

December 4, 2015



APPLICATION FOR A COASTAL ZONE ACT PERMIT

**State of Delaware
Department of Natural Resources & Environmental Control
Office of the Secretary**

Date of submission
Dry Ice Unit
Praxair Distribution, Inc.

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Permit Application Instructions

1. Complete all parts of the application. For sections which are not applicable to your project, do not leave blank; present a statement that clearly states why the section is not applicable to your project.
2. Because all applicants' projects are different, this word document template will provide you flexibility for needed space to answer the questions. Please insert additional lines for text where needed for your application. If appropriate, attach extra pages referencing each answer by the corresponding section and question number.
3. Submit eight complete hard copies of the permit application to:

Office of the Secretary
Department of Natural Resources & Environmental Control
State of Delaware
89 Kings Highway
Dover, DE 19901

- In addition to the eight hard copies, submit a complete electronic "pdf" copy of the permit application and a copy of the Offset Matrix in Microsoft Word format on cd-rom.
4. Comply, if required, or as requested by the DNREC Secretary, with [7 Delaware Code, Chapter 79, Section 7902](#). If requested, but not completed, your application will not be considered administratively complete until this form is reviewed.
 5. Be sure to include your permit application fee of \$3,000; otherwise the application will not be considered administratively complete. Make checks payable to the "State of Delaware."
 6. Be advised that the application for a Delaware Coastal Zone Act Permit is a public document, which may be displayed at DNREC offices, public libraries, and the web, among others. If this application requires you to place confidential information or data in the application to make it administratively complete, note the Delaware Freedom of Information Act ([29 Delaware Code, Chapter 100](#)) and [DNREC's Freedom of Information Act Regulation](#), Section 6 (Requests for Confidentiality), for the proper procedure in requesting confidentiality.

Note: This application template was last revised by DNREC on January 30, 2008. Please discard any previous versions.

December 3, 2015

PART 1

CERTIFICATION BY APPLICANT

Under the penalty of perjury pursuant to 11 Delaware Code §1221-1235, I hereby certify that all the information contained in this Delaware Coastal Zone Act Permit Application and in any attachments is true and complete to the best of my belief.

I hereby acknowledge that any falsification or withholding of information will be grounds for denial of a Coastal Zone Permit.

I also hereby acknowledge that all information in this application will be public information subject to the Delaware Freedom of Information Act, except for clearly identified proprietary information agreed to by the Secretary of the Department of Natural Resources & Environmental Control.

Denny Brown
Print Name of Applicant


Signature of Applicant

Praxair Distribution, Inc. Vice President
Title

12/4/15
Date

PART 2

APPLICANT INFORMATION AND SITE IDENTIFICATION

2.1 Identification of the applicant:

Company Name: Praxair Distribution, Inc.
Address: 39 Old Ridgebury Road, Danbury, CT 06810
Telephone: (203) 837-2000
Fax: (203) 837-2503

2.2 Primary contact: Please list the name, phone number and email of a preferred contact within your company in case the DNREC needs to contact you regarding this permit application.

Mr. Dave Copeland
Corporate SH&E Environmental Manager
Praxair, Inc.
(716) 879-2460
Dave_Copeland@praxair.com

2.3 Authorized agent (if any):

Name: Mr. Rick Beringer
Project Manager – Duffield Associates, Inc.
Address: 5400 Limestone Road, Wilmington, DE 19808
Telephone: (302) 239-6634
Fax: (302) 239-8485

If you have an authorized agent for this permit application process, provide written authorization from client for being the authorized agent.

2.4 Project property location (street address):

Delaware City Refinery Company LLC
4550 Wrangle Hill Road
Delaware City, Delaware 19706

2.5 In a separate attachment, provide a general map of appropriate scale to clearly show the project site.

Please see **Attachment A**

2.6 Is the applicant claiming confidentiality in any section of their application?

NO

If yes, see instructions on page 3.

PART 3

PROJECT SUMMARY

Provide a one-page summary describing the proposed project. Include a brief quantitative description of the anticipated environmental impacts, and how the Environmental Offset Proposal will “clearly and demonstrably” more than offset any negative impacts.

The Dry Ice Unit will be installed within the footprint of the permitted liquid carbon dioxide unit (“CO₂ Unit”) located within the Delaware City Refinery (“Refinery”). Praxair Distribution Inc. (“PDI”) will take a portion of the liquid CO₂ produced by Praxair, Inc. and convert it to dry ice. PDI is a wholly owned subsidiary of Praxair, Inc.

Liquid carbon dioxide will be sent from the CO₂ Unit to the horizontal above grade tank shown in Attachment A for use in the production of a maximum of 156 tons per day of dry ice. The liquid CO₂ is converted to dry ice snow through a simple pressure reduction. When liquid CO₂ is depressurized about 45% of the material forms dry snow and about 55% of the material forms gaseous CO₂. The dry ice snow is then pressed into 50-pound blocks within the block press or used to make nuggets and pellets within extruders. The majority of the gaseous CO₂ is recovered by a CO₂ recycling system which is located on the Recovery Skid and will recycle approximately 187 tons per day of CO₂. This equates to approximately 1.3 pounds of liquid CO₂ needed to produce 1.0 pound of dry ice.

The Dry Ice Unit will utilize water and produce wastewater for personnel sanitation facilities and for power washing the dry ice storage boxes. It is estimated that the Dry Ice Unit will use an average of 315 gallons per day potable water and generate the same amount of wastewater to be sent to the Refinery’s existing wastewater treatment system. The power consumption of the Dry Ice Unit will average approximately 1,625 kWh, which will be supplied by Delmarva Power’s distribution system.

The Dry Ice Unit will be centrally located to several distribution centers owned and operated by PDI, which will result in decreased transportation associated with dry ice transport from distant dry ice production facilities. The dry ice has many beneficial uses, not the least of which is public use for refrigeration of foods during emergency situations. Dry ice is used for the following:

- Blast cleaning of industrial components,
- Airline catering,
- Food processing,
- Shipping,
- Labs,
- Pharmaceutical,
- Biotech,
- Chemical companies,
- Blood centers,
- Food service industry,
- Distributors – package gases or wet ice,

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- Recreation/hunting/fishing, and
- Retail with hard goods in store.

The Dry Ice Unit will not have any regulated air discharges, no impact on water usage or wastewater generation, no impact to wetlands, flora or fauna, no aesthetic impacts, no increase in storm water flow, no change in glare, heat, noise or vibration, no impact from radiation, electromagnetic interference and noxious odors, no adverse impact on neighboring land use, and the only supporting facility required is the permitted liquid CO₂ unit. Thus, there are no negative impacts resulting from this project.

PART 4

**PROJECT PROPERTY RECORD AND
EVIDENCE OF LOCAL ZONING AND PLANNING APPROVAL**

PROJECT PROPERTY RECORD

4.1 Name and address of project premises owner(s) of record:

Project Property Owner:

Delaware City Refining Company LLC
1 Sylvan Way – Corporate Office
Parsippany, NJ 07054

Project Property:

Delaware City Refining Company LLC
4550 Wrangle Hill Road
New Castle, DE 19706

Project Property Tax Parcel Number:

Parcel 2B – 12-008.00-014

4.2 Name and address of project premises equitable owner(s):

Delaware City Refining Company LLC
4550 Wrangle Hill Road
Delaware City, DE
19706

4.3 Name and address of lessee(s):

Praxair, Inc.
39 Old Ridgebury Road
Danbury, CT
06810

4.4 Is the project premises under option by permit applicant?

No

4.5 What is the present zoning of the land for this entire project site?

Heavy Industrial

EVIDENCE OF LOCAL ZONING AND PLANNING APPROVAL

I, _____, for _____
(Name of County, City of Town)

do hereby affirm that the project proposed by _____
(Name of Applicant)

located at _____, in
(Address)

the _____ zoning district is in
full compliance with the zoning code as it applies to this project.

The above named applicant's project is in compliance with the adopted comprehensive development plan for the geographic area within which the project will be located.

(Signature)

(Title)

(Date)

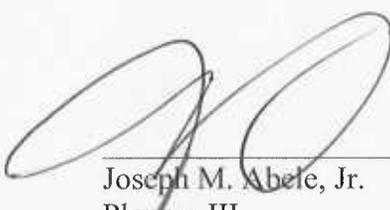
This part is essential for a complete Coastal Zone Act Permit Application. No application will be considered administratively complete without it. While the applicant is strongly advised to use this form, the local zoning jurisdiction may utilize a different form or document to demonstrate "evidence of local zoning approval," provided such documents are signed and dated by the proper official.

Zoning Certification

I, Joseph M. Abele, on behalf of New Castle County Department of Land Use, certify that tax parcel number 12-008.00-014, 765 School House Road, New Castle DE, the "Property," is located in the HI (Heavy Industrial) Zoning District. Applicant, Delaware City Refining Company, LLC proposes to "construct an industrial plant that will extract nitrogen gas from the atmosphere and supply it to the Delaware City refinery for making the atmospheres inside refinery tanks and processes inert. The project also includes the construction of an industrial plant that will extract carbon dioxide gas from a refinery process gas stream." This type of use is categorized as Heavy Industrial and is allowable in the HI Zoning District pursuant to Chapter 40 of the *New Castle County Code* also known as the Unified Development Code.

This certification shall not be construed as approval of the proposed use by New Castle County. Approval may only be granted after review of a land development application, if applicable, for compliance with the provisions of the Unified Development Code.

The Property is located in the Delaware Coastal Zone, and state law contains additional restrictions on uses allowable therein. This certification does not certify that the proposed use is compliance with the Delaware Coastal Zone Act ("Act"), 7 *Del. C.* 7001 *et seq.* or the regulations and administrative codes adopted pursuant to the Act. Furthermore, this zoning certification does not supercede any applicable state or federal law.



Joseph M. Abele, Jr.
Planner III
New Castle County Department of Land Use

Dated: June 8, 2015

PART 5

PROJECT OPERATIONS

5.1 Describe the characteristics of the manufactured product and all the process and/or assembly operations utilized by the proposed project. Include in the description (use attachments if necessary):

- a. the raw materials, intermediate products, by-products and final products and characteristics of each. Review any materials' risk of carcinogenicity, toxicity, mutagenicity and/or the potential to contribute to the formation of smog. Provide material safety data sheets (MSDS) if available;

Raw Materials:

- Liquid CO₂ from Praxair Inc. CO₂ Unit
- Food Grade USP Propylene glycol for binding
- Activated carbon for Recovery Unit CO₂ purification
- Food grade hydraulic fluid

Intermediate Products:

- None

Final Products:

- Dry ice blocks, nuggets and pellets

MSDS Sheets have been provided in **Attachment C**. None of these materials have a risk of toxicity, carcinogenicity, mutagenicity or the potential to contribute to the formation of smog.

- b. the step-by-step procedures or processes for manufacturing and/or assembling the product(s). Provide a flow diagram to illustrate procedures;

Please see **Attachment B**

- c. the nature of the materials mentioned above in 4.1(a) as to whether or not the materials require special means of storage or handling;

The liquid carbon dioxide raw material requires storage at very low temperatures to maintain carbon dioxide as a liquid.

Dry ice is stored at a temperature of -109°F and is stored in insulated boxes. Dry ice must be handled with care as dry ice can freeze skin cells upon contact, which causes injury similar to burns.

- d. list the machinery (new and/or existing) to be utilized by this project;

- Primary pressure reduction vessel

- Secondary pressure reduction vessel
- Pressure reducing valves
- One block press
- Seven nugget and pellet extruders
- Dry ice block reformer
- Vapor recovery system consisting of:
 - Two compressors
 - A surge vessel
 - One activated carbon filter
 - Two preheaters
 - Liquefier

e. list any new buildings or other facilities to be utilized;

- The Dry Ice Building has an area of approximately 7,357 square feet,
- The Recovery Skid will be mounted on a concrete pad having approximate dimensions of 60 feet by 10 feet, and the Recovery Skid will be covered, and
- A couple small utility pads.

f. list the size and contents of any anticipated aboveground or underground storage tank systems that may be constructed or utilized in support of facility operations;

- One 7,500 gallon, liquid carbon dioxide AST

g. if this project represents an increase or decrease in production at an already existing facility, what will be the new rate of maximum production?

Not Applicable.

h. if this project represents a totally new facility at a new or existing site, what will be the maximum production rate?

Approximately 156 tons per day of dry ice

5.2 Describe daily hours of plant operations and the number of operating shifts.

The Dry Ice Unit typically will operate 16 hours per day from Monday through Friday. One working day will consist of two 8-hour operating shifts. Continuous operation (i.e., three 8-hour operating shifts, 7 days/wk) is a possibility depending upon market and customer demands.

- 5.3 Provide a site plan of this project with:
- a. a north arrow;
 - b. a scale of not less than one inch to 200 feet;
 - c. identity of the person responsible for the plan, including any licenses and their numbers;
 - d. the acreage of the applicant's entire property and acreage of the proposed project;
 - e. property lines of entire property;
 - f. lines designating the proposed project area for which application is being made, clearly distinguished from present facilities and operating areas (if any);
 - g. existing and proposed roads, railroads, parking and loading areas, piers, wharfs, and other transportation facilities;
 - h. existing water bodies and wetlands and proposed dredge and fill areas, and;
 - i. existing and proposed drainage ways, gas, electric, sewer, water, roads, and other rights-of-way.

Please see **Attachment A**

- 5.4 How many acres of land in total are required for this proposed project?

Existing/ currently utilized/ developed land: < 1.0 acres.

New land: 0 acres.

- 5.5 Has the property been involved with a state or federal site cleanup program such as Superfund, Brownfields, HSCA Voluntary Cleanup Program, RCRA Corrective Action, Aboveground or Underground Storage Tank Cleanup Programs? If so please specify which program.

Delaware City Refining Company is required to comply with RCRA Corrective Action Permit HW09A13. There are 35 Solid Waste Management Units (SWMUs) identified at the Refinery under the RCRA permit. Praxair is an independent legal entity and is not subject to the Delaware City Refining Company RCRA Corrective Action permit.

According to the SWMU location map included in the Phase II SWMU RFI Report prepared by URS and dated 9/23/2010, the Dry Ice Unit will be constructed near Area D, Unit F.

- 5.6 With regards to environmental cleanup actions, has a Uniform Environmental Covenant, Final Plan of Remedial Action, or no further action letter been issued by the Department? If so are the planned construction activities consistent with the requirements or conditions stated in these documents?

The Solid and Hazardous Waste Section of the DNREC indicated that Area D, Unit F was dropped from further consideration under RCRA during the Phase I RFI because no substance detections exceeded the USEPA Region 3 risk-based screening criteria for residential and industrial soil. DNREC indicated that no ecological habitat is part of Unit F. As such, Unit F has been eliminated from the Ecological Risk Assessment.

Praxair is a proud member of the American Chemistry Council, and a *Responsible Care*[®] company. As a member company, we are committed to supporting the continuing effort to improve the industry's management of chemicals.

As a *Responsible Care* company we:

- Continually improve our health, safety and environmental performance
- Listen and respond to public concerns
- Assist others in achieving their optimum performance
- Report our goals and progress to the public

Through the *Responsible Care* initiative and the *Responsible Care* Global Charter, our industry has made a worldwide commitment to improve our environmental, health, safety and security performance. We are committed to:

- Leading our companies in ethical ways that benefit society, the economy and the environment
- Designing and developing products that can be manufactured, transported, used, and disposed of or recycled safely
- Working with customers, carriers, suppliers, distributors and contractors to foster the safe and secure use, transport and disposal of chemicals and provide hazard and risk information that can be accessed and applied in their operations and products
- Designing and operating our facilities in a safe, secure and environmentally-sound manner
- Instilling a culture throughout our organizations to continually identify, reduce and manage process safety risks
- Promoting pollution prevention, minimization of waste and conservation of energy and other critical resources at every stage of our product life cycles
- Cooperating with governments and organizations in the development of effective and efficient safety, health, environmental and security laws, regulations and standards
- Supporting education and research on the health, safety, environmental effects and security of our products and processes
- Communicating product, service and process risks to our stakeholders and listening to and considering their perspectives
- Making continual progress towards our goal of no accidents, injuries or harm to human health and the environment and openly reporting our health, safety, environmental and security performance
- Seeking continual improvement in our integrated *Responsible Care* Management System to address environmental, health, safety and security performance
- Promoting *Responsible Care* by encouraging and assisting others to adhere to these Guiding Principles

The American Chemistry Council has certified our commitment to the principles of *Responsible Care*, which has been demonstrated through third-party assessments of our corporate headquarters in Danbury, Connecticut and more than 20 of our operating facilities that acknowledge we meet the rigorous *Responsible Care* requirements.

