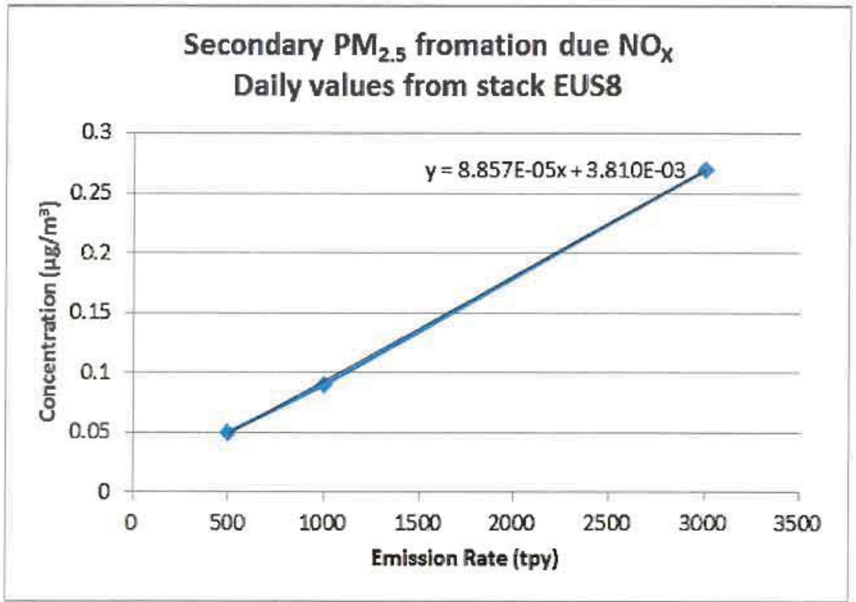
3.4.2 *Secondary $PM_{2.5}$ and EPA MERPs Guidance*

In addition to the photochemical ozone modeling for various hypothetical sources across the US contained in the MERPs guidance, EPA has also provided photochemical modeling for $PM_{2.5}$ for the same hypothetical sources due to emissions of $PM_{2.5}$ precursor pollutants NO_X and SO_2. The use of MERPs for NO_X and SO_2 to determine whether a project would have significant $PM_{2.5}$ impacts (i.e., exceed the applicable SILs) is complicated by the fact that a project's total impact on $PM_{2.5}$ air quality includes contributions from both precursor emissions and direct emissions of $PM_{2.5}$ from project sources. Section 4 of this report presents model results that indicate that the $PM_{2.5}$ SILs are exceeded due to directly emitted $PM_{2.5}$ alone. Therefore, calculation of MERPs would not be needed since the Project already has significant $PM_{2.5}$ impacts. However, the photochemical model results for hypothetical sources in the MERPs guidance can still serve as a resource to assess the potential contribution of secondary $PM_{2.5}$ to the total modeled concentrations due to the Project. The approach described in the following paragraphs represents a Tier 1 secondary $PM_{2.5}$ assessment, as described in Section 5.4.2(b) in the revised Guideline on Air Quality Models (EPA 2017).

Tables A-2 and A-3 of the MERPs guidance contain model results for $PM_{2.5}$ 24-hr and annual averaging periods for the various hypothetical sources modeled by EPA across the US. Similar to the modeling conducted for ozone, EPA conducted photochemical modeling of hypothetical sources using emissions of 500 tpy, 1,000 tpy, and 3,000 tpy of both NO_X and SO_2.

In order to characterize expected maximum modeled impacts of $PM_{2.5}$ from the proposed project, Roxul has used the model results for EPA Source 8 located in Southern Pennsylvania, Adams County. Figures 3-1 and 3-2 present plots of the modeled $PM_{2.5}$ concentrations for Source 8 plotted against modeled emissions of NO_X and SO_2 for the 500 tpy, 1,000 tpy, and 3,000 tpy "high" stack height cases. Each plot includes a trend line with a linear equation. The linear equation for each precursor and $PM_{2.5}$ averaging period can be used in conjunction with the Project potential emissions of NO_X and SO_2 to calculate an appropriate $PM_{2.5}$ concentration that can be added to the direct $PM_{2.5}$ concentration from AERMOD.

Figure 3-1 *EPA Hypothetical Source $PM_{2.5}$ Modeling Results – Source 8 (Pennsylvania) – 24-hr Average*



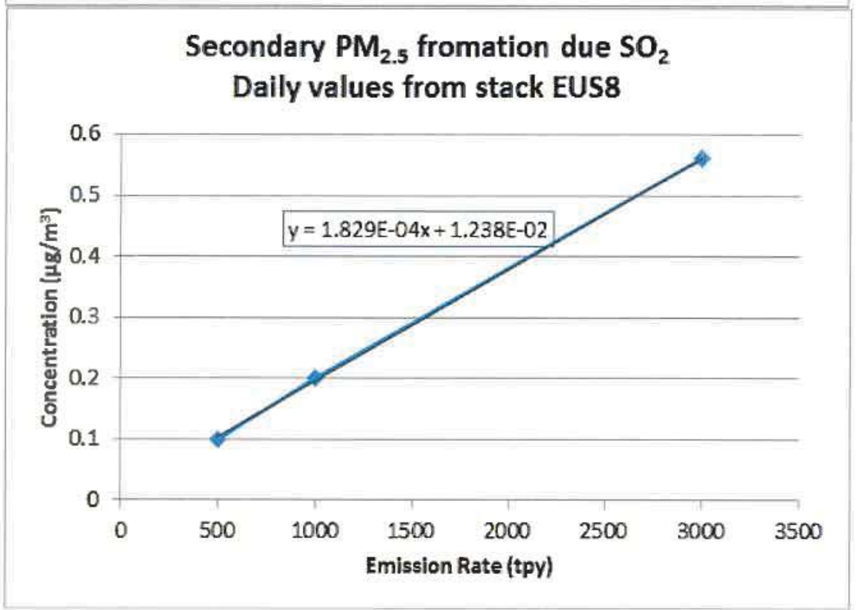
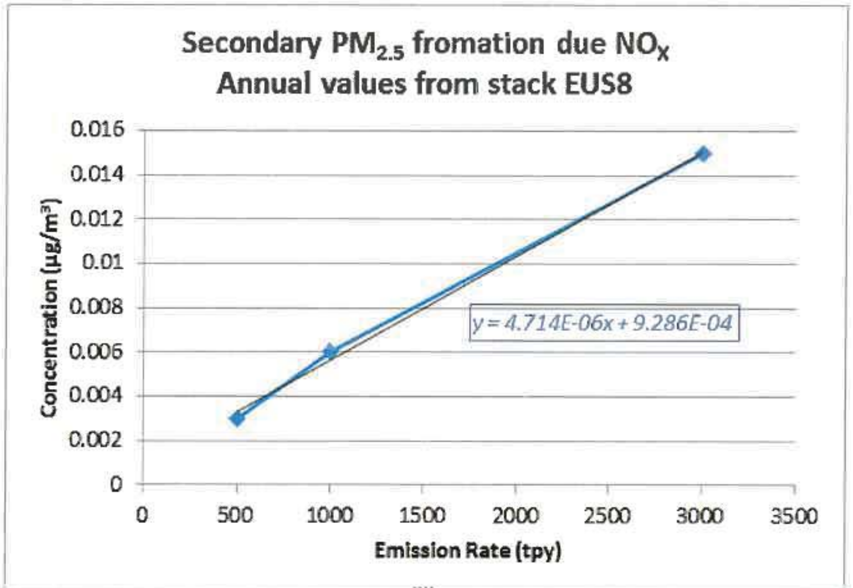
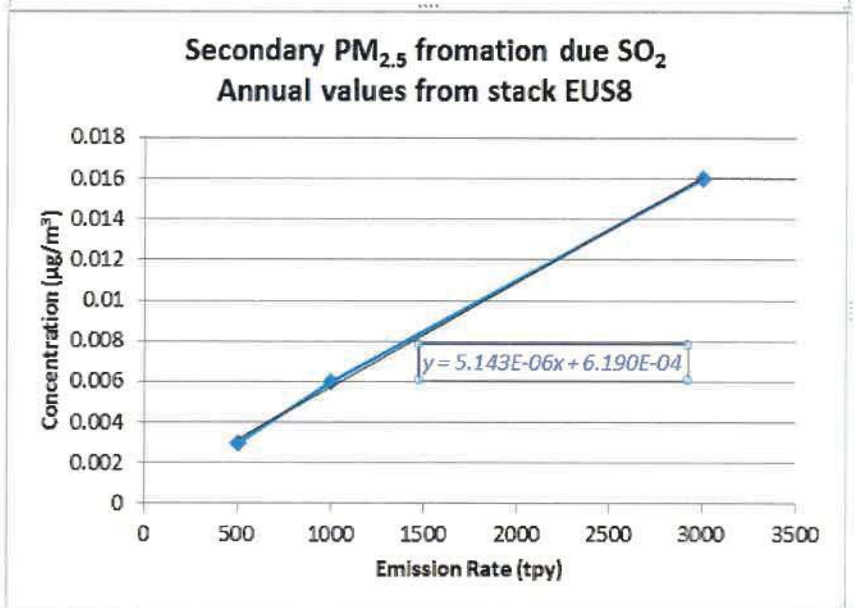


Figure 3-2 *EPA Hypothetical Source $PM_{2.5}$ Modeling Results – Source 8 (Pennsylvania) – Annual Average*





The secondary $PM_{2.5}$ concentrations due to the Project derived from the equations shown in Figures 3-2 and 3-3 are as follows:

24-hr Secondary $PM_{2.5}$ due NO_X = 8.56e^{-5}*(241 tpy) +3.81e^{-3} = 0.025 µg/m^3
+
24-hr Secondary $PM_{2.5}$ due SO_2 = 1.83e^{-4}*(163 tpy) +1.24e^{-2} = 0.042 µg/m^3

Total Secondary $PM_{2.5}$ (24-hr) = 0.067 µg/m^3

Annual Secondary $PM_{2.5}$ due NO_X = 4.71e^{-6}*(241 tpy) +9.29e^{-4} = 0.0021μg/m^3
+
Annual Secondary $PM_{2.5}$ due SO_2 = 5.14e^{-6}*(163 tpy) +6.19e^{-4} = 0.0015 μg/m^3

Total Secondary $PM_{2.5}$ (Annual) = 0.0035 μg/m^3

The secondary $PM_{2.5}$ concentrations determined above, based on a relationship between $PM_{2.5}$ concentrations and precursor emissions that were derived from maximum $PM_{2.5}$ modeled concentrations from EPA hypothetical source photochemical modeling in the same region as the proposed project, can be added to direct $PM_{2.5}$ modeled concentrations to determine the total project air quality impact on $PM_{2.5}$. These concentrations represent only very small fraction of the SIL values – approximately 5.58% of the 24-hour SIL and 1.75% of the annual. Therefore the project impacts could be considered as insignificant and no further modeling actions would be required.

3.5 BACKGROUND POLLUTANT CONCENTRATIONS

As discussed in Section 3.1.3, representative background pollutant concentrations must be utilized if a cumulative air quality modeling analysis is necessary for NO_2, $PM_{2.5}$, PM_{10}, SO_2, or CO. The following discussion presents the most current monitor design values for nearby monitors that Roxul has identified that are representative of Jefferson County.

3.5.1 Representative Background Concentrations of NO_2

Table 3-6 presents the most recent NO_2 monitor design values for the regional transport monitor in Adams County, PA (EPA ID 42-001-0001). This is the closest NO_2 monitor to the proposed Project with a valid 2016 monitor design value. The Adams County monitor is located 77 km to the northeast of the project site. The NO_2 data coverage of 93.0% was found sufficient for modeling purposes. The monitor is placed in rural setting similar to the project site.

Table 3-6 Annual and 1-hr NO_2 Monitor Design Values

POLLUTANT	MONITOR LOCATION	MONITOR ID	Distance to Project (km)	AVERAGING PERIOD	DESIGN CONCENTRATION (µg/m3)
NO_2	Adams Co., PA	42-001-0001	77	1-Hour	33.2
				Annual	9.4

To characterize 1-hr background NO_2 values, Roxul proposes to utilize EPA guidance (EPA 2011) and calculate the design value based on the most recent three years of data. The proposed NAAQS analysis would be performed in two stages. In the first stage a conservative approach would be applied by adding a single design value to all model predicted concentrations. If needed a refined approach would be applied by calculating variable background values. Specifically, the most recent 3-year average of the 98th percentile monitor values by season and hour-of-day are to be calculated. EPA guidance suggests that the season and hour-of-day combination be based on the 3rd highest values to represent the 98th percentile.

3.5.2 *Representative Background Concentrations of $PM_{2.5}$*

As discussed in Section 3.3, the proposed $PM_{2.5}$ ambient data are collected at the Garrett County, MD monitoring station. Roxul proposes to use these data to characterize background $PM_{2.5}$ for use in any necessary cumulative $PM_{2.5}$ analysis. Table 3-7 presents the current annual and 24-hr monitor design values.

Table 3-7 $PM_{2.5}$ Monitor Design Values

POLLUTANT	MONITOR LOCATION	MONITOR ID	Distance to Project (km)	AVERAGING PERIOD	DESIGN CONCENTRATION (μg/m3)
$PM_{2.5}$	Pine Run Garrett Co., MD	24-023-0002	105	24-Hour	14.3
				Annual	5.7

To characterize 24-hr background $PM_{2.5}$ values, Roxul proposes to utilize EPA guidance (EPA 2014) and calculate the design value based on the most recent three years of data 2014-2016. The proposed NAAQS analysis would be performed in two stages. In the first stage a conservative approach would be applied by adding a single design value to all model predicted concentrations. If needed a refined approach would be applied by calculating variable background values. Specifically, the EPA guidance recommends the following approach:

- For each year, determine the annual 98th percentile 24-hr monitor value;
- For all 24-hr values in the year less than or equal to the 98th percentile value, divide the distribution into four seasonal categories;
- Determine the maximum concentration in each seasonal category;
- Average the seasonal maximum concentrations across the three years (e.g., average spring value for years 1-3).

The approach described above will result in four 24-hr values that will be used as input as background values in AERMOD if the overall 24-hr monitor design value is unnecessarily conservative.

3.5.3 *Representative Background Concentrations of PM_{10}*

The closest PM_{10} monitor to the proposed Project is located in Winchester City, VA, 33 km to the southwest. Based on proximity, Roxul proposes the use of Winchester City monitor observations in the PM_{10} NAAQS analysis for this application. The maximum second highest monitor design value over the most recent three years of available data will be used to characterize background PM_{10} in the cumulative NAAQS analysis, if needed. Table 3-8 summarizes the most recent design value from the Winchester City, VA PM_{10} monitor.

Table 3-8 PM_{10} Monitor Design Values

POLLUTANT	MONITOR LOCATION	MONITOR ID	Distance to Project (km)	AVERAGING PERIOD	DESIGN CONCENTRATION (µg/m3)
PM_{10}	Winchester City, VA	51-840-0002	33	24-Hour	24

3.5.4 *Representative Background Concentrations of SO_2*

Table 3-9 presents the most recent SO_2 monitor design values for the regional transport monitor in Garrett County, MD (EPA ID 24-023-0002). This is the most representative SO_2 monitor with a valid 2016 monitor design value. The Garrett County monitor is located 105 km west-northwest of the Project site. The SO_2 data coverage of 85.6% was found sufficient for modeling purposes. The monitor is placed in rural setting similar to the Project site.

Table 3-9 SO_2 Monitor Design Values

POLLUTANT	MONITOR LOCATION	MONITOR ID	Distance to Project (km)	AVERAGING PERIOD	DESIGN CONCENTRATION (µg/m3)
SO_2	Garrett Co., MD	24-023-0002	105	1-Hour	39.5
				3-Hour	39.5
				24-Hour	17.5
				Annual	3.2

To characterize 1-hr background SO_2 values, Roxul proposes to utilize EPA guidance (EPA 2011) and calculate the design value based on the most recent three years of data. The proposed NAAQS analysis would be performed in two stages. In the first stage a conservative approach would be applied by adding a single design value to all model predicted concentrations. If needed a refined approach would be applied by calculating variable background values. Specifically, the most recent 3-year average of the 99th percentile monitor values by season and hour-of-day are to be calculated. EPA guidance suggests that the season and hour-of-day combination be based on the 2nd highest values to represent the 99th percentile. Roxul proposes to use the 1-hr SO_2 design value in the 3-hour NAAQS analysis.

3.5.5 *Representative Background Concentrations of CO*

The most representative CO monitor found in the vicinity of the Project is the Garrett County, MD regional transport monitor. If a cumulative analysis is triggered, Roxul will utilize the maximum highest-second highest monitor design value over the most recent three years of available monitor data for both the 1-hr and 8-hr averages to characterize background CO. Table 3-10 summarizes the most recent design values from the Garrett County, MD CO monitor.

Table 3-10 CO Monitor Design Values

POLLUTANT	MONITOR LOCATION	MONITOR ID	Distance to Project (km)	AVERAGING PERIOD	DESIGN CONCENTRATION (µg/m3)
CO	Garrett Co., MD	24-023-0002	105	1-Hour	458
				8-Hour	344

3.6 *NO_X TO NO_2 CONVERSION*

For the NO_2 modeling analyses, Roxul proposes to make use of the Ambient Ratio Method (ARM2) option in AERMOD to account for the formation of NO_2 from the emissions of NO_X from the Project sources. Roxul will utilize ARM2 with the national default range of NO_2 to NO_X ratios (50% to 90%). When ARM2 is used, AERMOD assigns the appropriate ratio for each hour and receptor based on the total modeled concentration of NO_X.

3.6.1 *Optional NO_2 Modeling Refinements*

The ARM approach described above is a Tier II NO_2 modeling methodology. Further refinements in AERMOD are available that account for NO_X to NO_2 transformation through the use of actual monitored concentrations of ozone. These refinements are referred to as Tier III NO_2 modeling methods. The Tier III approaches are the Plume Volume Molar Ratio Method (PVMRM) or the Ozone Limiting Method (OLM) options in AERMOD.

Roxul proposes to utilize a Tier III air quality modeling approach on an as-needed basis. Specifically, if the cumulative NO_2 modeling analysis results in unrealistically high concentrations of NO_2, then the Tier III options will be considered. EPA guidance (USEPA 2014a, USEPA 2015b) recommends the PVMRM approach over the OLM approach for "relatively isolated, elevated sources". Once the cumulative NO_X modeling inventory is finalized, Roxul will consider the appropriateness of both the PVMRM and OLM approaches. The characteristics of nearby NO_X sources and the interaction of those sources with Roxul's modeled NO_2 impacts will be considered in making the determination to apply PVMRM or OLM. The current PVMRM formulation in AERMOD 16216r is a revised version of PVMRM that was originally made available in AERMOD version 15181 as PVMRM2. PVMRM2 represents an improvement over the original PVMRM approach in that it addresses known issues with PVMRM in overestimating NO_2 conversion due to overestimates of plume volumes in stable conditions. EPA has published a technical support document that details the enhancements in PVMRM2 vs. PVMRM (USEPA 2015a).

Use of the Tier III refinements in AERMOD requires three additional inputs:

- Monitored ozone data;
- An equilibrium nitric oxide (NO)/NO_2 ratio; and
- Identification of source specific in-stack ratios of NO_2/NO_x.

Ozone data from the Berkeley County, WV ozone monitor will be used as input in the Tier III NO_2 modeling. Roxul will either characterize the ozone data on an hourly basis (a separate hour-by-hour file that will be read by AERMOD), or on a seasonal and hour-of-day basis. The default equilibrium nitric oxide (NO)/NO_2 ratio of 0.9 will be used.

In the absence of source-specific in-stack data, US EPA suggests a default in-stack NO_2/NO_x ratio of 0.5. Roxul will use an in-stack ratio of 0.5 for all project sources if manufacturer supported ratios cannot be obtained. For any cumulative inventory source greater than 1 km from the project site, Roxul will use an in-stack NO_2/NO_x ratio of 0.2. This approach is consistent with USEPA guidance for multi-source NO_2 modeling analyses (USEPA 2014a).

3.7 *GEOGRAPHIC SETTING*

3.7.1 *Land Use Characteristics*

The proposed facility will be located in the city of Ranson, Jefferson County, WV. AERMOD will be used in the default (rural) mode. Roxul has analyzed the land use classifications within an area defined by a 3 km radius from the approximate center of the site, and has determined that the land use within this area is less than 1% urban classification. This determination was made by analyzing the

USGS NLCD 1992 data, where urban classifications were assumed to be category 22 (high intensity residential) and category 23 (commercial /industrial/transportation).

3.7.2 *Terrain*

The Project site is situated in elevated terrain at approximately 162 m. The latest version of EPA's AERMAP program (version 11103) will be used to determine the ground elevation and hill scale for each modeled receptor, based on data obtained from the USGS National Elevation Database (NED). The NED data will be obtained at a horizontal resolution of 1 arc-second (30-m) for use in this analysis.

3.7.3 *Effects on Growth, Soils, Vegetation, and Visibility*

PSD requirements include an evaluation of the effects of growth due to a project, and an evaluation of the effects of project emissions on soils, vegetation, and visibility. Evaluation of potential impacts on vegetation and soils will be performed by comparison of maximum modeled impacts from the Project to Air Quality Related Value (AQRV) screening concentrations provided in the EPA document "A Screening Procedure for the Impacts of Air Pollution Sources on Plants, Soils, and Animals"[2] and to NAAQS secondary standards. The screening levels represent the minimum concentrations in either plant tissue or soils at which adverse growth effects or tissue injury was reported in the literature. The NAAQS secondary standards were set to protect public welfare, including protection against damage to crops and vegetation. Therefore, comparing the modeled emissions to the AQRVs and the NAAQS secondary standards provides an indication as to whether potential impacts are likely to be significant. Table 3-11 summarizes the applicable AQRVs or NAAQS secondary standards.

Table 3-11 Summary of Applicable AQRVs and AAQS

Pollutant	Averaging Period	AQRV Screening Levels (µg/m³)	Secondary NAAQS (µg/m³)
PM_{10}	24-hour	--	150
	Annual	--	50
$PM_{2.5}$	24-hour	--	35
	Annual	--	15
NO_2	4-hour	3,760	--
	8 hour	3,760	--
	1-month	564	--
	Annual	100	100

[2] USEPA, A Screening Procedure for the Impacts of Air Pollution Sources on Plants, Soils, and Animals, EPA 450/2-81-078, December 12, 1980.

Pollutant	Averaging Period	AQRV Screening Levels (μg/m³)	Secondary NAAQS (μg/m³)
SO_2	1-hour	917	--
	3-hour	786	1,300
	24-hour	--	260
	Annual	18	60
CO	1-hour	--	--
	8-hour	--	--
	Weekly[1]	1,800,000	--
Pb	Quarterly	1.5	0.15

"--" = not applicable or not available.
[1] Weekly average impact approximated by modeled 24-hr average impact.

With respect to visibility impacts, it should be noted that the facility will comply with the applicable WVDAQ visible emissions regulations. In addition, Roxul will consult with WVDAQ to determine if any areas in the vicinity are considered to be sensitive with respect to potential visibility degradation, and investigate the appropriateness of applying the EPA VISCREEN (Version 1.01, dated 13190) visibility model to sensitive viewsheds within these areas to conservatively assess the proposed Project's impact on visibility impairment. VISCREEN will be executed following the procedures described in EPA's Workbook for Plume Visual Impact Screening and Analysis for Level-1 visibility assessments, if necessary.[3]

3.8 *RECEPTOR GRIDS*

For this modeling analysis, nested Cartesian receptor grids of variable spacing will be utilized to resolve the ground concentration patterns. The grids will be defined using a common central point at the proposed project as an origin, extended distance from the origin, and receptor spacing. As a result of this approach the following sub-grid are defined:

- at most 50-meter spacing along the fence line;
- 100-meter spacing from origin out 3 km;
- 250-meter spacing from 3 km to 5 km from the facility;
- 500-meter spacing from 5 km to 10 km from the facility;
- 1000-meter spacing from 10 km to 20 km from the facility; and
- 2000-meter spacing from 20 km to 50 km from the facility, as needed.

As noted previously, AERMAP will be used to define ground elevations and hill scales for each receptor. Roxul will analyze isopleths of modeled concentrations

[3] EPA, Workbook for Plume Visual Impact Screening and Analysis (Revised), EPA-454/R-92-023, 1992.

due to the proposed Project, and determine if the proposed receptor grid adequately accounts for the worst case impacts. The receptor grid extent will be adjusted accordingly in a manner to adequately resolve the areas with increasing ground concentration gradients. In case of isolated high impacts from the proposed Project appearing in sections of the coarse receptor grid (500-m spacing and larger), then additional 100-meter spaced sub-grids will be used to better resolve the concentration patterns. Roxul will make any adjustments to the proposed grid on a case by case basis, and provide justification for any refinements in the modeling report to WVDAQ.

The facility fence line will be used as the boundary to determine ambient air. No receptors will be placed within this fence line boundary. A physical fence will control public access to the facility.

All Cartesian coordinates will be in UTM system, zone 18, datum NAD-83.

3.9 *METEOROLOGICAL DATA FOR AIR QUALITY MODELING*

EPA requires site-specific meteorological data to be included in the PSD application modeling. In absence of site-specific data, data from a representative NWS station should be used.

Roxul proposes to utilize meteorological data collected from 2012-2016 at the Eastern WV Regional Airport, Shepherd Field (KMRB) in this modeling analysis. The KMRB Automated Surface Observation System (ASOS) system is located approximately 9.8 km to the west of the Project site. Upper air data from Washington Dulles International Airport (IAD) will also be used in the analysis. The following steps will be taken to prepare and process these data with the latest versions of EPA's processing programs:

- AERMET version 16216 will be used to process the surface and upper air meteorological data;
- The ADJ_U* option will be used in AERMET;
- One-minute and five-minute ASOS wind data will be processed for input into AERMET through the use of the AERMINUTE version 15272 preprocessor;
- AERSURFACE will be run with varying options for moisture conditions (average, wet, and dry) at seasonal temporal resolution;
- Climatological data from the National Climatic Data Center (NCDC) will be used to assign the moisture and snowfall characteristics for each season of the 5-year modeling period;
- The resulting files will be processed into 5 individual calendar years and one 5-year period for model input.

The ADJ_U* option addresses a known bias towards underprediction of friction velocity under stable, low wind speed conditions, leading to observed model overprediction for these conditions. ADJ_U* is a regulatory option in the default application of AERMET version 16216 for use in AERMOD. In addition, for this application no site-specific meteorological data is available. The surface data included were recorded at the Martinsburg airport NWS station and do not include turbulence observations.

AERMET processing is performed in 3 stages. Stage 1 processing reads the raw onsite, surface, and upper air files, performs data range and completeness checks, and formats data for input to Stage 2. Stage 2 reads the files prepared in Stage 1, adds the 1- and 5-minute wind observations and prepares a single merged file with all necessary inputs for Stage 3. Stage 3 carries out the boundary layer parameterizations needed to calculate turbulence parameters such as the friction velocity, convective velocity scale, Monin-Obukhov length scale, and convective and mechanical mixing depths as well as determines hourly surface characteristics (albedo, Bowen Ratio, and surface roughness length) based on the AERSURFACE outputs.

3.9.2 *Summary of AERMET Location Inputs*

Integrated Surface Hourly Data (ISHD) format data from KMRB will be input in the AERMET "SURFACE" pathway, and FSL format upper air data will be input in the AERMET "UPPERAIR" pathway. The following location data will be used in AERMET:

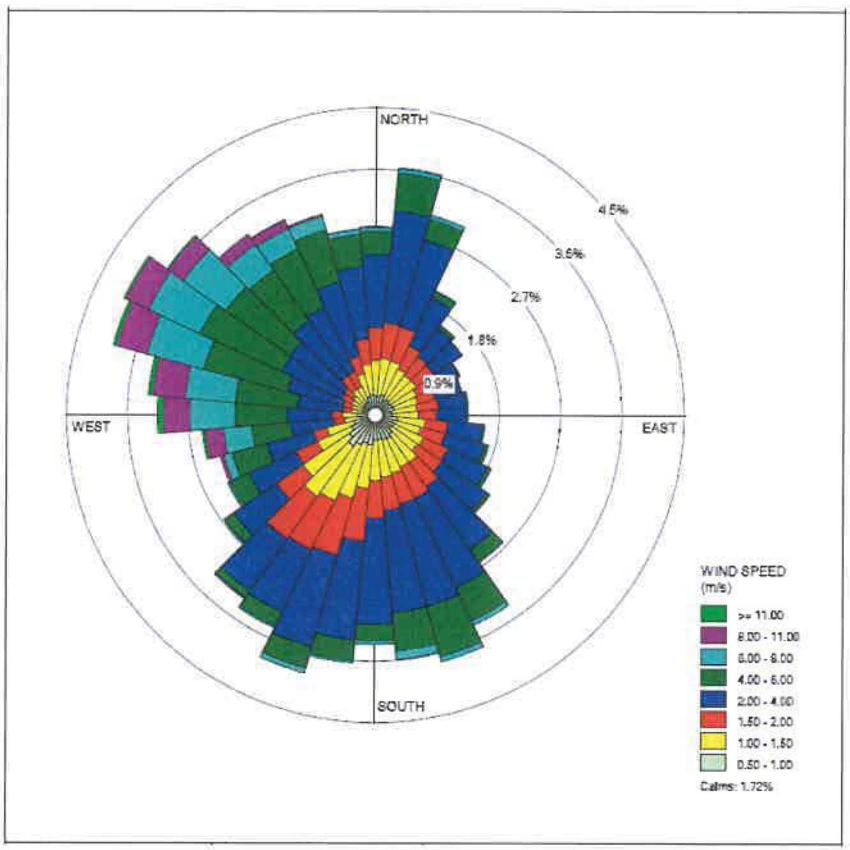
- KMRB ASOS Location: 39.402N 77.984W - specified by NCEI;
- KMRB Elevation: 162.8 m – specified in NCEI;
- IAD Upper Air Location: 38.98N 77.47W – noted in FSL file header; and
- Hourly AERMET data is processed in time zone 5.

3.9.3 *Meteorological Data Representativeness*

3.9.3.1 *Representativeness of Wind Measurements*

A wind rose for KMRB for 2012-2016 is shown in Figure 3-3.

Figure 3-3 KMRB Wind Rose – 2012-2016



The proposed Project site and KMRB are both situated in the gently rolling terrain region of the Potomac Highlands. The Project site is located approximately 10 km east of the meteorological station; both locations have similar terrain elevation: Project – 177 m, KMRB – 165 m. Both sites are situated in a the valley east of the Allegheny Mountain and west of the northern tip of Blue Ridge Mountain; therefore, it is reasonable to assume they are both exposed to the same regional wind pattern, and would not experience local steering of the wind from the dominant northwesterly and southerly direction. Roxul asserts that due to the relatively close proximity and similar terrain setting, that the KMRB winds are representative of the proposed Project site.

3.9.3.2 *Representativeness of Surface Characteristics*

The surface characteristics required by AERMET (surface roughness, Bowen ratio, and albedo) are required to be representative of the meteorological measurement site, as specified in the EPA's AERMOD Implementation Guidance. The AERSURFACE (Version 13016) land-use processor will be used for the development of the necessary micrometeorological parameters for use in AERMET. The following is a summary of the settings that will be used in AERSURFACE:

- USGS 1992 NLCD input land use data
- Center Latitude (decimal degrees): 39.402
- Center Longitude (decimal degrees): -77.984
- Datum: NAD83
- Study radius (km) for surface roughness: 1.0
- Airport? Y, Continuous snow cover? Y
- Surface moisture? **Variable**, Arid region? N
- Temporal resolution: Seasonal
- Month/Season assignments? Default
- Late autumn after frost and harvest, or winter with no snow: **0**
- Winter with continuous snow on the ground: **12 1 2**
- Transitional spring (partial green coverage, short annuals): 3 4 5
- Midsummer with lush vegetation: 6 7 8
- Autumn with unharvested cropland: 9 10 11

The variable inputs will be based on climatological data compiled by NCDC. The moisture characterization and snow cover will be characterized on seasonal basis based on NCDC climatological records for the airport site. AERSURFACE will be executed with seasonal resolution with 12 wind direction sectors.

Additional details on the moisture and snow cover options that will be used are provided in Section 3.9.4.

As noted previously, the KMRB station is located approximately 9.8 km west of the Project site. Bowen ratio and albedo are bulk variables in AERMET, that is, they are intended to be representative of the greater modeling domain as opposed to being highly site specific. AERSURFACE determines the appropriate value of Bowen ratio and albedo by considering the land-use within a 10 km by 10 km area centered on the meteorological instruments location. Table 3-12 summarizes the average values of surface roughness within 1 km of the KMRB ASOS site and the proposed Project site, as well as the Bowen ratio and albedo for both sites determined by AERSURFACE. AERSURFACE was executed on a seasonal basis for a single 360 wind direction sector for the purposes of this comparison.

Table 3-12 Comparison of Micrometeorological Variables

Season	Albedo		Bowen Ratio		Surface Roughness	
	Project	Airport	Project	Airport	Project	Airport
1	0.55	0.53	0.50	0.50	0.125	0.025
2	0.14	0.15	0.38	0.48	0.264	0.055
3	0.18	0.18	0.44	0.42	0.563	0.110
4	0.18	0.18	0.75	0.83	0.563	0.102

The NLCD 1992 land use data analyzed by AERSURFACE produce very similar average albedo and Bowen ratio values between the proposed Project and the airport site. However, the surface roughness values for the proposed site derived from AERSURFACE are notably higher than the values derived for KMRB from the NLCD 1992 land use data. Roxul proposes conservatively to use the KMRB surface roughness in the modeling.

3.9.4 *AERMET Processing*

AERMET (version 16216) will be executed using EPA recommended settings to produce the meteorological data needed for AERMOD. The five year period from 2011-2015 is proposed for use in this analysis. The AERMET analysis will include the use of both the AERMINUTE and AERSURFACE preprocessors. The AERMINUTE (version 15272) meteorological data processor will be used to produce wind speed and direction data based on archived 1-minute and 5-minute ASOS data for KMRB, for input into AERMET Stage 2. A 0.5 m/s wind speed threshold will be applied to the 1-minute ASOS derived wind speeds in AERMET.

In addition to the surface meteorological data from KMRB, Roxul will utilize upper air data from Washington Dulles International (IAD) airport in this analysis. Upper air data is used in AERMET to determine an initial potential temperature distribution from a morning sounding. AERMET assumes the 12Z sounding is to be nearly equivalent to a morning sounding. The initial potential temperature distribution is used by AERMET to characterize the growth of the daytime convective boundary layer. It is important to use upper air data that is representative of the model application site. IAD is the closest upper air collection station to the proposed project site.

Precipitation, snow fall and temperature statistics, provided by the National Center for Environmental Information (NCEI), were used in the determination of snow cover and moisture characteristics for each season. Monthly averages for 1981-2010 period collected at the KMRB station were consider to establish the historical precipitation amounts and temperatures. The guidance suggests that the 30-year rainfall record be examined, and then precipitation of the modeling period be compared to the 30 year statistical norms. A season was considered dry if the precipitation during a year of the modeling period is in the lower 30th percentile of the corresponding climatic norm. Similarly, average moisture is assumed for seasonal precipitation the in the range of 30th to 70th percentile, and wet moisture is assumed for the 70th percentile and greater. The proposed snow cover and moisture options for the 2012-2016 KMRB meteorological data processing are presented in Table 3-13.

Table 3-13 KMRB Snow Cover and Monthly Surface Moisture Assignments

Modeling Year	WINTER		SPRING	SUMMER	FALL
	Moisture	Continuous Snow on the ground?	Moisture	Moisture	Moisture
2012	Avg	Yes	Avg	Dry	Avg
2013	Wet	Yes	Dry	Avg	Wet
2014	Wet	Yes	Avg	Avg	Avg
2015	Dry	Yes	Avg	Dry	Dry
2016	Wet	Yes	Avg	Wet	Dry

3.10 *REGIONAL INVENTORY FOR CUMULATIVE MODELING ANALYSES*

As discussed in Section 3.1.3, cumulative air quality modeling analyses may be necessary if the Project's modeled impacts exceed the applicable SILs. The cumulative analyses will include representative background concentrations from regional monitors, as well as contributions from other sources in the area, "nearby sources" whose close proximity to the Project site would make their modeled impacts in relation to the modeled impacts from the proposed Project not well characterized by representative background monitor data alone.

Important considerations for identifying nearby sources to include in the cumulative modeling inventory, in a manner that does not make the assessment overly conservative or complicated, are discussed by EPA in Section 8.3 of the Guideline on Air Quality Models (40 CFR Part 51, Appendix W). Specifically, paragraph 8.3.3(b)(iii) of the Guideline provides the following language:

The number of nearby sources to be explicitly modeled in the air quality analysis is expected to be few except in unusual situations. In most cases, the few nearby sources will be located within 10 to 20 km from the source(s) under consideration.

The Guideline also contains the following language to define "nearby sources" in paragraph 8.3.3 (b):

Nearby Sources: All sources in the vicinity of the source(s) under consideration for emissions limits that are not adequately represented by ambient monitoring data should be explicitly modeled. Since an ambient monitor is limited to characterizing air quality at a fixed location, sources that cause a significant concentration gradient in the vicinity of the source(s) under consideration for emissions limits are not likely to be adequately characterized by the monitored data due to the high degree of variability of the source's impact.

Roxul anticipates that the maximum significant impact area (SIA, i.e., the distance defined by furthest receptor from the Project with a modeled concentration due to the Project in excess of an applicable SIL) will be within 50 km for the 1-hour average and within 20 km for the larger averaging periods. Considering the above referenced language from the Guideline, Roxul proposes to limit the cumulative inventory for all pollutants and averaging periods that exceed their respective SIL to major sources within an area of radius 25km of the proposed Project site.

Separate inventories will be developed for CO, NO_X, PM_{10}, $PM_{2.5}$, and SO_2 in conjunction with WVDAQ, if required. Title V permits and permit applications that are publically available will be the primary basis for the development of modeled emission rates for these inventories. The stack parameters will be based on the WVDAQ, MDDEP, and VADEQ emission inventory and available permits.

If the modeling results imply that further refinement of the off-site inventories is necessary, Roxul will consult with WVDAQ.

3.11 CLASS I IMPACTS

The proposed Project is located within 300 km of three (3) federally protected Class I areas. All of these Class I areas are located generally to the east and southeast of the Project. The Class I areas and approximate distances from the Project site are as follows:

- Otter Creek Wilderness – 153 km, managed by the US Forest Service (USFS),
- Dolly Sods Wilderness – 131 km, managed by USFS, and
- Shenandoah National Park – 60 km, managed by the National Park Service (NPS).

The Federal Land Managers (FLMs) have recommended an emissions over distance screening threshold that can be used to preliminarily assess a project's significance with respect to air quality related values (AQRVs), namely visibility and deposition in Class I areas (NPS 2010). This ratio is represented by total annualized maximum 24-hour emissions of NO_X, SO_2, PM_{10}, and H_2SO_4 in tons/yr divided by distance to a Class I area in km and is referred to as the Q/D ratio. The FLM guidance suggests that projects with a Q/D ratio of less than 10 would not be expected to have significant impacts with respect to AQRVs in Class I areas. Roxul anticipates that Q/D ratios for the closest Class I area will be approximately 9.6, which is below the FLM screening level of 10 and therefore no AQRV analysis is proposed.

Roxul proposes to evaluate the project related increase of NO_2, PM_{10}, $PM_{2.5}$, and SO_2 against the Class I SILs by applying the AERMOD dispersion model at a distance of 50 km from the Project site. This proposed analysis represents the maximum spatial extent (50 km from source to receptor) for regulatory applications of AERMOD. The receptors will be placed at 1° intervals on an arc that represents the angular distance of the Class I area at 50 km from the project site. The angular distance will be determined based on the receptors used by the NPS to represent each Class I area for refined air quality modeling analyses[4]. If maximum modeled concentrations at the 50 km receptors are less than the Class I SILs for NO_2, PM_{10}, $PM_{2.5}$, and SO_2, then it can be assumed that the project would also have maximum potential impacts that would be less than the SILs at the more distant Class I areas.

To determine elevations for the 50 km ring of receptors, Roxul proposes to use AERMAP to determine the elevations for the receptor locations recommended by the NPS for each Class I area within 300 km. After the elevations for each Class I area receptor has been determined with AERMAP, Roxul will identify the maximum and minimum elevations (and associated hill scale heights) for all NPS Class I receptors, and use these elevations and associated hill scales as the elevation and hill scale for each receptor in the 50 km arc receptors for each Class I area.

If the Class I SILs are exceeded in the AERMOD screening evaluation, Roxul proposes refined analysis with the CALPUFF model to evaluative the project impact within the park proper. In the event of refined modeling, Roxul also proposes the use of chemical transformation with CALPUFF, namely the MESOPUFF II scheme coupled with the VISTAS meteorological data set provided by EPA. The use of the chemical transformation option would account also for the secondary $PM_{2.5}$ formation.

[4] http://www.nature.nps.gov/air/maps/receptors/

4.0 MODEL RESULTS PRESENTATION

Five (5) criteria pollutants will be modeled, namely CO, NO_2, $PM_{2.5}$, PM_{10}, and SO_2. Maximum ground level model design values will be identified for the appropriate averaging periods and compliance with SILs, and subsequently the NAAQS and PSD Increments, as necessary. Results will be presented in a tabular and graphical format (as needed). Electronic modeling files will be provided with the report.

