AGREEMENT FOR THE PURCHASE OF GOODS AND SERVICES

THIS AGREEMENT FOR THE PURCHASE OF GOODS AND SERVICES ("Agreement") is made _____, 2018 between TerraChem, Inc. ("Contractor"), whose address is 26868 Henry Road, Fellows CA 93224, and telephone number is 661-769-9091 and the City of Stockton, a municipal corporation ("City").

In consideration of the mutual promises set forth in this Agreement, the parties agree as follows:

1. Goods to be provided and services to be performed. Contractor shall provide the goods and perform the services as set forth in the Request for Bid documents and on the attached Exhibit A incorporated herein by reference. Contractor shall begin providing the goods/performing the services on July 1, 2018 and complete providing the goods/performing the services by June 30, 2019. The parties may agree to extend the contract on a year-to-year basis, not to exceed three (3) yearly renewals. The price for any succeeding period of service shall be agreed upon by both parties.

2. Compensation. For the goods and services under this Agreement, City shall pay Contractor the sum of $1.17 per gallon for delivery of Aqueous Ammonia. The not-to exceed amount for the potential 4-year contract term is $284,000.

3. Method of Payment. City shall pay Contractor within 30 days from the date Contractor's invoices are approved by the City Manager. Contractor shall submit monthly invoices.

4. Maintenance. Contractor shall maintain the goods as set forth in Exhibit A at a cost as set forth in Exhibit A. Contractor shall respond to calls for required maintenance from City personnel within 24 hours of the call; required maintenance occurs when the self check system fails to perform any of its functions. If Contractor is unable to resolve routine maintenance issues by phone within 48 hours, Contractor shall provide to City personnel a resolution report indicating how and when the Contractor intends to resolve the issue. Within the period of the maintenance agreement, Contractor shall implement all software and firmware upgrades to the goods identified in Exhibit A at no cost to City. If software and firmware upgrades require a hardware upgrade, Contractor shall provide the upgraded hardware at no cost to the City. City personnel shall review and approve any upgrades prior to their installation.

5. Warranty. Contractor warrants that for one year the goods installed shall be free of defects in materials and workmanship. The one year period shall begin upon the date the City provides in writing to Contractor acceptance of the goods. The warranty under this section shall provide coverage equal to or greater than those warranties that are customary in the industry and, at a minimum, include all parts and labor,

6. Hold Harmless. To the fullest extent permitted by law, Contractor shall hold harmless, defend at its own expense, and indemnify the City of Stockton, its Mayor,

Council, officers, representatives, agents, employees and volunteers, against any and all liability, claims, losses, damages, or expenses, including reasonable attorney's fees, arising from all acts or omissions to act of contractor or its officers, agents, or employees in rendering services under this contract; excluding, however, such liability, claims, losses, damages, or expenses arising from the City of Stockton's sole negligence or willful acts. The duty to defend and the duty to indemnify are separate and distinct obligations. The indemnification obligations of this section shall survive the termination of this agreement.

7. Insurance. During the term of this Agreement, Contractor shall maintain in full force and effect at its own cost and expense the insurance coverage set forth on the attached Exhibit B and shall otherwise comply with the provisions of Exhibit B.

8. Business License. Prior to its execution of this Agreement, Contractor shall obtain a City business license.

9. Audit. City reserves the right to periodically audit all charges for good and services provided by Contractor.

10. Ownership of Goods. All goods accepted by the City shall be the property of the City.

11. Changes to the Agreement. This Agreement may not be modified except in writing by both parties.

12. Applicable Law. This Agreement shall be governed by the laws of the State of California and venue for any action brought in state court shall be in the Superior Court, County of San Joaquin, Stockton Branch or, for actions brought in federal court, the United States District Court for the Eastern District of California, Sacramento Division.

13. Non-Assignability. Contractor shall not assign or transfer this Agreement or any interest or obligation in this Agreement without the prior written consent of the City and then only upon such terms and conditions as City may set forth in writing.

14. Notices. All notices herein required shall be in writing and shall be sent certified or registered mail, postage prepaid, addressed as follows:

To Contractor:	Terry Arnold TerraChem, Inc 26868 Henry Rd. Fellows, CA 93224	To City:	City Manager City of Stockton 425 N. El Dorado St. Stockton, CA 95202

15. Conformance to Applicable Laws. Contractor shall comply with all applicable Federal, State and Municipal laws, rules and ordinances. Contractor shall not discriminate in the employment of persons or in providing services under this

Agreement on the basis of any legally protected classification including race, color, national origin, sex or religion of such person.