Water Quality

- 6.5 Describe wastewater discharge (new, as well as any increase or decrease over current discharge levels) due to project operations:

The average flow of 315 gallons per day wastewater generated from the Dry Ice Unit is from personnel sanitation facilities and power washing of the dry ice storage boxes. This represents only 0.0024 percent of the Refinery’s wastewater treatment plant (WWTP) capacity of 13 million gallons per day. Therefore, the net increase or decrease in any potential pollutants in the wastewater is *de minimis*.

Pollutant	Current Discharge Concentration (ppm)	New or Changed Discharge Concentration (ppm)	Current Discharge		Net Increase/Decrease		New Total Emissions	
			Lbs/day	Tons/year	Lbs/day	Tons/year	Lbs/day	Tons/year

- 6.6 Describe the current method of employee sanitary wastewater disposal and any proposed changes to that system due to this proposed project.

The *de minimis* amount of wastewater being sent to the Refinery wastewater treatment facility will not result in any changes to the existing wastewater system.

- 6.7 Identify the number, location, and name of receiving water outfall(s) of any and all process wastewater discharge (new or current) affected by this proposed project. Provide NPDES Permit Numbers for each discharge affected.

The Refinery’s treated wastewater (Outfall 601) is combined with storm water and the combined water flows to Outfall 001. The Refinery has current permits for the outfall:

- NPDES Permit Number DE 0000256
- State Permit Number WPCC 3256C/74

- 6.8 If any effluent is discharged into a public sewer system, is there any pretreatment program? If so, describe the program.

Not Applicable. No effluent will be discharged into a public sewer system.

6.9 Stormwater:

- a. Identify the number, location, and name of receiving waters of stormwater discharges. Provide permit number for each discharge.

Storm water will flow to Outfall 005, which receives storm water from west of the southern refinery process areas, undeveloped areas and public roads. This outfall discharges to Dragon Run, a tributary of the Delaware River. The permit number for the outfall is State Permit Number WPCC 3256D/74.

- b. Describe the sources of stormwater run-off (roofs, storage piles, parking lots, etc).

The source of storm water will be from building rooftops and paved surfaces.

- c. Describe the amount of stormwater run-off increase over current levels that will result from the proposed project.

According to the site designer, the run-off from the Dry Ice Unit will not increase the storm water runoff in its drainage basin over current levels.

- d. Describe any pollutants likely to be in the stormwater.

The storm water should not contain any pollutants associated with industrial activity. Storm water may contain constituents normally found in storm water run-off from building roofs and paved surfaces.

- e. Describe any pollution control device(s) or management technique(s) to be used to reduce the amount of stormwater generated, and devices to improve the quality of the stormwater run-off prior to discharge.

The storm water from the Dry Ice Unit impervious surfaces will be directed to two new bioretention basins, the storm water will then flow into a sump before discharging into the existing 18-inch storm drain leading to Outfall 005.

- f. Describe any new or improved stormwater drainage system required to safely carry off stormwater without flooding project site or neighboring areas down gradient.

There will not be any new or improved stormwater drainage systems required due to this project.

6.10 Will this project use a new water intake device, or increase the use (flow) from an existing intake device?

No, this project will not require the use of surface water obtained from sources within the State of Delaware Coastal Zone.

If yes, state:

- a. the volume of water to be withdrawn, and;
- b. describe what will be done to prevent entrainment and/or entrapment of aquatic life by the intake device.

6.11 Will this proposed project result in a thermal discharge of water, or an increase in the flow or temperature of a current thermal discharge?

No.

If yes, state:

- a. the volume of the new flow or increase from the existing thermal discharge, both in flow and amount of heat;
- b. how warm will the water be when it is discharged into a receiving waterway, discharge canal, or ditch, and what will be the difference in discharge temperature and ambient temperature (delta T) at various seasons of the year after all cooling water mechanisms have been applied to the hot water?
- c. the equipment and/or management techniques that will be used to reduce the thermal load of the discharge water.

6.12 Will any proposed new discharge or change in existing discharge cause, or have potential to cause, or contribute to, the exceedence of applicable criteria appearing in the [“State of Delaware Surface Water Quality Standards”](#)?

No.

If yes, explain:

6.13 Describe any oils discharged to surface waters due to this proposed project.

There will not be any discharge of oils to surface waters as a result of this project.

6.14 Describe any settleable or floating solid wastes discharged to surface waters due to this project.

There will not be any settleable or floating solid wastes discharged to surface waters as a result of this project.

- 6.15 Show evidence that the applicant has, or will have, the ability to maintain and utilize any water pollution control equipment listed in questions 5.5 through 5.14 in a consistently proper and efficient manner. (For example, provide operator license numbers, college transcripts and/or training courses and summary of prior experience with this pollution control equipment of person(s) responsible for pollution control equipment, and/or provide copies of contracts with pollution control firms.)

The Refinery has licensed wastewater treatment plant (WWTP) operators at the facility and the DNREC has the WWTP Operator license numbers in their files.

- 6.16 Estimate the amount of water to be used for each specified purpose including cooling water. State daily and maximum water use in the unit of gallons per day for each purpose and source of water. State if water use will vary with the seasons, time of day, or other factors.

The Dry Ice Unit will utilize an average of approximately 315 gallons per day for personnel sanitation facilities and power washing of the dry ice storage boxes. Water use is not expected to vary significantly with seasons or time of day.

- 6.17 Identify the source of water needed for the proposed project, including potable water supplies.

Water for the Dry Ice Unit will be purchased from United Water Delaware whose water supply includes intakes along Red Clay Creek and White Clay Creek, with an alternate supply from Christina River.

- 6.18 Are wells going to be used?

NO

If yes:

- a. Identify the aquifer to be pumped and the depth, size and pumping capacity of the wells.
- b. Has a permit been applied for to do this?
- c. How close is the proposed well(s) to any well(s) on adjacent lands?

Solid Waste

6.19 Will this project result in the generation of any solid waste?

Yes.

If yes, describe each type and volume of any solid waste (including biowastes) generated by this project, and the means used to transport, store, and dispose of the waste(s).

The Dry Ice Unit will use an activated carbon filter in the CO₂ Recovery Skid to remove impurities from the CO₂ vapor. The activated carbon filter has estimated lifetimes of 16,000 hours (approximately 2 years).

Spent activated carbon media will be transported to a permitted landfill. It should be noted that as part of Praxair's pollution prevention initiatives, these types of waste streams are periodically evaluated for recycling and reclamation opportunities.

6.20 Will there be any on-site recycling, re-use, or reclamation of solid wastes generated by this project?

NO

If yes, describe:

6.21 Will any waste material generated by this project be destroyed on-site?

NO

If yes, how will that be done?

Hazardous Waste

- 6.22 Will this proposed project result in the generation of any hazardous waste as defined by the [“Delaware Regulations Governing Hazardous Waste”](#)?

NO

If yes, identify each hazardous waste, its amount, and how it is generated:

- 6.23 Describe the transport of any hazardous waste and list the permitted hazardous waste haulers that will be utilized.

Not Applicable.

- 6.24 Will the proposed project cause the applicant to store, treat, and/or dispose of hazardous waste?

NO

If yes, describe:

- 6.25 Does the applicant currently generate any hazardous waste at this site?

NO

If yes, describe:

Habitat Protection

- 6.26 What is the current use of the land that is to be used for the proposed project?

The Dry Ice Unit will be located in previously developed areas within the existing Refinery footprint. Therefore, this project will not result in a significant change in land use.

- 6.27 Will the proposed project result in the loss of any wetland habitat?

NO

If yes, describe:

- 6.28 Will any wastewater and/or stormwater be discharged into a wetland?

NO

If yes, will the discharge water be of the same salinity as the receiving wetlands?

- 6.29 Will the proposed project result in the loss of any undisturbed natural habitat or public use of tidal waters?

NO

If yes, how many acres?

- 6.30 Do threatened or endangered species (as defined by the DNREC and/or the Federal Endangered Species Act) exist at the site of the proposed project, or immediately adjacent to it?

YES

If yes, list each species:

The Department of Natural Resources and Environmental Control, Division of Fish & Wildlife was contacted in connection with the CO2 Unit, and they evaluated the project site for rare, threatened and endangered species (see **Attachment D**). Their review revealed that a suitable habitat for the federally listed bog turtle may be within the project area, but that a Phase I bog turtle survey conducted in May 2013 by a Delaware Certified Bog Turtle Surveyor found that there is no habitat that would support federally threatened bog turtle. Therefore, the letter states: "Consequently, WSCRCP has no concerns about adverse impacts to bog turtles for this project."

The WSCRCP letter also pointed out that the project is within 5 miles of known Northern Long-eared Bat hibernacula, which have been proposed for federal listing as threatened under the U.S. Endangered Species Act. The letter stated

that: "...we do not believe this project would be of concern for Northern Long-eared Bat."

- 6.31 Will this proposed project have any effect on these threatened or endangered species (as defined by the DNREC and/or the Federal Endangered Species Act).

NO

If yes, explain:

- 6.32 What assurances can be made that no threatened or endangered species exist on the proposed project site?

DNREC Natural Heritage Program information and the current state of site develop indicate that there are no suitable habitats for threatened or endangered species within the project site (see **Attachment D**).

- 6.33 Describe any filling, dredging, or draining that may affect nearby wetlands or waterways.

There will not be any filling, dredging or draining that would affect nearby wetlands as a result of this project.

- 6.34 If dredging is proposed, how much will occur and where will the dredged materials go for disposal?

Not Applicable

Other Environmental Effects

- 6.35 Describe any noticeable effects of the proposed project site including: heat, glare, noise, vibration, radiation, electromagnetic interference, odors, and other effects.

There may be some noise during construction activities, but the noise will be within existing noise levels associated with daily operations of the Refinery. During normal operations of the plant, there will be noise generated from the compressors. This level of noise is not expected to exceed or greatly contribute to noise associated with current refinery operations. The plant will not contribute to heat, glare, vibration, radiation, electromagnetic interference or odors.

- 6.36 Describe what will be done to minimize and monitor such effects.

The proposed unit is located within the existing petroleum refinery. The unit will be monitored and maintained for normal operations. Abnormal operations will be a cause for shutdown of the Dry Ice Unit. Under normal operating conditions, the unit will not produce heat, glare, noise, vibration, radiation, electromagnetic interference, odors, and other effects that will be noticeable in public areas near the Refinery.

- 6.37 Describe any effect this proposed project will have on public access to tidal waters.

This project will not impede public access to tidal waters.

- 6.38 Provide a thorough scenario of the proposed project's potential to pollute should a major equipment malfunction or human error occur, including a description of backup controls, backup power, and safety provisions planned for this project to minimize any such accidents.

In the event of a power disruption or failure, the Dry Ice Unit would be shut down.

- 6.39 Describe how the air, water, solid and hazardous waste streams, emissions, or discharge change in the event of a major mechanical malfunction or human error.

A major equipment malfunction or human error would cause either the damaged piece of equipment within the Dry Ice Unit or the entire Dry Ice Unit to cease operations.

An error or malfunction could cause a release of liquid carbon dioxide from an above grade storage tank (AST). The release of large amounts of liquid carbon dioxide into the environment poses two risk items to plant personnel in the immediate area of the release:

- a) Asphyxiation can occur (e.g. displaces the oxygen in the air), and
- b) This material is often handled at very cold temperatures.

These risks most notably impact the facility personnel who work in the very immediate area of the material (e.g. plant operators and maintenance personnel), and therefore significant effort is placed on the process design, maintenance and training of personnel to ensure the safety of the personnel and the environment.

In the very unlikely event of a major release of liquid carbon dioxide from an AST, the area of impact would be localized and extremely unlikely to go past the facility fence line. Thus, the event would not affect areas accessible to the public (e.g. outside of Refinery's fence line).

PART 6B

ENVIRONMENTAL OFFSET PROPOSAL REDUCTION CLAIM

Is applicant claiming the right to have a reduced offset proposal due to past voluntary improvements as defined in the “Regulations Governing Delaware’s Coastal Zone”?

~~YES~~

NO

If yes, provide an attachment to the application presenting sufficient tangible documentation to support your claim.

PART 6C

ENVIRONMENTAL OFFSET PROPOSAL

If the applicant or the Department finds that an Environmental Offset Proposal is required, the proposed offset project shall include all the information needed to clearly establish:

- A. A qualitative and quantitative description of how the offset project will “*clearly and demonstrably*” more than offset the negative impacts from the proposed project.
- B. How and in what period of time the offset project will be carried out.
- C. What the environmental benefits will be and when they will be achieved.
- D. What scientific evidence there is concerning the efficacy of the offset project in producing its intended results.
- E. How the success or failure of the offset project will be measured in both the short and long term.
- F. What, if any, negative impacts are associated with the offset project.
- G. How the offset will impact the attainment of the Department’s environmental goals for the Coastal Zone and the environmental indicators used to assess long-term environmental quality within the Coastal Zone.

Additional Offset Proposal Information for the Applicant

1. The offset proposals must “*clearly and demonstrably*”¹ more than offset any new pollution from the applicant’s proposed project. The applicant can claim (with documentation) evidence of past voluntary environmental investments (as defined in the Regulations) implemented prior to the time of application. Where the Department concurs with the applicant that such has occurred, the positive environmental improvement of the offset proposal against the new negative impact can be somewhat reduced.
2. The applicant must complete the Coastal Zone Environmental Impact Offset Matrix. This matrix can be found on the CZA web page (<http://www.dnrec.delaware.gov/Admin/CZA/CZAHome.htm>), or by clicking on [this link](#). On page one, the applicant must list all environmental impacts in the column labeled “Describe Environmental Impacts.” In the column to the immediate right, the applicant should reference the page number of the application or attachment which documents each impact listed. In the “Describe Environmental Offset Proposal” column, applicant must state what action is offsetting the impact. The offset action shall be referenced by page number in the column to the right to show how the offset will work. The applicant shall not utilize the far right column. *Please ensure the matrix is complete, detailed, and as specific as possible, given the allotted space. Also, thoroughly proof-read to ensure there are no spelling or grammatical errors.* The applicant must submit a completed matrix both in hardcopy and electronic form.
3. Please note: the entire offset proposal, including the matrix, shall be available to the public, as well as the evidence of past voluntary environmental enhancements.

¹ For purposes of this requirement, the DNREC will interpret the phrase “clearly and demonstrably” to mean an offset proposal that is obviously so beneficial without detailed technical argument or debate. The positive environmental benefits must be obviously more beneficial to the environment than the new pollution that minimal technical review is required by the Department and the public to confirm such. The total project must have a positive environmental impact. The burden of proof is on the applicant.

December 3, 2015

ENVIRONMENTAL OFFSET PROPOSAL

This project does not result in any negative environmental impacts. Therefore, in accordance with Regulations Governing Delaware's Coastal Zone, Part 101, Section 9.1.1., an offset proposal is not required.

PART 7

ECONOMIC EFFECTS

Construction

- 7.1 Estimate the total number of workers for project construction and the number to be hired in Delaware.

Approximately 36 construction workers. The majority of the workers will be local.

- 7.2 Estimate the weekly construction payroll.

\$170,000 at peak; \$102,000/week on average

- 7.3 Estimate the value of construction supplies and services to be purchased in Delaware.

\$4.0 million

- 7.4 State the expected dates of construction initiation and completion.

03/1/16 - 03/1/17

- 7.5 Estimate the economic impact from the loss of natural habitat, or any adverse economic effects from degraded water or air quality from the project on individuals who are directly or indirectly dependent on that habitat or air or water quality (e.g. commercial fishermen, waterfowl guides, trappers, fishing guides, charter or head boat operators, and bait and tackle dealers).

None

Operations

7.6 State the number of new employees to be hired as a direct result of this proposed project and how many of them will be existing Delaware residents and how many will be transferred in from other states.

7 full-time employees including Manager

7.7 If employment attributable to the proposed project will vary on a seasonal or periodic basis, explain the variation and estimate the number of employees involved.

