

May 8, 2015



APPLICATION FOR A COASTAL ZONE ACT PERMIT

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

May 8, 2015
Carbon Dioxide Purification and Liquefaction Unit
Nitrogen Air Separation Unit
Praxair, 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.

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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.

Jeff Barnhard
Print Name of Applicant


Signature of Applicant

Praxair Vice President
Title

May 7, 2015
Date

PART 2

APPLICANT INFORMATION AND SITE IDENTIFICATION

2.1 Identification of the applicant:

Company Name: Praxair, 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 Praxair Carbon Dioxide and Nitrogen Units will be installed within the Delaware City Refinery (“Refinery”). A CO₂-rich byproduct gas feed from the Refinery will be purified to generate beverage-grade liquid carbon dioxide for use outside of the Refinery. A simple and well known air separation process will be used to separate nitrogen from the air for use at the refinery.

The Praxair Carbon Dioxide Purification and Liquefaction Unit (CO₂ Unit) will be installed within the Delaware City Refinery (“Refinery”). A CO₂-rich byproduct gas feed containing mostly CO₂ (>85%) and water (~5 to 15%) from the Refinery will be purified and liquefied to generate beverage-grade liquid carbon dioxide for use outside of the Refinery.

Currently this byproduct gas is utilized in the following ways;

- a) At the Refinery as an inert gas (i.e., oxygen free) in the same manner in which refineries use nitrogen gas to reduce fire hazards, and for uses such as blanketing storage tanks and purging process lines.
- b) At an existing carbon dioxide unit, which purifies the byproduct gas to generate liquid carbon dioxide and dry ice.
- c) The Refinery may discharge through a stack any excess byproduct gas to the atmosphere if it cannot be utilized as described in “a” or “b” above.

The operator of the existing carbon dioxide unit has a contract with the Refinery which is set to expire in 2016. Praxair has entered into a contract with the Refinery to receive this feedstock gas when the new Praxair CO₂ Unit has been constructed and after the expiration of the current contract. Once the Praxair CO₂ Unit starts to receive this byproduct gas stream, the operator of the existing carbon dioxide unit will cease operations.

The Praxair CO₂ Unit is designed to purify approximately 43,100 lbs/hr of byproduct gas from the Refinery. The unit purifies the gas using a series of scrubbers and filters followed by carbon dioxide liquefaction. The unit will require a water source of approximately 55 gallons per minute (gpm), which will be provided by United Water Delaware. United Water Delaware obtains water from Red Clay Creek, White Clay Creek, or Christina River at locations outside of Delaware’s Coastal Zone. The unit will generate a peak wastewater flow of approximately 24 gpm that will be sent to the Refinery’s existing wastewater treatment system. The power consumption of the CO₂

Unit will average approximately 2.69 megawatts per hour, which will be supplied by Delmarva Power’s distribution system.

Praxair will purify up to 43,100 lbs/hr (517tons/day) of carbon dioxide-rich byproduct gas. The existing CO2 unit was permitted by the DNREC to purify up to about 526 tons/day of byproduct gas. Anticipated air emissions from Praxair’s CO2 Unit are compared to the permitted air emissions for the existing unit in the following table.

	Byproduct Gas Ton/yr In	Existing CO2 Unit permit, ton/yr	Praxair Ton/yr	Amount Decrease, ton/yr
Raw Gas	---	192,194	179,398	12,796
Hydrogen	95.60	530.81	95.60	435
Carbon Monoxide	20.08	107.35	20.08	87
Non-VOC*	76.48	87.82	76.48	11
HAPs**	4.95	4.52	2.48	2
VOC***	5.23	6.79	2.63	4
Hydrogen sulfide	0.24	0.079	0.00	0.079

* Non VOC – mostly methane and ethane

** Hazardous Air Pollutants – mostly methanol with trace benzene, toluene and ethyl benzene

*** VOC mostly methanol/ethanol with trace benzene, toluene and ethyl benzene

The table shows the constituents in the byproduct gas feed, maximum permitted emissions for the existing unit, and potential emissions from the Praxair CO2 Unit. For each constituent, the emissions decrease from Praxair’s CO2 Unit as compared to the existing unit’s permitted emissions. The offset for the Carbon Dioxide Purification and Liquefaction Unit is the replacement of the existing CO2 unit with Praxair’s Unit, which has a demonstrable decrease in air emissions.

The Nitrogen Unit will separate nitrogen gas from approximately 28,000 pounds per hour (lbs/hr) ambient air utilizing a standard cryogenic distillation process. This process is considered to have *de minimis* environmental impacts as supported by the Delaware Code (7 DE Admin. Code 1102), which exempts equipment used to liquefy or separate oxygen, nitrogen or the rare gases from air permitting requirements. Discharges from the plant to the environment are limited to denitrified and dehumidified air, and condensate derived from the dehumidification process. Condensate generation is anticipated to average approximately 53 lbs/hr (442 gallons per hour), but is directly dependent on the moisture content of the air at the time of processing. The power consumption of the Nitrogen Unit will be approximately 1.104 megawatts per hour, which will be supplied by Delmarva Power’s distribution system.

Nitrogen is currently shipped to the refinery in cryogenic trailers and is stored on site. Nitrogen is used to generate inert atmospheres within tanks, process vessels and other confined spaces as a safety measure and to minimize the emissions of volatile compounds

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during refining processes. The proposed nitrogen unit will replace the need for shipments of nitrogen to the refinery. The proposed plant also will support an expanded use of nitrogen in place of carbon dioxide (CO₂) for creating inert atmospheres. In these uses, nitrogen is anticipated to slowly return to the ambient atmosphere through vents or during steps in the petroleum refining process. As such, the nitrogen will not be removed from the Coastal Zone.

The Praxair Nitrogen Unit will not emit substances to the environment that are not already present in the ambient air. The Nitrogen Unit will offset the current delivery of nitrogen to the Refinery by an average of 100 trucks per month.

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
765 School House Road & 4448 Wrangle Hill Road
New Castle, DE 19720

Project Property Tax Parcel Number:

Parcel 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.

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;

Carbon Dioxide Unit:

Raw Materials:

- CO₂-rich byproduct gas from Refinery
- Potable water
- Propylene glycol for cooling system
- Anhydrous ammonia for cooling system
- Activated carbon for air purification
- Purblend product, an aluminum oxide absorbent for gas drying
- Purblend product, zeolite absorbent for gas drying
- Spectrus OX909, or equivalent, Biocide for treatment of cooling system water
- Gengard GN8141, or equivalent, Corrosion Inhibitor for treatment of cooling water
- Mineral oil for compressors

Intermediate Products:

- Condensate drain from the direct contact cooler/scrubber containing removed alcohols and aldehydes
- Other components found in the Refinery byproduct gas stream (See Part 6.1)

Final Products:

- Beverage-grade liquid carbon dioxide

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

Nitrogen Unit:

Raw materials:

- Ambient air

- Propylene glycol for cooling system
- Liquid nitrogen for the cold end gel trap (CEGT) regeneration

Intermediate Components:

- Water (condensate) separated from ambient air
- Other components found in ambient air, such as oxygen, argon, carbon dioxide

Final products:

- Nitrogen gas

Material Safety Data Sheets (MSDS) have been provided in **Attachment C** for nitrogen gas and liquid nitrogen. Neither of these materials has a risk of carcinogenicity, toxicity, 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;

Carbon Dioxide Unit:

The anhydrous ammonia used for the cooling system requires special storage and handling. Praxair will comply with Delaware's Accidental Release Prevention Regulation, as applicable. The liquid carbon dioxide product requires cryogenic storage to maintain carbon dioxide as a liquid.

Nitrogen Unit:

The nitrogen gas will be used by the Delaware City Refining Company within the Delaware City Refinery. Nitrogen production is tied to the rate of use within the refinery. The liquid nitrogen used for the regeneration of the CEGT requires cryogenic storage to maintain nitrogen as a liquid.

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

Carbon Dioxide Unit:

- Byproduct gas knockout drum (i.e., liquid/vapor separator)
- Direct contact cooler/scrubber
- One Compressor
- Two activated carbon filters
- Aftercooler

- Dehumidifier
- Dehumidifier separator
- Primary dryer bed
- Secondary dryer bed
- Carbon dioxide liquefaction equipment (condenser, stripper column, reboiler)
- Subcooler
- Ammonia cooling system
- Propylene glycol cooling system

Nitrogen Unit:

- Ambient air suction filter
- Two, 2-stage, compressors
- Two aftercoolers
- Moisture separator
- Cold box consisting of
 - Reversing heat exchanger
 - Turbine/air brake
 - Silica gel filter
 - Distillation column
 - Condenser
- Propylene glycol cooling system

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

The CO₂ Unit will be within a footprint having approximate dimensions of 304 feet by 493 feet. There will be four enclosed structures:

- Carbon Dioxide Unit, Maintenance and Office building with an area of approximately 6,200 square feet,
- Equipment and Operations building with an area of approximately 550 square feet,
- MCC building with an area of approximately 550 square feet, and
- A small electrical enclosure.

The Nitrogen Unit equipment will be mounted in an area having dimensions of approximately 75 feet by 110 feet. Praxair does not intend to enclose the equipment in a building. There will be a trailer-style building that will be used for a control room and office space.

- 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;

Carbon Dioxide Unit:

- Four 106,360 gallon, liquid carbon dioxide ASTs
- One 95,545 gallon, liquid carbon dioxide AST

- One, 250-gallon, water treatment tank
- One ammonia AST capable of holding an 8,400-pound charge

Nitrogen Unit:

- One, 6,000-gallon, liquid nitrogen above ground storage tank (AST)
- One, 132.5-gallon, propylene glycol 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?

Carbon Dioxide Unit: Approximately 41,000 lbs/hr beverage-grade liquid carbon dioxide

Nitrogen Unit: Approximately 11,600 lbs/hr nitrogen gas

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

Carbon Dioxide Unit:

The Carbon Dioxide Unit typically will operate continuously except during times of maintenance or when all of the liquid carbon dioxide tanks are full. Three operators and one Superintendent will work one operating shift, five days per week. The remainder of the time, the plant will be monitored and controlled remotely.

Nitrogen Unit:

The Nitrogen Unit typically will operate continuously except during times of maintenance and periods of time when the Refinery may not have a need for the nitrogen gas. The plant will be monitored and controlled remotely as is typical of small air separation plants.

- 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: 3.63 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 Carbon Dioxide Plant will be constructed near Area D, Unit F and the Nitrogen Plant will be constructed near Area C, 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?

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The Solid and Hazardous Waste Section of the DNREC indicated that both Area D, Unit F and Area C, Unit F were 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.

PART 6A

ENVIRONMENTAL IMPACTS

Air Quality

- 6.1 Describe project emissions (new, as well as any increase or decrease over current emissions) by type and amount under maximum operating conditions:

Carbon Dioxide Unit:

The Praxair CO2 Unit does not create any new air pollutants. Any of its associated air pollutants are already within the contaminants in the byproduct gas. These are not “new” air emissions but rather a re-allotment of existing byproduct gas utilizations.

It should be noted that the Praxair CO2 Unit will handle ammonia and some ammonia is expected to be released in the environment through fugitive emissions. This is minimized by having ambient ammonia monitors present in the areas that handle ammonia. It is estimated that these emissions will be < 3 tpy which is well below the existing CO2 Unit’s emissions of over 8 tpy as reported on their SARA TRI Reports for 2013.

As mentioned in the Project Summary, the byproduct gas stream is currently utilized in the following ways:

- a) Used in the refinery as an inert gas. Note that when used in this form it is ultimately emitted somewhere in the refinery process either as a fugitive emission, a tank vent, process vent or through a process safety device.
- b) Sent to the existing CO2 unit for purification.
- c) Emitted directly out a stack at the Refinery.

It is important to note that the total amount of byproduct gas generated by the Refinery is not expected to change. The change lies within the fractionation of byproduct gas going to each use. Therefore, the Praxair CO2 Unit serves as an additional outlet of the three options above, recognizing that option “b” will no longer be an option after the existing CO2 Unit ceases operations.

The “existing emissions” in the following Table represents the constituents in the Refinery’s byproduct gas stream that could be sent either to Praxair’s CO2 Unit, or elsewhere by options “a”, “b”, or “c” above.

For comparison purposes only, the last column is included in the Table which shows the existing carbon dioxide plant’s air permit limitations. Praxair is unable to verify how these values have been derived, and makes no claim as to the actual amounts of constituents emitted by the other CO2 unit. Please note that the

permit for the existing carbon dioxide unit does not have a limit for carbon dioxide, and thus the value in the carbon dioxide row represents their maximum amount of byproduct gas permitted to process.

Pollutant	Existing Emissions		Net Increase/Decrease		New Total Emissions		Percent Change (compare tons/year)	Existing permit limits Tons/year
	Lbs/day	Tons/year	Lbs/day	Tons/year	Lbs/day	Tons/year		
Carbon dioxide	983,003	179,398	(966,504)	(176,387)	16,499	3,011	(98.32)	192,194*
Hydrogen	523.8	95.6	0	0	523.8	95.6	0	530.81
Carbon monoxide	110	20.08	0	0	110	20.08	0	107.35
Non VOC**	419	76.48	0	0	419	76.48	0	87.82
HAPs***	27.1	4.95	(13.6)	(2.47)	13.6	2.48	(50)	4.52
VOC****	28.7	5.23	(14.3)	(2.60)	14.4	2.63	(50)	6.79
Hydrogen sulfide	1.32	0.24	(1.32)	(0.24)	0	0	(100)	0.0791

* This value is byproduct gas processed per year

** Non VOC – mostly methane and ethane

*** Hazardous Air Pollutants – mostly methanol with trace benzene, toluene and ethyl benzene

**** VOC mostly methanol/ethanol with trace benzene, toluene and ethyl benzene

Nitrogen Unit:

As discussed, the Nitrogen Unit is simply separating nitrogen from ambient air. Therefore, there will not be any new criteria pollutant air emissions from the Nitrogen Plant.

- 6.2 Describe how the above emissions change in the event of a mechanical malfunction or human error.

If the carbon dioxide liquefaction process fails, then the Existing Emissions shown in the preceding table would either be emitted through the Refinery’s existing permitted emission point(s) or used within the Refinery as an inert gas.

- 6.3 Describe any pollution control measures to be utilized to control emissions to the levels cited above in 5.1.

The Carbon Dioxide Unit is reducing emissions of carbon dioxide gas and hydrogen sulfide gas at the Refinery. In a sense, the entire Carbon Dioxide Plant is a byproduct stream unit that reduces overall facility emissions. In the process, carbon dioxide gas emissions are reduced and sorption materials are used to remove hydrogen sulfide and other contaminants. The sorption media is then

removed as solid waste and disposed of in a permitted landfill. Additionally, alcohol-based organics (methanol, ethanol) and aldehydes are reduced from the byproduct gas stream by condensation processes, and the condensate is sent to the Refinery's WWTP.

A sparger system will be installed at the Carbon Dioxide Unit to control potential emissions of anhydrous ammonia during upset conditions. The sparger tank will include pH monitoring. The sparger tank will not be continuously drained; rather it will be drained either once the amount of ammonia equivalent to 50% of tank capacity has been sent to the sparger tank or every five (5) years. The drained ammonia/water mixture will be pumped onto a truck and disposed of offsite.

- 6.4 Show evidence that applicant has, or will have, the ability to maintain and utilize this equipment listed in 5.3 in a consistently proper and efficient manner. (For example, provide college transcripts and/or records of training courses and summary of experience with this pollution control equipment of person(s) responsible for pollution control equipment, and/or provide copies of contracts with pollution control firms to be responsible for maintaining and utilizing this equipment.)

Praxair has been in the industrial gas business for over 100 years. Praxair owns and operates approximately 50 Carbon Dioxide Units and 180 significant air separation plants (nitrogen, oxygen and/or argon), as well as many more small air separation plants all over the world.

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

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- 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 peak flow of 24 gallons per minute (gpm) wastewater generated from the Carbon Dioxide Unit is only 0.26 percent of the Refinery’s WWTP capacity of 13 million gallons per day (approximately 9,030 gpm). The average flow of condensate generated from the Nitrogen Unit is approximately 7.4 gpm, which is 0.08 percent of the Refinery’s WWTP capacity. Therefore, the net increase or decrease in any potential pollutants in the wastewater is *de minimus*.

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 peak 24 gpm of wastewater from the Carbon Dioxide Unit consists of approximately 8.2 gpm from the condensate drain and the remainder will come from cooling system blowdown water. The *de minimus* 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.

Carbon Dioxide Unit:

Storm water from the Carbon Dioxide Unit 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.

Nitrogen Unit:

Storm water from the Nitrogen Unit area flows to Outfall 016, which receives discharges from the east side of the power plant area. This storm water eventually discharges to the Delaware River. The permit number for the outfall is State Permit Number WPCC 3256D/74 and NPDES Permit Number DE0000256.

- 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 Carbon Dioxide Unit will not increase the storm water runoff in its drainage basin over current levels. Run-off from the Nitrogen Unit is considered to be a *de minimis* amount.

- 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 Carbon Dioxide 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.

The majority of storm water from the drainage basin that will include the Carbon Dioxide Unit currently drains through two 24-inch culverts on the existing CO2 Unit's property prior to reaching Outfall 005. The Carbon Dioxide project proposes to improve stormwater drainage by eliminating the existing CO2 Unit's discharge to Outfall 005, which, in turn, decreases the amount of storm water runoff flowing to Outfall 005. This will be accomplished by capping the culverts and installing a new storm drain around the existing CO2 Unit.

There are no new or improved storm water drainage systems required for the Nitrogen Unit.

- 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 Carbon Dioxide Unit will utilize a maximum of 53 gpm, or approximately 76,400 gallons per day for the direct contact cooler/scrubber and for the cooling systems. Water use is not expected to vary significantly with seasons or time of day.

There will not be a need for increased water consumption for the daily operation of the Nitrogen Unit.

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

Water for the Carbon Dioxide Unit will be purchased from United Water Delaware whose water supply includes intakes along Red Clay Creek and White Clay Creek. Christina River is an alternative source for United Water.

- 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 CO2 Unit will use two activated carbon filters. One filter will remove hydrogen sulfide from the Refinery byproduct gas stream being fed to the CO2 Unit, and the second filter will polish the discharge from the first filter to remove remaining hydrogen sulfide and hydrocarbons. The first and second activated carbon filters have estimated lifetimes of 16,000 hours (approximately 2 years) and 8,000 hours (approximately 1 year), respectively.

The dryers include a primary and a secondary dryer bed. The primary dryer bed uses an aluminum oxide absorbent and the secondary dryer bed uses a zeolite absorbent. The lifetime expectancy of both absorbents is approximately 16,000 hours (approximately two years).

Spent activated carbon media and spent absorbents will be transported to a permitted landfill.

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 Carbon Dioxide and Nitrogen Units 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, 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, WSCRIP has no concerns about adverse impacts to bog turtles for this project."