16. Miscellaneous Provisions.

a. City may terminate this Agreement at any time by mailing notice to Contractor at the address first stated above. Contractor shall be paid for that portion of goods provided / services provided when notice is received.

b. Contractor shall not assign or transfer this Agreement.

c. In the performance of this Agreement, Contractor, its employees and agents shall have the status of an independent contractor and not as an employee of the City for any purpose.

d. If either City or Contractor waives a breach of this Agreement, such waiver shall not constitute a waiver of other or succeeding breaches of this Agreement.

e. This Agreement constitutes the entire understanding of the parties.

IN WITNESS WHEREOF, the parties hereto have executed this Agreement the date and year first above written.

CITY OF STOCKTON

_____
KURT O. WILSON
CITY MANAGER

CONTRACTOR

By: Donna Moe
Signature

Donna Moe
Print name

Business Manager / Corp. Officer
Title

[If Contractor is a corporation, signatures must comply with Corporations Code §313]

ATTEST:

_____
BRET HUNTER, CMC
CITY CLERK

APPROVED AS TO FORM

_____
CITY ATTORNEY

EXHIBIT A

BAY AREA CHEMICAL CONSORTIUM
STANDARD AGREEMENT, PAGE 1 OF 2
BID NO. 03-2018
SUPPLY AND DELIVERY OF AQUEOUS AMMONIA

Bay Area Chemical Consortium (BACC)
c/o Dublin San Ramon Services District
Regional Wastewater Treatment Facility
7399 Johnson Drive
Pleasanton, CA 94588

Dear Sirs:

I hereby agree to furnish Aqueous Ammonia identified in the attached bid forms, as solicited by the Bay Area Chemical Consortium (BACC), to one or more of the participating BACC Agencies.

Company: TerraChem
Address: 26868 Henry Rd.
City, State, ZIP: Fellows, Calif. 93224
Phone: 661 769 9091
Email: terry@bestchemsolutions.com
Authorized Representative: Terry Arnold
Signature:
Date: 4/1/18

WE ACKNOWLEDGE RECEIVING ADDENDUM/ADDENDA NUMBER _____ THROUGH_____.

SPECIFIC DEVIATIONS (if applicable, attach additional sheets if necessary):

STANDARD AGREEMENT, PAGE 2 OF 2

BIDDER INFORMATION

1. Legal Name of Bidder: TerraChem Inc.

2. Bidder's Street Address: 26868 Henry Rd. Fellows, Calif. 93224

3. Mailing Address: PO Box 246 Taft, Calif. 93268

4. Business Telephone: 661 769 9091 Fax Number: 661 769 9018

5. Type of Supplier:
   X Sole Proprietor □ Partnership □ Corporation
   If Corporation, indicate State where incorporated: _____

6. Business License Number issued by the City where the Supplier's principal place of business is located.
   Number: SIC 1389 Issuing City: Bakersfield, Ca.

7. Supplier Federal Tax Identification Number: 27-4635293

8. Emergency Contact: Name: Terry Arnold
   Phone Number: 661 428 4001

9. Order Contact: Name: Donna Moe
   Address: 26868 Henry Rd.
   Phone Number:661 769 9091 Fax Number: 661 769 9018
   Email: orders@bestchemsolutions.com

10. References:

Company/Agency Name	Contact Name	Phone Number
1) Air Gas Liquids	Michael Cartwright	(209) 483-3778
2) AG Layne	Kyle Lee	(818) 207-2636
3) Brown & Reich	Danny Frye	661 765 5457

11. Chemical Manufacturer's name and address (if different from Bidder):

Airgas Specialty Products

7166 Fair Oaks Blvd Carmichael, CA 95608

Non-Collusion Affidavit
To Be Executed By Bidder and Submitted With Bid

State of California)
) ss.
County of Kern)

Donna Moe, being first duly sworn, deposes and says that he or she is
(Contractor's Authorized Representative)

Officer (Sec) of TerraChem the party making the
(Title of Representative) (Contractor's Name)

Foregoing bid that the bid is not made in the interest of, or on behalf of, any undisclosed person, partnership, company, association, organization, or corporation; that the bid is genuine and not collusive or sham; that the bidder has not directly or indirectly induced or solicited any other bidder to put in a false or sham bid, and has not directly or indirectly colluded, conspired, connived, or agreed with any bidder or anyone else to put in a sham bid, or that anyone shall refrain from bidding; that the bidder has not in any manner, directly or indirectly, sought by agreement, communication, or conference with anyone to fix the bid price of the bidder or any other bidder, or to fix any overhead, profit, or cost element of the bid price, or of that of any other bid, or to secure any advantage against the public body awarding the contract of anyone interested in the proposed contract; that all statements contained in the bid are true; and, further, that the bidder has not, directly or indirectly, submitted his or her bid price or any breakdown thereof, or the contents thereof, or divulged information or data relative thereto, or paid, and will not pay, any fee to any corporation, partnership, company association, organization, bid depository, or to any member or agent thereof to effectuate a collusive or sham bid.

