



TECHNICAL SUPPORT DOCUMENT

**Air Discharge Permit ADP 25-3719
Air Discharge Permit Application L-752**

Issued: July 30, 2025

Cardinal FG Winlock

SWCAA ID - 2175

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ABBREVIATIONS

List of Acronyms

ADP	Air Discharge Permit	NOV	Notice of Violation/
AP-42	Compilation of Emission Factors, AP-42, 5th Edition, Volume 1, Stationary Point and Area Sources – published by EPA	NSPS	New Source Performance Standard
		PSD	Prevention of Significant Deterioration
ASIL	Acceptable Source Impact Level	RCW	Revised Code of Washington
BACT	Best available control technology	SCC	Source Classification Code
CAM	Compliance Assurance Monitoring	SDS	Safety Data Sheet
CAS#	Chemical Abstracts Service registry number	SQER	Small Quantity Emission Rate listed in WAC 173-460
CFR	Code of Federal Regulations	SWCAA	Southwest Clean Air Agency
EPA	U.S. Environmental Protection Agency	T-BACT	Best Available Control Technology for toxic air pollutants
EU	Emission Unit	WAC	Washington Administrative Code
NESHAP	National Emission Standards for Hazardous Air Pollutants		

List of Units and Measures

µg/m ³	Micrograms per cubic meter	MMBtu	Million British thermal unit
µm	Micrometer (10 ⁻⁶ meter)	MMcf	Million cubic feet
acfm	Actual cubic foot per minute	ppm	Parts per million
bhp	Brake horsepower	ppmv	Parts per million by volume
dscfm	Dry Standard cubic foot per minute	ppmvd	Parts per million by volume, dry
gpm	Gallon per minute	scfm	Standard cubic foot per minute
gr/dscf	Grain per dry standard cubic foot	tph	Ton per hour
hp	Horsepower	tpy	Tons per year
hp-hr	Horsepower-hour		
kW	Kilowatt		

List of Chemical Symbols, Formulas, and Pollutants

CO	Carbon monoxide	PM	Particulate Matter with an aerodynamic diameter 100 µm or less
CO ₂	Carbon dioxide		
CO _{2e}	Carbon dioxide equivalent	PM ₁₀	PM with an aerodynamic diameter 10 µm or less
H ₂ S	Hydrogen sulfide	PM _{2.5}	PM with an aerodynamic diameter 2.5 µm or less
HAP	Hazardous air pollutant listed pursuant to Section 112 of the Federal Clean Air Act	SO ₂	Sulfur dioxide
HCl	Hydrochloric acid	SO _x	Sulfur oxides
NH ₃	Ammonia	TAP	Toxic air pollutant pursuant to Chapter 173-460 WAC
NO _x	Nitrogen oxides	VOC	Volatile organic compound
O ₂	Oxygen		
O ₃	Ozone		

Terms not otherwise defined have the meaning assigned to them in the referenced regulations or the dictionary definition, as appropriate.

1. FACILITY IDENTIFICATION

Applicant Name:	Cardinal FG Winlock
Applicant Address:	545 Avery Road West, Winlock, WA 98596
Facility Name:	Cardinal FG Winlock
Facility Address:	545 Avery Road West, Winlock, WA 98596
SWCAA Identification:	2175
Contact Person:	David Heller, Environmental Engineer
Primary Process:	Flat Glass Manufacturing
SIC/NAICS Code:	3211 / Flat Glass 327211 / Flat Glass Manufacturing
Facility Latitude and Longitude	46° 32' 39.51" N 122° 55' 33.45" W
Facility Classification:	Synthetic Minor (PSD Opt-out - Criteria)

2. FACILITY DESCRIPTION

Cardinal FG Company Winlock (Cardinal) operates a flat glass manufacturing plant located near the intersection of Avery Road and Highway 603 in Winlock, Washington. The facility is similar in design to plants operated by other Cardinal companies in Wisconsin (Menomonie and Portage), Oklahoma (Durant) and North Carolina (Mooresville).

3. CURRENT PERMITTING ACTION

This permitting action is in response to Air Discharge Permit application number L-752 (ADP Application L-752) dated May 14, 2025. Cardinal submitted ADP Application L-752 requesting approval of the following:

- Addition of alternate visible emissions limit for periods of SCR maintenance;
- Revision of Glass Furnace Exhaust Reheater rated heat input from 17.0 MMBtu/hr to 19.2 MMBtu/hr to reflect actual installation; and
- Use of two Thermjet portable burners to conduct checker burnouts.

The current permitting action provides approval for the modifications proposed in ADP Application L-752. ADP 25-3719 will supersede ADP 23-3596 in its entirety.

4. PROCESS DESCRIPTION

- 4.a. Raw Material Handling (existing). The manufacturing process primarily uses the following raw materials: silica sand, soda ash, nepheline syenite feldspar, high calcium limestone (calcium carbonate), dolomitic limestone (calcium-magnesium carbonate), salt cake (sodium sulfate), cullet (broken glass), rouge (iron),

and carbon. Other minor additives are incorporated as necessary to give desired special product qualities (e.g., color or photo-filtration). Raw materials are received in bulk by rail and truck from commercial suppliers and stored in bins or silos. Truck and railcar shipments are received with a single below-grade unloading hopper. The railcar/truck unloading operation is enclosed in a steel building with a concrete floor. A conveyor beneath the unloading hopper feeds a bucket elevator discharging into a rotary distributor above the top of the storage silos. Dust from receiving operations is controlled with process enclosure and multiple dust collectors. Typical operation is less than 40 hr/wk.

The facility batch plant prepares the proper mix of materials for use in the Glass Furnace. Raw materials are withdrawn from storage silos/bins and conveyed into hopper scales for weighing. Cullet (scrap glass) from both onsite and offsite is stored and metered in the batch plant. Each batch of weighed materials is mechanically mixed and conveyed to a charging bin near the melting furnace. Maximum material throughput is specified as 750 tpd. Typical operation is 18 hr/dy.

- 4.b. Glass Furnace (existing). Mixed raw materials and cullet are fed into the melting section of a natural gas-fired melting furnace, where they are refined and temperature conditioned. Molten glass flows from the melting section onto the surface of a tin bath, creating a ribbon of floating glass extending to the bath exit. The float or "tin" bath consists of a refractory lined chamber containing molten tin 2 to 4 inches deep with a steel roof housing electric heating elements. Tools are inserted through seals in the sides of the bath to control ribbon width, thickness, and temperature. Rolls at the bath exit pull the floating glass ribbon through the bath. A hydrogen and nitrogen atmosphere is maintained inside the bath section to prevent tin oxidation. During normal operation, production disruptions of up to 72 hours in length may occasionally occur, largely due to interruption of the glass ribbon at the tin bath. During these periods, no raw materials are fed into the furnace. Maximum glass production is rated at 750 tpd as currently configured.

Cardinal will use two Thermjet checker burners rated at 12.0 MMBtu/hr each to conduct burnouts of the furnace checker packs. The burners are connected to a natural gas tap at the bottom of the checker packs and operate consistently during the burnout process. Cardinal generally performs burnouts when air flow through a regenerator/port starts to diminish or experience other issues.

The Glass Furnace operates in multi-year production cycles. At the end of each cycle, glass is drained from the furnace and it is rebricked (90-120 day period). Equipment associated with the glass making process (including air pollution control equipment) is inspected and overhauled at that time.