The WSCRIP 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 units are located within the existing petroleum refinery. The units will be monitored and maintained for normal operations. Abnormal operations will be a cause for shutdown of both the Carbon Dioxide and Nitrogen Units. Under normal operating conditions, the units 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 Carbon Dioxide Unit will shut down. The shutdown of the Carbon Dioxide Unit would result in the use of the byproduct gas as either an inert gas or would be discharged through a Refinery stack.

The loss of power could affect the anhydrous ammonia refrigeration system resulting in an increase in ammonia pressure. In this event, a relief valve will release the ammonia pressure and the released ammonia will flow through pipes to an ammonia sparger tank, where the ammonia gas will become dissolved in water.

In the event of a power disruption or failure, the Nitrogen Unit will shut down. The shutdown of the Nitrogen Unit would not result in the release of any pollutants since it is an ambient air separation process.

- 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 the Carbon Dioxide Unit to shut down. As discussed in 6.38, the byproduct gas stream from the Refinery will be used by the Refinery elsewhere.

A major malfunction or human error associated with operation of the Nitrogen Unit would not affect air, water, solid and hazardous waste streams emissions or discharges. In this event, the Nitrogen Unit would be shut down and the separation of ambient air would cease.

An error or malfunction could cause a release of either liquid nitrogen or liquid carbon dioxide from an above grade storage tank (AST). The release of large amounts of liquid nitrogen or 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) These materials are often handled at cryogenic temperatures (e.g. very cold).

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

May 8, 2015

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 nitrogen or 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).

If the CO2 Unit's ammonia system had a major release of ammonia offsite impacts of odor as well as vapor exposure could occur. Praxair will comply with Delaware's Accidental Release Prevention Regulation for ammonia systems, as applicable.

These risks most notably impact the facility personnel who work in the very immediate area of these materials (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. Examples of this is in the implementation of the sparger unit and ammonia ambient monitoring network to help minimize these risks.

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.

ENVIRONMENTAL OFFSET PROPOSAL

Praxair will contract with the Refinery for processing up to 43,100 lbs/hr (517tons/day) of carbon dioxide-rich byproduct gas. The existing CO2 unit was permitted by the DNREC to process up to about 526 tons/day of byproduct gas. Anticipated air emissions from Praxair's CO2 Unit are compared to the permitted air emissions from the existing unit in the following table.

	Byproduct Gas Ton/yr In	Other CO2 Unit permit, ton/yr	Praxair Ton/yr	Amount Decrease, ton/yr
Raw Gas	---	192,194	179,398	12,796
Hydrogen	95.60	530.81	95.60	435
Carbon Monoxide	20.08	107.35	20.08	87
Non-VOC	76.48	87.82	76.48	11
HAPs	4.97	4.52	2.49	2
VOC	5.23	6.79	2.62	4
Hydrogen sulfide	0.24	0.079	0.00	0.079

The table shows the constituents in the byproduct gas feed, maximum permitted emissions for the existing unit, and potential emissions from the Praxair CO2 Unit. For each constituent, the emissions decrease from Praxair's CO2 Unit as compared to the existing unit's permitted emissions.

If Praxair does not process the CO2 rich byproduct gas when the other CO2 unit's contract with the Refinery expires, the uses for the 517 tons/day of byproduct gas will be limited to use as an inert gas or discharged through a Refinery stack. Either of these two uses will ultimately result in the discharge of the byproduct gas constituents shown in the table into the Coastal Zone atmosphere.

The offset for the Carbon Dioxide Purification and Liquefaction Unit is the replacement of the existing CO2 unit with Praxair's Unit, which has a demonstrable decrease in air emissions. The Praxair Nitrogen Unit will not emit substances to the environment that are not already present in the ambient air. The Nitrogen Unit will offset the current delivery of nitrogen to the Refinery by an average of 100 trucks per month.

PART 7

ECONOMIC EFFECTS

Construction

- 7.1 Estimate the total number of workers for project construction and the number to be hired in Delaware.
- 50 at peak. 30 average. 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.
- \$11.0 million
- 7.4 State the expected dates of construction initiation and completion.
- 10/1/15 - 10/1/16
- 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.

Four full time plant operators
6-8 truck drivers

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	7 truck drivers (64%)
\$50,000-64,999	3 technicians (27%)
\$65,000-74,999	
\$75,000-99,999	1 superintendent (9%)
>\$100,000	

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

State personal income taxes:	\$	\$36,181
State corporate income taxes	\$	\$300
Gross receipt tax	\$	\$3,500

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

ATTACHEMENTS TO FOLLOW

COASTAL ZONE ENVIRONMENTAL IMPACT OFFSET MATRIX

Applicant: Praxair, Inc.
 Project: Nitrogen and Carbon Dioxide Plants
 Application Date: May 8, 2015
 CZA Offset Review Reference: (DNREC Only)

Amendments:
 Offset Review Date: (DNREC Use Only)
 Matrix Amended:

ENVIRONMENTAL IMPACTS	(Applicant's Use) DESCRIBE ENVIRONMENTAL IMPACTS	PAGE NO.	(Applicant's Use) DESCRIBE ENVIRONMENTAL OFFSET PROPOSAL ¹	PAGE NO.	(DNREC Use Only) OFFSET SUFFICIENCY Yes, No or N/A
Air Quality (Applicant to List Below by Parameter)	Air emissions from the Praxair CO2 Unit are as follows:	18	In addition to the below, all H2S gas will be removed as a solid, and the exiting permitted H2S is 0.0791 ton/yr		
	Hydrogen: 95.6 ton/yr	18	Removal of existing CO2 unit permitted hydrogen emissions of 530.81		
	Carbon monoxide: 20.08 ton/yr	18	Removal of existing CO2 unit permitted CO emissions of 107.35 ton/yr		
	Non-VOC: 76.48 ton/yr	18	Removal of existing CO2 unit permitted Non-VOC emissions of 87.82 ton/yr		
	HAPs: 2.48 ton/yr	18	Removal of existing CO2 unit permitted HAPs of 4.52 ton/yr		
	VOCs: 2.63 ton/yr	18	Removal of existing CO2 unit permitted VOC of 6.79 ton/yr		
Water Quality					
Surface	None	21-24	Not required		
Groundwater	None	21-24	Not required		
Water Quantity					
Surface	United Water obtains their water supply from outside of the Coastal Zone	25	Not required		
Groundwater	None	25	Not required		
Water Use For:					
Processing	2.2 gallons per minute	24	Not required		
Cooling	50.8 gallons per minute	24	Not required		
Effluent Removal					
Solid Waste	Granular activated carbon filter media used for hydrogen sulfide removal. This solid waste is not considered hazardous and may be land applied in municipal landfills.	26	Not required		
Hazardous Waste	None	27	Not required		
Habitat	The Carbon Dioxide Unit is proposed to be constructed and operated within the confines of the Delaware City Refinery, which is presently zoned Heavy Industrial. Thus, there will be no disturbance of natural habitat.	28-29	Not required		
Wetlands	None	28-29	Not required		
Flora Fauna	None	28-29	Not required		
Drainage/Flood Control	The storm water quantity will not increase over current quantities	22	Not required		
Erosion ²	The project will disturb greater than 5,000 square feet of land. Therefore, an Erosion and Sediment Control Plan will be prepared and submitted to the DNREC for approval. All construction activities will comply with the DNREC-approved Sediment and Erosion Control Plan.	23	Not required		
Land Use Effects					
Glare	None	29			
Heat	None	29			
Noise	None	29			
Odors	None	29			
Vibration	None	29			
Radiation	None	29			
Electro-Magnetic Interference	None	29			
Other Effects					
Threatened & Endangered Species	The letter from the DNREC Div. of Fish and Wildlife indicated that there is no adverse impact to the bog turtles and the project will not be of a concern to the Northern Long-eared Bat.	28	Not required		
Impacts From:					
Raw Material	The project is an additional use of the raw material generated by the Refinery.	11-12			
Intermediate Products	Discussed herein under Air Quality	11-12			
By-Products	None	11-12			
Final Products	None	11-12			

¹ See paragraph I.1.b in "Secretary Assessment"

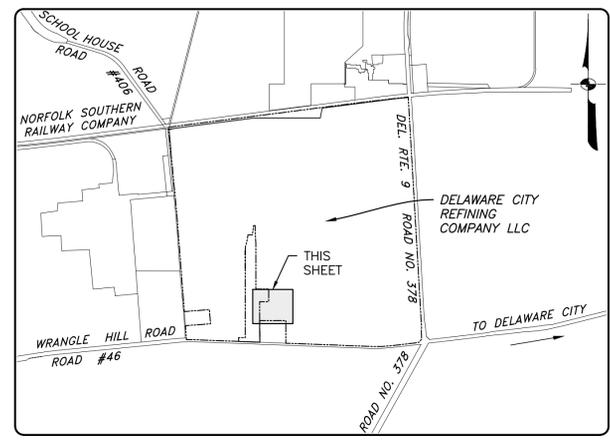
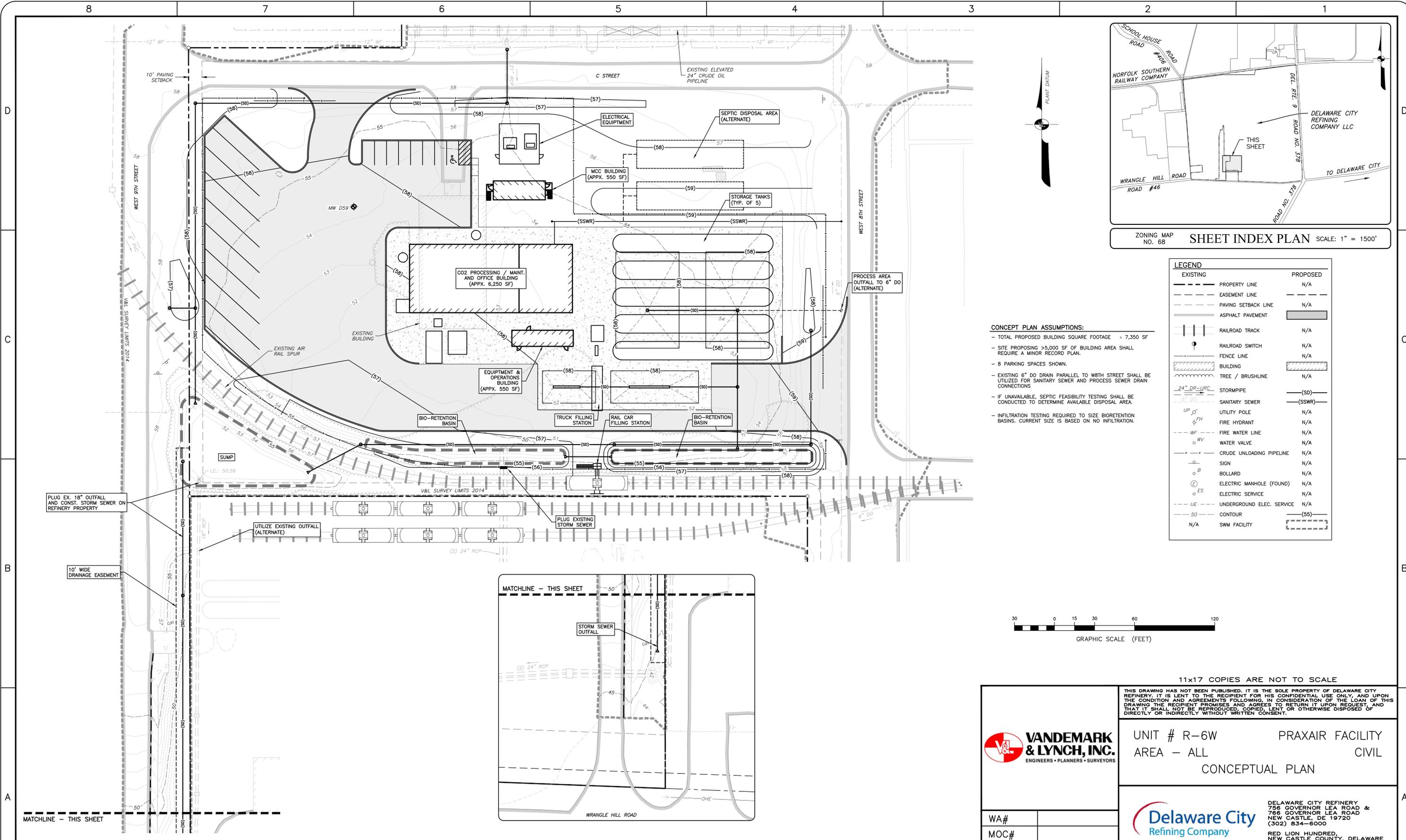
COASTAL ZONE ENVIRONMENTAL IMPACT OFFSET MATRIX

Applicant: Praxair, Inc.
Project: Nitrogen and Carbon Dioxide Plants
Application Date: May 8, 2015
CZA Offset Review Reference: (DNREC Only)

Amendments:
Offset Review Date: (DNREC Use Only)
Matrix Amended:

2 Construction and normal operation

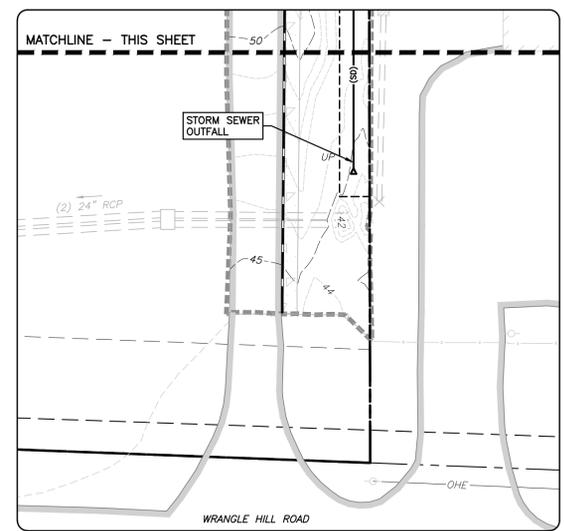
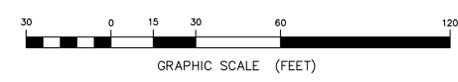
ATTACHMENT A



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

LEGEND		EXISTING	PROPOSED
---	PROPERTY LINE	---	N/A
---	EASEMENT LINE	---	N/A
---	PAVING SETBACK LINE	---	N/A
---	ASPHALT PAVEMENT	---	---
---	RAILROAD TRACK	---	N/A
---	RAILROAD SWITCH	---	N/A
---	FENCE LINE	---	N/A
---	BUILDING	---	---
---	TREE / BRUSHLINE	---	N/A
---	24" DR-URC	---	(SD)
---	6" DR	---	(SSWR)
---	UTILITY POLE	---	N/A
---	FIRE HYDRANT	---	N/A
---	FIRE WATER LINE	---	N/A
---	WATER VALVE	---	N/A
---	CRUDE UNLOADING PIPELINE	---	N/A
---	SIGN	---	N/A
---	BOLLARD	---	N/A
---	ELECTRIC MANHOLE (FOUND)	---	N/A
---	ELECTRIC SERVICE	---	N/A
---	UNDERGROUND ELEC. SERVICE	---	N/A
---	CONTOUR	---	(55)
---	N/A	---	SWM FACILITY

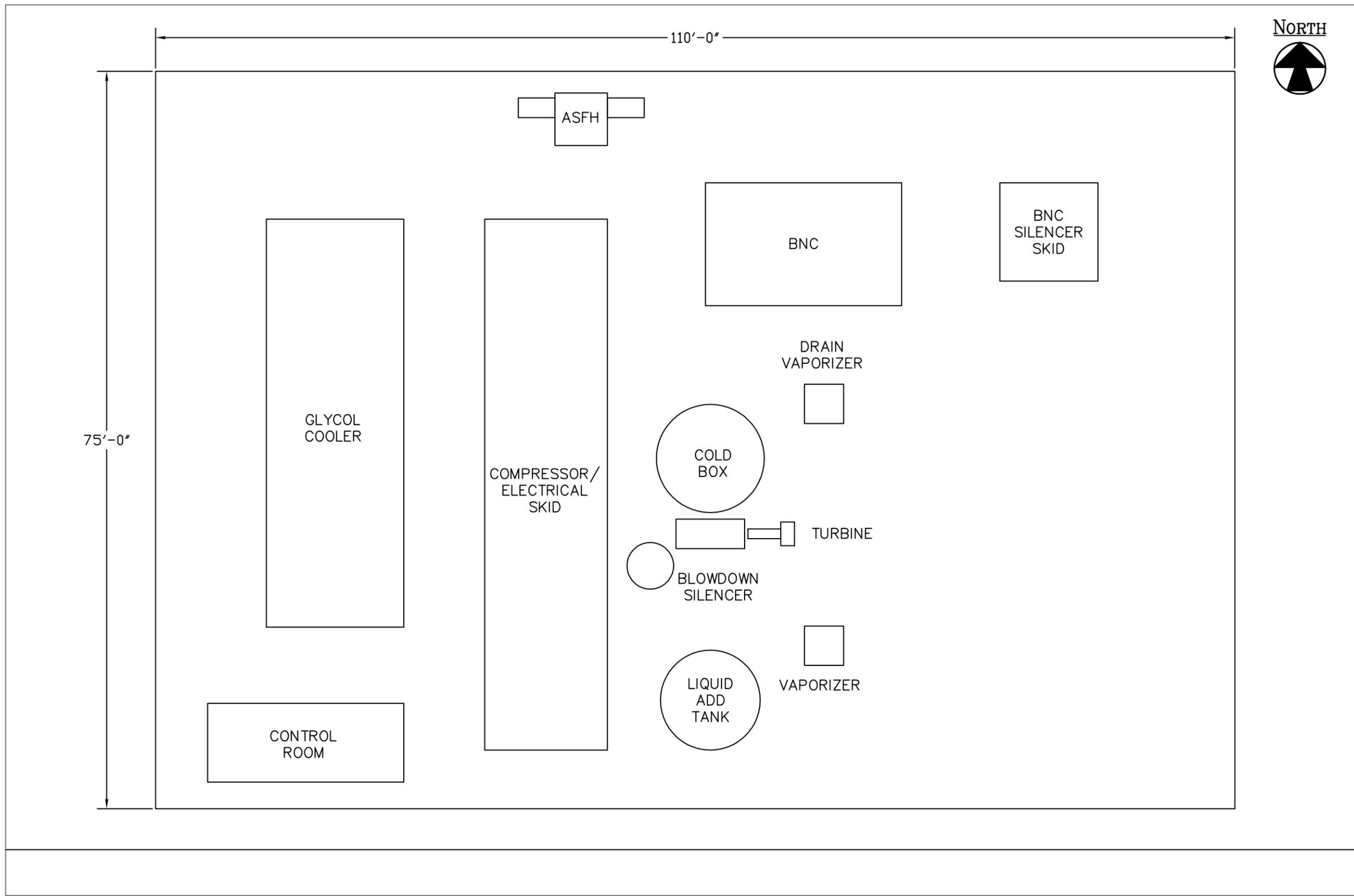
- CONCEPT PLAN ASSUMPTIONS:**
- TOTAL PROPOSED BUILDING SQUARE FOOTAGE = 7,350 SF
 - SITE PROPOSING >5,000 SF OF BUILDING AREA SHALL REQUIRE A MINOR RECORD PLAN.
 - 8 PARKING SPACES SHOWN.
 - EXISTING 6" DR DRAIN PARALLEL TO W8TH STREET SHALL BE UTILIZED FOR SANITARY SEWER AND PROCESS SEWER DRAIN CONNECTIONS
 - IF UNAVAILABLE, SEPTIC FEASIBILITY TESTING SHALL BE CONDUCTED TO DETERMINE AVAILABLE DISPOSAL AREA.
 - INFILTRATION TESTING REQUIRED TO SIZE BIORETENTION BASINS. CURRENT SIZE IS BASED ON NO INFILTRATION.