I declare under penalty of perjury under the laws of the state of California that the foregoing is true and correct.

Donna Moe(Secretary)
Signature of: President, Secretary,
Manager, Owner, or Representative

Subscribed and sworn to before me this, _____ day of _____, 2018 _

_____
Signature of Notary Public In and For

Please see attached CA Notary Certificate

The County of _____,

State of _____

All Signatures Must Be Witnessed By Notary

ATTACHMENT A

CALIFORNIA JURAT WITH AFFIANT STATEMENT

GOVERNMENT CODE § 8202

☑ See Attached Document (Notary to cross out lines 1–6 below)
☐ See Statement Below (Lines 1–6 to be completed only by document signer[s], not Notary)

Signature of Document Signer No. 1

Signature of Document Signer No. 2 (if any)

A notary public or other officer completing this certificate verifies only the identity of the individual who signed the document to which this certificate is attached, and not the truthfulness, accuracy, or validity of that document.

State of California
County of Kern

Subscribed and sworn to (or affirmed) before me
on this 10th day of April, 2018,
by Date Month Year
Donna Moe

Name(s) of Signer(s)

proved to me on the basis of satisfactory evidence to be the person(s) who appeared before me.

MEGAN RUSSELL
Notary Public - California
Kern County
Commission # 2166620
My Comm. Expires Oct 30, 2020

Seal
Place Notary Seal Above

Signature Megan Russell
Signature of Notary Public

OPTIONAL

Though this section is optional, completing this information can deter alteration of the document or fraudulent reattachment of this form to an unintended document.

Description of Attached Document

Title or Type of Document: Non-Collusion Affidavit to be Executed By Bidder and Submitted with Bid

Number of Pages: 1 Document Date: 4/10/18

BAY AREA CHEMICAL CONSORTIUM
BID FORM FOR BID NO. 03-2018

Sealed bids must be enclosed in an envelope clearly marked:

"BID FOR AQUEOUS AMMONIA
BACC BID NO. 03-2018"

And delivered to:

Gemma Lathi
Administrative Analyst – Operations
Dublin San Ramon Services District
Regional Wastewater Treatment Facility
7399 Johnson Drive
Pleasanton, CA 94588

No later than 9:00 A.M. PDT
Tuesday, April 10, 2018

Business Name: TerraChem

Business Address
26868 Henry Rd.
Fellows, Ca. 93224

Telephone Number: 661 769 9091
Facsimile Number: 661 769 9018
Email Address:
orders@bestchemsolutions.com

Authorized Representative (Please Print):
Terry Arnold
Signature:
Date: 4/4/18

I. **All costs except California State sales tax for the purchase of Aqueous Ammonia must be included in the amount shown below on this Bid Form, including any and all mill assessments, fees, excise taxes, transportation charges, etc. Any exceptions to the bid must be noted under Specific Deviations on the Standard Agreement. Bidders shall submit bids per unit of measure as specified in attached Exhibit A to Bid Form.**

II. **Bidders must submit all of the following, attached to this Bid Form:**

a. An affidavit of compliance to the appropriate American Water Works Association (AWWA) and/or National Sanitation Foundation (NSF) standard is required for all chemicals and polymers being provided for potable water treatment. Bidders must include a statement by the chemical manufacturer, signed by an authorized representative on letterhead stationery, attesting to the affidavit's validity. In lieu of submitting an affidavit of compliance with AWWA/NSF standards and a letter attesting to the affidavit's validity, a current printout from NSF.org is acceptable.
b. A representative analysis of the chemical to be supplied, as prepared by a reputable outside laboratory or bidder's in-house laboratory if ISO certified.
c. Product Bulletin and Typical Properties.
d. Safety Data Sheet (SDS).
e. If applicable, the name, address, and contact information for the third party hauling company as well as an affidavit signed by the Bidder that the third party hauler can and will deliver the chemical to each and every participating BACC Agency.

ATTACHMENT A

Tera chem

BAY AREA CHEMICAL CONSORTIUM
EXHIBIT A TO BID FORM
BID NO. 03-2018
AQUEOUS AMMONIA

Bidders shall submit bids in US$ per unit of measure as indicated below, FOB Destination.
Bid prices must be based on bulk deliveries of 2,000 gallons or 1 ton or more.
Refer to paragraph 2.4 Bid Pricing for full details.