ADP Application L-752. The permit modifications proposed by Cardinal will not change basic glass furnace operation or configuration. The revised exhaust reheater description reflects the rated heat input of the burner as installed versus the specification in the original application. The revision is not related to a change in design or function. Likewise, the addition of an alternate visible emission limit is only intended to support periodic visual inspections of SCR internal elements for the purpose of maintenance and is not related to any change in furnace operation. The new Thermjet checker burners will be used to perform burnouts in the same manner as previously conducted. Cardinal is acquiring the burners to allow in-house staff to conduct burnouts rather than using outside contractors/equipment. Similar to current practice, all burner emissions will vent to the furnace exhaust. Potential furnace emission will not be affected.

- 4.c. Annealing Lehr (existing). Glass ribbon exits the tin bath and enters the lehr, which is a roller hearth oven designed to slowly cool the glass ribbon after it exits the float bath. Cooling rates are controlled both

across the width of the lehr and along its length to prevent the formation of excessive stresses in the glass (annealing). In the first part of the lehr, heat is supplied by electric heating elements to compensate for heat losses from the ribbon edges. A system of fans and ducts provides atmospheric air as the cooling medium. Heat is transferred from the glass to the air by a combination of tube heat exchangers and by direct impingement of air on the glass. The glass ribbon is transported through the lehr by mechanically driven rolls. Sulfur dioxide (SO₂) from storage tanks is injected on the rollers and the top and bottom surfaces of the glass to prevent staining. Unreacted SO₂ gas exhausts to the Glass Furnace headspace. As the glass ribbon exits the lehr, it passes through an inspection booth where defects are identified and marked. Defective sections are later scrapped and returned as cullet for remelting.

- 4.d. Glass Cutting (existing). As the glass ribbon travels toward the packing area on rollers, cutting wheels automatically score the ribbon to define the final lite size and remove non-saleable ribbon edges. A lubricant (mineral spirits) is applied to the cutting wheels to assist in cutting the glass. The lubricant evaporates into the building and is released as a fugitive emission. Emissions are minimized by controlling usage of the cutting lubricant. As the ribbon proceeds down the production line, right angle scores, edge trim scores and parallel scores are sequentially "snapped" to form individual glass lites. Edge trim and rejected lites (cullet) are reduced in size by glass breakers underneath the cutting station. These breakers discharge onto a belt conveyor located in a sub-floor tunnel. A second belt conveyor at right angles to the cutting conveyors moves cullet from the tunnel belt to the exterior of the lehr building. A third belt, above grade, transfers cullet to the batch plant and/or flat storage area.
- 4.e. Glass Packaging and Storage (existing). Finished glass lites are packed on metal racks or in wooden cases using mechanical and/or manual means depending upon piece size. Racks and cases of glass are transported through the warehouse by battery-powered industrial trucks. The glass packing lines include powder applicators, hopper/crushers, and various handling conveyors. Air pollution (dust) emissions from packing operations are generally minor. The facility's original packing lines are served by Cullet Return System #1. The packing lines approved under ADP Application L-627 are served by Cullet Return System #2.
- 4.f. Emergency Power Generation (existing). Two diesel engine driven generators are used to generate emergency electrical power for the facility. Operation of Emergency Generator #1 for the purposes of maintenance and testing is limited to a maximum of 50 hr/yr. Operation of Emergency Generator #2 for the purposes of maintenance and testing is limited to a maximum of 35 hr/yr.
- 4.g. Hydrogen Generation System (existing). One hydrogen generation system is used to produce hydrogen for use in the tin bath. The system converts natural gas into hydrogen using a steam methane reformer. Hydrogen produced by the system is mixed with nitrogen to create the necessary production atmosphere for the tin bath.

5. EQUIPMENT/ACTIVITY IDENTIFICATION

- 5.a. Glass Furnace (modified). One site-built float furnace with a side port, multi-cell regenerative configuration. First glass pull from the furnace occurred on September 26, 2006. The furnace was partially rebricked in February/March 2019.

Glass Furnace

Rated Heat Input: 231.0 MMBtu/hr
Capacity: 750 tpd
Fuel: Natural gas
ESP Make/Model: United McGill
Exhaust: 8' dia vertical stack at ~175' above ground level
Location: 46°32'28.96"N 122°55'29.21"W

Exhaust Reheater

Rated Heat Input: 19.2 MMBtu/hr (nominal)
Fuel: Natural gas
Exhaust: Exhausted through furnace exhaust stack

Emission Controls. SO₂ emissions from the glass furnace are controlled by raw material selection and a spray dryer. PM emissions are controlled with an electrostatic precipitator (ESP). CO emissions are controlled by proper combustion control. NO_x emissions are controlled by a selective catalytic reduction (SCR) system. The SCR system is guaranteed by the manufacturer to reduce NO_x emissions by a minimum of 80%. Installation of the SCR system was a voluntary action by Cardinal and is not considered to be a BACT measure. The SCR system is configured with a direct-fired heater in the exhaust ductwork between the ESP and the SCR system to heat the exhaust stream to the minimum temperature required by SCR system. Approval requirements allow by-pass of the ESP/spray dryer and SCR system for purposes of maintenance for up to 120 hours per year. Maintenance of each system may be conducted independently. The exhaust ductwork configuration allows for by-pass of either system individually.

ADP Application L-752. This permitting action makes two changes to the description and approval requirements for the glass furnace. First, the maximum rated heat input of the exhaust reheater has been changed from 17.0 to 19.2 MMBtu/hr. This change reflects actual equipment specifications as installed. Equipment descriptions and emission calculations have been updated to reflect the difference. Second, Cardinal proposes to modify existing visible emissions limits to add an alternate limit for SCR maintenance. Maintenance staff needs to periodically open portals and/or remove panels to visually inspect internal elements of the SCR system. Airflow through the viewing portals has the potential to cause transitory spikes in opacity similar to hot fan load changes. Cardinal proposes to add an alternate visible emissions limit of 20% opacity, applicable during periods of maintenance inspection.

- 5.b. Annealing Lehr (existing). One site built annealing Lehr with direct SO₂ injection. Exhaust streams from the Lehr are vented back into the Glass Furnace and exhausted through the Glass Furnace exhaust stack.
- 5.c. Glass Cutting Operations (existing). Multiple cutting wheel assemblies used to size and trim product by scoring glass ribbon subsequent to production. This operation applies mineral spirits to the glass ribbon as a cutting lubricant.

Location: 46°32'38.69"N 122°55'29.29"W

- 5.d. Baghouse / Cullet Return System #1 (existing). Cullet return system #1 conveys broken/reject lites and glass dust from the production line back to the cullet flat storage area at a maximum rate of 750 tpd. The cullet return baghouse is used in conjunction with equipment enclosure to control dust emissions from the portion of the glass return system operating at the production line.

Mfg / Model: Donaldson / 324MBWS10
 Rated Airflow: 41,500 acfm
 Filtration Area / Media: 5,196 ft² of 10.5 oz/yd² Dura-Life Polyester
 Cleaning System: Reverse Pulse-jet
 Exhaust Configuration: 34" dia exhaust discharging vertical at 100' above grade
 Location: 46°32'38.48"N 122°55'29.60"W

- 5.e. Baghouse / Cullet Return System #2 (existing). Cullet return system #2 collects and conveys broken/reject glass and glass dust from the lite packing lines approved under ADP Application L-627.

Mfg / Model: Carothers and Son / 195TR10HEI
 Rated Airflow: 25,000 acfm
 Filtration Area / Media: 3,120 ft² of 16 oz/yd² polyester
 Cleaning System: Reverse Airjet
 Exhaust Configuration: 32" dia exhaust discharging vertical at 32' 6" above grade
 Location: 46°32'38.03"N 122°55'29.45"W

- 5.f. EP Dust Collection System / Baghouse #1 (existing). A pneumatic transfer system is used to convey material catch from the furnace's electrostatic precipitator to the raw material storage silos. Baghouse #1 controls emissions from a surge tank and transfer point in the system.