REV.	DATE	DESCRIPTION	MOC#	BY	REV'WD	APPR'D	REV.	DATE	DESCRIPTION	MOC#	BY	REV'WD	APPR'D	REFERENCE DWG NUMBER	REFERENCE DWG TITLE
C	11.05.14	UPDATED PER PRAXAIR LAYOUT		SED	DME										
B	10.28.14	UPDATED TO SHOW EXISTING TOPOGRAPHY		SED	DME										
A	10.27.14	ISSUED FOR REVIEW		SED	DME										

WA#	
MOC#	
PROCESS	
OPERATIONS	
PROCESS CONTROL	
ENGINEERING	
ORIGINAL ISSUE	APPROVED/DATE

11x17 COPIES ARE NOT TO SCALE				
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UNIT # R-6W		PRAXAIR FACILITY		
AREA - ALL		CIVIL		
CONCEPTUAL PLAN				
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				
CHARGE#	FILE NAME	ENGINEER	DESIGNER	DRAFTER
	23614.12-CONCP-01	DME	DME	SED
SCALE	DRAWING NUMBER			
1" = 30'				
DATE	REVISION			
10.27.14	C			



ALTRN	BY	DATE	CHKD	RESD	APVD	ALTRN	BY	DATE	CHKD	RESD	APVD	ALTRN	BY	DATE	CHKD	RESD	APVD	ALTRN	BY	DATE	CHKD	RESD	APVD	ALTRN	BY	DATE	CHKD	RESD	APVD	ALTRN	BY	DATE	CHKD	RESD	APVD	ALTRN
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PRAXAIR BUSINESS CONFIDENTIAL
 PRAXAIR TECHNOLOGY CENTER - TONAWANDA, NEW YORK

TYPE OF PLANT
N180 PLANT

TITLE
 EQUIPMENT LOCATION PLAN

PBF ENERGY
 DELWARE CITY, DE

DRWN BY	CHECKED	SITE IDENTIFICATION	
TMR			
REVIEWED	APPROVED	PROJECT NUMBER	
		17336B	
SCALE	DATE	SHEET	TOT. SHTS.
	12/10/14	1	1
SIZE	DRAWING NUMBER	ALTERNATION	
D	17336B-030	0	

ATTACHMENT B

ATTACHMENT B

Carbon Dioxide Plant:

As shown on the Process Flow Diagram CO₂ Liquefaction Plant, the Carbon Dioxide Plant includes a knock out drum, direct contact cooler/water scrubber, compressor, activated carbon filters, dehumidifier and separator, dryer beds, carbon liquefaction equipment and cooling systems. The process is described as follows:

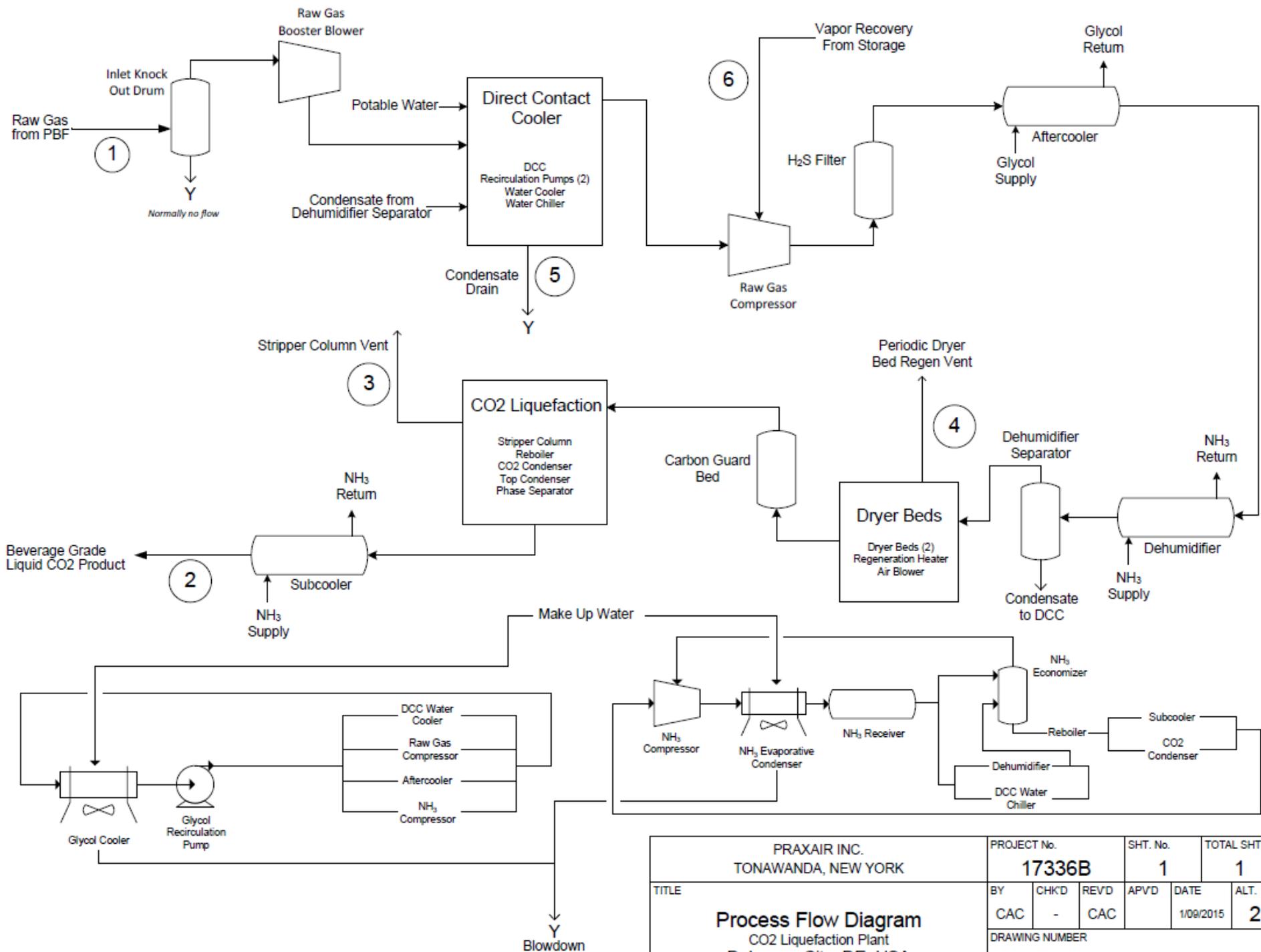
- The byproduct gas from the Refinery first enters a knock out drum.
- A compressor raises the pressure of the gas prior to entering the Direct Contact Cooler (DCC)/Water Scrubber. The gas is cooled in the bottom section by water to remove water-soluble organics including alcohols and aldehydes. The gas is cooled in the top section by scrubbing the gas with refrigerant cooled water.
- The cooled gas is compressed and flows through an activated carbon filter to remove hydrogen sulfide.
- The gas is cooled again and flows through a dehumidifier to remove additional moisture. The water is recycled back to the DCC/Water Scrubber.
- The gas stream is then dried in the dual-tower dryer system with the primary dryer bed consisting of an aluminum oxide absorbent and the secondary consisting of a zeolite absorbent. One dryer bed will be online and the other regenerated using a heater air blower on a 12 hour cycle. The heat regeneration removes trace impurities from the gas stream through the dryer bed vent.
- The dryer bed is followed by an activated carbon filter which will act as a polishing filter to remove any residual sulfur and hydrocarbons from the gas stream.
- The gas stream flows to the CO₂ Liquefaction unit where it is cooled and condensed (cryogenic separation). The condensate flows through a distillation column to produce the beverage-grade liquid carbon dioxide. Internal recycling within the CO₂ Liquefaction unit is optimized for high efficiency capture of the liquid carbon dioxide product.

Nitrogen Plant:

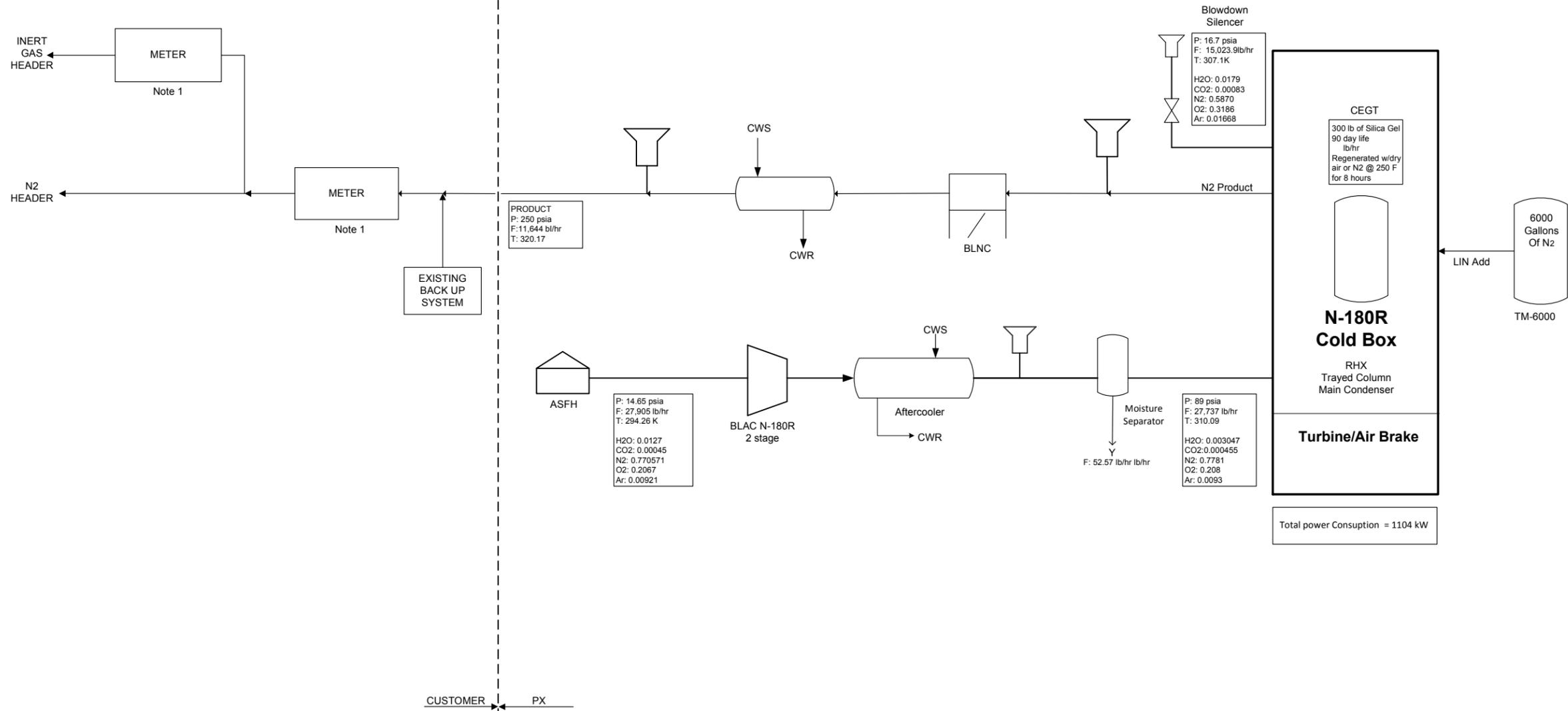
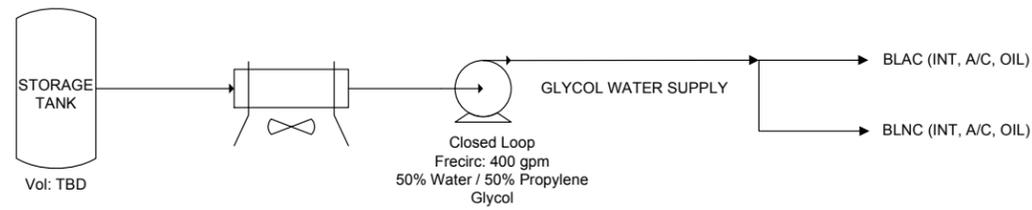
As shown in the N-180 Block Flow Diagram, the Nitrogen Plant includes an air suction filter house, the main air compressor (MAC), a moisture separator, a cold box, a waste vent silencer, a compressor and cooling systems. The air separation process occurs primarily within the equipment located within the cold box. The main components of the cold box include the reversing heat exchanger (RHX), one (1) distillation column, a cold end gel trap (CEGT) and an air-brake loaded expansion turbine. The process is described as follows:

- Ambient air is drawn through the air suction filter houses, which contain filter elements for the removal of particulate materials that could cause damage to downstream equipment.
- The resulting filtered air stream enters the main air compressor (MAC), which also heats the air.
- The air is cooled using a closed-loop glycol cooling system. The cooling creates condensation, which is removed in the moisture separator.

- The air flows into the equipment within the cold box. The air separation process within the cold box is described as follows:
 - The ambient air stream enters a reversing heat exchanger (RHX) where it is cooled against warm nitrogen and waste streams. This cooling causes water and carbon dioxide contained within the air to solidify on the surface of the RHX.
 - Periodically, RHX switching valves allow warm air to flow through the RHX releasing the separated and solidified water and carbon dioxide that have accumulated in the RHX. These separated components are released back into the atmosphere.
 - A cold end gel trap (CEGT) separates any remaining components prior to the air entering the distillation column. The CEGT is regenerated once every three months using stored liquid nitrogen.
 - The distillation column separates the purified nitrogen vapor at the top of the column from the oxygen-enriched liquid at the bottom.
 - The nitrogen vapor is heated for collection of nitrogen gas product. The separated oxygen liquid is heated for release back into the atmosphere.
- The purified nitrogen product leaving the cold box is compressed and then split into two streams for use by the Refinery.



PRAXAIR INC. TONAWANDA, NEW YORK		PROJECT No. 17336B	SHT. No. 1	TOTAL SHTS 1			
TITLE Process Flow Diagram CO2 Liquefaction Plant Delaware City, DE, USA		BY CAC	CHK'D -	REVD CAC	APVD	DATE 1/09/2015	ALT. 2
DRAWING NUMBER		-					



NOTES:
1. Supplied by Praxair. Installed by Costumer



PRAXAIR INC. TONAWANDA, NEW YORK		DATE	BY		
N-180R DELAWARE CITY, DELAWARE BFD		1/12/15	ARS		
N-180R BLOCK FLOW DIAGRAM					

ATTACHMENT C

Emergency Number: (989) 496-3780

Section 1 **Product Name and Information**

Product (Trade Name and Synonyms): CP-4624-F Series

Chemical Name: Polyalphaolefin

Chemical Family: Synthetic Hydrocarbon

Formula: $C_{10n}H_{20n+2}$

CAS#: Proprietary

Section 2 **Components and Hazard Statement**

This material has no known hazards under applicable laws. The product contains no known carcinogens. No special warning labels are required under OSHA 29 CFR 1910.1200.

Section 3 **Safe Handling and Storage**

Handling: Do not take internally. Avoid contact with skin, eyes, and clothing. Upon contact with skin, wash exposed area with soap and water. If product enters the eyes, flush with water for 15 minutes and consult a physician. Wash contaminated clothing before reuse.

Storage: Keep container tightly sealed when not in use.

Section 4 **Physical Data**

Appearance: Clear liquid, light yellow to light brown tint
Boiling Point: >300°F
Vapor Pressure: <0.01mmHg @ 20°C
Specific Gravity (water=1): 0.83-0.84
Volatiles, Percent by Volume: 0%
Odor: None
Solubility in Water: Insoluble
Evaporation Rate (butyl acetate=1): Nil

Section 5 **Fire and Explosion Hazards**

Flash Point (Cleveland Open Cup): 450°F
Flammable Limits: not established
Auto ignition Temperature: no data
HMIS Ratings:
 Health: 0
 Flammability: 1
 Reactivity: 0
 Personal Protection: B
NFPA Ratings in air: not established

Extinguishing Media: Dry chemical; CO₂ foam; water spray (fog)

Unusual Fire and Explosion Hazards: None

Special Fire Fighting Techniques: Toxic fumes, gases or vapors may evolve on burning. Firefighters should use NIOSH/MNSA-approved self-contained breathing apparatus. Use water to cool fire-exposed containers. Use water carefully near exposed liquid to avoid frothing and splashing of hot liquid.

Section 6 **Reactivity Data**

Stability: Stable

Hazardous Polymerization: Will not occur

Incompatible Materials: Strong oxidizers

Conditions to Avoid: Excessive heat

Hazardous Decomposition Products: Analogous compounds evolve carbon monoxide, carbon dioxide, and other unidentified chemicals when burned. See section 5.

Section 7 **Health Hazard Data**

Threshold Limit Value: 5mg/m³ ACGIH

Situations to Avoid: Avoid breathing oil mists.

First Aid Procedures:

Ingestion: DO NOT INDUCE VOMITING. If conscious, give 2 glasses of water and consult physician. May cause nausea and diarrhea.

Inhalation: Product is not toxic by inhalation. If oil mist is inhaled, remove to fresh air and consult physician.

Contact: Upon contact with skin, wash exposed area with soap and water.

Section 8 **Personal Protection Information**

Respiratory Protection: Use in well ventilated area

Ventilation: Local exhaust

Protective Gloves: Not required, but recommended, especially for prolonged exposure

Eye/Face Protection: Safety glasses or goggles

Section 9

Spill or Leak Procedures

In Case of Spill: Wear suitable protective equipment, especially goggles. Stop the source of the spill. Dike the spill area. Use absorbent materials to soak up fluid (i.e. sand, sawdust and commercially available materials). Wash the spill area with large amounts of water. Properly dispose of all materials.

Section 10

Waste Disposal Methods

Incinerate this product and all associated waste in a licensed facility in accordance with Federal, State, and local regulation. This material is not a hazardous waste under RCRA Regulation 40 CFR 261.

The information in this material safety data sheet should be provided to all who use, handle, store, transport or are otherwise exposed to this product. We believe the information in this document to be reliable and up to date as of the date of publication, but makes no guarantee that it is.

Date Revised: 7/08

Emergency Number: (989) 496-3780

Section 1

Product Name and Information

Product (Trade Name and Synonyms): CP-1000 F Series

Chemical Name: Semi-synthetic Hydrocarbon

Chemical Family: Mineral Oil

Formula: Proprietary

CAS#: Proprietary

Section 2

Components and Hazard Statement

This material has no known hazards under applicable laws. The product contains no known carcinogens. No special warning labels are required under OSHA 29 CFR 1910.1200.