	Unit of Measure	Bid Price per Unit of Measure
Aqueous Ammonia 19% Solution		
Central Valley City of Stockton	gal	$ 1.17
East Bay Alameda County Water District	gal	$ 0.74
Peninsula City of Daly City/North San Mateo County Sanitation District	gal	$ 3.19
South Bay San Jose - Santa Clara Regional Wastewater Facility Santa Clara Valley Water District	gal	$ 0.61
Tri Valley Dublin San Ramon Services District Zone 7 Water Agency	gal	$ 3.31
Aqueous Ammonia 29% Solution		
Sacramento City of Roseville	gal	$ 3.19
Aqueous Ammonia 30% Solution		
Marin Sonoma Napa Marin Municipal Water District	gal	$ 3.31

ATTACHMENT A

NSF International

09/06/2017

Mr. Rickey Davenport
Airgas Specialty Products Inc.
2530 Sever Road
Suite 300
Lawrenceville, GA 30043

Subject: Revised Authorized Registered Formulation for Standard 60

Enclosed is a copy of your revised Authorized Registered Formulation. This complete formulation (original copy with blue watermark) must be retained and on file at the identified plant location for review by an NSF Field Representative, conducting the annual/follow-up audits. Please forward the Authorized Registered Formulation to the appropriate plant. Each product is identified by Document Control Code (DCC number) located in the upper left hand corner of the each page. All previous and now outdated Authorized Registered Formulations for your products are to be destroyed and replaced with the enclosed revisions.

The NSF audit of your plant, including materials/process verification and product sampling, will be guided by this formulation. Failure to maintain this information at the plant may require special follow-up audits or result in removal of products from Listing.

Only those specific material/ingredients and use levels indicated in the Authorized Registered Formulation are authorized for use in the Certified Product. To obtain authorization for an alternate supplier (or other modification) please contact your Certification Project Manager at 1-800-NSF-MARK to request the appropriate forms. For customers outside the USA, please use 1-734-769-8010 and ask for your Certification Project Manager. As a reminder, you are not permitted to make any formulation changes to NSF Certified products without prior written approval from NSF.

If you have any questions about the Authorized Registered Formulation, please contact your Certification Project Manager indicated below.

Enclosure: Authorized Registered Formulation

Certification Project Manager: Susan Gauvin, 1-734-827-5667, gauvin@nsf.org

Plant: C0005988
DCC: DA04347

This is a copy of the Authorized Registered Formulation. If you have received this ARF in hard copy, you may confirm the most current ARF by contacting your Certification Project Manager or going directly to the secured NSF Online website (http:\\clients.nsf.org) for the latest, most accurate information.

NSF/ANSI Standard 60 - Drinking Water Treatment Chemicals
Authorized Registered Formulation

Reason for Revision: W0424297 Add supplier Helm to DA04340 and DA04347

Customer Name: Airgas Specialty Products Inc.
Customer Number: 27370

Facility Location: Riverside, CA
Facility At: Riverside, CA
Facility Number: C0005988

Trade Name Level Functions: Chloramination

Trade Name(s)	MUL(mg/L)
Ammonium Hydroxide	10
Aqua Ammonia	10

Section/Category: DSOX, SECTION 6 - DISINFECTION AND OXIDATION

Chemical Name: Ammonium Hydroxide **Physical State:** Liquid

Auditor Notes

Formulation 1 is a dilution of a NSF Certified product and/or product covered by the testing and evaluation of an Approved Ingredient (AI) DCC.

Formulation 2 is a dilution or repackage of a NSF Certified product and/or product covered by the testing and evaluation of an Approved Ingredient (AI) DCC.

Sample Notes

Please submit for testing:
- Sample with its supplier indicated on the shipping document
- Safety Data Sheet (SDS)

Liquid samples typically require 125 mL for testing, and solid samples typically require 100 g for testing.