Mfg / Model: Nol-Tec / 238-84NT25
 Rated Airflow: 1,500 acfm
 Filtration Media: 263 ft² of 16 oz/yd² polyester
 Cleaning System: Reverse Airjet
 Exhaust Configuration: 8" dia exhaust discharging ~100' above grade
 Location: 46°32'29.07"N 122°55'29.41"W

- 5.g. EP Dust Collection System / Baghouse #2 (existing). A pneumatic transfer system is used to convey material catch from the furnace's electrostatic precipitator to the raw material storage silos. Baghouse #2 controls emissions from a surge tank and transfer point in the system.

Mfg / Model: Nol-Tec / 238-84NT25
 Rated Airflow: 1,500 acfm
 Filtration Media: 263 ft² of 16 oz/yd² polyester
 Cleaning System: Reverse Airjet
 Exhaust Configuration: 8" dia exhaust discharging ~100' above grade
 Location: 46°32'29.24"N 122°55'29.42"W

- 5.h. Emergency Diesel Generator #1 (existing). A diesel engine driven electric generator used to provide emergency power to essential facility functions during interruptions of utility power.

Engine Make / Model: Caterpillar / D3516 (s/n GZS00700)

Engine Power Rating: 2,885 bhp
 Engine Fuel Consumption: 146.6 gal/hr (100% load)
 Engine Mfg Date: 2005
 NSPS/MACT: - / ZZZZ
 Generator Make / Model: Caterpillar (s/n 1HN00940)
 Generator Power Rating: 2,000 kW
 Exhaust Configuration: 16.5" dia exhaust discharging 58' above grade
 Location: 46°32'30.06"N 122°55'31.42"W

- 5.i. Emergency Diesel Generator #2 (existing). A diesel engine driven electric generator used to provide emergency power to essential facility functions during interruptions of utility power.

Engine Make / Model: Caterpillar / 3516C
 Engine Power Rating: 2,937 bhp
 Engine Fuel Consumption: 133.6 gal/hr
 Engine Mfg Date: TBD (EPA Tier 2)
 NSPS/MACT: IIII / ZZZZ
 Generator Make / Model: Caterpillar
 Generator Power Rating: 2,000 kW
 Exhaust Configuration: 16.5" dia exhaust discharging 58' above grade
 Location: 46°32'30.02"N 122°55'31.52"W

- 5.j. Hydrogen Generation System (existing). A stand-alone packaged hydrogen generation system that produces hydrogen for use in the tin bath. Hydrogen is produced from pipeline natural gas using a steam methane reformer. The system is described as follows:

Make / Model: Air Products / PHG100
 Rated Heat Input: 0.85 MMBtu/hr
 Fuel: Natural gas
 Exhaust: 18" dia vertical stack at 18' above ground level.
 Location: 46°32'32.40"N 122°55'32.60"W

- 5.k. Miscellaneous Burners / Space Heaters (existing). A collection of natural gas fired maintenance burners, minor process heaters and air makeup heaters operating in support of glass production operations. Combined rated heat input for all equipment is 19.188 MMBtu/hr. Individual pieces of equipment are described below.

<u>Facility Area</u>	<u>Unit Description</u>	<u>Unit Count</u>	<u>Unit Capacity (Btu/hr)</u>
Cafeteria	Oven	1	70,000
	Range	1	191,000
	Charbroiler	1	50,000
	Griddle	1	80,000
	Fryers	2	180,000
Warehouse/Cold End	Unit Heater 2	22	250,000
	Rooftop Unit 11	1	120,000
Cold End Addition	HVAC-1 Heater/Cooler	1	80,000
	Unit Heater 1	1	100,000

<u>Facility Area</u>	<u>Unit Description</u>	<u>Unit Count</u>	<u>Unit Capacity (Btu/hr)</u>
Office	Rooftop Unit 4	1	80,000
	Rooftop Unit 5	1	120,000
	Rooftop Unit 6	1	120,000
	Rooftop Unit 7	1	60,000
	Rooftop Unit 8	1	80,000
	Rooftop Unit 9	1	60,000
	Rooftop Unit 10	1	150,000
	Rooftop Unit 12	1	60,000
	Water Heater 3	1	75,000
	Rooftop Unit 3	1	120,000
Shop/Utility Room	Unit Heater 6	1	250,000
	Unit Heater 5	3	175,000
	Unit Heater 7	3	100,000
Generator/Substation Room	Unit Heater 8	1	25,600
	Unit Heater 9	1	25,600
SO ₂ /Water Meter Building	Rooftop Unit 1	1	120,000
	Rooftop Unit 2	1	120,000
Hot End Control Room	Unit Heater 1 st Floor	1	400,000
	Unit Heater 4LX60	2	200,000
Batch House	Shotgun Burners	2	705,000
	Shotgun Burners	8	412,000
	Shotgun Burners	2	2,420,000

5.1. Insignificant Emission Units. The following pieces of facility equipment have been determined to have insignificant emissions, and are not registered as emission units:

- Dust Collector / Raw Materials Elevator – Top. The raw materials elevator conveys raw materials to the top of the storage silos/bins at a maximum rate of 300 tph. The elevator top dust collector is used in conjunction with equipment enclosure to control dust emissions from raw material transfer between the top of the elevator and the rotary distributor for the storage silos. *This unit originally exhausted to the ambient atmosphere. The unit was blinded off in September 2013.*

Mfg / Model: JBD / DF110R
 Rated Airflow: 324 acfm
 Filtration Area / Media: 108 ft² (8 oz/yd² spun bond polyester filter cartridge)
 Cleaning System: Reverse Pulse-jet

- Dust Collector / Cullet Elevator - Top. The cullet elevator conveys cullet from the flat storage area to the storage bins in the batch house at a maximum rate of 150 tph. The top dust collector is used in conjunction with equipment enclosure to control dust emissions from cullet transfer between the top of the elevator and the batch house storage bins. *This unit originally exhausted to the ambient atmosphere. The unit was blinded off in September 2013.*

Mfg / Model: JBD / DF110R
 Rated Airflow: 324 acfm
 Filtration Area / Media: 108 ft² (8 oz/yd² spun bond polyester filter cartridge)
 Cleaning System: Reverse Pulse-jet

- Natural gas metering station.
- Hydrogen storage and vaporization plant.
- On-site nitrogen generation, storage and vaporization plant.
- Re-circulated water system including cooling tower & storage tank.
- Fire protection water storage tank and pump.

5.m. Equipment/Activity Summary.

ID No.	Equipment/Activity	Control Equipment/Measure
1	Glass Furnace / Annealing Lehr	Selective Catalytic Reduction, Spray Dryer, Electrostatic Precipitator, Low Sulfur Fuel (Nat Gas)
2	Glass Cutting Operations	Restriction on Material Type and Use
3	Cullet Return System #1	Process Enclosure, Fabric Filtration (Donaldson – 41,500 acfm)
4	Cullet Return System #2	Process Enclosure, Fabric Filtration (Carothers/Son – 25,000 acfm)
5	EP Dust Collection System #1	Process Enclosure, Fabric Filtration (Nol-Tec – 1,500 acfm)
6	EP Dust Collection System #2	Process Enclosure, Fabric Filtration (Nol-Tec – 1,500 acfm)
7	Emergency Generator #1	Low Sulfur Fuel ($\leq 0.0015\%$ by wt), Operating Limit (≤ 50 hr/yr)
8	Emergency Generator #2	Low Sulfur Fuel ($\leq 0.0015\%$ by wt), Operating Limit (≤ 35 hr/yr)
9	Misc. Burners/Space Heaters	Low Sulfur Fuel (Nat Gas)
10	Hydrogen Generation System	Low Sulfur Fuel (Nat Gas)

6. EMISSIONS DETERMINATION

Emissions to the ambient atmosphere from glass manufacturing operations, as proposed in ADP Application L-752, consist of nitrogen oxides (NO_x), carbon monoxide (CO), volatile organic compounds (VOC), particulate matter (PM), sulfur dioxide (SO₂), toxic air pollutants (TAPs), and hazardous air pollutants (HAPs).