Not applicable

7.8 Estimate the percent distribution of annual wages and salaries (based on regular working hours) for employees attributable to this project:

<u>Wage/salary</u>	<u>Percent of employees</u>
<\$10,000	
\$10,000-14,999	
\$15,000-24,999	
\$25,000-34,999	
\$35,000-49,999	
\$50,000-64,999	6 employees (86%)
\$65,000-74,999	1 Manager (14%)
\$75,000-99,999	
>\$100,000	

7.9 Estimate the annual taxes to be paid in Delaware attributable to this proposed project:

State personal income taxes:	\$	\$130,000.00
State corporate income taxes	\$	\$20,000.00
County and school district taxes:	\$	No appreciable change
Municipal taxes:	\$	No appreciable change

PART 8

SUPPORTING FACILITIES REQUIREMENTS

Describe the number and type of new supporting facilities and services that will be required as a result of the proposed project, including, but not limited to:

a. Roads

None

b. Bridges

None

c. Piers and/or docks

None

d. Railroads

None

e. Microwave towers

None

f. Special fire protection services not now available

None

g. Traffic signals

None

h. Sewer expansion

None

i. Energy related facilities expansion

None

j. Pipelines

None

PART 9

AESTHETIC EFFECTS

- 9.1 Describe whether the proposed project will be located on a site readily visible from a public road, residential area, public park, or other public meeting place (such as schools or cultural centers).

Because the project will be constructed within the existing Refinery footprint and integrated into the Refinery, the project will not be readily distinguishable from the Refinery. Thus, the project should not be readily visible from a public road, residential area, public park, or other public meeting place.

- 9.2 Is the project site location within a half mile of a place of historic or scenic value?

There are no places of historic or scenic value located within ½ mile of the project site. Other sites located greater than ½ mile and listed in the 2014 National Register under the location of Delaware City include Chelsea on Route 9, the eastern lock of the Chesapeake and Delaware Canal, the Delaware City Historic District and Fort Delaware on Pea Patch Island.

- 9.3 Describe any planned attempt to make the proposed facility aesthetically compatible with its neighboring land uses. Include schematic plans and/or drawings of the proposed project after it is complete, including any landscaping and screening.

The proposed facilities will not be distinguishable from the Refinery.

PART 10

EFFECTS ON NEIGHBORING LAND USES

- 10.1 How close is the nearest year-round residence to the site of this proposed project?

There is a residential community approximately 1.0 mile south of the project location and Delaware City is approximately 2.0 mile southeast of the Refinery.

- 10.2 Will this proposed project interfere with the public's use of existing public or private recreational facilities or resources?

The proposed project will not interfere with the public's use of existing public or private recreational facilities or resources.

- 10.3 Will the proposed project utilize or interfere with agricultural areas?

No

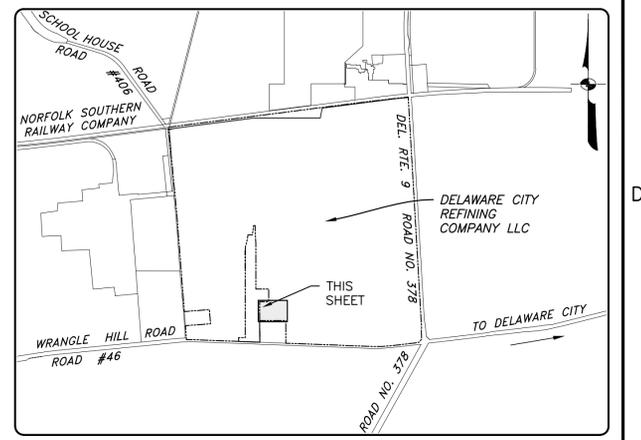
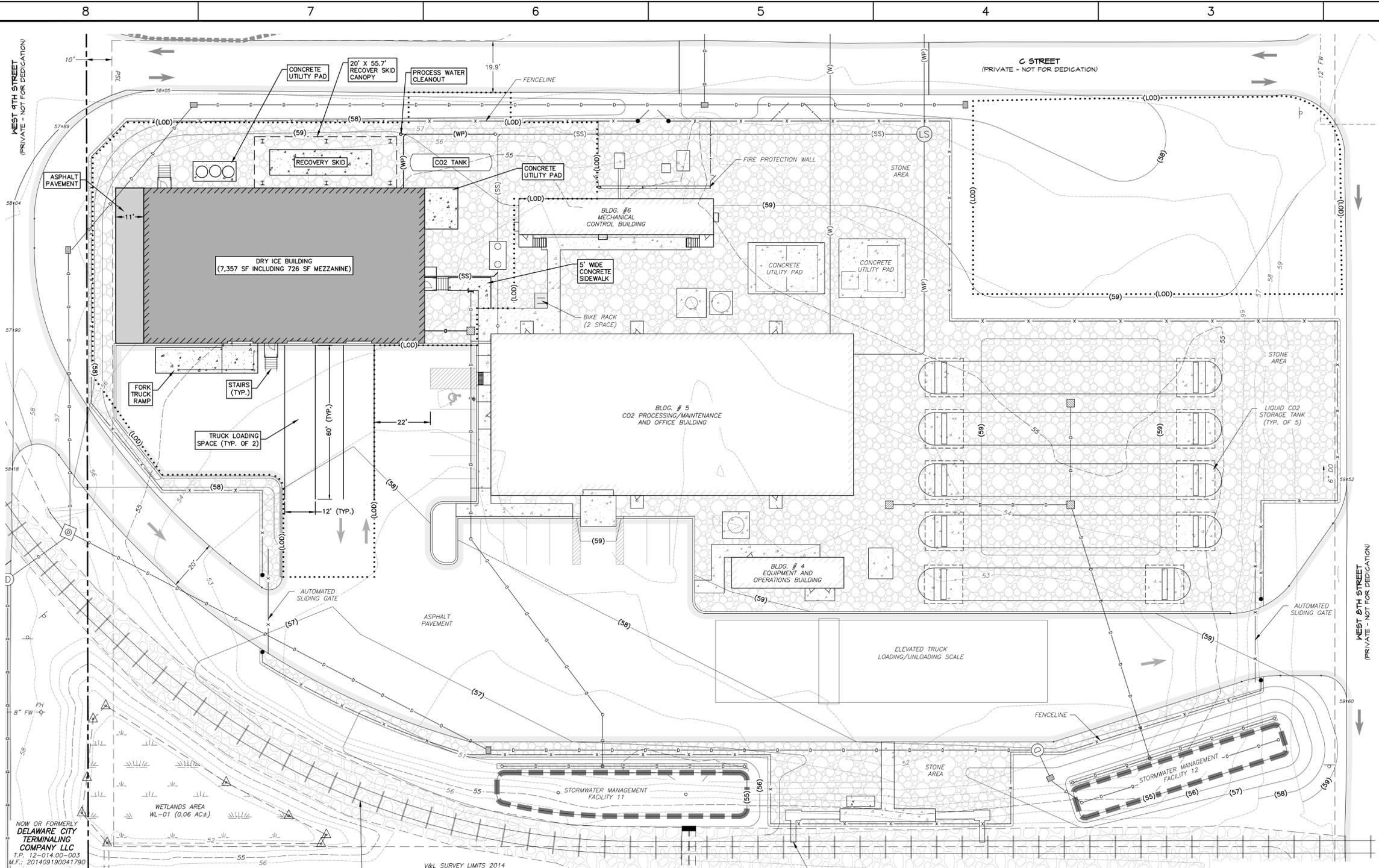
- 10.4 Is there any possibility that the proposed project could interfere with a nearby existing business, commercial or manufacturing use?

No

END OF APPLICATION

ATTACHMENTS TO FOLLOW

ATTACHMENT A



ZONING MAP NO. 68 SHEET INDEX PLAN SCALE: 1" = 1500'

EXISTING		PROPOSED	
---	PROPERTY LINE	---	N/A
---	PAVING/BUILDING SETBACK LINE	---	N/A
---	ASPHALT PAVEMENT	---	N/A
---	CURB	---	N/A
---	CONCRETE	---	N/A
---	STONE	---	N/A
---	RAILROAD TRACK	---	N/A
---	FENCE LINE	---	N/A
---	BUILDING	---	N/A
---	TREE / BRUSHLINE	---	N/A
---	STORMPIPE	---	N/A
---	UNDER DRAIN	---	N/A
---	STORM SEWER MANHOLE	---	N/A
---	STORM SEWER CATCH BASIN	---	N/A
---	SANITARY SEWER	---	N/A
---	PROCESS WATER	---	N/A
---	UTILITY POLE	---	N/A
---	FIRE HYDRANT	---	N/A
---	WATER LINE	---	N/A
---	WATER VALVE	---	N/A
---	SIGN	---	N/A
---	BOLLARD	---	N/A
---	BIKE RACK	---	N/A
---	WETLANDS / CONSERVATION EASEMENT	---	N/A
---	SWM FACILITY	---	N/A
---	CONTOURS	---	N/A
---	CONTOURS	---	N/A
---	LIMIT OF DISTURBANCE	---	N/A
---	V&L SURVEY LIMIT 2014	---	N/A



NOW OR FORMERLY DELAWARE CITY TERMINAL COMPANY LLC T.P. 12-014.00-003 M.F. 201409190041790

NOW OR FORMERLY CARDONX CORP. T.P. 12-014.00-001 M.F. NO.: 001643

NOTES
 1. PRAXAIR CO2 FACILITY UNDER CONSTRUCTION, REFER TO APPLICATION NO. 2015-03375. PRAXAIR CO2 FACILITY INCLUDES THE CO2 PROCESSING/MAINTENANCE AND OFFICE BUILDING, EQUIPMENT AND OPERATIONS BUILDING, THE MECHANICAL CONTROL BUILDING, AND THE ASSOCIATED SITE IMPROVEMENTS.



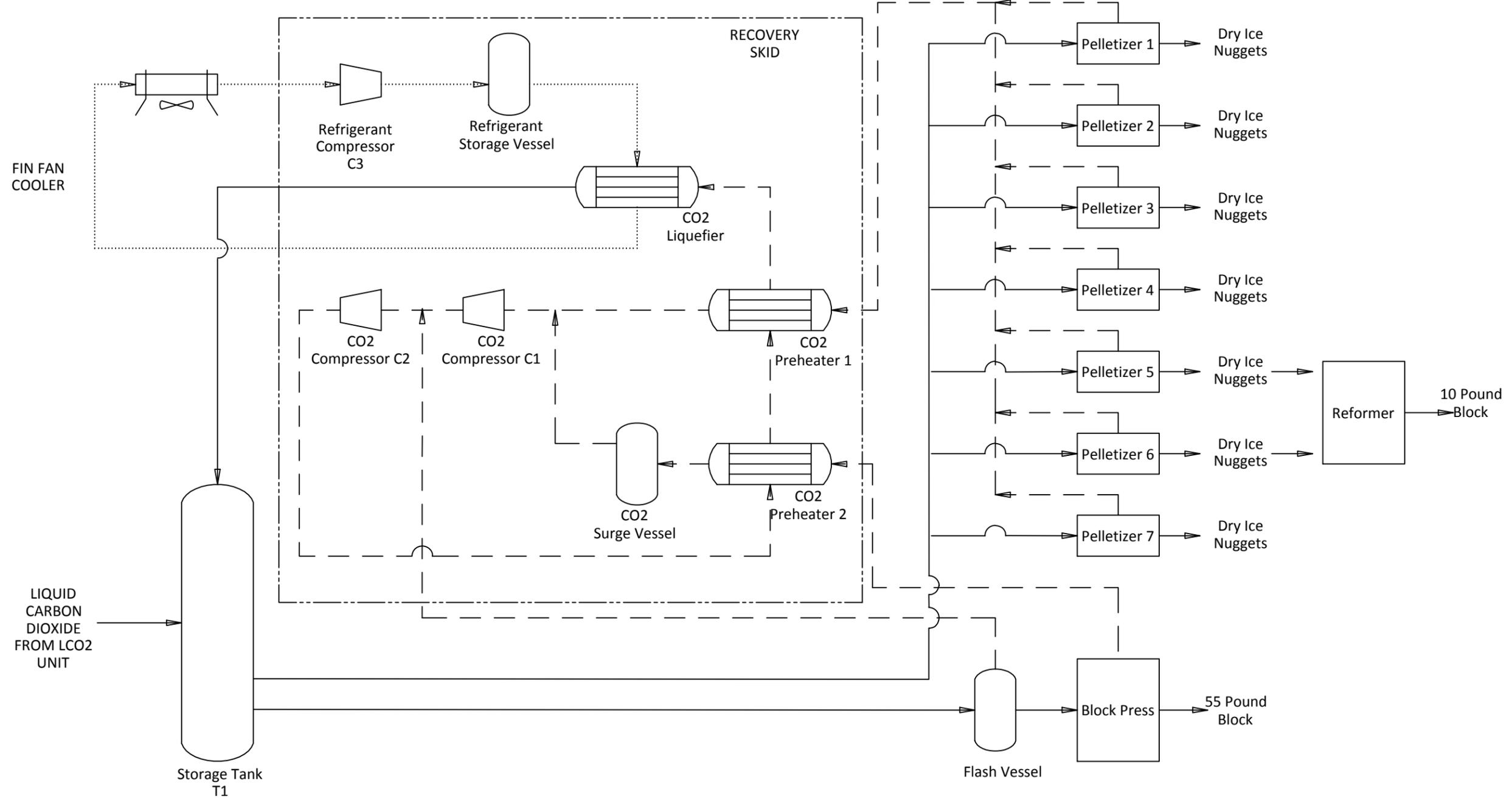
NCC APPLICATION NO. _____
 11x17 COPIES ARE NOT TO SCALE

UNIT # 10 PRAXAIR DRY ICE
 AREA - Q-5E CIVIL
 EXPLORATORY PLAN

Delaware City Refining Company
 DELAWARE CITY REFINERY
 756 GOVERNOR LEA ROAD &
 766 GOVERNOR LEA ROAD
 NEW CASTLE, DE 19720
 (302) 834-6000
 RED LION HUNDRED,
 NEW CASTLE COUNTY, DELAWARE

REV.	DATE	DESCRIPTION	MOC#	BY	REV'WD	APPR'D	REV.	DATE	DESCRIPTION	MOC#	BY	REV'WD	APPR'D	REFERENCE DWG NUMBER	REFERENCE DWG TITLE	ORIGINAL ISSUE	APPROVED/DATE	CHARGE#	FILE NAME	ENGINEER	DESIGNER	DRAFTER	REVISION
A	11.04.15	ISSUED FOR REVIEW		JUG	DME														23614.23-EXPLR-02	DME	JUG	JUG	A
																			1201 - 0110 - CD - 1891				

ATTACHMENT B



——— SOLID CO2
 ——— LIQUID CO2
 - - - GAS CO2
 REFRIGERANT

PROCESS FLOW DIAGRAM	PRAXAIR BUSINESS CONFIDENTIAL PRAXAIR CHICAGO CENTER - BURR RIDGE, IL			DRAWN BY	APPROVED	PROJECT NUMBER
	TYPE OF PLANT DRY ICE FACILITY			ML	RB	198862
11/30/15	TITLE PROPOSED DRY ICE UNIT PRAXAIR DISTRIBUTION INC DELAWARE CITY, DE			SCALE	DATE	SHEET
	11/30/15			NONE	11/30/15	1
SIZE B			DRAWING NUMBER B-2302158		TOT. SHS. 1	ALTERATION NEW

ATTACHMENT B

Dry Ice Unit Process:

As shown on the Process Flow Diagram, Dry Ice Facility, the Dry Ice Unit includes a liquid carbon dioxide storage tank, a flash vessel, a block press, seven (7) pelletizers, a reformer, and a Recovery Skid. The Recovery Skid includes compressors, preheaters, a surge vessel, an activated carbon filter, a carbon dioxide liquefier and a cooling system. The process is described as follows:

- Liquid carbon dioxide is sent to the horizontal storage tank from the liquid Carbon Dioxide Unit.
- The liquid carbon dioxide is sent to the block press and/or the pelletizers.
- Block Press: The liquid carbon dioxide is maintained as a liquid by storing it at high pressures. To make dry ice, the pressure of liquid carbon dioxide is decreased by simply storing the liquid at lower pressures until the pressure is low enough to form dry ice “snow” by passing the liquid through a reducing valve. This occurs in the flash vessel. A portion of the carbon dioxide that will not solidify into dry ice will be sent to the Recovery Skid for reuse in the process. The dry ice “snow” is formed into blocks using a hydraulic ram in the block press.
- Pelletizers: Identical to the block press process, the dry ice “snow” is formed by decreasing the liquid carbon dioxide pressure. When the liquid is passes through a control valve, it causes the liquid to flash creating the dry ice “snow”. The portion that did not solidify will be sent to the Recovery Skid. A hydraulic ram pushes the “snow” though the extrusion chamber, which makes pellets and nuggets of various sizes.
- Recovery Skid: The recovered carbon dioxide gas stream is sent through an activated carbon bed to remove any hydraulic fluid impurities the gas may have picked up during the dry ice process and pressure increasing equipment to form liquid carbon dioxide. The liquid carbon dioxide is reused to form additional dry ice.