Formulation

Formulation Description: FORMULATION 1

Chemical Description	Trade Name	Supplier	% or PPW	DCC	Acceptance Date
AMMONIA, ANHYDROUS	AMMONIA, ANHYDROUS	MOSAIC	9-30	AI00499	08/27/2015
AMMONIA, ANHYDROUS	AMMONIA, ANHYDROUS	TAMPA PORT SERVICES, LLC	9-30	AI00499	08/27/2015
AMMONIA, ANHYDROUS	ANHYDROUS AMMONIA	ADVANSIX	9-30	AI00498	08/27/2015
AMMONIA, ANHYDROUS	ANHYDROUS AMMONIA	CHEVRON (PASCAGOULA, MS)	9-30	AI00023	12/21/2012
AMMONIA, ANHYDROUS	AMMONIA, ANHYDROUS	AGRIUM US INC	9-30	AI00019	12/21/2012
AMMONIA, ANHYDROUS	ANHYDROUS AMMONIA	NORTHERN NITROGEN INC. ***	9-30	AI00488	07/31/2015
AMMONIA, ANHYDROUS	ANHYDROUS AMMONIA	AGRIUM WHOLESALE	9-30	AI00488	07/31/2015
AMMONIA, ANHYDROUS	AMMONIA, ANHYDROUS	OCI FERTILIZER USA ****	9-30	AI00487	07/31/2015
AMMONIA, ANHYDROUS	AMMONIA, ANHYDROUS	OCI BEAUMONT, LLC	9-30	AI00487	07/31/2015
AMMONIA, ANHYDROUS	ANY NSF CERTIFIED ANHYDROUS AMMONIA	AIRGAS SPECIALTY PRODUCTS INC.	9-30		
WATER	RO AND/OR DI WATER	ON-SITE FACILITY/PLANT SUPPLY	70-91		

Notes

End product is 18% - 33% ammonia.

* Distributor (not a repackage) of Anhydrous Ammonia supplied by United States Steel Corporation (USS).

** Distributor (not a repackage) of Anhydrous Ammonia supplied by JR Simplot Company.

*** Distributor (not a repackage) of Anhydrous Ammonia supplied by Agrium Wholesale

**** Distributor (not a repackage) of Ammonia, Anhydrous supplied by OCI Beaumont, LLC

ATTACHMENT A

DCC: DA04347

Date: 09/06/2017

Formulation

Formulation Description: FORMULATION 2

Chemical Description	Trade Name	Supplier	% or PPW	DCC	Acceptance Date
AMMONIA, ANHYDROUS	ANY NSF CERTIFIED ANHYDROUS AMMONIA	ANY SUPPLIER	66-99.99		
AMMONIA, ANHYDROUS	ANY NSF CERTIFIED ANHYDROUS AMMONIA	TERRA INTERNATIONAL (CANADA) INC.	66-99.99		
AMMONIA, ANHYDROUS	ANY NSF CERTIFIED ANHYDROUS AMMONIA	CF INDUSTRIES NITROGEN, LLC	66-99.99		
AMMONIA, ANHYDROUS	ANHYDROUS AMMONIA	PCS SALES (USA), INC	66-99.99	AI00010	12/21/2012
AMMONIA, ANHYDROUS	ANHYDROUS AMMONIA	CF VERDIGRIS	66-99.99	AI00317	12/21/2012
AMMONIA, ANHYDROUS	ANHYDROUS AMMONIA [PRYOR CHEMICAL]	AIRGAS SPECIALTY PRODUCTS INC.	66-99.99	AI00316	12/21/2012
AMMONIA, ANHYDROUS	ANHYDROUS AMMONIA	CHEROKEE NITROGEN, SUBS OF ELDORADO CHEM., SUBS OF LSB IND.	66-99.99	AI00012	12/21/2012
AMMONIA, ANHYDROUS	ANHYDROUS AMMONIA	UNITED STATES STEEL CORP (USS)	66-99.99	AI00015	12/21/2012
AMMONIA, ANHYDROUS	ANHYDROUS AMMONIA	CLARION *	66-99.99	AI00015	12/21/2012
AMMONIA, ANHYDROUS	ANHYDROUS AMMONIA	CF IND. HOLDINGS, INC (FORMERLY TERRA)	66-99.99	AI00016	12/21/2012
AMMONIA, ANHYDROUS	ANHYDROUS AMMONIA (CALAMCO/JR SIMPLOT CO)	AI00017	66-99.99		
AMMONIA, ANHYDROUS	ANHYDROUS AMMONIA	CALAMCO **	66-99.99	AI00017	12/21/2012
AMMONIA, ANHYDROUS	ANY NSF CERTIFIED AMMONIUM HYDROXIDE	CHEVRON PRODUCTS COMPANY (EL SEGUNDO, CA)	66-99.99		
AMMONIA, ANHYDROUS	AMMONIA (100%)	TRAMMO, INC.	66-99.99	AI00018	12/21/2012
AMMONIA, ANHYDROUS	AMMONIA, ANHYDROUS	KOCH NITROGEN COMPANY	66-99.99	AI00020	12/21/2012
AMMONIA, ANHYDROUS	ANHYDROUS AMMONIA	ADVANSIX	66-99.99	AI00498	08/27/2015
AMMONIA, ANHYDROUS	ANHYDROUS AMMONIA	CHEVRON (PASCAGOULA, MS)	66-99.99	AI00023	12/21/2012
AMMONIA, ANHYDROUS	AMMONIA, ANHYDROUS	MOSAIC	66-99.99	AI00499	08/27/2015