5.0 *REFERENCES*

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Best Available Control Technology
Appendix D

November 2017
Project No. 0408003

Environmental Resources Management
204 Chase Drive
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D.0 BEST AVAILABLE CONTROL TECHNOLOGY (BACT) ANALYSIS

Based on potential emissions, BACT is required by the West Virginia Department of Environmental Protection (WVDEP) air pollution control regulations contained in Title 45 Code of State Regulations Series 14 (45 CSR 14) for sulfur dioxide (SO_2), volatile organic compounds (VOCs) , nitrogen oxides (NO_X), particulate matter (PM), and particulate matter with a diameter of 10 micrometers or less (PM_{10}), particulate matter with a diameter of 2.5 micrometers or less ($PM_{2.5}$), carbon monoxide (CO), sulfuric acid (H_2SO_4) mist, and carbon dioxide equivalents (CO_2e) from all project emissions sources, including:

- Source L1 – Mineral Wool Line 1 (including recycle plant),
- Source RFN1 – Rockfon Line,
- Source COAL1 – Coal Milling, and
- Other Facility - Wide Operations.

A BACT analysis for each project emission source and corresponding set of criteria pollutants is included in this section. A greenhouse gas (GHG) BACT analysis is provided in Section D.9.

D.1 BACT ANALYSIS PROCESS

BACT is defined in 45 CSR 14 as:

> *Best available control technology (BACT) means an emissions limitation (including a visible emissions standard) based on the maximum degree of reduction for each regulated NSR pollutant which would be emitted from any proposed major stationary source or major modification which the Secretary, 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 federally enforceable emissions limitations or emissions limitations enforceable by the Secretary. If the Secretary 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.*

Federal guidance on BACT requires an evaluation that follows a "top down" approach, as described in the New Source Review Workshop Manual[1] issued by the United States Environmental Protection Agency (USEPA) in 1990. The five basic steps of a top-down BACT analysis are:

Step 1:	Identify potential control technologies;
Step 2:	Eliminate technically infeasible options;
Step 3:	Rank remaining control technologies by control effectiveness;
Step 4:	Evaluate the most effective controls and document results; and
Step 5:	Select BACT.

The first step is to identify potentially "available" control options for each emission unit and for each pollutant under review. Available options consist of a comprehensive list of those technologies with a potentially practical application to the emissions unit in question. The list includes lowest achievable emission rate (LAER) technologies, innovative technologies, and controls applied to similar source categories. Reasonably available control technology (RACT), State regulations, and federal regulations were reviewed as a starting point for potential BACT limits.

For this analysis, the following sources were investigated to identify potentially available control technologies:

- USEPA's RACT/BACT/LAER Clearinghouse (RBLC) database;
- USEPA's New Source Review (NSR) website;
- In-house experts;
- Technical books and articles;
- State permits issued for similar sources that have not been entered into the RBLC;
- Vendor quotes and communications with control device equipment manufacturers;
- Guidance documents referenced within this application; and
- Proposed and existing New Source Performance Standards (NSPS) and National Emission Standards for Hazardous Air Pollutants (NESHAP), including Maximum Achievable Control Technology (MACT).

After identifying potential technologies, the second step is to eliminate technically infeasible options from further consideration. To be considered feasible, a technology must be both available and applicable. In this step, technical arguments for eliminating a technology from further consideration

[1] *New Source Review Workshop Manual Prevention of Significant Deterioration and Nonattainment Area Permitting*, EPA, Draft October 1990.

must be clearly documented based on physical, chemical, engineering, and source-specific factors related to safe and successful use of the controls.

The third step is to rank the technologies not eliminated in the second step in order of descending control effectiveness for each pollutant of concern. If the highest ranked technology is proposed as BACT, it is not necessary to perform any further technical or economic evaluation. Potential adverse impacts must still be identified and evaluated.

The fourth step entails an evaluation of energy, environmental, and economic impacts for determining a final level of control. The evaluation begins with the most stringent control option and continues until a technology under consideration cannot be eliminated based on adverse energy, environmental, or economic impacts. The economic or "cost-effectiveness" analysis is conducted in a manner consistent with USEPA's Office of Air Quality Planning and Standards (OAPQS) Control Cost Manual, Sixth Edition and subsequent revisions.

The fifth and final step is to select as BACT the emission limit from application of the most effective of the remaining technologies under consideration for each pollutant of concern. BACT must be no less stringent than the level of control required by any applicable NSPS and NESHAP or State regulatory standards applicable to the emission units included in this permit application.

This BACT analysis provides background information on potential control technologies, a summary of determinations contained in the RBLC database for similar emission units, a discussion of other potential control options that may be applicable to the emission units, and proposed BACT emission limits. A report[2] developed by the European Commission Joint Research Centre was used as a starting point for potentially applicable melting furnace controls and control device efficiencies. The report provides installation data on facilities throughout the European Union (EU) with melting processes similar to the proposed facility.

The primary basis of the emission estimates for the proposed Roxul facility is stack emissions data from similar Roxul facilities. These emissions reflect control devices that are typical to Roxul mineral wool facility designs and as such are used as a starting point for this BACT analysis.

D.2 BACT DETERMINATION FOR EMISSIONS FROM MATERIAL DELIVERY, HANDLING, STORAGE, AND TRANSFER OPERATIONS

Emissions of filterable $PM/PM_{10}/PM_{2.5}$ are generated from material handling operations. Generally, these emissions can be grouped as fugitive or point (vent) source emissions. This section evaluates BACT for the following fugitive and point or vent emission sources as described in Section 2.0 of the application.

[2] European Commission, *Best Available Techniques (BAT) Reference Document for the Manufacture of Glass*, Integrated Pollution Prevention and Control (IPPC) Industrial Emissions Directive 2010/75/EU, 2013.

Fugitive Sources:

- Coal Milling Building (B235);
- Coal Unloading (Delivery Truck to Bunker) (B230);
- Coal Loading Hopper (B231);
- Raw Material Outdoor Stockpile (Including Delivery to Stockpile from Offsite) (RMS);
- Raw Material Storage (Delivery to Raw Material Storage from Offsite or Stockpile) (B210);
- Raw Material Loading Hopper (B215);
- Raw Material Reject Collection Bin (RM_REJ);
- Sieve Reject Collection Bin (S_REJ);
- Melting Furnace Portable Crusher & Storage (Including Drop to Pit Waste, and Pit Waste Stock Pile Wind Erosion) (B170); and
- Raw Material, Finished Product, and Coal Transport on Paved Haul Roads (Rd_RM, Rd_FP, Rd_CM).

Vent Sources:

- De-Dusting Baghouse (CE01);
- Vacuum Cleaning Baghouse (CE02);
- Three (3) Coal Storage Silos (IMF03);
- Coal Feed Tank (IMF25);
- Charging Building Vacuum Cleaning Filter (IMF21);
- Sorbent Silo (IMF08);
- Spent Sorbent Silo (IMF09);
- Two (2) Storage Silos (Filter Fines Day/ Secondary Energy Materials) (IMF07);
- Filter Fines Receiving Silo (IMF10);
- Conveyor Transition Point (B215 to B220) (IMF11);
- Conveyor Transition Point (B210 to B220) (IMF12);
- Conveyor Transition Point (B220 No. 1) (IMF14);
- Conveyor Transition Point (B220 No. 2) (IMF15);
- Conveyor Transition Point (B220 to B300) (IMF16);
- Charging Material Handling Building Vent 1 (IMF17);
- Charging Material Handling Building Vent 2 (IMF18);

- Coal Conveyor Transition Point (B231 to B235) (IMF04)
- Coal Conveyor Transition Point (B231 to B235) (IMF13);
- Recycle Building Vent 1 (CM10);
- Recycle Building Vent 2 (CM11);
- Recycle Building Vent 3 (CM08); and
- Recycle Building Vent 4 (CM09).

D.2.1 Fugitive Emissions from Material Delivery, Handling, Storage, and Transport Operations– Filterable PM, PM_{10}, and $PM_{2.5}$

Raw materials are delivered in bulk by truck and are temporarily staged between two buildings facing inward. Daily quantities of the bulk materials are transferred with a front-end loader and subdivided into three (3) sided concrete enclosures with a fixed roof. Alternatively, materials are delivered directly to a stockpile. Front-end loaders are used to transfer raw materials from the material storage building or stockpile into a loading hopper that feeds an enclosed conveyor system.

In addition to raw material unloading and storage, fugitive emissions are also generated from material drops associated with the melting furnace portable crusher and reject material transfers.

Coal or pet coke for on-site milling will be delivered in lump size by truck and unloaded at the coal bunker enclosed at 3 sides and roofed (B230). From the coal bunker, the coal is loaded by a front-end loader into the loading hopper (B231) enclosed on 3 sides and roofed. The Coal Loading Hopper (B231) feeds material onto a series of enclosed conveyors that direct the material to a day bin inside the coal milling building (B235).

BACT Floor

Per Title 45 Code of State Regulations Series 7 (45 CSR 07), the facility shall not emit filterable PM into the open air from any process source operation greater than 20 percent opacity. This emissions limit applies to the Melting Furnace Portable Crusher & Storage.

Per 45 CSR 07-5, the facility must limit fugitive emissions by equipping manufacturing processes with a system to minimize fugitive PM emissions. This BACT analysis analyzes the feasibility of add-on controls to reduce fugitive emissions. All roads will be paved to minimize fugitive dust emissions.

The requirements of Title 40 Code of Federal Regulations (40 CFR) Part 60, Subpart OOO apply to the Raw Material Reject Collection Bin and Sieve Reject Collection Bin. In accordance with this regulation, these emission sources must not exceed 7 percent opacity.

Step 1 – Identify Potential Control Technologies

Control efficiencies for potentially applicable technologies are shown in the table below.

Control Type	Estimated PM/PM_{10}/$PM_{2.5}$ Control Efficiency
Wind screens and/or partial enclosures	Varies (50% - 75%)
Water sprays or wet suppression	Varies
Fabric filter (Baghouse)	95-99+% [As low as 0.001 grains per dry standard cubic foot (gr/dscf)]
Good housekeeping practices	Varies

- *Wind Screens and/or Partial Enclosures* – The use of screen walls and other structures to shelter material handling operations from wind effects has been shown to provide a reduction in airborne dust from such operations. Partial enclosures are most effective and practical at dedicated loading and unloading points.
- *Water Sprays or Wet Suppression* – Fine mists of water applied to dust generating sources, such as bulk material drop points, reduce dust emissions by impacting small particulates with water. The wetted particulate becomes heavier and quickly settles out of the air, reducing airborne dust. Alternatively, material may be thoroughly wetted prior to handling, which suppresses the generation of dust when the material is disturbed.
- *Fabric Filter (Baghouse)* – Local collection hoods and fabric filters, or baghouses, are the industry standard for particulate controls and the most efficient means of removing varying sizes of particulate material. An additional advantage of using local collection hoods and baghouses is that air flows can be adjusted individually to accommodate changes in the dust loading. The best results are obtained when the fabric filter's velocity is controlled for the particular emission characteristics (air-to-cloth ratio) and providing additional capacity to handle the baghouse's cleaning cycle. The primary method of particle leakage is through pores in the filter that are not covered with the filter cake. The velocity of the exhaust through the pores is high, entraining both small and large particles. Once a filter cake forms, only a few of these pores exist.
- *Good Housekeeping Practices* – Good housekeeping practices are used in areas where it is difficult to feasibly implement other control technologies. Good housekeeping practices generally consist of activities such as the application of water or other chemicals to suppress dust from becoming airborne for unpaved roads, utilizing paved roads when possible, posting speed limits for trucks and vehicles while on-site, and sweeping to keep roadways free of dust.

Step 2 – Eliminate Technically Infeasible Options

Water Sprays or Wet Suppression

Water sprays and wet suppression of the materials delivered by truck are infeasible due to the need to move the materials onto a conveyor system where dry material is required to prevent clogging. The raw materials and fuel to be used (coal) are not suitable for this type of control.

Fabric Filter

Fabric filters are technically infeasible because large vent hoods and air flows would be needed to collect the material from the storage areas. Emissions of PM, PM_{10}, and $PM_{2.5}$ from the Raw Material Reject Collection Bin and Sieve Reject Collection Bin may not require exceedingly large vent hoods and air flows; however, if these sources were vented at 100 dry standard cubic feet per minute (dscfm), the particulate concentration would be below the threshold at which fabric filters are considered technically feasible for PM reduction (<0.0002 gr PM/dscf). As such, fabric filters are eliminated from further consideration.

Step 3 – Rank Remaining Technically Feasible Control Options

1. Wind screens and/or partial enclosures.
2. Good housekeeping practices.

Step 4 – Evaluate Remaining Control Technologies

Wind Screens and/or Partial Enclosures

Wind screens and partial enclosures are effective at blocking wind which both entrains and carries dust and particulate away from the source. As previously mentioned, truck deliveries are unloaded between enclosures in the middle of a building. The material will be temporarily staged in this location; therefore, short-term wind effects will be minimized by two walls and by moving the material for longer-term storage. The facility plans to install three-sided concrete raw material and coal bins with a fixed roof and covers on outdoor loading hoppers to reduce the effects of wind. Fugitive emissions from rejected material will be minimized by directing the material into bins with 4-sided rubber drop guards. Fugitive emissions associated with the storage of crushed material exiting the portable crusher will be minimized through the use of three-sided concrete enclosures.

Good Housekeeping Practices

Good housekeeping practices will also be applied to material handling operations. The facility will have paved roads and paved material handling areas to help suppress vehicular dusting. Speed limits will be posted for trucks and vehicles while on-site to prevent loose materials from becoming airborne during transportation. Most of the processing will take place within buildings. Roadways and other surfaced areas will be periodically swept to remove dust.

The Raw Material Reject Collection Bin and Sieve Reject Collection Bin will comply with NSPS OOO emission limits through Visible Emissions (VE) monitoring. Compliance with NSPS OOO ensures good housekeeping practices have been applied for these two sources.

The most efficient and effective control of filterable PM, PM_{10} and $PM_{2.5}$ emissions for the material handling sources are a combination of partial enclosures and good housekeeping practices. No other control procedures are applicable.

Step 5 – Selection of BACT

A combination of partial enclosures along with good housekeeping practices will represent BACT for controlling fugitive PM, PM_{10} and $PM_{2.5}$ emissions from these fugitive sources. Roxul proposes compliance with NSPS Subpart OOO with no add-on controls as BACT for $PM/PM_{10}/PM_{2.5}$ from the Raw Material Reject Collection Bin and Sieve Reject Collection Bin. Compliance will be demonstrated through recordkeeping and VE observations, as indicated in Attachment O.

D.2.2 Vent Emissions from Material Delivery, Handling, Storage, and Transport Operations - Filterable PM, PM_{10}, and $PM_{2.5}$

A BACT analysis is presented below for emissions from material handling vents associated with material handling, storage, and transfer. These activities include loading materials (e.g., coal, raw materials, or wool waste) into a hopper, transferring materials on conveyors, loading materials into silos, and performing crushing and sizing operations.

BACT Floor

Per 45 CSR 07, the facility shall not emit filterable PM into the open air from any process source operation greater than 20 percent opacity. Emission limits for each source are summarized in Attachment O.

The requirements of 40 CFR Part 60, Subpart OOO apply to certain storage silos, building vents, and conveyor transfer points. In accordance with this regulation, emissions from the building vents and storage bins must not exceed 7 percent opacity, while the conveyor transfer points must not exceed a PM emission rate of 0.014 gr/dscf.

Step 1 – Identify Potential Control Technologies

Control efficiencies for potentially applicable technologies are shown in the table below.

Control Type	Estimated $PM/PM_{10}/PM_{2.5}$ Control Efficiency
Enclosed (or partially enclosed) conveyors and transfer stations	Varies
Water sprays or wet suppression	Varies
Fabric filter (baghouse or bin vent filter)	95-99+% (As low as 0.001 gr/dscf)
Good housekeeping practices	Varies

Control technologies for filterable $PM/PM_{10}/PM_{2.5}$ are discussed earlier in Section D.2.1.

Step 2 – Eliminate Technically Infeasible Options

Water Sprays or Wet Suppression

Water sprays and wet suppression are not suitable for control of the raw material and coal transfer and conveying emissions because the systems for material handling, transfer, and storage are designed for dry materials. Wet materials may clog equipment and create additional wear. Water sprays and wet suppression are technically infeasible and will not be considered further.

Fabric Filter (Charging Material Handling Building Vents 1 & 2)

The emission concentrations of PM, PM_{10}, and $PM_{2.5}$ from Charging Material Handling Building Vent 1 and Vent 2 are below the threshold at which fabric filters are considered technically feasible for PM reduction (0.001 gr PM/dscf). Therefore, fabric filters are eliminated from further consideration for these two vents.

Step 3 – Rank Remaining Technically Feasible Control Options

1. Fabric filter and bin vent filter.
2. Enclosed conveyors and transfer stations.
3. Good housekeeping practices.

Step 4 – Evaluate Remaining Control Technologies

Fabric Filter or Bin Vent Filter

The most efficient and effective control devices for filterable $PM/PM_{10}/PM_{2.5}$ emissions from material handling, storage, and transfer are fabric filters and bin vent filters. Fabric filters or bin vent filters will be used to reduce particulate emissions from point dust sources as shown in Attachment O. Baghouses or fabric filters will be implemented to control emissions from the loading hoppers, charging building vacuum cleaner, and conveyor transfer points because vents can be used to collect airborne material from indoor process areas and routed to a filter. Bin vent filters are used to control emissions from storage silos and feed tanks.

Recycle plant transfer and milling operations are conducted indoors. The building will be kept closed with a fast roller gate controlled by the movement of the front-end loader to minimize fugitive emissions. Emissions will be released indoors, which allows a majority of the particulate emissions to settle inside. The building is equipped with four vents (Recycle Building Vents), and each of these vents is equipped with a fabric filter to control emissions that do not settle within the Recycle Plant Building. A de-dusting baghouse will control dust generated from wool waste transfer, handling, and storage and dust generated by mechanical saws on the mineral wool line. A vacuum cleaning baghouse will be used to control dust from the packaging area.

Enclosed (or Partially Enclosed) Conveyors and Transfer Stations

Enclosed (or partially enclosed) conveyors and transfer stations will be used as appropriate, as well as using indoor conveyors, when possible.

Good Housekeeping Practices

Good housekeeping practices will also be applied to material handling and storage operations. Process and storage areas and other surfaced areas will be periodically swept to remove dust.

The top most effective controls (baghouses/fabric filters and bin vent filters) are proposed to be BACT.

Step 5 – Selection of BACT

Roxul proposes to use baghouses/fabric filters, and bin vent filters as BACT for controlling $PM/PM_{10}/PM_{2.5}$ emissions from material delivery, handling, storage, and transport vents. Roxul proposes compliance with NSPS Subpart OOO with no add-on controls as BACT for $PM/PM_{10}/PM_{2.5}$ from the Charging Material Handling Vents. Proposed control devices, BACT emission limits, and compliance demonstration methods are summarized in Attachment O for each emission source.

D.3 BACT DETERMINATION FOR MELTING FURNACE

This section evaluates BACT for the following sources as described in Section 2.1 of the application:

- Melting Furnace: IMF01.

D.3.1 Melting Furnace – Filterable PM, PM_{10}, $PM_{2.5}$, and Condensable PM (CPM)

The RBLC, recent permits, and other relevant documents were reviewed to identify the most stringent BACT limits for $PM/PM_{10}/PM_{2.5}$ established for melting furnaces. The Melting Furnace is subject to regulation under federal and State rules, as identified in Section 4.0 of the permit application.

BACT Floor

The requirements of 40 CFR Part 63, Subpart DDD apply to owners or operators of mineral wool production facilities that are located at major sources of hazardous air pollutants (HAP) emissions. The Melting Furnace must, at a minimum comply with the applicable Mineral Wool MACT filterable PM emission limit of 0.05 kilogram per megagram (kg/Mg) of melt (0.10 pound per ton [lb/ton] of melt).

WVDEP air pollution control regulation Title 45 Code of State Regulations Series 6 (45 CSR 06) will apply to the Melting Furnace. The Melting Furnace must, at a minimum comply with the applicable emissions rate.

Step 1 – Identify Potential Control Technologies

Potentially applicable controls include fabric filters or baghouses, ceramic filters, wet scrubbers or Venturi scrubbers, dry electrostatic precipitators (ESPs), or wet electrostatic precipitators (WESPs). Other available control technologies for controlling PM emissions include high efficiency cyclones. Control efficiencies for potentially applicable technologies are shown in the table below.

Control Type	**Estimated $PM/PM_{10}/PM_{2.5}$ and CPM Control Efficiency**[3]
Fabric filter (baghouse)	95-99+% (As low as 0.001 gr/dscf)
Ceramic filter	95-99+% (As low as 0.001 gr/dscf)
Wet scrubber or high efficiency Venturi scrubber	70-99% (~0.01 gr/dscf)
ESP	95-99% (0.002 – 0.004 gr/dscf)
WESP	95-99% (0.002 – 0.004 gr/dscf)
High efficiency cyclone	80-99% for PM, 30-90% for PM_{10}, 0-40% for $PM_{2.5}$ (>0.01 gr/dscf)

There are four primary types of particulate control systems[4]:

- *Fabric Filters*[5]. – This type of particulate control technology utilizes filters to remove dry particles from gas streams. Fabric filter filtration involves the use of reusable filter bags. Initially, dust is deposited on the surface and on the fibers within the fabric filter. Dust becomes the dominant filter medium as

[3] Grain loadings are for filterable $PM/PM_{10}/PM_{2.5}$ only. Limited data is available for the condensable portion, and not all particulate control devices effectively control CPM.

[4] European Commission, Best Available Techniques (BAT) Reference Document for the Manufacture of Glass, Integrated Pollution Prevention and Control (IPPC) Industrial Emissions Directive 2010/75/EU, 2013.

[5] Air Pollution Control Technology Fact Sheet: Fabric Filter Pulse-Jet Cleaned Type, EPA-452/F-03-025, Washington, D.C.: Clean Air Technology Center, July 2003.

the dust cake layer builds on the filter. The resistance to gas flow and pressure drop increase as the thickness of the dust cake layer increases until the gas can no longer easily pass through for filtration. Reusable filters can be cleaned by mechanically shaking, reversing the air flow, or pulsing the bags (i.e., fabric filter baghouses); filter bags must be replaced when they become loaded with PM to the point that the pressure drop across the filter bags reaches a specified level. The design efficiency of dry filtration typically ranges between 0.001 to 0.01 gr/dscf. Baghouse technology has been used extensively to control filterable $PM/PM_{10}/PM_{2.5}$ emissions from melting furnaces achieving outlet concentrations below 0.01 gr/dscf. Baghouses are expected to be the most effective control device and the device most commonly used to limit filterable PM emissions.

- *Ceramic Filter*[6]- When exhaust temperatures exceed the bag filter operating range, the filter must be bypassed or cooled by dilution to avoid burning bags. In certain applications, high-temperature filter media can substitute conventional filter media and are instead of a candle filter design. For example, the candles in the Tri-Mer systems are manufactured from a new generation of low-density ceramic fibers that give the candles an ability to capture fine particulates at the surface without blinding at significant elevated temperatures above what is possible with fabric bags. This control technology has been installed to control emissions from a variety of high temperature exhausts, such as glass furnace exhaust streams.
- *Wet Scrubbers*[7] – This type of particulate control technology removes PM from a gas stream by capturing it in liquid droplets. Wet scrubbers are efficient for removing fine and sub micrometer particles. High efficiency Venturi scrubbers utilize a downdraft of air to push the particulates into contact with water droplets. The collection efficiency of a Venturi scrubber is highly dependent on pressure drop, the liquid-to-gas ratio, and chemical nature of wettability of the particulate. Efficiency improves with increased liquid-to-gas ratios, but at the expense of higher pressure drop and energy consumption. Venturi scrubbers must be followed by an entrainment collector for the liquid spray. The collectors are typically centrifugal and will have an additional pressure drop. Water scrubber systems are in use, but can be less effective for controlling PM/PM_{10} emissions than baghouses.
- *ESP, WESP* [8,9,10] – ESPs use an electrostatic field to charge particles contained in the gas stream. The charged particles migrate to a grounded collection

[6] Tri-Mer Corporation "Catalytic Ceramic Filter Systems Air Pollution Treatment" Presented at the South Coast Air Quality Management District Symposium, June 2015. Available online at: http://www.aqmd.gov/docs/default-source/Agendas/aqmp/control-strategy-symposium/pm2-5-moss.pdf?sfvrsn=2

[7] Air Pollution Control Technology Fact Sheet: Venturi Scrubber, EPA-452/F-03-017, Washington, D.C.: Clean Air Technology Center, July 2003

[8] Air Pollution Control Technology Fact Sheet: Dry Electrostatic Precipitator (ESP) Wire –Pipe Type, EPA- 452/F-03-027, Washington, D.C.: Clean Air Technology Center, July 2003

[9] Air Pollution Control Technology Fact Sheet: Wet Electrostatic Precipitator (ESP) Wire –Pipe Type, EPA-452 F-03-029, Washington, D.C.: Clean Air Technology Center, July 2003

surface where they are periodically dislodged by vibrating or rapping. The dust is collected in a hopper at the bottom of the ESP. With respect to $PM_{2.5}$ emissions, dry ESPs have a lower overall efficiency than baghouses. Dry ESPs are not designed to collect wet or sticky PM, such as condensable particles. Condensable matter will clog the ESP, stay attached to the plates, and possibly short out the unit. However, WESPs can collect sticky particles and mists, as well as highly resistive or explosive dusts. The humid atmosphere that results from the continuous or intermittent washing in a wet ESP enables these units to collect high resistivity particles, absorb gases or cause pollutants to condense, and cool and condition the gas stream. Liquid particles or aerosols present in the gas stream are collected along with particles and provide another means of rinsing the collection electrodes.

- *Mechanical Collectors*[11] – This type of particulate control technology (such as a cyclone) is typically utilized to remove large particles (greater than 8 to 10 microns [μm] in aerodynamic diameter) through centrifugal and inertial forces induced by mechanically accelerating the particle-laden gas stream. This type of control is not effective in removing small particles - achieving approximately 30% control efficiency for PM_{10}. Therefore, it is not considered a "best" available control technology.

For the Melting Furnace operations, $PM/PM_{10}/PM_{2.5}$ control technologies can be ranked in terms of effectiveness as follows: baghouse equivalent to ceramic filter; high efficiency Venturi scrubber; then ESP or WESP. Baghouses do have advantages compared to ceramic filters regarding operational cost (lower pressure drop, less costly exchange of filter media) and investment cost (filter media cost and possible length of bags compared to candles and herby weight and footprint of filter) and are therefore expected to be the most effective control device and the device most commonly used to limit PM emissions.

Step 2 – Eliminate Technically Infeasible Options

High Efficiency Cyclone

No BACT determinations were found that include the use of mechanical collectors, so this type of control is considered to be technically infeasible for removing fine PM emissions. Mechanical collectors are used primarily for pretreatment control devices and are not considered a "best" available control technology; for these reasons, this control technology is eliminated from further consideration.

Step 3 – Rank Remaining Technically Feasible Control Options

1. Fabric filter (baghouse).

[10] Air Pollution Control Technology Fact Sheet: Wet Electrostatic Precipitator (ESP) Wire –Plate Type, EPA- 452/F-03-030, Washington, D.C.: Clean Air Technology Center, July 2003

[11] Air Pollution Control Technology Fact Sheet: Cyclones, EPA- 452/F-03-005, Washington, D.C.: Clean Air Technology Center, July 2003

2. Ceramic filter.
3. Wet scrubber or high efficiency Venturi scrubber.
4. WESP or ESP.

Step 4 – Evaluate Remaining Control Technologies

BACT Limit Overview

According to the RBLC search results, the most stringent limits for cupola filterable particulate emissions are achieved by using baghouses as the add-on control technology. RBLC search results for $PM/PM_{10}/PM_{2.5}$ BACT emission limits for iron cupolas, glass melting furnaces, and fiberglass melting furnaces indicate that the concentration established as BACT ranged from 0.005 gr PM_{10}/dscf to 0.007 gr/dscf, while the BACT emission rate ranged from 0.07 lb PM_{10}/ton to 1.87 lb/ton for similar emission source categories. These limits are for the PM/PM_{10} filterable portion and do not include condensable particulate. BACT emission limits in terms of lb/hr are preferred because the effluent concentration from a baghouse is nearly constant.

Fabric Filter (Baghouse)

A baghouse is the top ranked control technology for $PM/PM_{10}/PM_{2.5}$ control. Flue gas from the melting furnace will be directed to a baghouse to collect raw material fines. A second baghouse in series is used for control of emissions of filterable $PM/PM_{10}/PM_{2.5}$. Since baghouses do not effectively control CPM, additional control of $PM/PM_{10}/PM_{2.5}$, primarily comprised of CPM, will be considered for use after dry filtration.

Ceramic Filter

Ceramic filter systems are utilized primarily in the glass industry for hot gas solutions and can achieve control efficiencies as high as a traditional fabric filter systems. High temperature filters are no longer used for abating emissions from stone wool cupolas due to high costs and permanent plant shut downs.[12] Compared to traditional filter systems, a ceramic filtration system is much heavier, which would require careful engineering and additional load bearing support for the additional weight. Generally, these systems are much larger than a traditional bag filter system. The ceramic filter system pressure drop is also much greater than a traditional filter system, which corresponds to considerably higher energy demands for the ceramic filter system. Hot gas solutions are not required to control emissions from the Melting Furnace exhaust; therefore, ceramic filtration is eliminated due to negative energy/environmental impacts compared to a traditional baghouse.

[12] European Commission, BAT Reference Document for the Manufacture of Glass, Integrated Pollution Prevention and Control (IPPC) Industrial Emissions Directive 2010/75/EU, 2013.

Wet Scrubber or High Efficiency Venturi Scrubber

High gas velocities and turbulence in the Venturi scrubber result in high collection efficiencies ranging from 70% to 99% for particles larger than 1 μm and at least 50% for sub-micron particles. These control efficiency ranges are based on an inlet pollutant loading range of 0.1 to 50 grains per standard cubic foot (gr/scf) and will be considerably lower based on the $PM/PM_{10}/PM_{2.5}$ concentration in the Melting Furnace exhaust after initial dry filtration. To achieve high filtration efficiencies, Venturi scrubbers require large pressure drops, which in turn, increase energy consumption and operating costs. A majority of the CPM compounds will be sub-micron particles. A 50% control efficiency is a conservative control estimate for Venturi scrubber control based on the expected particle size and pollutant inlet loading; however, for economic analysis purposes, a 90% control efficiency was applied. A cost-effectiveness calculation for installing a Venturi scrubber to control $PM/PM_{10}/PM_{2.5}$ from the Melting Furnace exhaust indicates that this technology is not cost-effective. Not only are wet scrubbers less effective on smaller particulate sizes, but these systems also generate waste in the form of a slurry or wet sludge, creating the need for both wastewater treatment and solid waste disposal. Although the facility will not have wastewater treatment on site, additional wastewater treatment costs were not accounted for in the economic analysis and it was assumed that wastewater could be discharged to the sewer. The cost per ton of pollutant removed is at least $13,739 for $PM/PM_{10}/PM_{2.5}$ as shown in Appendix D-1. A Venturi scrubber is not cost effective and has been eliminated from further consideration.

WESP

The cost per ton of pollutant removed by WESP is at least $27,378 for $PM/PM_{10}/PM_{2.5}$ as shown in Appendix D-1. Thus, a WESP is not economically viable for reducing the $PM/PM_{10}/PM_{2.5}$ in the Melting Furnace exhaust after initial dry filtration.

The emissions from the Melting Furnace will be controlled using a baghouse to collect the filterable particulate. This is the most effective remaining control technology for controlling filterable particulate emissions from the Melting Furnace. BACT emission limits are proposed in units of pounds per hour (lb/hr) because the emissions from the baghouse are directly related to the nearly constant concentration.

Step 5 – Selection of BACT

Roxul proposes to use a baghouse as BACT to control $PM/PM_{10}/PM_{2.5}$ from the Melting Furnace and meet an emission limit of 2.32 lb PM_{filt} /hr (1.05 kg PM_{filt}/hr), 8.22 lb PM_{10}/hr (3.73 kg PM_{10}/hr), and 7.47 lb $PM_{2.5}$/hr (3.39 kg $PM_{2.5}$/hr). Attachment O contains a summary of proposed compliance demonstration methods.

D.3.2 *Melting Furnace – CO, VOC*

The RBLC, recent permits, and other relevant documents were reviewed to identify the most stringent BACT limits for CO and VOCs established for melting furnaces. The Melting Furnace is subject to regulation under federal and State rules, as identified in Section 4.0 of the application.

BACT Floor

The requirements of 40 CFR Part 63, Subpart DDD apply to owners or operators of mineral wool production facilities that are located at major sources of HAP emissions. The Melting Furnace must, at a minimum comply with the applicable Mineral Wool MACT carbonyl sulfide (COS) (a VOC) emission limit of 3.2 lb/ton of melt for open-top cupolas.

Step 1 – Identify Potential Control Technologies

Potentially applicable controls include afterburners, regenerative incineration, and recuperative incineration. Control efficiencies for potentially applicable technologies are shown in the table below.

Control Type	Estimated CO/VOC Control Efficiency
Thermal oxidizer (afterburner)	98-99+%
Recuperative thermal oxidizer	98-99+%
Regenerative thermal oxidizer	95-99%
Catalytic oxidizer	90-99%
Adsorber (Carbon Filtration)	95-98%
Wet Scrubber	70-99+% (Packed Tower) 50-95% (Spray Tower)
Condenser	50-90%
Good combustion practices	Varies

CO is formed through the incomplete oxidation of organic material to carbon dioxide (CO_2). CO_2 arises from the combustion of fuel, from the decomposition of carbonates, and from the oxidation of other carbon-containing raw materials. Factors that may lead to the formation of CO include inadequate air flow rates, inadequate mixing of air and fuel, and improper temperatures in combustion zones. Melting conditions will affect the constituents present in the melting exhaust.

The melt process in the Melting Furnace is an oxidizing process, which operates with an excess of oxygen. In other words, the furnace is designed to operate with more oxygen (O_2) than required for complete combustion of fuel to occur, which allows for the maximum conversion of organic pollutants to CO_2. Roxul will be required to monitor the quantity of O_2, air, and fuel introduced to the Melting Furnace in order to determine the percent excess oxygen, which is used as an indicator for compliance with the Mineral Wool MACT.

CO emission control beyond inherent control achieved by the oxidizing furnace design can be achieved by:

- *Good Combustion Practices* - Good combustion practices, such as operating logs and recordkeeping, training, maintenance knowledge, routine and preventive maintenance, burner and control adjustments, monitoring fuel quality, etc., to maintain proper operating conditions; or
- *Add-on Controls (that will facilitate the further oxidation of CO to CO_2)* – In situations where CO is generated by process activities (such as chemical reactions) or where combustion equipment design modifications are inadequate to achieve the desired level of control, add-on controls may be necessary to limit CO emissions. Add-on control equipment for CO includes thermal or catalytic oxidation techniques to convert CO to CO_2. The choice of controls is based upon several factors, including the degree of control desired, the concentration of CO in the air stream, and other physical characteristics of the air stream (including the presence of other pollutants).

VOCs will be present in the Melting Furnace exhaust due to the volatilization of organic compounds during the melting process, including re-melting of wool with binder. There are two basic categories of controls for VOCs: destruction processes; and reclamation processes. Destruction technologies reduce the VOC concentration by high temperature oxidation into CO_2 and water vapor. Reclamation is the capture of VOCs for reuse or disposal.

The destruction of organic compounds usually requires temperatures ranging from 1,200°F to 2,200°F (649°C to 1,204°C) for direct thermal oxidizers or 600°F to 1,250°F (316°C to 677°C) for catalytic systems. Combustion temperature depends on the chemical composition and the desired destruction efficiency. CO_2 and water vapor are the typical products of complete combustion. Turbulent mixing and combustion chamber retention times of 0.75 seconds or greater are needed to obtain high destruction efficiencies.

Combustion or oxidation is the most efficient method of destroying VOCs, typically designed to achieve at least 98% control efficiency. However, high control efficiencies may not be achievable in gas flows with low VOC concentrations. As a result, the cost of combustion may be limiting for high gas flows with low VOC concentrations. Combustion control technologies include thermal oxidation, recuperative thermal oxidation, regenerative thermal oxidation, and catalytic oxidation.

- *Thermal Oxidizer or Afterburner*[13] – A thermal oxidizer is a large vessel with a burner where fuel, gaseous waste, and air are introduced and combined to achieve the required destruction removal efficiency (DRE). The mixture must be (1) exposed to a sufficiently high temperature, (2) for an adequate time

[13] Air Pollution Control Technology Fact Sheet: Thermal Incinerator, EPA-452/F-03-022, Washington, D.C.: Clean Air Technology Center, July 2003.

period, (3) in a relatively turbulent environment to enable the chemical reactions to reach the degree of completion needed to achieve the DRE.

- *Recuperative or Regenerative Thermal Oxidizers*[14,15] – Recuperative and regenerative thermal oxidizers (RTOs) are two types of oxidizers that are widely applied to the control of VOCs. Both include some form of internal heat recovery, designed to reduce the operating cost of the system related to the consumption of a fuel source (typically natural gas) to raise the incoming gas temperature up to a combustion temperature within the burner zone as necessary to achieve the desired DRE. It is possible that a recuperative unit can achieve up to 99% DRE, depending on the gaseous inlet VOC concentration. RTOs have the ability to achieve an efficiency of 95%, and a DRE of up to 99%, again depending on the VOC inlet concentration. The normal operating temperature for an RTO in the combustion zone is between 1,400°F to 1,600°F (760°C to 871°C).
- *Catalytic Oxidizers* – Catalytic oxidation systems are also used to reduce VOC and organic HAP emissions. As the exhaust gas contacts the catalyst, the catalyst promotes the oxidation of CO and VOC compounds to form CO_2 and water. For a catalytic oxidation system to operate correctly, the exhaust gas must contain excess O_2 and must be within a particular temperature range depending on the type of catalyst material used. Exhaust gas temperatures that are too high may cause permanent damage to the catalyst, while operating temperatures that are too low result in lower pollutant conversion efficiency. Catalysts are typically made from a precious metal such as platinum, palladium, or rhodium. The typical VOC removal efficiency of a catalytic oxidation system is 90% or greater.

Organic compounds may be reclaimed by one of three possible methods: adsorption; absorption (scrubbing); or condensation. In general, the organic compounds are separated from the emission stream and reclaimed for reuse or disposal. Depending on the nature of the contaminant and the inlet concentration of the emission stream, recovery technologies can reach efficiencies of at least 98% for VOCs, but these technologies are not efficient for control of CO emissions.

- *Adsorption Systems*[16] – Adsorption is a surface phenomenon where attraction between an adsorbent, such as activated carbon, and the adsorbate, such as VOC molecules, binds the pollutants to the carbon surface. Both the carbon and VOC are chemically intact after adsorption. The VOCs may be removed, or desorbed, from the carbon and reclaimed or destroyed.

[14] Air Pollution Control Technology Fact Sheet: Incinerator – Recuperative Type, EPA-452/F-03-020, Washington, D.C.: Clean Air Technology Center, July 2003.

[15] Air Pollution Control Technology Fact Sheet: Regenerative Incinerator, EPA-452/F-03-021, Washington, D.C.: Clean Air Technology Center, July 2003.

[16] *Technical Bulletin: Choosing an Adsorption System for VOC: Carbon, Zeolite, or Polymers,* EPA 456/F-99-004, Research Triangle Park, NC: Office of Air Quality Planning and Standards, May 1999.

- *Absorption Systems* – Absorption is a unit operation where components of a gas phase mixture (pollutants) are selectively transferred to a relatively nonvolatile liquid, usually water.

- *Condensation Systems*[17] – Condensation is the separation of VOCs from an emission stream through a phase change, by either increasing the system pressure or, more commonly, lowering the system temperature below the dew point of the VOC vapor. When condensers are used for air pollution control, they usually operate at the pressure of the emission stream, and typically require a refrigeration unit to obtain the temperature necessary to condense the VOCs from the emission stream.

Afterburners are expected to be the most effective control device and the device most commonly used to limit CO and VOC emissions from melting operations. RTOs are expected to be the second most effective control device.

Step 2 – Eliminate Technically Infeasible Options

Catalytic Oxidizer

Exhaust gas streams that contain impurities (particulates) will likely cause fouling of the catalyst, so use of a catalytic oxidizer on the Melting Furnace exhaust is technically infeasible.

Adsorber (Carbon Filtration), Wet Scrubber, and Condenser

Reclamation technologies are not technically feasible for the control of CO emissions. Further, adsorption and absorption systems are not considered technically feasible to control VOC emissions if there is a high amount of PM in the exhaust stream. Condensation systems are not technically feasible because this type of system requires a high VOC concentration in the exhaust stream to achieve appropriate control efficiencies. No examples of adsorption, absorption, or condensation add-on control systems were found in the RBLC for CO and VOC emissions from melting furnaces.

Step 3 – Rank Remaining Technically Feasible Control Options

1. Afterburner/thermal oxidizer.
2. Recuperative thermal oxidizer.
3. Regenerative thermal oxidizer.
4. Good combustion practices.