ATTACHMENT C

Carbon dioxide, refrigerated liquid

Safety Data Sheet P-4573

according to U.S. Code of Federal Regulations 29 CFR 1910.1200, Hazard Communication.

Date of issue: 01/01/1997 Revision date: 12/18/2014 Supersedes: 12/01/2009

SECTION 1: Product and company identification

1.1. Product identifier

Product form : Substance
Name : Carbon dioxide, refrigerated liquid
CAS No : 124-38-9
Formula : CO₂
Other means of identification : Liquiflow Liquid Carbon Dioxide, Medipure Liquid Carbon Dioxide

1.2. Relevant identified uses of the substance or mixture and uses advised against

Use of the substance/mixture : Industrial use
Medical applications.
Food applications.

1.3. Details of the supplier of the safety data sheet

Praxair, Inc.
39 Old Ridgebury Road
Danbury, CT 06810-5113 - USA
T 1-800-772-9247 (1-800-PRAXAIR) - F 1-716-879-2146
www.praxair.com

1.4. Emergency telephone number

Emergency number : Onsite Emergency: 1-800-645-4633

CHEMTREC, 24hr/day 7days/week — Within USA: 1-800-424-9300, Outside USA: 001-703-527-3887 (collect calls accepted, Contract 17729)

SECTION 2: Hazards identification

2.1. Classification of the substance or mixture

Classification (GHS-US)
Refrigerated liquefied gas H281
Full text of H-phrases: see section 16

2.2. Label elements

GHS-US labeling

Hazard pictograms (GHS-US) :



GHS04

Signal word (GHS-US) : Warning
Hazard statements (GHS-US) : H281 - CONTAINS REFRIGERATED GAS; MAY CAUSE CRYOGENIC BURNS OR INJURY
OSHA-H01 - MAY DISPLACE OXYGEN AND CAUSE RAPID SUFFOCATION.
CGA-HG03 - MAY INCREASE RESPIRATION AND HEART RATE.
Precautionary statements (GHS-US) : P202 - Do not handle until all safety precautions have been read and understood
P271+P403 - Use and store only outdoors or in a well-ventilated place.
P282 - Wear neoprene gloves, eye protection, face shield, protective clothing, cold insulating gloves
CGA-PG05 - Use a back flow preventive device in the piping.
CGA-PG24 - DO NOT change or force fit connections.
CGA-PG06 - Close valve after each use and when empty.
CGA-PG23 - Always keep container in upright position.

Carbon dioxide, refrigerated liquid

Safety Data Sheet P-4573

according to U.S. Code of Federal Regulations 29 CFR 1910.1200, Hazard Communication.

Date of issue: 01/01/1997 Revision date: 12/18/2014 Supersedes: 12/01/2009

2.3. Other hazards

Other hazards not contributing to the classification : Asphyxiant in high concentrations.
Contact with liquid may cause cold burns/frostbite.

2.4. Unknown acute toxicity (GHS-US)

No data available

SECTION 3: Composition/information on ingredients

3.1. Substance

Name	Product identifier	%
Carbon dioxide, refrigerated liquid (Main constituent)	(CAS No) 124-38-9	100

3.2. Mixture

Not applicable

SECTION 4: First aid measures

4.1. Description of first aid measures

First-aid measures after inhalation : Remove victim to uncontaminated area wearing self contained breathing apparatus. Keep victim warm and rested. Call a doctor. Apply artificial respiration if breathing stopped.

First-aid measures after skin contact : For exposure to liquid, immediately warm frostbite area with warm water not to exceed 105°F (41°C). Water temperature should be tolerable to normal skin. Maintain skin warming for at least 15 minutes or until normal coloring and sensation have returned to the affected area. In case of massive exposure, remove clothing while showering with warm water. Seek medical evaluation and treatment as soon as possible.

First-aid measures after eye contact : Immediately flush eyes thoroughly with water for at least 15 minutes. Hold the eyelids open and away from the eyeballs to ensure that all surfaces are flushed thoroughly. Get immediate medical attention.

First-aid measures after ingestion : Ingestion is not considered a potential route of exposure.

4.2. Most important symptoms and effects, both acute and delayed

No additional information available

4.3. Indication of any immediate medical attention and special treatment needed

None.

SECTION 5: Firefighting measures

5.1. Extinguishing media

Suitable extinguishing media : Use extinguishing media appropriate for surrounding fire.

5.2. Special hazards arising from the substance or mixture

Reactivity : No reactivity hazard other than the effects described in sub-sections below.

5.3. Advice for firefighters

Firefighting instructions : DANGER! Extremely cold liquid and gas under pressure. Take care not to direct spray onto vents on top of container. Do not discharge sprays directly into liquid; cryogenic liquid can freeze water rapidly.

Evacuate all personnel from the danger area. Use self-contained breathing apparatus (SCBA) and protective clothing. Immediately cool containers with water from maximum distance. Stop flow of gas if safe to do so, while continuing cooling water spray. Remove ignition sources if safe to do so. Remove containers from area of fire if safe to do so. On-site fire brigades must comply with OSHA 29 CFR 1910.156 and applicable standards under 29 CFR 1910 Subpart L—Fire Protection.

Protection during firefighting : Compressed gas: asphyxiant. Suffocation hazard by lack of oxygen.

Special protective equipment for fire fighters : Use self-contained breathing apparatus. Standard protective clothing and equipment (Self Contained Breathing Apparatus) for fire fighters.

Carbon dioxide, refrigerated liquid

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according to U.S. Code of Federal Regulations 29 CFR 1910.1200, Hazard Communication.

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- Specific methods** : Stop flow of product if safe to do so. Use fire control measures appropriate for the surrounding fire. Exposure to fire and heat radiation may cause gas containers to rupture. Cool endangered containers with water spray jet from a protected position. Prevent water used in emergency cases from entering sewers and drainage systems. Use water spray or fog to knock down fire fumes if possible. If leaking do not spray water onto container. Water surrounding area (from protected position) to contain fire. Exposure to fire may cause containers to rupture/explode.
- Other information** : Cryogenic liquid causes severe frostbite, a burn-like injury. Heat of fire can build pressure in a closed container and cause it to rupture. Venting vapors may obscure visibility. Air will condense on surfaces such as vaporizers or piping exposed to liquid or cold gas. Nitrogen, which has a lower boiling point than oxygen, evaporates first, leaving an oxygen-enriched condensate.

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

- General measures** : Prevent from entering sewers, basements and workpits, or any place where its accumulation can be dangerous. Evacuate area. Ensure adequate air ventilation. Wear self-contained breathing apparatus when entering area unless atmosphere is proven to be safe. Stop leak if safe to do so.

6.1.1. For non-emergency personnel

No additional information available

6.1.2. For emergency responders

No additional information available

6.2. Environmental precautions

Try to stop release.

6.3. Methods and material for containment and cleaning up

No additional information available

6.4. Reference to other sections

See also sections 8 and 13.

SECTION 7: Handling and storage

7.1. Precautions for safe handling

- Precautions for safe handling** : Wear leather safety gloves and safety shoes when handling cylinders. Protect cylinders from physical damage; do not drag, roll, slide or drop. While moving cylinder, always keep in place removable valve cover. Never attempt to lift a cylinder by its cap; the cap is intended solely to protect the valve. When moving cylinders, even for short distances, use a cart (trolley, hand truck, etc.) designed to transport cylinders. Never insert an object (e.g., wrench, screwdriver, pry bar) into cap openings; doing so may damage the valve and cause a leak. Use an adjustable strap wrench to remove over-tight or rusted caps. Slowly open the valve. If the valve is hard to open, discontinue use and contact your supplier. Close the container valve after each use; keep closed even when empty. Never apply flame or localized heat directly to any part of the container. High temperatures may damage the container and could cause the pressure relief device to fail prematurely, venting the container contents. For other precautions in using this product, see section 16.

7.2. Conditions for safe storage, including any incompatibilities

- Storage conditions** : Store in a cool, well-ventilated place. Store and use with adequate ventilation. Store only where temperature will not exceed 125°F (52°C). Firmly secure containers upright to keep them from falling or being knocked over. Install valve protection cap, if provided, firmly in place by hand. Store full and empty containers separately. Use a first-in, first-out inventory system to prevent storing full containers for long periods.

OTHER PRECAUTIONS FOR HANDLING, STORAGE, AND USE: When handling product under pressure, use piping and equipment adequately designed to withstand the pressures to be encountered. Never work on a pressurized system. Use a back flow preventive device in the piping. Gases can cause rapid suffocation because of oxygen deficiency; store and use with adequate ventilation. If a leak occurs, close the container valve and blow down the system in a safe and environmentally correct manner in compliance with all international, federal/national, state/provincial, and local laws; then repair the leak. Never place a container where it may become part of an electrical circuit.

Carbon dioxide, refrigerated liquid

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according to U.S. Code of Federal Regulations 29 CFR 1910.1200, Hazard Communication.

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7.3. Specific end use(s)

None.

SECTION 8: Exposure controls/personal protection

8.1. Control parameters

Carbon dioxide, refrigerated liquid (124-38-9)		
ACGIH	ACGIH TLV-TWA (ppm)	5000 ppm
ACGIH	ACGIH TLV-STEL (ppm)	30000 ppm
USA OSHA	OSHA PEL (TWA) (mg/m ³)	9000 mg/m ³
USA OSHA	OSHA PEL (TWA) (ppm)	5000 ppm

8.2. Exposure controls

Appropriate engineering controls	: Oxygen detectors should be used when asphyxiating gases may be released. Ensure exposure is below occupational exposure limits (where available).
Hand protection	: Wear working gloves when handling gas containers.
Eye protection	: Wear safety glasses with side shields. Wear goggles and a face shield when transfilling or breaking transfer connections.
Respiratory protection	: When workplace conditions warrant respirator use, follow a respiratory protection program that meets OSHA 29 CFR 1910.134, ANSI Z88.2, or MSHA 30 CFR 72.710 (where applicable). Use an air-supplied or air-purifying cartridge if the action level is exceeded. Ensure that the respirator has the appropriate protection factor for the exposure level. If cartridge type respirators are used, the cartridge must be appropriate for the chemical exposure (e.g., an organic vapor cartridge). For emergencies or instances with unknown exposure levels, use a self-contained breathing apparatus (SCBA).
Thermal hazard protection	: Wear cold insulating gloves. Wear cold insulating gloves when transfilling or breaking transfer connections.
Environmental exposure controls	: None necessary.
Other information	: Wear leather safety gloves and safety shoes when handling cylinders.

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

Physical state	: Gas
Appearance	: Colorless gas.
Molecular mass	: 44 g/mol
Color	: Colorless.
Odor	: No data available
Odor threshold	: No data available
pH	: 3.7 (carbonic acid)
Relative evaporation rate (butyl acetate=1)	: No data available
Relative evaporation rate (ether=1)	: Not applicable.
Melting point	: -78.5 °C
Freezing point	: No data available
Boiling point	: -78.5 °C
Flash point	: No data available
Critical temperature	: 31 °C
Auto-ignition temperature	: Not applicable.
Decomposition temperature	: No data available
Flammability (solid, gas)	: No data available
Vapor pressure	: 5730 kPa
Critical pressure	: 7375 kPa
Relative vapor density at 20 °C	: No data available
Relative density	: 0.82

Carbon dioxide, refrigerated liquid

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according to U.S. Code of Federal Regulations 29 CFR 1910.1200, Hazard Communication.

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Specific gravity / density	: 762 kg/m ³
Relative gas density	: 1.52
Solubility	: Water: 2000 mg/l Completely soluble.
Log Pow	: 0.83
Log Kow	: Not applicable.
Viscosity, kinematic	: Not applicable.
Viscosity, dynamic	: Not applicable.
Explosive properties	: Not applicable.
Oxidizing properties	: None.
Explosive limits	: No data available

9.2. Other information

Sublimation point	: -78.5 °C
Gas group	: Refrigerated liquefied gas
Additional information	: Gas/vapor heavier than air. May accumulate in confined spaces, particularly at or below ground level.

SECTION 10: Stability and reactivity

10.1. Reactivity

No reactivity hazard other than the effects described in sub-sections below.

10.2. Chemical stability

Stable under normal conditions.

10.3. Possibility of hazardous reactions

None.

10.4. Conditions to avoid

None under recommended storage and handling conditions (see section 7).

10.5. Incompatible materials

Alkali metals, Alkaline earth metals, Acetylide forming metals, Chromium, Titanium > 1022°F (550°C), Uranium (U) > 1382°F (750°C), Magnesium > 1427°F (775°C).

10.6. Hazardous decomposition products

Electrical discharges and high temperatures decompose carbon dioxide into carbon monoxide and oxygen. The welding process may generate hazardous fumes and gases. If using carbon dioxide for welding and cutting, see Praxair SDS P-4574, Gaseous Carbon Dioxide.

SECTION 11: Toxicological information

11.1. Information on toxicological effects

Acute toxicity : Not classified

Carbon dioxide, refrigerated liquid (f)124-38-9

Additional information	Low concentrations of CO2 cause increased respiration and headache
------------------------	--

Skin corrosion/irritation	: Not classified
	pH: 3.7 (carbonic acid)
Serious eye damage/irritation	: Not classified
	pH: 3.7 (carbonic acid)
Respiratory or skin sensitization	: Not classified
Germ cell mutagenicity	: Not classified
Carcinogenicity	: Not classified
Reproductive toxicity	: Not classified
Specific target organ toxicity (single exposure)	: Not classified

Carbon dioxide, refrigerated liquid

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Specific target organ toxicity (repeated exposure) : Not classified
 No known effects from this product.

Aspiration hazard : Not classified
 Not applicable.

SECTION 12: Ecological information

12.1. Toxicity

Ecology - general : No ecological damage caused by this product.

12.2. Persistence and degradability

Carbon dioxide, refrigerated liquid (124-38-9)

Persistence and degradability	No ecological damage caused by this product.
-------------------------------	--

12.3. Bioaccumulative potential

Carbon dioxide, refrigerated liquid (124-38-9)

BCF fish 1	No bioaccumulation
Log Pow	0.83
Log Kow	Not applicable.
Bioaccumulative potential	No ecological damage caused by this product.

12.4. Mobility in soil

Carbon dioxide, refrigerated liquid (124-38-9)

Mobility in soil	No data available.
Ecology - soil	No ecological damage caused by this product.

12.5. Other adverse effects

Other adverse effects : Can cause frost damage to vegetation.
 Effect on ozone layer : None.
 Global warming potential [CO2=1] : 1
 Effect on the global warming : When discharged in large quantities may contribute to the greenhouse effect.

SECTION 13: Disposal considerations

13.1. Waste treatment methods

Waste disposal recommendations : Do not attempt to dispose of residual or unused quantities. Return container to supplier.

SECTION 14: Transport information

In accordance with DOT

Transport document description : UN2187 Carbon dioxide, refrigerated liquid, 2.2
 UN-No.(DOT) : UN2187
 Proper Shipping Name (DOT) : Carbon dioxide, refrigerated liquid
 Department of Transportation (DOT) Hazard Classes : 2.2 - Class 2.2 - Non-flammable compressed gas 49 CFR 173.115
 Hazard labels (DOT) : 2.2 - Non-flammable gas





Carbon dioxide, refrigerated liquid

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according to U.S. Code of Federal Regulations 29 CFR 1910.1200, Hazard Communication.

Date of issue: 01/01/1997 Revision date: 12/18/2014 Supersedes: 12/01/2009

DOT Special Provisions (49 CFR 172.102) : T75 - When portable tank instruction T75 is referenced in Column (7) of the 172.101 Table, the applicable refrigerated liquefied gases are authorized to be transported in portable tanks in accordance with the requirements of 178.277 of this subchapter.
TP5 - For a portable tank used for the transport of flammable refrigerated liquefied gases or refrigerated liquefied oxygen, the maximum rate at which the portable tank may be filled must not exceed the liquid flow capacity of the primary pressure relief system rated at a pressure not exceeding 120 percent of the portable tank's design pressure. For portable tanks used for the transport of refrigerated liquefied helium and refrigerated liquefied atmospheric gas (except oxygen), the maximum rate at which the tank is filled must not exceed the liquid flow capacity of the pressure relief device rated at 130 percent of the portable tank's design pressure. Except for a portable tank containing refrigerated liquefied helium, a portable tank shall have an outage of at least two percent below the inlet of the pressure relief device or pressure control valve, under conditions of incipient opening, with the portable tank in a level attitude. No outage is required for helium.