ATTACHMENT A

DCC: DA04347

Date: 09/06/2017

Formulation

Formulation Description: FORMULATION 2

Chemical Description	Trade Name	Supplier	% or PPW	DCC	Acceptance Date
AMMONIA, ANHYDROUS	AMMONIA, ANHYDROUS	TAMPA PORT SERVICES, LLC	66-99.99	AI00499	08/27/2015
AMMONIA, ANHYDROUS	ANHYDROUS AMMONIA (AGRIUM US INC)	AIRGAS SPECIALTY PRODUCTS INC.	66-99.99	AI00019	12/21/2012
AMMONIA, ANHYDROUS	ANHYDROUS AMMONIA	NORTHERN NITROGEN INC. ***	66-99.99	AI00488	07/31/2015
AMMONIA, ANHYDROUS	ANHYDROUS AMMONIA	AGRIUM WHOLESALE	66-99.99	AI00488	07/31/2015
AMMONIA, ANHYDROUS	AMMONIA, ANHYDROUS	OCI FERTILIZER USA ****	66-99.99	AI00487	07/31/2015
AMMONIA, ANHYDROUS	ANY NSF CERTIFIED ANHYDROUS AMMONIA	AIRGAS SPECIALTY PRODUCTS INC.	66-99.99		
AMMONIA, ANHYDROUS	AMMONIA, ANHYDROUS	HELM U.S. CORPORATION	66-99.99	AI00615	09/06/2017
AMMONIA, ANHYDROUS	AMMONIA, ANHYDROUS	OCI BEAUMONT, LLC	66-99.99	AI00487	07/31/2015
WATER	RO AND/OR DI WATER	ON-SITE FACILITY/PLANT SUPPLY	0.01-34		

Notes

End product is 18% - 33% ammonia.

*** Distributor (not a repackage) of Anhydrous Ammonia supplied by Agrium Wholesale

**** Distributor (not a repackage) of Ammonia, Anhydrous supplied by OCI Beaumont, LLC

Definitions of Terminology used in this Document:

Trade name: The name given to the ingredient, material or assembly by the company that makes the product.

Supplier: The name of the company that provides an ingredient, material or assembly directly to the company that makes the product covered by this registration. The supplier could be a formulator, distributor, fabricator, molder, extruder, mixer, manufacturer or assembler.

Formulator: The name of the company that prepares a material according to a formula. The formulator and the supplier could be the same company. This field may be blank as this information is only reported when the information is not confidential.

THIS IS THE LAST PAGE OF THIS DOCUMENT

ATTACHMENT A

ATTACHMENT A

CORNERSTONE LABORATORIES, LLC

1775 Moriah Woods Blvd., Ste. 12 ▪ Memphis, TN 38117 ▪ (901) 398-4001

Cornerstone Report#: 031-18-006
Attn: Marie Becker, Airgas Specialty Products-Riverside, CA
Cornerstone Reference #(s): 142623.

Date Sampled: 01/17/18
Date Received: 01/31/18
Date of Report: 02/05/18

Quality Conformance Results

Process Water

9753-011718-DI

Premium Grade Parameters

Analysis	Results	Units	USEPA-Method	Detection Limit	Specification Limit
Chlorides	<0.1	ppm, w/v	325	0.1	0.1 max
Sulfates	<0.1	ppm, w/v	375.4	0.1	0.1 max
Phosphates	<0.1	ppm, w/v	365	0.1	0.5 max
Iron	<0.005	ppm, w/v	200.7	0.005	0.05 max
Lead	<0.005	ppm, w/v	200.7	0.005	0.02 max

Premium Grade Parameters

Calcium	<0.005	ppm, w/v	200.7	0.005	0.1 max
Magnesium	<0.005	ppm, w/v	200.7	0.005	0.1 max
Sodium	<0.005	ppm, w/v	200.7	0.005	0.1 max
Potassium	<0.005	ppm, w/v	200.7	0.005	0.1 max
Copper	<0.005	ppm, w/v	200.7	0.005	0.1 max
Aluminum	<0.005	ppm, w/v	200.7	0.005	0.1 max
Zinc	<0.005	ppm, w/v	200.7	0.005	0.1 max
Arsenic	<0.005	ppm, w/v	200.7	0.005	0.05 max
Siloxanes	<0.005	ppm, w/v	200.7	0.005	0.1 max
Nitrates	<0.1	ppm, w/v	352.2	0.1	0.1 max

Samuel J. LaBonia
President and Technical Director

CORNERSTONE LABORATORIES, LLC

1775 Moriah Woods Blvd., Ste. 12 ▪ Memphis, TN 38117 ▪ (901) 398-4001

Cornerstone Report#: 031-18-006
Attn: Marie Becker, Airgas Specialty Products-Riverside, CA
Cornerstone Reference #(s): 142624.