Step 4 – Evaluate Remaining Control Technologies

BACT Limit Overview

[17] *Technical Bulletin: Refrigerated Condensers for Control of Organic Air Emissions*, EPA-456/R-01-004, Research Triangle Park, NC: Office of Air Quality Planning and Standards, December 2001.

CO and VOC emissions are higher from traditional stone wool cupolas[18] than from glass melting furnaces, so the typical CO and VOC emission range found in the RBLC is misleading for melting furnaces due to process differences. The Roxul facility in Byhalia, Mississippi complies with a CO BACT emission limit of 13.29 lb/hr (6.03 kg/hr) on a 30-day rolling average basis. No examples of add on control technologies were found in the RBLC review for glass melting furnaces, fiberglass melting furnaces, or mineral wool melting furnaces. Thermal oxidizers and RTOs were selected as BACT for iron cupolas and gray iron melting.

Afterburner, Regenerative Thermal Oxidizer, and Recuperative Thermal Oxidizer

Cost effectiveness results are evaluated (on a top down basis) for thermal oxidation, recuperative incineration, and regenerative thermal oxidation. A cost effectiveness calculation for installing thermal oxidizer for VOC and CO control on the Melting Furnace indicates that this technology is not cost effective. The cost per ton of VOC removed is $20,743, and cost per ton of CO removed is $21,664, as shown in Appendix D-1. Similarly, a recuperative thermal oxidizer and an RTO are not cost effective. The cost per ton of VOC removed is $13,240 and cost per ton of CO removed is $13,776, as shown in Appendix D-1.

Good Combustion Practices.

The base case, good combustion practices, is the last remaining control option for VOC and CO reduction. Good combustion practices do not have any adverse economic or environmental impacts. Good combustion practices include, but are not limited to the following:

- Proper combustion tuning, temperature, and air/fuel mixing;
- Documentation of good combustion practices including:
  - Specifications for temperature and air/fuel mixing obtained through empiric knowledge, Continuous Emission Monitoring (CEM) system data, operational experience, etc.;
  - Criteria for monitoring, inspecting, preventative maintenance, and training; and

[18] European Commission, BAT Reference Document for the Manufacture of Glass, Integrated Pollution Prevention and Control (IPPC) Industrial Emissions Directive 2010/75/EU, 2013.

- Recommended frequency and dates for all scheduled maintenance related activities.

Potential VOC emissions are primarily based on the MACT COS limit (lb/ton melt); therefore a separate short-term limit is not necessary for BACT.

Step 5 – Selection of BACT

Roxul proposes to maintain an oxidizing atmosphere as BACT to control both CO and VOC from the Melting Furnace. The CO emissions limit from the Melting Furnace is proposed to be 11.21 lb/hr (5.09 kg/hr) based on a 30-day rolling average (based on a CEM for CO). VOC emissions will be limited to 51.08 tpy (46.34 metric ton [tonne]/yr). Proposed compliance demonstration methods are summarized in Attachment O.

D.3.3 *Melting Furnace – SO_2, H_2SO_4 Mist*

The RBLC, recent permits, and other relevant documents were reviewed to identify the most stringent BACT limits for SO_2 and acid gases established for melting furnaces. Sulfur from coal and furnace slag in the batch are sources of SO_2 and sulfur compounds. Slag is a material that has the potential to be landfilled if not otherwise utilized; furthermore, it replaces the need for natural stone and quarried materials.

Step 1 – Identify Potential Control Technologies

Potential controls include wet scrubbers or Venturi scrubbers and sorbent injection systems with upstream filtration. These types of controls are effective for reducing SO_2 emissions, as well as for reducing emissions of acid gases (such as sulfuric, hydrochloric, and hydrofluoric acid). Control efficiencies for potentially applicable technologies are shown in the table below.

Control Type	Estimated SO_2, H_2SO_4 Mist Control Efficiency
Wet scrubber	90-95%
Sorbent Injection System (with Upstream Filter)	Up to 95%

In general, flue gas desulfurization (FGD) systems remove SO_2 from exhaust streams by using an alkaline reagent to form sulfite and sulfate salts by either a wet or dry contact system. Control technologies for SO_2 and acid gases include the following types of FGD controls:

- *Wet Scrubber*[19] – In a wet scrubber, the gas stream is brought into contact with a scrubbing liquid, typically by spraying the liquid in a contacting tower. Depending upon the removal efficiency and scrubbing reagent, the contacting device can be a Venturi, spray tower, packed tower, or other device that provides excellent gas-liquid contact. FGD wet scrubbers typically employ sodium, calcium, or dual-alkali reagents using packed or spray towers. The required excess of reactant in the solution to achieve high acid gas dissolution rates is small. The reaction rate is mainly determined by the absorption of gas by the liquid. Wet FGD systems generate wastewater and wet sludge streams requiring treatment and disposal. Wet scrubber system disadvantages include waste treatment and higher energy consumption.
- Sorbent Injection System (with Upstream Filter) – A fabric filter (or baghouse) is one of the most efficient means of separating particulates from a gas stream. The advantage of fabric filters is that efficiency is largely insensitive to the physical characteristics of the gas stream and changes in the dust loading. Baghouse installations are an industry standard for particulate controls and can also be used with alkali salts to remove acid gases. A reagent is injected into the flue gas stream to remove acid gases by surface reactions. In order to reduce the sorbent requirements, these systems typically recycle most of the baghouse collection into the feed system to promote better sorbent utilization. Furthermore, filter cake on the fabric due to deposited absorption reagent, can improve the absorption of acid gases.

Step 2 – Eliminate Technically Infeasible Options

Each identified control technology is technically feasible.

Step 3 – Rank Remaining Technically Feasible Control Options

1. Wet scrubber; Sorbent Injection System with Upstream Filter.

Step 4 – Evaluate Remaining Control Technologies

BACT Limit Overview

RBLC search results for SO_2 BACT emission limits for iron cupolas, glass melting furnaces, and fiberglass melting furnaces indicate that the concentration established as BACT ranges from 0.22 lb SO_2/ton to 2.02 lb SO_2/ton for similar emission source categories. The most stringent limits are achieved by using dry sorbent injection technology. For example, the gray iron cupola at Waupaca Foundry, Inc. in Tennessee complies with the most stringent BACT limit of 0.22 lb SO_2/ton through the use of dry injection scrubbing systems located upstream of a pulse-jet fabric filter baghouse control system. No examples of BACT limits

[19] Air Pollution Control Technology Fact Sheet: Flue Gas Desulfurization (FGD) – Wet, Spray Dry, and Dry Scrubbers, EPA- 452/F-03-034, Washington, D.C.: Clean Air Technology Center, July 2003

for a mineral wool facility were included in the RBLC search results; however, the mineral wool melting furnace at Roxul's plant in Byhalia, Mississippi is limited to a BACT emission rate of 78.77 lb SO_2/hr (35.73 kg/hr) based on a 30-day rolling average.

Wet Scrubber; Sorbent Injection System (with Upstream Filter)

Both wet scrubbers and sorbent injection systems (with upstream filters), can achieve up to 95% control. Adverse environmental and energy impacts must be considered. A wet scrubber will result in a liquid or slurry waste stream, which would require solid and wet waste disposal, as well as wastewater treatment prior to discharge from the facility. No wastewater treatment will be conducted at the facility, and piping, pumping, storage, and disposal of a liquid or slurry waste product would have significant costs. A baghouse with sorbent injection can capture salts that are formed when gaseous acids react with sorbent. Because of process and site conditions, a dry waste is easier to treat and dispose of than wet. Upstream filtration (such as the second baghouse at Roxul) would offer an additional environmental benefit of filterable PM/PM_{10}/$PM_{2.5}$ control. A wet scrubber would have energy demands to meet the same level of additional control. Therefore, Roxul proposes to use a sorbent injection system (with upstream filter) to treat the Melting Furnace gases.

Step 5 – Selection of BACT

Roxul proposes to use a sorbent injection system as BACT to control SO_2 and acid gas emissions from the Melting Furnace. The SO_2 BACT emissions limit from the Melting Furnace is proposed to be 33.63 lb/hr (15.26 kg/hr) based on a 30-day rolling average (based on a CEM for SO_2). The H_2SO_4 mist BACT emissions limit from the Melting Furnace is proposed to be 3.74 lb/hr (1.70 kg/hr). Proposed compliance demonstration methods are summarized in Attachment O.

D.3.4 *Melting Furnace – NO_x*

The RBLC, recent permits, and other relevant documents were reviewed to identify the most stringent BACT limits for NO_x established for melting furnaces.

Step 1 – Identify Potential Control Technologies

Potentially applicable controls include oxy-fuel fired burners and combustion control. Other available control technologies for controlling NO_x emissions include selective catalytic reduction (SCR) and selective non-catalytic reduction (SNCR). Control efficiencies for potentially applicable technologies are shown in the table below.

Control Type	Estimated NO_x Control Efficiency
SCR	70%-95%
Ceramic catalytic filter	60% - 90% or higher, depending on

Control Type	Estimated NO_x Control Efficiency
	temperature
SNCR	40%-75%
Oxy-fuel fired burners	70%-85%
Good combustion practices	Varies

NO_x emissions from melting activities arise primarily from three sources: nitrates in raw materials, fuel NO_x and thermal NO_x. The fourth source, prompt NO_x, is relatively insignificant. Thermal NO_x is the most significant contributor to NO_x emissions and can be reduced if fuel consumption is reduced. Therefore, techniques that improve energy efficiency generally result in lower overall NO_x emissions on a lb/ton basis. NO_x controls can be classified into two types: post-combustion methods; and combustion control techniques. Post-combustion control methods include SCR, catalytic filters (baghouses), and SNCR.

- *SCR*[20,21] – SCR involves the injection of ammonia or urea in conjunction with a metal oxide catalyst into the flue gases. The optimum operating temperature of this technology is between 600 to 900 °F. Typical long-term removal efficiencies are maintained between 70% and 80%, although the systems are normally designed to achieve between 75% to 95% reduction.
- *Ceramic Catalytic Filter* - Ceramic filters can be manufactured with filter walls that have nanobits of highly-efficient SCR catalyst for NO_x control (such as Tri-Mer Corporation's UltraCat Catalyst filters).
- *SNCR*[22,23] - SNCR utilizes similar techniques as SCR where chemical additions of ammonia or urea are exposed to hot combustion gases. However, the reactions take place at higher temperatures without the presence of a catalyst. This methodology has been demonstrated in systems with operating temperatures between 1,600°F and 2,100°F, with the optimum temperature around 1750°F to 1850°F. NO_x reductions in the range of 40% to 70% are commonly quoted for SNCR, although figures above 80% have been reported in other industries. In a well-controlled process where optimum conditions can be achieved, reductions of 50% to 75% are possible.

Combustion control techniques include: burner modifications; flue gas recirculation (FGR) low excess air firing; or low nitrogen (N_2) fuel (if applicable and available). The following examples of control techniques are applicable to the Melting Furnace.

[20] Air Pollution Control Technology Fact Sheet: Selective Catalytic Reduction (SCR), EPA- 452/F-03-032, Washington, D.C.: Clean Air Technology Center, July 2003

[21] *Best Available Techniques Reference Document for the Manufacture of Glass*, Section 4.4.2.7 Selective Catalytic Reduction, Industrial Emissions Directive 2010/75/EU, European Commission JRC Reference Report, 2013.

[22] Air Pollution Control Technology Fact Sheet: Selective Non-Catalytic Reduction (SNCR), EPA-452/F-03-031, Washington, D.C.: Clean Air Technology Center, July 2003

[23] *Best Available Techniques Reference Document for the Manufacture of Glass*, Section 4.4.2.8 Selective Non-Catalytic Reduction, Industrial Emissions Directive 2010/75/EU, European Commission JRC Reference Report, 2013.

- *Oxy-fuel Burners*[24] –An approach to increasing combustion efficiency is to fire specially designed burners with O_2 instead of air. The conversion to O_2 firing instead of air firing reduces NO_x emissions by eliminating some of the N_2 in combustion air. In addition, when small amounts of combustion air are replaced with O_2, a significant increase in flame temperature can be realized and an intense flame is produced. An example of this is a cyclone burner where the flame is short and intense. Excess fuel air or steam, injected just after the combustion chamber, is sufficient to rapidly quench the flue gas to temperatures below the NO_x formation temperature range. Combustion can then be completed in over fire air. (This technique also is used with low-NO_x burners to prevent the formation of prompt NO_x.)
- *Good Combustion Practices* – Good combustion practices, such as operating logs and recordkeeping, training, maintenance knowledge, routine and preventive maintenance, burner and control adjustments, monitoring fuel quality, etc. help maintain proper equipment operation.

Step 2 – Eliminate Technically Infeasible Options

Ceramic Catalytic Filter

Conventional ceramic filters for PM control can withstand operating temperatures up to 1650°F (899°C). However, when NO_x removal capabilities are required as part of the ceramic filter capability, the acceptable maximum temperature decreases significantly due to risks of sintering for the catalyst. Tri-Mer defines a temperature range for PM+NO_x removal from 350°F to 950°F (177°C to 510°C), with limitations of operating temperatures for high NO_x reduction between 350°F to 750°F (177°C to 399°C). This is in line with specifications of other vendors of de-NO_x catalytic ceramic candles available on the market, like TopFrax™ from Haldor Topsoe which treats industrial high-temperature off gases for de-NO_x purposes up to 750°F (399°C). Potential locations for the installation and operation of a ceramic catalytic filter are evaluated below.

The temperature range up-stream of the Melting Furnace heat recovery system is 900°F to 1075°F (482°C to 579°C), with temperature peaks up to 1300°F (704°C). This location is not compatible with an installation of a catalytic ceramic filter for de-NO_x control because the operating temperature is too high for the catalytic ceramic candles.

There will be a significant risk over time that the catalyst will deactivate by ammoniumbisultafate salts (ABS) if a catalytic ceramic filter is installed downstream of the Melting Furnace heat recovery system. Risk of ABS formation is due to unwanted oxidation of SO_2 from the Melting Furnace flue gasses to sulfur trioxide (SO_3) over the catalyst and unreacted ammonia (NH_3). The

[24] *Technical Bulletin: Refrigerated Condensers for Control of Organic Air Emissions*, EPA-456/F-99-006R, Research Triangle Park, NC: Office of Air Quality Planning and Standards, November 1999.

oxidation rate of SO_2 to SO_3 is low at low temperatures (below 1%); however, ABS catalytic deactivation is well known from other industries (e.g., power plants and waste incinerators) and widely documented in the literature for deactivation of SCR catalysts. ABS has the potential to cause major clogging problems on the catalyst surface due to its small and sticky particle formation.[25] At a location downstream of the desulfurization system, the ABS risk is significantly decreased. However, due to the operating temperature of 265°F (129°C), the temperature is too low for the catalyst to be active.

SCR

A conventional clean gas tail-end SCR installation would require excessive energy due to re-heating the flue gasses from the operating temperature of 265°F to the required SCR operating temperature of 600°F to 900°F. Installing de-NO_x equipment as a clean tail-end technology would not require dust removal and would be a conventional SCR solution.

As a result of the temperature barriers discussed, neither a ceramic catalytic filter nor a conventional clean gas tail-end SCR installation is technically feasible. Both controls are eliminated from further consideration.

Step 3 – Rank Remaining Technically Feasible Control Options

1. SNCR.
2. Oxy-fuel burners.
3. Good combustion practices.

Step 4 – Evaluate Remaining Control Technologies

BACT Limit Overview

RBLC search results for NO_x BACT emission limits for iron cupolas, glass melting furnaces, and fiberglass melting furnaces indicate that the emission rates established as BACT ranged from 7.09 lb NO_x/hr to 48.61 lb NO_x/hr and from 0.44 lb NO_x/ton to 13.56 lb NO_x/ton for similar emission source categories. These BACT emission rates are achieved through the use of low NO_x burners (LNB) and good engineering practices. No other examples of control technologies were found in the RBLC review for similar emission source categories.

SNCR

An SNCR will be integrated into the Melting Furnace design and is proposed as BACT for the Melting Furnace. Because the top remaining control is proposed to be BACT, a cost effectiveness calculation is not required. The negative

[25] Gutberlet, Licata, and Schluter. "Deactivation of SCR Catalyst." Available online at: https://www.netl.doe.gov/publications/proceedings/00/scr00/LICATA.PDF

environmental impacts related to the SNCR include ammonia emissions. Safety measures are required to prevent ammonia leakage and exposure to fugitive ammonia emissions during storage operations and before injection into the flue gas stream. These safety and environmental issues are the same for each of the identified add-on control technologies and do not present enough risk to prohibit the implementation of an add-on control device. Emissions from un-reacted ammonia and slip will be reduced by ensuring proper integrated SNCR design.

Oxy-Fuel Burners

Oxy-fuel burners will also be used in the Melting Furnace because they are technically feasible and will result in energy savings.

The most efficient and effective control of NO_x emissions for the Melting Furnace is a combination of SNCR and oxy-fuel burners.

Step 5 – Selection of BACT

Roxul proposes to use the Melting Furnace integrated SNCR and oxy-fuel burners to control NO_x emissions from the Melting Furnace. The BACT emission limit is proposed to be 37.37 lb/hr (16.95 kg/hr) based on a 30-day rolling average (based on a CEM for NO_x). Proposed compliance demonstration methods are summarized in Attachment O.

D.4 BACT DETERMINATION FOR THE GUTTER, SPINNING CHAMBER, CURING OVEN, CURING OVEN HOODS, AND COOLING ZONE

This section evaluates BACT for the Gutter Exhaust, Spinning Chamber, Curing Oven, Curing Oven Hoods, and Cooling Zone (HE01) as described in Section 2.1 of the application. These emission units will be combined prior to exhausting to the atmosphere and comprise emission point HE01.

D.4.1 Gutter, Spinning Chamber, Curing Oven, Curing Oven Hoods, and Cooling Zone- Filterable PM, PM_{10}, $PM_{2.5}$, and CPM

The RBLC, recent permits, and other relevant documents were reviewed to identify the most stringent BACT limits for filterable $PM/PM_{10}/PM_{2.5}$ and CPM established for the gutter exhaust, spinning chamber, curing oven, curing oven hoods, and cooling zone.

BACT Floor

Per 45 CSR 6-4.3, opacity of emissions from the curing oven afterburner shall not exceed 20 percent, except as provided by 45 CSR 6-4.4. At a minimum, PM emissions from this unit cannot exceed the levels calculated in accordance with 6-4.1.

Step 1 – Identify Potential Control Technologies

Controls include fabric filters, wet scrubbers, WESPs, and stone wool filters. Control efficiencies for potentially applicable technologies are shown in the table below.

Control Type	Estimated $PM/PM_{10}/PM_{2.5}$ Control Efficiency
Fabric filter (baghouse)	95-99+% (As low as 0.001 gr/dscf)
Wet scrubber (packed bed) or high efficiency Venturi scrubber	70-99% (<0.01 gr/dscf)
WESP	>98% (0.004 – 0.01 gr/dscf)
Stone Wool Filters	>95% (<0.01 gr/dscf)

Control technologies for filterable $PM/PM_{10}/PM_{2.5}$ and CPM are discussed earlier in Section D.3.1.

- *Stone Wool Filters* - When traditional fabric filters are unsuitable for treating waste gases due to adhesive and moist waste gas, stone wool filters can be employed. Stone wool filters can be used to control emissions of PM and binder droplets (as CPM) with effective removal efficiency, but have low removal efficiency for gaseous components. This type of filter needs to be replaced periodically in order to maintain good removal efficiency and to prevent increased resistance to airflow. Used filter media can usually be recycled to the furnace. The operation can be semi-dry; however, overall efficiency is improved if the operation is dry.

Step 2 – Eliminate Technically Infeasible Options

Fabric Filter (Baghouses)

Conventional fabric filter (baghouses) are unsuitable for controlling the waste gases from the Gutter Exhaust, Spinning Chamber, Curing Oven, Curing Oven Hoods, and Cooling Zone because of the damp and adhesive nature of the exhaust, which would lead to rapid blinding.

Step 3 – Rank Remaining Technically Feasible Control Options

1. WESP.
2. Wet Scrubber (Packed Bed or Venturi).
3. Stone Wool Filters.

Step 4 – Evaluate Remaining Control Technologies

BACT Limit Overview

RBLC search results for $PM/PM_{10}/PM_{2.5}$ BACT emission limits for natural gas fired curing ovens indicate that the emission rate established as BACT ranges from 0.03 lb PM_{10}/hr to 2.02 lb PM_{10}/hr for similar emission source categories with no add-on controls. One example of add-on controls appeared in the RBLC search results for the Owens Corning facility in Crisp County, Georgia. At this facility, the bonded line cooling section and curing oven are controlled with low pressure drop scrubbers and a cyclone separator. The BACT emission limits are 7.84 lb PM/ton from bonded line forming and curing and 0.95 lb PM/ton for bonded line cooling.

WESP

CPM emissions make up the major portion of the pollutants from the Gutter Exhaust, Spinning Chamber, Curing Oven, Curing Oven Hoods, and Cooling Zone. A wet scrubber or a WESP will control filterable and CPM emissions. A WESP is the most effective remaining control technology and is selected as BACT for removal of $PM/PM_{10}/PM_{2.5}$, including droplets and aerosols. Process water will consist of collected storm water from outside areas and supplemental water from the public water supply. Adverse environmental impacts are minimized because WESPs have relatively low pressure drop requirements and relatively low energy usage requirements. WESPs generally have long operating lives with low maintenance requirements.

Step 5 – Selection of BACT

Roxul proposes to use a WESP as BACT to control $PM/PM_{10}/PM_{2.5}$ and CPM emissions from the Gutter, Spinning Chamber, Curing Oven, Curing Oven Hoods, and Cooling Zone. Roxul is proposing BACT emission limits of 21.21 lb PM_{filt}/hr (9.62 kg PM_{filt}/hr), 21.21 lb PM_{10}/hr (9.62 kg PM_{10}/hr), and 19.22 lb $PM_{2.5}$/hr (8.72 kg $PM_{2.5}$/hr). Compliance will be demonstrated based on initial performance testing, as shown in Attachment O.

D.4.2 Gutter, Spinning Chamber, Curing Oven, Curing Oven Hoods, and Cooling Zone – CO, VOC

The RBLC, recent permits, and other relevant documents were reviewed to identify the most stringent BACT limits for CO and VOCs established for the gutter exhaust, spinning chamber, curing oven, curing oven hoods, and cooling zone. Note that not all of the sources that comprise emission point HE01 are sources of CO, but each source is listed for ease of discussion as it relates to both VOC and CO.

BACT Floor

The requirements of 40 CFR Part 63, Subpart DDD apply to owners or operators of mineral wool production facilities that are located at major sources of HAP emissions. The combined collection/curing operations must, at a minimum comply with the applicable Mineral Wool MACT emission limit of 2.4 lb formaldehyde/ton of melt, 0.71 lb phenol/ton of melt, and 0.92 lb methanol/ton of melt.

The requirements of 40 CFR Part 63, Subpart JJJJ apply to each new and existing facility that is a major source of HAP, at which web coating lines are operated. The Curing Oven is included in the web coating (Fleece Application) line. The Fleece Application line (including the Curing Oven) must, at a minimum comply with the applicable organic HAP emissions limits. Roxul will comply with NESHAP JJJJ through the use of compliant coatings without additional controls for organic HAP or VOC reduction. Proposed BACT emissions limits include emissions from compliant coatings. Refer to Section D.5.1 for additional discussion for Fleece Application.

Step 1 – Identify Potential Control Technologies

Thermal oxidation is generally used to control organic compounds from curing ovens. No add-on control devices were identified in this review for spinning or cooling; however, typical controls would include afterburners, recuperative incineration, and RTOs. Control efficiencies for potentially applicable technologies are shown in the table below.

Control Type	Estimated CO/VOC Control Efficiency
Thermal oxidizer	98-99+%
Recuperative thermal oxidizer	98-99+%
Regenerative thermal oxidizer	95-99%
Catalytic oxidizer	90-99%
Adsorber (Carbon Filtration)	95-98%
Wet Scrubber	70-99+% (Packed Tower) 50-95% (Spray Tower)
Condenser	50-90%
Good combustion practices (Curing Oven)	Varies

Control technologies for CO and VOC are discussed earlier in Section D.3.2.

Step 2 – Eliminate Technically Infeasible Options

Catalytic Oxidizer

Exhaust gas streams that contain impurities will likely cause fouling of the catalyst, so use of a catalytic oxidizer to control VOC and CO from the Gutter Exhaust, Spinning Chamber, Curing Oven, Curing Oven Hoods, and Cooling Section is technically infeasible.

Adsorber (Carbon Filtration), Wet Scrubber, and Condenser

Reclamation technologies are not technically feasible for the control of CO emissions. Further, adsorption and absorption systems are typically not considered technically feasible to control VOC emissions if there is a high amount of PM in the exhaust stream as with these sources. Condensation systems are not technically feasible because this type of system requires a high

VOC concentration in the exhaust stream to achieve appropriate control efficiencies.

Step 3 – Rank Remaining Technically Feasible Control Options

1. Afterburner/thermal oxidizer.
2. Recuperative thermal oxidizer.
3. Regenerative thermal oxidizer.
4. Good combustion practices (Curing Oven).

Step 4 – Evaluate Remaining Control Technologies

BACT Limit Overview

RBLC search results for VOC and CO BACT emission limits for natural gas fired curing ovens indicate that the emission rate established as BACT ranges from 0.01 lb VOC/hr to 2.56 lb VOC/hr and 0.14 lb CO/hr to 4.09 lb CO/hr for similar emission source categories with no add-on controls. These RBLC emission limits are not specific to mineral wool manufacturing facilities and do not account for the organics in the resins and binders specific to mineral wool production. However, one example of add-on controls appeared in the RBLC search results for a fiberglass facility (Owens Corning facility in Crisp County, Georgia). At this fiberglass facility, the bonded line cooling section and curing oven are controlled by a thermal oxidizer and are limited to 4 lb VOC/ton and 5 lb CO/ton. Emissions from the Gutter Exhaust, Spinning Chamber, Curing Oven, Curing Oven Hoods, and Cooling Zone include volatile binder materials, binder break down products, and products of combustion. The final Mineral Wool MACT was promulgated on July 29, 2015, during the development of this set of federal rules, maximum achievable controls were assessed. Currently the Mineral Wool MACT represents the most stringent emissions limits for organic HAP, which represents the majority of organic compounds emitted from the Gutter Exhaust, Spinning Chamber, Curing Oven, Curing Oven Hoods, and Cooling Zone.

Thermal Oxidizer (Afterburner)

The gaseous emissions from the Curing Oven will be exhausted through an afterburner to reduce VOC and CO emissions. An afterburner is the top ranked control device and best option for achieving high VOC and CO destruction efficiency; therefore, no further analysis for CO and VOC reduction from the Curing Oven is necessary. The afterburner will treat only the Curing Oven exhaust, which will minimize the natural gas (energy) usage necessary to destruct VOC and CO emissions and minimize environmental impacts from the products of combustion.

A cost-effectiveness calculation for installing an afterburner for VOC control on the Spinning Chamber and for VOC and CO control on the Cooling Section indicates that this technology is not cost-effective due to the large volume of air that must be routed through the afterburner. All VOC emissions not emitted from the cooling section were assumed to be emitted from the Spinning Chamber for a "worst-case" cost estimate. The cost per ton of pollutants removed from the Spinning Chamber is $25,842 for VOC as shown in Appendix D-1. The cost per ton of pollutants removed from the Cooling Section is $2,827,380 for CO and $52,878 for VOC as shown in Appendix D-1.

Recuperative or Regenerative Thermal Oxidizers

Similarly, a recuperative thermal oxidizer and an RTO are not cost-effective control technologies for the Spinning Chamber and Cooling Section. The cost per ton of pollutants removed from the Spinning Chamber is $10,252 for VOC, as shown in Appendix D-1. The cost per ton of pollutants removed from the Cooling Section is $1,424,419 for CO and $26,574 for VOC. The addition of a combustion device for the control of such a large air flow would also cause a notable NO_x and CO_2 emissions increase due to increased fuel requirements. Further, CPM is the predominant pollutant which is better controlled by a WESP rather than an afterburner. Because these control devices (afterburner, recuperative thermal oxidizer, RTO) are not cost-effective, BACT is no add-on control for the Spinning Chamber and Cooling Section and compliance with the Mineral Wool MACT emissions limits.

Step 5 – Selection of BACT

Roxul proposes to use an afterburner as BACT for CO and VOC emissions from the Curing Oven, with no add-on controls for the Spinning Chamber and Cooling Sections. Roxul is proposing a CO emission limit of 1.82 lb/hr (0.82 kg/hr) and a VOC emission limit of 78.02 lb/hr (35.39 kg/hr) as BACT for the combined Gutter Exhaust, Curing Oven, Curing Oven Hoods, Spinning Chamber, and Cooling Zone (HE01). Proposed compliance demonstration methods are summarized in Attachment O.

D.4.3 Gutter, Spinning Chamber, Curing Oven, Curing Oven Hoods, and Cooling Zone – SO_2

The RBLC, recent permits, and other relevant documents were reviewed to identify the most stringent BACT limits for SO_2 established for the gutter exhaust, spinning chamber, curing oven, curing oven hoods, and cooling zone. The only source of SO_2 from the HE01 stack originates from natural gas combustion in the curing oven.

The curing oven oxidizes sulfur compounds present in natural gas into SO_2. The control of SO_2 emissions is most directly associated with using a low sulfur fuel such as natural gas. Potential SO_2 emissions are directly related to the sulfur content of fuels. Minimizing fuel sulfur content through the use of low sulfur fuels, such as natural gas has been determined to be BACT for many combustion processes, including ovens. Therefore, Roxul proposes use of low sulfur fuel (pipeline quality natural gas, as supplied) as BACT for the curing oven.

D.4.4 *Gutter, Spinning Chamber, Curing Oven, Curing Oven Hoods, and Cooling Zone – NO_x*

The RBLC, recent permits, and other relevant documents were reviewed to identify the most stringent BACT limits for NO_x established for the gutter exhaust, spinning chamber, curing oven, curing oven hoods, and cooling zone. No controls were identified for the spinning chamber or gutter. NO_x emissions from these sources are from natural gas fuel combustion and from binder materials. Note that not all of the sources that comprise emission point HE01 are sources of NOx (e.g., spinning).

Step 1 – Identify Potential Control Technologies

Control efficiencies for potentially applicable technologies are shown in the table below.

Control Type	Estimated NO_x Control Efficiency
SCR	70-95%
SNCR	40-75%
Low NO_x burners	30-40%
Ultra-Low NO_x burners	80–90%
Good combustion practices	Varies

Control technologies for NO_x are discussed earlier in Section D.3.4.

- *Low NO_X Burners*[26,27] - LNB technology is designed to control the mixing of fuel and air at each burner in order to amplify the size and width of the flames, which increases the surface area of the flame. Peak flame temperature is thereby reduced, which results in less NO_x formation.

  The utilization of LNBs results in a more efficient combustion process. A more efficient process will require less excess air for combustion. Thus, unburned N_2 will be minimized, resulting in a reduction of NO_x emissions.

- *Ultra-Low NOx Burners (ULNB)*[28] - ULNB technology utilizes internal FGR and fuel staging to reduce NO_x emissions. Flue gas is internally recirculated back into the combustion zone to reduce peak flame temperatures and the average O_2 concentration to reduce thermal NO_x. The fuel to air ratio is diluted by the recirculated flue gas, which results in an increased flame length. ULNBs can achieve NO_x reduction ranging from 80 percent to 90

[26] World Bank Group Pollution Prevention and Abatement Handbook, Nitrogen Oxides: Pollution Prevention and Control, July 1998.

[27] Evaluation and Costing of NO_X Controls for Existing Utility Boilers in the NESCAUM Region, EPA 453/R-92-010, Table 1-2 Combustion Controls for Oil and Gas-fired Utility Boilers, December 1992.

[28] US Department of Energy, Office of Energy Efficiency & Renewable Energy, Advanced Manufacturing Office: Ultra-Low NOx Premixed Industrial Burner, "Reduction of Burner NOx Production with Premixed Combustion."

percent below baseline NO_x concentrations depending on the specific burner and combustion design.

Step 2 – Eliminate Technically Infeasible Options

SCR and SNCR

The Gutter Exhaust, Spinning Chamber, Curing Oven, Curing Oven Hoods, and Cooling Zone will not have a gas stream in the temperature range to employ either SCR or SNCR technology. The minimum temperature required for SCR control is approximately 480°F (249°C), while the minimum temperature required for SNCR is approximately 1600°F (871°C). The maximum exhaust temperature from the Gutter Exhaust (211°F/99°C), Spinning Chamber (139°F/59°C), Curing Oven (391°F/199°C), and Cooling Zone (193°F/89°C) streams will be well below the minimum temperature required for SCR or SNCR. Therefore, SCR and SNCR are technically infeasible.

Ultra-Low NO_x Burners

ULNB cannot be used in the Curing Oven, or in the Curing Oven afterburner. The burners in the Cure Oven and in the afterburner are in open air systems using direct combustion. ULNB would have little or no reduction beyond baseline low NO_x emissions in an open air application.

Step 3 – Rank Remaining Technically Feasible Control Options

1. LNB (Curing Oven and Curing Oven afterburner).
2. Good combustion practices (Curing Oven and Curing Oven afterburner).

Step 4 – Evaluate Remaining Control Technologies

BACT Limit Overview

There was one RBLC query result for a NO_x BACT emission limit for forming and curing. This result indicated that good combustion practices and a NO_x emission limit of 3 lb/ton satisfy BACT.

Low NO_X Burners

LNBs are applicable, economical, and will be employed for the Curing Oven and Curing Oven afterburner. Low NO_x burners will achieve emissions of 0.078 lb NO_x/MMBtu for circulation burners and afterburner when utilizing natural gas only.

Good Combustion Practices

Good combustion practices are applicable, economical, and will be employed for the Curing Oven and Curing Oven afterburner. Good combustion practices include activities such as maintaining combustion equipment according to the manufacturer's instructions and adjusting air-to-fuel ration per the manufacturer's recommendations.

Step 5 – Selection of BACT

Roxul proposes to use good combustion practices and LNB for the Curing Oven and Curing Oven afterburner. Roxul is proposing a NO_x emissions limit of 14.55 lb/hr (6.60 kg/hr) with no add-on controls as BACT for NO_x emissions from the Gutter Exhaust, Spinning Chamber, Curing Oven, Curing Oven Hoods, and Cooling Zone. Proposed compliance demonstration methods are summarized in Attachment O.

D.5 BACT DETERMINATION FOR FLEECE APPLICATION

This section evaluates BACT for Fleece Application (CM12 and CM13) as described in Section 2.1 of the application.

D.5.1 Fleece Application – VOC

The RBLC, recent permits, and other relevant documents were reviewed to identify the most stringent BACT limits for VOCs established for the Fleece Application System.

BACT Floor

The requirements of 40 CFR Part 63, Subpart JJJJ apply to each new and existing facility that is a major source of HAP, at which web coating lines are operated. NESHAP Subpart JJJJ requires that HAP emissions be limited to "no more than 1.6 percent of the mass of coating materials applied for each month at new affected sources" or "no more than 8 percent of the coating solids applied for each month at new affected sources." The binder applied at the Fleece Application station is considered a compliant coating per NESHAP Subpart JJJJ without the need for additional controls. NESHAP Subpart JJJJ allows for compliance with this limit using VOC as a surrogate for organic HAP. At a minimum, the facility must comply with NESHAP Subpart JJJJ for Fleece Application.

Step 1 – Identify Potential Control Technologies

Potential add-on control technologies for evaporative losses include afterburners, thermal incineration, and recuperative incineration. BACT determinations were not found in the RBLC for this type of fleece application system; however, similar emission sources[29] also subject to NESHAP Subpart JJJJ were found and the related BACT determinations were used to identify potentially applicable

[29] These determinations are primarily related to paper coating.

controls. In general, the same type of control equipment can be used for controlling emissions of VOCs.

VOCs will be present due to the volatilization of organic compounds resulting from the binder dip tank and binder-coated fleece just prior to entry into the Curing Oven. However, as addressed in Step 4, evaporative losses are anticipated to be low due to operation at ambient temperature.

Control Type	Estimated VOC Control Efficiency
Thermal Oxidizer (Afterburner)	98-99+%
Recuperative Thermal Oxidizer	98-99+%
Regenerative Thermal Oxidizer	95-99%
Catalytic Oxidizer	90-99%
Adsorber (Carbon Filtration)	95-98%
Wet Scrubber	70 – 99+% (Packed Tower) 50 – 95% (Spray Tower)
Condenser	50 – 90%
Material Selection (Low-VOC Binder)	80 – 99%
Good Work Practices	Varies

Control technologies for VOC are discussed earlier in Section D.3.2.

- *Material Selection* – The use of low-VOC materials, where feasible, can reduce VOC emissions and eliminate the need for add-on control technologies. The material selections for the coating (s) used in the Fleece Application system by-and-large are defined by the product specifications. Accordingly, the consideration of materials must account for potential impacts on Roxul's final products, as well as technical and customer specifications. The potential for reductions in VOC emissions using alternative materials is an appropriate VOC-reduction method to evaluate further.
- *Good Work Practices* – Good work practices for the storage, handling, and use of VOC-containing materials can be effective in limiting evaporative losses. For example, storing VOC-containing materials in closed tanks or containers, cleaning up spills, and minimizing cleaning with VOC compounds can reduce VOC emissions.

<u>Step 2 – Eliminate Technically Infeasible Options</u>

According to the NESHAP Subpart JJJJ preamble, most existing major source facilities in the paper coating industry that apply solvent -based coatings use a thermal oxidation system to reduce emissions because the exhaust streams are laden with high concentrations of VOCs, unlike the Fleece Application System.

The VOC emissions from Fleece Application were conservatively assumed to be emitted entirely as fugitive emissions, although most of the VOC emissions will be emitted and controlled by the Curing Oven afterburner.

Thermal Oxidizer, Recuperative Thermal Oxidizer Regenerative Thermal Oxidizer

Recuperative/Regenerative Thermal Oxidation is not practical given the exhaust stream characteristics, including a relatively low VOC concentration and low flow rate (if the source were fully enclosed and vented). Accordingly, this technology is determined to be not technically feasible. As further consideration, thermal oxidation would generate additional pollutants from natural gas combustion.

Wet Scrubber

Wet Scrubbing is more commonly used for controlling inorganic gases than for controlling VOC emissions. Wet scrubbers are typically not recommended for VOC control as a standalone control device. Accordingly, this technology is determined to be not technically feasible.

Condenser

Condensation is not practical given the low VOC concentration in the gas stream and low temperature needed to achieve any significant reduction. Accordingly, this technology is determined to be not technically feasible. As further considerations, condensation produces a waste stream that would require disposal and the power requirement to cool the air would be costly and would generate additional pollutants from electric utilities, as documented in the NESHAP Subpart JJJJ preamble.

Step 3 – Rank Remaining Technically Feasible Control Options

1. Thermal Oxidizer.
2. Catalytic Oxidizer.
3. Material Selection (Low-VOC Binder).
4. Carbon Adsorber.
5. Good Work Practices.

Step 4 – Evaluate Remaining Control Technologies

Thermal Oxidizer (Afterburner)

A cost-effectiveness calculation for installing an afterburner for VOC control on the Fleece Application System indicates that this technology is not cost-effective due to the low concentration of VOCs in the exhaust stream. The cost per ton of pollutants removed is at least $12,339 for VOC as shown in Appendix D-1, assuming 100% of the VOC emissions from the coating are emitted and captured prior to the Curing Oven. In reality, most of the emissions will not be emitted as fugitives and will be emitted and controlled during the curing process, though no emission reduction credit is taken by the Curing Oven afterburner. The cost-effectiveness calculation excludes the additional capital costs that would be required for the addition of an enclosure and ventilation system to deliver emissions to a separate control device. The cost-effectiveness calculation conservatively assumes an exhaust flow rate of 500 scfm, which is a minimum exhaust flow rate for thermal incineration. The minimum exhaust flow rate corresponds with the lowest equipment base cost and lowest operating and maintenance costs (i.e., smallest system). The addition of a combustion device for the control of VOC would create a NO_x emissions increase from natural gas combustion.

Catalytic Oxidizer

Likewise, a catalytic oxidizer is not cost effective, since a simple thermal oxidizer (afterburner) is the least expensive type of incinerator. A catalytic oxidizer would incur additional labor and material costs for the catalyst replacement. Furthermore, exhaust streams that contain impurities will likely cause fouling of the catalyst. There is also potential for the coupling agent/additives in the coating (binder) to destroy the catalyst, rendering it ineffective.

Adsorber (Carbon Filtration)

Carbon (or other adsorbent) adsorption is a proven technology for removal of VOCs. However, carbon adsorption has a number of limitations including: the need to filter emissions ahead of the adsorption units to prevent plugging the units; the build-up of heel on the carbon; the adverse effects of relative humidity on removal efficiency; and the potential for carbon bed fires related to the exothermic reaction associated with adsorption. In addition, carbon has a finite adsorption capacity. After the carbon filter has reached the adsorption limit, breakthrough of the organics in the air stream will occur. When breakthrough occurs, the outlet concentration from the carbon bed can be greater than the inlet concentration. When carbon has reached its adsorption capacity, it must be regenerated or replaced, which can be a limiting cost factor. For the purposes of this assessment, carbon filtration is considered to be technically feasible for the application of controlling VOC emissions. The control efficiency of carbon adsorption is variable and when breakthrough occurs, the control is not effective. The two most common bed types are fixed regenerable beds or disposable/rechargeable canisters. Once the carbon (or other adsorbent) is saturated with VOCs, the adsorbent would need to be disposed of, generating a solid waste stream, or regenerated, using potentially energy-intensive methods.