Unless otherwise specified by SWCAA, actual emissions must be determined using the specified input parameter listed for each emission unit and the following hierarchy of methodologies:

- (a) Continuous emissions monitoring system (CEMS) data;
 - (b) Source emissions test data (EPA reference method). When source emissions test data conflicts with CEMS data for the time period of a source test, source test data must be used;
 - (c) Source emissions test data (other test method); and
 - (d) Emission factors or methodology provided in this TSD.
- 6.a. Glass Furnace / Annealing Lehr (modified). Potential emissions from glass production are calculated from maximum glass production of 750 tpd, maximum natural gas consumption of 250.2 MMBtu/hr (Furnace - 231 MMBtu/hr, Reheater - 19.2 MMBtu/hr), emission test data from similar glass plants, emission limits proposed by the applicant, and emission factors from EPA AP-42. Emission calculations assume 8,640 hr/yr of regular operation and 120 hr/yr of control equipment maintenance. Annual emissions will be calculated from actual production, fuel use and CERMS data.

NO_x emissions are controlled by an SCR system with a minimum rated control efficiency of 80%. CO and VOC emissions are minimized with proper combustion controls and operation of the furnace in an oxidizing mode. PM and SO₂ emissions are controlled with an ESP/Spray Dryer combination.

All PM emissions are assumed to be PM_{2.5}. Emission factors for TAP and HAP compounds from natural gas combustion (AP-42, Tables 1.4-3 and 1.4-4) with a quality rating of "D" or "E" were not included in calculations due to the general unreliability of the data, and/or the questionable applicability of the data to this source.

<u>Pollutant</u>		<u>Emission Factor*</u>	<u>Emissions</u>	
			<u>Lb/hr</u>	<u>Tpy</u>
NO _x				245.00
	Normal Operation	1.63 lb/ton _g (30-day)	101.8 (24-hr)	
	SCR Maintenance	-	415.6 (24-hr)	
CO		1.8 lb/ton _g (30-day)	112.6 (24-hr)	246.38
VOC		0.1 lb/ton _g (1-hr)	3.1 lb/hr (1-hr)	13.69
SO ₂				114.19
	Normal Operation	0.8 lb/ton _g (30-day)	25.0 (24-hr)	
	ESP/SD Maintenance	-	103.1 (24-hr)	
PM ₁₀ /PM _{2.5} (f)				61.69
	Normal Operation	0.45 lb/ton _g (1-hr)	14.1 (1-hr)	
	ESP/SD Maintenance		15.6 (1-hr)	
PM ₁₀ /PM _{2.5} (t)		0.94 lb/ton _g (1-hr)	29.4 (1-hr)	128.66
CO ₂ e		117 lb/MMBtu	29,273	128,217
TAPs (total)				20.00
HAPs (total)				3.43
Ammonia		0.07 lb/ton _g (1-hr)	2.19 (1-hr)	9.58
Hydrogen Fluoride		0.022 lb/ton _g	0.69	3.01
Sulfuric acid		0.051 lb/ton _g	1.57	6.98

<u>Pollutant</u>	<u>Emission Factor*</u>	<u>Lb/hr</u>	<u>Lb/yr</u>
Arsenic	645 ppmw (PM)	0.019	165.6
Barium	4.3137E-6 lb/MMBtu	0.00108	9.4
Beryllium	1.1765E-8 lb/MMBtu	0.000003	0.026
Benzene	2.06E-6 lb/MMBtu	0.00051	4.5
Cadmium	840 ppmw (PM)	0.0247	216.4
Chromium (total)	630 ppmw (PM)	0.0185	162.1
Cobalt	8.2353E-8 lb/MMBtu	0.00002	0.18
Copper	8.3E-7 lb/MMBtu	0.00021	1.8
Formaldehyde	7.35E-5 lb/MMBtu	0.0182	161.2
Lead	297 ppmw (PM)	0.0087	76.2
Manganese	3.7255E-7 lb/MMBtu	0.000093	0.82
Mercury	2.549E-7 lb/MMBtu	0.000064	0.56
Molybdenum	1.0784E-6 lb/MMBtu	0.00027	2.3
Nickel	190 ppmw (PM)	0.0056	49.1
Selenium	2.3529E-8 lb/MMBtu	0.000006	0.052
Toluene	3.33E-6 lb/MMBtu	0.00083	7.3

* tong - ton of glass drawn.

ADP Application L-752. The maximum rated heat input of the exhaust reheater has been changed from 17.0 to 19.2 MMBtu/hr to reflect actual equipment specifications as installed. Equipment descriptions have been updated to reflect the difference. Glass Furnace emission limits will remain the same so there is no change in potential emissions.

- 6.b. Glass Cutting (existing). Potential emissions from glass cutting operations are calculated from maximum lubricant consumption of 7,317 pounds per month, material content data from the vendor and material balance methodology. Benzene content of the lubricant is specified as no greater than 1 ppmw. Annual emissions will be calculated from actual material consumption.

<u>Pollutant</u>	<u>Emissions</u>	
VOC	10.0 lb/hr	43.90 tpy
Benzene	--	0.088 lb/yr

- 6.c. Material Handling Systems – Dust Collectors (existing). The proposed cullet return system will operate in similar fashion to existing dust collection systems at the facility. Emissions from each dust collector are calculated from rated discharge, a maximum emission concentration of 0.005 gr/dscf, and 8,760 hr/yr of operation. All PM emissions are assumed to be PM_{2.5}. Annual emissions will be calculated from actual hours of operation.

<u>Dust Collector</u>	<u>Pollutant</u>	<u>Discharge Rate (cfm)</u>	<u>Emission Factor</u>	<u>Operation (hr/yr)</u>	<u>Emissions</u>	
					<u>(lb/hr)</u>	<u>(tpy)</u>
Cullet Return BH #1	PM/PM ₁₀ /PM _{2.5}	41,500	0.005 gr/dscf	8,760	1.78	7.79
Cullet Return BH #2	PM/PM ₁₀ /PM _{2.5}	25,000	0.005 gr/dscf	8,760	1.07	4.69
EP Dust Baghouse #1	PM/PM ₁₀ /PM _{2.5}	1,500	0.005 gr/dscf	8,760	0.064	0.28
EP Dust Baghouse #2	PM/PM ₁₀ /PM _{2.5}	1,500	0.005 gr/dscf	8,760	0.064	0.28

- 6.d. Diesel Engine – Emergency Generator #1 (existing). Potential emissions from diesel engine operation are calculated from the emission factors listed below and hours of operation. Emission factors for all pollutants other than SO₂ are taken from manufacturer's data. SO₂ emission rates are calculated from EPA AP-42, Table 3.4-1 assuming a maximum fuel sulfur content of 0.0015% sulfur, a specific fuel consumption of 146.6 gal/hr, and a diesel heat content of 140,000 Btu/gal. All PM emissions are assumed to be PM_{2.5}. Annual emissions will be calculated from actual hours of operation using the emission factors identified below.

