

# MODERN MECHANICAL SYSTEMS

## Purging Checklist

	Yes	No	Notes
Has a Purging-Job Hazard Analysis been completed?	X		Meeting on site to be scheduled
Have all fuel line sources been identified?	X		Nitrogen purge prior to final connection to fuel cell
Have all fuel lines not required for the purging operation been secured or locked out?			NA
Are blanks or blinds required to safely isolate fuel lines, fittings, gauges?			NA
Is the purging discharge line located outside, away from personnel, equipment, & buildings?	X		Entire site is outside
Could high pressure discharge direct gasses or foreign objects towards personnel, equipment, or building?	X		60 psi purge cycles to be extended up or away from personnel.
Is inert gas being used as the purging medium?	X		Source Nitrogen compressed gas regulated to 60 psi
a) If YES to above, will oxygen levels be monitored to maintain adequate concentration between 19.5% and 23.5%?	X		Discharge personnel to have 4 gas monitor on person
Will purging operation involve flammable gas?		X	
Will the flammable gas purged settle into low areas where there are uncontrolled ignition sources?		X	
Will the Gas Purging Plan be communicated to and approved by local Authority Having Jurisdiction?			
Have all non-essential personnel been evacuated to a safe location from the purging operations?	X		
Are reliable combustible gas meters being used to sample gas concentration?	X		
Have employees using the combustible gas meters been trained on their use?	X		
Have the combustible gas meters been properly calibrated and tested per manufacturer specifications?	X		
Have all employees been specifically trained in safe procedures for the gas purging operations?	X		
Is a temporary hose or line required to direct the purged gas to a safe location(s) outside of the building?	X		All purge piping is exterior of a building
Have emergency response personnel (Fire Dept., EMS, etc.) been notified of the gas purging activities planned?			
Are additional ventilation sources required to maintain gas concentrations within acceptable levels?		X	
Have all ignition sources been isolated, deenergized, and locked-out?		X	NA empty pipe no Flammable gas available
Completed by (Print Name):	Date:		

**NOTE: This checklist is not all-inclusive and should be used to help monitor your worksite.**

# MODERN MECHANICAL SYSTEMS, INC.

October 4, 2024

Mr. Adam Burkitt  
Advanced Energy Efficiencies. LLC.  
VFS, LLC  
5827 Terex  
Clarkson, MI. 48346

## **TAFT School Bloom Energy Fuel Cell Project; CT DEEP Siting Council Compliance**

### **Ref: Place in service Natural gas pipe system cleaning purge experience**

Per your request we offer the following identification of personnel performing the work, including past projects experience and qualification to perform the work.

### **Project Oversight.**

Jeffery Clement; CT licenses PLM.0277512-P1, HTG.0303543-S1

### **Site Specific:**

Jimmy Sokola, CT licenses PLM.0280716-P2, HTG.0353785-S2, OSHA 30  
Scott Genlot, CT license HTG.0303197-S1, HTG.0388667-G8, OSHA 10  
Randy Hubert, Ct license HTG.0408627-S2, HTG.0392998-G8, OSHA 10  
Tim Curran, CT license HTG.0393164-S2, OSHA 30

### **Past Projects:**

Bradley International Airport; Consolidated Rental Car Facility  
CT. Army National Guard: Camp Hartell Combined Support Maintenance Shop (CSMS)  
CT. ANG Westbrook maintenance facility Gas pipe replacement  
UCONN CSST Gas Pipe replacement Project  
Bloom Energy Cells throughout CT. Including New Britain Fuel Cell Project  
Fairfield University convocation Center  
Fairfield University Dormitories 5ea  
Fairfield University academic buildings. School of Nursing, School of Business  
Fairfield University Student center and cafeteria  
Fairfield Prep Xavier Hall Science center.

We will follow NFPA54, 56 and Bloom Energy gas system commissioning procedures.  
We appreciate the opportunity to be involved with this significant project.

Sincerely,  
Paul Palaia

*Paul Palaia*

Project Manger

**519 COOKE STREET P.O. BOX 492 FARMINGTON, CT 06034-0492**  
**PHONE 860 / 677-2222 FAX 860 / 676-8305**  
**HTG.0303543-S1 PLM.0277512-P1 HTG.0401564-ST1**

*Affirmative Action / An Equal Opportunity Employer*

# **Gas System Commissioning – N2**

**DOC-1010208**

**Revision A**

**Estimated Evolution Time: 2 hrs**

**Number of Personnel: 2 Total**

**1 Inlet Attendant &**

**1 Discharge Attendant**

### Purpose

- This procedure intends to provide a clear process for CIG field workers ensuring natural gas delivery to site within Bloom Energy Specifications. More specifically, the objective of this procedure is to:
  - Ensure Compliance with:
    - NFPA 54 National Fuel Gas Code
    - OSHA and CalOSHA construction safety standards
    - Title 49 of the Code of Federal Regulations (DOT) safety standards
    - Regional Air Quality Management Board Regulations
    - Bloom Energy's Critical to Quality Standards, especially regarding
      - Gas piping system blow-down and purging standards
    - Only valid in the state of CT

### Scope

- This procedure applies to all US BE construction sites in Connecticut.

### Audience

- 1 CDA Input attendant (general or sub-contractor)
- 1 Discharge Attendant (Bloom Qualified Gas Personnel)

### Applicable Documents

- NFPA 54
- DOC-1007152 SVC
- DOC-1009468 – Gas System Commissioning - CDA

### **Preliminary Requirements**

#### **Required Safety Trainings**

- Bloom personnel on site must be documented as Bloom Energy (BE) Qualified Gas System Personnel, which includes:
  - Pipeline Safety
  - Compressed Gas Safety
  - LOTO
  - Valve Safety

#### **Required Personal Protection Equipment (PPE)**

- Safety glasses
- Gloves
- Hard hat
- High visibility clothing
- Work boots with safety toe protection

#### **Special Precautions and Potential Hazards**

- Verify fuel plumbing has been pressure tested for leaks by the utility and general contractor before executing this SOP (House Line Release).
- Oxygen monitoring is required for this operation.

#### **Required Tools, Materials, and Equipment**

- YFP Purge Hose (124422)
- House line installed
- Multi-Gas Monitor: minimum detection of Oxygen and Methane LEL
- Adjustable Wrench Set and/or two (2) Pipe Wrenches
- Gas Sampling Kit (BE# 131263)
- Caution tape and delineators
- Fire Extinguisher (2A or better).
  - This should already be on site.
- Filled Nitrogen Tank
  - QTY 1 approximately 75 Cu. Ft tank per 250 linear feet of 2" gas line (Praxair part NI-Q or equivalent)
  - QTY 1 approximately 140 Cu. Ft tank per 500 linear feet of 2" gas line (Praxair part NI-S or equivalent)

## Section A: Nitrogen Purge of Construction Plumbing

### 1. Site Setup

- 1.1. Ensure all customer protocols are met and scheduled accordingly
  - 1.1.1. Multiple RSA on the same site requires a dedicated MOP, using this procedure as a guide.
- 1.2. Put On PPE.
- 1.3. Turn on personal gas monitor(s) and attach to the person(s) at the discharge location.
- 1.4. Set up cones and caution tape to establish a discharge area around the fuel stub up farthest from the MSA with a 10 foot radius around the point of discharge. Remove all non-essential personnel.
  - 1.4.1. Ensure that there will be no open flame within 50 ft
- 1.5. Ensure a 2A or better fire extinguisher is located within 50 feet of the discharge area.
- 1.6. Verify Each Fuel stub up valve is in the closed position (at YFP, and Upstream facilities valve, where applicable and shut each fuel stub up valve. See Figure 1.