Material Selection

Low-VOC materials (compliant coatings) are at least as effective in reducing VOCs as add-on carbon adsorption systems, according to AP-42 Chapter 4, Section 4.2.2.6 – Evaporative Losses for Paper Coating. Because low-VOC materials are at least as effective in reducing VOCs as adsorption and do not have the same environmental implications (i.e., requiring additional energy or generating additional waste), the use of low-VOC materials [0.016 kilogram VOC/kilogram (kg VOC/kg) coating[30]] are selected as BACT for the Fleece Application System.

Good Work Practices

Good work practices, such as storing VOC-containing materials in closed tanks or containers, cleaning up spills, and minimizing cleaning with VOC compounds, will also be implemented to minimize VOC emissions. Good work practices are the base case for VOC reductions and do not have any adverse economic or environmental impacts.

Step 5 – Selection of BACT

Roxul proposes to use a combination of low-VOC coatings in accordance with the NESHAP Subpart JJJJ limit for new sources, and good work practices with no add-on controls as BACT VOC emissions from Fleece Application. Roxul will comply with the applicable requirements of NESHAP Subpart JJJJ, which will establish an emission limit for organic HAP (or VOC as a surrogate) from Fleece Application. VOC emissions will be limited to 25.58 tpy (25.93 tonne/yr) on a rolling 12-month basis. Proposed compliance demonstration methods are summarized in Attachment O.

D.6 BACT DETERMINATION FOR ROCKFON LINE OPERATIONS

This section evaluates BACT for the following sources as described in Section 2.2 of the application:

- IR Zone (RFNE1), Hot Press and Cure (RFNE2), De-dusting Baghouse (RFNE8), and Cooling Zone (RFNE7);
- Spray Paint Cabin (RFNE5);
- Drying Oven 1 (RFNE4);
- High Oven A (RFNE3) and High Oven B (RFNE9); and
- Drying Oven 2 and 3 (RFNE6).

D.6.1 IR Zone & Hot Press & Cure - Filterable PM, PM_{10}, $PM_{2.5}$, and CPM

Emissions of $PM/PM_{10}/PM_{2.5}$, including CPM, from the IR Zone and Hot Press & Cure are 0.02 lb/hr (0.01 kg/hr) per source. In addition, the maximum concentration of filterable $PM/PM_{10}/PM_{2.5}$ is 0.001 gr/dscf per source, which is well below the concentration at which add-on controls are considered. As a result, the addition of control devices cannot be cost effective for BACT

[30] Per NESHAP Subpart JJJJ for new sources.

compliance. Roxul proposes BACT for the IR Zone to be 0.02 lb/hr (0.01 kg/hr) for PM/PM_{10}, 0.01 lb/hr (6.30E-03 kg/hr) for $PM_{2.5}$. Roxul proposes BACT for the Hot Press & Cure to be 0.02 lb/hr (0.01 kg/hr) for PM/PM_{10}, 0.01 lb/hr (6.30E-03 kg/hr) for $PM_{2.5}$.

D.6.2 *IR Zone & Hot Press and Cure – VOC*

The IR Zone and Hot Press and Cure operations include the application of glue. VOC emissions from the IR Zone and Hot Press and Cure are slightly above the threshold concentration at which add-on controls are technically feasible.

Step 1 – Identify Potential Control Technologies

The RBLC, recent permits, and other relevant documents were reviewed to identify the most stringent BACT limits for VOCs emitted from curing operations. Potential add-on control technologies for evaporative losses include afterburners, thermal incineration, and recuperative incineration. Control efficiencies for potentially applicable technologies are shown in the table below.

Control Type	Estimated VOC Control Efficiency
Thermal Oxidizer (Afterburner)	98-99+%
Recuperative Thermal Oxidizer	98-99+%
Regenerative Thermal Oxidizer	95-99%
Catalytic Oxidizer	90-99%
Material Selection (Low-VOC Glues/Coatings)	80 – 99%

Descriptions of these controls were previously discussed in Sections D.3.2 and D.5.1.

Step 2 – Eliminate Technically Infeasible Options

Recuperative Thermal Oxidizer, Regenerative Thermal Oxidizer

Recuperative/Regenerative Thermal Oxidation is not practical given the low exhaust flow rate (less than 2,000 scfm per source) and low VOC concentration in the exhaust streams (less than 50 ppm per source). Regenerative thermal oxidizers (TOs) perform best at inlet concentrations around 1,000 ppm and exhaust flow rates of at least 5,000 scfm and up to 500,000 scfm. Recuperative TOs perform best at inlet concentrations of at least 2,000 ppm and typical gas flow rates from 500 scfm to 500,000 scfm. Based on the exhaust characteristics (low concentration and low exhaust flow rate), RTO technology is determined to be not technically feasible. The heat of combustion of hydrocarbon gases is insufficient to sustain high temperatures required without the addition of expensive auxiliary fuel. Thermal oxidizers without heat regeneration are applicable for lower flow rates and lower VOC concentrations. As further consideration, thermal oxidation would generate additional pollutants from natural gas combustion.

Step 3 – Rank Remaining Technically Feasible Control Options

1. Thermal Oxidizer.
2. Material Selection (Low-VOC Glues/Coatings).
3. Catalytic Oxidizer.

Step 4 – Evaluate Remaining Control Technologies

Thermal Oxidizer (Afterburner)

A conservative cost-effectiveness calculation was completed for installing an afterburner to control total process VOC emissions from both the IR Zone and Hot Press & Cure. The results indicate that this technology is not cost-effective due to the low VOC mass in the exhaust stream. The cost per ton of pollutants removed is $56,551 for VOCs as shown in Appendix D-1. Further, the addition of a combustion device for the control of such low VOC concentrations would also cause a NO_x emissions increase from natural gas combustion.

Catalytic Oxidizer

Likewise, a catalytic oxidizer is not cost effective because costs for a catalytic oxidizer substantially increase when the VOC concentration in the exhaust stream is below 100 ppm. A simple thermal oxidizer is the least expensive type of incinerator. A catalytic oxidizer would incur additional labor and material costs for the catalyst replacement. Furthermore, catalytic oxidation is best suited for systems with little variation in type and concentration of VOCs, where heavy hydrocarbons and particulates are not present.

Material Selection (Low-VOC Glues/Coatings)

Use of low-VOC materials, such as solidified glue, is the most effective remaining available control to minimize VOC emissions.

Step 5 – Selection of BACT

BACT for VOC from the IR Zone and Hot Press and Cure operations is proposed to be use of glue with 53 gram per kilogram (g/kg) VOC content and no add-on controls, with a numerical VOC emission limit of 7.48 tpy (6.78 tonne/yr) on a rolling 12-month basis. Proposed compliance demonstration methods are summarized in Attachment O.

D.6.3 **De-dusting Baghouse - Filterable PM, PM_{10}, $PM_{2.5}$**

Exhaust from cutting, sanding, milling, and crushing operations will be directed to the De-dusting Baghouse for control of filterable $PM/PM_{10}/PM_{2.5}$ emissions. The De-dusting Baghouse will be designed with an alternative venting option, so that filtered exhaust air can be directed through a high efficiency particulate air

(HEPA) filter and used as warm air in the Rockfon production building. Product quality and worker health necessitates the use of a HEPA filter for this exhaust. Any filterable $PM/PM_{10}/PM_{2.5}$ emissions from this exhaust that may be emitted from the enclosed Rockfon production building would be emitted as a fugitive source; however, these emissions would be a fraction of those emitted from the De-dusting Baghouse stack, due to the HEPA filter and "building" control. Fugitive particulate emissions entrained in the warm air will be controlled to concentrations beyond what is considered BACT because these emissions will pass through a HEPA filter before entering the building and becoming fugitive. The fugitive emissions from alternative venting will be controlled to concentrations beyond what is considered BACT.

The "worst-case" (non-HEPA filtered) particulate emissions contained in the De-dusting Baghouse stack exhaust will be controlled to concentrations beyond what is considered BACT (0.0005 gr/dscf). Therefore, BACT for the cutting, sanding, milling, and crushing operations is proposed to be the use of a baghouse, with a numerical emission limit of 0.34 lb/hr (0.15 kg/hr) for PM/PM_{10} and 0.17 lb/hr (0.08 kg/hr) for $PM_{2.5}$. Material collected in the De-dusting Baghouse will be conveyed in an enclosed container to the Recycle Plant for reuse in the process, minimizing waste and environmental impacts. Proposed compliance demonstration methods are summarized in Attachment O.

D.6.4 Drying Oven 1, Drying Oven 2 & 3, High Oven A, and High Oven B - Filterable PM, PM_{10}, $PM_{2.5}$, and CPM

Particulate dust emissions are generated by air flow passing over the product in the Rockfon Ovens and by natural gas combustion.

Step 1 – Identify Potential Control Technologies

The RBLC, recent permits, and other relevant documents were reviewed to identify the most stringent BACT limits for filterable $PM/PM_{10}/PM_{2.5}$ process emissions from Drying Oven 1, Drying Oven 2 & 3, High Oven A, and High Oven B. Control efficiencies for potentially applicable technologies are shown in the table below for Drying Oven 1 and Drying Oven 2 & 3.

Control Type	**Estimated $PM/PM_{10}/PM_{2.5}$ Control Efficiency**
Fabric Filter (Baghouse)	95-99+% (As low as 0.001 gr/dscf)
Wet Scrubber or High Efficiency Venturi Scrubber	70-99% (<0.01 gr/dscf)
ESP	>98% (0.004 – 0.01 gr/dscf)
WESP	>98% (0.004 – 0.01 gr/dscf)
Natural Gas Fuel and Good Combustion Practices	Varies

Descriptions of these controls were previously included in Section D.3.1.

Step 2 – Eliminate Technically Infeasible Options

ESP, WESP, or Wet Scrubber/High Efficiency Venturi Scrubber

No BACT determinations were found that include the use of an ESP, WESP, or scrubber to control PM emissions from similar drying ovens; thus, these types of control can be considered technically infeasible because they are not demonstrated control technologies for this particular application.

The exhaust grain loading is below the threshold where add-on controls are technically feasible for both High Oven A and High Oven B (below 0.002 gr/dscf).

Step 3 – Rank Remaining Technically Feasible Control Options

1. Fabric Filter (Drying Oven 1, Drying Oven 2 & 3 only).
2. Natural Gas Fuel and Good Combustion Practices (All Rockfon Ovens).

Step 4 – Evaluate Remaining Control Technologies

Particulate Filter

Dry filtration is the best remaining available control for Drying Oven 1 and Drying Oven 2 & 3. Dry filtration is capable of achieving a PM concentration of less than 0.005 gr/dscf.

Natural Gas Fuel and Good Combustion Practices

Use of natural gas and good combustion practices are applicable, economical, and will be employed for the Drying Oven 1, Drying Oven 2 & 3, High Oven A, and High Oven B. Good combustion practices include activities such as maintaining operating logs and recordkeeping, conducting training, ensuring maintenance knowledge, performing routine and preventive maintenance, conducting burner and control adjustments, monitoring fuel quality, etc.

Step 5 – Selection of BACT

Roxul proposes to equip Drying Oven 1 and Drying Oven 2 & 3 with particulate filters as BACT to control $PM/PM_{10}/PM_{2.5}$ from drying operations. Roxul proposes no add-on controls for High Oven A and High Oven B. Each of the ovens will combust natural gas and implement good combustion practices. The following numerical emission limits are proposed as BACT:

- 0.08 lb/hr (0.04 kg/hr) for PM/PM_{10} and 0.06 lb/hr (0.03 kg/hr) for $PM_{2.5}$ (Drying Oven 1),

- 0.12 lb/hr (0.05 kg/hr) for PM/PM_{10} and 0.09 lb/hr (0.04 kg/hr) for $PM_{2.5}$ (High Oven A),
- 0.13 lb/hr (0.06 kg/hr) for PM/PM_{10} and 0.09 lb/hr (0.04 kg/hr) for $PM_{2.5}$ (Drying Oven 2 & 3), and
- 0.12 lb/hr (0.05 kg/hr) for PM/PM_{10} and 0.09 lb/hr (0.04 kg/hr) for $PM_{2.5}$ (High Oven B).

Proposed compliance demonstration methods are summarized in Attachment O.

D.6.5 Drying Oven 1, Drying Oven 2 & 3, High Oven A, and High Oven B – VOC, CO

Evaporative emissions are generated by drying paints and coatings. Additional VOC and CO emissions result from incomplete combustion caused when some of the fuel is only partially burned. VOC emissions from the coating application and drying were estimated by assuming that all of the VOC in the product is driven off and emitted in the Drying or High Ovens.

Step 1 – Identify Potential Control Technologies

The RBLC, recent permits, and other relevant documents were reviewed to identify the most stringent BACT limits for organic evaporative losses and combustion emissions from dryers and ovens. Controls include afterburners and RTOs. Control efficiencies for potentially applicable technologies are shown in the table below.

Control Type	Estimated CO/VOC Control Efficiency
Thermal Oxidizer (Afterburner)	98-99+%
Recuperative Thermal Oxidizer	98-99+%
Regenerative Thermal Oxidizer	95-99%
Catalytic Oxidizer	90-99%
Material Selection (Low-VOC Paints/Coatings)	80 – 99%
Natural Gas Fuel and Good Combustion Practices	Varies

These potential control technologies for VOC emissions are discussed earlier in Sections D.3.2 and D.5.1.

Due to variability of the Rockfon product mix, a wide variety of paints may be used at multiple stages of the process, depending on product style, color, etc. Therefore, Roxul proposes a combined VOC limit for the Spray Paint Cabin, Drying Oven 1, High Oven A, High Oven B, Drying Oven 2 & 3, and Cooling Zone. The most affordable cost to control scenario assumes that all of the VOC emissions from these sources are emitted from the Drying Oven 1 exhaust because it has the lowest exhaust flow rate and highest exhaust temperature.

Step 2 – Eliminate Technically Infeasible Options

Each of the add-on control technologies are anticipated to not be technically feasible for Drying Oven 2 & 3, High Oven A, or High Oven B because each of these sources will have exhaust concentrations of less than 20 ppmv. However, for this exercise none of the control technologies identified in Step 1 were deemed technically infeasible.

Step 3 – Rank Remaining Technically Feasible Control Options

Drying Oven 1, Drying Oven 2 & 3, High Oven A, High Oven B:

1. Afterburner.
2. Recuperative Thermal Oxidizer.
3. Regenerative Thermal Oxidizer.
4. Material Selection (Low-VOC Paints/Coatings).
5. Catalytic Oxidation.
6. Use of Natural Gas and Good Combustion Practices.

Step 4 – Evaluate Remaining Control Technologies

Thermal Oxidizer (Afterburner)

A conservative cost-effectiveness calculation was completed for installing an afterburner to control total VOC emissions from Drying Oven 1. Drying Oven 1 has the lowest exhaust flow rate of the sources evaluated, which corresponds to the lowest equipment cost. Additionally, Drying Oven 1 has the highest exhaust temperature, which corresponds to the lowest auxiliary fuel requirement. Each of the other sources would be more expensive to control than Drying Oven 1. Assuming that all VOC emissions (30.69 tpy) from the Spray Paint Cabin, Drying Oven 1, High Oven A, High Oven B, Drying Oven 2 & 3, and Cooling Zone are emitted from Drying Oven 1 yields the most affordable cost scenario (i.e., lowest cost to control value). The cost per ton of pollutants removed is $14,648 for VOC as shown in Appendix D-1 and is not cost effective. The addition of a combustion device for the control of VOC would also cause an increase of pollutant emissions from natural gas combustion.

Recuperative Thermal Oxidizer or Regenerative Thermal Oxidizer

Based on the exhaust characteristics from Drying Oven 1, an RTO is also not cost effective. RTO technology is not cost effective because the capital costs of RTO systems are much higher than traditional TOs (approximately double). Further, the operation costs are not low enough to offset the higher capital investment since the heat of combustion of the hydrocarbon gases is insufficient to sustain high thermal oxidation temperatures required without the addition of expensive auxiliary fuel.

Catalytic Oxidizer

Likewise, a catalytic oxidizer is not cost effective, since a simple thermal oxidizer (afterburner) is the least expensive type of incinerator. A catalytic oxidizer would incur additional labor and material costs for the catalyst replacement. Furthermore, catalytic oxidation is best suited for systems with little variation in type and concentration of VOCs.

Material Selection

Because low-VOC materials are at least as effective in reducing VOCs as adsorption and do not have the same environmental implications (i.e., requiring additional energy or generating additional waste), the use of low-VOC materials [80 gram VOC per liter (g VOC/L)] is selected as BACT for the Rockfon Drying Ovens. Low-VOC coatings contain lower amounts of VOC than conventional organic solvent-borne coatings and usually fall into three major categories: high solids, waterborne, or powder coatings. The coatings used in the Rockfon operation will have a maximum VOC content of 80 grams per liter of coating. The low-VOC coatings will not be applied in large enough quantities to generate VOC emissions above the 20 ppmv threshold, where add-on controls become technically feasible for the Rockfon Ovens.

Natural Gas Fuel and Good Combustion Practices

For small, natural gas combustion sources, good combustion practices are the only applicable control for emissions generated from products of combustion. Good combustion practices, such as maintaining operating logs and recordkeeping, conducting training, ensuring maintenance knowledge, performing routine and preventive maintenance, conducting burner and control adjustments, monitoring fuel quality, etc. will be used to ensure complete combustion, so the conversion of VOC and CO to CO_2 is maximized.

Step 5 – Selection of BACT

Based on results from this top-down BACT analysis, Roxul proposes to use low-VOC coatings, containing a maximum VOC content of 80 g/L, to reduce process VOC emissions from Drying Oven 1, Drying Oven 2 & 3, High Oven A, and High Oven B. Roxul also proposes good combustion practices and use of natural gas to reduce CO and VOC emissions from combustion with a numerical emission limit of 84 lb CO/million standard cubic feet (MMscf) (1,346 kg/million standard cubic meter [$MMsm^3$]) of natural gas. A numerical emission limit of 30.69 tpy (27.85 tonne/yr) VOC on a rolling 12-month basis is proposed as BACT for the Spray Paint Cabin, Drying Oven 1, Drying Oven 2 & 3, High Oven A, and High Oven B, and the Cooling Zone. Proposed compliance demonstration methods are summarized in Attachment O.

D.6.6 *Drying Oven 1, Drying Oven 2 & 3, High Oven A, and High Oven B - SO_2*

The Rockfon Ovens oxidize sulfur compounds present in natural gas into SO_2. The control of SO_2 emissions is most directly associated with using a low sulfur fuel such as natural gas. Potential SO_2 emissions are directly related to the sulfur content of fuels. Minimizing fuel sulfur content through the use of low sulfur fuels, such as pipeline quality natural gas, has been determined to be BACT for many combustion processes. Therefore, Roxul proposes use of natural gas (a low sulfur fuel, as supplied) as BACT for SO_2 emissions from Drying Oven 1, Drying Oven 2 & 3, High Oven A, and High Oven B.

D.6.7 Drying Oven 1, Drying Oven 2 & 3, High Oven A, and High Oven B - NO_x

NO_x are formed primarily through the thermal NO_x mechanism where N_2 thermally dissociates and subsequently reacts with O_2 molecules in the combustion air. NO_x can also be formed through a mechanism called prompt NO_x, when early reactions of N_2 molecules in the combustion air and hydrocarbon radicals in the fuel occur. Prompt NO_x is usually negligible compared to thermal NO_x. The third mechanism is called fuel NO_x, and stems from the reaction of fuel-bound N_2 compounds with O_2. Natural gas has negligible chemically bound fuel N_2; thus, potential NO_x emissions are minimal. Each of the burners is direct-fired and less than 5 MMBtu/hr combined, which does not warrant low NO_x burners. Further, NO_x emissions in the Rockfon Oven exhausts are very low, and as a result, addition of control devices cannot be cost effective. Roxul proposes minimizing NO_x emissions through the use natural gas and good combustion practices, with a numerical emission limit of 100 lb NOx/MMscf (1,602 kg/MMsm^3) of natural gas as BACT. Good combustion practices include activities such as maintaining operating logs and recordkeeping, conducting training, ensuring maintenance knowledge, performing routine and preventive maintenance, conducting burner and control adjustments, monitoring fuel quality, etc.

D.6.8 Cooling Zone

The Cooling Zone is electrically heated and pollutant concentrations from the Cooling Zone ($PM/PM_{10}/PM_{2.5}$, CPM, and VOCs) are below the concentrations at which add-on controls are applicable. VOCs are emitted in the Cooling Zone due to evaporative losses. The coatings used in the Rockfon operation will have a maximum VOC content of 80 g/L. Roxul proposes BACT for the Cooling Zone to be the use of low-VOC materials, containing a maximum VOC content of 80 g/L. Further, Cooling Zone emissions were conservatively included in Section D.6.5 (see VOC cost calculation description for Drying Oven 1). Cooling Zone VOC emissions will also be limited in the proposed overall combined VOC emission limit for Drying Oven 1, Drying Oven 2 & 3, High Oven A, High Oven B, and Cooling Zone. Additionally, Roxul proposes a numerical emission limit of 0.19 lb/hr (0.09 kg/hr) for PM/PM_{10} and 0.14 lb/hr (0.07 kg/hr) for $PM_{2.5}$. Proposed compliance demonstration methods are summarized in Attachment O.

D.6.9 Spray Paint Cabin - Filterable PM, PM_{10}, $PM_{2.5}$, and CPM

High solids, low-VOC coatings are used in the Spray Paint Cabin to coat the ceiling tile surface. The RBLC, recent permits, and other relevant documents were reviewed to identify the most stringent BACT limits for filterable $PM/PM_{10}/PM_{2.5}$ emissions from spray painting operations.

Step 1 – Identify Potential Control Technologies

Control efficiencies for potentially applicable technologies are shown in the table below.

Control Type	Estimated $PM/PM_{10}/PM_{2.5}$ Control Efficiency
Particulate Filter	95-99+% (As low as 0.001 gr/dscf)
Wet Scrubber or High Efficiency Venturi Scrubber	70-99% (<0.01 gr/dscf)
ESP	>98% (0.004 – 0.01 gr/dscf)
WESP	>98% (0.004 – 0.01 gr/dscf)

Each of the applicable control technologies are described in Section D.3.1.

Step 2 – Eliminate Technically Infeasible Options

ESP/WESP

No BACT determinations were found that include the use of an ESP, or WESP to control PM emissions from spray booths, so these types of control can be considered technically infeasible because they are not demonstrated control technologies for this particular application.

Step 3 – Rank Remaining Technically Feasible Control Options

1. Particulate Filter.
2. Wet Scrubber Or High Efficiency Venturi Scrubber.

Step 4 – Evaluate Remaining Control Technologies

Potential remaining add-on control technologies for solids from spray painting include dry, or fabric, filtration and high efficiency wet scrubbing.

Particulate Filter

The most common BACT control device for spray booths is dry filtration. Dry filtration is capable of achieving a PM concentration of less than 0.01 gr/dscf and can reduce PM emissions more effectively than wet scrubbing; therefore, dry filtration is the best remaining control technology and proposed to be BACT.

Step 5 – Selection of BACT

Roxul proposes to equip the Spray Paint Cabin with a particulate filter as BACT to control $PM/PM_{10}/PM_{2.5}$ from spray paint operations, with a numerical emission limit of 0.88 lb/hr (0.40 kg/hr) for PM/PM_{10} and 0.66 lb/hr (0.30 kg/hr) for $PM_{2.5}$. Proposed compliance demonstration methods are summarized in Attachment O.

D.6.10 Spray Paint Cabin - VOCs

The spray paint coating used in the Rockfon operation will be a low-VOC coating. VOC emissions from the Spray Paint Cabin will not be present in amounts above the threshold where add-on controls become technically feasible. Roxul proposes to use low-VOC coatings with a maximum VOC content of 80 g/L in the Spray Paint Cabin as BACT for VOC emissions. Further, the Spray Paint Cabin emissions were conservatively included in Section D.6.5 (see VOC cost calculation description for Drying Oven 1). Spray Paint Cabin VOC emissions will also be limited in the proposed overall combined VOC emission limit for the Spray Paint Cabin, Drying Oven 1, Drying Oven 2 & 3, High Oven A, High Oven B, and the Cooling Zone. Proposed compliance demonstration methods are summarized in Attachment O.

D.7 BACT DETERMINATION FOR COAL MILLING

This section evaluates BACT for the Coal Milling Burner and Baghouse (IMF05) and Coal Milling De-Dusting Baghouse (IMF06). Coal is milled using a vertical coal mill equipped with a natural gas-fired direct heating unit and a separator equipped with a dust filter. Control evaluations for emissions from coal milling sources associated with material handling, transportation, and storage are included in Section D.2.

D.7.1 Coal Milling - Filterable PM, PM_{10}, $PM_{2.5}$, and CPM

Particulate dust emissions are primarily generated by pulverizing coal, and a small amount of particulate emissions are generated as by-products of natural gas combustion and trace amounts of noncombustible particles.

Step 1 – Identify Potential Control Technologies

The RBLC, recent permits, and other relevant documents were reviewed to identify the most stringent BACT limits for filterable $PM/PM_{10}/PM_{2.5}$ process emissions from Coal Milling. Control efficiencies for potentially applicable technologies are shown in the table below for the vertical coal mill.

Control Type	Estimated $PM/PM_{10}/PM_{2.5}$ Control Efficiency
High efficiency cyclone	80-99% for PM, 30-90% for PM_{10}, 0-40% for $PM_{2.5}$ (>0.01 gr/dscf)
Fabric Filter (Baghouse)	95-99+% (As low as 0.001 gr/dscf)

Control Type	Estimated $PM/PM_{10}/PM_{2.5}$ Control Efficiency
Natural Gas Fuel and Good Combustion Practices	Varies

Descriptions of these controls were previously included in Section D.3.1.

Step 2 – Eliminate Technically Infeasible Options

All controls identified in Step 1 are technically feasible.

Step 3 – Rank Remaining Technically Feasible Control Options

1. Fabric Filter (Baghouse).
2. High Efficiency Cyclone.
3. Natural Gas Fuel and Good Combustion Practices.

Step 4 – Evaluate Remaining Control Technologies

BACT Limit Overview

RBLC search results for $PM/PM_{10}/PM_{2.5}$ BACT emission limits for coal milling, pulverizing, and grinding activities indicate that the typical concentration established as BACT ranged from 0.004 gr PM_{10}/dscf to 0.02 gr/dscf, for similar sources. The most stringent limits for coal milling particulate emissions are achieved by using baghouses as the add-on control technology.

Fabric Filter (Baghouse)

Dry filtration is the best available control for coal milling and is capable of achieving a PM concentration of 0.005 gr/dscf.

High Efficiency Cyclone

Cyclones are used primarily for pretreatment control devices and are not considered a "best" available control technology; for these reasons, this control technology is eliminated from further consideration.

Natural Gas Fuel and Good Combustion Practices

Use of natural gas and good combustion practices are applicable, economical, and will be employed for the vertical coal mill. Good combustion practices include activities such as maintaining operating logs and recordkeeping, conducting training, ensuring maintenance knowledge, performing routine and preventive maintenance, conducting burner and control adjustments, monitoring fuel quality, etc.

Step 5 – Selection of BACT

Roxul proposes to equip the Coal Mill Burner &Baghouse (IMF05) and the De-dusting Baghouse (IMF06) with a fabric filters as BACT to control $PM/PM_{10}/PM_{2.5}$. The Coal Mill Burner and Baghouse (IMF05) will combust natural gas and Roxul will implement good combustion practices. The BACT numerical PM/PM_{10} emission limit for the Coal Mill Burner and Baghouse (IMF05) is proposed to be 0.32 lb/hr (0.14 kg/hr) and 0.26 lb/hr (0.12 kg/hr) for $PM_{2.5}$. BACT numerical limits from the Coal Milling De-dusting Filter are proposed to be 0.22 lb/hr (0.10 kg/hr) for PM/PM_{10} (filterable) and 0.11 lb/hr (0.05 kg/hr) for $PM_{2.5}$ (filterable). Proposed compliance demonstration methods are summarized in Attachment O.

D.7.2 Coal Milling – VOC, CO

Coal milling operations are performed at temperatures high enough to cause organics to volatilize and release VOC emissions from the process. Additional VOC and CO emissions result from incomplete combustion caused when some of the fuel is only partially burned.

Step 1 – Identify Potential Control Technologies

The RBLC, recent permits, and other relevant documents were reviewed to identify the most stringent BACT limits for organic evaporative losses and combustion emissions from coal milling. No examples of add-on control devices were found in the RBLC for coal milling or coal processing operations. The most common controls include good combustion practices and good engineering design. Potentially applicable add-on controls include oxidation devices, while good combustion practices can be used to mitigate VOC emissions. Control efficiencies for potentially applicable controls are shown in the table below.

Control Type	Estimated CO/VOC Control Efficiency
Thermal Oxidizer (Afterburner)	98-99+%
Recuperative Thermal Oxidizer	98-99+%
Regenerative Thermal Oxidizer	95-99%
Catalytic Oxidizer	90-99%
Natural Gas Fuel and Good Combustion Practices	Varies

These potential control technologies for VOC emissions are discussed earlier in Section D.3.2 and D.5.1.

Step 2 – Eliminate Technically Infeasible Options

The VOC/CO concentration is dilute in the Coal Milling exhaust stream and is less than 20 ppmv, well below the threshold concentration for any of the add-on control devices identified in Step 1 to be effective and to be considered technically applicable or feasible. The concentration of VOC/CO from Coal

Milling is well below the VOC/CO concentration found in well-controlled streams. Further reduction of the VOC or CO concentrations found in the Coal Milling exhaust stream cannot be backed by a vendor; therefore add-on controls are not technically feasible or applicable to reduce VOC or CO emissions.

Step 3 – Rank Remaining Technically Feasible Control Options

1. Natural Gas Fuel and Good Combustion Practices.

Step 4 – Evaluate Remaining Control Technologies

Natural Gas Fuel and Good Combustion Practices

The only remaining technically feasible control technology for controlling the dilute Coal Mill Burner & Baghouse exhaust stream is use of natural gas and good combustion practices.

BACT will be based upon good combustion practices, the only remaining feasible control technology, in order to minimize VOC and CO emissions.

Step 5 – Selection of BACT

Good combustion practices have been selected to control VOC and CO emissions from Coal Milling. Numerical VOC BACT emission limits from Coal Milling are proposed to be 0.41 lb/hr (0.19 kg/hr). Numerical CO BACT emission limits from Coal Milling are proposed to be 84 lb/MMscf (1,346 kg/MMsm^3). Proposed compliance demonstration methods are summarized in Attachment O.

D.7.3 Coal Milling - SO_2

The coal milling burner oxidizes sulfur compounds present in natural gas into SO_2. Potential SO_2 emissions are directly related to the sulfur content of fuels; therefore, the control of SO_2 emissions is most directly associated with using a low sulfur fuel such as natural gas. For relatively small natural gas-fired sources, post combustion controls are technically infeasible and impractical due to the small quantities of SO_2 present in the exhaust gas. Furthermore, there were no examples available in the RBLC of these control devices being applied to natural gas-fired combustion sources. Therefore, Roxul proposes use of natural gas as BACT for SO_2 emissions from Coal Milling. Proposed compliance demonstration methods are summarized in Attachment O. Emissions of SO_2 from drying of coal in the mill are not expected because the coal is dried at 180°F (82°C), which is not a high enough temperature to undergo combustion.

D.7.4 Coal Milling - NO_x

As previously discussed, natural gas has negligible chemically bound fuel N_2; thus, potential NO_x emissions are minimal. Low-NO_x burner technology is the only technically feasible control option identified for reducing NO_x emissions.

Low-NO_x burners are commonly used in small boilers to reduce NO_x emissions. Roxul proposes minimizing NO_x emissions through the use of LNB (at 60 ppmvd at 3% O_2 based on manufacturer specification) and natural gas along with good combustion practices. Good combustion practices include activities such as maintaining operating logs and recordkeeping, conducting training, ensuring maintenance knowledge, performing routine and preventive maintenance, conducting burner and control adjustments, monitoring fuel quality, etc. Emissions of NO_x from drying of coal in the mill are not expected because the coal is dried at 180°F (82°C), which is not a high enough temperature to undergo combustion.

D.8 BACT DETERMINATION FOR OTHER FACILITY-WIDE ACTIVITIES

This section evaluates BACT for the following sources as described in Section 2 of the application:

- Rockfon Building Heat (RFN10);
- Natural Gas Boiler 1 and Natural Gas Boiler 2 (CM03, CM04);
- Product Marking (P_MARK);
- Emergency Fire Pump Engine (EFP1);
- Furnace Cooling Tower (IMF02);
- Gutter Cooling Tower (HE02); and
- Miscellaneous Storage Tanks (TKS).

D.8.1 Rockfon Building Heat, Natural Gas Boiler 1, and Natural Gas Boiler 2 – Filterable PM, PM_{10}, $PM_{2.5}$, and CPM

PM emissions from combustion are primarily the result of incomplete combustion, though PM emissions are also produced from the carryover of noncombustible trace constituents in the fuel (such as ash and metallic additives). Natural gas contains a very small amount of noncombustible trace constituents that result in PM emissions.

Step 1 – Identify Potential Control Technologies

The following technologies are potentially available control technologies for $PM/PM_{10}/PM_{2.5}$ emission controls for natural gas-fired combustion (boilers).

Control Type	Estimated $PM/PM_{10}/PM_{2.5}$ and CPM Control Efficiency
Fabric filter (baghouse)	95-99+% (As low as 0.001 gr/dscf)
Wet scrubber or high efficiency Venturi scrubber	70-99% (<0.01 gr/dscf)
ESP	>98% (0.004 – 0.01 gr/dscf)
Clean fuel and good combustion practices	Varies

With the exception of clean fuel, descriptions of these controls were previously discussed in Section D.3.1.

- *Clean Fuel and Good Combustion Practices* - Clean Fuel and Good Combustion Practices - Fuels containing ash have the potential to produce particulate emissions. Additionally, fuels containing sulfur have the potential to produce sulfur compounds that may form condensable particulate emissions. Natural gas contains negligible amounts of particulate and is considered a low sulfur fuel. The use of good combustion practices can minimize the potential particulate emissions associated with incomplete combustion.

Step 2 – Eliminate Technically Infeasible Options

Fabric Filter (Baghouse)

A baghouse is a post-combustion control technology that utilizes a fine mesh filter to remove particulate emissions primarily from large volume gas streams containing high particulate concentrations. No examples have been found where a baghouse has been applied to a small natural gas fired boiler due to the reduced volume and minimal particulate concentration of the associated exhaust gas stream. Therefore, baghouse technology is not technically feasible for the boilers.

ESP

ESP is a post-combustion particulate emissions control most readily applied to large volume gas streams containing high particulate concentrations. No examples have been found where an ESP has been applied to a small natural gas fired boiler due to the reduced volume and minimal particulate concentration of the associated exhaust gas stream. Therefore, ESP is not technically feasible for the boilers.

Wet Scrubber or High Efficiency Venturi Scrubber

For relatively small natural gas-fired sources, post-combustion controls, such as wet scrubbers are both technically infeasible and impractical due to the high pressure drops associated with these units and the low concentrations of $PM/PM_{10}/PM_{2.5}$ present in the exhaust gas.

Step 3 – Rank Remaining Technically Feasible Control Options

1. Clean fuel (natural gas) and good combustion practices.

Step 4 – Evaluate Remaining Control Technologies

Clean Fuel and Good Combustion Practices

Because emissions of PM are small, add-on controls would not be necessary and would be considerably cost prohibitive. During the review of available control technologies for combustion sources at similar plants, no determinations were found for the use of add-on controls to reduce PM emissions from natural gas-fired equipment. Therefore, Roxul considers BACT for these combustion sources to be the use of natural gas, a clean-burning fuel with low PM emissions, and good combustion practices.

Step 5 – Selection of BACT

Roxul proposes to use clean fuel (natural gas) and good combustion practices with no add-on controls as BACT for $PM/PM_{10}/PM_{2.5}$ emissions from the boilers. Proposed compliance demonstration methods are summarized in Attachment O.

D.8.2 Rockfon Building Heat, Natural Gas Boiler 1, and Natural Gas Boiler 2 – CO, VOC

CO and VOC emissions from combustion result from incomplete combustion caused when some of the fuel is only partially burned.

Step 1 – Identify Potential Control Technologies

The most stringent control technology used to control CO emissions from combustion is catalytic oxidation. Catalytic oxidation systems are also used to reduce VOC and organic HAP emissions. The following technologies are potentially available control technologies for CO and VOC emission controls for natural gas combustion sources.

Control Type	Estimated CO/VOC Control Efficiency
Thermal oxidizer (afterburner)	98-99+%
Recuperative Thermal Oxidizer	98-99+%
Regenerative Thermal Oxidizer	95-99%
Catalytic oxidizer	90-99%
Clean fuel and good combustion practices	Varies

Except for clean fuel, descriptions of these controls were previously discussed in Section D.3.2. Clean fuel and good combustion practices are discussed in Section D.8.1.

Step 2 – Eliminate Technically Infeasible Options

Catalytic Oxidation

Catalytic oxidation is a post-combustion control technology that utilizes a catalyst to oxidize CO and VOC into CO_2 or water (H_2O). The technology has most commonly been applied to natural gas fired combustion turbines. No examples were identified where add-on control technology has been applied to a small natural gas-fired boiler. Because of the low quantities of CO and VOC emissions and the limited use of the boilers, the use of catalytic oxidation technology is determined to be not technically feasible.

Thermal Oxidizer, Recuperative Thermal Oxidizer, and Regenerative Thermal Oxidizer

For relatively small natural gas-fired sources, post-combustion controls, such as thermal oxidizers, recuperative and regenerative thermal oxidizers are both technically infeasible and impractical due to the relatively small quantities of CO and VOC present in the exhaust gas.

Step 3 – Rank Remaining Technically Feasible Control Options

1. Clean fuel (natural gas) and good combustion practices.

Step 4 – Evaluate Remaining Control Technologies

Clean Fuel and Good Combustion Practices

Add-on controls, even if feasible, are not typically required for combustion sources fired with natural gas. During the review of available control technologies for combustion sources at similar plants, no determinations were found for the use of add-on controls to reduce CO and VOC emissions from natural gas-fired equipment. Therefore, Roxul proposes that BACT for CO and VOC emissions from the boilers be limited to the use of natural gas (a clean-burning fuel with low CO and VOC emissions), good combustion practices, and a numerical emission limit of 84 lb CO/MMscf (1,346 kg/MMsm^3) natural gas.

Step 5 – Selection of BACT

Roxul will utilize clean fuel (natural gas) and good combustion practices with no add-on controls, and a numerical emission limit of 84 lb CO/MMscf (1,346 kg/ MMsm^3) natural gas as BACT for CO and VOC emissions from the boilers. Proposed compliance demonstration methods are summarized in Attachment O.

D.8.3 ***Rockfon Building Heat, Natural Gas Boiler 1, and Natural Gas Boiler 2 – SO_2***

The boilers oxidize sulfur compounds present in natural gas into SO_2. The control of SO_2 emissions is most directly associated with using a low sulfur fuel such as natural gas. Minimizing fuel sulfur content through the use of low sulfur diesel fuels or natural gas has been determined to be BACT for many combustion processes, including natural gas-fired boilers. Therefore, Roxul proposes use of low sulfur fuel (pipeline quality natural gas, as supplied) as BACT for the natural gas-fired boilers. Proposed compliance demonstration methods are summarized in Attachment O.

D.8.4 ***Rockfon Building Heat, Natural Gas Boiler 1, and Natural Gas Boiler 2 – NO_x***

The principle pollutant generated by combustion of natural gas in the boilers is nitric oxide (NO) and nitrogen dioxide (NO_2), collectively referred to as NO_x. The majority of NO_x produced during combustion is NO (95%), but once emitted into the atmosphere, NO reacts to form NO_2. Proposed compliance demonstration methods are summarized in Attachment O.

Step 1 – Identify Potential Control Technologies

The following technologies are determined to be potentially available control technologies for NO_x emission controls from the natural gas-fired boilers.

Control Type	Estimated NO_x Control Efficiency
SCR	70-95%
SNCR	40-75%
Low NO_x Burners	30-40%
Good combustion practices	Varies

Descriptions of these controls were previously discussed in Section D.3.4. and Section D.4.4.

Step 2 – Eliminate Technically Infeasible Options

SCR

SCR is a post-combustion technology that reduces NO_x emissions by reacting NO_x with ammonia in the presence of a catalyst. SCR technology has been most commonly applied to larger boilers and to natural gas-fired combustion turbines. The outlet gas temperature will be substantially below that required for SCR. A precious metal catalyst may be feasible for SCR at a lowered temperature and a reduced NO_x control performance, but substantial reheat of the gas stream would be required. Therefore, SCR is not technically feasible for the small boilers.

SNCR

SNCR is a post-combustion NO_x control technology where ammonia or urea is injected into the exhaust to react with NO_x to form N_2 and water without the use of a catalyst. Use of this technology requires uniform mixing of the reagent and exhaust gas within a narrow temperature range. Operations outside of this temperature range will significantly reduce removal efficiencies and may result in ammonia emissions or increased NO_x emissions. No examples were found where SNCR has been applied to a small boiler. Small boilers are limited by the availability of sufficient residence times and temperature zones. There is no appropriate temperature range zone for SNCR. Therefore, SNCR is not technically feasible for the small boilers.