Additional information

Emergency Response Guide (ERG) Number : 120 (UN1013, UN1845, UN2187)
Other information : No supplementary information available.
Special transport precautions : Avoid transport on vehicles where the load space is not separated from the driver's compartment. Ensure vehicle driver is aware of the potential hazards of the load and knows what to do in the event of an accident or an emergency. Before transporting product containers:
- Ensure there is adequate ventilation. - Ensure that containers are firmly secured. - Ensure cylinder valve is closed and not leaking. - Ensure valve outlet cap nut or plug (where provided) is correctly fitted. - Ensure valve protection device (where provided) is correctly fitted.

Transport by sea

UN-No. (IMDG) : 2187
Proper Shipping Name (IMDG) : CARBON DIOXIDE, REFRIGERATED LIQUID
Class (IMDG) : 2 - Gases
MFAG-No : 120

Air transport

UN-No.(IATA) : 2187
Proper Shipping Name (IATA) : Carbon dioxide, refrigerated liquid
Class (IATA) : 2
Civil Aeronautics Law : Gases under pressure/Gases nonflammable nontoxic under pressure

SECTION 15: Regulatory information

15.1. US Federal regulations

Carbon dioxide, refrigerated liquid (124-38-9)	
Listed on the United States TSCA (Toxic Substances Control Act) inventory	
SARA Section 311/312 Hazard Classes	Immediate (acute) health hazard Sudden release of pressure hazard

15.2. International regulations

CANADA

Carbon dioxide, refrigerated liquid (124-38-9)	
Listed on the Canadian DSL (Domestic Substances List)	
WHMIS Classification	Class A - Compressed Gas

EU-Regulations

Carbon dioxide, refrigerated liquid (124-38-9)	
Listed on the EEC inventory EINECS (European Inventory of Existing Commercial Chemical Substances)	

Classification according to Regulation (EC) No. 1272/2008 [CLP]
Refrigerated liquefied gas H281

Carbon dioxide, refrigerated liquid

Safety Data Sheet P-4573

according to U.S. Code of Federal Regulations 29 CFR 1910.1200, Hazard Communication.

Date of issue: 01/01/1997 Revision date: 12/18/2014 Supersedes: 12/01/2009

Full text of H-phrases: see section 16

15.2.2. National regulations

Carbon dioxide, refrigerated liquid (124-38-9)

Listed on the AICS (Australian Inventory of Chemical Substances)
Listed on IECSC (Inventory of Existing Chemical Substances Produced or Imported in China)
Listed on the Japanese ENCS (Existing & New Chemical Substances) inventory
Listed on the Korean ECL (Existing Chemicals List)
Listed on NZIoC (New Zealand Inventory of Chemicals)
Listed on PICCS (Philippines Inventory of Chemicals and Chemical Substances)
Listed on the Canadian IDL (Ingredient Disclosure List)

15.3. US State regulations

Carbon dioxide, refrigerated liquid(124-38-9)

U.S. - California - Proposition 65 - Carcinogens List	No
U.S. - California - Proposition 65 - Developmental Toxicity	No
U.S. - California - Proposition 65 - Reproductive Toxicity - Female	No
U.S. - California - Proposition 65 - Reproductive Toxicity - Male	No
State or local regulations	U.S. - Massachusetts - Right To Know List U.S. - New Jersey - Right to Know Hazardous Substance List U.S. - Pennsylvania - RTK (Right to Know) List

SECTION 16: Other information

Revision date : 12/18/2014 12:00:00 AM

Other information : When you mix two or more chemicals, you can create additional, unexpected hazards. Obtain and evaluate the safety information for each component before you produce the mixture. Consult an industrial hygienist or other trained person when you evaluate the end product. Before using any plastics, confirm their compatibility with this product.

Praxair asks users of this product to study this SDS and become aware of the product hazards and safety information. To promote safe use of this product, a user should (1) notify employees, agents, and contractors of the information in this SDS and of any other known product hazards and safety information, (2) furnish this information to each purchaser of the product, and (3) ask each purchaser to notify its employees and customers of the product hazards and safety information.

The opinions expressed herein are those of qualified experts within Praxair, Inc. We believe that the information contained herein is current as of the date of this Safety Data Sheet. Since the use of this information and the conditions of use are not within the control of Praxair, Inc., it is the user's obligation to determine the conditions of safe use of the product.

Praxair SDSs are furnished on sale or delivery by Praxair or the independent distributors and suppliers who package and sell our products. To obtain current SDSs for these products, contact your Praxair sales representative, local distributor, or supplier, or download from www.praxair.com. If you have questions regarding Praxair SDSs, would like the document number and date of the latest SDS, or would like the names of the Praxair suppliers in your area, phone or write the Praxair Call Center (Phone: 1-800-PRAXAIR/1-800-772-9247; Address: Praxair Call Center, Praxair, Inc., P.O. Box 44, Tonawanda, NY 14151-0044).

PRAXAIR and the Flowing Airstream design are trademarks or registered trademarks of Praxair Technology, Inc. in the United States and/or other countries.

Full text of H-phrases:

Refrigerated liquefied gas	Gases under pressure Refrigerated liquefied gas
H281	CONTAINS REFRIGERATED GAS; MAY CAUSE CRYOGENIC BURNS OR INJURY

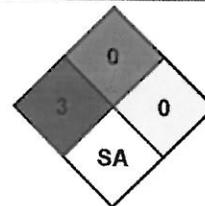
Carbon dioxide, refrigerated liquid

Safety Data Sheet P-4573

according to U.S. Code of Federal Regulations 29 CFR 1910.1200, Hazard Communication.

Date of issue: 01/01/1997 Revision date: 12/18/2014 Supersedes: 12/01/2009

- NFPA health hazard : 3 - Short exposure could cause serious temporary or residual injury even though prompt medical attention was given.
- NFPA fire hazard : 0 - Materials that will not burn.
- NFPA reactivity : 0 - Normally stable, even under fire exposure conditions, and are not reactive with water.
- NFPA specific hazard : SA - This denotes gases which are simple asphyxiants.



HMIS III Rating

- Health : 3 Serious Hazard - Major injury likely unless prompt action is taken and medical treatment is given
- Flammability : 0 Minimal Hazard
- Physical : 2 Moderate Hazard

SDS US (GHS HazCom 2012) - Praxair

This information is based on our current knowledge and is intended to describe the product for the purposes of health, safety and environmental requirements only. It should not therefore be construed as guaranteeing any specific property of the product.

Carbon Dioxide, Solid or Dry Ice

Safety Data Sheet P-4575

according to U.S. Code of Federal Regulations 29 CFR 1910.1200, Hazard Communication.

Date of issue: 01/01/1997 Revision date: 01/12/2015 Supersedes: 05/01/2009

SECTION 1: Product and company identification

1.1. Product identifier

Product form : Substance
Name : Carbon Dioxide, Solid or Dry Ice
CAS No : 124-38-9
Formula : CO₂
Other means of identification : Dry ice (nuggets, pellets, or blocks), carbonice, carbonic anhydride

1.2. Relevant identified uses of the substance or mixture and uses advised against

Use of the substance/mixture : Industrial use. Use as directed.

1.3. Details of the supplier of the safety data sheet

Praxair, Inc.
39 Old Ridgebury Road
Danbury, CT 06810-5113 - USA
T 1-800-772-9247 (1-800-PRAXAIR) - F 1-716-879-2146
www.praxair.com

1.4. Emergency telephone number

Emergency number : Onsite Emergency: 1-800-645-4633

CHEMTREC, 24hr/day 7days/week — Within USA: 1-800-424-9300, Outside USA: 001-703-527-3887 (collect calls accepted, Contract 17729)

SECTION 2: Hazards identification

2.1. Classification of the substance or mixture

Classification (GHS-US)

Not classified

2.2. Label elements

GHS-US labeling

Hazard pictograms (GHS-US) :



None

Signal word (GHS-US) :

Danger

Hazard statements (GHS-US) :

CGA-HG01 - MAY CAUSE FROSTBITE.
MAY CAUSE CRYOGENIC BURNS OR INJURY
CGA-HG03 - MAY INCREASE RESPIRATION AND HEART RATE.
VAPOR MAY DISPLACE OXYGEN AND CAUSE RAPID SUFFOCATION

2.3. Other hazards

Other hazards not contributing to the classification :

Refrigerated solidified gas. CONTACT WITH PRODUCT MAY CAUSE COLD BURNS OR FROSTBITE.

Dry ice sublimates to carbon dioxide vapor at -109°F (-78°C). VAPOR MAY DISPLACE OXYGEN AND CAUSE RAPID SUFFOCATION.

2.4. Unknown acute toxicity (GHS-US)

No data available

SECTION 3: Composition/information on ingredients

3.1. Substance

Carbon Dioxide, Solid or Dry Ice

Safety Data Sheet P-4575

according to U.S. Code of Federal Regulations 29 CFR 1910.1200, Hazard Communication.

Date of issue: 01/01/1997 Revision date: 01/12/2015 Supersedes: 05/01/2009

Name	Product identifier	%
Carbon Dioxide, Solid or Dry Ice (Main constituent)	(CAS No) 124-38-9	100

3.2. Mixture

Not applicable

SECTION 4: First aid measures

4.1. Description of first aid measures

- First-aid measures after inhalation : Remove victim to uncontaminated area wearing self contained breathing apparatus. Keep victim warm and rested. Call a doctor. Apply artificial respiration if breathing stopped.
- First-aid measures after skin contact : In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes.
- First-aid measures after eye contact : Immediately flush eyes thoroughly with water for at least 15 minutes. Hold the eyelids open and away from the eyeballs to ensure that all surfaces are flushed thoroughly. Get immediate medical attention.
- First-aid measures after ingestion : Ingestion is not considered a potential route of exposure.

4.2. Most important symptoms and effects, both acute and delayed

No additional information available

4.3. Indication of any immediate medical attention and special treatment needed

None.

SECTION 5: Firefighting measures

5.1. Extinguishing media

No additional information available

5.2. Special hazards arising from the substance or mixture

Reactivity : None.

5.3. Advice for firefighters

Firefighting instructions : Evacuate all personnel from danger area. Do not discharge sprays onto solid carbon dioxide. Solid carbon dioxide will freeze water rapidly. NEVER HANDLE SOLID CARBON DIOXIDE WITH YOUR BARE HANDS. USE GLOVES OR DRY ICE TONGS OR A DRY SHOVEL OR SCOOP. Move packages away from fire area if safe to do so. Self-contained breathing apparatus may be required by rescue workers. On-site fire brigades must comply with OSHA 29 CFR 1910.156 and applicable standards under 29 CFR 1910 Subpart L—Fire Protection.

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

General measures : Use protective clothing. Wear cold-insulating gloves/face shield/eye protection. Chemical asphyxiant. Exposure to low concentrations for extended periods may result in dizziness or unconsciousness, and may lead to death. Wear self-contained breathing apparatus when entering area unless atmosphere is proven to be safe. NEVER HANDLE SOLID CARBON DIOXIDE WITH YOUR BARE HANDS. USE GLOVES OR DRY ICE TONGS OR A DRY SHOVEL OR SCOOP.

6.1.1. For non-emergency personnel

No additional information available

6.1.2. For emergency responders

No additional information available

6.2. Environmental precautions

Prevent waste from contaminating the surrounding environment. Prevent soil and water pollution. Dispose of contents/container in accordance with local/regional/national/international regulations. Contact supplier for any special requirements.

6.3. Methods and material for containment and cleaning up

No additional information available

Carbon Dioxide, Solid or Dry Ice

Safety Data Sheet P-4575

according to U.S. Code of Federal Regulations 29 CFR 1910.1200, Hazard Communication.

Date of issue: 01/01/1997 Revision date: 01/12/2015 Supersedes: 05/01/2009

6.4. Reference to other sections

See also sections 8 and 13.

SECTION 7: Handling and storage

7.1. Precautions for safe handling

Precautions for safe handling : Avoid materials incompatible with cryogenic use; some metals such as carbon steel may fracture easily at low temperature. Vapor can cause rapid suffocation due to oxygen deficiency. Never allow any unprotected part of your body to touch solid carbon dioxide or to touch uninsulated pipes or vessels containing solid or liquid carbon dioxide or cold carbon dioxide gas. Not only can you suffer frostbite, your skin may stick fast to the cold surfaces. Use tongs or insulated gloves when handling solid carbon dioxide or objects in contact cold carbon dioxide in any form. Wear protective clothing and equipment as prescribed in section 8. For other precautions in using carbon dioxide, see section 16.

7.2. Conditions for safe storage, including any incompatibilities

Storage conditions : Store and use with adequate ventilation. Do not store in tight containers or confined spaces. Storage areas should be clean and dry. Solid carbon dioxide is generally delivered to customers in 50-lb (22.7-kg), ½-cubic ft (0.0142 cubic meter) blocks (approximate dimensions), wrapped in kraft paper. Small pellets or nuggets are also produced. The product should be stored in insulated containers that open from the top. Lids should fit loosely so the carbon dioxide vapor given off as the solid sublimates can escape into the atmosphere. Carbon dioxide gas is about 1½ times as heavy as air and will accumulate in low-lying areas, so ventilation must be adequate at floor or below grade level.

7.3. Specific end use(s)

None.

SECTION 8: Exposure controls/personal protection

8.1. Control parameters

Carbon Dioxide, Solid or Dry Ice (124-38-9)		
ACGIH	ACGIH TLV-TWA (ppm)	5000 ppm
ACGIH	ACGIH TLV-STEL (ppm)	30000 ppm
USA OSHA	OSHA PEL (TWA) (mg/m ³)	9000 mg/m ³
USA OSHA	OSHA PEL (TWA) (ppm)	5000 ppm

8.2. Exposure controls

Appropriate engineering controls : Oxygen detectors should be used when asphyxiating gases may be released. Ensure exposure is below occupational exposure limits (where available). Systems under pressure should be regularly checked for leakages. Provide adequate general and local exhaust ventilation. Consider work permit system e.g. for maintenance activities.

Hand protection : Cold-insulating gloves.

Eye protection : Wear safety glasses with side shields.

Respiratory protection : When workplace conditions warrant respirator use, follow a respiratory protection program that meets OSHA 29 CFR 1910.134, ANSI Z88.2, or MSHA 30 CFR 72.710 (where applicable). Use an air-supplied or air-purifying cartridge if the action level is exceeded. Ensure that the respirator has the appropriate protection factor for the exposure level. If cartridge type respirators are used, the cartridge must be appropriate for the chemical exposure (e.g., an organic vapor cartridge). For emergencies or instances with unknown exposure levels, use a self-contained breathing apparatus (SCBA).

Thermal hazard protection : Wear cold insulating gloves.

Environmental exposure controls : None necessary.

Other information : Wear safety shoes while handling containers.

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

Physical state : Solid

Appearance : Opaque. White crystalline solid.

Molecular mass : 44 g/mol

Carbon Dioxide, Solid or Dry Ice

Safety Data Sheet P-4575

according to U.S. Code of Federal Regulations 29 CFR 1910.1200, Hazard Communication.

Date of issue: 01/01/1997 Revision date: 01/12/2015 Supersedes: 05/01/2009

Color	: White.
Odor	: No data available
Odor threshold	: No data available
pH	: 3.7 (carbonic acid)
Relative evaporation rate (butyl acetate=1)	: No data available
Relative evaporation rate (ether=1)	: Not applicable.
Melting point	: -78.5 °C
Freezing point	: No data available
Boiling point	: -78.5 °C
Flash point	: Not applicable.
Critical temperature	: 30 °C
Auto-ignition temperature	: Not applicable.
Decomposition temperature	: No data available
Flammability (solid, gas)	: No data available
Vapor pressure	: 5730 kPa
Critical pressure	: 7375 kPa
Relative vapor density at 20 °C	: No data available
Relative density	: 0.82
Specific gravity / density	: 1562 kg/m ³
Relative gas density	: 1.52
Solubility	: Water: 2000 mg/l Completely soluble.
Log Pow	: 0.83
Log Kow	: Not applicable.
Viscosity, kinematic	: Not applicable.
Viscosity, dynamic	: Not applicable.
Explosive properties	: Not applicable.
Oxidizing properties	: None.
Explosive limits	: Not applicable.