Hours of Operation = 50 hours

<u>Pollutant</u>	EF	Emissions	
	<u>lb/hr</u>	<u>tpy</u>	<u>EF Source</u>
NO _x	40.56	1.01	Manufacturer
CO	4.15	0.10	Manufacturer
VOC	1.08	0.027	Manufacturer
SO _x as SO ₂	0.030	0.001	Mass Balance
PM/PM ₁₀	0.91	0.023	Manufacturer
PM _{2.5}	0.91	0.023	Manufacturer
Total GHG - CO ₂ e	3,313	82.8	40 CFR 98

- 6.e. Diesel Engine – Emergency Generator #2 (existing). Potential emissions from diesel engine operation are calculated from the emission factors listed below and hours of operation. Emission factors for all pollutants other than SO₂ are calculated from manufacturer's data. SO₂ emission rates are calculated from EPA AP-42, Table 3.4-1 assuming a maximum fuel sulfur content of 0.0015% sulfur, a specific fuel consumption of 133.6 gal/hr, and a diesel heat content of 140,000 Btu/gal. All PM emissions are assumed to be PM_{2.5}. Annual emissions will be calculated from actual hours of operation using the emission factors identified below.

Hours of Operation = 35 hours

<u>Pollutant</u>	EF	Emissions	
	<u>lb/hr</u>	<u>tpy</u>	<u>EF Source</u>
NO _x	35.38	0.62	Manufacturer
CO	1.94	0.034	Manufacturer
VOC	0.70	0.012	Manufacturer
SO _x as SO ₂	0.029	0.00051	AP-42 Table 3.4-1, 0.0015% S
PM/PM ₁₀	0.17	0.0030	Manufacturer
PM _{2.5}	0.17	0.0030	Manufacturer
Total GHG - CO ₂ e	3,070	53.7	40 CFR 98

- 6.f. Miscellaneous Burners/Space Heaters (existing). Potential emissions from burner and space heater operation are calculated from a combined rated heat input of 19.188 MMBtu/hr, 51,000 MMBtu/yr of natural gas consumption and emission factors from EPA AP-42 §1.4 "Natural Gas Combustion" (3/98). All PM is assumed to be PM_{2.5}. Annual emissions will be calculated based on actual fuel consumption using the same methodology.

Heat Input = 19.188 MMBtu/hr
 Gas Consumption = 51,000 MMBtu

<u>Pollutant</u>	EF	Emissions	
	<u>lb/MMBtu</u>	<u>lb/hr</u>	<u>tpy</u>
NO _x	0.098	1.88	2.50
CO	0.082	1.57	2.09
VOC	0.0054	0.10	0.14
SO ₂	0.0006	0.01	0.015
PM/PM ₁₀ /PM _{2.5}	0.0075	0.14	0.19
CO ₂ e	117.65	2,257	3,000
Benzene	2.06E-06	0.00004	0.11 lb/yr
Formaldehyde	7.35E-05	0.00141	3.75 lb/yr

- 6.g. Hydrogen Generation System (existing). Potential emissions from hydrogen generation system operation are calculated from a rated heat input of 0.867 MMBtu/hr, 8,760 hr/yr of total operation, 81 hours of startup/shutdown/tuning operation, and emission factors from EPA AP-42 Section 1.4 "Natural Gas Combustion" (7/10) and the manufacturer. All PM emissions are assumed to be PM_{2.5}. Annual emissions will be calculated based on actual fuel consumption using the same methodology.

Total Operation = 8,760 hours
 Startup/Shutdown/Tuning = 81 hours

<u>Pollutant</u>	EF	Emissions	
	<u>(lb/hr)</u>	<u>(tpy)</u>	<u>EF Source</u>
NO _x	0.0850	0.37	AP-42 Sec. 1.4 (7/93)
CO (Base Operation)	0.0714	0.31	AP-42 Sec. 1.4 (7/93)
CO (SU/SD/Tuning)	20.00	0.81	Manufacturer
VOC	0.0047	0.020	AP-42 Sec. 1.4 (7/93)
SO _x as SO ₂	0.0005	0.0022	AP-42 Sec. 1.4 (7/93)
PM/PM ₁₀ /PM _{2.5}	0.0065	0.028	AP-42 Sec. 1.4 (7/93)
CO ₂	102.0	446.8	40 CFR 98

- 6.h. Emissions Summary/Facility-wide Potential to Emit. Facility-wide potential to emit as calculated in the sections above is summarized below.

<u>Pollutant</u>	<u>Potential Emissions (tpy)</u>	<u>Project Increase (tpy)</u>
NO _x	249.49	0.0
CO	249.73	0.0
VOC	57.79	0.0
SO ₂	114.21	0.0
Lead	0.04	0.0
PM	141.95	0.0
PM ₁₀	141.95	0.0
PM _{2.5}	141.95	0.0
TAP	20.00	0.0
HAP	3.43	0.0
CO ₂ e	121,962	0

<u>Pollutant</u>	<u>CAS Number</u>	<u>Category</u>	<u>Facility-wide Emissions (lb/yr)</u>	<u>Incremental Increase (lb/yr)</u>	<u>WAC 173-460 SQER (lb/yr)</u>
Ammonia	7664-41-7	TAP B	19,162.5	0.0	17,500
Arsenic	7440-38-2	HAP/TAP A	165.6	0.0	0
Barium	7440-39-3	TAP B	9.45	0.0	175
Beryllium	7440-41-7	HAP/TAP A	0.03	0.0	0
Benzene	71-43-2	HAP/TAP A	4.7	0.0	20
Cadmium	7440-43-9	HAP/TAP A	216.4	0.0	0
Chromium (total)	N/A	HAP/TAP A	162.1	0.0	175
Cobalt	7440-48-4	HAP/TAP B	0.18	0.0	175
Copper	7440-50-8	TAP B	1.8	0.0	175
Formaldehyde	50-00-0	HAP/TAP A	164.9	0.0	20
Hydrogen Fluoride	7664-39-3	HAP/TAP B	6,023	0.0	175
Lead	7439-92-1	HAP/TAP A	76.2	0.0	50
Manganese	7439-96-5	HAP/TAP B	0.82	0.0	175
Mercury	7439-97-6	HAP/TAP B	0.56	0.0	175
Molybdenum	7439-98-7	TAP B	2.4	0.0	5,250
Nickel	7440-02-0	HAP/TAP A	49.1	0.0	0.5
Selenium	7782-49-2	HAP/TAP B	0.052	0.0	175
Sulfuric acid	7664-93-9	TAP B	13,961	0.0	175
Toluene	108-88-3	HAP/TAP B	7.3	0.0	43,748

7. REGULATIONS AND EMISSION STANDARDS

Regulations that have been used to evaluate the acceptability of the proposed facility and establish emission limits and control requirements include, but are not limited to, the regulations, codes, or requirements listed below.