For relatively small natural gas-fired sources, post-combustion controls, such as SCR and SNCR are both technically infeasible and impractical due to the relatively small quantities of NO_x present in the exhaust gas.

Step 3 – Rank Remaining Technically Feasible Control Options

1. Low-NO_x burners.
2. Good combustion practices.

Step 4 – Evaluate Remaining Control Technologies

Low NO_x Burners

Low-NO_x burner technology is the only technically feasible control option identified for reducing NO_x emissions. Low-NO_x burners are commonly used in small boilers to reduce NO_x emissions.

Step 5 – Selection of BACT

Roxul will utilize low-NO_x burners with a NO_x emission limit of 30 ppmvd @3% O_2 with no add-on controls as BACT for NO_x emissions from the boilers. Proposed compliance demonstration methods are summarized in Attachment O.

D.8.5 Emergency Fire Pump Engine

One diesel-fueled emergency fire pump engine will be installed to pump water in the event of a fire. The engine will be certified by the manufacturer to the standards in NSPS Subpart IIII.

Roxul proposes BACT for the emergency fire pump engine to be use of an engine certified to meet the standards of NSPS Subpart IIII. Emissions from the engine will be minimal because of limited operating hours. As a result, the addition of control devices cannot be cost effective. The engine will meet BACT through USEPA standards for PM, NO_x+NMHC (non-methane hydrocarbon), and CO and compliance with NSPS Subpart IIII. Further, the use of ultra-low sulfur diesel (ULSD) fuel (15 ppm sulfur) will limit emissions of SO_2.

D.8.6 Product Marking

Product marking emissions are generated by branding wheels fired by natural gas combustion (combined maximum burner capacity 0.4 MMBtu/hr) or inkjet labeling.

Individual pollutant emissions from combustion associated with branding wheels are very small (less than 0.05 lb/hr for individual criteria pollutants). The concentration of criteria pollutant emissions is below the threshold where add-on controls are applicable, and the addition of control devices cannot be cost effective for BACT. However, for the products of combustion, Roxul proposes to use clean fuel (natural gas) and no add-on controls as BACT to control $PM/PM_{10}/PM_{2.5}$, CPM, VOC, CO, SO_2, and NO_x combustion emissions.

The inkjet labeling system utilizes VOC-containing inkjet inks and VOC-containing ink cleaners. These emissions will be fugitive and will have a lower emission rate than the VOC emissions from the Fleece Application line. As such, add-on controls will not be cost effective. Potential material substitutions, such as dye sublimation inks (used for fabrics with high percentages of polyester fibers) and UV-curable inks (used for rigid substrates because of their susceptibility to cracking on a flexible substrate) are not suitable for this process. Therefore, good work practices are selected as BACT. Good work practices include storing VOC-containing materials in closed tanks or containers, cleaning up spills, and minimizing cleaning with VOC compounds. VOC emissions from inking will be limited to 9.48 tpy (8.60 tonne/yr) on a rolling 12-month basis.

D.8.7 Melting Furnace Cooling Tower and Gutter Cooling Tower – Filterable PM, PM_{10}, and $PM_{2.5}$

$PM/PM_{10}/PM_{2.5}$ emissions from cooling towers occur because wet cooling towers provide direct contact between the cooling water and the air passing through the tower. Some of the liquid water may be entrained within the air stream and carried out of the tower as "drift" droplets. Therefore, the particulate constituent (suspended and dissolved solids) of the drift droplets may be classified as an emission.

Step 1 – Identify Potential Control Technologies

Control efficiencies for potentially applicable technologies are shown in the table below.

Control Type	Estimated $PM/PM_{10}/PM_{2.5}$ Control Efficiency
High efficiency drift/mist eliminators	0.001 – 0.0005% drift loss
Limit Total Dissolved Solids (TDS) Concentration in Circulating Water	Varies

- *High Efficiency Drift Eliminators* - High efficiency drift eliminators remove entrained water droplets from the air, thus, reducing PM, PM_{10}, and $PM_{2.5}$ emissions. Types of drift eliminators include herringbone (blade-type), wave form, and cellular (or honeycomb) designs. Drift eliminator system materials of construction may include ceramics, fiber reinforced cement, fiberglass, metal, plastic, or wood. Typically, drift eliminators are constructed of polyvinyl chloride plastic material, which effectively eliminates corrosion. Drift eliminators also incorporate ultraviolet inhibitors to resist cracking and degradation due to sunlight. Drift eliminator system designs may include other features, such as corrugations and water removal channels, to enhance the drift removal further. The drift rate as a percentage of circulating water flow rates varies with the specific project, and typically ranges from 0.01 to 0.0005% of circulating water flow rates. Higher efficiency drift eliminators can achieve drift loss rates of 0.001% to 0.0005% of the circulating water flow rates.

- *Limiting TDS Concentrations in the Circulating Water* - In general, water droplets released as drift from wet cooling towers contain TDS concentrations equivalent to the solids concentrations in the circulating water. Dissolved solids can accumulate in the cooling water due to the following:
    - An increase in the concentration of dissolved solids in the make- up water as the circulating water evaporates;
    - Adding anti-corrosion additives to the cooling water; and/or
    - Adding anti-biocide additives to the cooling water.

Limiting the TDS concentration in the cooling water can reduce particulate emissions.

Drift/mist eliminators are the most commonly used control technique for $PM/PM_{10}/PM_{2.5}$ emissions from cooling towers. A typical drift loss for cooling towers is 0.001%.

Step 2 – Eliminate Technically Infeasible Options

All proposed control technologies are technically feasible.

Step 3 – Rank Remaining Technically Feasible Control Options

The remaining control technologies for minimizing PM, PM_{10}, and $PM_{2.5}$ emissions from the cooling towers are ranked in order of most effective to least effective, as follows:

1. High Efficiency Drift Eliminators (0.001% of circulating flow).
2. Limiting TDS Concentration in the circulating water.

Step 4 – Evaluate Remaining Control Technologies

High Efficiency Drift/Mist Eliminators

As previously discussed, there is a loss of water to the environment due to the evaporative cooling process. Trace chemicals and solids in the water droplets are emitted as PM. A drift eliminator is designed to capture the water droplets; thus, controlling the amount of total liquid drift. Drift eliminators cause the droplets to change direction and lose velocity at impact on the blade walls and fall back into the cooling tower. A review of the RBLC database and several other recently permitted cooling towers throughout the U.S. indicates that a high efficiency drift eliminator, achieving a drift rate of 0.001% is BACT for PM emissions from a cooling tower. Therefore, BACT for the cooling towers is proposed to be the top ranked control, high efficiency mist eliminators with a drift loss of 0.001%.

BACT Limit Overview

In the RBLC, BACT for cooling towers at certain energy centers, power plants, and refineries is selected as mist eliminators with a drift rate of 0.0005% instead of the typical drift rate of 0.001%. As previously mentioned, cooling tower particulate emissions depend not only on water circulation flow, but also drift rate and TDS content. According to RBLC search results, the typical circulating water rate associated with these units at energy-related facilities is over 100,000 gallons per minute (gpm). Specific examples include: Okeechobee Clean Energy Center's Mechanical Draft Cooling Tower with a flow rate of 465,815 gpm and a maximum TDS concentration of 35,000 ppm and Oregon Clean Energy Center's Mechanical Draft Cooling Tower with a flow rate of 322,000 gpm and a TDS of 2,030.5 ppm. A system with a lower water circulation rate can have a relatively higher particulate emissions rate if the TDS concentration is high. For example, Energy Answers Arecibo, LLC's Wet Cooling Tower has a flow rate of 65,150 gpm and a TDS concentration of 16,100 ppm. Each of these specific cooling tower examples with a drift rate of 0.0005% have an hourly emission limit ranging from 1.03 lb PM_{10}/hr (4.5 tons per year) up to 1.79 lb PM_{10}/hr (7.84 tons per year). The hourly emission rates from the Melting Furnace Cooling Tower and Gutter Cooling Tower will be a fraction of these rates (0.01 lb/hr or less).

Based on the circulating water flow rate, the TDS content, and drift rate, the emission rate from each cooling tower is 0.04 tpy of PM_{10} or less and 0.02 tpy of $PM_{2.5}$ or less; therefore, a drift loss of 0.001% is appropriate as BACT and is consistent with recent BACT determinations in the RBLC. If the circulating water flow rate or TDS concentration were significantly higher, then a drift loss of 0.0005% might be considered appropriate.

Step 5 – Selection of BACT

Roxul proposes to utilize a high efficiency drift/mist eliminator with 0.001% drift loss as BACT to control PM/PM_{10}/$PM_{2.5}$ emissions from the Melting Furnace Cooling Tower and Gutter Cooling Tower. Proposed compliance demonstration methods are summarized in Attachment O.

D.8.8 Pre-Heat Burner - Filterable PM, PM_{10}, $PM_{2.5}$, and CPM

A small indirect-fired natural gas fired preheat burner is used to warm the Melting Furnace baghouses to prevent condensation prior to operation. PM emissions from combustion are primarily the result of incomplete combustion, though PM emissions are also produced from the carryover of noncombustible trace constituents in the fuel (such as ash and metallic additives). Natural gas contains a very small amount of noncombustible trace constituents that result in PM emissions.

Step 1 – Identify Potential Control Technologies

The following technologies are potentially available control technologies for $PM/PM_{10}/PM_{2.5}$ emission controls for natural gas-fired heat transfer units.

Control Type	Estimated $PM/PM_{10}/PM_{2.5}$ and CPM Control Efficiency
Fabric filter (baghouse)	95-99+% (As low as 0.001 gr/dscf)
Wet scrubber or high efficiency Venturi scrubber	70-99% (<0.01 gr/dscf)
ESP	>98% (0.004 – 0.01 gr/dscf)
Clean fuel and good combustion practices	Varies

Descriptions of these controls were previously discussed in Sections D.3.1 and D.8.1.

Step 2 – Eliminate Technically Infeasible Options

Fabric Filter (Baghouse)

A baghouse is a post-combustion control technology that utilizes a fine mesh filter to remove particulate emissions primarily from large volume gas streams containing high particulate concentrations. No examples have been found where a baghouse has been applied to an indirect natural gas fired heat transfer unit due to the reduced volume and minimal particulate concentration of the associated exhaust gas stream. Therefore, baghouse technology is not technically feasible for the preheat burner.

ESP

ESP is a post-combustion particulate emissions control most readily applied to large volume gas streams containing high particulate concentrations. No examples have been found where an ESP has been applied to an indirect natural gas fired heat transfer unit due to the reduced volume and minimal particulate concentration of the associated exhaust gas stream. Therefore, ESP is not technically feasible for the preheat burner.

Wet Scrubber or High Efficiency Venturi Scrubber

For relatively small natural gas-fired sources, post-combustion controls, such as wet scrubbers are both technically infeasible and impractical due to the high pressure drops associated with these units and the low concentrations of $PM/PM_{10}/PM_{2.5}$ present in the exhaust gas.

Step 3 – Rank Remaining Technically Feasible Control Options

1. Clean fuel (natural gas) and good combustion practices.

Step 4 – Evaluate Remaining Control Technologies

Clean Fuel and Good Combustion Practices

Because emissions of PM are small, add-on controls would not be necessary and would be considerably cost prohibitive. During the review of available control technologies for combustion sources at similar plants, no determinations were found for the use of add-on controls to reduce PM emissions from natural gas-fired equipment. Therefore, Roxul considers BACT for the Preheat Burner to be the use of natural gas, a clean-burning fuel with low PM emissions, and good combustion practices.

Step 5 – Selection of BACT

Roxul proposes to use clean fuel (natural gas) and good combustion practices with no add-on controls as BACT for $PM/PM_{10}/PM_{2.5}$ emissions from the pre-heat burner. Proposed compliance demonstration methods are summarized in Attachment O.

D.8.9 Pre-Heat Burner – CO, VOC

CO and VOC emissions from combustion result from incomplete combustion caused when some of the fuel is only partially burned.

Step 1 – Identify Potential Control Technologies

The most stringent control technology used to control CO emissions from combustion is catalytic oxidation. Catalytic oxidation systems are also used to reduce VOC and organic HAP emissions. The following technologies are potentially available control technologies for CO and VOC emission controls for natural gas combustion sources.

Control Type	Estimated CO/VOC Control Efficiency
Thermal oxidizer (afterburner)	98-99+%
Recuperative thermal oxidizer	98-99+%
Regenerative thermal oxidizer	95-99%
Catalytic oxidizer	90-99%
Clean fuel and good combustion practices	Varies

Except for clean fuel, descriptions of these controls were previously discussed in Section D.3.2. Clean fuel and good combustion practices are discussed in Section D.8.1.

Step 2 – Eliminate Technically Infeasible Options

Catalytic Oxidizer

Catalytic oxidation is a post-combustion control technology that utilizes a catalyst to oxidize CO and VOC into CO_2 or H_2O. The technology has most commonly been applied to natural gas fired combustion turbines. No examples were identified where add-on control technology has been applied to an indirect natural gas-fired heat transfer unit. Because of the low quantities of CO and VOC emissions and the limited use of the boilers, the use of catalytic oxidation technology is determined to be not feasible.

Thermal Oxidizer (Afterburner), Recuperative Thermal Oxidizer, and Regenerative Thermal Oxidizer

For relatively small natural gas-fired sources, post-combustion controls, such as thermal oxidizers, recuperative thermal oxidizers, and regenerative thermal oxidizers are both technically infeasible and impractical due to the relatively small quantities of CO and VOC present in the exhaust gas.

Step 3 – Rank Remaining Technically Feasible Control Options

1. Clean fuel (natural gas) and good combustion practices.

Step 4 – Evaluate Remaining Control Technologies

Clean Fuel and Good Combustion Practices

Add-on controls, even if feasible, are not typically required for combustion sources fired with natural gas. During the review of available control technologies for combustion sources at similar plants, no determinations were found for the use of add-on controls to reduce CO and VOC emissions from natural gas-fired equipment. Therefore, Roxul proposes that BACT for CO and VOC emissions from the preheat burner be limited to the use of natural gas (a clean-burning fuel with low CO and VOC emissions), good combustion practices, and a numerical emission limit of 84 lb CO/MMscf (1,346 kg/MMsm^3) natural gas.

Step 5 – Selection of BACT

Roxul will utilize clean fuel (natural gas) and good combustion practices with no add-on controls, and a numerical emission limit of 84 lb CO/MMscf (1,346 kg/MMsm^3) natural gas as BACT for CO and VOC emissions from the pre-heat burner. Proposed compliance demonstration methods are summarized in Attachment O.

D.8.10 **Pre-Heat Burner – SO_2**

The preheat burner oxidizes sulfur compounds present in natural gas into SO_2. The control of SO_2 emissions is most directly associated with using a low sulfur fuel such as natural gas. Potential SO_2 emissions are directly related to the sulfur content of fuels. Minimizing fuel sulfur content through the use of low sulfur diesel fuels or natural gas has been determined to be BACT for many combustion processes, including indirect natural gas-fired heat transfer units. Therefore, Roxul proposes use of low sulfur fuel (pipeline quality natural gas, as supplied) as BACT for the natural gas-fired pre-heat burner.

D.8.11 *Pre-Heat Burner – NO_x*

The principle pollutant generated by combustion of natural gas in the boilers is NO and NO_2, collectively referred to as NO_x. The majority of NO_x produced during combustion is NO (95%), but once emitted into the atmosphere, NO reacts to form NO_2.

Step 1 – Identify Potential Control Technologies

The following technologies are determined to be potentially available control technologies for NO_x emission controls from the preheat burner.

Control Type	Estimated NO_x Control Efficiency
SCR	70-95%
SNCR	40-75%
Low NO_x burners	30-40%
Ultra-Low NO_x burners	80–90%
Good combustion practices	Varies

Descriptions of these controls were previously discussed in Section D.3.4. and Section D.4.4.

Step 2 – Eliminate Technically Infeasible Options

SCR

SCR is a post-combustion technology that reduces NO_x emissions by reacting NO_x with ammonia in the presence of a catalyst. SCR technology has been most commonly applied to larger boilers and to natural gas-fired combustion turbines. The outlet gas temperature will be substantially below that required for SCR. A precious metal catalyst may be feasible for SCR at a lowered temperature and a reduced NO_x control performance, but substantial reheat of the gas stream would be required. Therefore, SCR is not technically feasible for the small pre-heat burner.

SNCR

SNCR is a post-combustion NO_x control technology where ammonia or urea is injected into the exhaust to react with NO_x to form N_2 and water without the use of a catalyst. Use of this technology requires uniform mixing of the reagent and exhaust gas within a narrow temperature range. Operations outside of this temperature range will significantly reduce removal efficiencies and may result in ammonia emissions or increased NO_x emissions. No examples were found where SNCR has been applied to a small natural gas-fired burner. There is no appropriate temperature range zone for SNCR. Therefore, SNCR is not technically feasible for the small pre-heat burner.

For relatively small natural gas-fired sources, post-combustion controls, such as SCR and SNCR are both technically infeasible and impractical due to the relatively small quantities of NO_x present in the exhaust gas.

ULNB

ULNB cannot be used in the Pre-Heat Burner because it is an open air system using direct combustion. ULNB would have little or no reduction beyond baseline low NO_x emissions in an open air application.

Step 3 – Rank Remaining Technically Feasible Control Options

1. Low NO_x burners.
2. Good combustion practices.

Step 4 – Evaluate Remaining Control Technologies

BACT Limit Overview

RBLC search results for NO_x BACT emission limits for small natural gas fired sources indicate that the typical BACT the emission rate established for small natural gas fired burners (approximately 5 MMBtu/hr) is 0.1 lb/MMBtu (60 ppmvd @ 3% O_2) with good combustion practices and no add-on control.

LNB

LNB are applicable, economical, and will be employed for the Pre-Heat Burner. Low NO_x burners will be installed to meet 60 ppmvd at 3% O_2 based on manufacturer specification.

Good Combustion Practices

Good combustion practices are applicable, economical, and will be employed for the Pre-Heat Burner. Good combustion practices include activities such as maintaining combustion equipment according to the manufacturer's instructions and adjusting air-to-fuel ratio per the manufacturer's recommendations.

Step 5 – Selection of BACT

Roxul proposes to implement good combustion practices and LNB at 60 ppmvd @ 3% O_2 for NO_x emissions from the Pre-Heat Burner.

D.8.12 Miscellaneous Facility-wide Storage Tanks

Roxul proposes BACT for these emission units (refer to Section 2 of the application for a complete list) to be use of good operating practices with no add-on controls. All tanks that store volatile organic liquids at the Roxul facility will have capacities less than 19,813 gallons and are therefore not subject to NSPS

Subpart Kb. VOC emissions from these storage tanks are very small. As a result, the addition of control devices cannot be cost effective.

D.9 GREENHOUSE GAS BACT ANALYSIS

The GHG BACT analysis will be conducted using the same five-step "top-down" process outlined in Section D.1. In the USEPA document, *PSD and Title V Permitting Guidance for Greenhouse Gases*, potentially applicable control alternatives have been identified and evaluated according to the following three categories:

1. Inherently lower-emitting processes/management practices and methods/system designs;
2. Add-on controls; and
3. Combinations of inherently lower emitting processes/practices/ designs and add-on controls.

The BACT analysis should consider potentially applicable control techniques from these three categories to capture a broad array of potential options for pollution control. An important consideration for mineral wool production facilities is the source definition. USEPA permit guidance indicates that the Clean Air Act (CAA) does not provide latitude for a permitting authority to redefine a source as part of a BACT evaluation. Specifically, USEPA recognizes the following:

> *"a ... list of options need not necessarily include inherently lower polluting processes that would fundamentally redefine the nature of the source proposed by the permit applicant."*[31]

A series of white papers have been developed by the USEPA that summarize readily available information on control techniques and measures to mitigate GHG emissions from specific industrial sectors. These white papers are intended to provide basic information on GHG control technologies and reduction measures to assist regulatory agencies and regulated entities in implementing technologies or measures to reduce GHGs under the CAA, particularly in permitting under the Prevention of Significant Deterioration (PSD) program and the assessment of BACT. Of interest for this BACT analysis, USEPA has developed a white paper for the Portland cement industry, *Available and Emerging Technologies for Reducing Greenhouse Gas Emissions from the Portland Cement Industry*. Although the mineral wool sources are not generally similar to Portland cement sources, the processes share conceptually similar characteristics; therefore, similar CO_2e emissions controls may be relevant.

Only technologies that are relevant to the proposed equipment and fit within the business objectives of the facility should be considered in Step 1 of a BACT evaluation. For example, factors such as fuel type (coal versus solar or wind)

[31] PSD and Title V Permitting Guidance for Greenhouse Gases, EPA-457/B-11-001. Office of Air Quality Planning and Standards, Air Quality Policy Division, Research Triangle Park, NC, March 2011. Available on-line at: https://www.epa.gov/sites/production/files/2015-12/documents/ghgpermittingguidance.pdf.

would be considered part of the "source definition" for a melting furnace. In general, there are two strategies available to minimize GHGs for mineral wool production: (1) add-on control via carbon capture systems and (2) energy efficiency methods.

Although USEPA has historically interpreted the BACT requirement to be inapplicable to secondary emissions, which do not come from the source itself, energy efficient methods should be considered and can be classified in two categories. The first category includes technologies or processes that maximize the energy efficiency of the individual emissions unit and the second category includes energy efficiency improvements that can improve utilization of thermal energy and electricity that is generated and used on site. USEPA recommends consideration of process improvements for a facility's higher-energy-using equipment, processes, or operations. The Melting Furnace will be the most energy-intensive operation, accounting for 62.5% of the facility's GHG emissions; therefore, energy efficient measures pertaining to the melting operation will have the most direct impact on GHG emissions and are included in this analysis.

D.9.1 GREENHOUSE GAS EMISSIONS

The GHG Tailoring Rule regulates emissions from six (6) covered GHG pollutants: CO_2, methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorinated compounds (PFCs), and sulfur hexafluoride (SF_6). GHG emissions associated with combustion equipment are limited to CO_2, CH_4 and N_2O.

Carbon dioxide emissions are created in various ways, including as a by-product of burning fossil fuels and biomass, as well as from land-use changes and other industrial and natural processes. CO_2 is formed through the complete oxidation of organic material. All fossil fuels contain significant amounts of carbon, and during combustion, the fuel carbon is oxidized into CO and CO_2. Full oxidation of fuel carbon to CO_2 is deemed the most acceptable emission by some government agencies because CO has long been a regulated pollutant with established adverse health impacts, and because full combustion releases more useful energy within the process, maximizing energy conservation and efficiency.

Methane emissions result from incomplete combustion. Incomplete combustion can also result in emissions of PM, CO, and organic HAP.

Nitrous oxide emissions from combustion result primarily from low temperature combustion (between temperatures of 900 to 1,700°F) and conditions of excess O_2.

D.9.2 Description of CO_2e Control Technologies

Global Warming Potentials (GWPs) are used to calculate CO_2e to normalize emissions of pollutants such as CH_4 and N_2O, which are deemed to have a greater detrimental impact on a mass basis than CO_2. Potential control options are addressed for CO_2e below. Because the primary GHG emitted by Roxul's mineral wool production facility will be CO_2, the control technologies and measures presented in this section focus on CO_2 control technologies.

D.9.2.1 CO_2 Control Technologies

Discussions of CO_2 control technologies and other measures are presented below.

Carbon Capture and Sequestration

Carbon capture and sequestration (CCS) can make a contribution to the overall GHG reduction effort by reducing the emissions of CO_2 from the use of fossil fuels. CCS is the only potentially available add-on control option to reduce large-scale direct emissions from industrial processes.[32] CCS is the long-term isolation of fossil fuel CO_2 emissions from the atmosphere through capturing and storing the CO_2 deep in the subsurface of the Earth. CCS is made up of three key stages:

1. Capture: Carbon capture is the separation of CO_2 from other gases produced when fossil fuels are combusted. Post-combustion CO_2 separation can be performed with chemical absorption systems using aqueous solution of amines as chemical solvents, or physical absorption systems using methanol or other solvents.
2. Transport: After separation, CO_2 is compressed to facilitate transportation and storage if a locally available site for direct injection is unavailable. After compression, CO_2 is transported via pipeline to a suitable geologic storage site.
3. Storage: At a storage site, CO_2 is injected into deep underground rock formations, often at depths of one (1) km or more. Appropriate storage sites include depleted oil fields, depleted gas fields, or rock formations which contain a high degree of salinity (saline formations). These storage sites generally have an impermeable rock above them, with seals and other geologic features to prevent CO_2 from returning to the surface. Monitoring, reporting, and verification are important to demonstrate that CO_2 is safely stored.

Energy Efficiency Measures

Thermal efficiency is an emissions reduction strategy focused on increasing energy efficiency. Higher thermal efficiency means less fuel is required for a given output, which directly results in lower GHG emissions. Important design factors vary depending on the emissions source.

[32] The Global Status of CCS: 2016 Summary Report. Global CCS Institute, Canberra, Australia, November 2016. Available on-line at: http://hub.globalccsinstitute.com/sites/default/files/publications/201158/global-status-ccs-2016-summary-report.pdf

In addition to maximizing thermal efficiency, certain measures may be implemented to maintain energy efficient operations. These measures may be related through technologies, processes, and practices at the emitting unit and are discussed in detail, depending on the emissions source. Consideration must be given to the individual and overall impact of various energy efficient measures to ensure a source is constructed and operated in a manner consistent with the energy efficient goals determined to be BACT. Energy efficiency measures were identified based on recent permit applications, European Commission Joint Research Centre's "Best Available Techniques (BAT) Reference Document for the Manufacture of Glass," and USEPA's Portland cement industry guidance document.

Lower Carbon Fuels

$CO_2$is produced as a combustion product of any carbon containing fuel. All fossil fuels contain varying amounts of fuel-bound carbon that is converted during the combustion process to produce CO and CO_2. However, the use of lower carbon content gaseous fuels such as pipeline-quality natural gas, compared to the use of higher carbon containing fuels such as coal, pet-coke or residual fuel oils, can reduce CO_2 emissions from combustion. The use of lower carbon containing fuels can be an effective means to reduce the generation of CO_2 during the combustion process for sources with natural gas combustion capabilities.

D.9.2.2 CH_4 Control Technologies

Specific technologies and mitigation approaches for CH_4 vary by emission source due to different characteristics and emission processes. CH_4 emissions can be reduced by operating combustion processes with higher flame temperatures and higher excess O_2 levels. Available control technologies for the control of CH_4 emissions are the same as for the control of CO and VOC emissions, and include good combustion practices, oxidation catalysts, and thermal oxidation. Unfortunately, techniques for reducing CH_4 emissions can increase NO_x emissions. Consequently, achieving low CH_4 and low NO_x emission rates is a balancing act in combustion process design and operation. In general, installing controls on combustion sources for CH_4 emissions alone would not be cost-effective. Mitigation options can include: technology or equipment upgrades; improvement of management practices; and improvement of operational procedures.

D.9.2.3 N_2O Control Technologies

N_2O is generally emitted from industry through fossil fuel combustion, so technological upgrades and fuel switching are effective ways to reduce industry emissions of N_2O. N_2O emissions can be minimized when combustion temperatures are kept high (above 1,475°F) and excess O_2 is kept to a minimum (less than 1%). The control of N_2O emissions is primarily achieved through reductions in fossil fuel consumption through energy efficiency and energy saving measures. Because N_2O emissions will be a small fraction of the GHG emissions produced, installing controls for N_2O emissions alone would not be cost-effective.

D.9.3 Energy Improvements for Facility Operations

Energy efficiency improvements can be made by effectively managing the energy used in facility operations. Roxul will work to utilize energy optimizations and reduce off site energy demand. While Roxul works to further energy efficiency in any way possible, the energy efficiency improvements listed below are not considered BACT for on-site emission sources. These energy efficiency improvements generally improve off-site or secondary GHG emissions and are discussed for a complete overview of the facility.

Table D-9-1 lists energy efficiency improvements that are potentially applicable for operations at the Roxul Facility, along with a description of the energy efficiency measures and proposed methods for implementation.

Table D-9-1 Energy Efficiency Improvements for Operations at the Roxul Facility

Energy Efficiency	Description	Proposed Implementation
High Efficiency Motors	A motor management plan can reduce electricity use and save in energy and maintenance costs.	National Electrical Manufacturers Association (NEMA) or equivalent (IE3) motors will be applied for all standard motors (with exceptions for specific process integrated equipment).
Variable Frequency Drives (VFDs)	Variable frequency drives can reduce energy consumption and therefore reduce CO_2 emissions.	VFDs will be used for controlling and optimization of process.
Optimization of Compressed Air Systems	Implementing an optimized design and control system for compressed air systems and other efficiency improvements can reduce energy consumption.	Roxul plans to implement an optimized design and control system with distribution system for compressed air.
Lighting System Efficiency Improvements	Automated lighting controls and lights with more efficient bulbs can reduce energy use. For example, replacing T-12 lights with T-8 lights, replacing mercury lights with metal halide or high pressure sodium lights, and/or replacing electronic ballasts with magnetic ballasts can reduce energy consumption.	Roxul plans to use automated lighting controls and lights with efficient bulbs when practical.
Use of Thermal Oil System	Indirect heat transfer will be done by a thermal oil system as a pre-heating transfer of energy and to extract heat for heat recovery.	Roxul plans to use thermal oil system to heat buildings.

Roxul will use energy efficient electric equipment (motors and fans) and controls where feasible and practical to reduce power consumption.

D.9.4 GHG BACT Determination For Melting Furnace

Mineral wool production is a high temperature, energy-intensive process; however, environmental benefits associated with the products include energy savings during the consumer usage. The energy-saving benefits of mineral wool products are not quantified in this analysis, but are documented and readily available. CO_2e emissions from the melting furnace are generated primarily from fuel combustion, the decomposition of carbonates, and from the oxidation of other carbon containing raw materials in the batch. Emissions of CO_2e are strongly dependent on the energy efficiency of the melting process.

Step 1 - Identify Potential Control Technologies

Based upon this review of BACT emission limits and control technologies for similar operations, the following control technologies are potentially available for reducing CO_2e emissions from the Melting Furnace:

1. Carbon capture and sequestration;
2. Energy efficiency measures
3. Lower carbon fuels

A description of each of the identified technologies or processes is presented previously in Section D.9.2.

Carbon capture has not been demonstrated for mineral wool manufacturing facilities and is not commercially available for mineral wool melting furnaces. It is unknown if this technology is viable for mineral wool facilities, particularly due to the relatively high criteria pollutant loading in the exhaust stream; however, CCS is evaluated further.

Step 2 - Eliminate Technically Infeasible Options

The technical feasibility of each control strategy identified under Step 1 of the BACT analysis has been evaluated by reviewing whether the specific technology is available for the application and is effective at reducing CO_2 emissions. The following control technologies have been determined to be not technically feasible and have been eliminated from further consideration.

Lower carbon fuels

Coal and natural gas are the predominant fuels that will be used in the melting process. Changing fuels could reduce GHGs; however, these design changes would fundamentally redefine the process of a coal/natural gas/oxy-fired

Melting Furnace. The use of coal as a combustion fuel, in preference over PET coke, results in fewer GHG emissions per unit of energy output. This property is reflected in 40 CFR Part 98, Table C-1 (the Mandatory Reporting Rule for Emissions of Greenhouse Gases), where coal is ranked as having a lower CO_2e generation rate than coke (21.68% less). Natural gas, the fuel that results in the lowest GHG emissions per unit energy output, is the primary fuel used elsewhere in the plant.

A reduction in CO_2 emissions could be realized by switching from a traditional fossil fuel to a biomass fuel (such as animal meal, waste wood products, sawdust, and sewage sludge), which could be considered to be a carbon-neutral fuel. Roxul is currently researching and will conduct small scale testing on biofuels for this purpose; however, these biomass fuels must have sufficient heating value and consistent quality to reach the required Melting Furnace temperature. As such, biofuels are in the development stage and are not technically feasible.

With respect to the use of "clean fuels" on page 27 of the GHG guidance document, USEPA states:

> *The CAA includes "clean fuels" in the definition of BACT. Thus, clean fuels which would reduce GHG emissions should be considered, but EPA has recognized that the initial list of control options for a BACT analysis does not need to include "clean fuel" options that would fundamentally redefine the source. Such options include those that would require a permit applicant to switch to a primary fuel type (i.e., coal, natural gas, or biomass) other than the type of fuel that an applicant proposes to use for its primary combustion process.*

Therefore, based on USEPA policies and guidance, the use of lower carbon containing fuels is not an available or technically feasible control alternative for this project, since the use of other fuels would fundamentally redefine the project.

Carbon Capture with Dedicated Sequestration

Dedicated geological sequestration of CO_2 requires close proximity to a favorable geologic formation. The proposed Roxul facility will be located in the Eastern Mesozoic Rift Basins, which neighbors the Eastern Mid-Continent area. A recent report from the US Geological Survey (USGS)[33], National Assessment of Geologic Carbon Dioxide Storage Resources, indicates that within the area of the Eastern Mesozoic Rift Basins, there is potential for subsurface CO_2 storage capacity that is technically accessible (only buoyant trapping storage resources). The Eastern Mesozoic Rift Basins only accounts for less than 1% of potential buoyant trapping storage capacity within the United States. Currently, there are no facilities actively using these types of storage resources in the Eastern Mesozoic Rift Basins.

[33] National Assessment of Geologic Carbon Dioxide Storage Resources, US Department of the Interior, June 2013, revised September 2013. Available on-line at: http://pubs.usgs.gov/circ/1386/

In the neighboring Eastern Mid-Content area, there is potential for subsurface CO_2 storage capacity that is technically accessible (both buoyant and residual trapping storage resources). The Eastern Mid-Continent only accounts for less than 8% of potential buoyant and residual trapping storage capacity within the United States. The Appalachian Basin is closest basin that has been assessed, and is located approximately 200 miles away. Roxul's facility will not be located within the boundaries of this basin.

A geologic validation phase CO_2 storage project[34] was conducted to examine the feasibility of injecting CO_2 into three different deep rock formations in the Appalachian Basin at depths between 5,900 and 8,300 feet. The rock formations, the Oriskany, Salina, and Clinton/Medina, are representative of formations that are pervasive across the Appalachian Valley. The test indicated that porosity, void space, and permeability of target formations were lower than expected, and the validation test site did not have sufficient porosity and permeability for completing a small scale injection of 3,000 tons of CO_2 as planned. The results of this project provided valuable geologic understanding and lessons within an area of the Appalachian Basin that has few existing deep wells for geologic characterization. As a result, there are no nearby sites that have been characterized will sufficient CO_2 storage capacity[35] and there are no known favorable geologic formations near Roxul.

Without a nearby storage location, CCS with dedicated sequestration becomes infeasible.

Step 3 - Rank Remaining Technically Feasible Control Options

1. Carbon capture with transport and sequestration.
2. Energy efficiency measures.

Step 4 - Evaluate Remaining Control Technologies

Carbon Capture with Transport and Sequestration

CCS is a three-step process that includes the capture of CO_2 from industrial sources, transport of the captured CO_2 (usually in pipelines), and storage of that CO_2 in suitable geologic reservoirs. There are neither geologic reservoirs, nor pipelines dedicated to CO_2 transport available near the proposed project at this time. Notwithstanding the infrastructure issues, an economic evaluation of CCS is included in this BACT analysis for completeness purposes. The economic feasibility of transporting CO_2 for sequestration at a distant storage site depends on whether a long-distance pipeline exists within a reasonable distance of the facility to make a connection to the system.

[34] Midwest Regional Carbon Sequestration Partnership, R.E. Burger – Validation Phase. Available on-line at: http://www.mrcsp.org/r-e-burger-site---validation-phase

[35] NATCARB Viewer, October 2017. Available on-line at: http://www.natcarbviewer.com/

Approximate costs for capturing, transporting, and storing the CO_2 emissions from the Melting Furnace are shown in Appendix D-1. At approximately $176 per ton of CO_2e controlled, utilizing Carbon Capture with Transport and Sequestration for the Melting Furnace is found to be economically infeasible.

Energy Efficiency Measures

Roxul will implement unique process improvements with a focus on energy efficiency. The Melting Furnace is the most energy intensive unit operation in the facility, and as such, the process design maximizes the use of energy input.

Recycled wool waste can be remelted in the furnace without briquetting. Direct material input removes additional any energy requirements for briquetting and energy consumption will be further reduced because wool requires less energy to re-melt than raw materials. The furnace is able to utilize raw materials that do not exist in lump form, e.g., waste from production, thus saving virgin raw materials and reducing waste that would otherwise go to a landfill.

Table D-9-2 includes a list of energy efficiency measures that are applicable to the Melting Furnace, along with a description of the energy efficiency measures and proposed methods for implementation.

Table D-9-2 Melting Furnace Energy Efficiency Measures

Energy Efficiency Measure	Description	Proposed Implementation
Refractory Material Selection	The refractory material lining the Melting Furnace is the primary insulating material.	The Melting Furnace will be lined on the inside with a special refractory which maintains the heat in the combustion zone and minimizes heat transfer losses to the steel jacket and cooling water.
Use of Recycled Materials to Reduce Energy Demand	Recycled wool waste materials can melt at a lower temperature thus reducing the fuel energy demand.	Recycled wool will save raw materials in addition to demanding less energy to melt. Decomposition of carbonates to CO_2 will be reduced.
Heat Recovery from Process Streams	Exhaust streams with significant amounts of heat energy can be recovered for other heating purposes.	Multiple heat integration plans will be implemented using the unused heat from the melting process, such as: Hot off gas from melting is heat exchanged with Melting Furnace incoming air. Heat loss in Melting Furnace cooling water will be utilized to heat factory and office buildings, for domestic hot water.
Use of Preheaters	Preheaters allow higher energy transfer efficiency and lower fuel requirements.	Air to the Melting Furnace will be pre-heated.
Furnace Design	An excess of oxygen allows for the conversion of organic pollutants to CO_2, which possesses the lowest global warming potential.	The melt process is an oxidizing process, which operates with an excess of oxygen.
O_2 Enrichment	O_2 enrichment could increase combustion	O_2 enrichment will be used in the

Energy Efficiency Measure	Description	Proposed Implementation
	efficiency, reduce exhaust gas volume, and reduce available N_2 that may form NOx.	melting process to optimize complete combustion.

RBLC entries for various combustion sources were reviewed. These entries support a CO_2e emission limit basis of tpy or tpy rolling 12-month. A rolling 12-month basis is appropriate because there is no ambient air quality driver for reducing the averaging period for GHGs.

Step 5 - Selection of BACT

For CO_2e emissions generated from the Melting Furnace, BACT is selected to be the implementation of energy efficiency measures identified in Step 4. Energy efficiency measures are the only remaining technically and economically feasible control option for minimizing CO_2 emissions from the Melting Furnace. No adverse energy, environmental, or economic impacts are associated with the selected control option. The proposed numerical BACT emission limits are shown in Attachment O.

D.9.5 GHG BACT Determination For Natural Gas Combustion Units

CO_2e emissions from combustion units identified below will result from the combustion of natural gas. In a properly tuned boiler, heater, or oven, nearly all of the fuel carbon in natural gas is converted to CO_2 during the combustion process. This conversion is relatively independent of combustor type. Unconverted fuel carbon results in emissions of CH_4, CO, and/or other VOC emissions due to incomplete combustion. Even boilers and heaters operating with poor combustion efficiency produce insignificant amounts of CH_4, CO, and VOC compared to CO_2 levels. Thus, the following control analysis focuses on CO_2 emissions. The following sources utilize natural-gas fired burners and have been grouped together to streamline this GHG analysis:

- Pre-heat burner (IMF24)
- Curing Oven Burners (HE01, Curing Oven Afterburner, Curing Oven Circulation Burner #1, and Curing Oven Circulation Burner #2)
- Product Marking (P_Mark)
- High Oven A (RFNE3)
- High Oven B (RFNE9)
- Drying Oven 1 (RFNE4)
- Drying Oven 2 & 3 (RFNE6)
- Natural Gas Boiler 1 (CM03)
- Natural Gas Boiler 2 (CM04)
- RFN Building Heat (RFN10)

- Coal Mill Burner & Baghouse (IMF05)

Step 1 - Identify Potential Control Technologies

The following technologies and innovative processes were identified as potential control measures for CO_2e emissions associated with the natural gas combustion units.

1. Carbon Capture and Sequestration
2. Energy Efficiency Measures
3. Lower carbon fuels

Step 2 - Eliminate Technically Infeasible Options

The technical feasibility/infeasibility of each control strategy identified under Step 1 of the BACT analysis has been evaluated by reviewing whether the specific technology is available for the application and is effective at reducing CO_2 emissions.

Carbon Capture with Dedicated Sequestration

Dedicated geological sequestration of CO_2 requires close proximity to a favorable geologic formation. CCS with dedicated sequestration is technically infeasible for the reasons included in Section D.9.4.

Step 3 - Rank Remaining Technically Feasible Control Options

1. Carbon Capture with Transport and Sequestration.
2. Lower carbon fuels.
3. Energy Efficiency Measures.

Step 4 - Evaluate Remaining Control Technologies

Carbon Capture with Transport and Sequestration

The exhaust streams from each of the natural gas combustion sources will be relatively dilute in CO_2 content, compared to projects that typically utilize CCS. Additional processing of the exhaust gas will be required to implement CCS, especially for units containing process particulates in the gas stream.