Section 3

Safe Handling and Storage

Handling: Do not take internally. Avoid contact with skin, eyes, and clothing. Upon contact with skin, wash exposed area with soap and water. If product enters the eyes, flush with water for 15 minutes and consult a physician. Wash contaminated clothing before reuse.

Storage: Keep container tightly sealed when not in use.

Section 4**Physical Data**

Appearance: Colorless liquid

Boiling Point: >500°F

Vapor Pressure: <0.1 mmHg @20°C

Specific Gravity (water=1): :0.85

Volatiles, Percent by Volume: 0%

Odor: slight

Solubility in Water: insoluble

Evaporation Rate (butyl acetate=1): nil

Section 5**Fire and Explosion Hazards**

Flash Point (Cleveland Open Cup): 213-243°C(415-470°F)

Flammable Limits: not established

Auto ignition Temperature: no data

HMIS Ratings:

Health: 0

Flammability: 1

Reactivity: 0

Personal Protection: B

NFPA Ratings in air: no data

Extinguishing Media: Dry chemical; CO₂ foam; water spray (fog)

Unusual Fire and Explosion Hazards: None

Special Fire Fighting Techniques: Toxic fumes, gases or vapors may evolve on burning.

Firefighters should use NIOSH/MNSA-approved self-contained breathing apparatus. Use water to cool fire-exposed containers. Use water carefully near exposed liquid to avoid frothing and splashing of hot liquid.

Section 6

Reactivity Data

Stability: Stable

Hazardous Polymerization: Will not occur

Incompatible Materials: Strong oxidizers

Conditions to Avoid: Excessive heat

Hazardous Decomposition Products: Analogous compounds evolve carbon monoxide, carbon dioxide, and other unidentified chemicals when burned. See section 5.

Section 7

Health Hazard Data

Threshold Limit Value: 5mg/m³ for oil mist

Situations to Avoid: Avoid breathing oil mists.

First Aid Procedures:

Ingestion: DO NOT INDUCE VOMITING. If conscious, give 2 glasses of water and consult physician. May cause nausea and diarrhea.

Inhalation: Product is not toxic by inhalation. If oil mist is inhaled, remove to fresh air and consult physician.

Contact: Upon contact with skin, wash exposed area with soap and water.

Section 8

Personal Protection Information

Respiratory Protection: Use in well ventilated area

Ventilation: Local exhaust

Protective Gloves: Not required, but recommended, especially for prolonged exposure

Eye/Face Protection: Safety glasses or goggles

Section 9

Spill or Leak Procedures

In Case of Spill: Wear suitable protective equipment, especially goggles. Stop the source of the spill. Dike the spill area. Use absorbent materials to soak up fluid (i.e. sand, sawdust and commercially available materials). Wash the spill area with large amounts of water. Properly dispose of all materials.

Section 10

Waste Disposal Methods

Incinerate this product and all associated waste in a licensed facility in accordance with Federal, State, and local regulation. This material is not a hazardous waste under RCRA Regulation 40 CFR 261.

The information in this material safety data sheet should be provided to all who use, handle, store, transport or are otherwise exposed to this product. We believe the information in this document to be reliable and up to date as of the date of publication, but makes no guarantee that it is.

Date Revised: 7/04

Puriblend #1

Safety Data Sheet

Version 1
 January 2014

Section 1: Identification of the substance/mixture and of the company/undertaking

1.1. Product identifier	
Product name:	Puriblend #1
REACH registration number:	01-2119529248-35-0027, 01-2119529248-35-0028, 01-2119529248-35-0038

1.2. Relevant identified uses of the substance or mixture and uses advised against	
Relevant identified uses:	Adsorbent for the chemical industry

1.3. Supplier of safety data sheet	
Company name:	Union Engineering a/s Snaremoesvej 27 DK-7000 Fredericia
Tel:	+45 7620 7700
Fax:	+45 7620 7800
Email:	union@union.dk
Web:	www.union.dk

Section 2: Hazards identification

2.1. Classification of the substance or mixture	
According to Regulation (EC) No 1272/2008 [CLP]	No need for classification according to GHS criteria for this product. Globally Harmonized System, EU (GHS).
According to Directive 67/548/EEC or 1999/45/EC	Possible Hazards: The product does not require a hazard warning label in accordance with EC Directives.

2.2. Label elements	
According to Regulation (EC) No 1272/2008 [CLP]	The product does not require a hazard warning label in accordance with GHS criteria.
According to Directive 67/548/EEC or 1999/45/EC	Directive 1999/45/EC ('Preparation Directive'). The product does not require a hazard warning label in accordance with EC Directives.

2.3. Other hazards

According to Regulation (EC) No 1272/2008 [CLP]	Other Hazards (GHS): No specific dangers known, if the regulations/notes for storage and handling are considered.
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Section 3: Composition/information on ingredients

3.1. Mixtures

Hazardous ingredients (GHS) according to Regulation (EC) No. 1272/2008	No particular hazards known.
--	------------------------------

Ingrediens:		
CAS Number: 1344-28-1 EC-Number: 215-691-6	Aluminium oxide (Content (W/W):	>= 82 % - <= 94 %
CAS Number: 7732-18-5 EC-Number: 231-791-2	Water (Content (W/W):	>= 6 % - <= 16 %

Section 4: First aid measures

4.1. Description of first aid measures

General information	Remove contaminated clothing.
After inhalation	Keep patient calm, remove to fresh air.
After eye contact	Wash affected eyes for at least 15 minutes under running water with eyelids held open.
After skin contact	Wash thoroughly with soap and water.
On ingestion:	Rinse mouth and then drink plenty of water.
Information for doctor:	
Most important symptoms and effects, both acute and delayed	Symptoms: No significant reaction of the human body to the product known.
Indication of any immediate medical attention and special treatment needed	Treat according to symptoms (decontamination, vital functions), no known specific antidote.

Section 5: Fire-fighting measures

5.1. Extinguishing media

Suitable extinguishing agents	carbon dioxide, foam, dry powder, water spray
Special hazards arising from the substance or mixture	No further relevant information available.
Advice for firefighters	
Protective equipment:	Wear a self-contained breathing apparatus
Additional information	Product itself is non-combustible; fire extinguishing method of surrounding areas must be considered.

Section 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

Environmental precautions:	Discharge into the environment must be avoided.
Methods and material for containment and cleaning up:	Avoid raising dust. Dampen, pick up mechanically and dispose of. Dispose of absorbed material in accordance with regulations.
Personal precautions, protective equipment and emergency procedures	Avoid dust formation. Avoid contact with the skin, eyes and clothing. Use personal protective clothing. Information regarding personal protective measures see, chapter 8.

Section 7: Handling and storage

7.1. Precautions for safe handling

Precautions for safe handling	Handle in accordance with good industrial hygiene and safety practice.
Information about protection against explosions and fires:	The product does not contribute to the spreading of flames, nor is it self-combustible, not explosive.
Conditions for safe storage, including any incompatibilities	
Suitable materials for containers:	Carbon steel (iron), Low density polyethylene (LDPE)
Further information on storage conditions	Containers should be stored tightly sealed in a dry place.
Storage stability:	Storage temperature: ≤ 35 °C Keep container dry.
Specific end use(s):	For the relevant identified use(s) listed in Section 1 the advice mentioned in this section 7 is to be observed.

Section 8: Exposure controls/personal protection

8.1. Control parameters

Components with workplace control parameters	The nuisance dust limit value is to be kept. 1344-28-1: aluminium oxide
PNEC	Freshwater: 0.0749 mg/l STP: 20 mg/l
DNEL	No DNEL value available.

8.2. Exposure controls/Personal protective equipment

Personal protective equipment	The usual precautionary measures should be adhered to in handling the chemicals.
Respiratory protection:	Breathing protection if dusts are formed. Particle filter with low efficiency for solid particles (e.g. EN 143 or 149, Type P1 or FFP1)
Hand protection:	Suitable chemical resistant safety gloves (EN 374) also with prolonged, direct contact (Recommended: Protective index 6, corresponding > 480 minutes of permeation time according to EN 374): E.g. nitrile rubber (0.4 mm), chloroprene rubber (0.5 mm), butyl rubber (0.7 mm) and other
Eye protection:	Safety glasses with side-shields (frame goggles) (e.g. EN 166)
Body protection:	Body protection must be chosen depending on activity and possible exposure, e.g. apron, protecting boots, chemical-protection suit (according to EN 14605 in case of splashes or EN ISO 13982 in case of dust).
General safety and hygiene measures	Handle in accordance with good industrial hygiene and safety practice. Hands and/or face should be washed before breaks and at the end of the shift.

Section 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties	
Appearance:	
Form:	Spherical
Color:	Off-white
Odour:	Odourless
Odour threshold:	Not applicable
pH-value:	Not applicable
Change in condition	
Melting point/Melting range:	2,050 °C
Boiling point/Boiling range:	Not determined
Flash point:	Non-flammable.
Evaporation rate:	Not applicable
Flammability:	does not ignite
Lower explosion limit:	Product is not selfigniting.
Danger of explosion:	Product is not explosive.
Critical values for explosion:	
Lower:	Not determined.
Upper:	Not determined.
Ignition temperature:	Not applicable
Vapour pressure:	Not applicable
Solubility in water:	insoluble
Solubility in / Miscibility with water:	Unsoluble
Partitioning coefficient n-octanol/water (log Kow):	The value has not been determined because the substance is inorganic.
Self-ignition:	Not self-igniting
Thermal decomposition:	No decomposition if used correctly.
Viscosity, dynamic:	Not applicable
Fire promoting properties:	Not fire-propagating
Self-heating ability:	It is not a substance capable of spontaneous heating.
Bulk density:	Approx. 650 kg/m ³
pKA:	Not soluble
Surface tension:	Not applicable

Section 10: Stability and reactivity

10.1. Reactivity	
Reactivity:	No hazardous reactions if stored and handled as prescribed/indicated.
Corrosion to metals:	No corrosive effect on metal.
Formation of flammable gases:	Forms no flammable gases in the presence of water.

10.2. Chemical stability	
Chemical stability:	The product is chemically stable.

10.3. Possibility of hazardous reactions

Hazardous reactions:	No hazardous reactions known. The product is chemically stable.
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10.4. Conditions to avoid

Conditions to avoid:	Avoid deposition of dust. Avoid dust formation.
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10.5. Incompatible materials

Materials to avoid:	Water, reducing agents
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10.6. Hazardous decomposition products

Hazardous decomposition products:	No hazardous decomposition products known.
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Section 11: Toxicological information

The classification of risk is based on knowledge of the toxicity of the components contained in this product.

11.1. Information on toxicological effects

Acute toxicity:	Assessment of acute toxicity: Virtually nontoxic after a single skin contact. Virtually nontoxic by inhalation. Virtually nontoxic after a single ingestion.
Experimental/calculated data:	LD50 rat (oral): > 5,000 mg/kg (OECD Guideline 401) LC50 rat (by inhalation): > 2.3 mg/l 4 h (OECD Guideline 403) Tested as dust aerosol. (dermal): Study scientifically not justified.
Irritation	Assessment of irritating effects: Not irritating to the skin. Not irritating to the eyes.
Experimental/calculated data:	Skin corrosion/irritation rabbit: non-irritant (OECD Guideline 404) Serious eye damage/irritation rabbit: non-irritant (OECD Guideline 405)
Respiratory/Skin sensitization	Assessment of sensitization: No sensitizing effect. Experimental/calculated data: guinea pig: Non-sensitizing.
Germ cell mutagenicity	Assessment of mutagenicity: The substance was not mutagenic in bacteria.
Carcinogenicity	Assessment of carcinogenicity: The whole of the information available provides no indication of a carcinogenic effect.
Reproductive toxicity	Assessment of reproduction toxicity: The results of animal studies suggest a fertility impairing effect.
Developmental toxicity	Assessment of teratogenicity: No indications of a developmental toxic / teratogenic effect were seen in animal studies.
Specific target organ toxicity (single exposure)	Assessment of STOT single: Based on the available information there is no specific target organ toxicity to be expected after a single exposure.
Repeated dose toxicity and Specific target organ toxicity (repeated exposure)	Assessment of repeated dose toxicity: No adverse effects were observed after repeated exposure in animal studies.
Aspiration hazard	No aspiration hazard expected.
Other relevant toxicity information	The product has been assessed on the basis of the components' available data. To some extent data gaps exist for individual components. According to our present knowledge and experience dangers which are not covered by the current labeling are not to be expected.

Section 12: Ecological information

12.1. Toxicity	
Assessment of aquatic toxicity:	There is a high probability that the product is not acutely harmful to aquatic organisms. No toxic effects occur within the range of solubility.
Toxicity to fish:	LC50 (96 h) > 218.64 mg/l, Pimephales promelas (Fish test acute, semistatic). The product has not been tested. The statement has been derived from products of a similar structure or composition. Tested above maximum solubility.
Aquatic invertebrates:	No observed effect concentration (48 h) > 100 mg/l, Daphnia magna (OECD Guideline 202, part 1, static) Tested above maximum solubility. The details of the toxic effect relate to the nominal concentration.
Aquatic plants:	No observed effect concentration (72 h) > 100 mg/l (growth rate), Selenastrum capricornutum (OECD Guideline 201, static) Tested above maximum solubility. The details of the toxic effect relate to the nominal concentration.
Microorganisms/Effect on activated sludge:	Study scientifically not justified.
Chronic toxicity to fish:	EC10 (7 d) 0.0938 mg/l, Pimephales promelas (semistatic)
Chronic toxicity to aquatic invertebrates:	No observed effect concentration (21 d), 0.076 mg/l, Daphnia magna (OECD Guideline 211, semistatic) The statement of the toxic effect relates to the analytically determined concentration. The product has not been tested. The statement has been derived from products of a similar structure or composition.

12.2. Persistence and degradability	
Assessment biodegradation and elimination (H ₂ O):	Inorganic product which cannot be eliminated from water by biological purification processes.

12.3. Bioaccumulative potential	
Assessment bioaccumulation potential:	Significant accumulation in organisms is not to be expected.

12.4. Mobility in soil (and other compartments if available)	
Assessment transport between environmental compartments:	Adsorption to solid soil phase is not expected.

12.5. Results of PBT and vPvB assessment	
According to Annex XIII of Regulation (EC) No.1907/2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH): Not applicable for inorganic substances.	

12.6. Additional information	
Other ecotoxicological advice:	The product has been assessed on the basis of the components' available data. To some extent data gaps exist for individual components. According to our present knowledge and experience dangers which are not covered by the current labeling are not to be expected.

Section 13: Disposal considerations

13.1. Waste treatment methods

Recommendation:	Observe national and local legal requirements. Contact specialized companies about recycling.
Contaminated packaging:	Dispose of in accordance with national, state and local regulations. Contaminated packaging should be emptied as far as possible and disposed of in the same manner as the substance/product.

Section 14: Transport information

14.1 Transport information

Land transport	ADR: Not classified as a dangerous good under transport regulations RID: Not classified as a dangerous good under transport regulations
Inland waterway transport	ADN: Not classified as a dangerous good under transport regulations
Sea transport	IMDG: Not classified as a dangerous good under transport regulations
Air transport	IATA/ICAO: Not classified as a dangerous good under transport regulations

Section 15: Regulatory information

15.1. Safety, health and environmental regulations/legislation specific for the substance or mixture

Section 16: Other information

16.1. Other information

The data contained in this safety data sheet are based on our current knowledge and experience and describe the product only with regard to safety requirements. The data do not describe the product's properties (product specification). Neither should any agreed property nor the suitability of the product for any specific purpose be deduced from the data contained in the safety data sheet. It is the responsibility of the recipient of the product to ensure any proprietary rights and existing laws and legislation are observed.

-----end-----

Praxair Material Safety Data Sheet

1. Chemical Product and Company Identification

Product Name: Ammonia	Trade Name: Ammonia
Product Use: Not available.	
Chemical Name: Ammonia	Synonym: Ammonia Gas, Spirit of Hartshorn.
Chemical Formula: NH ₃	Chemical Family: Amine
Telephone: Emergencies: * 1-800-363-0042	Supplier /Manufacture: Praxair Canada Inc. 1 City Centre Drive Suite 1200 Mississauga, ON L5B 1M2
	Phone: 905-803-1600
	Fax: 905-803-1682

**Call emergency numbers 24 hours a day only for spills, leaks, fire, exposure, or accidents involving this product. For routine information, contact your supplier or Praxair sales representative.*

2. Hazards Identification

Emergency Overview

DANGER! Corrosive liquid and gas under pressure. Harmful if inhaled. Can cause eye, skin, and respiratory tract burns. May cause kidney and respiratory system damage. Can catch fire. Self-contained breathing apparatus and protective clothing must be worn by rescue workers. Under ambient conditions, this is a colourless gas with a pungent, irritating odour.

ROUTES OF EXPOSURE: Inhalation, skin contact, skin absorption, eye contact, and swallowing..

EFFECTS OF A SINGLE (ACUTE) OVEREXPOSURE

- INHALATION:** Overexposure to concentrations moderately above the threshold limit value (TLV) of 25 ppm may cause irritation of the eyes, nose, and throat. Higher concentrations may cause breathing difficulty, chest pain, bronchospasm, pink frothy sputum, and pulmonary edema. Overexposure may predispose to the development of acute bronchitis and pneumonia. STEL = 35 ppm (ACGIH).
- SKIN CONTACT:** Prolonged or widespread skin contact may result in the absorption of potentially harmful amounts of material.
- SKIN ABSORPTION:** Prolonged or widespread skin contact with the liquid may result in the absorption of harmful amounts of material.
- SWALLOWING:** An unlikely route of exposure. This product is a gas at normal temperature and pressure, but may cause chemical burns of the mouth, throat, esophagus, and stomach.

EYE CONTACT: Liquid may cause pain, severe redness and swelling of the conjunctiva, damage to the iris, corneal opacification, glaucoma, and cataract. Exposure to the gas may cause pain and excessive tearing, with acute corneal injury at high concentrations.

EFFECTS OF REPEATED (CHRONIC) OVEREXPOSURE:

Chronic exposure may cause chemical pneumonitis and kidney damage.

OTHER EFFECTS OF OVEREXPOSURE:

None known.

MEDICAL CONDITIONS AGGRAVATED BY OVEREXPOSURE:

Inhalation may aggravate asthma and inflammatory or fibrotic pulmonary disease. Because of its irritating properties, this material may aggravate an existing dermatitis.

SIGNIFICANT LABORATORY DATA WITH POSSIBLE RELEVANCE TO HUMAN HEALTH HAZARD EVALUATION:

None currently known.

CARCINOGENICITY:

Not listed as carcinogen by OSHA, NTP or IARC.

3. Composition and Information on Ingredients

COMPONENTS	CAS NUMBER	CONCENTRATION % by Mole
Ammonia	7664-41-7	100

4. First Aid Measures

INHALATION:

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

SKIN CONTACT:

Immediately flush affected areas with water for at least 15 minutes while removing contaminated clothing and shoes. Discard clothing and shoes. Call a physician.