- 7.a. 40 CFR 60.7 "Notification and Recordkeeping" requires that notification shall be submitted to SWCAA, the delegated authority, for date construction commenced, anticipated initial startup, and initial startup. These requirements have been met by past reporting actions.
- 7.b. 40 CFR 60.8 "Performance Tests" requires that emission tests be conducted according to test methods approved in advance by the permitting authority and a copy of the results be submitted to the permitting authority.
- 7.c. 40 CFR 60, Subpart CC "Standards of Performance for Glass Manufacturing Plants" applies to any glass melting furnace that commences operation after June 5, 1979. The Glass Furnace at this facility is subject to this requirement.
- 7.d. 40 CFR 60, Subpart IIII "Standards of Performance for Stationary Compression Ignition Internal Combustion Engines" applies to each compression ignition (CI) internal combustion engine (ICE) that commences construction after July 11, 2005 and is manufactured after April 1, 2006, or that is modified or reconstructed after July 11, 2005. This regulation is applicable to the power unit for Emergency Generator #2 but is not applicable to the power unit for Emergency Generator #1 because it was manufactured prior to April 1, 2006.
- 7.e. 40 CFR 61, Subpart N "National Emissions Standards for Hazardous Air Pollutants for Inorganic Arsenic Emissions from Primary Copper Smelters" applies to each glass melting furnace that uses commercial arsenic as a raw material. The Glass Furnace at this facility does not use commercial arsenic as a raw material. Therefore, this regulation is not applicable.
- 7.f. 40 CFR 63, Subpart ZZZZ "National Emissions Standards for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines" applies to each new and existing stationary reciprocating internal combustion engines (RICE) located at major and area sources of HAP emissions. The power unit for Emergency Generator #1 is classified as an existing compression ignition (CI) stationary RICE. The power unit for Emergency Generator #2 is classified as a new compression ignition (CI) stationary RICE.
- 7.g. 40 CFR 63, Subpart SSSSSS "National Emissions Standards for Hazardous Air Pollutants for Glass Manufacturing Area Sources" applies to each existing or new affected glass melting furnace that is located at a glass manufacturing facility and satisfies the requirements specified in paragraphs 40 CFR 63.11449(a). The glass production process at this facility does not use a "glass manufacturing metal HAP" in its batch formulation. Therefore, this regulation is not applicable.
- 7.h. 40 CFR 64 "Compliance Assurance Monitoring" requires the owner or operator of selected pollutant specific emission units at a major stationary source to develop and implement a monitoring plan that provides a reasonable assurance of compliance with applicable emission limitations or standards. These units are generally characterized as having uncontrolled potential to emit > 100 tpy and using a control device to comply with applicable emission standards. This regulation is applicable to the glass melting furnace at this facility.

- 7.i. 40 CFR 68 "Chemical Accident Prevention Provisions" requires affected stationary sources to compile and submit a risk management plan, as provided in Sections 68.150 to 68.185. Applicability is determined by the type and quantity of material stored at the facility. This regulation could potentially be applicable to this facility due to the storage of large quantities of hydrogen gas and/or sulfur dioxide. However, the storage capacity for both of these compounds is less than the applicable threshold so the regulation is not applicable.
- 7.j. Revised Code of Washington (RCW) 70A.15.2040 empowers any activated air pollution control authority to prepare and develop a comprehensive plan or plans for the prevention, abatement and control of air pollution within its jurisdiction. An air pollution control authority may issue such orders as may be necessary to effectuate the purposes of the Washington Clean Air Act [RCW 70A.15] and enforce the same by all appropriate administrative and judicial proceedings subject to the rights of appeal as provided in Chapter 62, Laws of 1970 ex. sess.
- 7.k. RCW 70A.2210 provides for the inclusion of conditions of operation as are reasonably necessary to assure the maintenance of compliance with the applicable ordinances, resolutions, rules and regulations when issuing an Air Discharge Permit for installation and establishment of an air contaminant source.
- 7.l. Washington Administrative Code (WAC) 173-401 "Operating Permit Regulation" requires all major sources and other sources as defined in WAC 173-401-300 to obtain an operating permit. This source is a major source, so this regulation is applicable.
- 7.m. WAC 173-442 "Clean Air Rule" establishes GHG emissions standards starting in 2017 for certain stationary sources, petroleum product producers/importers, and natural gas distributors. The proposed facility will have covered GHG emissions in excess of the thresholds listed in WAC 173-442-030. Therefore, this regulation is applicable to this facility. Implementation of the regulation will be carried out by the Department of Ecology.
- 7.n. WAC 173-460 "Controls for New Sources of Toxic Air Pollutants" requires Best Available Control Technology for toxic air pollutants (T-BACT), identification and quantification of emissions of toxic air pollutants and demonstration of protection of human health and safety.
- 7.o. WAC 173-476 "Ambient Air Quality Standards" establishes ambient air quality standards for PM₁₀, PM_{2.5}, lead, sulfur dioxide, nitrogen dioxide, ozone, and carbon monoxide in the ambient air, which shall not be exceeded.
- 7.p. SWCAA 400-040 "General Standards for Maximum Emissions" requires all new and existing sources and emission units to meet certain performance standards with respect to Reasonably Available Control Technology (RACT), visible emissions, fallout, fugitive emissions, odors, emissions detrimental to persons or property, sulfur dioxide, concealment and masking, and fugitive dust.
- 7.q. SWCAA 400-050 "Emission Standards for Combustion and Incineration Units" requires that all provisions of SWCAA 400-040 be met and that no person shall cause or permit the emission of particulate matter from any combustion or incineration unit in excess of 0.23 grams per dry cubic meter (0.1 grains per dry standard cubic foot) of exhaust gas at standard conditions.
- 7.r. SWCAA 400-060 "Emission Standards for General Process Units" requires that all new and existing sources not emit particulate matter in excess of 0.1 grains per dry standard cubic foot of exhaust gas.

- 7.s. SWCAA 400-091 "Voluntary Limits on Emissions" allows sources to request voluntary limits on emissions and potential to emit by submittal of an ADP application as provided in SWCAA 400-109. Upon completion of review of the application, SWCAA shall issue a Regulatory Order that reduces the source's potential to emit to an amount agreed upon between SWCAA and the permittee. The voluntary modifications proposed by Cardinal will lower facility emissions to levels below major source thresholds. Cardinal has requested that SWCAA issue enforceable permit limits to make the facility a synthetic minor source.
- 7.t. SWCAA 400-109 "Air Discharge Permit Applications" requires that an Air Discharge Permit application be submitted for all new installations, modifications, changes, or alterations to process and emission control equipment consistent with the definition of "new source". Sources wishing to modify existing permit terms may submit an Air Discharge Permit application to request such changes. An Air Discharge Permit must be issued, or written confirmation of exempt status must be received, before beginning any actual construction, or implementing any other modification, change, or alteration of existing equipment, processes, or permits.
- 7.u. SWCAA 400-110 "New Source Review" requires that SWCAA issue an Air Discharge Permit in response to an Air Discharge Permit application prior to establishment of the new source, emission unit, or modification.
- 7.v. SWCAA 400-113 "Requirements for New Sources in Attainment or Nonclassifiable Areas" requires that no approval to construct or alter an air contaminant source shall be granted unless it is evidenced that:
- (1) The equipment or technology is designed and will be installed to operate without causing a violation of the applicable emission standards;
 - (2) Best Available Control Technology will be employed for all air contaminants to be emitted by the proposed equipment;
 - (3) The proposed equipment will not cause any ambient air quality standard to be exceeded; and
 - (4) If the proposed equipment or facility will emit any toxic air pollutant regulated under WAC 173-460, the proposed equipment and control measures will meet all the requirements of that Chapter.

8. RACT/BACT/BART/LAER/PSD/CAM DETERMINATIONS

The proposed equipment and control systems incorporate Best Available Control Technology (BACT) for the types and amounts of air contaminants emitted by the processes as described below:

New BACT Determinations

This permitting action is limited to modification of maintenance provisions and a minor revision of equipment rating. No new BACT determinations have been made.