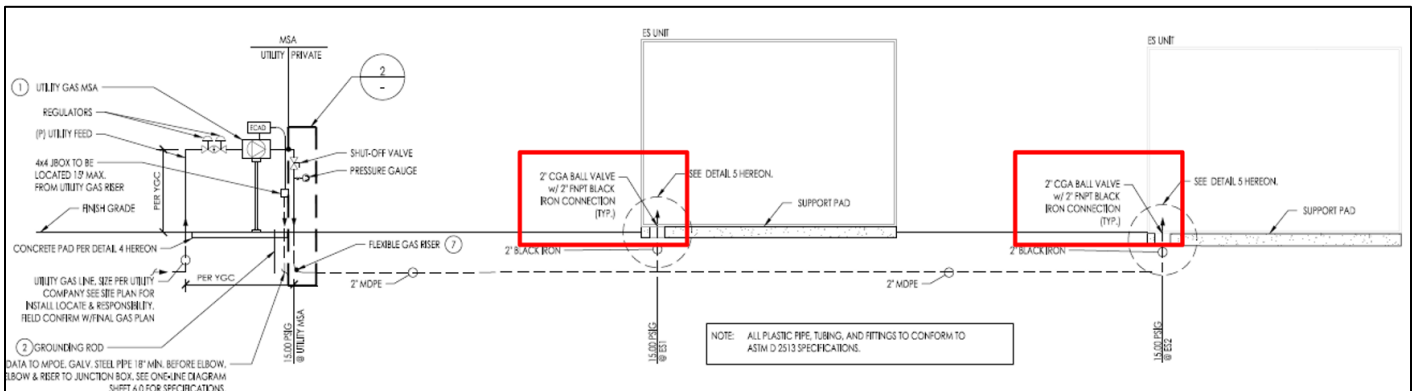


Figure 1

1.7. Identify Isolation valves on meter assembly.

1.8. Ensure all shut off valves are open between MSA and ESS and the stub-up valves are closed.

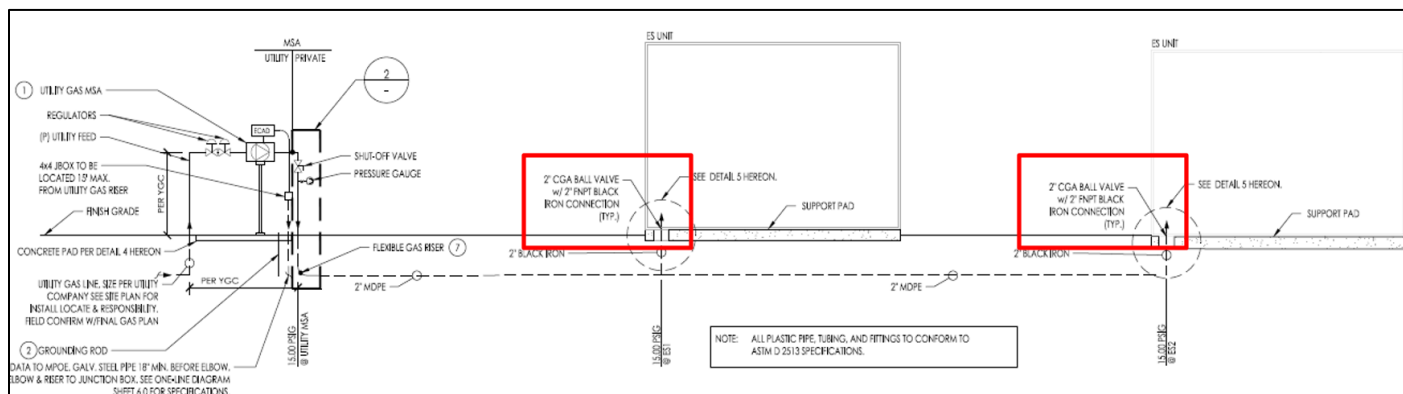


Figure 2

a. If a YBB, reach out to the Construction Program Manager. Future instructions will go here. See Figure 3.

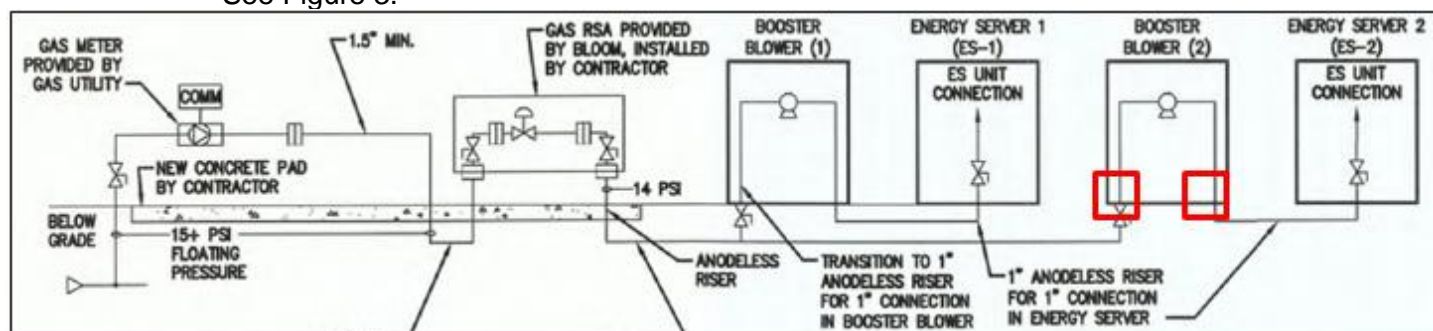


Figure 3

2. Follow the gas line from the MSA (or MSA gap) to the isolation valve on the stub up.
  - 2.1. Identify Isolation valve on meter assembly.
  - 2.2. Determine if gas pressure is available to the plumbing being purged, apply a LOTO to isolate gas if required.
  - 2.3. Perform a valve lineup to achieve the following:
    - 2.3.1. Meter Isolation valve is shut
    - 2.3.2. System gas stub up valve is shut
    - 2.3.3. All other valves between the meter isolation and system gas stub up are open
      - 2.3.3.1. If Parallel regulators, ensure only one set open, close isolations to the other set of regulators

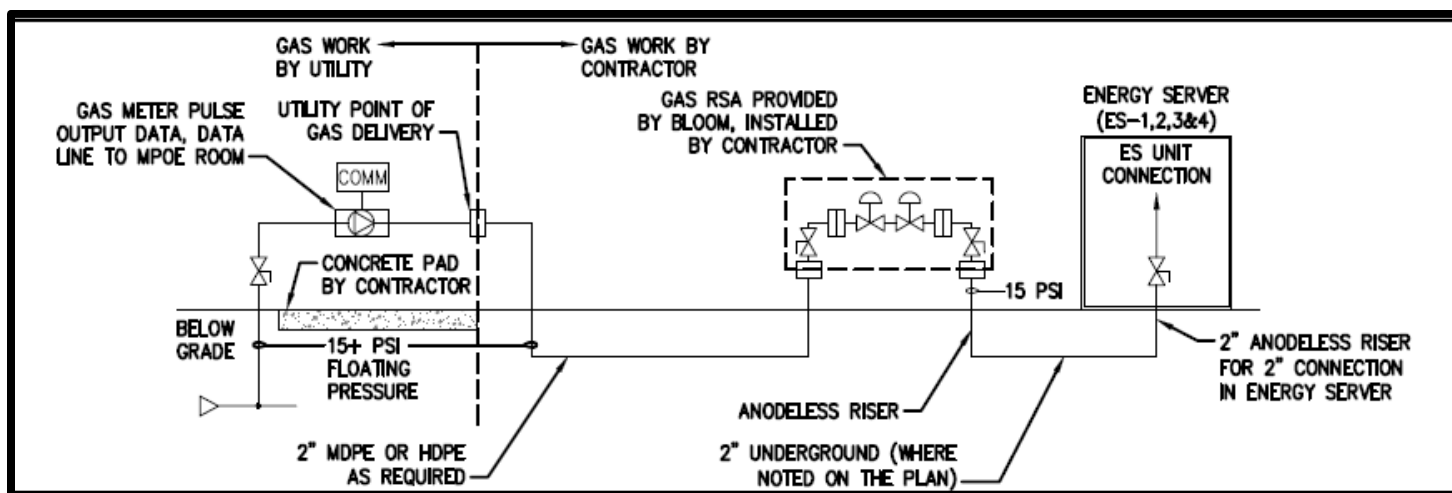


Figure 4

3. General/Subcontractor connects the supply of Nitrogen to the furthest point upstream without interfering with the Gas Utility scope of work.
4. Position Discharge Attendant with air monitor at the point of discharge.