SWALLOWING:

This product is a gas at normal temperature and pressure. Rinse mouth with water. If patient is fully conscious, give two glasses of water or milk. Do not induce vomiting. Call a physician.

EYE CONTACT:

Immediately flush eyes with running water for at least 15 minutes, keeping eyelids open. See a physician, preferably an ophthalmologist, immediately.

NOTES TO PHYSICIAN:

Victims of overexposure should be observed for at least 72 hours for delayed onset of pulmonary edema. The hazards of this material are mainly due to its severe irritant and corrosive properties on the skin and mucosal surfaces. There is no specific antidote. Treatment of over-exposure should be directed at the control of symptoms and the clinical condition.

5. Fire Fighting Measures

FLAMMABLE : Yes. **IF YES, UNDER WHAT CONDITIONS?** Slightly flammable.

EXTINGUISHING MEDIA:

In case of fire, use water spray (fog), foam, dry chemical, or CO2.

PRODUCTS OF COMBUSTION:

These products are nitrogen oxides (NO, NO2...).

PROTECTION OF FIREFIGHTERS:

7. Handling and Storage

PRECAUTIONS TO BE TAKEN IN HANDLING:

Protect cylinders from damage. Use a suitable hand truck to move cylinders; do not drag, roll, slide, or drop. Never attempt to lift a cylinder by its cap; the cap is intended solely to protect the valve. 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. Open valve slowly. If valve is hard to open, discontinue use and contact your supplier. For other precautions, see Section 16.

RECOMMENDED EQUIPMENT: In semiconductor process gas and other suitable applications, Praxair recommends the use of engineering controls such as gas cabinet enclosures, automatic gas panels (used to purge systems on cylinder changeout), excess-flow valves throughout the gas distribution system, double containment for the distribution system, continuous gas monitors, fire sprinkler, heat sensor for fire monitoring and Class 1, Division 2 hazard Class electrical inside the cabinet.

For additional information on storage and handling, refer to Compressed Gas Association (CGA) pamphlet P-1, *Safe Handling of Compressed Gases in Containers*, available from the CGA. Refer to Section 16 for the address and phone number along with a list of other available publications.

PRECAUTIONS TO BE TAKEN IN STORAGE:

Store and use with adequate ventilation. Separate flammable cylinders from oxygen, chlorine, and other oxidizers by at least 6 m or use a barricade of non-combustible material. This barricade should be at least 1.5 m high and have a fire resistance rating of at least ½ hour. Firmly secure cylinders upright to keep them from falling or being knocked over. Screw valve protection cap firmly in place by hand. Post "No Smoking or Open Flames" signs in storage and use areas. There must be no sources of ignition. All electrical equipment in storage areas must be explosion-proof. Storage areas must meet national electric codes for Class 1 hazardous areas. Store only where temperature will not exceed 52 C. Store full and empty cylinders separately. Use a first-in, first-out inventory system to prevent storing full cylinders for long periods.

OTHER HAZARDOUS CONDITIONS OF HANDLING, STORAGE, AND USE:

Corrosive high-pressure gas. Harmful if inhaled. Do not breathe gas. Do not get vapour in eyes, on skin, or on clothing. Have safety showers and eyewash fountains immediately available. Use piping and equipment adequately designed to withstand pressures to be encountered. Use only in a closed system constructed of corrosion-resistant materials. Store and use with adequate ventilation at all times. **Prevent reverse flow.** Reverse flow into cylinder may cause rupture. Use a check valve or other protective device in any line or piping from the cylinder. **Never work on a pressurized system.** If there is a leak, close the cylinder valve. Vent the system down in a safe and environmentally sound manner in compliance with all federal, provincial, and local laws; then repair the leak. When returning the cylinder to supplier, be sure valve is closed, then install valve outlet plug tightly. **Never place a compressed gas cylinder where it may become part of an electrical circuit.**

RECOMMENDED PUBLICATIONS:

Additional information on storage, handling, and use of this product is provided in **NFPA 55: Standard for the Storage, Use, and Handling of Compressed and Liquefied Gases in Portable Cylinders**, published by the National Fire Protection Association.

See also Praxair publication P-14-153, *Guidelines for Handling Gas Cylinders and Containers*. Obtain from your local supplier.

8. Exposure Controls/Personal Protection

INGREDIENTS	CAS NUMBER	LD ₅₀ (Species & Routes)	LC ₅₀ (Rat, 4 hrs.)	Exposure Limits
Ammonia	7664-41-7	Not available.	Not available.	TWA: 25 ppm 8 hours. STEL: 35 ppm 15 minutes.

IMMEDIATELY DANGEROUS TO LIFE AND HEALTH (IDLH):**VENTILATION/ENGINEERING CONTROLS:**

LOCAL EXHAUST: An explosion-proof, corrosion resistant exhaust system is acceptable. See SPECIAL.

MECHANICAL (General): Inadequate. See SPECIAL.

SPECIAL: Use only in a closed system. Explosion-proof, corrosion resistant, forced draft fume hood is preferred.

OTHER: See SPECIAL.

PERSONAL PROTECTION:

RESPIRATORY PROTECTION: Select in accordance with provincial regulations, local bylaws or guidelines. Selection should also be based on the current CSA standard Z94.4, "Selection, Care and Use of Respirators". Respirators should also be approved by NIOSH and MSHA. For concentrations up to 10 times, the applicable exposure limit any NIOSH/MSHA approved supplied air respirator is recommended. Up to 50 times, a NIOSH/MSHA approved respirator with a full face piece or self-contained breathing apparatus is recommended. For higher concentrations, use only self-contained apparatus operated in the pressure-demand mode.

SKIN PROTECTION: Neoprene gloves.

EYE PROTECTION: Wear safety glasses when handling cylinders.

Select in accordance with the current CSA standard Z94.3, "Industrial Eye and Face Protection", and any provincial regulations, local bylaws or guidelines.

OTHER PROTECTIVE EQUIPMENT: Metatarsal shoes for cylinder handling. Protective clothing where needed. Cuffless trousers should be worn outside the shoes. Select in accordance with the current CSA standard Z195, "Protective Foot Wear", and any provincial regulations, local bylaws or guidelines.

9. Physical and Chemical Properties			
PHYSICAL STATE:	Gas. (Compressed Gas.)	FREEZING POINT:	-77.7°C (-107.9°F)
		pH:	Not applicable.
BOILING POINT	-33.4°C (-28.1°F)	VAPOUR PRESSURE	786.3 kPa (@ 20°C)
		MOLECULAR WEIGHT:	17.031 g/mole
SPECIFIC GRAVITY:	0.6819 (Water = 1)	SOLUBILITY IN WATER, TOTAL	
LIQUID (Water = 1)			
SPECIFIC GRAVITY:	0.588 g/ml @ 25 C	EVAPORATION RATE	> 1 compared to (Butyl Acetate=1)
VAPOUR (air = 1)		COEFFICIENT OF WATER/OIL DISTRIBUTION:	Not applicable.
VAPOUR DENSITY:	0.000771 g/ml @ 25 C	% VOLATILES BY VOLUME:	100% (v/v).
		ODOUR THRESHOLD:	5 ppm

APPEARANCE & ODOUR: Colourless. Odour: Pungent. Irritant.

10. Stability and Reactivity

STABILITY:	The product is stable.
CONDITIONS OF CHEMICAL INSTABILITY:	Not applicable.
INCOMPATIBILITY (materials to avoid):	Gold, silver, mercury, oxidizing agents, halogens, halogenated compounds, acids, copper, copper-zinc alloys (brass), aluminum, chlorates, zinc.
HAZARDOUS DECOMPOSITION PRODUCTS:	Hydrogen may be formed at temperatures in excess of 840 C in the absence of air and oxygen.
HAZARDOUS POLYMERIZATION:	Hydrogen may be formed at temperatures in excess of 840 C in the absence of air and oxygen. The normal products of combustion are nitrogen and water.
CONDITIONS TO AVOID:	None known.
CONDITIONS OF REACTIVITY:	Contact with incompatible materials may result in explosive or violent reactions or form explosive mixtures with air.

11. Toxicological Information

ACUTE DOSE EFFECTS: LC50 = 7338 ppm, 1 hr, rat.

MUTAGENIC EFFECTS: In-vitro studies have shown toxic levels of ammonia to be mutagenic in e-coli bacteria. Mutagenic effects have also been reported in drosophila (fruit flies). There is no evidence that ammonia is mutagenic in mammals.

12. Ecological Information

No adverse ecological effects expected. This product does not contain any Class I or Class II ozone-depleting chemicals. The components of this mixture are not listed as marine pollutants by TDG Regulations.

13. Disposal Considerations

WASTE DISPOSAL METHOD: Do not attempt to dispose of residual or unused quantities. Return cylinder to supplier.

14. Transport Information

TDG/IMO SHIPPING NAME: Ammonia, anhydrous

HAZARD CLASS: CLASS 2.3(8): Toxic and corrosive gas.	IDENTIFICATION #: UN1005	PRODUCT REPORTABLE RQ: Any accidental release in a quantity that could pose a danger to public safety or any sustained release of 10 minutes or more.
---	---------------------------------	---

SHIPPING LABEL(s): Toxic gas primary label, corrosive material subsidiary label

PLACARD (When Required): Toxic Gas placard or, as an option when transported in bulk, special Anhydrous Ammonia placard with the words "Anhydrous Ammonia, Inhalation Hazard" on a contrasting background on at least two sides of the vehicle.

SPECIAL SHIPPING INFORMATION:

Cylinders should be transported in a secure position, in a well-ventilated vehicle. Cylinders transported in an enclosed, non-ventilated compartment of a vehicle can present serious safety hazards.

15. Regulatory Information

The following selected regulatory requirements may apply to this product. Not all such requirements are identified. Users of this product are solely responsible for compliance with all applicable federal, provincial, and local regulations. This product has been classified in accordance with the hazard criteria of the CPR and the MSDS contains all the information required by the CPR.

WHMIS (Canada): Class A: Compressed gas.
Class B-1: Flammable gas.
Class D-1A: Material causing immediate and serious toxic effects (Very toxic).
Class E: Corrosive gas.
This product is on the DSL list.

International Regulations:

EINECS: Not available.
DSCL (EEC): R20- Harmful by inhalation.

International Lists: No products were found.

16. Other Information

MIXTURES:

When two or more gases, or liquefied gases are mixed, their hazardous properties may combine to 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 make your safety evaluation of the end product. Remember, gases and liquids have properties which can cause serious injury or death.

HAZARD RATING SYSTEM:

HMIS RATINGS:

HEALTH 3
FLAMMABILITY 1
PHYSICAL HAZARD 2

STANDARD VALVE CONNECTIONS FOR U.S. AND CANADA:

THREADED: CGA-705 standard, CGA-240 standard, CGA-660 limited
PIN-INDEXED YOKE: Not available.
ULTRA-HIGH-INTEGRITY CONNECTION: CGA-720

Use the proper CGA connections. **DO NOT USE ADAPTERS.** Additional limited-standard connections may apply. See CGA pamphlets V-1 and V-7 listed below.

Ask your supplier about free Praxair safety literature as referred to in this MSDS and on the label for this product. Further information about this product can be found in the following pamphlets published by the Compressed Gas Association, Inc. (CGA), 4221 Walney Road, 5th Floor, Chantilly, VA 20151-2923, Telephone (703) 788-2700, Fax (703) 961-1831, website: www.cganet.com.

- AV-1 Safe Handling and Storage of Compressed Gas
- G-2 Anhydrous Ammonia
- G-2.1 ANSI Safety Requirements for the Storage and Handling of Anhydrous Ammonia
- P-1 Safe Handling of Compressed Gases in Containers
- P-14 Accident Prevention in Oxygen-Rich, Oxygen-Deficient Atmosphere
- SB-2 Oxygen-Deficient Atmospheres
- V-1 Compressed Gas Cylinder Valve Inlet and Outlet Connections

V-7 Standard Method of Determining Cylinder Valve Outlet Connections for Industrial Gas Mixtures
--- Handbook of Compressed Gases, Fifth Edition

Praxair asks users of this product to study this MSDS and become aware of 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 MSDS 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.

PREPARATION INFORMATION:

DATE: October 15, 2013
DEPARTMENT: Safety and Environmental Services
TELEPHONE: 905-803-1600

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

Praxair Canada Inc. requests the users of this product to study this Material Data Sheet (MSDS) and become aware of product hazards and safety information. To promote safe use of this product, a user should (1) notify its employees, agents and contractors of the information on this MSDS and any product hazards and safety information, (2) furnish this same information to each of its customers for the product, and (3) request such customers to notify their employees and customers for the product of the same product hazards and safety information.

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Praxair Canada Inc.
1 City Centre Drive
Suite 1200
Mississauga, ON L5B 1M2

Puriblend #4

Safety Data Sheet

Version 1
 January 2014

1 Commercial product name and supplier

1.1	Commercial product name /designation:	Puriblend #4
1.1.1	Synonym:	Activated Carbon HDS with 1 or more pre-registered substances
1.1.2	Molecular formula:	$m \text{ CaO} * n \text{ Na}_2\text{O} * \text{Al}_2\text{O}_3 * 2.5 \text{ SiO}_2 * z \text{ H}_2\text{O}$
1.2	Application / use:	Adsorption of water as well as polar organic and inorganic matters.
1.3	TOX emergency number:	+41 44 251 51 51 (Toxicological Information Centre, CH-8032 Zurich)
1.4	CAS Name CAS No.	Zeolite 1318-02-1
1.5	EINECS-No.	215-283-8
1.6	Product No:	3090

2 Composition

2.1	Chemical characterisation:	Zeolite (CAS No. 1318-02-1; EINECS: 215-283-8) natural mineral binder
2.2	Hazardous components:	Does not contain any dangerous substances according to the criteria of the EC (Council Directive 99/45/EC and 2001/60/EC).
	CAS No. 14808-60-7 quartz Index No.	< 1 % quartz
2.3	Further information:	

3 Hazard Identification

The activated product evolves much heat on contact with water.
 May cause sensitization by inhalation and skin contact.

4 First aid measures

4.1	Eye contact:	Flush copiously with water for at least 15 minutes whilst keeping the eyes wide open.
4.2	Skin contact:	Wash thoroughly with soap and water.
4.3	Ingestion:	Drink a lot of water if large amounts are ingested. Do not induce vomiting. Call a physician and/or transport to emergency facility immediately.
4.4	Inhalation:	Take into fresh air.
4.5	Further information	This product is a desiccant and generates heat when it adsorbs water. The used product can obtain materials of a hazardous nature. Identify that material and treat symptomatically.

5 Fire-fighting measures

5.1	Suitable extinguishing media:	Adapt the fire extinguisher to surroundings
5.2	Extinguishing media to avoid:	Water
5.3	Personal protective equipment:	
5.4	ERI-Cards:	
5.5	Further information:	Non-flammable product.

6 Accidental release measures

Sweep carefully together to minimise dust generation.
Advise water authority if spillage has entered water course or drainage system.

7 Handling and storage

7.1	Handling	No specific requirements.
7.2	Industrial hygiene	Avoid breathing dust. Avoid eye and skin contact. Avoid eating, drinking and storage of foodstuffs in the working room.
7.3	Storage	The product must be kept air tight to avoid loss of activity. Ensure lids are resealed after use.
7.4	Place of storage	Store in a dry place
7.5	Fire- and explosion protection	Take precautions to avoid accumulation of electrostatic charge.

8 Exposure controls / personal protection

8.1	Technical measures	Provide general and/or local exhaust ventilation to control airborne levels below the exposure guidelines.
8.2	Control of threshold limits	
8.3	MAK value	10 mg/m ³ general dust 3 mg/m ³ alveolar dust
8.4	Personal protective equipment	
8.4.1	Respiratory protection	Dust mask
8.4.2	Hand protection	Protective gloves.
8.4.3	Eye protection	Safety glasses.
8.4.4	Other	

9 Physical and chemical properties

9.1	Appearance	Globes
9.2	Color	Beige
9.3	Odour	Odourless
9.4	Change of physical state Test method:	Does not soften below 700 °C
9.5	Density bulk density	600-700 kg/m ³ ISO 787-9
9.6	Vapour pressure	
9.7	Viscosity	
9.8	Solubility in water	< 1 g/l (20°C) insoluble
9.9	pH	9.0 - 11.5 ISO 787-9
9.10	Flash point	not flammable
9.11	Ignition temperature	not flammable
9.12	Explosion limits	Lower: - vol. %
9.13	Further information	Upper: - vol. %

10 Stability and reactivity

10.1	Materials to avoid	Evolves considerable heat on contact with water. (max. 4200 kJ/kg water)
10.2	Conditions to avoid Stability	The product is stable.
10.3	Hazardous decomposition products	None under standard conditions.
10.4	Further information	On unloading used sieve, beware of any impurities and their dangers.

11 Toxicological information

11.1	Acute toxicity	The oral LD50 for rats is > 10'000 mg/kg. The dermal LD50 for rabbits is >2000 mg/kg. The LC50 for inhalation in rats is >18.3 mg/L. Short single exposure is not likely to cause skin irritation. May cause slight eye irritation.
	Irritation / Cauterization	Eyes
11.2	Subacute / chronic toxicity	Based on available data, repeated exposures are not anticipated to cause additional significant adverse effects.
11.3	Further information	The product is an adsorbent. Contact with the skin will dry it out. Heat is evolved on contact with water and this may cause burning. If the MAK-value is exceeded, then an overloading of the respiratory tract is likely.

12 Ecological information

Category of water hazard CH - D nwg
 Toxicity to daphnia LC50 96h: 1800-3200 mg/l
 Toxicity to fish EC50 48h: 1000-1800 mg/l
 Biodegradability n.a.
 Indication of danger: The product is practically insoluble so it is possible to separate by filtration or sedimentation.

13 Disposal considerations

	The used product will have properties other than that of the fresh product. This Safety Datasheet cannot give details about the used product, which should be disposed of in an approved waste disposal site in accordance with the local rules and regulations.	
13.1	EC waste key	This code depends on the industrial application for the product, and, therefore, must be determined by the user.
13.2	Swiss waste code	Not used product gets the waste code 15 02 03
13.3	Origin	

14 Transport information

	Dangerous Goods	yes <input type="checkbox"/> no <input checked="" type="checkbox"/>
14.1	Transport at land: RID / ADR Warning label Packing group Overland statement	Class UN No. Classification code Hazard id. no.
14.2	Transport at sea: IMDG UN No. Class Subsidiary Risk EMS Proper Shipping Name	
14.3	Air transport: ICAO / IATA-GR UN No. Class Subsidiary Risk Hazard Label(s) Packing Group Passenger Aircraft Cargo Aircraft only	Packing Instruction max. Packing Instruction max.
14.4	Further information	Product is not classified for any mode of transportation.