9.2. Other information

Sublimation point	: -78.5 °C Expansion ratio for solid to gas at sublimation point is 1 to 554.
Additional information	: Gas/vapor heavier than air. May accumulate in confined spaces, particularly at or below ground level.

SECTION 10: Stability and reactivity

10.1. Reactivity

None.

10.2. Chemical stability

Stable under normal conditions.

10.3. Possibility of hazardous reactions

None.

10.4. Conditions to avoid

None under recommended storage and handling conditions (see section 7).

10.5. Incompatible materials

Alkali metals, Alkaline earth metals, Acetylide forming metals, Chromium, Titanium > 1022°F (550°C), Uranium (U) > 1382°F (750°C), Magnesium > 1427°F (775°C).

10.6. Hazardous decomposition products

Electrical discharges and high temperatures decompose carbon dioxide into carbon monoxide and oxygen.

SECTION 11: Toxicological information

11.1. Information on toxicological effects

Acute toxicity	: Not classified
Skin corrosion/irritation	: Not classified pH: 3.7 (carbonic acid)
Serious eye damage/irritation	: Not classified pH: 3.7 (carbonic acid)
Respiratory or skin sensitization	: Not classified
Germ cell mutagenicity	: Not classified
Carcinogenicity	: Not classified
Reproductive toxicity	: Not classified
Specific target organ toxicity (single exposure)	: Not classified
Specific target organ toxicity (repeated exposure)	: Not classified No known effects from this product.
Aspiration hazard	: Not classified Not applicable.

SECTION 12: Ecological information

12.1. Toxicity

Ecology - general : No ecological damage caused by this product.

12.2. Persistence and degradability

Carbon Dioxide, Solid or Dry Ice (124-38-9)

Persistence and degradability	No ecological damage caused by this product.
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12.3. Bioaccumulative potential

Carbon Dioxide, Solid or Dry Ice (124-38-9)

BCF fish 1	(no bioaccumulation)
Log Pow	0.83
Log Kow	Not applicable.
Bioaccumulative potential	No ecological damage caused by this product.

12.4. Mobility in soil

Carbon Dioxide, Solid or Dry Ice (124-38-9)

Mobility in soil	No data available.
Ecology - soil	No ecological damage caused by this product.

12.5. Other adverse effects

Other adverse effects	: Can cause frost damage to vegetation.
Effect on ozone layer	: None.
Global warming potential [CO ₂ =1]	: 1
Effect on the global warming	: When discharged in large quantities may contribute to the greenhouse effect.

SECTION 13: Disposal considerations

13.1. Waste treatment methods

Waste treatment methods	: See Section 6.
Waste disposal recommendations	: Dispose of contents/container in accordance with local/regional/national/international regulations. Contact supplier for any special requirements.

Carbon Dioxide, Solid or Dry Ice

Safety Data Sheet P-4575

according to U.S. Code of Federal Regulations 29 CFR 1910.1200, Hazard Communication.

Date of issue: 01/01/1997 Revision date: 01/12/2015 Supersedes: 05/01/2009

SECTION 14: Transport information

In accordance with DOT

Transport document description : UN1845 Carbon dioxide, solid, 9
 UN-No.(DOT) : UN1845
 Proper Shipping Name (DOT) : Carbon dioxide, solid
 Department of Transportation (DOT) Hazard Classes : 9 - Class 9 - Miscellaneous hazardous material 49 CFR 173.140
 Hazard labels (DOT) : 9 - Class 9 (Miscellaneous dangerous materials)



DOT Symbols : A - Material is regulated as a hazardous material only when be transported by air,W - Material is regulated as a hazardous material only when be transported by water

Additional information

Emergency Response Guide (ERG) Number : 120 (UN1013)
 Other information : No supplementary information available.
 Special transport precautions : Avoid transport on vehicles where the load space is not separated from the driver's compartment. Ensure vehicle driver is aware of the potential hazards of the load and knows what to do in the event of an accident or an emergency. Before transporting product containers:
 - Ensure there is adequate ventilation. - Ensure that containers are firmly secured. - Ensure cylinder valve is closed and not leaking. - Ensure valve outlet cap nut or plug (where provided) is correctly fitted. - Ensure valve protection device (where provided) is correctly fitted.

Transport by sea

UN-No. (IMDG) : 1845
 Proper Shipping Name (IMDG) : CARBON DIOXIDE, SOLID (DRY ICE)
 Class (IMDG) : 9 - Miscellaneous dangerous compounds

Air transport

UN-No.(IATA) : 1845
 Proper Shipping Name (IATA) : Carbon dioxide, solid
 Class (IATA) : 9 - Miscellaneous Dangerous Goods

SECTION 15: Regulatory information

15.1. US Federal regulations

Carbon Dioxide, Solid or Dry Ice (124-38-9)	
Listed on the United States TSCA (Toxic Substances Control Act) inventory	
SARA Section 311/312 Hazard Classes	Immediate (acute) health hazard

15.2. International regulations

CANADA

Carbon Dioxide, Solid or Dry Ice (124-38-9)	
Listed on the Canadian DSL (Domestic Substances List)	
WHMIS Classification	Class A - Compressed Gas

EU-Regulations

Carbon Dioxide, Solid or Dry Ice (124-38-9)	
Listed on the EEC inventory EINECS (European Inventory of Existing Commercial Chemical Substances)	

Classification according to Regulation (EC) No. 1272/2008 [CLP]

Not classified

Carbon Dioxide, Solid or Dry Ice

Safety Data Sheet P-4575

according to U.S. Code of Federal Regulations 29 CFR 1910.1200, Hazard Communication.

Date of issue: 01/01/1997 Revision date: 01/12/2015 Supersedes: 05/01/2009

15.2.2. National regulations

Carbon Dioxide, Solid or Dry Ice (124-38-9)

Listed on the AICS (Australian Inventory of Chemical Substances)
Listed on IECSC (Inventory of Existing Chemical Substances Produced or Imported in China)
Listed on the Japanese ENCS (Existing & New Chemical Substances) inventory
Listed on the Korean ECL (Existing Chemicals List)
Listed on NZIoC (New Zealand Inventory of Chemicals)
Listed on PICCS (Philippines Inventory of Chemicals and Chemical Substances)
Listed on the Canadian IDL (Ingredient Disclosure List)

15.3. US State regulations

Carbon Dioxide, Solid or Dry Ice(124-38-9)

U.S. - California - Proposition 65 - Carcinogens List	No
U.S. - California - Proposition 65 - Developmental Toxicity	No
U.S. - California - Proposition 65 - Reproductive Toxicity - Female	No
U.S. - California - Proposition 65 - Reproductive Toxicity - Male	No
State or local regulations	U.S. - Massachusetts - Right To Know List U.S. - New Jersey - Right to Know Hazardous Substance List U.S. - Pennsylvania - RTK (Right to Know) List

SECTION 16: Other information

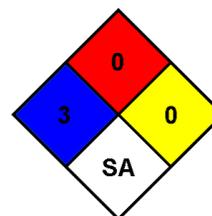
Revision date : 1/12/2015 12:00:00 AM

NFPA health hazard : 3 - Short exposure could cause serious temporary or residual injury even though prompt medical attention was given.

NFPA fire hazard : 0 - Materials that will not burn.

NFPA reactivity : 0 - Normally stable, even under fire exposure conditions, and are not reactive with water.

NFPA specific hazard : SA - This denotes gases which are simple asphyxiants.



HMIS III Rating

Health : 3 Serious Hazard - Major injury likely unless prompt action is taken and medical treatment is given

Flammability : 0 Minimal Hazard

Physical : 0 Minimal Hazard

SDS US (GHS HazCom 2012) - Praxair

This information is based on our current knowledge and is intended to describe the product for the purposes of health, safety and environmental requirements only. It should not therefore be construed as guaranteeing any specific property of the product.

MATERIAL SAFETY DATA SHEET

PROPYLENE GLYCOL (ALL GRADES)

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Brenntag Canada Inc.
43 Jutland Rd.
Toronto, ON
M8Z 2G6
(416) 259-8231

WHMIS#: 00060619
Index: GCD1351/13B
Effective Date: 2013 May 30
Date of Revision: 2013 May 30

Website: <http://www.brenntag.ca>

EMERGENCY TELEPHONE NUMBER (For Emergencies Involving Chemical Spills or Releases)

1 855 273 6824

PRODUCT IDENTIFICATION

Product Name: Propylene Glycol (All Grades).
Chemical Name: 1,2-Propanediol.
Synonyms: Propylene Glycol 95 - 100 %; Propylene Glycol 40 - 60 %; 1,2-Dihydroxypropane; Methylethylene Glycol; Monopropylene Glycol; Propane-1,2-diol; alpha-Propyleneglycol; 1,2-Propylene Glycol; Propylene Glycol USP; PuraGuard.
Chemical Family: Glycols.
Molecular Formula: C₃H₈O₂.
Product Use: Pharmaceutical. Automotive coolant/antifreeze. Solvent used in paints and coating products.

Glycols are not intended for the production of theatrical fog or artificial smoke. The normal use of glycols in the workplace usually includes preventative measures to reduce or minimize personnel contact. Such measures may not be consistent with theatrical or entertainment settings where these special effects may be produced.

WHMIS Classification / Symbol:

Not WHMIS Regulated.



READ THE ENTIRE MSDS FOR THE COMPLETE HAZARD EVALUATION OF THIS PRODUCT.

2. COMPOSITION, INFORMATION ON INGREDIENTS (Not Intended As Specifications)

Ingredient	CAS#	ACGIH TLV (TWA)	% Concentration
Propylene Glycol	57-55-6	---	40 - 100

3. HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW: Low hazard for usual industrial or commercial handling. Can decompose at high temperatures forming toxic gases. Contents may develop pressure on prolonged exposure to heat.

POTENTIAL HEALTH EFFECTS

Inhalation: This product has a low vapour pressure and is not expected to present an inhalation hazard at ambient conditions. Prevent aerosolization or misting of this product. (3) See "Other Health Effects" Section.

Skin Contact:	This product is non-irritating upon contact. Prolonged, confined (especially under the finger nails, under rings or watch bands) or repeated exposure may cause skin irritation.
Skin Absorption:	A single, prolonged skin exposure is not likely to result in the absorption of toxic amounts of the material.
Eye Contact:	This product may cause mild, transient irritation. May cause blurred vision.
Ingestion:	This product may cause mild gastrointestinal discomfort.
Other Health Effects:	Effects (irritancy) on the skin and eyes may be delayed. Strict adherence to first aid measures following any exposure is essential. May cause liver damage, kidney damage and central nervous system (CNS) depression. CNS depression is characterized by headache, dizziness, drowsiness, nausea, vomiting and incoordination. Severe overexposures may lead to coma and possible death due to respiratory failure. Liver damage is characterized by the loss of appetite, jaundice (yellowish skin colour), and occasional pain in the upper left-hand side of the abdomen. Signs and symptoms of kidney damage generally progress from oliguria, to blood in the urine, to total renal failure.

4. FIRST AID MEASURES

FIRST AID PROCEDURES

Inhalation:	If respiratory problems arise, move the victim to fresh air. Give artificial respiration ONLY if breathing has stopped. Give cardiopulmonary resuscitation (CPR) if there is no breathing AND no pulse. Obtain medical advice IMMEDIATELY.
Skin Contact:	Start flushing while removing contaminated clothing. Wash affected areas thoroughly with soap and water. If irritation, redness, or a burning sensation develops and persists, obtain medical advice.
Eye Contact:	Flush skin with running water for a minimum of 15 minutes. Start flushing while removing contaminated clothing. If irritation, redness, or a burning sensation develops and persists, obtain medical attention.
Ingestion:	Do not attempt to give anything by mouth to an unconscious person. If victim is alert and not convulsing, rinse mouth out and give 1/2 to 1 glass of water to dilute material. DO NOT induce vomiting. If spontaneous vomiting occurs, have victim lean forward with head down to avoid breathing in of vomitus, rinse mouth and administer more water. Obtain medical attention IMMEDIATELY.
Note to Physicians:	This product contains materials that may cause severe pneumonitis if aspirated. If ingestion has occurred less than 2 hours earlier, carry out careful gastric lavage; use endotracheal cuff if available, to prevent aspiration. Observe patient for respiratory difficulty from aspiration pneumonitis. Give artificial resuscitation and appropriate chemotherapy if respiration is depressed. Medical conditions that may be aggravated by exposure to this product include neurological and cardiovascular disorders, diseases of the skin, eyes or respiratory tract, preexisting liver and kidney disorders.

5. FIRE-FIGHTING MEASURES

Flashpoint (°C)	Autoignition Temperature (°C)	Flammability Limits in Air (%):	
		LEL	UEL
99 - 109 (3)	371 - 421. (3)	2.4 (3)	17.4 (3)
Flammability Class (WHMIS):	Not regulated.		
Hazardous Combustion Products:	Thermal decomposition products are toxic and may include oxides of carbon and irritating gases. Heating in air may produce irritating aldehydes, acids and ketones.		
Unusual Fire or Explosion Hazards:	Do not direct a solid stream of foam into hot, burning pools. This may cause spattering and increase fire intensity. Closed containers exposed to heat may burst. Spilled material may cause floors and contact surfaces to become slippery. Aqueous solutions containing less than 95 % Propylene Glycol by weight have no flash points as obtained by standard test methods. However, aqueous solutions of Propylene Glycol greater than 22 % by weight, if heated sufficiently, will produce flammable vapours. Only aqueous solutions of Propylene Glycol less than 22 % by weight should be used in sprinkler systems or other fire-fighting equipment. (3)		
Sensitivity to Mechanical Impact:	Not expected to be sensitive to mechanical impact.		
Rate of Burning:	Not available.		
Explosive Power:	Not available.		

Sensitivity to Static Discharge: Not expected to be sensitive to static discharge.

EXTINGUISHING MEDIA

Fire Extinguishing Media: Use carbon dioxide or dry chemical media for small fires. If only water is available, use it in the form of a fog. Do not use high volume water jet.

FIRE FIGHTING INSTRUCTIONS

Instructions to the Fire Fighters: Use water spray to cool fire-exposed containers or structures. Use water spray to disperse vapours. Isolate materials that are not involved in the fire and protect personnel. Cool containers with flooding quantities of water until well after the fire is out. Spilled material may cause floors and contact surfaces to become slippery.

Fire Fighting Protective Equipment: Use self-contained breathing apparatus and protective clothing.

6. ACCIDENTAL RELEASE MEASURES

Information in this section is for responding to spills, leaks or releases in order to prevent or minimize the adverse effects on persons, property and the environment. There may be specific reporting requirements associated with spills, leaks or releases, which change from region to region.

Containment and Clean-Up Procedures: Wear protective clothing. Collect product for recovery or disposal. For release to land, or storm water runoff, contain discharge by constructing dykes or applying inert absorbent; for release to water, utilize damming and/or water diversion to minimize the spread of contamination. Ventilate enclosed spaces. Notify applicable government authority if release is reportable or could adversely affect the environment. Spilled material may cause floors and contact surfaces to become slippery.

7. HANDLING AND STORAGE

HANDLING

Handling Practices: Use normal "good" industrial hygiene and housekeeping practices. Containers exposed to heat may be under internal pressure. These should be cooled and carefully vented before opening. A face shield and apron should be worn. Vent container frequently, and more often in warm weather, to relieve pressure.

Ventilation Requirements: See Section 8, "Engineering Controls".

Other Precautions: Use only with adequate ventilation and avoid breathing aerosols (vapours or mists). Avoid contact with eyes, skin or clothing. Wash thoroughly with soap and water after handling. Wash contaminated clothing thoroughly before re-use. Do not use cutting or welding torches on empty drums that contained this material/product. Spills on hot fibrous insulation may lead to the lowering of the autoignition temperature possibly resulting in spontaneous combustion.

STORAGE

Storage Temperature (°C): Ideal storage temperature is 18 to 32.

Ventilation Requirements: General exhaust is acceptable.