5. Connect YFP Purge Hose.
  - 5.1. Disconnect YFP from the fuel stub up, if connected
  - 5.2. Attach YFP purge hose to fuel stub up
  - 5.3. Attach YFP purge hose to overhead QDC
6. Inlet attendant supplies intended operational system pressure (min of 60 PSI) to plumbing and corrects any leaks.
7. Once pressure holds, the Discharge Attendant slowly opens all valves between the Nitrogen supply and the discharge assembly
8. Discharge attendant then opens the discharge assembly full open
  - 8.1. Continuously monitor the discharge area for the following and create an incident report if any are found:
    - 8.1.1. Debris
    - 8.1.2. Liquid water
    - 8.1.3. Gas other than compressed air
    - 8.1.4. Discharge attendant shall continuously monitor the discharge area and be prepared to secure the flow.
9. Let Nitrogen flow through the purge assembly for 60 seconds, then secure for 60 seconds.
  - 9.1. Perform at least 6 on/off cycles (6 cycles per 200 ft. of underground pipe)
10. Close the stub up isolation valve
11. If part of the assembly, remove the purge hose Y strainer
  - 11.1. If debris found, take pictures, clean and log an incident.
12. Reinstall "y" strainer.
13. If the Gas stick is provided by Bloom, perform Section B, if it is provided by the utility (fixed pressure) Move to Section C

## Section B: Setting the Bloom Gas Regulators

### 1. Possible Bloom Gas Stick Setups:

#### 1.1. Dual Regulator (two regulators on a single run of pipe)

##### 1.1.1. Perform Section B as written

#### 1.2. Dual Parallel (four regulators on two runs of pipe)

##### 1.2.1. Perform Section B once for each set

##### 1.2.2. Ensure that the set not being used is isolated

#### 1.3. Single Regulator (one regulator on a single run of pipe)

##### 1.3.1. Follow instructions for the upstream regulator only

### 2. Di Discharge Attendant throttles open the discharge valve as little as possible while still discharging air.

### 3. Contract Plumber will throttle the compressed gas regulator to achieve delivery pressure (min of 60PSI) on pressure gauge upstream of the regulator set.

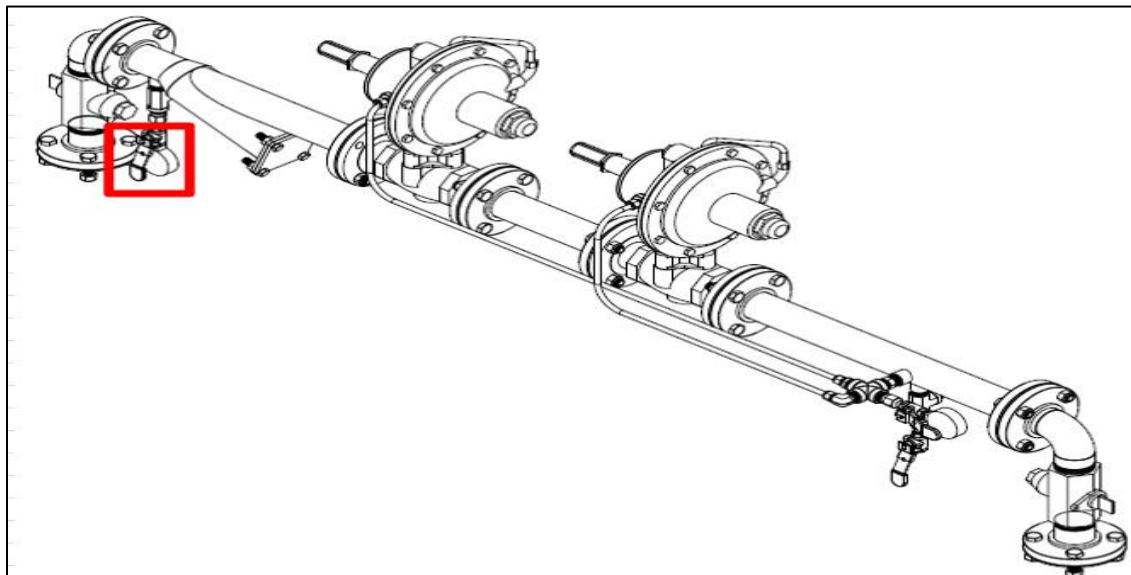


Figure 10

4. Discharge Attendant closes the valve on the vent assembly.
5. Remove the gray plastic covers from the Main Body Pilot adjustment screw from both regulators. Leave the cover on the small independent series 67 pilot assembly alone. See Figure 11.

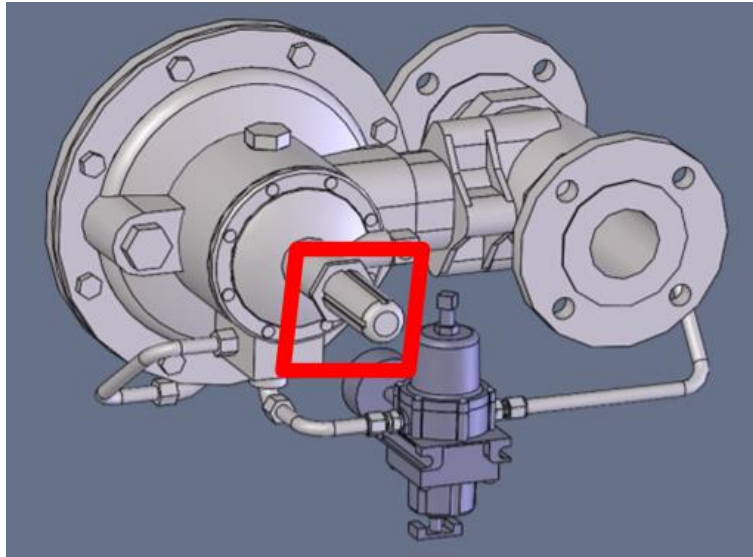


Figure 11

6. Turn the **Main Body Pilot** on the **upstream** regulator fully counter clockwise to stop any flow of gas.
7. Turn the **Main Body Pilot** on the **downstream** regulator clockwise so the regulator is fully open.
- 7.1. If single regulator, ignore all **downstream** regulator instructions

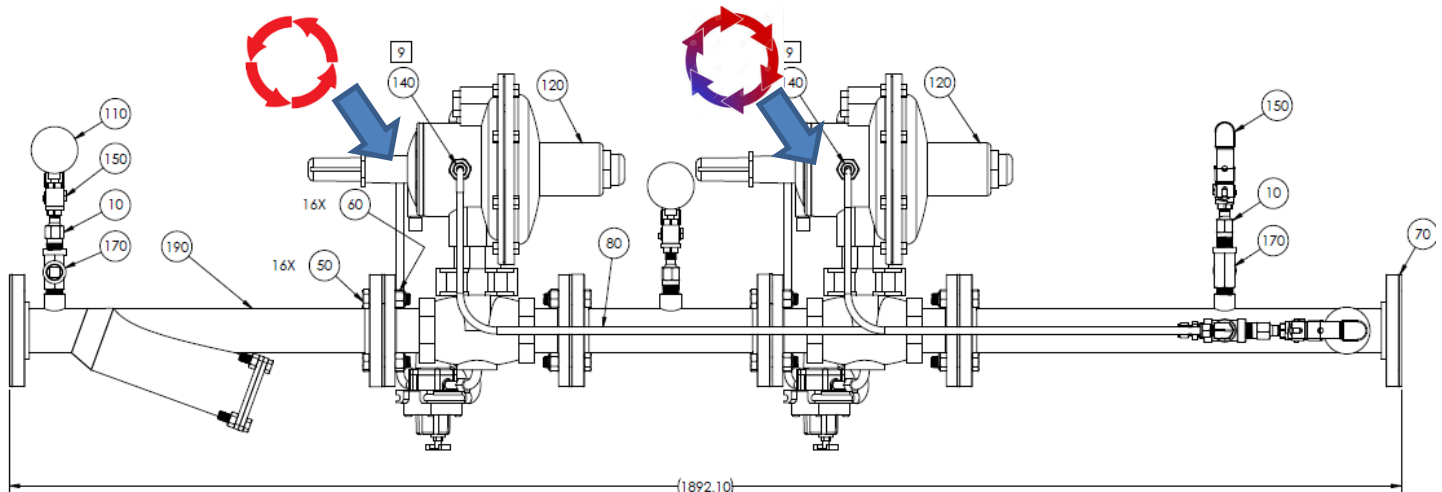


Figure 12

8. Crack open the discharge valve just enough so that the flow of air can be heard or felt.



Figure 13

9. Adjust the **Upstream** regulator first.
10. On the **Main Body Pilot** assembly, turn the adjusting screw clockwise to increase outlet pressure to achieve **18** psi as read on a gauge as far downstream as possible.
- 10.1. Be sure to adjust slowly to allow system pressure to stabilize after adjustment.