15 Regulatory information

15.1.1	Swiss toxicity class	--
15.1.2	BAG T Nr. / EDV-No.	
15.2	Index-No.	
15.3	Hazard symbols	
15.4	Hazard designation	
15.5	Risk phrases	R: -
15.6	Safety phrases	S: -
15.7	CEA classification	F6 s PN4
15.8	VbF (D)	not flammable
15.9	USA (TSCA) Canada (DSL) Australia (AICS) Japan (ENCS) Korea (ECL)	listed CAS Nr.: 1318-02-1 listed CAS Nr.: 1318-02-1 listed CAS Nr.: 1318-02-1 listed ENCS : 1-508 listed ECL : KE-30974
15.10	Further information	

16 Other information

Abbreviations: n.a. = not applicable; n.d. = not determined; n.cl. = not classified.

The above mentioned data correspond to our present state of knowledge and experience. The safety data sheet serves as description of the products in regard to necessary safety measures. The indications do not imply any guarantee of a property.

91/155/EEC



Material Safety Data Sheet

Issue Date: 11-MAY-2012
Supersedes: 07-FEB-2012

GENGARD GN8141

1 Identification

Identification of substance or preparation

GENGARD GN8141

Product Application Area

Corrosion inhibitor

Company/Undertaking Identification

GE Betz, Inc.
4636 Somerton Road
Trevose, PA 19053
T 215 355-3300, F 215 953 5524

Emergency Telephone

(800) 877-1940

Prepared by Product Stewardship Group: T 215-355-3300 Prepared on: 11-MAY-2012

2 Hazard(s) identification

EMERGENCY OVERVIEW

DANGER

Corrosive to skin. Corrosive to the eyes. Mists/aerosols may cause irritation to upper respiratory tract.

DOT hazard: Corrosive to skin

Odor: Slight Ammonia; Appearance: Amber To Dark Brown, Liquid

Fire fighters should wear positive pressure self-contained breathing apparatus(full face-piece type). Proper fire-extinguishing media: dry chemical, carbon dioxide, foam or water

POTENTIAL HEALTH EFFECTS

ACUTE SKIN EFFECTS:

Primary route of exposure; Corrosive to skin.

ACUTE EYE EFFECTS:

Corrosive to the eyes.

ACUTE RESPIRATORY EFFECTS:

Mists/aerosols may cause irritation to upper respiratory tract.

INGESTION EFFECTS:

May cause severe irritation or burning of mouth, throat, and gastrointestinal tract with severe chest and abdominal pain, nausea, vomiting, diarrhea, lethargy and collapse. Possible death when ingested in very large doses.

TARGET ORGANS:

Prolonged or repeated exposures may cause primary irritant dermatitis and/or toxicity to the lung.

MEDICAL CONDITIONS AGGRAVATED:

Not known.

SYMPTOMS OF EXPOSURE:

May cause redness or itching of skin.

3 Composition / information on ingredients

Information for specific product ingredients as required by the U.S. OSHA HAZARD COMMUNICATION STANDARD is listed. Refer to additional sections of this MSDS for our assessment of the potential hazards of this formulation.

HAZARDOUS INGREDIENTS:

Cas#	Chemical Name	Range (w/w%)
1310-73-2	SODIUM HYDROXIDE Corrosive; toxic (by ingestion)	3-7
202420-04-0	CHLOROTOLYLTRIAZOLE SODIUM SALT May cause mild eye irritation	3-7
68515-73-1	D-GLUCOSE, DECYL OCTYL ETHERS, OLIGOMERIC Irritant (eyes)	1-5

4 First-aid measures

SKIN CONTACT:

URGENT! Wash thoroughly with soap and water. Remove contaminated clothing. Get immediate medical attention. Thoroughly wash clothing before reuse.

EYE CONTACT:

URGENT! Immediately flush eyes with water for 30 minutes while removing contact lenses. Hold eyelids apart. Get immediate medical attention.

INHALATION:

If nasal, throat or lung irritation develops - remove to fresh air and get medical attention.

INGESTION:

Do not feed anything by mouth to an unconscious or convulsive victim. Do not induce vomiting. Immediately contact physician. Rinse mouth with plenty of water. Dilute contents of stomach using 4-10 fluid ounces (120-300 mL) of milk or water.

NOTES TO PHYSICIANS:

Material is corrosive. It may not be advisable to induce vomiting. Possible mucosal damage may contraindicate the use of gastric lavage.

5 Fire-fighting measures

FIRE FIGHTING INSTRUCTIONS:

Fire fighters should wear positive pressure self-contained breathing apparatus (full face-piece type).

EXTINGUISHING MEDIA:

dry chemical, carbon dioxide, foam or water

HAZARDOUS DECOMPOSITION PRODUCTS:

oxides of carbon, nitrogen and phosphorus; hydrogen chloride

FLASH POINT:

> 213F > 101C P-M(CC)

MISCELLANEOUS:

Corrosive to skin

UN 3267;Emergency Response Guide #153

6 Accidental release measures

PROTECTION AND SPILL CONTAINMENT:

Ventilate area. Use specified protective equipment. Contain and absorb on absorbent material. Place in waste disposal container. Flush area with water. Wet area may be slippery. Spread sand/grit.

DISPOSAL INSTRUCTIONS:

Water contaminated with this product may be sent to a sanitary sewer treatment facility, in accordance with any local agreement, a permitted waste treatment facility or discharged under a permit. Product as is - Incinerate or land dispose in an approved landfill.

7 Handling and storage

HANDLING:

Alkaline. Corrosive(Eyes). Do not mix with acidic material.

STORAGE:

Store below 100F (38C). Keep containers closed when not in use. Protect from freezing. If frozen, thaw completely and mix thoroughly prior to use. Store away from acids. Do not store in aluminum containers.

8 Exposure controls / personal protection

EXPOSURE LIMITS

CHEMICAL NAME

SODIUM HYDROXIDE

PEL (OSHA): 2 MG/M3

TLV (ACGIH): TWA (Ceiling) = 2 MG/M3

CHLOROTOLYLTRIAZOLE SODIUM SALT

PEL (OSHA): LIMITS HAVE NOT BEEN ESTABLISHED BY US OSHA.

TLV (ACGIH): LIMITS HAVE NOT BEEN ESTABLISHED BY ACGIH.

D-GLUCOSE, DECYL OCTYL ETHERS, OLIGOMERIC

PEL (OSHA): LIMITS HAVE NOT BEEN ESTABLISHED BY US OSHA.

TLV (ACGIH): LIMITS HAVE NOT BEEN ESTABLISHED BY ACGIH.

ENGINEERING CONTROLS:

Adequate ventilation to maintain air contaminants below exposure limits.

PERSONAL PROTECTIVE EQUIPMENT:

Use protective equipment in accordance with 29CFR 1910 Subpart I

RESPIRATORY PROTECTION:

A RESPIRATORY PROTECTION PROGRAM THAT MEETS OSHA'S 29 CFR 1910.134 AND ANSI Z88.2 REQUIREMENTS MUST BE FOLLOWED WHENEVER WORKPLACE CONDITIONS WARRANT A RESPIRATOR'S USE.

USE AIR PURIFYING RESPIRATORS WITHIN USE LIMITATIONS ASSOCIATED WITH THE EQUIPMENT OR ELSE USE SUPPLIED AIR-RESPIRATORS.

If air-purifying respirator use is appropriate, use any of the following particulate respirators: N95, N99, N100, R95, R99, R100, P95, P99 or P100.

SKIN PROTECTION:

gauntlet-type rubber, butyl or neoprene gloves, chemical resistant apron -- Wash off after each use. Replace as necessary.

EYE PROTECTION:

splash proof chemical goggles, face shield

9 Physical and chemical properties

Spec. Grav. (70F, 21C)	1.241	Vapor Pressure (mmHG)	~ 18.0
Freeze Point (F)	9	Vapor Density (air=1)	< 1.00
Freeze Point (C)	-13		
Viscosity (cps 70F, 21C)	70	% Solubility (water)	100.0

Odor	Slight Ammonia
Appearance	Amber To Dark Brown
Physical State	Liquid
Flash Point	P-M(CC) > 213F > 101C
pH As Is (approx.)	13.6
Evaporation Rate (Ether=1)	< 1.00
Percent VOC:	0.0

NA = not applicable ND = not determined

10 Stability and reactivity

CHEMICAL STABILITY:

Stable under normal storage conditions.

POSSIBILITY OF HAZARDOUS REACTIONS:

Contact with strong acids may cause a violent reaction releasing heat. Contact with water reactive compounds may cause fire or explosion.

INCOMPATIBILITIES:

May react with acids or strong oxidizers.

DECOMPOSITION PRODUCTS:

oxides of carbon, nitrogen and phosphorus; hydrogen chloride

11 Toxicological information

Oral LD50 RAT: 2970 mg/kg
NOTE - Calculated value according to GHS additivity formula
Dermal LD50 RABBIT: >5000 mg/kg
NOTE - Calculated value according to GHS additivity formula

12 Ecological information

AQUATIC TOXICOLOGY

Daphnia magna 48 Hour Static Renewal Bioassay (pH adjusted)
LC50= 386; No Effect Level= 125 mg/L
Fathead Minnow 96 Hour Static Renewal Bioassay (pH adjusted)
LC50= 142; No Effect Level= 125 mg/L
Rainbow Trout 96 Hour Static Renewal Bioassay (pH adjusted)
LC50= 65; No Effect Level= 50 mg/L

BIODEGRADATION

BOD-28 (mg/g): 31
BOD-5 (mg/g): 15
COD (mg/g): 244
TOC (mg/g): 77

13 Disposal considerations

If this undiluted product is discarded as a waste, the US RCRA hazardous waste identification number is :
D002=Corrosive(pH).

Please be advised; however, that state and local requirements for waste disposal may be more restrictive or otherwise different from federal regulations. Consult state and local regulations regarding the proper disposal of this material.

14 Transport information

Transportation Hazard: Corrosive to skin
DOT: CORROSIVE LIQUID, BASIC, ORGANIC, N.O.S. (ACRYLATE TERPOLYMER, SODIUM HYDROXIDE)
8, UN3267, PG III, RQ
DOT EMERGENCY RESPONSE GUIDE #: 153
Note: Some containers may be DOT exempt, please check BOL for exact container classification
IATA: CORROSIVE LIQUID, BASIC, ORGANIC, N.O.S. (ACRYLATE TERPOLYMER, SODIUM HYDROXIDE)
8, UN3267, PG III
IMDG: CORROSIVE LIQUID, BASIC, ORGANIC, N.O.S. (ACRYLATE TERPOLYMER, SODIUM HYDROXIDE)
8, UN3267, PG III

15 Regulatory information

TSCA:

All components of this product are included on or are in compliance with the U.S. TSCA regulations.

CERCLA AND/OR SARA REPORTABLE QUANTITY (RQ) :

2,053 gallons due to SODIUM HYDROXIDE;

NSF Registered and/or meets USDA (according to 1998 Guidelines):

Registration number: 145783

Category Code(s):

G5 Cooling and retort water treatment products - all food processing areas

G7 Boiler treatment products - all food processing areas/nonfood contact

SARA SECTION 312 HAZARD CLASS:

Immediate(acute);Delayed(Chronic)

SARA SECTION 302 CHEMICALS:

No regulated constituent present at OSHA thresholds

SARA SECTION 313 CHEMICALS:

No regulated constituent present at OSHA thresholds

CALIFORNIA REGULATORY INFORMATION

CALIFORNIA SAFE DRINKING WATER AND TOXIC

ENFORCEMENT ACT (PROPOSITION 65) :

This product contains one or more ingredients at trace levels known to the state of California to cause cancer.

MICHIGAN REGULATORY INFORMATION

No regulated constituent present at OSHA thresholds

16 Other information

HMIS vII

CODE TRANSLATION

Health	3	Serious Hazard
Fire	1	Slight Hazard
Reactivity	0	Minimal Hazard
Special	CORR	DOT corrosive
(1) Protective Equipment	D	Goggles,Face Shield,Gloves,Apron

(1) refer to section 8 of MSDS for additional protective equipment recommendations.

CHANGE LOG

	EFFECTIVE DATE	REVISIONS TO SECTION:	SUPERCEDES
	-----	-----	-----
MSDS status:	14-SEP-2010		** NEW **
	01-FEB-2011	8	14-SEP-2010
	08-MAR-2011	10,12	01-FEB-2011
	05-APR-2011	11	08-MAR-2011
	01-JUL-2011	3,8	05-APR-2011
	07-FEB-2012	2,4,5,8,14,16	01-JUL-2011
	11-MAY-2012	2,4,5,8,14,16,15	07-FEB-2012

Carbonblend #2

Safety Data Sheet

Version 1

January 2014

Section 1: Identification of the substance/mixture and of the company/undertaking

1.1. Product identifier	
Product name:	Carbonblend #2
REACH registered name:	Activated Carbon HDS
REACH registered number(s):	01-2119488894-16-0007/8
CAS number:	7440-44-0
EINECS number:	931-328-0
Product code:	7274

1.2. Relevant identified uses of the substance or mixture and uses advised against	
Use of substance / mixture:	Adsorbent

1.3. Supplier of safety data sheet	
Company name:	Union Engineering a/s Snaremoosevej 27 DK-7000 Fredericia
Tel:	+45 7620 7700
Fax:	+45 7620 7800
Email:	union@union.dk
Web:	www.union.dk

Section 2: Hazards identification

2.1. Classification of the substance or mixture	
Classification under CLP:	This product has no classification under CLP

2.2. Label elements	
Label elements:	This product has no label elements.

2.3. Other hazards

Other hazards:	Caution - Wet activated carbon removes oxygen from air causing severe hazard to workers inside vessels or enclosed or confined spaces containing activated carbon. Before entering such an area, follow the sampling and work procedures for low oxygen levels. Contact with airborne dust may be slightly irritating to eyes and respiratory tract. Observe all local and national regulations. PBT: This substance is not identified as a PBT substance.
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Section 3: Composition/information on ingredients

3.1. Description of composition/information on ingredients

Chemical identity:	ACTIVATED CARBON HDS (*WEL)
CAS number:	7440-44-0
EINECS number:	931-328-0
Contains:	NON-CLASSIFIED SUBSTANCE UNDER GHS/CLP

Section 4: First aid measures

4.1. Description of first aid measures

Skin Contact:	Wash immediately with plenty of soap and water
Eye contact:	Bathe the eye with running water for 15 minutes
Ingestion:	Wash out mouth with water
Inhalation:	Remove casualty from exposure ensuring one's own safety whilst doing so

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

Skin Contact:	There may be mild irritation at the site of contact
Eye contact:	There may be irritation and redness
Ingestion:	No symptoms.
Inhalation:	There may be irritation of the throat with a feeling of tightness in the chest
Delayed/immediate effects:	Not applicable

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

Immediate / special treatment:	Not applicable.
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Section 5: Fire-fighting measures

5.1. Extinguishing media

Extinguishing media:	Water. Water spray. Carbon dioxide. Alcohol or polymer foam. Dry chemical powder.
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5.2. Special hazards arising from the substance or mixture

Exposure hazards:	In combustion emits toxic fumes of carbon dioxide / carbon monoxide.
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5.3. Advice for fire-fighters

Advice for fire-fighters:	Wear self-contained breathing apparatus
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Section 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

Personal precautions:	Refer to section 8 of SDS for personal protection details
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6.2. Environmental precautions

Environmental precautions:	Do not discharge into drains or rivers
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6.3. Methods and material for containment and cleaning up

Clean-up procedures:	Transfer to a suitable container
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6.4. Reference to other sections

Section 7: Handling and storage

7.1. Precautions for safe handling

Handling requirements:	Avoid direct contact with the substance. Avoid the formation or spread of dust in the air. Ensure there is sufficient ventilation of the area. Smoking is forbidden.
------------------------	--

7.2. Conditions for safe storage, including any incompatibilities

Storage conditions:	Store in cool, well-ventilated area. Keep away from sources of ignition. Keep container tightly closed. Avoid incompatible materials and conditions - see section 10 of SDS.
Suitable packaging:	Must only be kept in original packaging.

Section 8: Exposure controls/personal protection

8.1. Control parameters

Workplace exposure limits:

Respirable dust:

State	Workplace exposure limits:		Respirable dust:	
	8 hour TWA	15 min. STEL	8 hour TWA	15 min. STEL
EU	3 mg/m ³	-	1 mg/m ³	-

8.2. Exposure controls

Engineering measures:	Ensure there is sufficient ventilation of the area.
Respiratory protection:	Approved particulate filter is recommended if excessive dust is generated.
Hand protection:	Protective gloves.
Eye protection:	Safety glasses with side-shields. Safety goggles. Ensure eye bath is to hand.
Skin protection:	Protective clothing with elasticated cuffs and closed neck.
Environmental:	Prevent from entering in public sewers or the immediate environment.

Section 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

State:	Non-powder
Colour:	Black
Odour:	Odourless
Solubility in water:	Insoluble

9.2. Other information

Other information:	No data available
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Section 10: Stability and reactivity

10.1. Reactivity

Reactivity:	Stable under recommended transport or storage conditions
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10.2. Chemical stability

Chemical stability:	Stable under normal conditions.
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10.3. Possibility of hazardous reactions

Hazardous reactions:	Hazardous reactions will not occur under normal transport or storage conditions.
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10.4. Conditions to avoid

Conditions to avoid:	Sources of ignition.
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10.5. Incompatible materials

Materials to avoid:	Strong oxidising agents.
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10.6. Hazardous decomposition products

Haz. decomp. products:	In combustion emits toxic fumes of carbon dioxide / carbon monoxide.
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Section 11: Toxicological information

11.1. Information on toxicological effects

Toxicity values:

Route:	Species:	Test:	Value:	Units:
ORAL	RAT	LD50	>2000	mg/kg
DUST/MIST	RAT	1H LC50	>64.4	mg/l
DERMAL	RBT	-	0	Skin irritant index

11.2. Symptoms / routes of exposure

Skin contact:	There may be mild irritation at the site of contact.
Eye contact:	There may be irritation and redness.
Ingestion:	No symptoms.
Inhalation:	There may be irritation of the throat with a feeling of tightness in the chest.
Delayed/immediate effects:	Not applicable.
Other information:	Not applicable.

Section 12: Ecological information

12.1. Toxicity

Species:	Test_	Value:	Units:
FISH	96H LC50	Exempt	-
DAPHNIA	48H EC50	Exempt	-
ALGAE	72H IC50	Exempt	-

12.2. Persistence and degradability

Persistence and degradability:	Not biodegradable.
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12.3. Bioaccumulative potential

Bioaccumulative potential	No bioaccumulation potential.
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12.4. Mobility in soil

Mobility:	Insoluble in water. Non-volatile.
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12.5. Results of PBT and vPvB assessment

PBT identification:	This substance is not identified as a PBT substance.
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12.6. Other adverse effects

Other adverse effects:	Negligible ecotoxicity.
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Section 13: Disposal considerations

13.1. Waste treatment methods

Disposal operations:	Land treatment (e.g. biodegradation of liquid or sludge discards in soils, etc.).
Waste code number:	15 02 03
Disposal of packaging:	Dispose of as normal industrial waste.
NB:	The user's attention is drawn to the possible existence of regional or national regulations regarding disposal.