Date Sampled: 01/17/18
Date Received: 01/31/18
Date of Report: 02/05/18

Quality Conformance Results

9753-011718-29%
ASP Premium Grade Parameters

Analysis	Results	Units	Method	Specification Limit
Chemical				
Assay as NH_3	29.5	%, w/w	AOAC-955.04	29-30
Physical				
Appearance	Clear, Free of Suspension	-	Subjective	Clear
Residue on Ignition	0.0010	%, w/w	ASTM-D7348-08	0.002
Substance Reducing MnO_4	PASS	-	ASTM-D1363-06	PASS
Anions				
Chlorides	<0.5	ppm, w/w	USEPA-325M	0.5
Carbon Dioxide	<0.001	%, w/w	ASTM-D513-11e1	0.001
Sulfates	<1	ppm, w/w	USEPA-375.4	1
Phosphates	<1	ppm, w/w	USEPA-365	1
Cations				
Heavy Metals as Lead	<0.5	ppm, w/w	USEPA-6010C	0.5
Iron	<0.2	ppm, w/w	USEPA-6010C	0.2

Additional Airgas Parameters

Analysis	Results	Units	Method	Specification Limit
Anions				
Nitrates	<1	ppm, w/w	USEPA-352.2	1
Cations				
Calcium	<1	ppm, w/w	USEPA-6010C	1
Magnesium	<1	ppm, w/w	USEPA-6010C	1
Sodium	<1	ppm, w/w	USEPA-6010C	1
Potassium	<1	ppm, w/w	USEPA-6010C	1
Copper	<0.1	ppm, w/w	USEPA-6010C	0.1
Aluminum	<1	ppm, w/w	USEPA-6010C	1
Zinc	<0.1	ppm, w/w	USEPA-6010C	0.1
Arsenic	<0.5	ppm, w/w	USEPA-6010C	0.5
Siloxanes	<0.5	ppm, w/w	USEPA-6010C	0.5

Samuel J. LaBonia
President and Technical Director

CORNERSTONE LABORATORIES, LLC

1775 Moriah Woods Blvd., Ste. 12 ▪ Memphis, TN 38117 ▪ (901) 398-4001

Cornerstone Report#: 031-18-006
Attn: Marie Becker, Airgas Specialty Products-Riverside, CA
Cornerstone Reference #(s): 142625.

Date Sampled: 01/17/18
Date Received: 01/31/18
Date of Report: 02/05/18

Quality Conformance Results

9753-011718-30%

ASP Premium Grade Parameters

Analysis	Results	Units	Method	Specification Limit
Chemical				
Assay as NH_3	30.3	%, w/w	AOAC-955.04	30-31
Physical				
Appearance	Clear, Free of Suspension	-	Subjective	Clear
Residue on Ignition	0.0015	%, w/w	ASTM-D7348-08	0.002
Substance Reducing MnO_4	PASS	-	ASTM-D1363-06	PASS
Anions				
Chlorides	<0.5	ppm, w/w	USEPA-325M	0.5
Carbon Dioxide	<0.001	%, w/w	ASTM-D513-11e1	0.001
Sulfates	<1	ppm, w/w	USEPA-375.4	1
Phosphates	<1	ppm, w/w	USEPA-365	1
Cations				
Heavy Metals as Lead	<0.5	ppm, w/w	USEPA-6010C	0.5
Iron	<0.2	ppm, w/w	USEPA-6010C	0.2

Additional Airgas Parameters

Analysis	Results	Units	Method	Specification Limit
Anions				
Nitrates	<1	ppm, w/w	USEPA-352.2	1
Cations				
Calcium	<1	ppm, w/w	USEPA-6010C	1
Magnesium	<1	ppm, w/w	USEPA-6010C	1
Sodium	<1	ppm, w/w	USEPA-6010C	1
Potassium	<1	ppm, w/w	USEPA-6010C	1
Copper	<0.1	ppm, w/w	USEPA-6010C	0.1
Aluminum	<1	ppm, w/w	USEPA-6010C	1
Zinc	<0.1	ppm, w/w	USEPA-6010C	0.1
Arsenic	<0.5	ppm, w/w	USEPA-6010C	0.5
Siloxanes	<0.5	ppm, w/w	USEPA-6010C	0.5

Samuel J. LaBonia
President and Technical Director

EPA#TN01074
AOCS#485183

AOAC#93939

CORNERSTONE LABORATORIES, LLC

1775 Moriah Woods Blvd., Ste. 12 ▪ Memphis, TN 38117 ▪ (901) 398-4001

Cornerstone Report#: 031-18-006
Attn: Marie Becker, Airgas Specialty Products-Riverside, CA
Cornerstone Reference #(s): 142626.