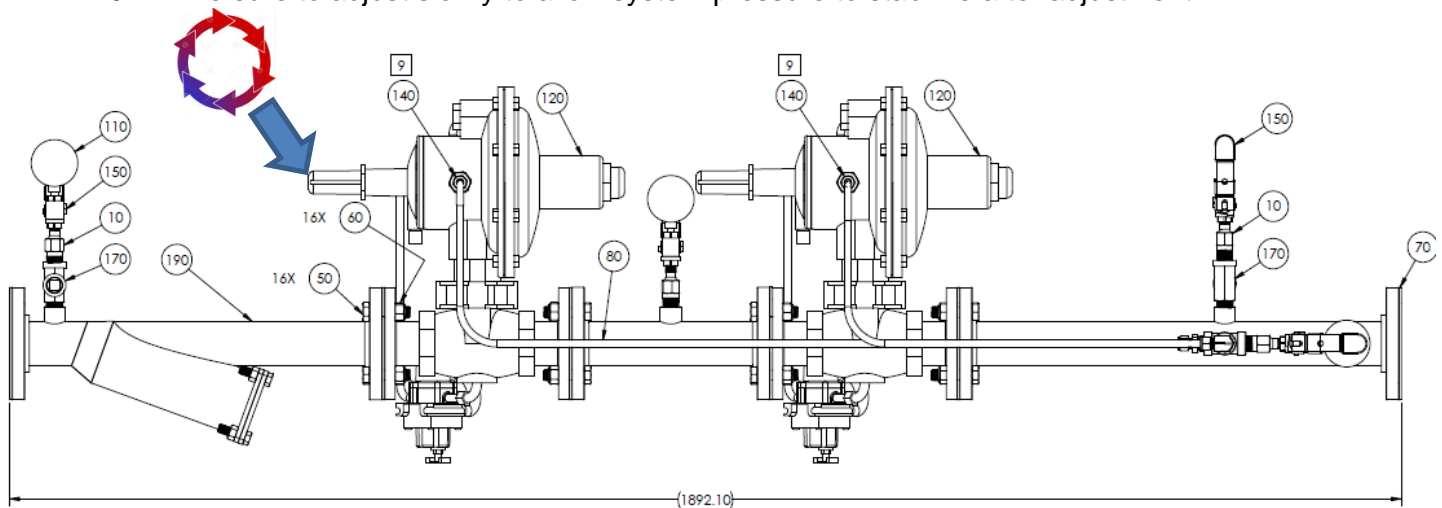


Figure 14

## 11. Adjust the **downstream** regulator second

11.1. On the **Main Body Pilot** assembly, turn the adjusting screw clockwise to increase outlet pressure or counterclockwise to decrease outlet pressure to achieve **15 psi** as read as far downstream as possible.

11.2. Be sure to wait for system pressure to change.

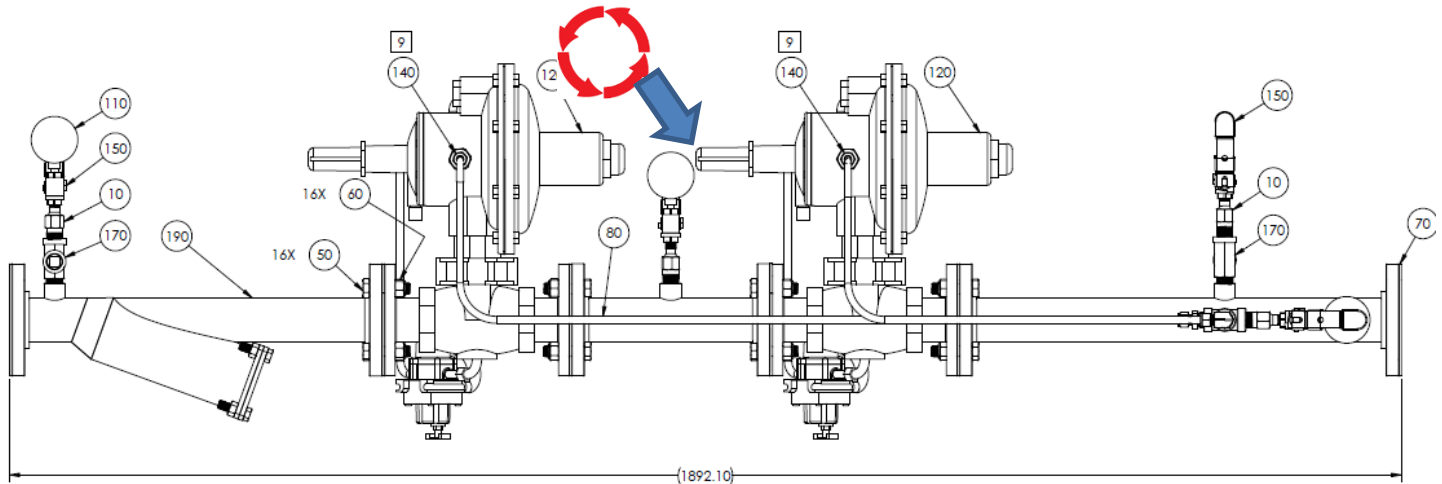


Figure 15

12. If the pressure on the upstream RSA riser gauge drops below expected delivery pressure at any time during the procedure, STOP, and re-pressurize the line and consider throttling down on the discharge valve.

13. Close the vent assembly valve.

14. If the gas stick is a dual parallel set and this is the first set dialed in, do the following (skip to next step if not):

- 14.1. Isolate the dialed in set with the valves provided on the turndown
- 14.2. Open the isolation valves for the pair that has not yet been set
- 14.3. Repeat Section B for the second set of regulators

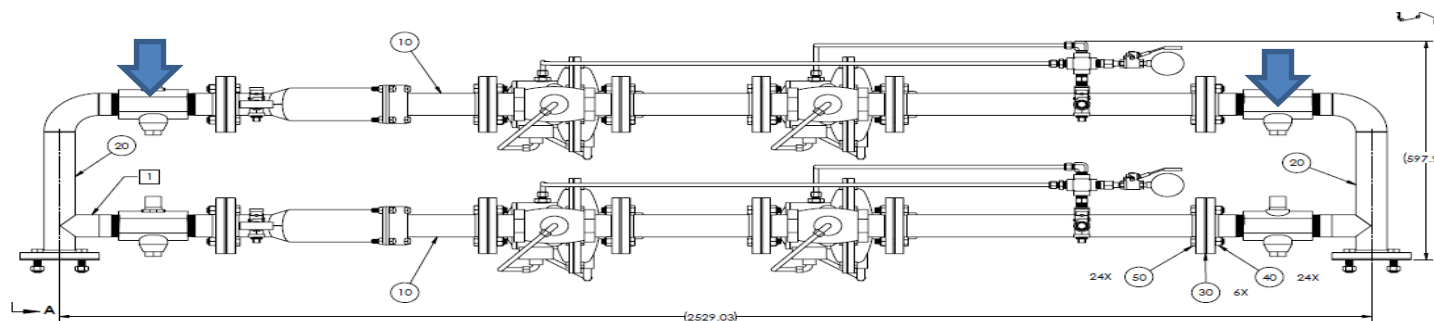


Figure 16

### Section C: Process closeout

#### 1. Restore system Conditions

- 1.1. Turn off the air compressor
- 1.2. Isolate the test equipment from the system
- 1.3. Remove all test equipment
  - 1.3.1. Air Compressor
  - 1.3.2. Purge Hose
- 1.4. Close all fuel stub up valves and reconnect YFP to fuel stub up
- 1.5. Leave meter isolation valves open
  - 1.5.1. If dual parallel, leave only one set open, isolate the second set

**Version History**

Revision	Date	Process Owner	Change Description	Training Required	
A		Andy Blakeslee	Initial Release	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No
A	4/27/17	Shane Peters	Reformatted into Standard Template, suggested edits	<input type="checkbox"/> Yes	<input type="checkbox"/> No
A	6/8/17	Shane Peters	Thomas Sipe updates, with Shane's reformatting.	<input type="checkbox"/> Yes	<input type="checkbox"/> No
A	2/20/18	Thomas Sipe	Split CDA, N2 and Moisture Sample	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
				<input type="checkbox"/> Yes	<input type="checkbox"/> No

Electronic Signature approvals are on file in Agile.



**Richard Gregoire, P.E.**

Principal  
Project Manager



**Experience:**

Mr. Gregoire holds a Masters Degree in Chemical Engineering with over 25 years of experience in specialty & hazardous chemicals, solids handling, pharmaceutical, bio-pharmaceutical, high purity systems, environmental and polymer industries. His background encompasses the full range of process engineering activities, code and safety reviews / evaluations, as well as project engineering and business development work at several major engineering firms. Mr. Gregoire has lectured at Interphex on "Controlling Solvent Emissions from Process Vents". He is a registered Professional Engineer in 13 U.S states. He is also a registered NCEES member. Mr. Gregoire has responsibility for various process/project engineering activities and technical leadership at **IDEA**.