Section 14: Transport information

Transport class:	This product does not require a classification for transport.
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Section 15: Regulatory information

15.1. Safety, health and environmental regulations/legislation specific for the substance or mixture

Specific regulations:	Not applicable.
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15.2. Chemical Safety Assessment

Chemical safety assessment:	A chemical safety assessment has been carried out for the substance or the mixture by the supplier.
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Section 16: Other information

16.1. Other information

Other information:	This safety data sheet is prepared in accordance with Commission Regulation (EU) No 453/2010. Not classified as UN1362 for transport purposes, exemption under special provisions 646 (ADR), 925 (IMDG) and A3 (IATA) * indicates text in the SDS which has changed since the last revision.
Legal disclaimer:	The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. Union Engineering provides no warranty with respect to this information and disclaims all liability associated with its use.

-----end-----

Carbonblend #7

Safety Data Sheet

Version 1
 January 2014

Section 1: Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier	
Product name:	Carbonblend #7
REACH registered name:	Activated Carbon
REACH registered number(s):	01-2119488894-16-0009
CAS number:	7440-44-0
EINECS number:	931-328-0

1.2 Relevant identified uses of the substance or mixture and uses advised against	
Use of substance / mixture:	Adsorbent

1.3 Supplier of safety data sheet	
Company name:	Union Engineering a/s Snaremoosevej 27 DK-7000 Fredericia
Tel:	+45 7620 7700
Fax:	+45 7620 7800
Email:	union@union.dk
Web:	www.union.dk

Section 2: Hazards identification

2.1 Classification of the substance or mixture	
Classification according to Regulation (EC) No 1272/2008	The product is not classified according to the CLP regulation.
Classification according to Directive 67/548/EEC or Directive 1999/45/EC	The product is not a dangerous substance according to Directive 67/548/EEC. Void
Classification system:	The classification is in line with current EC lists. It is expanded, however, by information from technical literature and by information furnished by supplier companies.

2.2 Label elements

Labelling according to Regulation (EC) No 1272/2008:	Void
Hazard pictograms	Void
Signal word	Void
Hazard statements	Void

2.3 Other hazards

Results of PBT and vPvB assessment	
PBT:	Not applicable.
vPvB:	Not applicable.

Section 3: Composition/information on ingredients

3.1 Mixtures

Chemical characterization: Substances	Activated carbon, water steam activated (High Density Skeleton) - activated carbon, extruded
Chemical characterization:	Mixtures
Dangerous components:	Void

Non-dangerous components		
CAS: 7440-44-0 EINECS: 931-328-0	Carbon	> 50%

Section 4: First aid measures

4.1 Description of first aid measures

General information	Take affected persons into the open air.
After inhalation	Supply fresh air; consult doctor in case of symptoms.
After skin contact	The product is not skin irritating.
After eye contact	Rinse opened eye for several minutes under running water.
After swallowing	Rinse out mouth and then drink plenty of water.

Section 5: Fire-fighting measures

5.1 Extinguishing media

Suitable extinguishing agents:	Water spray jet. Foam
For safety reasons unsuitable extinguishing agents	Carbon dioxide
Special hazards arising from the substance or mixture	Can be released in case of fire: carbon monoxide (CO) carbon dioxide (CO ₂)
Advice for firefighters Protective equipment:	No special measures required.

Section 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures

Personal precautions:	Avoid causing dust. Ensure adequate ventilation
Environmental precautions:	No special measures required
Methods and material for containment and cleaning up:	Collect mechanically. Dispose of contaminated material as waste according to chapter 13
Reference to other sections	No dangerous materials are released.

Section 7: Handling and storage

7.1 Precautions for safe handling

Precautions for safe handling	No special measures required.
Information about protection against explosions and fires:	Keep ignition sources away - Do not smoke.

7.2 Conditions for safe storage, including any incompatibilities

Requirements to be met by storerooms and containers:	Store only in the original container.
Information about storage in one common storage facility:	Keep separately from oxidizing agents, solvents and other chemicals.
Further information about storage conditions:	Store under dry conditions

Section 8: Exposure controls/personal protection

8.1 Control parameters

Additional information about design of technical systems:	No further data; see chapter 7.
Control parameters	
Components with critical values that require monitoring at the workplace:	7440-44-0 carbon WEL Long-term value: 10* 4** mg/m ³
Additional information:	The lists that were valid during the compilation were used as basis

8.2 Exposure controls

Personal protective equipment	Ensure there is sufficient ventilation of the area.
General protective and hygienic measures	The usual precautionary measures should be adhered to in handling the chemicals. Wash hands during breaks and at the end of the work. Use skin protection cream for preventive skin protection.
Breathing equipment:	Use breathing protection with high concentrations. Short term filter device: Filter P2.
Protection of hands:	Protective gloves. The glove material has to be impermeable and resistant to the product/ the substance/ the preparation. Due to missing tests no recommendation to the glove material can be given for the product/ the preparation/ the chemical mixture. Selection of the glove material on consideration of the penetration times, rates of diffusion and the degradation

Material of gloves	Leather gloves
Penetration time of glove material	The selection of the suitable gloves does not only depend on the material, but also on further marks of quality and varies from manufacturer to manufacturer.
Eye protection:	Safety glasses recommended during refilling.
Body protection:	Protective work clothing.

Section 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

General Information:

Appearance: Form: Colour:	Solid Black
Smell:	Characteristic
pH-value	Not determined
Change in condition Melting point/Melting range: Boiling point/Boiling range:	Not determined Not determined
Flash point:	Not applicable
Inflammability (solid, gaseous)	Product is flammable
Ignition temperature:	>250°C
Critical values for explosion: Lower: Upper:	Not determined Not applicable
Steam pressure:	Not applicable
Density	Not determined
Settled apparent density at 20°C	300-550 kg/m ³
Solubility in / Miscibility with Water:	Unsoluble
Viscosity: Dynamic:	Not applicable

Section 10: Stability and reactivity

10.1 Reactivity

Reactivity:	
Chemical stability	
Thermal decomposition / conditions to be avoided:	No decomposition if used according to specifications.
Possibility of hazardous reactions	The product is not capable of dust explosion in the form supplied; enrichment with fine dust causes risk of dust explosion
Hazardous decomposition products:	Carbon monoxide and carbon dioxide

Section 11: Toxicological information

11.1 Information on toxicological effects

Information on toxicological effects

Acute toxicity:

LD/LC50 values that are relevant for classification:

7440-44-0 carbon

Oral	LD50	>2000 mg/kg (rat, female) OECD 401
Inhalative	LC50/4h	>64.4 mg/l (rat)

11.2 Primary Irritant effect:

Skin contact:	No irritant effect.
Eye contact:	No irritant effect.
Sensitization:	No sensitizing effect known.
Additional toxicological information:	When used and handled according to specifications, the product does not have any harmful effects according to our experience and the information provided to us. The material is not subject to classification according to EC lists in the last version.

Section 12: Ecological information

12.1 Toxicity

Acquatic toxicity:	Not determined
Additional ecological information:	
General notes:	not hazardous for water
Results of PBT and vPvB assessment:	
PBT:	Not applicable
vPvB:	Not applicable

Section 13: Disposal considerations

13.1 Waste treatment methods

Recommendation	Contact manufacturer for recycling information. Disposal according to official regulations.
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European waste catalogue

06 00 00	WASTES FROM INORGANIC CHEMICAL PROCESSES
06 13 00	wastes from inorganic chemical processes not otherwise specified
06 13 02*	spent activated carbon (except 06 07 02)

13.2 Uncleaned packagings:

Recommendation	Disposal must be made according to official regulations.
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Section 14: Transport information

14.1 Transport information

Land transport ADR/RID and GGVS/GGVE (cross-border/domestic) ADR/RID Class:	-
Maritime transport IMDG: IMDG Class: Marine pollutant: No	- No
Air transport ICAO-TI and IATA-DGR: ICAO/IATA Class:	-
UN "Model Regulation"	-
Special precautions for user	Not applicable
Transport/Additional information:	Not dangerous according to the above regulations.

Section 15: Regulatory information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

National regulations	
Water hazard class:	Not hazardous for water.
Chemical safety assessment:	A Chemical Safety Assessment has not been carried out.

15.2 Chemical Safety Assessment

Chemical safety assessment:	A chemical safety assessment has not been carried out for the substance or the mixture by the supplier.
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Section 16: Other information

16.1 Other information

These data are based on our present knowledge. However, they shall not constitute a guarantee for any specific product features and shall not establish a legally valid contractual relationship.	
Department issuing data specification sheet:	Product safety department
Abbreviations and acronyms:	<p>ADR: Accord européen sur le transport des marchandises dangereuses par Route (European Agreement concerning the International Carriage of Dangerous Goods by Road) RID: Règlement international concernant le transport des marchandises dangereuses par chemin de fer (Regulations Concerning the International Transport of Dangerous Goods by Rail) IMDG: International Maritime Code for Dangerous Goods IATA: International Air Transport Association IATA-DGR: Dangerous Goods Regulations by the "International Air Transport Association" (IATA) ICAO: International Civil Aviation Organization ICAO-TI: Technical Instructions by the "International Civil Aviation Organization" (ICAO) GHS: Globally Harmonized System of Classification and Labelling of Chemicals EINECS: European Inventory of Existing Commercial Chemical Substances CAS: Chemical Abstracts Service (division of the American Chemical Society) LC50: Lethal concentration, 50 percent LD50: Lethal dose, 50 percent</p>

-----end-----

Nitrogen, Refrigerated Liquid

Safety Data Sheet P-4630

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

Date of issue: 01/01/1979 Revision date: 10/03/2014 Supersedes: 12/01/2013

SECTION 1: Product and company identification

1.1. Product identifier

Product form : Substance
Name : Nitrogen, Refrigerated Liquid
CAS No : 7727-37-9
Formula : N₂
Other means of identification : Nitrogen (cryogenic liquid), Nitrogen, Medipure Liquid Nitrogen

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

Use of the substance/mixture : Medical applications.
Industrial use
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 Emergencies: 1-800-645-4633
CHEMTREC: USA 1-800-424-9300, International 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.
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 cold insulating gloves, face shield, eye protection
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.

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

Nitrogen, Refrigerated Liquid

Safety Data Sheet P-4630

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

Date of issue: 01/01/1979 Revision date: 10/03/2014 Supersedes: 12/01/2013

SECTION 3: Composition/information on ingredients

3.1. Substance

Name	Product identifier	%
Nitrogen, Refrigerated Liquid (Main constituent)	(CAS No) 7727-37-9	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.
- Specific methods : Use fire control measures appropriate for the surrounding fire. Exposure to fire and heat radiation may cause gas receptacles to rupture. Cool endangered receptacles with water spray jet from a protected position. Prevent water used in emergency cases from entering sewers and drainage systems. Exposure to fire may cause containers to rupture/explode. Stop flow of product if safe to do so. 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.
- 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. Containers are equipped with a pressure relief device. (Exceptions may exist where authorized by DOT.).

Nitrogen, Refrigerated Liquid

Safety Data Sheet P-4630

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

Date of issue: 01/01/1979 Revision date: 10/03/2014 Supersedes: 12/01/2013

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

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

7.3. Specific end use(s)

None.

SECTION 8: Exposure controls/personal protection

8.1. Control parameters

Nitrogen, Refrigerated Liquid (7727-37-9)	
ACGIH	Not established
USA OSHA	Not established

Nitrogen, Refrigerated Liquid

Safety Data Sheet P-4630

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

Date of issue: 01/01/1979 Revision date: 10/03/2014 Supersedes: 12/01/2013

8.2. Exposure controls

Appropriate engineering controls	: Oxygen detectors should be used when asphyxiating gases may be released. 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	: 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	: Self contained breathing apparatus (SCBA) or positive pressure airline with mask are to be used in oxygen-deficient atmospheres.
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 safety shoes while handling containers.

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

Physical state	: Gas
Appearance	: Colorless liquid.
Molecular mass	: 28 g/mol
Color	: Colorless liquid.
Odor	: No data available
Odor threshold	: No data available
pH	: Not applicable.
Relative evaporation rate (butyl acetate=1)	: No data available
Relative evaporation rate (ether=1)	: Not applicable.
Melting point	: -210 °C
Freezing point	: No data available
Boiling point	: -195.8 °C
Flash point	: No data available
Critical temperature	: -149.9 °C
Auto-ignition temperature	: Not applicable.
Decomposition temperature	: No data available
Flammability (solid, gas)	: No data available
Vapor pressure	: Not applicable.
Critical pressure	: 3390 kPa
Relative vapor density at 20 °C	: No data available
Relative density	: 0.8
Specific gravity / density	: 808.5 kg/m ³ Liquid density at boiling point and 1 atm
Relative gas density	: 0.97
Solubility	: Water: 20 mg/l
Log Pow	: Not applicable.
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

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

Nitrogen, Refrigerated Liquid

Safety Data Sheet P-4630

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

Date of issue: 01/01/1979 Revision date: 10/03/2014 Supersedes: 12/01/2013

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

Avoid high temperatures, exposure to Lithium (Li), Neodymium (Nd), Titanium (Ti), Magnesium.

10.5. Incompatible materials

None.

10.6. Hazardous decomposition products

Under certain conditions, nitrogen can react violently with lithium, neodymium, titanium (above 1472°F/800°C), and magnesium to form nitrides. At high temperature, it can also combine with oxygen and hydrogen.

SECTION 11: Toxicological information

11.1. Information on toxicological effects

Acute toxicity	: Not classified
Skin corrosion/irritation	: Not classified
	pH: Not applicable.
Serious eye damage/irritation	: Not classified
	pH: Not applicable.
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

Nitrogen, Refrigerated Liquid (7727-37-9)	
Persistence and degradability	No ecological damage caused by this product.

12.3. Bioaccumulative potential

Nitrogen, Refrigerated Liquid (7727-37-9)	
Log Pow	Not applicable.
Log Kow	Not applicable.
Bioaccumulative potential	No ecological damage caused by this product.

12.4. Mobility in soil

Nitrogen, Refrigerated Liquid (7727-37-9)	
Mobility in soil	No data available.

Nitrogen, Refrigerated Liquid

Safety Data Sheet P-4630

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

Date of issue: 01/01/1979 Revision date: 10/03/2014 Supersedes: 12/01/2013

Nitrogen, Refrigerated Liquid (7727-37-9)

Ecology - soil	No ecological damage caused by this product.
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12.5. Other adverse effects

Other adverse effects : Can cause frost damage to vegetation.
 Effect on ozone layer : None.
 Effect on the global warming : No known effects from this product.

SECTION 13: Disposal considerations

13.1. Waste treatment methods

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

SECTION 14: Transport information

In accordance with DOT

Transport document description : UN1977 Nitrogen, refrigerated liquid cryogenic liquid, 2.2
 UN-No.(DOT) : UN1977
 Proper Shipping Name (DOT) : Nitrogen, refrigerated liquid
 cryogenic 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



DOT Special Provisions (49 CFR 172.102) :

- 345 - "Nitrogen, refrigerated liquid (cryogenic liquid), UN1977" transported in open cryogenic receptacles with a maximum capacity of 1 L are not subject to the requirements of this subchapter. The receptacles must be constructed with glass double walls having the space between the walls vacuum insulated and each receptacle must be transported in an outer packaging with sufficient cushioning and absorbent materials to protect the receptacle from damage.
- 346 - "Nitrogen, refrigerated liquid (cryogenic liquid), UN1977" transported in accordance with the requirements for open cryogenic receptacles in §173.320 and this special provision are not subject to any other requirements of this subchapter. The receptacle must contain no hazardous materials other than the liquid nitrogen which must be fully absorbed in a porous material in the receptacle.
- 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 : 121 (UN1066);120 (UN1977)
 Other information : No supplementary information available.

Nitrogen, Refrigerated Liquid

Safety Data Sheet P-4630

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

Date of issue: 01/01/1979 Revision date: 10/03/2014 Supersedes: 12/01/2013

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) : 1977
 Proper Shipping Name (IMDG) : NITROGEN, REFRIGERATED LIQUID
 Class (IMDG) : 2.2 - Non-flammable, non-toxic gases
 MFAG-No : 120

Air transport

UN-No.(IATA) : 1977
 Proper Shipping Name (IATA) : NITROGEN, 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

Nitrogen, Refrigerated Liquid (7727-37-9)	
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

Nitrogen, Refrigerated Liquid (7727-37-9)	
Listed on the Canadian DSL (Domestic Substances List)	
WHMIS Classification	Class A - Compressed Gas

EU-Regulations

Nitrogen, Refrigerated Liquid (7727-37-9)	
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

Full text of H-phrases: see section 16

Classification according to Directive 67/548/EEC [DSD] or 1999/45/EC [DPD]

Not classified

15.2.2. National regulations

Nitrogen, Refrigerated Liquid (7727-37-9)	
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 Korean ECL (Existing Chemicals List)	
Listed on NZIoC (New Zealand Inventory of Chemicals)	
Listed on PICCS (Philippines Inventory of Chemicals and Chemical Substances)	

15.3. US State regulations

Nitrogen, Refrigerated Liquid(7727-37-9)	
U.S. - California - Proposition 65 - Carcinogens List	No
U.S. - California - Proposition 65 - Developmental	No

Nitrogen, Refrigerated Liquid

Safety Data Sheet P-4630

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

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Nitrogen, Refrigerated Liquid(7727-37-9)	
Toxicity	
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 : 10/3/2014 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:

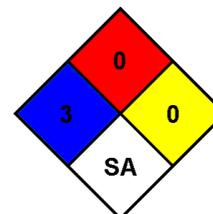
Refrigerated liquefied gas	Gases under pressure Refrigerated liquefied gas
H281	CONTAINS REFRIGERATED GAS; MAY CAUSE CRYOGENIC BURNS OR INJURY

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.





Nitrogen, Refrigerated Liquid

Safety Data Sheet P-4630

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

Date of issue: 01/01/1979 Revision date: 10/03/2014 Supersedes: 12/01/2013

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.

SECTION 1: Product and company identification

1.1. Product identifier

Product form : Substance
Name : Nitrogen, compressed
CAS No : 7727-37-9
Formula : N₂
Other means of identification : Dinitrogen, Refrigerant R728, Nitrogen, Medipure Nitrogen, Extendapak Nitrogen

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 Emergencies: 1-800-645-4633
CHEMTREC: USA 1-800-424-9300, International 001-703-527-3887 (Collect calls accepted, contract 17729)

SECTION 2: Hazards identification

2.1. Classification of the substance or mixture

Classification (GHS-US)

Compressed gas H280
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) : OSHA-H01 - MAY DISPLACE OXYGEN AND CAUSE RAPID SUFFOCATION.
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.
CGA-PG05 - Use a back flow preventive device in the piping.
CGA-PG10 - Use only with equipment rated for cylinder pressure.
CGA-PG06 - Close valve after each use and when empty.
CGA-PG02 - Protect from sunlight when ambient temperature exceeds 52°C (125°F).