Storage Requirements: Store in a cool, well-ventilated area. Keep away from heat, sparks and flames. Keep containers closed. Do not expose sealed containers to temperatures above 40° C. Protect from direct sunlight. Avoid moisture contamination. Hygroscopic. Protect against physical damage. It is recommended to protect against unnecessary absorption of moisture by blanketing the product with dry air or dry nitrogen - especially for quantities in bulk containers. (3)

Special Materials to be Used for Packaging or Containers: Materials of construction for storing the product include: mild steel or stainless steel. Attacks some types of rubber, plastics and coatings. Confirm suitability of any material before using.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Recommendations listed in this section indicate the type of equipment, which will provide protection against overexposure to this product. Conditions of use, adequacy of engineering or other control measures, and actual exposures will dictate the need for specific protective devices at your workplace.

ENGINEERING CONTROLS

Engineering Controls: General exhaust is acceptable. Local exhaust ventilation preferred. Make up air should be supplied to balance air that is removed by local or general exhaust ventilation. Ventilate low lying areas such as sumps or pits where dense vapours may collect.

PERSONAL PROTECTIVE EQUIPMENT (PPE)

Eye Protection:	Safety glasses with side shields are recommended to prevent eye contact. Use chemical safety goggles when there is potential for eye contact. Contact lenses should not be worn when working with this material.
Skin Protection:	Gloves and protective clothing made from neoprene should be impervious under conditions of use. Prior to use, user should confirm impermeability. Discard contaminated gloves.
Respiratory Protection:	No specific guidelines available. Respiratory protection should not be necessary unless the material is heated or a mist created. A NIOSH/MSHA-approved air-purifying respirator equipped with organic vapour cartridges for concentrations up to 1 000 ppm organic vapours. An air-supplied respirator if concentrations are higher or unknown. If while wearing a respiratory protection, you can smell, taste or otherwise detect anything unusual, or in the case of a full facepiece respirator you experience eye irritation, leave the area immediately. Check to make sure the respirator to face seal is still good. If it is, replace the filter, cartridge or canister. If the seal is no longer good, you may need a new respirator. (6)
Other Personal Protective Equipment:	Wear regular work clothing. The use of coveralls is recommended. Locate safety shower and eyewash station close to chemical handling area. Take all precautions to avoid personal contact.

EXPOSURE GUIDELINES
None established for this product.

9. PHYSICAL AND CHEMICAL PROPERTIES (Not intended as Specifications)

Physical State:	Liquid.
Appearance:	Clear, colourless liquid.
Odour:	Mild glycol odour.
Odour Threshold (ppm):	Not applicable.
Boiling Range (°C):	184 - 189.
Melting/Freezing Point (°C):	- 68
Vapour Pressure (mm Hg at 20° C):	0.07 - 0.20.
Vapour Density (Air = 1.0):	2.5 - 2.6.
Relative Density (g/cc):	1.03 - 1.04.
Bulk Density:	1 030 - 1 040 kg/m ³ .
Viscosity:	48.6 mPa.s @ 25 °C. (3)
Evaporation Rate (Butyl Acetate = 1.0):	0.01
Solubility:	Soluble in water. Hygroscopic (readily absorbs water).
% Volatile by Volume:	100.
pH:	6 - 8
Coefficient of Water/Oil Distribution:	< 0.
Volatile Organic Compounds (VOC):	28 % (ASTM D 2369) (3)
Flashpoint (°C):	99 - 109 (3)

10. STABILITY AND REACTIVITY

CHEMICAL STABILITY

Under Normal Conditions:	Stable.
Under Fire Conditions:	Not flammable.
Hazardous Polymerization:	Will not occur.
Conditions to Avoid:	High temperatures, sparks, open flames and all other sources of ignition. Temperatures above 40 °C (104 °F). Avoid moisture contamination. Hygroscopic.
Materials to Avoid:	Strong oxidizers. Strong acids. Isocyanates. Strong bases.
Decomposition or Combustion Products:	Thermal decomposition products are toxic and may include oxides of carbon and irritating gases. Heating in air may produce irritating aldehydes, acids and ketones.

11. TOXICOLOGICAL INFORMATION

TOXICOLOGICAL DATA:

SUBSTANCE	LD50 (Oral, Rat)	LD50 (Dermal, Rabbit)	LC50 (Inhalation, Rat, 4h)
Propylene Glycol	> 20 000 mg/kg (3)	> 2 000 mg/kg (3)	---
Carcinogenicity Data:	The ingredient(s) of this product is (are) not classed as carcinogenic by ACGIH, IARC, OSHA or NTP. See "Other Studies Relevant to Material".		
Reproductive Data:	Mice were exposed to 0, 1.0, 2.5 or 5.0% (approximately 1820, 4800 or 10100 mg/kg/day) in their drinking water in a continuous breeding (2-generation) study. No significant effects on fertility or reproduction were observed. (4)		
Mutagenicity Data:	Negative results are reported for 3 tests (host-mediated, dominant lethal and bone marrow chromosomal aberration) using rats and mice exposed to propylene glycol orally. These unpublished studies were reviewed by an expert panel and determined to be well conducted. Positive and negative results have been reported in other studies using live animals. However, the route of exposure (intraperitoneal injection) used in these studies is not considered relevant to occupational situations. Positive and negative results were observed in cultured mammalian cells. Negative results were obtained in cultured human cells. Negative results were obtained in bacteria and yeast. (4)		
Teratogenicity Data:	No adverse teratogenic effects are anticipated.		
Respiratory / Skin Sensitization Data:	None known.		
Synergistic Materials:	None known.		
Other Studies Relevant to Material:	Propylene Glycol, when tested by open and occluded patch tests, was found to be non-irritating to the skin of humans and animals. Slight irritation was noted when Propylene Glycol was administered to the eye. The irritation was non injurious and lasted until tears washed the Propylene Glycol away. (4)		

12. ECOLOGICAL INFORMATION

Ecotoxicity:	Low acute toxicity to aquatic organisms. 48-hour EC50 (Daphnia magna) = 4 850 - 34 000 mg/L (3) 96-hour LC50 (Rainbow Trout) = 44 000 - 51 600 mg/L (3)
Environmental Fate:	May be harmful if allowed to enter drinking water intakes. Do not contaminate domestic or irrigation water supplies, lakes, streams, ponds, or rivers. Propylene Glycol: Biological Oxygen Demand (BOD) = 69% (5 Days) (3) Biological Oxygen Demand (BOD) = 70% (10 days) (3) Biological Oxygen Demand (BOD) = 86% (20 days) (3) Propylene Glycol: has high mobility in soil. This material is not expected to bioaccumulate. (3) This product is biodegradable. If released to soil, propylene glycol is expected to have very high mobility based upon an estimated Koc of 8. Volatilization from moist soil surfaces is not expected to be an important fate process based upon an estimated Henry's Law constant of 1.3X10 ⁻⁸ atm-cu m/mole. Propylene glycol is not expected to volatilize from dry soil surfaces based upon its vapor pressure. Propylene glycol was mineralized 73-78% in laboratory studies conducted using an agricultural soil over a 51 day incubation period, suggesting biodegradation will be an important environmental fate process in soils. If released into water, propylene glycol is not expected to adsorb to suspended solids and sediment based upon the estimated Koc. Volatilization from water surfaces is not expected to be an important fate process based upon this compound's estimated Henry's Law constant. Numerous screening studies using wastewater or sewage inoculum as seed, suggests that propylene glycol will be degraded readily in aqueous environments. Propylene glycol is not expected to undergo hydrolysis since this compound lacks functional groups that hydrolyze under environmental conditions. An estimated BCF of 3 suggests the potential for bioconcentration in aquatic organisms is low. (4)

13. DISPOSAL CONSIDERATIONS

Deactivating Chemicals: Not available.

Waste Disposal Methods: This information applies to the material as manufactured. Reevaluation of the product may be required by the user at the time of disposal since the product uses, transformations, mixtures and processes may influence waste classification. Dispose of waste material at an approved (hazardous) waste treatment/disposal facility in accordance with applicable local, provincial and federal regulations. Do not dispose of waste with normal garbage, or to sewer systems.

Safe Handling of Residues: See "Waste Disposal Methods".

Disposal of Packaging: Empty containers retain product residue. Empty drums should be completely drained, properly bunged and promptly returned to a drum reconditioner. Do not dispose of package until thoroughly washed out.

14. TRANSPORTATION INFORMATION

CANADIAN TDG ACT SHIPPING DESCRIPTION:

This product is not regulated by TDG.

Label(s): Not applicable. Placard: Not applicable.

ERAP Index: -----; Exemptions: None known.

US DOT CLASSIFICATION (49CFR 172.101, 172.102):

This product is not regulated by DOT.

Label(s): Not applicable. Placard: Not applicable.

CERCLA-RQ: Not available. Exemptions: None known.

15. REGULATORY INFORMATION

CANADA

CEPA - NSNR: This material is included on the DSL under the CEPA.

CEPA - NPRI: Not included.

CANADIAN FOOD AND DRUG ACT/REGULATIONS: The use of this material/product as a food additive is regulated by Health Canada in the Food and Drug Act and the Food and Drug Regulations. It is incumbent on the user of this material/product to ensure any intended food application is consistent with Health Canada guidelines. Food Grade designation in no way implies that the product is safe for consumption by humans.

Controlled Products Regulations Classification (WHMIS):

Not WHMIS Regulated.

USA

Environmental Protection Act: This material is included on the TSCA Inventory.

OSHA HCS (29CFR 1910.1200): Not regulated.

U.S. FOOD AND DRUG ADMINISTRATION: This material/product is regulated for use by the US FDA. It is incumbent on the user of this material/product to ensure any intended food application is consistent with US FDA guidelines. Food Grade designation in no way implies that the product is safe for consumption by humans.

NFPA: 0 Health, 1 Fire, 0 Reactivity (3)

HMIS: 0 Health, 1 Fire, 0 Reactivity (3)

INTERNATIONAL

All components of this product are found on the following inventories: EINECS (European Inventory of Existing Commercial Chemical Substances), Australia (ACOIN), Japan (MITI) and Korea (ECL).

16. OTHER INFORMATION

REFERENCES

1. RTECS-Registry of Toxic Effects of Chemical Substances, Canadian Centre for Occupational Health and Safety RTECS database.
2. Clayton, G.D. and Clayton, F.E., Eds., Patty's Industrial Hygiene and Toxicology, 3rd ed., Vol. IIA,B,C, John Wiley and Sons, New York, 1981.
3. Supplier's Material Safety Data Sheet(s).

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4. CHEMINFO chemical profile, Canadian Centre for Occupational Health and Safety, Hamilton, Ontario, Canada.
 5. Guide to Occupational Exposure Values, 2011, American Conference of Governmental Industrial Hygienists, Cincinnati, 2011.
 6. Regulatory Affairs Group, Brenntag Canada Inc.
 7. The British Columbia Drug and Poison Information Centre, Poison Managements Manual, Canadian Pharmaceutical Association, Ottawa, 1981.
 8. Hensyl, William R., Stedman's Medical Dictionary, 25th Ed., Williams & Wilkins, Baltimore, 1990.
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The information contained herein is offered only as a guide to the handling of this specific material and has been prepared in good faith by technically knowledgeable personnel. It is not intended to be all-inclusive and the manner and conditions of use and handling may involve other and additional considerations. No warranty of any kind is given or implied and Brenntag Canada Inc. will not be liable for any damages, losses, injuries or consequential damages which may result from the use of or reliance on any information contained herein. This Material Safety Data Sheet is valid for three years.

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Prepared By: Regulatory Affairs Group, Brenntag Canada Inc., (416) 259-8231.



Material Safety Data Sheet

U.S. Department of Labor
Occupational Safety and Health Administration
This form is consistent with ANSI standard for preparation of MSDS's in accordance with OSHA's Hazard Communication Standard, 29 CFR 1910.1200.

Product Type: FILTRASORB 400	
Product Code: 2030	Profile No: 1
Effective Date: December 30, 2011	Supersedes: January 17, 2011

SECTION I - PRODUCT AND COMPANY INFORMATION

Product Name	Activated Carbon (Coal Based)	
Product Use	Used according to manufacturer's recommendation	
Company Identification (USA)	Calgon Carbon Corporation P.O. Box 717 Pittsburgh, PA 15230-0717	
Telephone Number(s)	Information	412-787-6700
	Emergency	412-787-6700
Company Identification (Europe)	Chemviron Carbon Zoning Industriel de Feluy B-7181 Feluy, Belgium	
Telephone Number(s)	Information	32 64 51 18 11
	Emergency	32 64 51 18 11
Date Prepared	Signature of Preparer	
June 12, 2013	(optional)	

SECTION II – HAZARD(S) IDENTIFICATION

OSHA Regulatory Status:	Not regulated		
HMIS Ratings: (NFPA)	Health	0	4 = Extreme/Severe 3 = High/Serious 2 = Moderate 1 = Slight 0 = Minimum W = Water Reactive OX = Oxidizer
	Flammability	1	
	Reactivity	0	
	Special		
Protective Equipment :	Safety glasses with side shields or goggles, gloves, long sleeve shirt or lab coat, long pants recommended.		
Health Effects:	See Section IV.		
Environmental Effects:	See Section XII.		

GHS Classification:

Hazard Symbol	Hazard / Category	Warning
	Eye Irritation Category 2B Respiratory Irritation Category 3	Contact may cause eye irritation. Dust may be slightly irritating to eyes and respiratory tract. Wet activated carbon removes oxygen from air causing a severe hazard to workers in enclosed or confined space.
Precautionary Statements		
Prevention:	Avoid generation of dust during handling. Avoid breathing dust. Wash thoroughly after handling. Use in a well-ventilated area.	
Response:	IF INHALED: Remove to fresh air and keep at rest in a position comfortable for breathing. IF IN EYES: Rinse cautiously with water for several minutes.	
Storage:	Store in a well-ventilated place. Keep container tightly closed.	
Container Labeling:	While Calgon Carbon Corporation has added GHS classification information to MSDS documents, changes to container labeling has not been implemented. Changes to container labels will be made in accordance to the requirements to be defined by OSHA's revision to the Hazard Communication Standard once final adoption of rule is approved and released.	

SECTION III – COMPOSITION / INFORMATION ON INGREDIENTS

Chemical Identity (% by Wt)	Common Name (Ingredient / Component)	CAS No	Impurities
100	Activated Carbon (Coal based)	7440-44-0	None

SECTION IV – FIRST-AID MEASURES

Route of Exposure	
Inhalation	Dust may cause mild irritation to the upper respiratory tract.
Skin	Dust may cause mild irritation, possibly reddening.
Eyes	Dust may cause mild irritation, possibly reddening.
Ingestion	Dust may cause mild irritation to digestive track resulting in nausea or diarrhea.
Signs/Symptoms of Exposure	Dust may cause irritation and redness of eyes, irritation of skin and respiratory system. The effects of long-term, low-level exposures to this product have not been determined.
Emergency and First Aid	For eye contact: Immediately flush with copious amounts of

Procedures	<p>water for at least 15 minutes, lifting both the upper and lower lids occasionally; seek medical attention.</p> <p>For skin contact: Wash with soap and water; seek medical attention.</p> <p>For inhalation: Remove to fresh air and rest as needed; seek medical attention for any breathing difficulty.</p> <p>For ingestion: Drink plenty of water; seek medical attention.</p>
Medical Conditions Generally Aggravated by Exposure	People with pre-existing skin conditions or eye problems or impaired respiratory function may be more susceptible to the potential effects of the dust.

SECTION V – FIRE FIGHTING MEASURES

Suitable Extinguishing Media	Use an extinguishing media suitable for surrounding the fire.
Unsuitable Extinguishing Media	None known
Specific Hazards	<p>As with most organic solids, fire is possible at elevated temperatures or by contact with an ignition source. Activated carbon is difficult to ignite and tends to burn slowly (smolder) without producing smoke or flame.</p> <p>Carbon monoxide and carbon dioxide gas may be emitted upon combustion of material.</p> <p>Contact with strong oxidizers such as ozone or liquid oxygen may cause rapid combustion.</p>
Protective Equipment and Procedures	Wear NIOSH approved self-contained breathing apparatus suitable for the surrounding fire.

SECTION VI – ACCIDENTAL RELEASE MEASURES

Personal Precautions	Wear protective equipment, keep unnecessary personnel away, and ventilate area of spill.
Environmental Precautions	The carbon is not soluble, but can cause a particulate emission if discharged to waterways; therefore, dike all entrances to sewers and drains to avoid introducing the material into the waterways.
Containment & Clean-up	<p>Dike all entrances to sewers and drains. Vacuum or shovel spilled material and place in closed container for disposal.</p> <p>Remove product to appropriate storage area until it can be properly disposed of in accordance with local, state and federal regulations. Avoid dust formation.</p> <p>See section XIII.</p>
Other Information	NA

SECTION VII – HANDLING AND STORAGE

Precautions for Safe Handling	Avoid prolonged contact with eyes and skin. Keep away from ignition sources. Use in well ventilated areas. Protect containers from physical damage. Wash hands after handling.
Conditions for Safe Storage	Store in cool, dry, ventilated area and in closed containers. Keep away from oxidizers, heat or flames. Store away from ignition sources.