Previous BACT Determinations

- 8.a. BACT Determination – Hydrogen Generation System (ADP 22-3529). The use of combustion equipment that fires low sulfur fuel (natural gas) and proper combustion controls has been determined to meet the requirements of BACT for the types and quantities of air contaminants emitted by the hydrogen generation system at this facility.

- 8.b. BACT Determination – Emergency Generator (ADP 21-3497). The use of a modern diesel engine design (EPA Tier 2), limited hours of operation (testing, maintenance, and emergency use only), and ultra-low sulfur distillate fuel (less than 0.0015% sulfur by weight) has been determined to meet the requirements of BACT for emergency generators at this facility. The proposed generator engine is certified to EPA Tier 2 standards. There are similar engines available certified to higher EPA Tier standards, but 40 CFR 60 Subpart IIII does not require their use for emergency applications. In addition, catalyst systems associated with higher Tier certifications do not provide significant emission reductions for the proposed operating scheme.
- 8.c. BACT Determination – Glass Furnace / Annealing Lehr (ADP 20-3409). The use of the following control measures has been determined to meet the requirements of BACT for the Glass Furnace / Annealing Lehr at this facility:

SO₂ – Low sulfur fuel and spray dryer system using a sodium carbonate solution.

PM – Electrostatic precipitator.

The following emission control measures have been employed by Cardinal on a voluntary basis:

NO_x – Selective catalytic reduction system with ammonia injection capable of reducing NO_x emissions by a minimum of 80%. Such control measures include operation, monitoring and maintenance provisions for the ammonia injection system such that stack emissions of ammonia will not exceed 10 ppmvd @ 15% O₂ (24-hr avg).

CO/VOC – Proper combustion controls.

- 8.d. BACT Determination – Misc. Burners / Space Heaters (ADP 20-3409). The use of combustion equipment that fires a low sulfur fuel (natural gas) and limits visible emissions to 0% opacity or less has been determined to meet the requirements of BACT for miscellaneous burners and space heaters at this facility.

Other Determinations

- 8.e. Prevention of Significant Deterioration (PSD) Applicability Determination. The potential to emit of this facility is less than applicable PSD applicability thresholds. Likewise, this permitting action will not result in a potential increase in emissions equal to or greater than the PSD thresholds. Therefore, PSD review is not applicable to this action.
- 8.f. Compliance Assurance Monitoring (CAM) Applicability Determination. With some exceptions, CAM is applicable to any emissions unit with the potential to emit (pre-controlled) 100 tons per year or more of any criteria air pollutant for which an emission standard (limit) applies, and that utilizes a control device to maintain compliance with the emission standard. PM emissions from the Glass Furnace are subject to CAM requirements.

9. AMBIENT IMPACT ANALYSIS

- 9.a. Criteria Air Pollutant Review. Criteria pollutant emissions from approved operations are not expected to cause an adverse impact on ambient air quality.

- 9.b. Toxic Air Pollutant Review. The modifications proposed in ADP Application L-752 will not change the previously approved ambient impact of this facility.

Conclusions

- 9.c. Addition of an alternate visible emissions limit, as proposed in ADP Application L-752, will not cause the ambient air quality requirements of Title 40 Code of Federal Regulations (CFR) Part 50 "National Primary and Secondary Ambient Air Quality Standards" to be violated.
- 9.d. Addition of an alternate visible emissions limit, as proposed in ADP Application L-752, will not cause the requirements of WAC 173-460 "Controls for New Sources of Toxic Air Pollutants" or WAC 173-476 "Ambient Air Quality Standards" to be violated.
- 9.e. Addition of an alternate visible emissions limit, as proposed in ADP Application L-752, will not cause a violation of emission standards for sources as established under SWCAA General Regulations Sections 400-040 "General Standards for Maximum Emissions," 400-050 "Emission Standards for Combustion and Incineration Units," and 400-060 "Emission Standards for General Process Units."

10. DISCUSSION OF APPROVAL CONDITIONS

SWCAA has made a determination to issue ADP 25-3719 in response to ADP Application L-752. ADP 25-3719 contains approval requirements deemed necessary to assure compliance with applicable regulations and emission standards as discussed below.

- 10.a. Supersession of Previous Permits. ADP 25-3719 supersedes ADP 23-3596 in its entirety.
- 10.b. General Basis. Permit requirements for equipment affected by this permitting action incorporate the operating schemes proposed by the applicant in ADP Application L-752. Permit requirements established by this action are intended to implement BACT, minimize emissions, and assure compliance with applicable requirements on a continuous basis. Emission limits for approved equipment are based on the maximum potential emissions calculated in Section 6 of this Technical Support Document.
- 10.c. Monitoring and Recordkeeping Requirements. ADP 25-3719 establishes monitoring and recordkeeping requirements sufficient to document compliance with applicable emission limits, ensure proper operation of approved equipment and provide for compliance with generally applicable requirements.
- 10.d. Reporting Requirements. ADP 25-3719 establishes general reporting requirements for annual air emissions, upset conditions and excess emissions. Specific reporting requirements are established for hours of operation, fuel consumption, material consumption, glass production, and emission test results. Reports are to be submitted on a quarterly basis.
- 10.e. Raw Materials Handling. Permit requirements for raw materials handling focus on full or partial enclosure of handling equipment such as elevators, conveyor belts, and storage silos/bins. All major sources of fugitive dust are controlled via dust collectors. Visible emissions from dust collector exhaust are limited to 0% opacity. There are no restrictions on equipment operation.

- 10.f. Glass Furnace / Annealing Lehr. Permit requirements for the Glass Furnace establish comprehensive emission limits for criteria pollutants. Emissions of NO_x, SO₂, and PM will be controlled through the use of add-on control technology. CO and VOC emissions are controlled through good combustion practices. A CEMS is in use to monitor exhaust flowrate and emissions of NO_x, CO and SO₂. Periodic emission testing will be required for the purposes of assuring ongoing compliance and certifying the accuracy of the emission monitoring systems. Annual emissions will be calculated from monitoring results, emission test data and actual operation. Approval conditions for this unit also incorporate applicable requirements from 40 CFR 60, Subpart CC.
- 10.g. Glass Cutting Operations. Permit requirements for glass cutting operations restrict both the amount and the type of mineral spirits that can be used as a cutting lubricant. The BACT determination for this facility includes a monthly consumption limit and a benzene material content limit for the cutting lubricant. Compliance with the consumption limit is based on material records kept by the facility. Cardinal's application specifically proposed the use of "Odorless Mineral Spirits" as a lubricant. According to vendor's data, the specifications for this product are drawn from the Type 3C specifications of ASTM D-235. SWCAA's original T-BACT determination incorporated the Type 3C specifications because the resulting product has a relatively low aromatic content ($\leq 0.5\%$ by wt) when compared with other mineral spirit mixtures.
- 10.h. Glass Packaging and Storage. Emissions from glass storage are negligible. Emissions from glass packaging primarily consist of fugitive dust from packing equipment and broken glass handling. Permit requirements for glass packaging focus on full or partial enclosure of the handling equipment (breakers, elevators, conveyors, etc.), and the use of dust collection systems to control ambient emissions. Visible emissions from dust collector exhaust are limited to 0% opacity. Periodic emission testing is required to ensure proper dust collector performance.
- 10.i. Emergency Generators. Permit requirements for the emergency generators are based on limited service restricted to actual emergencies and testing and maintenance. Testing and maintenance operation for Emergency Generator #1 is limited to 50 hr/yr. Testing and maintenance operation for Emergency Generator #2 is limited to 35 hr/yr. Emissions will be calculated based on applicable emission factors and annual operation as recorded and reported by the Cardinal. Visible emission limits have been established consistent with proper operation of the Caterpillar diesel engines, including provisions for start-up. The use of low sulfur diesel ($\leq 0.0015\%$ S by weight) is required. Fuel supplier certifications will be referenced as proof that low sulfur fuel is in use.
- 10.j. Hydrogen Generation System. The hydrogen generation system is self-contained unit that operates independently of glass manufacturing operations similar to the nitrogen plant. The unit uses natural gas as both a fuel and a feedstock. Emissions from the unit are minor so no testing has been required. Emissions will be calculated based on applicable emission factors and annual operation as recorded and reported by the Cardinal. Visible emissions from system operation are limited to 0% opacity.
- 10.k. Requirements for Unmodified Emission Units. Permit requirements for existing emission units not affected by ADP Application L-752 are carried forward unchanged from ADP 23-3596.