2.3. Other hazards

No additional information available

2.4. Unknown acute toxicity (GHS-US)

No data available

SECTION 3: Composition/information on ingredients

3.1. Substance

Nitrogen, compressed

Safety Data Sheet

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

Name	Product identifier	%
Nitrogen, compressed (Main constituent)	(CAS No) 7727-37-9	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 : Adverse effects not expected from this product.
- 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 : Under certain conditions, nitrogen can react violently with lithium, neodymium, titanium (above 1472°F/800°C), and magnesium to form nitrides. At high temperature, it can also combine with oxygen and hydrogen.

5.3. Advice for firefighters

- Firefighting instructions : 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 : Standard protective clothing and equipment (Self Contained Breathing Apparatus) for fire fighters.
- Specific methods : Use fire control measures appropriate for the surrounding fire. Exposure to fire and heat radiation may cause gas receptacles to rupture. Cool endangered receptacles with water spray jet from a protected position. Prevent water used in emergency cases from entering sewers and drainage systems. Stop flow of product if safe to do so. Use water spray or fog to knock down fire fumes if possible.

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

- General measures : Evacuate area. Ensure adequate air ventilation. Wear self-contained breathing apparatus when entering area unless atmosphere is proved 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

No additional information available

Nitrogen, compressed

Safety Data Sheet

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

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.

7.3. Specific end use(s)

None.

SECTION 8: Exposure controls/personal protection

8.1. Control parameters

Nitrogen, compressed (7727-37-9)	
ACGIH	Not established
USA OSHA	Not established

8.2. Exposure controls

Appropriate engineering controls : Oxygen detectors should be used when asphyxiating gases may be released. 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 : Wear working gloves when handling gas containers.

Eye protection : Wear safety glasses with side shields.

Respiratory protection : Self contained breathing apparatus (SCBA) or positive pressure airline with mask are to be used in oxygen-deficient atmospheres.

Thermal hazard protection : None necessary.

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 : Gas

Nitrogen, compressed

Safety Data Sheet

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

Appearance	: Colorless gas.
Molecular mass	: 28 g/mol
Color	: Colorless.
Odor	: No data available
Odor threshold	: No data available
pH	: Not applicable.
Relative evaporation rate (butyl acetate=1)	: No data available
Relative evaporation rate (ether=1)	: Not applicable.
Melting point	: -210 °C
Freezing point	: No data available
Boiling point	: -195.8 °C
Flash point	: No data available
Critical temperature	: -149.9 °C
Auto-ignition temperature	: Not applicable.
Decomposition temperature	: No data available
Flammability (solid, gas)	: No data available
Vapor pressure	: Not applicable.
Critical pressure	: 3390 kPa
Relative vapor density at 20 °C	: No data available
Relative density	: No data available
Specific gravity / density	: 1.16 kg/m ³
Relative gas density	: 0.97
Solubility	: Water: 20 mg/l
Log Pow	: Not applicable.
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

Gas group	: Compressed gas
Additional information	: None.

SECTION 10: Stability and reactivity

10.1. Reactivity

Under certain conditions, nitrogen can react violently with lithium, neodymium, titanium (above 1472°F/800°C), and magnesium to form nitrides. At high temperature, it can also combine with oxygen and hydrogen.

10.2. Chemical stability

Stable under normal conditions.

10.3. Possibility of hazardous reactions

May occur.

10.4. Conditions to avoid

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

10.5. Incompatible materials

None.

10.6. Hazardous decomposition products

None.

Nitrogen, compressed

Safety Data Sheet

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

SECTION 11: Toxicological information

11.1. Information on toxicological effects

Acute toxicity	: Not classified
Skin corrosion/irritation	: Not classified pH: Not applicable.
Serious eye damage/irritation	: Not classified pH: Not applicable.
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

Nitrogen, compressed (7727-37-9)

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

Nitrogen, compressed (7727-37-9)

Log Pow	Not applicable.
Log Kow	Not applicable.
Bioaccumulative potential	No ecological damage caused by this product.

12.4. Mobility in soil

Nitrogen, compressed (7727-37-9)

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

12.5. Other adverse effects

Effect on ozone layer : None.

Effect on the global warming : None.

SECTION 13: Disposal considerations

13.1. Waste treatment methods

Waste treatment methods	: May be vented to atmosphere in a well ventilated place. Consult supplier for specific recommendations. Do not discharge into any place where its accumulation could be dangerous. Contact supplier if guidance is required.
Waste disposal recommendations	: Dispose of contents/container in accordance with local/regional/national/international regulations. Contact supplier for any special requirements.

SECTION 14: Transport information

In accordance with DOT	
Transport document description	: UN1066 Nitrogen, compressed, 2.2
UN-No.(DOT)	: UN1066

10/09/2014

EN (English US)

SDS ID: P-4631

5/8

Nitrogen, compressed

Safety Data Sheet

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

Proper Shipping Name (DOT)	: Nitrogen, compressed
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



Additional information

Emergency Response Guide (ERG) Number	: 121 (UN1066);120 (UN1977)
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)	: 1066
Proper Shipping Name (IMDG)	: NITROGEN, COMPRESSED
Class (IMDG)	: 2 - Gases
MFAG-No	: 121

Air transport

UN-No.(IATA)	: 1066
Proper Shipping Name (IATA)	: NITROGEN, COMPRESSED
Class (IATA)	: 2
Civil Aeronautics Law	: Gases under pressure/Gases nonflammable nontoxic under pressure

SECTION 15: Regulatory information

15.1. US Federal regulations

Nitrogen, compressed (7727-37-9)	
Listed on the United States TSCA (Toxic Substances Control Act) inventory	
SARA Section 311/312 Hazard Classes	Sudden release of pressure hazard

15.2. International regulations

CANADA

Nitrogen, compressed (7727-37-9)	
Listed on the Canadian DSL (Domestic Substances List)	
WHMIS Classification	Class A - Compressed Gas

EU-Regulations

Nitrogen, compressed (7727-37-9)	
Listed on the EEC inventory EINECS (European Inventory of Existing Commercial Chemical Substances)	

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

Compressed gas H280

Full text of H-phrases: see section 16

Classification according to Directive 67/548/EEC [DSD] or 1999/45/EC [DPD]

Not classified

Nitrogen, compressed

Safety Data Sheet

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

15.2.2. National regulations

Nitrogen, compressed (7727-37-9)

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 Korean ECL (Existing Chemicals List)
Listed on NZIoC (New Zealand Inventory of Chemicals)
Listed on PICCS (Philippines Inventory of Chemicals and Chemical Substances)

15.3. US State regulations

Nitrogen, compressed(7727-37-9)

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 : 10/3/2014 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:

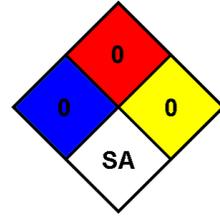
Compressed gas	Gases under pressure Compressed gas
H280	CONTAINS GAS UNDER PRESSURE; MAY EXPLODE IF HEATED

Nitrogen, compressed

Safety Data Sheet

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

NFPA health hazard	: 0 - Exposure under fire conditions would offer no hazard beyond that of ordinary combustible materials.
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	: 0 Minimal Hazard - No significant risk to health
Flammability	: 0 Minimal Hazard
Physical	: 3 Serious 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)

<i>Ingredient</i>	<i>CAS#</i>	<i>ACGIH TLV (TWA)</i>	<i>% Concentration</i>
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 1.3×10^{-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.

To obtain revised copies of this or other Material Safety Data Sheets, contact your nearest Brenntag Canada Regional office.

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



Material Safety Data Sheet

Issue Date: 08-FEB-2013
Supersedes: 09-NOV-2010

SPECTRUS OX909

1 Identification

Identification of substance or preparation
SPECTRUS OX909

Product Application Area
Biocide

Company/Undertaking Identification
GE Betz, Inc.
4636 Somerton Road
Trevose, PA 19053
T 215 355-3300, F 215 953 5524

Emergency Telephone
(800) 877-1940

Prepared by Product Stewardship Group: T 215-355-3300 Prepared on: 08-FEB-2013

2 Hazard(s) identification

EMERGENCY OVERVIEW

DANGER

Corrosive to skin. Corrosive to the eyes. Mists/aerosols cause irritation to the upper respiratory tract.

DOT hazard: Corrosive to skin
Odor: Mild; Appearance: Yellow-Orange, Liquid

Fire fighters should wear positive pressure self-contained breathing apparatus(full face-piece type). Proper fire-extinguishing media:
Flood with water. Use of CO2 or foam may not be effective.

POTENTIAL HEALTH EFFECTS

ACUTE SKIN EFFECTS:

Primary route of exposure; Corrosive to skin.

ACUTE EYE EFFECTS:

Corrosive to the eyes.

ACUTE RESPIRATORY EFFECTS:

Mists/aerosols cause irritation to the upper respiratory tract.

INGESTION EFFECTS:

May cause severe irritation or burning of the gastrointestinal tract.

TARGET ORGANS:

Prolonged or repeated exposures may cause primary irritant dermatitis and/or tissue necrosis.

MEDICAL CONDITIONS AGGRAVATED:

Not known.

SYMPTOMS OF EXPOSURE:

Causes severe irritation, burns or tissue ulceration with subsequent scarring.

3 Composition / information on ingredients

Information for specific product ingredients as required by the U.S. OSHA HAZARD COMMUNICATION STANDARD is listed. Refer to additional sections of this MSDS for our assessment of the potential hazards of this formulation.

HAZARDOUS INGREDIENTS:

Cas#	Chemical Name	Range (w/w%)
PROPRIETARY	HALOGENATED COMPLEX Strong oxidizer; corrosive	15-40
13845-18-6	SODIUM SULPHAMIDATE Potential irritant	15-40
1310-73-2	SODIUM HYDROXIDE Corrosive; toxic (by ingestion)	7-13

4 First-aid measures

SKIN CONTACT:

URGENT! Wash thoroughly with soap and water. Remove contaminated clothing. Get immediate medical attention. Thoroughly wash clothing before reuse.

EYE CONTACT:

URGENT! Immediately flush eyes with water for 30 minutes while removing contact lenses. Hold eyelids apart. Get immediate medical attention.

INHALATION:

Remove to fresh air. If breathing is difficult, give oxygen. If breathing has stopped, give artificial respiration. Get immediate medical attention.

INGESTION:

Do not feed anything by mouth to an unconscious or convulsive victim. Do not induce vomiting. Immediately contact physician. Dilute contents of stomach using 2-8 fluid ounces (60-240 mL) of milk or water. If vomiting occurs naturally have victim lean forward to reduce risk of aspiration.

NOTES TO PHYSICIANS:

Probable mucosal damage may contraindicate the use of gastric lavage.

5 Fire-fighting measures

FIRE FIGHTING INSTRUCTIONS:

Fire fighters should wear positive pressure self-contained breathing apparatus (full face-piece type).

EXTINGUISHING MEDIA:

Flood with water. Use of CO2 or foam may not be effective.

HAZARDOUS DECOMPOSITION PRODUCTS:

oxides of carbon, hydrogen chloride and hydrogen bromide

FLASH POINT:

> 200F > 93C P-M(CC)

MISCELLANEOUS:

Corrosive to skin

UN3266;Emergency Response Guide #154

6 Accidental release measures

PROTECTION AND SPILL CONTAINMENT:

Ventilate area. Use specified protective equipment. Contain and absorb on absorbent material. Place in waste disposal container. Flush with water. Spread sand/grit. Do not use organic materials.

DISPOSAL INSTRUCTIONS:

Water contaminated with this product may be sent to a sanitary sewer treatment facility, in accordance with any local agreement, a permitted waste treatment facility or discharged under a permit. Product as is - Incinerate or land dispose in an approved landfill.

7 Handling and storage

HANDLING:

Oxidizer. Avoid all contact with reducing agents, oils, greases, organics and acids. Corrosive to skin and/or eyes.

STORAGE:

Shelf life = 270 days. Store between 40 and 100F (4 and 38C). Avoid excessive heat and contamination. Store only in vented containers. Avoid exposure to direct sunlight. Store away from acids. Do not store in steel or aluminum containers.

8 Exposure controls / personal protection

EXPOSURE LIMITS

CHEMICAL NAME

HALOGENATED COMPLEX

PEL (OSHA): LIMITS HAVE NOT BEEN ESTABLISHED BY US OSHA.

TLV (ACGIH): LIMITS HAVE NOT BEEN ESTABLISHED BY ACGIH.

SODIUM SULPHAMIDATE

PEL (OSHA): LIMITS HAVE NOT BEEN ESTABLISHED BY US OSHA.

TLV (ACGIH): LIMITS HAVE NOT BEEN ESTABLISHED BY ACGIH.

SODIUM HYDROXIDE

PEL (OSHA): 2 MG/M3

TLV (ACGIH): TWA (Ceiling) = 2 MG/M3

ENGINEERING CONTROLS:

Adequate ventilation to maintain air contaminants below exposure limits.

PERSONAL PROTECTIVE EQUIPMENT:

Use protective equipment in accordance with 29CFR 1910 Subpart I

RESPIRATORY PROTECTION:

A RESPIRATORY PROTECTION PROGRAM THAT MEETS OSHA'S 29 CFR 1910.134 AND ANSI Z88.2 REQUIREMENTS MUST BE FOLLOWED WHENEVER WORKPLACE CONDITIONS WARRANT A RESPIRATOR'S USE.

USE AIR PURIFYING RESPIRATORS WITHIN USE LIMITATIONS ASSOCIATED WITH THE EQUIPMENT OR ELSE USE SUPPLIED AIR-RESPIRATORS.

If air-purifying respirator use is appropriate, use any of the following particulate respirators: N95, N99, N100, R95, R99, R100, P95, P99 or P100.

SKIN PROTECTION:

gauntlet-type nitrile gloves, chemical resistant apron-- Wash off after each use. Replace as necessary.

EYE PROTECTION:

splash proof chemical goggles, face shield

9 Physical and chemical properties

Spec. Grav. (70F, 21C)	1.347	Vapor Pressure (mmHG)	~ 18.0
Freeze Point (F)	21	Vapor Density (air=1)	1.10
Freeze Point (C)	-6		
Viscosity (cps 70F, 21C)	9	% Solubility (water)	100.0

Odor	Mild
Appearance	Yellow-Orange
Physical State	Liquid
Flash Point	P-M(CC) > 200F > 93C
pH As Is (approx.)	13.0
Evaporation Rate (Ether=1)	< 1.00
Percent VOC:	0.0

NA = not applicable ND = not determined

10 Stability and reactivity

CHEMICAL STABILITY:

Stable under normal storage conditions.

POSSIBILITY OF HAZARDOUS REACTIONS:

Contact with strong acids may cause a violent reaction releasing heat. Shock, friction, heat or other sources of ignition may cause a violent reaction releasing heat and toxic fumes. Contact with reducing agents or flammable/combustible material may cause fire or explosion. Contact with metals may cause a violent reaction releasing heat and toxic gas.

INCOMPATIBILITIES:

May react with organics or acids.

DECOMPOSITION PRODUCTS:

oxides of carbon, hydrogen chloride and hydrogen bromide

11 Toxicological information

Oral LD50 RAT: 2,491 mg/kg
Dermal LD50 RABBIT: >2,000 mg/kg
Inhalation LC50 RAT: >20.37 mg/L

12 Ecological information

AQUATIC TOXICOLOGY

Bluegill Sunfish 96 Hour Static Acute Bioassay
LC50= 3.8 mg/L
Daphnia magna 48 Hour Static Acute Bioassay
EC50= 4.8 mg/L
Menidia medidia (Silversides) 96 Hour Flow-Thru Bioassay
LC50= 2.3 mg/L
Rainbow Trout 96 Hour Static Acute Bioassay
LC50= 3 mg/L
Selenastrum (algae) 96 Hour Growth Inhibition
EC50= 2.6 mg/L

BIODEGRADATION

No Data Available.

13 Disposal considerations

If this undiluted product is discarded as a waste, the US RCRA hazardous waste identification number is :
D002=Corrosive(pH).

Please be advised; however, that state and local requirements for waste disposal may be more restrictive or otherwise different from federal regulations. Consult state and local regulations regarding the proper disposal of this material.

14 Transport information

Transportation Hazard: Corrosive to skin
DOT: CORROSIVE LIQUID, BASIC, INORGANIC, N.O.S. (HALOGENATED COMPLEX;
SODIUM HYDROXIDE)
8, UN3266, PG III, (SODIUM HYDROXIDE) RQ
DOT EMERGENCY RESPONSE GUIDE #: 154
Note: Some containers may be DOT exempt, please check BOL for exact container classification
IATA: CORROSIVE LIQUID, BASIC, INORGANIC, N.O.S. (HALOGENATED COMPLEX;
SODIUM HYDROXIDE)
8, UN3266, PG III
IMDG: CORROSIVE LIQUID, BASIC, INORGANIC, N.O.S. (HALOGENATED COMPLEX;
SODIUM HYDROXIDE)
8, UN3266, PG III

15 Regulatory information

TSCA:

This is an EPA registered biocide and is exempt from TSCA inventory requirements.

CERCLA AND/OR SARA REPORTABLE QUANTITY (RQ) :

900 gallons due to SODIUM HYDROXIDE;

FIFRA REGISTRATION NUMBER:

3377-55-3876

NSF Registered and/or meets USDA (according to 1998 Guidelines):

Registration number: 140719

Category Code(s):

- G5 Cooling and retort water treatment products - all food processing areas
- G7 Boiler treatment products - all food processing areas/nonfood contact

SARA SECTION 312 HAZARD CLASS:

Immediate(acute);Delayed(Chronic)

SARA SECTION 302 CHEMICALS:

No regulated constituent present at OSHA thresholds

SARA SECTION 313 CHEMICALS:

No regulated constituent present at OSHA thresholds

CALIFORNIA REGULATORY INFORMATION

CALIFORNIA SAFE DRINKING WATER AND TOXIC ENFORCEMENT ACT (PROPOSITION 65):

No regulated constituents present

MICHIGAN REGULATORY INFORMATION

No regulated constituent present at OSHA thresholds

16 Other information

HMIS vII

CODE TRANSLATION

Health	3	Serious Hazard
Fire	0	Minimal Hazard
Reactivity	0	Minimal Hazard
Special	CORR	DOT corrosive
(1) Protective Equipment	D	Goggles,Face Shield,Gloves,Apron

(1) refer to section 8 of MSDS for additional protective equipment recommendations.

CHANGE LOG

	EFFECTIVE DATE	REVISIONS TO SECTION:	SUPERCEDES
	-----	-----	-----
MSDS status:	14-OCT-2003		** NEW **
	10-DEC-2003	15	14-OCT-2003
	08-APR-2005	13	10-DEC-2003
	26-MAY-2006	8	08-APR-2005
	17-DEC-2007	14	26-MAY-2006
	24-JUN-2009	10,15	17-DEC-2007
	12-FEB-2010	14	24-JUN-2009
	09-NOV-2010	3,4,5,7,8,10	12-FEB-2010
	08-FEB-2013	7	09-NOV-2010

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)