SECTION VIII – EXPOSURE CONTROLS/PERSONAL PROTECTION

Component	OSHA PEL	ACGIH TLV	Other Limits
Activated Carbon	Data not available	Data not available	
Exposure Guidelines	Wet activated carbon removes oxygen from air posing a hazard to workers in enclosed or confined space. Before entering such an area, sample the air to assure sufficient oxygen supply. Use work procedures for low oxygen levels, observing all local, state and federal regulations.		
Engineering Controls	Exhaust ventilation should be designed to prevent accumulation and recirculation in the workplace and safely remove carbon black from the air. Note: Wet activated carbon removes oxygen from air causing a severe hazard to workers in enclosed or confined space. If risk of overexposure exists, wear an approved respirator. Provide adequate ventilation in warehouse or closed storage area.		
Personal Protective Equipment	Use of NIOSH approved particulate filter is recommended if dust is generated in handling. The usual precautionary measures for handling chemicals should be followed, i.e. gloves, safety glasses w/side shields or goggles, long sleeve shirt or lab coat, dust respirator if dusty and/or other protective clothing/equipment as determined appropriate.		
General Hygiene	The usual precautionary measures for handling chemicals should be followed: i.e. Keep away from food and beverage; remove contaminated clothing immediately; wash hands before breaks or eating; avoid contact with eyes and skin.		

SECTION IX – PHYSICAL AND CHEMICAL PROPERTIES

Physical State (Appearance)	Black granular or powder material		
Color	Black	Molecular Weight	NA
Odor	None	Odor Threshold	None
pH Value	NA	Vapor Pressure	0

Melting Point	NA	Vapor Density	Solid
Freezing Point	NA	Relative Density	0.4 to 0.7
Initial Boiling Point	NA	Solubility	Not Soluble
Flashpoint	NA	Partition Coefficient	NA
Evaporation Rate	NA	Auto Ignition Temp.	>220 ^o C
Flammability	>220 ^o C	Decomp. Temp.	NA
UEL	NA	Viscosity	NA
LEL	NA		

SECTION X – STABILITY AND REACTIVITY

CHEMICAL STABILITY	UNSTABLE		CONDITIONS TO AVOID: None
	STABLE	XX	
POSSIBILITY OF HAZARDOUS REACTION	MAY OCCUR		CONDITIONS TO AVOID: None
	WILL NOT OCCUR	XX	
Caution: High concentrations of organics in air will cause temperature rise due to heat of adsorption. At very high concentration levels this may result in a thermal excursion, referred to as a bed fire. High concentrations of Ketones and Aldehydes may cause a bed temperature rise due to adsorption and oxidation.			
Materials to Avoid		Alkali metals and strong oxidizers such as ozone, oxygen, permanganate, chlorine.	
Hazardous Decomposition Products		Carbon monoxide and carbon dioxide gas may be generated during combustion of this material.	

SECTION XI – TOXICOLOGICAL INFORMATION

Acute Effects		
Toxicity Studies	Oral LD ₅₀	Not determined on the finished product.
	Dermal LD ₅₀	Not determined on the finished product.
Inhalation	See section IV.	
Ingestion	See section IV.	
Eye Irritation	See section IV.	
Skin Irritation	See section IV.	
Sensitization	Not determined on the finished product.	
Target Organ (s) or System	Eyes, skin and upper respiratory system.	
Signs and Symptoms of Exposure	Irritation and redness of eyes, irritation of skin and respiratory system may result from exposure to carbon dust.	
	See Sections III and IV.	
Chronic Effects		
Carcinogenicity	Not determined on the finished product.	

Mutagenicity	Not determined on the finished product.
Reproductive Effects	Not determined on the finished product.
Developmental Factors	Not determined on the finished product.

SECTION XII – ECOLOGICAL INFORMATION

Ecotoxicity	Not determined on the finished product.
Persistence/Degradability	Not determined on the finished product.
Bioaccumulation/Accumulation	Not determined on the finished product.
Mobility in Environmental Media	Not determined on the finished product.
Other Adverse Effects	Not determined on the finished product.

SECTION XIII – DISPOSAL CONSIDERATIONS

Vacuum or shovel material into a closed container. Storage and disposal should be in accordance with applicable local, state and federal laws and regulations. Local regulations may be more stringent than state or federal requirements. Activated Carbon is an adsorbent media; hazard classification is generally determined by the adsorbate that the carbon has picked up. Consult with the US EPA Guidelines listed in 40 CFR Part 261.3 for the classifications of hazardous waste prior to disposal.

SECTION XIV – TRANSPORT INFORMATION

This information as presented below only applies to the material as shipped. The identification based on characteristic(s) or listing may not apply if the material has been used or otherwise contaminated. It is the responsibility of the waste generator to determine the toxicity and physical properties of the material generated to determine the proper waste identification and disposal methods in compliance with applicable regulations.

Land	DOT Regulations	UN/NA Identification Number:	FILTRASORB 400 None on finished product
		UN- Proper Shipping Name:	Not Regulated
		Transport Hazard Class:	None on finished product; see Note 1 below
		Packing Group:	None on finished product
		Marine Pollutant:	None on finished product
	Canadian WHMIS	Hazard Class:	None on finished product
Water	IMO / IMDG	UN/NA Identification Number:	FILTRASORB 400 None on finished product
		UN- Proper Shipping Name:	Not Regulated
		Transport Hazard Class:	None on finished product

		Packing Group:	None on finished product
		Marine Pollutant:	None on finished product
Air	ICAO / IATA	UN/NA Identification Number:	FILTRASORB 400 None on finished product
		UN- Proper Shipping Name:	Not Regulated
		Transport Hazard Class:	None on finished product
		Packing Group:	None on finished product
		Marine Pollutant:	None on finished product
		Information reported for product/size: 0.5 Kg	
<p>Note 1: Under the UN classification for activated carbon, all activated carbons have been identified as a class 4.2 product. However, This product has been tested according to the <u>United Nations Transport of Dangerous Goods</u> test protocol for a "self-heating substance" (<u>United Nations Transportation of Dangerous Goods, Manual of Tests and Criteria, Part III, Section 33.3.1.6 - Test N.4 - Test Method for Self Heating Substances</u>) and it has been specifically determined that this product does not meet the definition of a self heating substance (class 4.2) or any other hazard class, and therefore should not be listed as a hazardous material. This information is applicable only for the Activated Carbon Product identified in this document.</p>			

SECTION XV – REGULATORY INFORMATION

SARA Title III 302	Product is not subject to SARA Title III, section 302 regulation.	
SARA Title III 313	Product is not subject to SARA Title III, section 313 regulation.	
TSCA	Product is listed.	
California Proposition 65	Product is not listed.	
Canadian Classification	WHMIS	Product is listed.
	DSL #	Product is listed.
EEC Council Directives relating to the classification, packaging, and labeling of dangerous substances and preparations.		
Risk and Safety Phrases	R36: Irritating to the eyes. R37: Irritating to the respiratory system. R38: Irritating to the skin.	
Carbon, activated (CAS: 7440-44-0) is found on the following regulatory lists:	Canada - British Columbia Occupational Exposure Limits Canada - Yukon Permissible Concentrations for Airborne Contaminant Substances Canada Domestic Substances List (DSL) International Air Transport Association (IATA) Dangerous Goods Regulations OECD Representative List of High Production Volume (HPV) Chemicals US - Hawaii Air Contaminant Limits US - Idaho - Toxic and Hazardous Substances - Mineral Dust US - Minnesota Hazardous Substance List US - Minnesota Permissible Exposure Limits (PELs) US - Rhode Island Hazardous Substance List US - Vermont Permissible Exposure Limits Table Z-1-A Final Rule	

	Limits for Air Contaminants US - Washington Permissible exposure limits of air contaminants US DOE Temporary Emergency Exposure Limits (TEELs) US EPA High Production Volume Program Chemical List US FDA CFSAN Color Additive Status List 4 US FDA CFSAN Color Additive Status List 6
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SECTION XVI – OTHER INFORMATION

Intended Use	The material is generally used for treatment of gases and liquids.
The information contained in this document applies to this specific material as supplied. It may not be valid for this material if it is used in combination with any other materials. It is the user's responsibility to determine the suitability and completeness of this information for their particular use.	
While the information and recommendations set forth herein are believed to be accurate as of the date hereof, Calgon Carbon Corporation makes no warranty with respect to same and disclaims all liability for reliance there on.	

Legend:

ACGIH	- American Conference of Governmental Industrial Hygienists
ANSI	- American National Standards Institute
CAS #	- Chemical Abstracts Service Registry Number
CFR	- Code of Federal Regulations
CFSAN	- Center for Food Safety and Applied Nutrition
DOE	- Department of Energy
DOT	- Department of Transportation
DSL	- Domestic Substances List
EEC	- European Economic Community
EPA	- Environmental Protection Agency
FDA	- Food and Drug Administration
GHS	- Globally Harmonized System (of Classification and Labeling of Chemicals)
HMIS	- Hazardous Material Information System
IATA	- International Air Transportation Association
ICAO	- International Civil Aviation Organization
IMO	- International Maritime Organization
IMDG	- International Maritime Dangerous Goods
LD ₅₀	- Lethal Dose expected to kill 50% of a group of test animals
LEL	- Lower Explosive Limit
NA	- Not Applicable
NFPA	- National Fire Protection Association
NIOSH	- National Institute for Occupational Safety and Health
OECD	- Organization for Economic Cooperation and Development
OSHA	- Occupational Safety and Health Association
PEL	- Permissible Exposure Limit
SARA	- Superfund Amendments and Reauthorization Act
TLV	- Threshold Limit Value
TSCA	- Toxic Substances Control Act
UEL	- Upper Explosive Limit
WHMIS	- Workplace Hazardous Material Information System

END OF MATERIAL SAFETY DATA SHEET



CLARION® FOOD MACHINERY A/W OILS

Date 08/12

DESCRIPTION: Clarion Food Machinery A/W Oils are designed specifically for use as lubricants for food processing equipment. They are formulated with a high purity white mineral oil and additive system for food processing applications. They are available in four ISO viscosity grades.

QUALITIES: Clarion Food Machinery A/W Oils meet the requirements of U.S. FDA regulation 21 CFR 178.3570 for incidental food contact and are registered as NSF H1 lubricants (formerly USDA H1), for use in food processing plants under the jurisdiction of the USDA.

Clarion Food Machinery A/W Oils are certified as Kosher (passover) with the Union of Orthodox Jewish Congregations of America (U).

They are colorless, odorless, tasteless, non-staining lubricants that provide excellent wear, rust, and oxidation protection.

APPLICATIONS: Clarion Food Machinery A/W Oils are general purpose lubricants for machinery that processes, packages, or transports food for human consumption. These oils are recommended for medium pressure hydraulic systems, and circulating systems.

Clarion Food Machinery A/W Oils are recommended for medium pressure hydraulic systems in food processing, canning, bottling, and air line lubrication.

Clarion Food Machinery A/W 100 Oil may also be used as a light duty gear oil designed for use in food machinery worm gears, spur gears and valves.

CLASSIFICATIONS: **NSF H1 Registered** — Listed in “NSF Registered Proprietary Substances and Nonfood Compounds.” These products are authorized for use under USDA Inspection and Grading Programs.

NSF/ANSI Standard 60 and 61 — Clarion Food Machinery A/W 32 and A/W 68 Oils are certified under NSF/ANSI Standard 60: Drinking Water Treatment Chemicals—Health Effects and NSF/ANSI Standard 61: Drinking Water System Components—Health Effects. Clarion Food Machinery A/W 32 and A/W 68 Oils may be used in water well pump and other potable water system lubrication applications where lubricants certified to these standards are required or desired.



Certified to
NSF/ANSI Standard
60 and 61

Clarion Food Machinery
A/W 32 and A/W 68 Oils
(ONLY)

(Continued)



CLARION® FOOD MACHINERY A/W OILS

Date 08/12 - (Continued)

TYPICAL PROPERTIES:

CLARION® FOOD MACHINERY A/W OILS

ISO Grade	32	46	68	100
Material Code	633541009	633542009	633543009	633544009
Gravity, ASTM D 4052, °API	31.5	31.4	31.1	29.9
Density, lbs/gallon	7.23	7.23	7.25	7.30
Flash Point, COC, ASTM D 92, °C (°F)	202 (396)	206 (402)	242 (468)	250 (482)
Pour Point, ASTM D 97, °C (°F)	-18 (0)	-16 (+3)	-9 (+15)	-7 (+19)
Viscosity, ASTM D 445, cSt at 40°C	32.8	46.7	64.15	100
cSt at 100°C	5.56	6.96	8.52	11.0
Viscosity Index, D 2270	107	105	103	105
Color	L1.0	L1.0	L1.0	L1.0
Water Separation, ASTM D 1401				
at 130°F	40-40-0 (5)	40-40-0 (5)	40-40-0 (10)	—
at 180°F	—	—	—	40-40-0 (5)
Rust Test, ASTM D 665A	Pass	Pass	Pass	Pass
Four-Ball Wear, ASTM D 4172,				
Scar, mm at 20 Kg	0.32	0.32	0.32	0.34
Scar, mm at 40 Kg	0.40	0.40	0.40	0.42
Vickers Pump Wear, ASTM D 2882, mg	15	15	15	15
Oxidation Stability, ASTM D 943, hrs	8000+	8000+	8000+	8000+
Tackifier	No	No	No	Yes
Kosher	Ⓢ	Ⓢ	Ⓢ	Ⓢ
NSF Registered (Registration Number)	H1 (124625)	H1 (124628)	H1 (124632)	H1 (124620)
NSF/ANSI Standard 60 Certified	✓	—	✓	—
NSF/ANSI Standard 61 Certified	✓	—	✓	—
FDA, 21CFR 178.3570	✓	✓	✓	✓

ATTACHMENT D



STATE OF DELAWARE
DEPARTMENT OF NATURAL RESOURCES
& ENVIRONMENTAL CONTROL
DIVISION OF FISH & WILDLIFE
89 Kings Highway
Dover, Delaware 19901

OFFICE OF THE
DIRECTOR

Phone: (302) 739-9910
Fax: (302) 739-6157

March 9, 2015

Carrie DeSimone
CABE Duffield Associates Company
144 South Governors Ave.
Dover, DE 19904

Re: CABE 2015 Praxair Plants

Dear Ms. DeSimone:

Thank you for contacting the Wildlife Species Conservation and Research Program (WSCR) about information on rare, threatened and endangered species, unique natural communities, and other significant natural resources as they relate to the above referenced project.

A review of our database has revealed that there may be suitable habitat for the federally listed bog turtle (*Glyptemys muhlenbergii*) within the proposed project area. However, in May 2013 a Delaware Certified Bog Turtle Surveyor conducted a Phase I bog turtle survey at this site, and found that there is no habitat that would support federally threatened bog turtle (*Glyptemys muhlenbergii*). Consequently, WSCR has no concerns about adverse impacts to bog turtles for this project.

Next, please be aware that this project is within 5 miles of known Northern Long-eared Bat (*Myotis septentrionalis*) hibernacula. Northern Long-eared Bat have been proposed for federal listing as threatened under the U.S. Endangered Species Act, with an expected decision of April 2, 2015. If listed, we anticipate a regulatory zone of 5 miles surrounding known Northern Long-eared Bat hibernacula. Although we do not believe this project would be of concern for Northern Long-eared Bat, please note that future development activities may be subject to review by endangered species biologists.

We are continually updating our records on Delaware's rare, threatened and endangered species, unique natural communities and other significant natural resources. If the start of the project is delayed more than a year past the date of this letter, please contact us again for the latest information.

Please feel free to contact me if you have any questions or require additional information.

Sincerely,

***We Bring You Delaware's Great Outdoors
through Science and Service***

Find us on Facebook <http://www.facebook.com/DelawareFishWildlife>

Kate Fleming
Wildlife Biologist/Environmental Review Coordinator
(302) 735-8658
(302) 653-3431 fax
Kate.Fleming@state.de.us

(See invoice on next page)