**RELEVANT PROJECTS:**

**Fuel Cell Gas Line Purge Special Inspections**

Witness and Special Inspections of various pre-start-up fuel line purges using nitrogen for A/Z Corp., ENCON and Bloom Energy.

**Generation Bridge II, LLC**

**New Haven Harbor Power Station, New Haven, CT**  
Fuel Oil Dock engineering services including preparation of Electrical Area Classification Maps at barge dock.

**Bedoukian Research, Inc. – Danbury, CT**

500 gal. Still System - Schematic Design Package for a 45' high process structure including 2 reactors/stills, condensers and associated support systems.

Vent KO Tank Project – 200 gal. Vent KO Tank detailed design to decouple relief and vent header systems.

Safety and Environmental Upgrade Project – Evaluation and design for 13 reactor/vessel systems involving relief system upgrades and N2 padding modifications for enhanced safety and environmental control.

Synthetic chemistry scale-up project including bulk solids addition system, reactor & overheads system and high alloy vertical axis, top discharge centrifuge.

**A/Z Corporation – Stamford, CT**

**Fuel Cell Gas Line Purge Witness**

Co-witness to a Special Inspection for several Bloom energy fuel cell gas line purges at NBC Sports Group in Stamford, CT

**Rust-Oleum – Attleboro, MA**

PHA Addendum Safety Review including flammable liquids, combustible dust, equipment, electrical classification, containment and egress reviews.

**BD Biosciences – Miami, FL**

Advanced Bioprocessing Media Manufacturing Facility  
Solids Processing Lines - Weighing/Dispensing, N2 Recycle Milling System, Blending, Multiple Container Size Packaging System. Liquids Processing Line – Up to 3000L compounding, Bulk and Bottle Sterile Filling Lines Utilities expansion including a new WPI POU's and a new UPW sub-loop.

**Hamilton Sundstrand – Windsor Locks, CT**

Advanced Pneumatic Testing Lab Project with state-of-the-art controls and utilities including -70° to 800°F pneumatic temperature capabilities.

**ASPEN AEROGELS – E. Providence, RI**

Facility RTO and dust/fume scrubber systems for misc. process and drying ovens emission & fume environmental control.

**Boston University Medical Center – Boston, MA**

Commissioning of a national emerging infectious diseases laboratory and research center consisting of a seven (7) story building (194,000 sq. ft.) with Biosafety Level 2, 3, and 4 Laboratories, associated MEP systems and administrative offices.

**U.S. Surgical Corp. (div. of TYCO Healthcare) – North Haven, CT**

Monomer area expansion of cracking reactor, crystallizer & solvent recovery systems including hot oil & steam utilities studies.

**Sandoz Pharmaceuticals - East Hanover, NJ**

Environmental summary package for a state-of-the-art solvent recovery system.

Comparison study of various fluid bed and pan coater systems for a solids dosage development facility.

**Plaskon Electronics Materials, Ltd. (subsidiary of Rohm & Haas, Inc.) Jurong, Singapore.**

Plant operating procedures with subsequent computer sequence descriptions, system startup and debugging of an electronics grade epoxy molding compound plant  
Specialty chemical debottlenecking and start-up

**Pfizer Inc. - Groton, CT**

Refrigeration retrofit estimate & const. sequencing pkg.  
Vent emissions calculation packages and end-of-line device evaluations including estimates.

**Nycomed Amersham - Rensselaer, NY**

Bulk Chem. Retrofit Conceptual Design Pkg. & Estimate  
Pilot Plant Upgrades & Modifications

**Analog Devices - Wilmington, MA**

Wafer Fabrication Facility  
Utilities Retrofit  
Multiple Chilled Water System Integration

**Syntex - Springfield, MO**

Bulk Chemical Upgrade  
Vent Emissions & Thermal Oxidizer Project  
**Cities Service Company - Mont Belview, TX**  
Natural gas liquids fractionation plant.

**Searle Food Resources, Inc. - Augusta, GA**

ASPERTAME (NUTRASWEET) product recov. system.  
Static Cryst. simulation. Site waste treatment facility

**Harris/Fairchild Semiconductor - Mountaintop, PA**

HP Chemical Distribution Systems

**Sanders - Nashua, NH**

Piping & utilities systems modifications and documentation.

**Shell Oil Company - Argo, IL**

Batch custom resin solutions plant

**MAJOR CAREER ASSIGNMENTS:**

***IDEA, Inc., Milford, CT***

Principal / Manager, Process Engineering

**SKANSKA E&C, Shelton, CT (formerly CPI PLANTS, Inc.)**

Manager, Process Engineering  
Process Manager  
Senior Process Engineer

**KVAERNER / JOHN BROWN E&C (formerly CRAWFORD & RUSSELL, INC.), Stamford, CT)**

Process Engineer

**EDUCATION:**

RENSSELAER POLYTECHNIC INSTITUTE

B.S., Chemical Engineering - 1978

MANHATTAN COLLEGE

M.S., Chemical Engineering - 1983

**SOCIETIES:**

American Institute of Chemical Engineers; International Society for Pharmaceutical Engineering

**LICENSES:**

Licensed Professional Engineer, States of Connecticut, New York, Massachusetts, Rhode Island, Vermont, New Hampshire, Maine, Texas, California, North Carolina, Florida, Virginia and Arizona.

NCEES Registered Professional Engineer

**PUBLICATIONS:**

ISPE course leader for a workshop entitled "Controlling Solvent Emissions from Process Vents"



# Safety Task Analysis Risk Reduction Talk (STARRT)

<b>Work Location:</b> TAFT School Fuel Cell Project		
<b>Supervisor:</b> Paul Palaia		
<b>Company:</b> Modern Mechanical	<b>Date:</b>	
<b>Job Description:</b> Natural Gas Pipe Purging with Nitrogen Gas from header to energy cell		
<b>Planning Checklist (Supervisors)</b>	<b>Yes</b>	<b>No</b>
Are the right employees assigned to the task?	X	
Have I/we provided the correct materials?	X	
Have I/we provided the right tool(s) for the tasks?	X	
Do I/we understand the correct procedures to perform the work safely?	X	
Have I/we communicated all the necessary task instructions to perform the work safely?	X	
<b>Planning Checklist (Employees)</b>		
I/we have discussed the injuries/accidents that could occur while performing this/these task(s).	X	
I/we have received adequate instructions to perform this work.	X	
Do I/we know how to perform this work safely and without environmental incident?	X	
Do I/we have the correct tools/equipment to do the work safely?	X	
<b>I/We accept responsibility for safe behavior and environmental issues for myself/ourselves during work activities. Each employee will initial the right hand column as part of the Re-STARRT process, verifying that you have attended this meeting.</b>		
<b>Employee Name (print)</b>	<b>Signature</b>	<b>Re-STARRT Initials</b>
Scott kaczmarek		
Scott Genlot		
<b>Supervisor Name:</b>	<b>Signature</b>	<b>Re-STARRT Initials</b>
Paul Palaia		
<b>Was anyone injured or did an unplanned incident occur today?</b> <div style="text-align: center;">Yes / No</div>		
<b>Describe:</b>		
<b>Who was the incident reported to?</b>		
<b>Supervisor:</b> Steve Hasler		
<b>Safety Department:</b> Safety Officer		