11. START-UP AND SHUTDOWN/ALTERNATIVE OPERATING SCENARIOS/POLLUTION PREVENTION

- 11.a. Start-up and Shutdown Provisions. Pursuant to SWCAA 400-081 "Start-up and Shutdown", technology based emission standards and control technology determinations shall take into consideration the physical and operational ability of a source to comply with the applicable standards during start-up or shutdown. Where it is determined that a source is not capable of achieving continuous compliance with an emission standard during start-up or shutdown, SWCAA shall include appropriate emission limitations, operating parameters, or other criteria to regulate performance of the source during start-up or shutdown.

Diesel Engines. Visible emissions from diesel engine power units are limited to 10% opacity or less during normal operation. However, diesel engines may not be capable of reliably limiting visible emissions to less than 10% opacity until normal operating temperature is achieved. Therefore, the 10% opacity limit shall not apply to engine exhaust during start-up periods.

- 11.b. Alternate Operating Scenarios. SWCAA conducted a review of alternate operating scenarios applicable to equipment affected by this permitting action. Alternate requirements/limits for SCR maintenance periods, ESP/Spray Dryer maintenance periods, hot fan transition periods, and SCR inspection periods have been included in the permit.
- 11.c. Pollution Prevention Measures. SWCAA conducted a review of possible pollution prevention measures for the facility. No pollution prevention measures were identified by either the permittee or SWCAA separate from those measures required under BACT considerations. Therefore, none were included in the permit requirements.

12. EMISSION MONITORING AND TESTING

- 12.a. Emission Testing Requirements – Glass Furnace. Permit requirements for the Glass Furnace require periodic emission testing for VOC and PM for the purposes of demonstrating compliance with applicable emission limits. All emission testing shall be conducted in accordance with ADP 25-3719, Appendix A.
- 12.b. CEMS Audit Requirements – Glass Furnace. Permit requirements for the Glass Furnace require the installation and maintenance of a continuous emission monitoring system (CEMS) and data acquisition and handling system (DAHS) to monitor total flowrate and emission rates of NO_x, CO and SO₂ from the Glass Furnace exhaust stack. The CEMS must meet applicable audit requirements from 40 CFR 60, Appendices B and F. These requirements are summarized in ADP 25-3719, Appendix B.
- 12.c. Emission Testing Requirements – Cullet Return Baghouse #1. Permit requirements for Cullet Return Baghouse #1 require emission testing at least once every 36 months for the purpose of assuring compliance with applicable emission limits. All emission testing must be conducted in accordance with ADP 25-3719, Appendix C.
- 12.d. Emission Testing Requirements – Cullet Return Baghouse #2. Permit requirements for Cullet Return Baghouse #2 require emission testing at least once every 60 months for the purpose of assuring compliance with applicable emission limits. Required emission tests must be conducted in accordance with ADP 25-3719, Appendix D.

- 12.e. Emission Testing Requirements – Material Handling Baghouses. Routine PM emission testing of minor baghouses is not required by ADP 25-3719. Visible emissions (0% opacity) are used as a compliance surrogate. Permit provisions allow SWCAA to require reference method testing if excessive visible emissions are documented.

13. FACILITY HISTORY

- 13.a. Previous Permitting Actions. SWCAA has previously issued the following Permits for this facility:

<u>Permit Number</u>	<u>Application Number</u>	<u>Date</u>	<u>Purpose</u>
23-3596	L-735	8/14/2023	Modification of SCR maintenance schedule and hot fan transition language in the existing Air Discharge Permit.
<u>Obsolete/Expired Permits</u>			
22-3529	L-729	7/27/2022	Installation of a hydrogen generation system and modification of the maintenance period for Glass Furnace control equipment maintenance. Superseded by ADP 23-3596.
PSD 03-03-A2	--	12/13/2010	Modification of approval conditions to allow uncontrolled emissions during an annual 5-day control equipment maintenance period. This permit was rescinded on December 3, 2024.
21-3497	L-723	2/15/2022	Replacement of previously approved emergency diesel generator engine (Caterpillar 1,829 bhp) with a larger unit (Caterpillar 2,937 bhp) to accommodate changes to emission control equipment at the facility. Superseded by ADP 22-3529.
20-3409	L-706	2/11/2021	Modification to facility to install a new Selective Catalytic Reduction control system for NOx emissions from the glass furnace and increase glass production from 650 to 750 tpy. Installation of a second emergency diesel generator engine (Caterpillar 1,829 bhp). Removal of SCR from emergency diesel generator engine 1. Establishment of voluntary plant site emission limits below PSD major source thresholds. Superseded by ADP 21-3497.
04-2568R2	L-627	12/16/2008	Installation of Cullet Return Baghouse #2 and associated dust collection system. Modification of visible emission limits for Glass Furnace to allow higher visible emissions during lead hot fan transition. Superseded by ADP 20-3409.
PSD 03-03-A1	--	2/14/2008	Modification of permit terms to allow Glass Furnace compliance testing at less than 90% of daily glass draw capacity. A 90% relationship retained for glass draw at time of testing versus allowable operating capacity. PSD amendment considered administrative by Ecology. Superseded by PSD 03-03-A2.

<u>Permit Number</u>	<u>Application Number</u>	<u>Date</u>	<u>Purpose</u>
04-2568R1	L-597	9/26/2007	Approval of two baghouses serving the material catch reclaim system on the Glass Furnace ESP. The affected baghouses were installed during initial facility construction, but not cited in the original air quality permits (PSD 03-03, ADP 04-2568). Superseded by ADP 04-2568R2.
PSD 03-03	--	10/6/2004	Installation of a flat glass manufacturing facility. Superseded by PSD 03-03-A1.
04-2568	L-524	10/4/2004	Installation of a flat glass manufacturing facility. Superseded by ADP 04-2568R1.

- 13.b. Compliance History. A search of source records on file at SWCAA did not identify any previous or outstanding compliance issues during the past five (5) years.

14. PUBLIC INVOLVEMENT OPPORTUNITY

- 14.a. Public Notice for ADP Application L-752. Public notice for ADP Application L-752 was published on the SWCAA internet website for a minimum of (15) days beginning on June 5, 2025.
- 14.b. Public/Applicant Comment for ADP Application L-752. SWCAA did not receive specific comments, a comment period request or any other inquiry from the public regarding this ADP application. Therefore, no public comment period was provided for this permitting action.
- 14.c. State Environmental Policy Act. Lewis County previously conducted a SEPA review for modification of the glass furnace and installation of SCR. Lewis County issued a Determination of Nonsignificance on November 17, 2020 (*SEP20-0024*). Addition of an alternate visible emissions limit for SCR maintenance does not involve any material change in the scope of previously approved operations at the facility and is not expected to have any discernible impact on Glass Furnace emissions. Therefore, this modification proposal does not require a new SEPA review.