CCS is a three-step process that includes the capture of CO_2 from power plants or industrial sources, transport of the captured CO_2 (usually in pipelines), and storage of that CO_2 in suitable geologic reservoirs. Post-combustion capture through amine absorption is available for CO_2 separation processes. Utilizing a long-distance pipeline to deliver captured CO_2 to sequestration sites would virtually eliminate CO_2 emissions from these combustion sources.

Approximate costs for capturing, transporting, and storing the CO_2 emissions from the natural gas combustion units are shown in Appendix D-1. At approximately $595 per ton of CO_2e controlled, utilizing CCS for the natural gas combustion units is found to be economically infeasible.

Lower Carbon Fuels

The use of natural gas as a combustion fuel, in preference over other fossil fuels such as oil or coal, results in fewer GHG emissions per unit of energy output. This property has been well documented, and is reflected in 40 CFR Part 98, Table C-1 (the Mandatory Reporting Rule for Emissions of Greenhouse Gases), where natural gas is ranked as having one of the lowest CO_2 generation rates of any of the fuels listed. Natural gas also has benefits over other fossil fuels from the perspective of other criteria pollutant emissions. The fuel for firing the proposed ovens, boilers, and heaters will be limited to natural gas fuel. Natural gas combustion results in significantly less CO_2 generation per unit of energy when compared to most other fuels.

Energy Efficiency Measures

Roxul will implement unique process improvements with a focus on energy efficiency. For example, the Curing Oven will be well insulated to reduce energy losses to the surroundings. The Curing Oven will use pre-heating chambers to reduce energy requirements and air will be recirculated prior to exiting. Controls will be used for temperature regulation in infrared zones and drying ovens.

Maximizing combustion efficiency reduces the consumption of fuel by optimizing the quantity of usable energy transferred from the fuel to the process. Combustion efficiency is maximized when the combustion zone is provided the best possible mix of fuel and air conditions, such as fuel/air ratio, fuel temperature, combustion air temperature, combustion zone pressure, and heat transfer area.

Good combustion practices are a subset of energy efficiency measures and are a potential control option because they improve the fuel efficiency of the proposed ovens, boilers, and heaters. These practices include:

- Maintaining a proper fuel supply system to minimize fluctuations in fuel quality;
- Ensuring good air/fuel mixing in the combustion zone;
- Monitoring and maintaining a proper operating temperature in the primary combustion zone; and
- Maintaining overall excess O_2 levels high enough to complete combustion while maximizing thermal efficiency.

Good operating and maintenance practices also improve the fuel efficiency of the ovens, boilers, and heaters. These practices include:

- Following documented operating practices recommended by the manufacturer and controlling operating parameters according to manufacturer specifications;
- Implementing documented recommended maintenance and repair guidelines, such as performing preventive maintenance and calibration checks on the fuel flow meters and performing preventive maintenance checks on the O_2 control analyzers; and
- Conducting tune-ups according to manufacturer's specifications to restore optimal high-efficiency, low-emissions performance.

RBLC entries for various combustion sources were reviewed. These entries support a CO_2e emission limit basis of tpy or tpy rolling 12-month. A rolling 12-month basis is appropriate because there is no ambient air quality driver for reducing the averaging period for GHGs.

Step 5 - Selection of BACT

For CO_2e emissions emitted from the natural gas combustion units, BACT is selected to be lower carbon fuel selection (natural gas) and energy efficiency measures, including the implementation of good combustion practices and good operating and maintenance practices. These are the remaining technically and economically feasible control options for minimizing CO_2e emissions associated with the ovens, boilers, and heaters. No adverse energy, environmental, or economic impacts are associated with these control options. Numerical BACT limits for CO_2e emissions are included in Attachment O.

D.9.6 GHG BACT Determination For Dry Ice Cleaning

Dry ice pellets will be used for cleaning via blasting onto specialty equipment, for example perforated filters. Emissions from the production of dry ice pellets and cleaning activities via blasting consist of fugitive CO_2.

Step 1 – Identify Potential Control Technologies

The following technologies and innovative processes were identified as potential control measures for CO_2e.

1. Energy Efficiency Measures

Step 2 – Eliminate Technically Infeasible Options

The identified control option is technically feasible.

Step 3 – Rank Remaining Technically Feasible Control Options

1. Energy Efficiency Measures.

Step 4 – Evaluate Remaining Control Technologies

Energy Efficiency Measures

The dry ice cleaning system will be appropriately designed to generate only the amount of CO_2 needed to clean the filter and no more. CO_2 is the most feasible cleaning material because the cooling effect created by the sublimation of the CO_2 pellets hardens the particles of mineral wool clinging to the surface of the filter net. As a result, the reduced resiliency of the particles absorbs less mechanical energy and increases the cleaning efficiency. CO_2 pellet blasting protects the integrity of the filter net. Alternative blasting materials, such as water, are used when possible, whereas CO_2 pellets are used when a more abrasive substance is required to remove particles. The use of CO_2 pellets results in a smaller volume of solid waste for disposal.

Step 5 – Selection of BACT

For CO_2e emissions from dry ice cleaning, BACT is selected to be energy efficiency measures, including the use of CO_2 pellets for cleaning efficiency and waste reduction. No adverse energy, environmental, or economic impacts are associated with this option. Numerical BACT limits for CO_2e emissions from Dry Ice Cleaning are included in Attachment O. A facility-wide rolling 12-month basis is appropriate because there is no ambient air quality driver for reducing the averaging period for GHGs and this source is represents a small fraction of GHG emissions at the facility.

D.9.7 GHG BACT Determination For Emergency Fire Pump Engine

This section describes a detailed, step-by-step BACT analysis for control of CO_2e emissions from the proposed firewater pump engine. One 197-hp emergency fire pump engine will be used for the facility's firewater system. The emergency fire pump engine will be a diesel-fuel fired unit and used for emergency purposes only except for periodic readiness and maintenance testing.

CO_2 emissions from the emergency fire pump engine will be produced from the combustion of hydrocarbons present in the diesel fuel. CH_4 emissions result from incomplete combustion of hydrocarbons present in the diesel fuel. N_2O emissions from diesel-fueled unit will be formed as a byproduct of combustion. Potential annual emission rates are based on a maximum operation of 500 hours of operation per year.

Step 1 – Identify Potential Control Technologies

The following technologies were identified as potential control measures for CO_2e emissions associated with the emergency fire pump engine.

1. Lower carbon fuel
2. Energy Efficiency Measures

Step 2 - Eliminate Technically Infeasible Options

Lower Carbon Fuel

While natural gas-fueled fire pump engines may provide lower CO_2e emissions per unit of power output, natural gas is not considered a technically feasible fuel for the emergency fire pump engine since it will be used in the event of a fire, when natural gas supplies may be interrupted. Because the fire pump engine is intended for emergency use, the most technically feasible fuel is diesel fuel.

Step 3 – Rank Remaining Technically Feasible Control Options

1. Energy efficiency measures.

Step 4 – Evaluate Remaining Control Technologies

Compliance with NSPS Subpart IIII is proposed as BACT for CO_2e. Energy efficiency measures, such as good combustion, operating, and maintenance practices for compression ignition engines, include appropriate maintenance of equipment and operating within the recommended air to fuel ratio recommended by the manufacturer. Using good combustion practices, in conjunction with proper maintenance, results in longer life of the equipment and more efficient operation. Therefore, such practices indirectly reduce GHG emissions by supporting operation as designed and with consideration of energy optimization practices. Good combustion practices and good maintenance practices as recommended by the fire pump engine manufacturer will be incorporated to minimize CO_2e emissions and maximize energy efficiency.

Step 5 - Select BACT

For emissions of CO_2e generated by combustion from the emergency fire pump engine, BACT is selected to be implementation of energy efficiency measures, such as good combustion practices and proper maintenance practices. Further, this new engine will be subject to the NSPS for Stationary Compression Ignition Internal Combustion Engines (40 CFR 60 Subpart IIII). Numerical BACT limits for CO_2e emissions are included in Attachment O. A facility-wide rolling 12-month basis is appropriate because there is no ambient air quality driver for reducing the averaging period for GHGs and this source is represents a small fraction of GHG emissions at the facility.

Best Available Control Technology – Supporting Tables
Appendix D-1

November 2017
Project No. 0408003

Environmental Resources Management
204 Chase Drive
Hurricane, West Virginia 25526
304-757-4777

Table D-1. MELTING FURNACE - CO - TO Control Evaluation

TOTAL ANNUAL COST SPREADSHEET PROGRAM--THERMAL INCINERATORS
COST BASE DATE: April 1988 [1]

VAPCCI (First Quarter 2007--Preliminary: [2]	149.4	Updated 1st Quarter 2007
CEPCI (January 2007)	509.7	
CEPCI (February 2017)	558.3	

INPUT PARAMETERS

-- Gas flowrate (scfm):	21414	Exhaust	
-- Reference temperature (oF):	77	Ambient	
-- Inlet gas temperature (oF):	302	Roxul	
-- Inlet gas density (lb/scf):	0.0739	Calculated	
-- Primary heat recovery (fraction):	0.70	Default for TO	
-- Waste gas heat content (BTU/scf):	0.0381	Based on (lb/hr):	11.21
-- Waste gas heat content (BTU/lb):	0.516	Calculated	
-- Gas heat capacity (BTU/lb-oF):	0.255	Default	
-- Combustion temperature (oF):	1400	Roxul	
-- Preheat temperature (oF):	1071	Calculated	
-- Fuel heat of combustion (BTU/lb):	21502	Methane	
-- Fuel density (lb/ft3):	0.0408	Methane	

DESIGN PARAMETERS

-- Auxiliary Fuel Requirement (lb/min):	8.780	Calculated
(scfm):	215.2	Calculated
-- Total Gas Flowrate (scfm):	21629	Calculated

CAPITAL COSTS

Equipment Costs ($):		
-- Incinerator:		
@ 0 % heat recovery:	0	
@ 35 % heat recovery:	0	
@ 50 % heat recovery:	0	
@ 70 % heat recovery:	258,818	
-- Other (auxiliary equipment, etc.):	0	
Total Equipment Cost--base:	258,818	
' ' ' --escalated:	529,763	
Purchased Equipment Cost ($):	625,121	
Total Capital Investment ($):	1,011,444	Includes Monitoring Equip

ANNUAL COST INPUTS

Operating factor (hr/yr):	8760	TO hr/yr
Operating labor rate ($/hr):	28.00	Operator wage
Maintenance labor rate ($/hr):	40.00	Maintenance wage
Operating labor factor (hr/sh):	1.5	Default
Maintenance labor factor (hr/sh):	1.5	Default
Electricity price ($/kwh):	0.066	EIA, July 2017
Natural gas price ($/mscf):	5.00	EIA, 10 Year Avg
Annual interest rate (fraction):	0.07	Default
Control system life (years):	20	Default
Capital recovery factor:	0.0944	Default
Taxes, insurance, admin. factor:	0.04	Default
Pressure drop (in. w.c.):	19.0	Default

ANNUAL COSTS

Item	Cost ($/yr)	Wt. Factor	W.F.(cond.)	
Operating labor	45,990	0.044	----	
Supervisory labor	6,899	0.007	----	
Maintenance labor	65,700	0.063	----	
Maintenance materials	65,700	0.063	----	
Natural gas	565,366	0.542	----	
Electricity	46,334	0.044	----	
Overhead	110,573	0.106		0.283
Taxes, insurance, administrative	40,458	0.039	----	
Capital recovery	95,473	0.092		0.130
Total Annual Cost	1,042,493	1.000		1.000

[1] Original equipment costs reflect this date.
[2] VAPCCI = Vatavuk Air Pollution Control Cost Index (for thermal incinerators) corresponding to year and quarter shown. Original equipment cost, purchased equipment cost, and total capital investment have been escalated to this data via the VAPCCI and control equipment vendor data.

[3] Because VAPCCI updates are no longer available, CEPCI are used to adjust costs from January 2007 to February 2017.
[4] CEPCI = Chemical Engineering Plant Cost Index.

Melting Furnace CO Controlled by TO

CAPITAL COST (Pollution Control Equipment)	Unit Cost	Basis	Total ($)
Purchased Equipment:			
Basic Equipment & Auxiliaries	A=	(1)	$529,763
Instrumentation & Controls	0.10A	(2)	$52,976
Sales Taxes	0.03A	(2)	$15,893
Freight	0.05A	(2)	$26,488
Total Purchased Equipment Cost		B =	$625,121
Direct Installation Costs:			
Foundations & Supports	0.08B	(2)	$50,010
Handling & Erection	0.14B	(2)	$87,517
Electrical	0.04B	(2)	$25,005
Piping	0.02B	(2)	$12,502
Insulation for Ductwork	0.01B	(2)	$6,251
Painting	0.01B	(2)	$6,251
Total Direct Installation Costs			$187,536
Indirect Installation Costs:			
Engineering	0.10B	(2)	$62,512
Construction & Field Expenses	0.05B	(2)	$31,256
Contractor Fees	0.10B	(2)	$62,512
Start-up	0.02B	(2)	$12,502
Performance Test	0.01B	(2)	$6,251
Emissions Monitoring Equipment		(3)	$5,000
Contingencies	0.03B	(2)	$18,754
Total Indirect Installation Costs			$198,787
TOTAL CAPITAL COSTS:		C =	$1,011,444
ANNUAL OPERATION & MAINTENANCE			
Operating Labor		(1)	$45,990
Supervisory Labor (15% of operating labor)		(1)	$6,899
Maintenance Labor		(1)	$65,700
Maintenance Materials (100% of maintenance labor)		(1)	$65,700
Natural Gas		(1)	$565,366
Electricity		(1)	$46,334
Overhead		(1)	$110,573
Taxes, Insurance, Administrative Costs		(1)	$40,458
TOTAL OPERATION AND MAINTENANCE COSTS			$947,019

Capital Recovery System: 0.0944 Assumes 7% compound interest rate and system useful life of 20 years.
Capital Recovery System: $95,473

Amoritized Annual Costs = Annual O & M Costs + System Capital Recovery
Amoritized Annual Costs = $1,042,493

References:
(1) Factor based on USEPA Office of Air Quality Planning and Standards Cost Spreadsheets, posted on the Internet 7/99
(2) Factor based on USEPA Office of Air Quality Planning and Standards Control Cost Manual (EPA 453/B-96-001).
(3) Added an estimate of $5,000 for emissions monitoring equipment to indirect installation costs.

Note: USEPA OAQPS Cost Spreadsheets calculate Total Capital Investment for Thermal Incinerators.

Melting Furnace Controlled by TO
Case 1 - CO Emissions

CAPITAL COST (Pollution Control Equipment)	Unit Cost	Basis	Total ($)
TOTAL CAPITAL COSTS:		C =	$1,011,444
ANNUAL OPERATION & MAINTENANCE			
Operating Labor		(1)	$45,990
Supervisory Labor (15% of operating labor)		(1)	$6,899
Maintenance Labor		(1)	$65,700
Maintenance Materials (100% of maintenance labor)		(1)	$65,700
Natural gas		(1)	$565,366
Electricity		(1)	$46,334
Overhead		(1)	$110,573
Taxes, Insurance, Administrative Costs		(1)	$40,458
TOTAL OPERATION AND MAINTENANCE COSTS			$947,019

Capital Recovery System: 0.0944 Assumes 7% compound interest rate and system useful life of 20 years.
Total Capital Recovery System: $95,473

Amoritized Annual Costs = Annual O & M Costs + System Capital Recovery
Amoritized Annual Costs = $1,042,493

Tons CO removed = 48.12
Cost Per Ton Removed = $21,664

References:
(1) Factor based on USEPA Office of Air Quality Planning and Standards CO$T-AIR Control Cost Spreadsheets, posted on the Clean Air Technology Center webpage 7/99.

Table D-2. MELTING FURNACE - VOC - TO Control Evaluation

TOTAL ANNUAL COST SPREADSHEET PROGRAM--THERMAL INCINERATORS
COST BASE DATE: April 1988 [1]

VAPCCI (First Quarter 2007--Preliminary: [2]	149.4	Updated 1st Quarter 2007
CEPCI (January 2007)	509.7	
CEPCI (February 2017)	558.3	

INPUT PARAMETERS

-- Gas flowrate (scfm):	21414	Exhaust	
-- Reference temperature (oF):	77	Ambient	
-- Inlet gas temperature (oF):	302	Roxul	
-- Inlet gas density (lb/scf):	0.0739	Calculated	
-- Primary heat recovery (fraction):	0.70	Default for TO	
-- Waste gas heat content (BTU/scf):	0.1044	Based on (lb/hr):	11.66
-- Waste gas heat content (BTU/lb):	1.41	Calculated	
-- Gas heat capacity (BTU/lb-oF):	0.255	Default	
-- Combustion temperature (oF):	1400	Roxul	
-- Preheat temperature (oF):	1071	Calculated	
-- Fuel heat of combustion (BTU/lb):	21502	Methane	
-- Fuel density (lb/ft3):	0.0408	Methane	

DESIGN PARAMETERS

-- Auxiliary Fuel Requirement (lb/min):	8.713	Calculated
(scfm):	213.6	Calculated
-- Total Gas Flowrate (scfm):	21627	Calculated

CAPITAL COSTS

Equipment Costs ($):		
-- Incinerator:		
@ 0 % heat recovery:	0	
@ 35 % heat recovery:	0	
@ 50 % heat recovery:	0	
@ 70 % heat recovery:	258,813	
-- Other (auxiliary equipment, etc.):	0	
Total Equipment Cost--base:	258,813	
" " " --escalated:	529,753	
Purchased Equipment Cost ($):	625,109	
Total Capital Investment ($):	1,011,425	Includes Monitoring Equip

ANNUAL COST INPUTS

Operating factor (hr/yr):	8760	TO hr/yr
Operating labor rate ($/hr):	28.00	Operator wage
Maintenance labor rate ($/hr):	40.00	Maintenance wage
Operating labor factor (hr/sh):	1.5	Default
Maintenance labor factor (hr/sh):	1.5	Default
Electricity price ($/kwh):	0.066	EIA, July 2017
Natural gas price ($/mscf):	5.00	EIA, 10 Year Avg
Annual interest rate (fraction):	0.07	Default
Control system life (years):	20	Default
Capital recovery factor:	0.0944	Default
Taxes, insurance, admin. factor:	0.04	Default
Pressure drop (in. w.c.):	19.0	Default

ANNUAL COSTS

Item	Cost ($/yr)	Wt. Factor	W.F.(cond.)	
Operating labor	45,990	0.044	---	
Supervisory labor	6,899	0.007	---	
Maintenance labor	65,700	0.063	---	
Maintenance materials	65,700	0.063	---	
Natural gas	561,043	0.540	---	
Electricity	46,331	0.045	---	
Overhead	110,573	0.107		0.284
Taxes, insurance, administrative	40,457	0.039	---	
Capital recovery	95,471	0.092		0.131
Total Annual Cost	1,038,163	1.000		1.000

[1] Original equipment costs reflect this date.
[2] VAPCCI = Vatavuk Air Pollution Control Cost Index (for thermal incinerators) corresponding to year and quarter shown. Original equipment cost, purchased equipment cost, and total capital investment have been escalated to this data via the VAPCCI and control equipment vendor data.

[3] Because VAPCCI updates are no longer available, CEPCI are used to adjust costs from January 2007 to February 2017.
[4] CEPCI = Chemical Engineering Plant Cost Index.

Melting Furnace VOC Controlled by TO

CAPITAL COST (Pollution Control Equipment)	Unit Cost	Basis	Total ($)
Purchased Equipment:			
Basic Equipment & Auxiliaries	A=	(1)	$529,753
Instrumentation & Controls	0.10A	(2)	$52,975
Sales Taxes	0.03A	(2)	$15,893
Freight	0.05A	(2)	$26,488
Total Purchased Equipment Cost		B =	$625,109
Direct Installation Costs:			
Foundations & Supports	0.08B	(2)	$50,009
Handling & Erection	0.14B	(2)	$87,515
Electrical	0.04B	(2)	$25,004
Piping	0.02B	(2)	$12,502
Insulation for Ductwork	0.01B	(2)	$6,251
Painting	0.01B	(2)	$6,251
Total Direct Installation Costs			$187,533
Indirect Installation Costs:			
Engineering	0.10B	(2)	$62,511
Construction & Field Expenses	0.05B	(2)	$31,255
Contractor Fees	0.10B	(2)	$62,511
Start-up	0.02B	(2)	$12,502
Performance Test	0.01B	(2)	$6,251
Emissions Monitoring Equipment		(3)	$5,000
Contingencies	0.03B	(2)	$18,753
Total Indirect Installation Costs			$198,784
TOTAL CAPITAL COSTS:		C =	$1,011,425
ANNUAL OPERATION & MAINTENANCE			
Operating Labor		(1)	$45,990
Supervisory Labor (15% of operating labor)		(1)	$6,899
Maintenance Labor		(1)	$65,700
Maintenance Materials (100% of maintenance labor)		(1)	$65,700
Natural Gas		(1)	$561,043
Electricity		(1)	$46,331
Overhead		(1)	$110,573
Taxes, Insurance, Administrative Costs		(1)	$40,457
TOTAL OPERATION AND MAINTENANCE COSTS			$942,692

Capital Recovery System: 0.0944 Assumes 7% compound interest rate and system useful life of 20 years.
Capital Recovery System: $95,471

Amoritized Annual Costs = Annual O & M Costs + System Capital Recovery
Amoritized Annual Costs = $1,038,163

References:
(1) Factor based on USEPA Office of Air Quality Planning and Standards Cost Spreadsheets, posted on the Internet 7/99
(2) Factor based on USEPA Office of Air Quality Planning and Standards Control Cost Manual (EPA 453/B-96-001).
(3) Added an estimate of $5,000 for emissions monitoring equipment to indirect installation costs.

Note: USEPA OAQPS Cost Spreadsheets calculate Total Capital Investment for Thermal Incinerators.

Melting Furnace Controlled by TO
Case 2 - VOC Emissions

CAPITAL COST (Pollution Control Equipment)	Unit Cost	Basis	Total ($)
TOTAL CAPITAL COSTS:		C =	$1,011,425
ANNUAL OPERATION & MAINTENANCE			
Operating Labor		(1)	$45,990
Supervisory Labor (15% of operating labor)		(1)	$6,899
Maintenance Labor		(1)	$65,700
Maintenance Materials (100% of maintenance labor)		(1)	$65,700
Natural gas		(1)	$561,043
Electricity		(1)	$46,331
Overhead		(1)	$110,573
Taxes, Insurance, Administrative Costs		(1)	$40,457
TOTAL OPERATION AND MAINTENANCE COSTS			$942,692

Capital Recovery System: 0.0944 Assumes 7% compound interest rate and system useful life of 20 years.
Total Capital Recovery System: $95,471

Amoritized Annual Costs = Annual O & M Costs + System Capital Recovery
Amoritized Annual Costs = $1,038,163

Tons VOC removed = 50.05
Cost Per Ton Removed = $20,743

References:
(1) Factor based on USEPA Office of Air Quality Planning and Standards CO$T-AIR Control Cost Spreadsheets, posted on the Clean Air Technology Center webpage 7/99.

Table D-3. MELTING FURNACE - CO - RTO Control Evaluation

TOTAL ANNUAL COST SPREADSHEET PROGRAM--REGENERATIVE THERMAL OXIDIZERS
COST BASE DATE: December 1988 [1]

VAPCCI (First Quarter 2007--Preliminary): [2]	141.5	Updated 1st Quarter 2007
CEPCI (January 2007)	509.7	
CEPCI (February 2017)	558.3	

INPUT PARAMETERS

-- Gas flowrate (scfm):	21414	Exhaust	
-- Reference temperature (oF):	77	Ambient	
-- Inlet gas temperature (oF):	302	Roxul	
-- Inlet gas density (lb/scf):	0.0739	Calculated	
-- Primary heat recovery (fraction):	0.95	Default for RTO	
-- Waste gas heat content (BTU/scf):	0.0381	Based on (lb/hr):	11.21
-- Waste gas heat content (BTU/lb):	0.516	Calculated	
-- Gas heat capacity (BTU/lb-oF):	0.255	Default	
-- Combustion temperature (oF):	1400	Roxul	
-- Heat loss (fraction):	0.01	Default	
-- Exit temperature (oF):	357	Calculated	
-- Fuel heat of combustion (BTU/lb):	21502	Methane	
-- Fuel density (lb/ft3):	0.0408	Methane	

DESIGN PARAMETERS

Auxiliary Fuel Requirement (lb/min):	1.245	Calculated
(scfm):	30.5	Calculated
Total Gas Flowrate (scfm):	21444	Calculated

TOTAL CAPITAL INVESTMENT ($) [3]
(Cost correlations range: 5000 to 500,000 scfm)

@ 85 % heat recovery--base:	0	
" " " --escalated:	0	
@ 95 % heat recovery--base:	1,048,302	
" " " --escalated:	1,781,999	Includes Monitoring Equip

ANNUAL COST INPUTS

Operating factor (hr/yr):	8760	RTO hr/yr
Operating labor rate ($/hr):	28.00	Operator wage
Maintenance labor rate ($/hr):	40.00	Maintenance wage
Operating labor factor (hr/sh):	1.5	Default
Maintenance labor factor (hr/sh):	1.5	Default
Electricity price ($/kwh):	0.066	EIA, July 2017
Natural gas price ($/mscf):	5.00	EIA, 10 Year Avg
Annual interest rate (fraction):	0.07	Default
Control system life (years):	20	Default
Capital recovery factor:	0.0944	Default
Taxes, insurance, admin. factor:	0.04	Default
Pressure drop (in. w.c.):	20.0	Default

ANNUAL COSTS

Item	Cost ($/yr)	Wt. Factor	W.F.(cond.)
Operating labor	45,990	0.069	----
Supervisory labor	6,899	0.010	----
Maintenance labor	65,700	0.099	----
Maintenance materials	65,700	0.099	----
Natural gas	80,184	0.121	----
Electricity	48,353	0.073	----
Overhead	110,573	0.167	0.445
Taxes, insurance, administrative	71,280	0.108	----
Capital recovery	168,208	0.254	0.361
Total Annual Cost	662,887	1.000	1.000

[1] Base total capital investment reflects this date.
[2] VAPCCI = Vatavuk Air Pollution Control Cost Index (for regenerative thermal oxidizers) corresponding to year and quarter shown. Base total capital investment has been escalated to this date via VAPCCI and control equipment vendor data.
[3] Source: Vatavuk, William M. ESTIMATING COSTS OF AIR POLLUTION CONTROL. Boca Raton, FL Lewis Publishers, 1990.

[4] Because VAPCCI updates are no longer available, CEPCI are used to adjust costs from January 2007 to February 2017.
[5] CEPCI = Chemical Engineering Plant Cost Index.

Melting Furnace CO Controlled by RTO

CAPITAL COST (Pollution Control Equipment)	Unit Cost	Basis	Total ($)
Purchased Equipment:			
Basic Equipment & Auxiliaries	A=	(1)	$935,361
Instrumentation & Controls	0.10A	(2)	$93,536
Sales Taxes	0.03A	(2)	$28,061
Freight	0.05A	(2)	$46,768
Total Purchased Equipment Cost		B =	$1,103,726
Direct Installation Costs:			
Foundations & Supports	0.08B	(2)	$88,298
Handling & Erection	0.14B	(2)	$154,522
Electrical	0.04B	(2)	$44,149
Piping	0.02B	(2)	$22,075
Insulation for Ductwork	0.01B	(2)	$11,037
Painting	0.01B	(2)	$11,037
Total Direct Installation Costs			$331,118
Indirect Installation Costs:			
Engineering	0.10B	(2)	$110,373
Construction & Field Expenses	0.05B	(2)	$55,186
Contractor Fees	0.10B	(2)	$110,373
Start-up	0.02B	(2)	$22,075
Performance Test	0.01B	(2)	$11,037
Emissions Monitoring Equipment		(3)	$5,000
Contingencies	0.03B	(2)	$33,112
Total Indirect Installation Costs			$347,155
TOTAL CAPITAL COSTS:		C =	$1,781,999
ANNUAL OPERATION & MAINTENANCE			
Operating Labor		(1)	$45,990
Supervisory Labor (15% of operating labor)		(1)	$6,899
Maintenance Labor		(1)	$65,700
Maintenance Materials (100% of maintenance labor)		(1)	$65,700
Natural Gas		(1)	$80,184
Electricity		(1)	$48,353
Overhead		(1)	$110,573
Taxes, Insurance, Administrative Costs		(1)	$71,280
TOTAL OPERATION AND MAINTENANCE COSTS			$494,679

Capital Recovery System: 0.0944 Assumes 7% compound interest rate and system useful life of 20 years.
Capital Recovery System: $168,208

Amoritized Annual Costs = Annual O & M Costs + System Capital Recovery
Amoritized Annual Costs = $662,887

References:
(1) Factor based on USEPA Office of Air Quality Planning and Standards Cost Spreadsheets, posted on the Internet 7/99
(2) Factor based on USEPA Office of Air Quality Planning and Standards Control Cost Manual (EPA 453/B-96-001).
(3) Added an estimate of $5,000 for emissions monitoring equipment to indirect installation costs.

Melting Furnace Controlled by RTO
Case 1 - CO Emissions

CAPITAL COST (Pollution Control Equipment)	Unit Cost	Basis	Total ($)
TOTAL CAPITAL COSTS:		C =	$1,781,999
ANNUAL OPERATION & MAINTENANCE			
Operating Labor		(1)	$45,990
Supervisory Labor (15% of operating labor)		(1)	$6,899
Maintenance Labor		(1)	$65,700
Maintenance Materials (100% of maintenance labor)		(1)	$65,700
Natural gas		(1)	$80,184
Electricity		(1)	$48,353
Overhead		(1)	$110,573
Taxes, Insurance, Administrative Costs		(1)	$71,280
TOTAL OPERATION AND MAINTENANCE COSTS			$494,679

Capital Recovery System: 0.0944 Assumes 7% compound interest rate and system useful life of 20 years.
Total Capital Recovery System: $168,208

Amoritized Annual Costs = Annual O & M Costs + System Capital Recovery
Amoritized Annual Costs = $662,887

Tons CO removed = 48.12
Cost Per Ton Removed = $13,776

References:
(1) Factor based on USEPA Office of Air Quality Planning and Standards CO$T-AIR Control Cost Spreadsheets, posted on the Clean Air Technology Center webpage 7/99.

Table D-4. MELTING FURNACE - VOC - RTO Control Evaluation

TOTAL ANNUAL COST SPREADSHEET PROGRAM--REGENERATIVE THERMAL OXIDIZERS
COST BASE DATE: December 1988 [1]

VAPCCI (First Quarter 2007--Preliminary): [2]	141.5	Updated 1st Quarter 2007
CEPCI (January 2007)	509.7	
CEPCI (February 2017)	558.3	

INPUT PARAMETERS

-- Gas flowrate (scfm):	21414	Exhaust
-- Reference temperature (oF):	77	Ambient
-- Inlet gas temperature (oF):	302	Roxul
-- Inlet gas density (lb/scf):	0.0739	Calculated
-- Primary heat recovery (fraction):	0.95	Default for RTO
-- Waste gas heat content (BTU/scf):	0.1044	Based on (lb/hr): 11.66
-- Waste gas heat content (BTU/lb):	1.412	Calculated
-- Gas heat capacity (BTU/lb-oF):	0.255	Default
-- Combustion temperature (oF):	1400	Roxul
-- Heat loss (fraction):	0.01	Default
-- Exit temperature (oF):	357	Calculated
-- Fuel heat of combustion (BTU/lb):	21502	Methane
-- Fuel density (lb/ft3):	0.0408	Methane

DESIGN PARAMETERS

Auxiliary Fuel Requirement (lb/min):	1.241	Calculated
(scfm):	30.4	Calculated
Total Gas Flowrate (scfm):	21444	Calculated

TOTAL CAPITAL INVESTMENT ($) [3]
(Cost correlations range: 5000 to 500,000 scfm)

@ 85 % heat recovery--base:	0	
" " --escalated:	0	
@ 95 % heat recovery--base:	1,048,300	
" " --escalated:	1,781,996	Includes Monitoring Equip

ANNUAL COST INPUTS

Operating factor (hr/yr):	8760	RTO hr/yr
Operating labor rate ($/hr):	28.00	Operator wage
Maintenance labor rate ($/hr):	40.00	Maintenance wage
Operating labor factor (hr/sh):	1.5	Default
Maintenance labor factor (hr/sh):	1.5	Default
Electricity price ($/kwh):	0.066	EIA, July 2017
Natural gas price ($/mscf):	5.00	EIA, 10 Year Avg
Annual interest rate (fraction):	0.07	Default
Control system life (years):	20	Default
Capital recovery factor:	0.0944	Default
Taxes, insurance, admin. factor:	0.04	Default
Pressure drop (in. w.c.):	20.0	Default

ANNUAL COSTS

Item	Cost ($/yr)	Wt. Factor	W.F.(cond.)
Operating labor	45,990	0.069	----
Supervisory labor	6,899	0.010	----
Maintenance labor	65,700	0.099	----
Maintenance materials	65,700	0.099	----
Natural gas	79,941	0.121	----
Electricity	48,353	0.073	----
Overhead	110,573	0.167	0.445
Taxes, insurance, administrative	71,280	0.108	----
Capital recovery	168,208	0.254	0.361
Total Annual Cost	662,643	1.000	1.000

[1] Base total capital investment reflects this date.
[2] VAPCCI = Vatavuk Air Pollution Control Cost Index (for regenerative thermal oxidizers) corresponding to year and quarter shown. Base total capital investment has been escalated to this date via VAPCCI and control equipment vendor data.
[3] Source: Vatavuk, William M. ESTIMATING COSTS OF AIR POLLUTION CONTROL. Boca Raton, FL Lewis Publishers, 1990.

[4] Because VAPCCI updates are no longer available, CEPCI are used to adjust costs from January 2007 to February 2017.
[5] CEPCI = Chemical Engineering Plant Cost Index.

Melting Furnace VOC Controlled by RTO

CAPITAL COST (Pollution Control Equipment)	Unit Cost	Basis	Total ($)
Purchased Equipment:			
Basic Equipment & Auxiliaries	A=	(1)	$935,359
Instrumentation & Controls	0.10A	(2)	$93,536
Sales Taxes	0.03A	(2)	$28,061
Freight	0.05A	(2)	$46,768
Total Purchased Equipment Cost		B =	$1,103,724
Direct Installation Costs:			
Foundations & Supports	0.08B	(2)	$88,298
Handling & Erection	0.14B	(2)	$154,521
Electrical	0.04B	(2)	$44,149
Piping	0.02B	(2)	$22,074
Insulation for Ductwork	0.01B	(2)	$11,037
Painting	0.01B	(2)	$11,037
Total Direct Installation Costs			$331,117
Indirect Installation Costs:			
Engineering	0.10B	(2)	$110,372
Construction & Field Expenses	0.05B	(2)	$55,186
Contractor Fees	0.10B	(2)	$110,372
Start-up	0.02B	(2)	$22,074
Performance Test	0.01B	(2)	$11,037
Emissions Monitoring Equipment		(3)	$5,000
Contingencies	0.03B	(2)	$33,112
Total Indirect Installation Costs			$347,154
TOTAL CAPITAL COSTS:		C =	$1,781,996
ANNUAL OPERATION & MAINTENANCE			
Operating Labor		(1)	$45,990
Supervisory Labor (15% of operating labor)		(1)	$6,899
Maintenance Labor		(1)	$65,700
Maintenance Materials (100% of maintenance labor)		(1)	$65,700
Natural Gas		(1)	$79,941
Electricity		(1)	$48,353
Overhead		(1)	$110,573
Taxes, Insurance, Administrative Costs		(1)	$71,280
TOTAL OPERATION AND MAINTENANCE COSTS			$494,435

Capital Recovery System: 0.0944 Assumes 7% compound interest rate and system useful life of 20 years.
Capital Recovery System: $168,208

Amoritized Annual Costs = Annual O & M Costs + System Capital Recovery
Amoritized Annual Costs = $662,643

References:
(1) Factor based on USEPA Office of Air Quality Planning and Standards Cost Spreadsheets, posted on the Internet 7/99
(2) Factor based on USEPA Office of Air Quality Planning and Standards Control Cost Manual (EPA 453/B-96-001).
(3) Added an estimate of $5,000 for emissions monitoring equipment to indirect installation costs.

Melting Furnace Controlled by RTO
Case 2 - VOC Emissions

CAPITAL COST (Pollution Control Equipment)	Unit Cost	Basis	Total ($)
TOTAL CAPITAL COSTS:		C =	$1,781,996
ANNUAL OPERATION & MAINTENANCE			
Operating Labor		(1)	$45,990
Supervisory Labor (15% of operating labor)		(1)	$6,899
Maintenance Labor		(1)	$65,700
Maintenance Materials (100% of maintenance labor)		(1)	$65,700
Natural gas		(1)	$79,941
Electricity		(1)	$48,353
Overhead		(1)	$110,573
Taxes, Insurance, Administrative Costs		(1)	$71,280
TOTAL OPERATION AND MAINTENANCE COSTS			$494,435

Capital Recovery System: 0.0944 Assumes 7% compound interest rate and system useful life of 20 years.
Total Capital Recovery System: $168,208

Amoritized Annual Costs = Annual O & M Costs + System Capital Recovery
Amoritized Annual Costs = $662,643

Tons VOC removed = 50.05
Cost Per Ton Removed = $13,240

References:
(1) Factor based on USEPA Office of Air Quality Planning and Standards CO$T-AIR Control Cost Spreadsheets, posted on the Clean Air Technology Center webpage 7/99.

Table D-5. SPINNING CHAMBER - VOC - TO Control Evaluation

TOTAL ANNUAL COST SPREADSHEET PROGRAM--THERMAL INCINERATORS
COST BASE DATE: April 1988 [1]

VAPCCI (First Quarter 2007--Preliminary: [2]	149.4	Updated 1st Quarter 2007
CEPCI (January 2007)	509.7	
CEPCI (February 2017)	558.3	

INPUT PARAMETERS

-- Gas flowrate (scfm):	258986	Exhaust	
-- Reference temperature (oF):	77	Ambient	
-- Inlet gas temperature (oF):	140	Roxul	
-- Inlet gas density (lb/scf):	0.0739	Calculated	
-- Primary heat recovery (fraction):	0.70	Default for TO	
-- Waste gas heat content (BTU/scf):	0.0577	Based on (lb/hr):	78.02
-- Waste gas heat content (BTU/lb):	0.78	Calculated	
-- Gas heat capacity (BTU/lb-oF):	0.255	Default	
-- Combustion temperature (oF):	1400	Roxul	
-- Preheat temperature (oF):	1022	Calculated	
-- Fuel heat of combustion (BTU/lb):	21502	Methane	
-- Fuel density (lb/ft3):	0.0408	Methane	

DESIGN PARAMETERS

-- Auxiliary Fuel Requirement (lb/min):	117.174	Calculated
(scfm):	2871.9	Calculated
-- Total Gas Flowrate (scfm):	261858	Calculated

CAPITAL COSTS

Equipment Costs ($):		
-- Incinerator:		
@ 0 % heat recovery:	0	
@ 35 % heat recovery:	0	
@ 50 % heat recovery:	0	
@ 70 % heat recovery:	482,783	
-- Other (auxiliary equipment, etc.):	0	
Total Equipment Cost--base:	482,783	
' ' ' --escalated:	988,188	
Purchased Equipment Cost ($):	1,166,062	
Total Capital Investment ($):	1,882,360	Includes Monitoring Equip

ANNUAL COST INPUTS

Operating factor (hr/yr):	8760	TO hr/yr
Operating labor rate ($/hr):	28.00	Operator wage
Maintenance labor rate ($/hr):	40.00	Maintenance wage
Operating labor factor (hr/sh):	1.5	Default
Maintenance labor factor (hr/sh):	1.5	Default
Electricity price ($/kwh):	0.066	EIA, July 2017
Natural gas price ($/mscf):	5.00	EIA, 10 Year Avg
Annual interest rate (fraction):	0.07	Default
Control system life (years):	20	Default
Capital recovery factor:	0.0944	Default
Taxes, insurance, admin. factor:	0.04	Default
Pressure drop (in. w.c.):	19.0	Default

ANNUAL COSTS

Item	Cost ($/yr)	Wt. Factor	W.F.(cond.)
Operating labor	45,990	0.005	----
Supervisory labor	6,899	0.001	----
Maintenance labor	65,700	0.008	----
Maintenance materials	65,700	0.008	----
Natural gas	7,545,072	0.872	----
Electricity	560,963	0.065	----
Overhead	110,573	0.013	0.034
Taxes, insurance, administrative	75,294	0.009	----
Capital recovery	177,681	0.021	0.029
Total Annual Cost	8,653,872	1.000	1.000

[1] Original equipment costs reflect this date.
[2] VAPCCI = Vatavuk Air Pollution Control Cost Index (for thermal incinerators) corresponding to year and quarter shown. Original equipment cost, purchased equipment cost, and total capital investment have been escalated to this data via the VAPCCI and control equipment vendor data.

[3] Because VAPCCI updates are no longer available, CEPCI are used to adjust costs from January 2007 to February 2017.
[4] CEPCI = Chemical Engineering Plant Cost Index.