Permits / JHAs Required			Barricades Required		
Hot Work Permit (HWP)	Y	N	Hard barricades	Y	N
Confined space	Y	N	Yellow "Caution" tape	Y	N
Work Authorization (WA) or LOTO	Y	N	Red "Danger" tape	Y	N
Hex Chrome (JHA required)	Y	N	Proper identification tags	Y	N
Exiting JLG (JHA required)	Y	N	4-sided / 360° protection	Y	N
Electrical / Mechanical			Communication Methods		
Lockout / tagout required	Y	N	Radio (Ch. XX Functional)	Y	N
Locks / tags applied	Y	N	Air horns / whistles in use	Y	N
Extension cord inspected (for daily use)	Y	N	Proper signals (when rigging)	Y	N
GFCI Inspected (quarterly)	Y	N	Spotters / flaggers in use	Y	N
Fall Protection					
Fall from > 6' (1.8m)	Y	N	Lifeline inspected (weekly)	Y	N
100% tie-off maintained at shoulder height or above	Y	N	Cheaters being used (not greater than 6' in length)	Y	N
Proper anchorage points (5,000 lbs. or greater)	Y	N	Ladders secured from displacement	Y	N
Harness / lanyard inspections (for daily use)	Y	N	Ladder inspected / maintained	Y	N
SRL (yo-yo) inspected	Y	N	Floor and wall openings covered and labeled	Y	N
PPE			Welding, Cutting, and Grinding		
Basic PPE (hardhat, safety glasses, hi-vis vest, and steel toe boots)	Y	N	Welding hood / shaded face shield (torch cutting)	Y	N
Hybrid safety glasses	Y	N	Welding screens / fire blanket installed	Y	N
Double eye protection (face shield and hybrid safety glasses)	Y	N	Fire extinguisher(s) readily available	Y	N
Hearing protection	Y	N	Proper wheel / guard / handle installed on grinder	Y	N
Chain / chop saw chaps	Y	N	Combustibles / flammables removed from work area	Y	N
Dust masks / Respirators	Y	N	Compressed gas bottles secured	Y	N
Hands / Pinch Points			Gloves (Select Type)		
Pinch points identified (see back page)	Y	N	General Duty (ANSI Cut 4)	Y	N
Eyes on path / work	Y	N	Cut resistant /Kevlar/Impact	Y	N
Line of fire	Y	N	Welding	Y	N
Smashing, crushing hazard	Y	N	Chemical resistant	Y	N
Housekeeping					
Work area clean and organized	Y	N	Proper material storage	Y	N
Slip / trip hazards identified	Y	N	Trash cans available	Y	N
Hoses / Cords / Leads elevated or protected	Y	N	Rebar caps installed	Y	N
Environmental / Health Aspects			Scaffold		
Spill kits available	Y	N	Tags / shift inspection	Y	N
SDS reviewed	Y	N	Clear access and egress	Y	N
Containers labeled	Y	N	Head knockers / knee knockers	Y	N
Properly segregated waste	Y	N	Electrical cord / leads on hangers	Y	N
Heat / cold stress	Y	N	SRL (if needed)	Y	N

## Safety Task Analysis Risk Reduction Talk (STARRT)

JOB STEPS	HAZARD IDENTIFICATION	HOW TO ELIMINATE / MINIMIZE HAZARDS
Off load and place Size 1 cylinders on concrete pad	<ul style="list-style-type: none"> <li>- trip hazard</li> <li>- tip hazard</li> <li>- back injury</li> <li>- pinch injury</li> </ul>	<ul style="list-style-type: none"> <li>- clear area of any ground debris</li> <li>- minimum two person</li> <li>- use of pneumatic tire hand truck</li> <li>- use of fork truck or equipment lift.</li> </ul>
INSTALL PURGE DISCHARGE HOSE OR FITTING AT ENERGY CELLS	HAND INJURY COMPRESSED INERT GAS DISCHARGE	<ul style="list-style-type: none"> <li>-USE OF CUT RESISTANT GLOVES</li> <li>-RUN DISCHARGE HOSE FROM ANY IGNITION SOURCE. MINIMUM 25 FEET FROM RISK.</li> <li>-SAFETY CONE THE DISCHARGE AREA 10LF RADIUS</li> <li>-MONITOR DISCHARGE WITH SENSIT GAS MONITOR</li> </ul>
INSTALL INLET PURGE POINT VALVES, FITTINGS, HOSE  CONNECT COMPRESSED INERT GAS FROM CYLINDERS	HAND INJURY DROPPING TOOLS, FITTINGS  COMPRESSED GAS CYLINDER TIP OVER EXCESSIVE PRESSURE  LIQUID NITROGEN EXPOSURE	<ul style="list-style-type: none"> <li>-USE OF GLOVES</li> <li>- USE OF CRYO GLOVES</li> <li>- SECURE TANKS WITH WHEEL CHOCKS.</li> <li>- INSTALL REGULATOR TO REDUCE TANK OUTLET PRESSURE TO 75 PSI MAX</li> </ul>
BEGIN NITROGEN PURGE MAINTAIN INLET SUPERVISER PERSONEL TO MONITOR PURGE PRESSURE MIN 60 PSI	KEEP UNWANTED PERSONEL FROM PURGE POINTS. SPARK IGNITION SOURCE NEAR DISCHARGE	<ul style="list-style-type: none"> <li>-ENSURE PERSONEL ARE NOT SMOKING</li> <li>-ENSURE VEHICLES ARE NOT RUNNING</li> <li>-ENSURE NO ELECTRICAL OF FLAME NEAR DISCHARGE</li> </ul>
MONITOR DISCHARGE. APPLY GAS DETECTION MONITOR TO DISCHARGE PERSONEL. READ OXYGEN AND "LEL PPM". LOOK FOR DEBRIS OR WATER PURGE COMPLETE AFTER MAX (6) 60 SEC. CYCLES	LEL OR OXYGEN PRESENT DEBRIS OR WATER PRESENT UNWANTED PERSONEL PRESENT EXCESSIVE SOUND LEVELS	<ul style="list-style-type: none"> <li>- CONTINUE INERT GAS PURGE</li> <li>- CONTINUE TO KEEP DISCHARGE AREA CLEAR</li> <li>- DIRECT DISCHARGE AWAY FROM PERSONEL</li> <li>- USE OF OVER THE EARHEARING PROTECTION.</li> </ul>
REMOVE NITROGEN CYLINDERS FROM PURGE POINTS.  CLOSE GS2" BALL VALVE AND 2" CELL BALL VALVE  INSTALL BLANKS AND PLUGS	DROPPED OR TIPPED OVER CYLINDERS  DROPPED TOOLS, FITTINGS	-LOAD ALL CYLINDERS ON TO TRUCK FOR REMOVAL FROM SITE.

### Quarterly Inspection Color Codes

1st = **YELLOW** / 2nd = **GREEN** / 3rd = **RED** / 4th = **BLUE**



# SAFETY DATA SHEET

Nitrogen

**Airgas**  
an Air Liquide company

## Section 1. Identification

<b>GHS product identifier</b>	: Nitrogen
<b>Chemical name</b>	: nitrogen
<b>Other means of identification</b>	: nitrogen (dot); nitrogen gas; Nitrogen NF, Nitrogen FG
<b>Product type</b>	: Gas.
<b>Product use</b>	: Synthetic/Analytical chemistry.
<b>Synonym</b>	: nitrogen (dot); nitrogen gas; Nitrogen NF, Nitrogen FG
<b>SDS #</b>	: 001040
<b>Supplier's details</b>	: Airgas USA, LLC and its affiliates 259 North Radnor-Chester Road Suite 100 Radnor, PA 19087-5283 1-610-687-5253
<b>24-hour telephone</b>	: 1-866-734-3438

## Section 2. Hazards identification

<b>OSHA/HCS status</b>	: This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).
<b>Classification of the substance or mixture</b>	: GASES UNDER PRESSURE - Compressed gas SIMPLE ASPHYXIANTS

### GHS label elements

**Hazard pictograms**

:



**Signal word**

: Warning

**Hazard statements**

: Contains gas under pressure; may explode if heated.  
May displace oxygen and cause rapid suffocation.  
May displace oxygen and cause rapid suffocation.

### Precautionary statements

**General**

: Read and follow all Safety Data Sheets (SDS'S) before use. Read label before use. Keep out of reach of children. If medical advice is needed, have product container or label at hand. Close valve after each use and when empty. Use equipment rated for cylinder pressure. Do not open valve until connected to equipment prepared for use. Use a back flow preventative device in the piping. Use only equipment of compatible materials of construction.

**Prevention**

: Not applicable.

**Response**

: Not applicable.

**Storage**

: Protect from sunlight. Store in a well-ventilated place.

**Disposal**

: Not applicable.

**Supplemental label elements**

: Keep container tightly closed. Use only with adequate ventilation. Do not enter storage areas and confined spaces unless adequately ventilated.

**Hazards not otherwise classified**

: In addition to any other important health or physical hazards, this product may displace oxygen and cause rapid suffocation.

## Section 3. Composition/information on ingredients

<b>Substance/mixture</b>	: Substance
<b>Chemical name</b>	: nitrogen
<b>Other means of identification</b>	: nitrogen (dot); nitrogen gas; Nitrogen NF, Nitrogen FG
<b>Product code</b>	: 001040

### CAS number/other identifiers

**CAS number** : 7727-37-9

<b>Ingredient name</b>	<b>%</b>	<b>CAS number</b>
Nitrogen	100	7727-37-9

Any concentration shown as a range is to protect confidentiality or is due to batch variation.

There are no additional ingredients present which, within the current knowledge of the supplier and in the concentrations applicable, are classified as hazardous to health or the environment and hence require reporting in this section.

Occupational exposure limits, if available, are listed in Section 8.

## Section 4. First aid measures

### Description of necessary first aid measures

<b>Eye contact</b>	: Immediately flush eyes with plenty of water, occasionally lifting the upper and lower eyelids. Check for and remove any contact lenses. Continue to rinse for at least 10 minutes. Get medical attention if irritation occurs.
<b>Inhalation</b>	: Remove victim to fresh air and keep at rest in a position comfortable for breathing. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Get medical attention if adverse health effects persist or are severe. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband. In case of inhalation of decomposition products in a fire, symptoms may be delayed. The exposed person may need to be kept under medical surveillance for 48 hours.
<b>Skin contact</b>	: Flush contaminated skin with plenty of water. Remove contaminated clothing and shoes. Get medical attention if symptoms occur. Wash clothing before reuse. Clean shoes thoroughly before reuse.
<b>Ingestion</b>	: As this product is a gas, refer to the inhalation section.

### Most important symptoms/effects, acute and delayed

#### Potential acute health effects

<b>Eye contact</b>	: Contact with rapidly expanding gas may cause burns or frostbite.
<b>Inhalation</b>	: At very high concentrations, can displace the normal air and cause suffocation from lack of oxygen.
<b>Skin contact</b>	: Contact with rapidly expanding gas may cause burns or frostbite.
<b>Frostbite</b>	: Try to warm up the frozen tissues and seek medical attention.
<b>Ingestion</b>	: As this product is a gas, refer to the inhalation section.

#### Over-exposure signs/symptoms

<b>Eye contact</b>	: No specific data.
<b>Inhalation</b>	: No specific data.
<b>Skin contact</b>	: No specific data.
<b>Ingestion</b>	: No specific data.

### Indication of immediate medical attention and special treatment needed, if necessary

## Section 4. First aid measures

- Notes to physician** : In case of inhalation of decomposition products in a fire, symptoms may be delayed. The exposed person may need to be kept under medical surveillance for 48 hours.
- Specific treatments** : No specific treatment.
- Protection of first-aiders** : No action shall be taken involving any personal risk or without suitable training. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation.

See toxicological information (Section 11)

## Section 5. Fire-fighting measures

### Extinguishing media

**Suitable extinguishing media** : Use an extinguishing agent suitable for the surrounding fire.

**Unsuitable extinguishing media** : None known.

**Specific hazards arising from the chemical** : Contains gas under pressure. In a fire or if heated, a pressure increase will occur and the container may burst or explode.

**Hazardous thermal decomposition products** : Decomposition products may include the following materials:  
nitrogen oxides

**Special protective actions for fire-fighters** : Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training. Contact supplier immediately for specialist advice. Move containers from fire area if this can be done without risk. Use water spray to keep fire-exposed containers cool.

**Special protective equipment for fire-fighters** : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

## Section 6. Accidental release measures

### Personal precautions, protective equipment and emergency procedures

**For non-emergency personnel** : No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Avoid breathing gas. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment.

**For emergency responders** : If specialized clothing is required to deal with the spillage, take note of any information in Section 8 on suitable and unsuitable materials. See also the information in "For non-emergency personnel".

**Environmental precautions** : Ensure emergency procedures to deal with accidental gas releases are in place to avoid contamination of the environment. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air).

### Methods and materials for containment and cleaning up

**Small spill** : Immediately contact emergency personnel. Stop leak if without risk.

**Large spill** : Immediately contact emergency personnel. Stop leak if without risk. Note: see Section 1 for emergency contact information and Section 13 for waste disposal.



## Section 7. Handling and storage

### Precautions for safe handling

- Protective measures** : Put on appropriate personal protective equipment (see Section 8). Contains gas under pressure. Avoid breathing gas. Use only with adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Do not puncture or incinerate container. Use equipment rated for cylinder pressure. Close valve after each use and when empty. Protect cylinders from physical damage; do not drag, roll, slide, or drop. Use a suitable hand truck for cylinder movement.
- Avoid contact with eyes, skin and clothing. Empty containers retain product residue and can be hazardous.

- Advice on general occupational hygiene** : Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Remove contaminated clothing and protective equipment before entering eating areas. See also Section 8 for additional information on hygiene measures.

- Conditions for safe storage, including any incompatibilities** : Store in accordance with local regulations. Store in a segregated and approved area. Store away from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see Section 10). Cylinders should be stored upright, with valve protection cap in place, and firmly secured to prevent falling or being knocked over. Cylinder temperatures should not exceed 52 °C (125 °F). Keep container tightly closed and sealed until ready for use. See Section 10 for incompatible materials before handling or use.

## Section 8. Exposure controls/personal protection

### Control parameters

#### Occupational exposure limits

Ingredient name	Exposure limits
Nitrogen	ACGIH TLV (United States, 3/2019). Oxygen Depletion [Asphyxiant].

- Appropriate engineering controls** : Use only with adequate ventilation. Use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits.

- Environmental exposure controls** : Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

### Individual protection measures

- Hygiene measures** : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

- Eye/face protection** : Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists, gases or dusts. If contact is possible, the following protection should be worn, unless the assessment indicates a higher degree of protection: safety glasses with side-shields.

### Skin protection

- Hand protection** : Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary. Considering the parameters specified by the glove manufacturer, check during use that the gloves are still retaining their protective properties. It should be noted that the time to breakthrough for any glove material may be different for different glove manufacturers. In the case of mixtures, consisting of several substances, the protection time of the gloves cannot be accurately estimated.

## Section 8. Exposure controls/personal protection

- Body protection** : Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.
- Other skin protection** : Appropriate footwear and any additional skin protection measures should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.
- Respiratory protection** : The gas can cause asphyxiation without warning by replacing the oxygen in the air. Based on the hazard and potential for exposure, select a respirator that meets the appropriate standard or certification. If operating conditions cause high gas concentrations to be produced or any recommended or statutory exposure limit is exceeded, use an air-fed respirator or self-contained breathing apparatus. Respirators must be used according to a respiratory protection program to ensure proper fitting, training, and other important aspects of use. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.

## Section 9. Physical and chemical properties

### Appearance

- Physical state** : Gas. [Compressed gas.]
- Color** : Colorless.
- Odor** : Odorless.
- Odor threshold** : Not available.
- pH** : Not available.
- Melting point** : -210.01°C (-346°F)
- Boiling point** : -196°C (-320.8°F)
- Critical temperature** : -146.95°C (-232.5°F)
- Flash point** : [Product does not sustain combustion.]
- Evaporation rate** : Not available.
- Flammability (solid, gas)** : Not available.
- Lower and upper explosive (flammable) limits** : Not available.
- Vapor pressure** : Not available.
- Vapor density** : 0.967 (Air = 1) Liquid Density@BP: 50.46 lb/ft<sup>3</sup> (808.3 kg/m<sup>3</sup>)
- Specific Volume (ft<sup>3</sup>/lb)** : 13.8889
- Gas Density (lb/ft<sup>3</sup>)** : 0.072
- Relative density** : Not applicable.
- Solubility** : Not available.
- Solubility in water** : Not available.
- Partition coefficient: n-octanol/water** : 0.67
- Auto-ignition temperature** : Not available.
- Decomposition temperature** : Not available.
- Viscosity** : Not applicable.
- Flow time (ISO 2431)** : Not available.
- Molecular weight** : 28.02 g/mole

## Section 10. Stability and reactivity

<b>Reactivity</b>	: No specific test data related to reactivity available for this product or its ingredients.
<b>Chemical stability</b>	: The product is stable.
<b>Possibility of hazardous reactions</b>	: Under normal conditions of storage and use, hazardous reactions will not occur.
<b>Conditions to avoid</b>	: Do not allow gas to accumulate in low or confined areas.
<b>Incompatible materials</b>	: No specific data.
<b>Hazardous decomposition products</b>	: Under normal conditions of storage and use, hazardous decomposition products should not be produced.
<b>Hazardous polymerization</b>	: Under normal conditions of storage and use, hazardous polymerization will not occur.

## Section 11. Toxicological information

### Information on toxicological effects

#### Acute toxicity

Not available.

#### Irritation/Corrosion

Not available.

#### Sensitization

Not available.

#### Mutagenicity

Not available.

#### Carcinogenicity

Not available.