Spinning Chamber VOC Controlled by TO

CAPITAL COST (Pollution Control Equipment)	Unit Cost	Basis	Total ($)
Purchased Equipment:			
Basic Equipment & Auxiliaries	A=	(1)	$988,188
Instrumentation & Controls	0.10A	(2)	$98,819
Sales Taxes	0.03A	(2)	$29,646
Freight	0.05A	(2)	$49,409
Total Purchased Equipment Cost		B =	$1,166,062
Direct Installation Costs:			
Foundations & Supports	0.08B	(2)	$93,285
Handling & Erection	0.14B	(2)	$163,249
Electrical	0.04B	(2)	$46,642
Piping	0.02B	(2)	$23,321
Insulation for Ductwork	0.01B	(2)	$11,661
Painting	0.01B	(2)	$11,661
Total Direct Installation Costs			$349,819
Indirect Installation Costs:			
Engineering	0.10B	(2)	$116,606
Construction & Field Expenses	0.05B	(2)	$58,303
Contractor Fees	0.10B	(2)	$116,606
Start-up	0.02B	(2)	$23,321
Performance Test	0.01B	(2)	$11,661
Emissions Monitoring Equipment		(3)	$5,000
Contingencies	0.03B	(2)	$34,982
Total Indirect Installation Costs			$366,479
TOTAL CAPITAL COSTS:		C =	$1,882,360
ANNUAL OPERATION & MAINTENANCE			
Operating Labor		(1)	$45,990
Supervisory Labor (15% of operating labor)		(1)	$6,899
Maintenance Labor		(1)	$65,700
Maintenance Materials (100% of maintenance labor)		(1)	$65,700
Natural Gas		(1)	$7,545,072
Electricity		(1)	$560,963
Overhead		(1)	$110,573
Taxes, Insurance, Administrative Costs		(1)	$75,294
TOTAL OPERATION AND MAINTENANCE COSTS			$8,476,191

Capital Recovery System: 0.0944 Assumes 7% compound interest rate and system useful life of 20 years.
Capital Recovery System: $177,681

Amoritized Annual Costs = Annual O & M Costs + System Capital Recovery
Amoritized Annual Costs = $8,653,872

References:
(1) Factor based on USEPA Office of Air Quality Planning and Standards Cost Spreadsheets, posted on the Internet 7/99
(2) Factor based on USEPA Office of Air Quality Planning and Standards Control Cost Manual (EPA 453/B-96-001).
(3) Added an estimate of $5,000 for emissions monitoring equipment to indirect installation costs.

Note: USEPA OAQPS Cost Spreadsheets calculate Total Capital Investment for Thermal Incinerators.

Spinning Chamber Controlled by TO
Case 2 - VOC Emissions

CAPITAL COST (Pollution Control Equipment)	Unit Cost	Basis	Total ($)
TOTAL CAPITAL COSTS:		C =	$1,882,360
ANNUAL OPERATION & MAINTENANCE			
Operating Labor		(1)	$45,990
Supervisory Labor (15% of operating labor)		(1)	$6,899
Maintenance Labor		(1)	$65,700
Maintenance Materials (100% of maintenance labor)		(1)	$65,700
Natural gas		(1)	$7,545,072
Electricity		(1)	$560,963
Overhead		(1)	$110,573
Taxes, Insurance, Administrative Costs		(1)	$75,294
TOTAL OPERATION AND MAINTENANCE COSTS			$8,476,191

Capital Recovery System: 0.0944 Assumes 7% compound interest rate and system useful life of 20 years.
Total Capital Recovery System: $177,681

Amoritized Annual Costs = Annual O & M Costs + System Capital Recovery
Amoritized Annual Costs = $8,653,872

VOC removed = 334.88
Cost Per Ton Removed = $25,842

References:
(1) Factor based on USEPA Office of Air Quality Planning and Standards CO$T-AIR Control Cost Spreadsheets, posted on the Clean Air Technology Center webpage 7/99.

Table D-6. SPINNING CHAMBER - VOC - RTO Control Evaluation

TOTAL ANNUAL COST SPREADSHEET PROGRAM--REGENERATIVE THERMAL OXIDIZERS
COST BASE DATE: December 1988 [1]

VAPCCI (First Quarter 2007--Preliminary): [2]	141.5	Updated 1st Quarter 2007
CEPCI (January 2007)	509.7	
CEPCI (February 2017)	558.3	

INPUT PARAMETERS

-- Gas flowrate (scfm):	258986	Spinning Chamber exhaust
-- Reference temperature (oF):	77	Ambient
-- Inlet gas temperature (oF):	140	Roxul
-- Inlet gas density (lb/scf):	0.0739	Calculated
-- Primary heat recovery (fraction):	0.95	Default for RTO
-- Waste gas heat content (BTU/scf):	0.0577	Based on (lb/hr): 78.02
-- Waste gas heat content (BTU/lb):	0.781	Calculated
-- Gas heat capacity (BTU/lb-oF):	0.255	Default
-- Combustion temperature (oF):	1400	Roxul
-- Heat loss (fraction):	0.01	Default
-- Exit temperature (oF):	203	Calculated
-- Fuel heat of combustion (BTU/lb):	21502	Methane
-- Fuel density (lb/ft3):	0.0408	Methane

DESIGN PARAMETERS

Auxiliary Fuel Requirement (lb/min):	16.638	Calculated
(scfm):	407.8	Calculated
Total Gas Flowrate (scfm):	259394	Calculated

TOTAL CAPITAL INVESTMENT ($) [3]
(Cost correlations range: 5000 to 500,000 scfm)

@ 85 % heat recovery--base:	0	
' ' ' --escalated:	0	
@ 95 % heat recovery--base:	6,502,108	
' ' ' --escalated:	11,026,861	Includes Monitoring Equip

ANNUAL COST INPUTS

Operating factor (hr/yr):	8760	RTO hr/yr
Operating labor rate ($/hr):	28.00	Operator wage
Maintenance labor rate ($/hr):	40.00	Maintenance wage
Operating labor factor (hr/sh):	1.50	Default
Maintenance labor factor (hr/sh):	1.50	Default
Electricity price ($/kwh):	0.066	EIA, July 2017
Natural gas price ($/mscf):	5.00	EIA, 10 Year Avg
Annual interest rate (fraction):	0.07	Default
Control system life (years):	20	Default
Capital recovery factor:	0.0944	Default
Taxes, insurance, admin. factor:	0.04	Default
Pressure drop (in. w.c.):	20.0	Default

ANNUAL COSTS

Item	Cost ($/yr)	Wt. Factor	W.F.(cond.)
Operating labor	45,990	0.013	----
Supervisory labor	6,899	0.002	----
Maintenance labor	65,700	0.019	----
Maintenance materials	65,700	0.019	----
Natural gas	1,071,346	0.312	----
Electricity	584,888	0.170	----
Overhead	110,573	0.032	0.086
Taxes, insurance, administrative	441,074	0.128	----
Capital recovery	1,040,858	0.303	0.432
Total Annual Cost	3,433,028	1.000	1.000

[1] Base total capital investment reflects this date.
[2] VAPCCI = Vatavuk Air Pollution Control Cost Index (for regenerative thermal oxidizers) corresponding to year and quarter shown. Base total capital investment has been escalated to this date via VAPCCI and control equipment vendor data.
[3] Source: Vatavuk, William M. ESTIMATING COSTS OF AIR POLLUTION CONTROL. Boca Raton, FL Lewis Publishers, 1990.

[4] Because VAPCCI updates are no longer available, CEPCI are used to adjust costs from January 2007 to February 2017.
[5] CEPCI = Chemical Engineering Plant Cost Index.

Spinning Chamber VOC Controlled by RTO

CAPITAL COST (Pollution Control Equipment)	Unit Cost	Basis	Total ($)
Purchased Equipment:			
Basic Equipment & Auxiliaries	A=	(1)	$5,801,590
Instrumentation & Controls	0.10A	(2)	$580,159
Sales Taxes	0.03A	(2)	$174,048
Freight	0.05A	(2)	$290,080
Total Purchased Equipment Cost		B =	$6,845,877
Direct Installation Costs:			
Foundations & Supports	0.08B	(2)	$547,670
Handling & Erection	0.14B	(2)	$958,423
Electrical	0.04B	(2)	$273,835
Piping	0.02B	(2)	$136,918
Insulation for Ductwork	0.01B	(2)	$68,459
Painting	0.01B	(2)	$68,459
Total Direct Installation Costs			$2,053,763
Indirect Installation Costs:			
Engineering	0.10B	(2)	$684,588
Construction & Field Expenses	0.05B	(2)	$342,294
Contractor Fees	0.10B	(2)	$684,588
Start-up	0.02B	(2)	$136,918
Performance Test	0.01B	(2)	$68,459
Emissions Monitoring Equipment		(3)	$5,000
Contingencies	0.03B	(2)	$205,376
Total Indirect Installation Costs			$2,127,222
TOTAL CAPITAL COSTS:		C =	$11,026,861
ANNUAL OPERATION & MAINTENANCE			
Operating Labor		(1)	$45,990
Supervisory Labor (15% of operating labor)		(1)	$6,899
Maintenance Labor		(1)	$65,700
Maintenance Materials (100% of maintenance labor)		(1)	$65,700
Natural Gas		(1)	$1,071,346
Electricity		(1)	$584,888
Overhead		(1)	$110,573
Taxes, Insurance, Administrative Costs		(1)	$441,074
TOTAL OPERATION AND MAINTENANCE COSTS			$2,392,170

Capital Recovery System: 0.0944 Assumes 7% compound interest rate and system useful life of 20 years.
Capital Recovery System: $1,040,858

Amoritized Annual Costs = Annual O & M Costs + System Capital Recovery
Amoritized Annual Costs = $3,433,028

References:
(1) Factor based on USEPA Office of Air Quality Planning and Standards Cost Spreadsheets, posted on the Internet 7/99
(2) Factor based on USEPA Office of Air Quality Planning and Standards Control Cost Manual (EPA 453/B-96-001).
(3) Added an estimate of $5,000 for emissions monitoring equipment to indirect installation costs.

Spinning Chamber Controlled by RTO
Case 2 - VOC Emissions

CAPITAL COST (Pollution Control Equipment)	Unit Cost	Basis	Total ($)
TOTAL CAPITAL COSTS:		C =	$11,026,861
ANNUAL OPERATION & MAINTENANCE			
Operating Labor		(1)	$45,990
Supervisory Labor (15% of operating labor)		(1)	$6,899
Maintenance Labor		(1)	$65,700
Maintenance Materials (100% of maintenance labor)		(1)	$65,700
Natural gas		(1)	$1,071,346
Electricity		(1)	$584,888
Overhead		(1)	$110,573
Taxes, Insurance, Administrative Costs		(1)	$441,074
TOTAL OPERATION AND MAINTENANCE COSTS			$2,392,170

Capital Recovery System: 0.0944 Assumes 7% compound interest rate and system useful life of 20 years.
Total Capital Recovery System: $1,040,858

Amoritized Annual Costs = Annual O & M Costs + System Capital Recovery
Amoritized Annual Costs = $3,433,028

Tons VOC removed = 334.88
Cost Per Ton Removed = $10,252

References:
(1) Factor based on USEPA Office of Air Quality Planning and Standards CO$T-AIR Control Cost Spreadsheets, posted on the Clean Air Technology Center webpage 7/99.

Table D-7. Cooling Section - CO - TO Control Evaluation

TOTAL ANNUAL COST SPREADSHEET PROGRAM--THERMAL INCINERATORS		
COST BASE DATE: April 1988 [1]		
VAPCCI (First Quarter 2007--Preliminary: [2]	149.4	Updated 1st Quarter 2007
CEPCI (January 2007)	509.7	
CEPCI (February 2017)	558.3	

INPUT PARAMETERS

-- Gas flowrate (scfm):	50534	Exhaust	
-- Reference temperature (oF):	77	Ambient	
-- Inlet gas temperature (oF):	194	Roxul	
-- Inlet gas density (lb/scf):	0.0739	Calculated	
-- Primary heat recovery (fraction):	0.70	Default for TO	
-- Waste gas heat content (BTU/scf):	0.0002	Based on (lb/hr):	0.17
-- Waste gas heat content (BTU/lb):	0.003	Calculated	
-- Gas heat capacity (BTU/lb-oF):	0.255	Default	
-- Combustion temperature (oF):	1400	Roxul	
-- Preheat temperature (oF):	1038	Calculated	
-- Fuel heat of combustion (BTU/lb):	21502	Methane	
-- Fuel density (lb/ft3):	0.0408	Methane	

DESIGN PARAMETERS

-- Auxiliary Fuel Requirement (lb/min):	22.271	Calculated
(scfm):	545.8	Calculated
-- Total Gas Flowrate (scfm):	51080	Calculated

CAPITAL COSTS

Equipment Costs ($):		
-- Incinerator:		
@ 0 % heat recovery:	0	
@ 35 % heat recovery:	0	
@ 50 % heat recovery:	0	
@ 70 % heat recovery:	320,846	
-- Other (auxiliary equipment, etc.):	0	
Total Equipment Cost--base:	320,846	
' ' ' --escalated:	656,728	
Purchased Equipment Cost ($):	774,939	
Total Capital Investment ($):	1,252,651	Includes Monitoring Equip

ANNUAL COST INPUTS

Operating factor (hr/yr):	8760	TO hr/yr
Operating labor rate ($/hr):	28.00	Operator wage
Maintenance labor rate ($/hr):	40.00	Maintenance wage
Operating labor factor (hr/sh):	1.5	Default
Maintenance labor factor (hr/sh):	1.5	Default
Electricity price ($/kwh):	0.066	EIA, July 2017
Natural gas price ($/mscf):	5.00	EIA, 10 Year Avg
Annual interest rate (fraction):	0.07	Default
Control system life (years):	20	Default
Capital recovery factor:	0.0944	Default
Taxes, insurance, admin. factor:	0.04	Default
Pressure drop (in. w.c.):	19.0	Default

ANNUAL COSTS

Item	Cost ($/yr)	Wt. Factor	W.F.(cond.)
Operating labor	45,990	0.023	----
Supervisory labor	6,899	0.003	----
Maintenance labor	65,700	0.033	----
Maintenance materials	65,700	0.033	----
Natural gas	1,434,052	0.715	----
Electricity	109,425	0.055	----
Overhead	110,573	0.055	0.147
Taxes, insurance, administrative	50,106	0.025	----
Capital recovery	118,241	0.059	0.084
Total Annual Cost	2,006,686	1.000	1.000

[1] Original equipment costs reflect this date.
[2] VAPCCI = Vatavuk Air Pollution Control Cost Index (for thermal incinerators) corresponding to year and quarter shown. Original equipment cost, purchased equipment cost, and total capital investment have been escalated to this data via the VAPCCI and control equipment vendor data.

[3] Because VAPCCI updates are no longer available, CEPCI are used to adjust costs from January 2007 to February 2017.
[4] CEPCI = Chemical Engineering Plant Cost Index.

Cooling Section CO Controlled by TO

CAPITAL COST (Pollution Control Equipment)	Unit Cost	Basis	Total ($)
Purchased Equipment:			
Basic Equipment & Auxiliaries	A=	(1)	$656,728
Instrumentation & Controls	0.10A	(2)	$65,673
Sales Taxes	0.03A	(2)	$19,702
Freight	0.05A	(2)	$32,836
Total Purchased Equipment Cost		B =	$774,939
Direct Installation Costs:			
Foundations & Supports	0.08B	(2)	$61,995
Handling & Erection	0.14B	(2)	$108,491
Electrical	0.04B	(2)	$30,998
Piping	0.02B	(2)	$15,499
Insulation for Ductwork	0.01B	(2)	$7,749
Painting	0.01B	(2)	$7,749
Total Direct Installation Costs			$232,482
Indirect Installation Costs:			
Engineering	0.10B	(2)	$77,494
Construction & Field Expenses	0.05B	(2)	$38,747
Contractor Fees	0.10B	(2)	$77,494
Start-up	0.02B	(2)	$15,499
Performance Test	0.01B	(2)	$7,749
Emissions Monitoring Equipment		(3)	$5,000
Contingencies	0.03B	(2)	$23,248
Total Indirect Installation Costs			$245,231
TOTAL CAPITAL COSTS:		C =	$1,252,651
ANNUAL OPERATION & MAINTENANCE			
Operating Labor		(1)	$45,990
Supervisory Labor (15% of operating labor)		(1)	$6,899
Maintenance Labor		(1)	$65,700
Maintenance Materials (100% of maintenance labor)		(1)	$65,700
Natural Gas		(1)	$1,434,052
Electricity		(1)	$109,425
Overhead		(1)	$110,573
Taxes, Insurance, Administrative Costs		(1)	$50,106
TOTAL OPERATION AND MAINTENANCE COSTS			$1,888,445

Capital Recovery System: 0.0944 Assumes 7% compound interest rate and system useful life of 20 years.
Capital Recovery System: $118,241

Amoritized Annual Costs = Annual O & M Costs + System Capital Recovery
Amoritized Annual Costs = $2,006,686

References:
(1) Factor based on USEPA Office of Air Quality Planning and Standards Cost Spreadsheets, posted on the Internet 7/99
(2) Factor based on USEPA Office of Air Quality Planning and Standards Control Cost Manual (EPA 453/B-96-001).
(3) Added an estimate of $5,000 for emissions monitoring equipment to indirect installation costs.

Note: USEPA OAQPS Cost Spreadsheets calculate Total Capital Investment for Thermal Incinerators.

Cooling Section Controlled by TO
Case 1 - CO Emissions

CAPITAL COST (Pollution Control Equipment)	Unit Cost	Basis	Total ($)
TOTAL CAPITAL COSTS:		C =	$1,252,651
ANNUAL OPERATION & MAINTENANCE			
Operating Labor		(1)	$45,990
Supervisory Labor (15% of operating labor)		(1)	$6,899
Maintenance Labor		(1)	$65,700
Maintenance Materials (100% of maintenance labor)		(1)	$65,700
Natural gas		(1)	$1,434,052
Electricity		(1)	$109,425
Overhead		(1)	$110,573
Taxes, Insurance, Administrative Costs		(1)	$50,106
TOTAL OPERATION AND MAINTENANCE COSTS			$1,888,445

Capital Recovery System: 0.0944 Assumes 7% compound interest rate and system useful life of 20 years.
Total Capital Recovery System: $118,241

Amoritized Annual Costs = Annual O & M Costs + System Capital Recovery
Amoritized Annual Costs = $2,006,686

Tons CO removed = 0.71
Cost Per Ton Removed = $2,827,380

References:
(1) Factor based on USEPA Office of Air Quality Planning and Standards CO$T-AIR Control Cost Spreadsheets, posted on the Clean Air Technology Center webpage 7/99.

Table D-8. COOLING SECTION - VOC - TO Control Evaluation

TOTAL ANNUAL COST SPREADSHEET PROGRAM--THERMAL INCINERATORS
COST BASE DATE: April 1988 [1]

VAPCCI (First Quarter 2007--Preliminary: [2]	149.4	Updated 1st Quarter 2007
CEPCI (January 2007)	509.7	
CEPCI (February 2017)	558.3	

INPUT PARAMETERS

-- Gas flowrate (scfm):	50534	Exhaust	
-- Reference temperature (oF):	77	Ambient	
-- Inlet gas temperature (oF):	194	Roxul	
-- Inlet gas density (lb/scf):	0.0739	Calculated	
-- Primary heat recovery (fraction):	0.70	Default for TO	
-- Waste gas heat content (BTU/scf):	0.0334	Based on (lb/hr):	8.82
-- Waste gas heat content (BTU/lb):	0.45	Calculated	
-- Gas heat capacity (BTU/lb-oF):	0.255	Default	
-- Combustion temperature (oF):	1400	Roxul	
-- Preheat temperature (oF):	1038	Calculated	
-- Fuel heat of combustion (BTU/lb):	21502	Methane	
-- Fuel density (lb/ft3):	0.0408	Methane	

DESIGN PARAMETERS

-- Auxiliary Fuel Requirement (lb/min):	22.191	Calculated
(scfm):	543.9	Calculated
-- Total Gas Flowrate (scfm):	51078	Calculated

CAPITAL COSTS

Equipment Costs ($):		
-- Incinerator:		
@ 0 % heat recovery:	0	
@ 35 % heat recovery:	0	
@ 50 % heat recovery:	0	
@ 70 % heat recovery:	320,843	
-- Other (auxiliary equipment, etc.):	0	
Total Equipment Cost--base:	320,843	
' ' ' --escalated:	656,721	
Purchased Equipment Cost ($):	774,931	
Total Capital Investment ($):	1,252,639	Includes Monitoring Equip

ANNUAL COST INPUTS

Operating factor (hr/yr):	8760	TO hr/yr
Operating labor rate ($/hr):	28.00	Operator wage
Maintenance labor rate ($/hr):	40.00	Maintenance wage
Operating labor factor (hr/sh):	1.5	Default
Maintenance labor factor (hr/sh):	1.5	Default
Electricity price ($/kwh):	0.066	EIA, July 2017
Natural gas price ($/mscf):	5.00	EIA, 10 Year Avg
Annual interest rate (fraction):	0.07	Default
Control system life (years):	20	Default
Capital recovery factor:	0.0944	Default
Taxes, insurance, admin. factor:	0.04	Default
Pressure drop (in. w.c.):	19.0	Default

ANNUAL COSTS

Item	Cost ($/yr)	Wt. Factor	W.F.(cond.)
Operating labor	45,990	0.023	---
Supervisory labor	6,899	0.003	---
Maintenance labor	65,700	0.033	---
Maintenance materials	65,700	0.033	---
Natural gas	1,428,938	0.714	---
Electricity	109,421	0.055	---
Overhead	110,573	0.055	0.147
Taxes, insurance, administrative	50,106	0.025	---
Capital recovery	118,240	0.059	0.084
Total Annual Cost	2,001,566	1.000	1.000

[1] Original equipment costs reflect this date.
[2] VAPCCI = Vatavuk Air Pollution Control Cost Index (for thermal incinerators) corresponding to year and quarter shown. Original equipment cost, purchased equipment cost, and total capital investment have been escalated to this data via the VAPCCI and control equipment vendor data.

[3] Because VAPCCI updates are no longer available, CEPCI are used to adjust costs from January 2007 to February 2017.
[4] CEPCI = Chemical Engineering Plant Cost Index.

Cooling Section VOC Controlled by TO

CAPITAL COST (Pollution Control Equipment)	Unit Cost	Basis	Total ($)
Purchased Equipment:			
Basic Equipment & Auxiliaries	A=	(1)	$656,721
Instrumentation & Controls	0.10A	(2)	$65,672
Sales Taxes	0.03A	(2)	$19,702
Freight	0.05A	(2)	$32,836
Total Purchased Equipment Cost		B =	$774,931
Direct Installation Costs:			
Foundations & Supports	0.08B	(2)	$61,994
Handling & Erection	0.14B	(2)	$108,490
Electrical	0.04B	(2)	$30,997
Piping	0.02B	(2)	$15,499
Insulation for Ductwork	0.01B	(2)	$7,749
Painting	0.01B	(2)	$7,749
Total Direct Installation Costs			$232,479
Indirect Installation Costs:			
Engineering	0.10B	(2)	$77,493
Construction & Field Expenses	0.05B	(2)	$38,747
Contractor Fees	0.10B	(2)	$77,493
Start-up	0.02B	(2)	$15,499
Performance Test	0.01B	(2)	$7,749
Emissions Monitoring Equipment		(3)	$5,000
Contingencies	0.03B	(2)	$23,248
Total Indirect Installation Costs			$245,229
TOTAL CAPITAL COSTS:		C =	$1,252,639
ANNUAL OPERATION & MAINTENANCE			
Operating Labor		(1)	$45,990
Supervisory Labor (15% of operating labor)		(1)	$6,899
Maintenance Labor		(1)	$65,700
Maintenance Materials (100% of maintenance labor)		(1)	$65,700
Natural Gas		(1)	$1,428,938
Electricity		(1)	$109,421
Overhead		(1)	$110,573
Taxes, Insurance, Administrative Costs		(1)	$50,106
TOTAL OPERATION AND MAINTENANCE COSTS			$1,883,326

Capital Recovery System: 0.0944 Assumes 7% compound interest rate and system useful life of 20 years.
Capital Recovery System: $118,240

Amoritized Annual Costs = Annual O & M Costs + System Capital Recovery
Amoritized Annual Costs = $2,001,566

References:
(1) Factor based on USEPA Office of Air Quality Planning and Standards Cost Spreadsheets, posted on the Internet 7/99
(2) Factor based on USEPA Office of Air Quality Planning and Standards Control Cost Manual (EPA 453/B-96-001).
(3) Added an estimate of $5,000 for emissions monitoring equipment to indirect installation costs.

Note: USEPA OAQPS Cost Spreadsheets calculate Total Capital Investment for Thermal Incinerators.

Cooling Section Controlled by TO
Case 2 - VOC Emissions

CAPITAL COST (Pollution Control Equipment)	Unit Cost	Basis	Total ($)
TOTAL CAPITAL COSTS:		C =	$1,252,639
ANNUAL OPERATION & MAINTENANCE			
Operating Labor		(1)	$45,990
Supervisory Labor (15% of operating labor)		(1)	$6,899
Maintenance Labor		(1)	$65,700
Maintenance Materials (100% of maintenance labor)		(1)	$65,700
Natural gas		(1)	$1,428,938
Electricity		(1)	$109,421
Overhead		(1)	$110,573
Taxes, Insurance, Administrative Costs		(1)	$50,106
TOTAL OPERATION AND MAINTENANCE COSTS			$1,883,326

Capital Recovery System: 0.0944 Assumes 7% compound interest rate and system useful life of 20 years.
Total Capital Recovery System: $118,240

Amoritized Annual Costs = Annual O & M Costs + System Capital Recovery
Amoritized Annual Costs = $2,001,566

Tons VOC removed = 37.85
Cost Per Ton Removed = $52,878

References:
(1) Factor based on USEPA Office of Air Quality Planning and Standards CO$T-AIR Control Cost Spreadsheets, posted on the Clean Air Technology Center webpage 7/99.

Table D-9. COOLING SECTION- CO - RTO Control Evaluation

TOTAL ANNUAL COST SPREADSHEET PROGRAM--REGENERATIVE THERMAL OXIDIZERS

COST BASE DATE: December 1988 [1]		
VAPCCI (First Quarter 2007--Preliminary): [2]	141.5	Updated 1st Quarter 2007
CEPCI (January 2007)	509.7	
CEPCI (February 2017)	558.3	

INPUT PARAMETERS

-- Gas flowrate (scfm):	50534	Exhaust
-- Reference temperature (oF):	77	Ambient
-- Inlet gas temperature (oF):	194	Roxul
-- Inlet gas density (lb/scf):	0.0739	Calculated
-- Primary heat recovery (fraction):	0.95	Default for RTO
-- Waste gas heat content (BTU/scf):	0.0002	Based on (lb/hr): 0.17
-- Waste gas heat content (BTU/lb):	0.003	Calculated
-- Gas heat capacity (BTU/lb-oF):	0.255	Default
-- Combustion temperature (oF):	1400	Roxul
-- Heat loss (fraction):	0.01	Default
-- Exit temperature (oF):	254	Calculated
-- Fuel heat of combustion (BTU/lb):	21502	Methane
-- Fuel density (lb/ft3):	0.0408	Methane

DESIGN PARAMETERS

Auxiliary Fuel Requirement (lb/min):	3.264	Calculated
(scfm):	80.0	Calculated
Total Gas Flowrate (scfm):	50614	Calculated

TOTAL CAPITAL INVESTMENT ($) [3]
(Cost correlations range: 5000 to 500,000 scfm)

@ 85 % heat recovery--base:	0	
' ' ' --escalated:	0	
@ 95 % heat recovery--base:	1,716,870	
' ' ' --escalated:	2,915,303	Includes Monitoring Equip

ANNUAL COST INPUTS

Operating factor (hr/yr):	8760	RTO hr/yr
Operating labor rate ($/hr):	28.00	Operator wage
Maintenance labor rate ($/hr):	40.00	Maintenance wage
Operating labor factor (hr/sh):	1.5	Default
Maintenance labor factor (hr/sh):	1.5	Default
Electricity price ($/kwh):	0.066	EIA, July 2017
Natural gas price ($/mscf):	5.00	EIA, 10 Year Avg
Annual interest rate (fraction):	0.07	Default
Control system life (years):	20	Default
Capital recovery factor:	0.0944	Default
Taxes, insurance, admin. factor:	0.04	Default
Pressure drop (in. w.c.):	20.0	Default

ANNUAL COSTS

Item	Cost ($/yr)	Wt. Factor	W.F.(cond.)
Operating labor	45,990	0.045	----
Supervisory labor	6,899	0.007	----
Maintenance labor	65,700	0.065	----
Maintenance materials	65,700	0.065	----
Natural gas	210,174	0.208	----
Electricity	114,125	0.113	----
Overhead	110,573	0.109	0.292
Taxes, insurance, administrative	116,612	0.115	----
Capital recovery	275,184	0.272	0.388
Total Annual Cost	1,010,957	1.000	1.000

[1] Base total capital investment reflects this date.
[2] VAPCCI = Vatavuk Air Pollution Control Cost Index (for regenerative thermal oxidizers) corresponding to year and quarter shown. Base total capital investment has been escalated to this date via VAPCCI and control equipment vendor data.
[3] Source: Vatavuk, William M. ESTIMATING COSTS OF AIR POLLUTION CONTROL. Boca Raton, FL Lewis Publishers, 1990.

[4] Because VAPCCI updates are no longer available, CEPCI are used to adjust costs from January 2007 to February 2017.
[5] CEPCI = Chemical Engineering Plant Cost Index.

Cooling Section CO Controlled by RTO

CAPITAL COST (Pollution Control Equipment)	Unit Cost	Basis	Total ($)
Purchased Equipment:			
Basic Equipment & Auxiliaries	A=	(1)	$1,531,900
Instrumentation & Controls	0.10A	(2)	$153,190
Sales Taxes	0.03A	(2)	$45,957
Freight	0.05A	(2)	$76,595
Total Purchased Equipment Cost		B =	$1,807,641
Direct Installation Costs:			
Foundations & Supports	0.08B	(2)	$144,611
Handling & Erection	0.14B	(2)	$253,070
Electrical	0.04B	(2)	$72,306
Piping	0.02B	(2)	$36,153
Insulation for Ductwork	0.01B	(2)	$18,076
Painting	0.01B	(2)	$18,076
Total Direct Installation Costs			$542,292
Indirect Installation Costs:			
Engineering	0.10B	(2)	$180,764
Construction & Field Expenses	0.05B	(2)	$90,382
Contractor Fees	0.10B	(2)	$180,764
Start-up	0.02B	(2)	$36,153
Performance Test	0.01B	(2)	$18,076
Emissions Monitoring Equipment		(3)	$5,000
Contingencies	0.03B	(2)	$54,229
Total Indirect Installation Costs			$565,369
TOTAL CAPITAL COSTS:		C =	$2,915,303
ANNUAL OPERATION & MAINTENANCE			
Operating Labor		(1)	$45,990
Supervisory Labor (15% of operating labor)		(1)	$6,899
Maintenance Labor		(1)	$65,700
Maintenance Materials (100% of maintenance labor)		(1)	$65,700
Natural Gas		(1)	$210,174
Electricity		(1)	$114,125
Overhead		(1)	$110,573
Taxes, Insurance, Administrative Costs		(1)	$116,612
TOTAL OPERATION AND MAINTENANCE COSTS			$735,773

Capital Recovery System: 0.0944 Assumes 7% compound interest rate and system useful life of 20 years.
Capital Recovery System: $275,184

Amoritized Annual Costs = Annual O & M Costs + System Capital Recovery
Amoritized Annual Costs = $1,010,957

References:
(1) Factor based on USEPA Office of Air Quality Planning and Standards Cost Spreadsheets, posted on the Internet 7/99
(2) Factor based on USEPA Office of Air Quality Planning and Standards Control Cost Manual (EPA 453/B-96-001).
(3) Added an estimate of $5,000 for emissions monitoring equipment to indirect installation costs.

Cooling Section Controlled by RTO
Case 1 - CO Emissions

CAPITAL COST (Pollution Control Equipment)	Unit Cost	Basis	Total ($)
TOTAL CAPITAL COSTS:		C =	$2,915,303
ANNUAL OPERATION & MAINTENANCE			
Operating Labor		(1)	$45,990
Supervisory Labor (15% of operating labor)		(1)	$6,899
Maintenance Labor		(1)	$65,700
Maintenance Materials (100% of maintenance labor)		(1)	$65,700
Natural gas		(1)	$210,174
Electricity		(1)	$114,125
Overhead		(1)	$110,573
Taxes, Insurance, Administrative Costs		(1)	$116,612
TOTAL OPERATION AND MAINTENANCE COSTS			$735,773

Capital Recovery System: 0.0944 Assumes 7% compound interest rate and system useful life of 20 years.
Total Capital Recovery System: $275,184

Amoritized Annual Costs = Annual O & M Costs + System Capital Recovery
Amoritized Annual Costs = $1,010,957

Tons CO removed = 0.71
Cost Per Ton Removed = $1,424,419

References:
(1) Factor based on USEPA Office of Air Quality Planning and Standards CO$T-AIR Control Cost Spreadsheets, posted on the Clean Air Technology Center webpage 7/99.

Table D-10. COOLING SECTION - VOC - RTO Control Evaluation

TOTAL ANNUAL COST SPREADSHEET PROGRAM--REGENERATIVE THERMAL OXIDIZERS
COST BASE DATE: December 1988 [1]

VAPCCI (First Quarter 2007--Preliminary): [2]	141.5	Updated 1st Quarter 2007
CEPCI (January 2007)	509.7	
CEPCI (February 2017)	558.3	

INPUT PARAMETERS

-- Gas flowrate (scfm):	50534	Exhaust
-- Reference temperature (oF):	77	Ambient
-- Inlet gas temperature (oF):	194	Roxul
-- Inlet gas density (lb/scf):	0.0739	Calculated
-- Primary heat recovery (fraction):	0.95	Default for RTO
-- Waste gas heat content (BTU/scf):	0.0334	Based on (lb/hr): 8.82
-- Waste gas heat content (BTU/lb):	0.453	Calculated
-- Gas heat capacity (BTU/lb-oF):	0.255	Default
-- Combustion temperature (oF):	1400	Roxul
-- Heat loss (fraction):	0.01	Default
-- Exit temperature (oF):	254	Calculated
-- Fuel heat of combustion (BTU/lb):	21502	Methane
-- Fuel density (lb/ft3):	0.0408	Methane

DESIGN PARAMETERS

Auxiliary Fuel Requirement (lb/min):	3.186	Calculated
(scfm):	78.1	Calculated
Total Gas Flowrate (scfm):	50612	Calculated

TOTAL CAPITAL INVESTMENT ($) [3]
(Cost correlations range: 5000 to 500,000 scfm)

@ 85 % heat recovery--base:	0	
' ' ' --escalated:	0	
@ 95 % heat recovery--base:	1,716,826	
' ' ' --escalated:	2,915,228	Includes Monitoring Equip

ANNUAL COST INPUTS

Operating factor (hr/yr):	8760	RTO hr/yr
Operating labor rate ($/hr):	28.00	Operator wage
Maintenance labor rate ($/hr):	40.00	Maintenance wage
Operating labor factor (hr/sh):	1.5	Default
Maintenance labor factor (hr/sh):	1.5	Default
Electricity price ($/kwh):	0.066	EIA, July 2017
Natural gas price ($/mscf):	5.00	EIA, 10 Year Avg
Annual interest rate (fraction):	0.07	Default
Control system life (years):	20	Default
Capital recovery factor:	0.0944	Default
Taxes, insurance, admin. factor:	0.04	Default
Pressure drop (in. w.c.):	20.0	Default

ANNUAL COSTS

Item	Cost ($/yr)	Wt. Factor	W.F.(cond.)
Operating labor	45,990	0.046	----
Supervisory labor	6,899	0.007	----
Maintenance labor	65,700	0.065	----
Maintenance materials	65,700	0.065	----
Natural gas	205,137	0.204	----
Electricity	114,121	0.113	----
Overhead	110,573	0.110	0.293
Taxes, insurance, administrative	116,609	0.116	----
Capital recovery	275,177	0.274	0.389
Total Annual Cost	1,005,906	1.000	1.000

[1] Base total capital investment reflects this date.
[2] VAPCCI = Vatavuk Air Pollution Control Cost Index (for regenerative thermal oxidizers) corresponding to year and quarter shown. Base total capital investment has been escalated to this date via VAPCCI and control equipment vendor data.
[3] Source: Vatavuk, William M. ESTIMATING COSTS OF AIR POLLUTION CONTROL. Boca Raton, FL Lewis Publishers, 1990.

[4] Because VAPCCI updates are no longer available, CEPCI are used to adjust costs from January 2007 to February 2017.
[5] CEPCI = Chemical Engineering Plant Cost Index.

Cooling Section VOC Controlled by RTO

CAPITAL COST (Pollution Control Equipment)	Unit Cost	Basis	Total ($)
Purchased Equipment:			
Basic Equipment & Auxiliaries	A=	(1)	$1,531,860
Instrumentation & Controls	0.10A	(2)	$153,186
Sales Taxes	0.03A	(2)	$45,956
Freight	0.05A	(2)	$76,593
Total Purchased Equipment Cost		B =	$1,807,595
Direct Installation Costs:			
Foundations & Supports	0.08B	(2)	$144,608
Handling & Erection	0.14B	(2)	$253,063
Electrical	0.04B	(2)	$72,304
Piping	0.02B	(2)	$36,152
Insulation for Ductwork	0.01B	(2)	$18,076
Painting	0.01B	(2)	$18,076
Total Direct Installation Costs			$542,279
Indirect Installation Costs:			
Engineering	0.10B	(2)	$180,760
Construction & Field Expenses	0.05B	(2)	$90,380
Contractor Fees	0.10B	(2)	$180,760
Start-up	0.02B	(2)	$36,152
Performance Test	0.01B	(2)	$18,076
Emissions Monitoring Equipment		(3)	$5,000
Contingencies	0.03B	(2)	$54,228
Total Indirect Installation Costs			$565,355
TOTAL CAPITAL COSTS:		C =	$2,915,228
ANNUAL OPERATION & MAINTENANCE			
Operating Labor		(1)	$45,990
Supervisory Labor (15% of operating labor)		(1)	$6,899
Maintenance Labor		(1)	$65,700
Maintenance Materials (100% of maintenance labor)		(1)	$65,700
Natural Gas		(1)	$205,137
Electricity		(1)	$114,121
Overhead		(1)	$110,573
Taxes, Insurance, Administrative Costs		(1)	$116,609
TOTAL OPERATION AND MAINTENANCE COSTS			$730,729

Capital Recovery System: 0.0944 Assumes 7% compound interest rate and system useful life of 20 years.
Capital Recovery System: $275,177

Amoritized Annual Costs = Annual O & M Costs + System Capital Recovery
Amoritized Annual Costs = $1,005,906

References:
(1) Factor based on USEPA Office of Air Quality Planning and Standards Cost Spreadsheets, posted on the Internet 7/99
(2) Factor based on USEPA Office of Air Quality Planning and Standards Control Cost Manual (EPA 453/B-96-001).
(3) Added an estimate of $5,000 for emissions monitoring equipment to indirect installation costs.

Cooling Section Controlled by RTO
Case 2 - VOC Emissions

CAPITAL COST (Pollution Control Equipment)	Unit Cost	Basis	Total ($)
TOTAL CAPITAL COSTS:		C =	$2,915,228
ANNUAL OPERATION & MAINTENANCE			
Operating Labor		(1)	$45,990
Supervisory Labor (15% of operating labor)		(1)	$6,899
Maintenance Labor		(1)	$65,700
Maintenance Materials (100% of maintenance labor)		(1)	$65,700
Natural gas		(1)	$205,137
Electricity		(1)	$114,121
Overhead		(1)	$110,573
Taxes, Insurance, Administrative Costs		(1)	$116,609
TOTAL OPERATION AND MAINTENANCE COSTS			$730,729

Capital Recovery System: 0.0944 Assumes 7% compound interest rate and system useful life of 20 years.
Total Capital Recovery System: $275,177

Amoritized Annual Costs = Annual O & M Costs + System Capital Recovery
Amoritized Annual Costs = $1,005,906

Tons VOC removed = 37.85
Cost Per Ton Removed = $26,574

References:
(1) Factor based on USEPA Office of Air Quality Planning and Standards CO$T-AIR Control Cost Spreadsheets, posted on the Clean Air Technology Center webpage 7/99.