#### Reproductive toxicity

Not available.

#### Teratogenicity

Not available.

#### Specific target organ toxicity (single exposure)

Not available.

#### Specific target organ toxicity (repeated exposure)

Not available.

#### Aspiration hazard

Not available.

**Information on the likely routes of exposure** : Not available.

### Potential acute health effects

**Eye contact** : Contact with rapidly expanding gas may cause burns or frostbite.

**Inhalation** : At very high concentrations, can displace the normal air and cause suffocation from lack of oxygen.

## Section 11. Toxicological information

- Skin contact** : Contact with rapidly expanding gas may cause burns or frostbite.  
**Ingestion** : As this product is a gas, refer to the inhalation section.

### Symptoms related to the physical, chemical and toxicological characteristics

- Eye contact** : No specific data.  
**Inhalation** : No specific data.  
**Skin contact** : No specific data.  
**Ingestion** : No specific data.

### Delayed and immediate effects and also chronic effects from short and long term exposure

#### Short term exposure

- Potential immediate effects** : Not available.  
**Potential delayed effects** : Not available.

#### Long term exposure

- Potential immediate effects** : Not available.  
**Potential delayed effects** : Not available.

#### Potential chronic health effects

Not available.

- General** : No known significant effects or critical hazards.  
**Carcinogenicity** : No known significant effects or critical hazards.  
**Mutagenicity** : No known significant effects or critical hazards.  
**Teratogenicity** : No known significant effects or critical hazards.  
**Developmental effects** : No known significant effects or critical hazards.  
**Fertility effects** : No known significant effects or critical hazards.

### Numerical measures of toxicity

#### Acute toxicity estimates

Not available.

## Section 12. Ecological information

### Toxicity

Not available.

### Persistence and degradability

Not available.

### Bioaccumulative potential

Product/ingredient name	LogP <sub>ow</sub>	BCF	Potential
Nitrogen	0.67	-	low

### Mobility in soil

- Soil/water partition coefficient (K<sub>oc</sub>)** : Not available.






## Section 12. Ecological information

**Other adverse effects** : No known significant effects or critical hazards.

## Section 13. Disposal considerations

**Disposal methods** : The generation of waste should be avoided or minimized wherever possible. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Waste should not be disposed of untreated to the sewer unless fully compliant with the requirements of all authorities with jurisdiction. Empty Airgas-owned pressure vessels should be returned to Airgas. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible. This material and its container must be disposed of in a safe way. Empty containers or liners may retain some product residues. Do not puncture or incinerate container.

## Section 14. Transport information

	DOT	TDG	Mexico	IMDG	IATA
<b>UN number</b>	UN1066	UN1066	UN1066	UN1066	UN1066
<b>UN proper shipping name</b>	NITROGEN, COMPRESSED	NITROGEN, COMPRESSED	NITROGEN, COMPRESSED	NITROGEN, COMPRESSED	NITROGEN, COMPRESSED
<b>Transport hazard class(es)</b>	2.2 	2.2 	2.2 	2.2 	2.2 
<b>Packing group</b>	-	-	-	-	-
<b>Environmental hazards</b>	No.	No.	No.	No.	No.

“Refer to CFR 49 (or authority having jurisdiction) to determine the information required for shipment of the product.”

### Additional information

**DOT Classification** : **Limited quantity** Yes.  
**Quantity limitation** Passenger aircraft/rail: 75 kg. Cargo aircraft: 150 kg.

**TDG Classification** : Product classified as per the following sections of the Transportation of Dangerous Goods Regulations: 2.13-2.17 (Class 2).  
**Explosive Limit and Limited Quantity Index** 0.125  
**Passenger Carrying Road or Rail Index** 75

**IATA** : **Quantity limitation** Passenger and Cargo Aircraft: 75 kg. Cargo Aircraft Only: 150 kg.

**Special precautions for user** : **Transport within user's premises:** always transport in closed containers that are upright and secure. Ensure that persons transporting the product know what to do in the event of an accident or spillage.

**Transport in bulk according to IMO instruments** : Not available.

## Section 15. Regulatory information

**U.S. Federal regulations** : TSCA 8(a) CDR Exempt/Partial exemption: This material is listed or exempted.

**Clean Air Act Section 112 (b) Hazardous Air Pollutants (HAPs)** : Not listed

**Clean Air Act Section 602 Class I Substances** : Not listed

**Clean Air Act Section 602 Class II Substances** : Not listed

**DEA List I Chemicals (Precursor Chemicals)** : Not listed

**DEA List II Chemicals (Essential Chemicals)** : Not listed

### SARA 302/304

#### Composition/information on ingredients

No products were found.

**SARA 304 RQ** : Not applicable.

### SARA 311/312

**Classification** : Refer to Section 2: Hazards Identification of this SDS for classification of substance.

### State regulations

**Massachusetts** : This material is listed.

**New York** : This material is not listed.

**New Jersey** : This material is listed.

**Pennsylvania** : This material is listed.

### California Prop. 65

This product does not require a Safe Harbor warning under California Prop. 65.

### International regulations

#### Chemical Weapon Convention List Schedules I, II & III Chemicals

Not listed.

#### Montreal Protocol

Not listed.

#### Stockholm Convention on Persistent Organic Pollutants

Not listed.

#### Rotterdam Convention on Prior Informed Consent (PIC)

Not listed.

#### UNECE Aarhus Protocol on POPs and Heavy Metals

Not listed.

### Inventory list

**Australia** : This material is listed or exempted.

**Canada** : This material is listed or exempted.

**China** : This material is listed or exempted.

**Europe** : This material is listed or exempted.

**Japan** : **Japan inventory (ENCS)**: Not determined.  
**Japan inventory (ISHL)**: Not determined.

**New Zealand** : This material is listed or exempted.

**Philippines** : This material is listed or exempted.

## Section 15. Regulatory information

<b>Republic of Korea</b>	: This material is listed or exempted.
<b>Taiwan</b>	: This material is listed or exempted.
<b>Thailand</b>	: Not determined.
<b>Turkey</b>	: Not determined.
<b>United States</b>	: This material is active or exempted.
<b>Viet Nam</b>	: This material is listed or exempted.

## Section 16. Other information

### Hazardous Material Information System (U.S.A.)

Health	/	0
Flammability		0
Physical hazards		3

Caution: HMIS® ratings are based on a 0-4 rating scale, with 0 representing minimal hazards or risks, and 4 representing significant hazards or risks. Although HMIS® ratings and the associated label are not required on SDSs or products leaving a facility under 29 CFR 1910.1200, the preparer may choose to provide them. HMIS® ratings are to be used with a fully implemented HMIS® program. HMIS® is a registered trademark and service mark of the American Coatings Association, Inc.

The customer is responsible for determining the PPE code for this material. For more information on HMIS® Personal Protective Equipment (PPE) codes, consult the HMIS® Implementation Manual.

### National Fire Protection Association (U.S.A.)



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Copyright ©2001, National Fire Protection Association, Quincy, MA 02269. This warning system is intended to be interpreted and applied only by properly trained individuals to identify fire, health and reactivity hazards of chemicals. The user is referred to certain limited number of chemicals with recommended classifications in NFPA 49 and NFPA 325, which would be used as a guideline only. Whether the chemicals are classified by NFPA or not, anyone using the 704 systems to classify chemicals does so at their own risk.

### Procedure used to derive the classification

Classification	Justification
GASES UNDER PRESSURE - Compressed gas	Expert judgment
SIMPLE ASPHYXIANTS	Expert judgment

### History

<b>Date of printing</b>	: 8/31/2021
<b>Date of issue/Date of revision</b>	: 8/31/2021
<b>Date of previous issue</b>	: 4/30/2019
<b>Version</b>	: 1.04
<b>Key to abbreviations</b>	: ATE = Acute Toxicity Estimate BCF = Bioconcentration Factor GHS = Globally Harmonized System of Classification and Labelling of Chemicals IATA = International Air Transport Association IBC = Intermediate Bulk Container IMDG = International Maritime Dangerous Goods LogPow = logarithm of the octanol/water partition coefficient

## Section 16. Other information

MARPOL = International Convention for the Prevention of Pollution From Ships, 1973 as modified by the Protocol of 1978. ("Marpol" = marine pollution)

UN = United Nations

### References

: Not available.

### Notice to reader

To the best of our knowledge, the information contained herein is accurate. However, neither the above-named supplier, nor any of its subsidiaries, assumes any liability whatsoever for the accuracy or completeness of the information contained herein.

Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.