Table D-11. Fleece Application Station - VOC - TO Evaluation

TOTAL ANNUAL COST SPREADSHEET PROGRAM--THERMAL INCINERATORS
COST BASE DATE: April 1988 [1]

VAPCCI (First Quarter 2007--Preliminary: [2]	149.4	Updated 1st Quarter 2007
CEPCI (January 2007)	509.7	
CEPCI (February 2017)	558.3	

INPUT PARAMETERS

-- Gas flowrate (scfm):	500	Exhaust	
-- Reference temperature (oF):	77	Ambient	
-- Inlet gas temperature (oF):	68	Roxul	
-- Inlet gas density (lb/scf):	0.0739	Calculated	
-- Primary heat recovery (fraction):	0.70	Default for TO	
-- Waste gas heat content (BTU/scf):	2.50	Based on (lb/hr):	6.53
-- Waste gas heat content (BTU/lb):	33.85	Calculated	
-- Gas heat capacity (BTU/lb-oF):	0.255	Default	
-- Combustion temperature (oF):	1400	Roxul	
-- Preheat temperature (oF):	1000	Calculated	
-- Fuel heat of combustion (BTU/lb):	21502	Methane	
-- Fuel density (lb/ft3):	0.0408	Methane	

DESIGN PARAMETERS

-- Auxiliary Fuel Requirement (lb/min):	0.178	Calculated
(scfm):	4.4	Calculated
-- Total Gas Flowrate (scfm):	504	Calculated

CAPITAL COSTS

Equipment Costs ($):		
-- Incinerator:		
@ 0 % heat recovery:	0	
@ 35 % heat recovery:	0	
@ 50 % heat recovery:	0	
@ 70 % heat recovery:	101,139	
-- Other (auxiliary equipment, etc.):	0	
Total Equipment Cost--base:	101,139	
' ' ' --escalated:	207,018	
Purchased Equipment Cost ($):	223,580	
Total Capital Investment ($):	284,475	Includes Monitoring Equip

ANNUAL COST INPUTS

Operating factor (hr/yr):	8760	TO hr/yr
Operating labor rate ($/hr):	28.00	Operator wage
Maintenance labor rate ($/hr):	40.00	Maintenance wage
Operating labor factor (hr/sh):	1.5	Default
Maintenance labor factor (hr/sh):	1.5	Default
Electricity price ($/kwh):	0.066	EIA, July 2017
Natural gas price ($/mscf):	5.00	EIA, 10 Year Avg
Annual interest rate (fraction):	0.07	Default
Control system life (years):	20	Default
Capital recovery factor:	0.0944	Default
Taxes, insurance, admin. factor:	0.04	Default
Pressure drop (in. w.c.):	19.0	Default

ANNUAL COSTS

Item	Cost ($/yr)	Wt. Factor	W.F.(cond.)
Operating labor	45,990	0.133	---
Supervisory labor	6,899	0.020	---
Maintenance labor	65,700	0.190	---
Maintenance materials	65,700	0.190	---
Natural gas	11,461	0.033	---
Electricity	1,080	0.003	---
Overhead	110,573	0.320	0.853
Taxes, insurance, administrative	11,379	0.033	---
Capital recovery	26,852	0.078	0.111
Total Annual Cost	345,634	1.000	1.000

[1] Original equipment costs reflect this date.
[2] VAPCCI = Vatavuk Air Pollution Control Cost Index (for thermal incinerators) corresponding to year and quarter shown. Original equipment cost, purchased equipment cost, and total capital investment have been escalated to this data via the VAPCCI and control equipment vendor data.

[3] Because VAPCCI updates are no longer available, CEPCI are used to adjust costs from January 2007 to February 2017.
[4] CEPCI = Chemical Engineering Plant Cost Index.

Fleece Application Station VOC Controlled by TO

CAPITAL COST (Pollution Control Equipment)	Unit Cost	Basis	Total ($)
Purchased Equipment:			
Basic Equipment & Auxiliaries	A=	(1)	$207,018
Instrumentation & Controls	0.0A	(2)	$0
Sales Taxes	0.03A	(2)	$6,211
Freight	0.05A	(2)	$10,351
Total Purchased Equipment Cost		B =	$223,580
Direct Installation Costs:			
Foundations & Supports	0.0B	(2)	$0
Handling & Erection	0.03B	(2)	$6,707
Electrical	0.02B	(2)	$4,472
Piping	0.01B	(2)	$2,236
Insulation for Ductwork	0.01B	(2)	$2,236
Painting	0.01B	(2)	$2,236
Total Direct Installation Costs			$17,886
Indirect Installation Costs:			
Engineering	0.05B	(2)	$11,179
Construction & Field Expenses	0.05B	(2)	$11,179
Contractor Fees	0.05B	(2)	$11,179
Start-up	0.01B	(2)	$2,236
Performance Test	0.01B	(2)	$2,236
Emissions Monitoring Equipment		(3)	$5,000
Contingencies	0.0B	(2)	$0
Total Indirect Installation Costs			$43,009
TOTAL CAPITAL COSTS:		C =	$284,475
ANNUAL OPERATION & MAINTENANCE			
Operating Labor		(1)	$45,990
Supervisory Labor (15% of operating labor)		(1)	$6,899
Maintenance Labor		(1)	$65,700
Maintenance Materials (100% of maintenance labor)		(1)	$65,700
Natural Gas		(1)	$11,461
Electricity		(1)	$1,080
Overhead		(1)	$110,573
Taxes, Insurance, Administrative Costs		(1)	$11,379
TOTAL OPERATION AND MAINTENANCE COSTS			$318,782

Capital Recovery System: 0.0944 Assumes 7% compound interest rate and system useful life of 20 years.
Capital Recovery System: $26,852

Amoritized Annual Costs = Annual O & M Costs + System Capital Recovery
Amoritized Annual Costs = $345,634

References:
(1) Factor based on USEPA Office of Air Quality Planning and Standards Cost Spreadsheets, posted on the Internet 7/99
(2) Factor based on USEPA Office of Air Quality Planning and Standards Control Cost Manual (EPA 453/B-96-001).
(3) Added an estimate of $5,000 for emissions monitoring equipment to indirect installation costs.

Note: USEPA OAQPS Cost Spreadsheets calculate Total Capital Investment for Thermal Incinerators.

Fleece Application Station Controlled by TO
VOC Emissions

CAPITAL COST (Pollution Control Equipment)	Unit Cost	Basis	Total ($)
TOTAL CAPITAL COSTS:		C =	$284,475
ANNUAL OPERATION & MAINTENANCE			
Operating Labor		(1)	$45,990
Supervisory Labor (15% of operating labor)		(1)	$6,899
Maintenance Labor		(1)	$65,700
Maintenance Materials (100% of maintenance labor)		(1)	$65,700
Natural gas		(1)	$11,461
Electricity		(1)	$1,080
Overhead		(1)	$110,573
Taxes, Insurance, Administrative Costs		(1)	$11,379
TOTAL OPERATION AND MAINTENANCE COSTS			$318,782

Capital Recovery System: 0.0944 Assumes 7% compound interest rate and system useful life of 20 years.
Total Capital Recovery System: $26,852

Amoritized Annual Costs = Annual O & M Costs + System Capital Recovery
Amoritized Annual Costs = $345,634

Tons VOC removed = 28.01
Cost Per Ton Removed = $12,339

References:
(1) Factor based on USEPA Office of Air Quality Planning and Standards CO$T-AIR Control Cost Spreadsheets, posted on the Clean Air Technology Center webpage 7/99.

Table D-12. Hot Press & Cure - VOC - TO Evaluation

TOTAL ANNUAL COST SPREADSHEET PROGRAM--THERMAL INCINERATORS

COST BASE DATE: April 1988 [1]		
VAPCCI (First Quarter 2007--Preliminary: [2]	149.4	Updated 1st Quarter 2007
CEPCI (January 2007)	509.7	
CEPCI (February 2017)	558.3	

INPUT PARAMETERS

-- Gas flowrate (scfm):	1895	Exhaust	
-- Reference temperature (oF):	77	Ambient	
-- Inlet gas temperature (oF):	104	Roxul	
-- Inlet gas density (lb/scf):	0.0739	Calculated	
-- Primary heat recovery (fraction):	0.70	Default for TO	
-- Waste gas heat content (BTU/scf):	0.17	Based on (lb/hr):	1.68
-- Waste gas heat content (BTU/lb):	2.30	Calculated	
-- Gas heat capacity (BTU/lb-oF):	0.255	Default	
-- Combustion temperature (oF):	1400	Roxul	
-- Preheat temperature (oF):	1011	Calculated	
-- Fuel heat of combustion (BTU/lb):	21502	Methane	
-- Fuel density (lb/ft3):	0.0408	Methane	

DESIGN PARAMETERS

-- Auxiliary Fuel Requirement (lb/min):	0.865	Calculated
(scfm):	21.2	Calculated
-- Total Gas Flowrate (scfm):	1916	Calculated

CAPITAL COSTS

Equipment Costs ($):		
-- Incinerator:		
@ 0 % heat recovery:	0	
@ 35 % heat recovery:	0	
@ 50 % heat recovery:	0	
@ 70 % heat recovery:	141,204	
-- Other (auxiliary equipment, etc.):	0	
Total Equipment Cost--base:	141,204	
' ' ' --escalated:	289,025	
Purchased Equipment Cost ($):	312,147	
Total Capital Investment ($):	395,183	Includes Monitoring Equip

ANNUAL COST INPUTS

Operating factor (hr/yr):	8760	TO hr/yr
Operating labor rate ($/hr):	28.00	Operator wage
Maintenance labor rate ($/hr):	40.00	Maintenance wage
Operating labor factor (hr/sh):	1.5	Default
Maintenance labor factor (hr/sh):	1.5	Default
Electricity price ($/kwh):	0.066	EIA, July 2017
Natural gas price ($/mscf):	5.00	EIA, 10 Year Avg
Annual interest rate (fraction):	0.07	Default
Control system life (years):	20	Default
Capital recovery factor:	0.0944	Default
Taxes, insurance, admin. factor:	0.04	Default
Pressure drop (in. w.c.):	19.0	Default

ANNUAL COSTS

Item	Cost ($/yr)	Wt. Factor	W.F.(cond.)	
Operating labor	45,990	0.113	----	
Supervisory labor	6,899	0.017	----	
Maintenance labor	65,700	0.161	----	
Maintenance materials	65,700	0.161	----	
Natural gas	55,727	0.137	----	
Electricity	4,105	0.010	----	
Overhead	110,573	0.271		0.723
Taxes, insurance, administrative	15,807	0.039	----	
Capital recovery	37,303	0.091		0.130
Total Annual Cost	407,803	1.000		1.000

[1] Original equipment costs reflect this date.
[2] VAPCCI = Vatavuk Air Pollution Control Cost Index (for thermal incinerators) corresponding to year and quarter shown. Original equipment cost, purchased equipment cost, and total capital investment have been escalated to this data via the VAPCCI and control equipment vendor data.

[3] Because VAPCCI updates are no longer available, CEPCI are used to adjust costs from January 2007 to February 2017.
[4] CEPCI = Chemical Engineering Plant Cost Index.

Hot Press & Cure VOC Controlled by TO

CAPITAL COST (Pollution Control Equipment)	Unit Cost	Basis	Total ($)
Purchased Equipment:			
Basic Equipment & Auxiliaries	A=	(1)	$289,025
Instrumentation & Controls	0.0A	(2)	$0
Sales Taxes	0.03A	(2)	$8,671
Freight	0.05A	(2)	$14,451
Total Purchased Equipment Cost		B =	$312,147
Direct Installation Costs:			
Foundations & Supports	0.0B	(2)	$0
Handling & Erection	0.03B	(2)	$9,364
Electrical	0.02B	(2)	$6,243
Piping	0.01B	(2)	$3,121
Insulation for Ductwork	0.01B	(2)	$3,121
Painting	0.01B	(2)	$3,121
Total Direct Installation Costs			$24,972
Indirect Installation Costs:			
Engineering	0.05B	(2)	$15,607
Construction & Field Expenses	0.05B	(2)	$15,607
Contractor Fees	0.05B	(2)	$15,607
Start-up	0.01B	(2)	$3,121
Performance Test	0.01B	(2)	$3,121
Emissions Monitoring Equipment		(3)	$5,000
Contingencies	0.0B	(2)	$0
Total Indirect Installation Costs			$58,065
TOTAL CAPITAL COSTS:		C =	$395,183
ANNUAL OPERATION & MAINTENANCE			
Operating Labor		(1)	$45,990
Supervisory Labor (15% of operating labor)		(1)	$6,899
Maintenance Labor		(1)	$65,700
Maintenance Materials (100% of maintenance labor)		(1)	$65,700
Natural Gas		(1)	$55,727
Electricity		(1)	$4,105
Overhead		(1)	$110,573
Taxes, Insurance, Administrative Costs		(1)	$15,807
TOTAL OPERATION AND MAINTENANCE COSTS			$370,500

Capital Recovery System: 0.0944 Assumes 7% compound interest rate and system useful life of 20 years.
Capital Recovery System: $37,303

Amoritized Annual Costs = Annual O & M Costs + System Capital Recovery
Amoritized Annual Costs = $407,803

References:
(1) Factor based on USEPA Office of Air Quality Planning and Standards Cost Spreadsheets, posted on the Internet 7/99
(2) Factor based on USEPA Office of Air Quality Planning and Standards Control Cost Manual (EPA 453/B-96-001).
(3) Added an estimate of $5,000 for emissions monitoring equipment to indirect installation costs.

Note: USEPA OAQPS Cost Spreadsheets calculate Total Capital Investment for Thermal Incinerators.

Hot Press & Cure Controlled by TO
VOC Emissions

CAPITAL COST (Pollution Control Equipment)	Unit Cost	Basis	Total ($)
TOTAL CAPITAL COSTS:		C =	$395,183
ANNUAL OPERATION & MAINTENANCE			
Operating Labor		(1)	$45,990
Supervisory Labor (15% of operating labor)		(1)	$6,899
Maintenance Labor		(1)	$65,700
Maintenance Materials (100% of maintenance labor)		(1)	$65,700
Natural gas		(1)	$55,727
Electricity		(1)	$4,105
Overhead		(1)	$110,573
Taxes, Insurance, Administrative Costs		(1)	$15,807
TOTAL OPERATION AND MAINTENANCE COSTS			$370,500

Capital Recovery System: 0.0944 Assumes 7% compound interest rate and system useful life of 20 years.
Total Capital Recovery System: $37,303

Amoritized Annual Costs = Annual O & M Costs + System Capital Recovery
Amoritized Annual Costs = $407,803

Tons VOC removed = 7.21
Cost Per Ton Removed = $56,551

References:
(1) Factor based on USEPA Office of Air Quality Planning and Standards CO$T-AIR Control Cost Spreadsheets, posted on the Clean Air Technology Center webpage 7/99.

Table D-13. Drying Oven 1 - VOC - TO Evaluation

TOTAL ANNUAL COST SPREADSHEET PROGRAM--THERMAL INCINERATORS
COST BASE DATE: April 1988 [1]

VAPCCI (First Quarter 2007--Preliminary [2]	149.4	Updated 1st Quarter 2007
CEPCI (January 2007)	509.7	
CEPCI (February 2017)	558.3	

INPUT PARAMETERS

-- Gas flowrate (scfm):	3158	Exhaust	
-- Reference temperature (oF):	77	Ambient	
-- Inlet gas temperature (oF):	320	Roxul	
-- Inlet gas density (lb/scf):	0.0739	Calculated	
-- Primary heat recovery (fraction):	0.70	Default for TO	
-- Waste gas heat content (BTU/scf):	0.43	Based on (lb/hr):	7.01
-- Waste gas heat content (BTU/lb):	5.75	Calculated	
-- Gas heat capacity (BTU/lb-oF):	0.255	Default	
-- Combustion temperature (oF):	1400	Roxul	
-- Preheat temperature (oF):	1076	Calculated	
-- Fuel heat of combustion (BTU/lb):	21502	Methane	
-- Fuel density (lb/ft3):	0.0408	Methane	

DESIGN PARAMETERS

-- Auxiliary Fuel Requirement (lb/min):	1.222	Calculated
(scfm):	29.9	Calculated
-- Total Gas Flowrate (scfm):	3188	Calculated

CAPITAL COSTS

Equipment Costs ($):		
-- Incinerator:		
@ 0 % heat recovery:	0	
@ 35 % heat recovery:	0	
@ 50 % heat recovery:	0	
@ 70 % heat recovery:	160,371	
-- Other (auxiliary equipment, etc.):	0	
Total Equipment Cost--base:	160,371	
" " " --escalated:	328,256	
Purchased Equipment Cost ($):	354,517	
Total Capital Investment ($):	448,146	Includes Monitoring Equip

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ANNUAL COST INPUTS

Operating factor (hr/yr):	8760	TO hr/yr
Operating labor rate ($/hr):	28.00	Operator wage
Maintenance labor rate ($/hr):	40.00	Maintenance wage
Operating labor factor (hr/sh):	1.5	Default
Maintenance labor factor (hr/sh):	1.5	Default
Electricity price ($/kwh):	0.066	EIA, July 2017
Natural gas price ($/mscf):	5.00	EIA, 10 Year Avg
Annual interest rate (fraction):	0.07	Default
Control system life (years):	20	Default
Capital recovery factor:	0.0944	Default
Taxes, insurance, admin. factor:	0.04	Default
Pressure drop (in. w.c.):	19.0	Default

ANNUAL COSTS

Item	Cost ($/yr)	Wt. Factor	W.F.(cond.)	
Operating labor	45,990	0.104	---	
Supervisory labor	6,899	0.016	---	
Maintenance labor	65,700	0.149	---	
Maintenance materials	65,700	0.149	---	
Natural gas	78,667	0.179	---	
Electricity	6,830	0.016	---	
Overhead	110,573	0.251		0.669
Taxes, insurance, administrative	17,926	0.041	---	
Capital recovery	42,302	0.096		0.137
Total Annual Cost	440,587	1.000		1.000

[1] Original equipment costs reflect this date.
[2] VAPCCI = Vatavuk Air Pollution Control Cost Index (for thermal incinerators) corresponding to year and quarter shown. Original equipment cost, purchased equipment cost, and total capital investment have been escalated to this data via the VAPCCI and control equipment vendor data.

[3] Because VAPCCI updates are no longer available, CEPCI are used to adjust costs from January 2007 to February 2017.
[4] CEPCI = Chemical Engineering Plant Cost Index.

Drying Oven 1 VOC Controlled by TO

CAPITAL COST (Pollution Control Equipment)	Unit Cost	Basis	Total ($)
Purchased Equipment:			
Basic Equipment & Auxiliaries	A=	(1)	$328,256
Instrumentation & Controls	0.0A	(2)	$0
Sales Taxes	0.03A	(2)	$9,848
Freight	0.05A	(2)	$16,413
Total Purchased Equipment Cost		B =	$354,517
Direct Installation Costs:			
Foundations & Supports	0.0B	(2)	$0
Handling & Erection	0.03B	(2)	$10,636
Electrical	0.02B	(2)	$7,090
Piping	0.01B	(2)	$3,545
Insulation for Ductwork	0.01B	(2)	$3,545
Painting	0.01B	(2)	$3,545
Total Direct Installation Costs			$28,361
Indirect Installation Costs:			
Engineering	0.05B	(2)	$17,726
Construction & Field Expenses	0.05B	(2)	$17,726
Contractor Fees	0.05B	(2)	$17,726
Start-up	0.01B	(2)	$3,545
Performance Test	0.01B	(2)	$3,545
Emissions Monitoring Equipment		(3)	$5,000
Contingencies	0.0B	(2)	$0
Total Indirect Installation Costs			$65,268
TOTAL CAPITAL COSTS:		C =	$448,146
ANNUAL OPERATION & MAINTENANCE			
Operating Labor		(1)	$45,990
Supervisory Labor (15% of operating labor)		(1)	$6,899
Maintenance Labor		(1)	$65,700
Maintenance Materials (100% of maintenance labor)		(1)	$65,700
Natural Gas		(1)	$78,667
Electricity		(1)	$6,830
Overhead		(1)	$110,573
Taxes, Insurance, Administrative Costs		(1)	$17,926
TOTAL OPERATION AND MAINTENANCE COSTS			$398,285

Capital Recovery System: 0.0944 Assumes 7% compound interest rate and system useful life of 20 years.
Capital Recovery System: $42,302

Amoritized Annual Costs = Annual O & M Costs + System Capital Recovery
Amoritized Annual Costs = $440,587

References:
(1) Factor based on USEPA Office of Air Quality Planning and Standards Cost Spreadsheets, posted on the Internet 7/99
(2) Factor based on USEPA Office of Air Quality Planning and Standards Control Cost Manual (EPA 453/B-96-001).
(3) Added an estimate of $5,000 for emissions monitoring equipment to indirect installation costs.

Note: USEPA OAQPS Cost Spreadsheets calculate Total Capital Investment for Thermal Incinerators.

Drying Oven 1 Controlled by TO
VOC Emissions

CAPITAL COST (Pollution Control Equipment)	Unit Cost	Basis	Total ($)
TOTAL CAPITAL COSTS:		C =	$448,146
ANNUAL OPERATION & MAINTENANCE			
Operating Labor		(1)	$45,990
Supervisory Labor (15% of operating labor)		(1)	$6,899
Maintenance Labor		(1)	$65,700
Maintenance Materials (100% of maintenance labor)		(1)	$65,700
Natural gas		(1)	$78,667
Electricity		(1)	$6,830
Overhead		(1)	$110,573
Taxes, Insurance, Administrative Costs		(1)	$17,926
TOTAL OPERATION AND MAINTENANCE COSTS			$398,285

Capital Recovery System: 0.0944 Assumes 7% compound interest rate and system useful life of 20 years.
Total Capital Recovery System: $42,302

Amoritized Annual Costs = Annual O & M Costs + System Capital Recovery
Amoritized Annual Costs = $440,587

Tons VOC removed = 30.08
Cost Per Ton Removed = $14,648

References:
(1) Factor based on USEPA Office of Air Quality Planning and Standards CO$T-AIR Control Cost Spreadsheets, posted on the Clean Air Technology Center webpage 7/99.

Table D-14. MELTING FURNACE - PM10 and CPM - High Energy Venturi Scrubber Evaluation

TOTAL ANNUAL COST SPREADSHEET PROGRAM--HI-ENERGY (VENTURI) SCRUBBERS [1]

COST BASE DATE: June 1988 [2]

VAPCCI (Fourth Quarter 1998--FINAL): [3]	109.8	
CEPCI (1998 - Final)	389.5	
CEPCI (February 2017)	558.3	

INPUT PARAMETERS

-- Inlet stream flowrate (acfm):		30904	Exhaust
-- Inlet stream temperature (oF):		302	Roxul
-- Inlet moisture content (molar, fraction):		0.06	Default
-- Inlet absolute humidity (lb/lb b.d.a.): [4]		0.040	Calculated
-- Inlet water flowrate (lb/min):		60.0	Calculated
-- Saturation formula parameters: [5]			
	Slope, B:	3.335	Default
	Intercept,A:	9.405000E-09	Default
-- Saturation absolute humidity (lb/lb b.d.a.):		0.0875	Iterations
-- Saturation enthalpy temperature term (oF):[6]		121.9	
-- Saturation temperature (oF):		122.9	
-- Inlet dust loading (gr/dscf):		0.05	
-- Overall control efficiency (fractional):		0.90	
-- Overall penetration (fractional):		0.10	
-- Mass median particle diameter (microns): [7]		1.7	
-- 84th % aerodynamic diameter (microns): [7]		3.4	
-- Particle cut diameter (microns): [7]		0.44	
-- Scrubber liquid solids content (lb/lb H2O):		0.25	
-- Liquid/gas (L/G) ratio (gpm/1000 acfm):		5.0	Range 2 - 20
-- Recirculation pump head (ft of water):		100	Default
-- Material of construction (see list below):[8]		1	Base Case

DESIGN PARAMETERS

-- Scrubber pressure drop (in. w.c.): [9]	24.73
-- Inlet dry air flow rate (dscfm): [10]	20205
-- Inlet (= outlet) air mass rate (lb/min):	1514
circulation rate (gpm):	155
-- Outlet water mass rate (lb/min):	133
-- Outlet total stream flow rate (acfm):	25354
-- Scrubber liquid bleed rate (gpm):	0.06
-- Scrubber evaporation rate (gpm):	8.71
-- Scrubber liquid makeup rate (gpm):	8.77

CAPITAL COSTS

Equipment Costs ($):	
-- Scrubber (base)	47,119
' (escalated)	84,570
-- Other (auxiliaries, e.g.)	0
-- Total	84,570
Purchased Equipment Cost ($):	99,793
Total Capital Investment ($):	195,604

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ANNUAL COST INPUTS

Operating factor (hr/yr):	8760
Operating labor rate ($/hr):	28.00
Maintenance labor rate ($/hr):	40.00
Operating labor factor (hr/sh):	2
Maintenance labor factor (hr/sh):	1.5

Electricity price ($/kWhr):	0.066	EIA, July 2017
Chemicals price (specify) ($/ton):	--	
Process water price ($/1000 gal):	6.01	Jefferson Utilities Inc., Oct. 2017
Wastewater treatment ($/1000 gal):	3.80	
Overhead rate (fractional):	0.60	
Annual interest rate (fractional):	0.07	
Control system life (years):	20	
Capital recovery factor (system):	0.0944	
Taxes, insurance, admin. factor:	0.04	

ANNUAL COSTS

Item	Cost ($/yr)	Wt. Fact.		W.F.(cond.)
Operating labor	61,320	0.138	----	
Supervisory labor	9,198	0.021	----	
Maintenance labor	65,700	0.148	----	
Maintenance materials	65,700	0.148	----	
Electricity--fan	65,524	0.147	----	
Electricity--recirculation pump	2,582	0.006		
Chemicals	0	0.000	----	
Process water	27,696	0.062	----	
Wastewater treatment	125	0.000	----	
Overhead	121,151	0.272		0.726
Taxes, insurance, administrative	7,824	0.018	----	
Capital recovery	18,464	0.041		0.059
Total Annual Cost ($/yr)	445,283	1.000		1.000

Notes:

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[1] Data used to develop this program were taken from 'Estimating Costs of Air Pollution Control' (CRC Press/Lewis Publishers, 1990).

[2] Base equipment costs reflect this date.

[3] VAPCCI = Vatavuk Air Pollution Control Cost Index (for wet scrubbers) corresponding to year and quarter shown. Base equipment cost, purchased equipment cost, and total capital investment have been escalated to this date via the VAPCCI and control equipment vendor data. Because VAPCCI updates are no longer available, CEPCI are used to adjust costs from 1998 to February 2017. CEPCI = Chemical Engineering Plant Cost Index.

[4] Program calculates from the inlet moisture content.

[5] By assumption, the saturation humidity (hs)-temperature (ts) curve is a power function, of the form: hs = A*(ts)^B.

[6] To obtain the saturation temperature, iterate on the saturation humidity. Continue iterating until the saturation temperature and the saturation enthalpy term are approximately equal.

[7] Both the 'mass median' and '84th percentile aerodynamic' diameters are obtained from a log-normal distribution of the inlet stream particle diameters. The particle cut diameter is a graphical function of the the penetration, the mass median diameter, and the standard deviation of the particle size distribution. (For detailed guidance in determining these particle sizes, see "Wet Scrubbers: A Practical Handbook" by K.C. Schifftner and H.E. Hesketh (CRC Press/Lewis Publishers, 1986). A condensed procedure is given in "Estimating Costs of Air Pollution Control" by W.M. Vatavuk (CRC Press/Lewis Publishers, 1990).)

[8] Enter one of the following numbers: carbon steel--'1'; rubber-lined carbon steel--'1.6'; epoxy-coated carbon steel--'1.6'; fiber-reinforced plastic (FRP)--'1.6'.

[9] The scrubber pressure drop is extremely sensitive to the particle cut diameter. Hence, the user must determine the cut diameter with great care.

[10] Measured at 70 oF and 1 atmosphere.

MELTING FURNACE - PM10 and CPM - High Energy Venturi Scrubber Evaluation

CAPITAL COST (Pollution Control Equipment)	Unit Cost	Basis	Total ($)
Purchased Equipment:			
Basic Equipment & Auxiliaries	A=	(1)	$84,570
Instrumentation & Controls	0.10A	(2)	$8,457
Sales Taxes	0.03A	(2)	$2,537
Freight	0.05A	(2)	$4,229
Total Purchased Equipment Cost		B =	$99,793
Direct Installation Costs:			
Foundations & Supports	0.06B	(2)	$5,988
Handling & Erection	0.40B	(2)	$39,917
Electrical	0.01B	(2)	$998
Piping	0.05B	(2)	$4,990
Insulation for Ductwork	0.03B	(2)	$2,994
Painting	0.01B	(2)	$998
Total Direct Installation Costs			$55,884
Indirect Installation Costs:			
Engineering	0.10B	(2)	$9,979
Construction & Field Expenses	0.10B	(2)	$9,979
Contractor Fees	0.10B	(2)	$9,979
Start-up	0.01B	(2)	$998
Performance Test	0.01B	(2)	$998
Emissions Monitoring Equipment		(3)	$5,000
Contingencies	0.03B	(2)	$2,994
Total Indirect Installation Costs			$39,927
TOTAL CAPITAL COSTS:		C =	$195,604
ANNUAL OPERATION & MAINTENANCE			
Operating Labor		(1)	$61,320
Supervisory Labor (15% of operating labor)		(1)	$9,198
Maintenance Labor		(1)	$65,700
Maintenance Materials (100% of maintenance labor)		(1)	$65,700
Process Water		(1)	$27,696
Wastewater Treatment		(1)	$125
Electricity		(1)	$68,106
Overhead		(1)	$121,151
Taxes, Insurance, Administrative Costs		(1)	$7,824
TOTAL OPERATION AND MAINTENANCE COSTS			$426,819

Capital Recovery System: 0.0944 Assumes 7% compound interest rate and system useful life of 20 years.
Capital Recovery System: $18,464

Amoritized Annual Costs = Annual O & M Costs + System Capital Recovery
Amoritized Annual Costs = $445,283

References:
(1) Factor based on USEPA Office of Air Quality Planning and Standards Cost Spreadsheets, posted on the Internet 7/99
(2) Factor based on USEPA Office of Air Quality Planning and Standards Control Cost Manual (EPA 453/B-96-001).
(3) Added an estimate of $5,000 for emissions monitoring equipment to indirect installation costs.

Note: USEPA OAQPS Cost Spreadsheets calculate Total Capital Investment for Thermal Incinerators.

MELTING FURNACE - PM10 and CPM - High Energy Venturi Scrubber Evaluation

CAPITAL COST (Pollution Control Equipment)	Unit Cost	Basis	Total ($)
TOTAL CAPITAL COSTS:		C =	$195,604
ANNUAL OPERATION & MAINTENANCE			
Operating Labor		(1)	$61,320
Supervisory Labor (15% of operating labor)		(1)	$9,198
Maintenance Labor		(1)	$65,700
Maintenance Materials (100% of maintenance labor)		(1)	$65,700
Process Water		(1)	$27,696
Wastewater Treatment		(1)	$125
Electricity		(1)	$68,106
Overhead		(1)	$121,151
Taxes, Insurance, Administrative Costs		(1)	$7,824
TOTAL OPERATION AND MAINTENANCE COSTS			$426,819

Capital Recovery System:	0.0944	Assumes 7% compound interest rate and system useful life of 20 years.
Total Capital Recovery System:	$18,464	

Amoritized Annual Costs = Annual O & M Costs + System Capital Recovery

Amoritized Annual Costs =	$445,283
Tons PM10 Total removed =	32.41
Cost Per Ton Removed =	**$13,739**

References:

(1) Factor based on USEPA Office of Air Quality Planning and Standards CO$T-AIR Control Cost Spreadsheets, posted on the Clean Air Technology Center webpage 7/99.

Table D-15. MELTING FURNACE - PM10 and CPM - Wet Electrostatic Precipitator Evaluation

Capital Costs

Direct Costs	
Control Equipment Purchase Price	$320,000
Purchased Equipment Cost	$377,600
Direct Installation Costs	$252,992
Total Indirect Costs	$220,232
Total Capital Investment	$850,824

ANNUAL COST INPUTS

Operating factor (hr/yr):	8760	
Operating labor rate ($/hr):	28.00	
Maintenance labor rate ($/hr):	40.00	
Operating labor factor (hr/sh):	3	
Maintenance labor factor (hr/sh):	1.5	
Electricity price ($/kWhr):	0.066	EIA, July 2017
Chemicals price (specify) ($/ton):	–	
Process water price ($/1000 gal):	6.01	Jefferson Utilities Inc., Oct. 2017
Wastewater treatment ($/1000 gal):	3.80	
Overhead rate (fractional):	0.60	
Annual interest rate (fractional):	0.07	
Control system life (years):	20	
Capital recovery factor (system):	0.0944	
Taxes, insurance, admin. factor:	0.04	

DESIGN PARAMETERS

– ESP pressure drop (in. w.c.):	4.48	Default
– Exhaust flow rate (acfm):	30904	
– Water (gpm)	155	
– Recirculation pump head (ft of water):	100	Default

ANNUAL COSTS

Item	Cost ($/yr)
Operating labor	91,980
Supervisory labor	13,797
Maintenance labor	65,700
Maintenance materials (1% PEC)	3,776
Electricity--fan	14,488
Electricity--pump	39,230
Chemicals	0
Process water	488,105
Wastewater treatment	–
Overhead	105,152
Taxes, insurance, administrative	34,033
Capital recovery	80,312
Total Annual Cost ($/yr)	936,573

NOTES:
Control Equipment Purchase Price = Estimated from discussions with vendors
Direct Installation Costs = Purchased Equipment Cost x 0.67
Total Indirect Costs = Purchased Equipment Cost x 0.57 + Monitoring
Total Capital Investment = sum of Purchased Equipment Cost, Direct Installation Costs, Total Indirect Costs

MELTING FURNACE - PM10 and CPM - WESP

CAPITAL COST (Pollution Control Equipment)	Unit Cost	Basis	Total ($)
Purchased Equipment:			
Basic Equipment & Auxiliaries	A=		$320,000
Instrumentation & Controls	0.10A	(2)	$32,000
Sales Taxes	0.03A	(2)	$9,600
Freight	0.05A	(2)	$16,000
Total Purchased Equipment Cost		B =	$377,600
Direct Installation Costs:			
Foundations & Supports	0.04B	(2)	$15,104
Handling & Erection	0.50B	(2)	$188,800
Electrical	0.08B	(2)	$30,208
Piping	0.01B	(2)	$3,776
Insulation for Ductwork	0.02B	(2)	$7,552
Painting	0.02B	(2)	$7,552
Total Direct Installation Costs			$252,992
Indirect Installation Costs:			
Engineering	0.20B	(2)	$75,520
Construction & Field Expenses	0.20B	(2)	$75,520
Contractor Fees	0.10B	(2)	$37,760
Start-up	0.01B	(2)	$3,776
Performance Test	0.01B	(2)	$3,776
Model Study	.02B	(2)	$7,552
Emissions Monitoring Equipment		(3)	$5,000
Contingencies	0.03B	(2)	$11,328
Total Indirect Installation Costs			$220,232
TOTAL CAPITAL COSTS:		C =	$850,824
ANNUAL OPERATION & MAINTENANCE			
Operating Labor		(2)	$91,980
Supervisory Labor (15% of operating labor)		(2)	$13,797
Maintenance Labor		(2)	$65,700
Maintenance Materials (100% of maintenance labor)		(2)	$3,776
Process Water		(2)	$488,105
Electricity		(2)	$53,718
Overhead		(2)	$105,152
Taxes, Insurance, Administrative Costs		(2)	$34,033
TOTAL OPERATION AND MAINTENANCE COSTS			$856,261

Capital Recovery System: 0.0944 Assumes 7% compound interest rate and system useful life of 20 years.
Capital Recovery System: $80,312

Amortized Annual Costs = Annual O & M Costs + System Capital Recovery
Amortized Annual Costs = $936,573

References:
(1) Factor based on USEPA Office of Air Quality Planning and Standards Cost Spreadsheets, posted on the Internet 7/99
(2) Factor based on USEPA Office of Air Quality Planning and Standards Control Cost Manual (EPA 453/B-96-001).
(3) Added an estimate of $5,000 for emissions monitoring equipment to indirect installation costs.

MELTING FURNACE - PM10 and CPM - WESP

CAPITAL COST (Pollution Control Equipment)	Unit Cost	Basis	Total ($)
TOTAL CAPITAL COSTS:		C =	$850,824
ANNUAL OPERATION & MAINTENANCE			
Operating Labor		(2)	$91,980
Supervisory Labor (15% of operating labor)		(2)	$13,797
Maintenance Labor		(2)	$65,700
Maintenance Materials (100% of maintenance labor)		(2)	$3,776
Process Water		(2)	$488,105
Electricity		(2)	$53,718
Overhead		(2)	$105,152
Taxes, Insurance, Administrative Costs		(2)	$34,033
TOTAL OPERATION AND MAINTENANCE COSTS			$856,261

Capital Recovery System: 0.0944 Assumes 7% compound interest rate and system useful life of 20 years.
Total Capital Recovery System: $80,312

Amoritized Annual Costs = Annual O & M Costs + System Capital Recovery
Amoritized Annual Costs = $936,573

Tons PM10 Total removed = 34.21
Cost Per Ton Removed = $27,378

References:
(1) Factor based on USEPA Office of Air Quality Planning and Standards CO$T-AIR Control Cost Spreadsheets, posted on the Clean Air Technology Center webpage 7/99.

GHG BACT Analysis
Table D-16 Conceptual Cost Estimate for Carbon Capture and Sequestration
Melting Furance & Pre-heat Burner

Post-Combustion CO_2 Capture and Compression		
Max Rated Heat Input	MMBtu/hr	104
	Capital & O&M	
Capital [1]	$78,530/MMBtu/hr	$9,767,145
Annual O&M [1]	$14,320/MMBtu/hr/yr	$1,493,616

Pipeline Cost Breakdown [2]		
L, Pipeline Length (miles)		150
D, Pipeline Diameter (inches)		12
	Pipeline Costs	
Materials	$64,632 + $1.85 x L x (330.5 x D^2 + 686.7 x D + 26,960)	$23,039,523
Labor	$341,627 + $1.85 x L x (343.2 x D^2 + 2074 x D + 170,013)	$68,140,927
Miscellaneous	$150,166 + $1.58 x L x (8,417 x D + 7,234)	$25,802,572
Right of Way	$48,037 + $1.2 x L x (577 x D + 29,788)	$6,656,197
	Other Capital	
CO_2 Surge Tank	Fixed	$1,150,636
Pipeline Control System	Fixed	$110,632
	O&M	
Fixed O&M ($/year)	$8,632 x L	$1,294,800

Annualized Cost Estimate	
Economic Life, years	20
Interest Rate (%)	7
Capital Costs	$134,667,632
O&M Costs (Annual)	$2,788,416
Capital Recovery	$12,711,670
Total Annualized Cost	$15,500,086
Total CO_2 Controlled (tpy)[3]	87,846
CO_2 Cost Effectiveness ($/ton)	176

[1] Adapted from Vol 1 Chapter 3: Economic and Cost Analysis for CO2 Capture Costs in the Capture Project Scenarios (http://www.co2captureproject.com/pubdownload.php?downid=155) (table 15 baseline scenario). Capital costs adjusted using the Chemical Engineering Plant Cost Index to 2017 dollars. O&M costs not adjusted.

[2] Pipeline and Geologic Storage cost estimates based on National Energy Technology Laboratory (US DOE) document, *Estimating Carbon Dioxide Transport and Storage Costs*, DOE/NETL-2010/1447 (March 2010).

[3] Total CO2 Controlled is based on 90% control efficiency, based on *The Global CCS Institute document, The Global Status of CCS, 2016*.

GHG BACT Analysis
Table D-17 Conceptual Cost Estimate for Carbon Capture and Sequestration
Natural Gas Combustion Units

	Post-Combustion CO_2 Capture and Compression	
Max Rated Heat Input	MMBtu/hr	52
	Capital & O&M	
Capital [1]	\$78,530/MMBtu/hr	\$4,842,205
Annual O&M [1]	\$14,320/MMBtu/hr/yr	\$740,482

	Pipeline Cost Breakdown [2]	
L, Pipeline Length (miles)		150
D, Pipeline Diameter (inches)		12
	Pipeline Costs	
Materials	$\$64,632 + \$1.85 \times L \times (330.5 \times D^2 + 686.7 \times D + 26,960)$	\$23,039,523
Labor	$\$341,627 + \$1.85 \times L \times (343.2 \times D^2 + 2074 \times D + 170,013)$	\$68,140,927
Miscellaneous	$\$150,166 + \$1.58 \times L \times (8,417 \times D + 7,234)$	\$25,802,572
Right of Way	$\$48,037 + \$1.2 \times L \times (577 \times D + 29,788)$	\$6,656,197
	Other Capital	
CO_2 Surge Tank	Fixed	\$1,150,636
Pipeline Control System	Fixed	\$110,632
	O&M	
Fixed O&M (\$/year)	$\$8,632 \times L$	\$1,294,800

	Annualized Cost Estimate	
Economic Life, years		20
Interest Rate (%)		7
Capital Costs		\$129,742,691
O&M Costs (Annual)		\$2,035,282
Capital Recovery		\$12,246,790
Total Annualized Cost		\$14,282,072
Total CO_2 Controlled (tpy)[3]		24,002
CO_2 Cost Effectiveness (\$/ton)		595

[1] Adapted from Vol 1 Chapter 3: Economic and Cost Analysis for CO2 Capture Costs in the Capture Project Scenarios (http://www.co2captureproject.com/pubdownload.php?downid=155) (table 15 baseline scenario). Capital costs adjusted using the Chemical Engineering Plant Cost Index to 2017 dollars. O&M costs not adjusted.

[2] Pipeline and Geologic Storage cost estimates based on National Energy Technology Laboratory (US DOE) document, *Estimating Carbon Dioxide Transport and Storage Costs*, DOE/NETL-2010/1447 (March 2010).

[3] Total CO2 Controlled is based on 90% control efficiency, based on *The Global CCS Institute document, The Global Status of CCS, 2016*. CO2 controlled does not incldue other GHGs.