Date Sampled: 01/17/18
Date Received: 01/31/18
Date of Report: 02/05/18

Quality Conformance Results

9753-011718-19%

ASP Premium Grade Parameters

Analysis	Results	Units	Method	Specification Limit
Chemical				
Assay as NH_3	19.4	%, w/w	AOAC-955.04	19-20
Physical				
Appearance	Clear, Free of Suspension	-	Subjective	Clear
Residue on Ignition	0.0015	%, w/w	ASTM-D7348-08	0.002
Substance Reducing MnO_4	PASS	-	ASTM-D1363-06	PASS
Anions				
Chlorides	<0.5	ppm, w/w	USEPA-325M	0.5
Carbon Dioxide	<0.001	%, w/w	ASTM-D513-11e1	0.001
Sulfates	<1	ppm, w/w	USEPA-375.4	1
Phosphates	<1	ppm, w/w	USEPA-365	1
Cations				
Heavy Metals as Lead	<0.5	ppm, w/w	USEPA-6010C	0.5
Iron	<0.2	ppm, w/w	USEPA-6010C	0.2

Additional Airgas Parameters

Analysis	Results	Units	Method	Specification Limit
Anions				
Nitrates	<1	ppm, w/w	USEPA-352.2	1
Cations				
Calcium	<1	ppm, w/w	USEPA-6010C	1
Magnesium	<1	ppm, w/w	USEPA-6010C	1
Sodium	<1	ppm, w/w	USEPA-6010C	1
Potassium	<1	ppm, w/w	USEPA-6010C	1
Copper	<0.1	ppm, w/w	USEPA-6010C	0.1
Aluminum	<1	ppm, w/w	USEPA-6010C	1
Zinc	<0.1	ppm, w/w	USEPA-6010C	0.1
Arsenic	<0.5	ppm, w/w	USEPA-6010C	0.5
Siloxanes	<0.5	ppm, w/w	USEPA-6010C	0.5

Samuel J. LaBonia
President and Technical Directo

EPA#TN01074
AOCS#485183

AOAC#93939

ATTACHMENT A

SAFETY DATA SHEET

Aqua Ammonia (5-19.9%)

Airgas
an Air Liquide company

Section 1. Identification

GHS product identifier : Aqua Ammonia (5-19.9%)

Other means of identification : Aqua Ammonia, Ammonium Hydroxide

Product type : Liquid.

Product use : Synthetic/Analytical chemistry.

Synonym : Aqua Ammonia, Ammonium Hydroxide

SDS # : 001196

Supplier's details : Airgas USA, LLC and its affiliates
259 North Radnor-Chester Road
Suite 100
Radnor, PA 19087-5283
1-610-687-5253

24-hour telephone : 1-866-734-3438

Section 2. Hazards identification

OSHA/HCS status : This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).

Classification of the substance or mixture : SKIN CORROSION - Category 1B
SPECIFIC TARGET ORGAN TOXICITY (SINGLE EXPOSURE) (Respiratory tract irritation) - Category 3
AQUATIC HAZARD (ACUTE) - Category 1

GHS label elements

Hazard pictograms :

Signal word : Danger

Hazard statements : May displace oxygen and cause rapid suffocation.
Causes severe skin burns and eye damage.
May cause respiratory irritation.
Very toxic to aquatic life.

Precautionary statements

General : Read label before use. Keep out of reach of children. If medical advice is needed, have product container or label at hand.

Prevention : Wear protective gloves. Wear eye or face protection. Wear protective clothing. Use only outdoors or in a well-ventilated area. Avoid release to the environment. Avoid breathing vapor. Wash hands thoroughly after handling.

Response : Collect spillage. IF INHALED: Remove person to fresh air and keep comfortable for breathing. Immediately call a POISON CENTER or physician. IF SWALLOWED: Immediately call a POISON CENTER or physician. Rinse mouth. Do NOT induce vomiting. IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water or shower. Wash contaminated clothing before reuse. Immediately call a POISON CENTER or physician. IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISON CENTER or physician.

Storage : Store locked up.

Disposal : Dispose of contents and container in accordance with all local, regional, national and international regulations.

Section 2. Hazards identification

Hazards not otherwise classified : None known.

Section 3. Composition/information on ingredients

Substance/mixture : Mixture

Other means of identification : Aqua Ammonia, Ammonium Hydroxide

Product code : 001196

Ingredient name	%	CAS number
Aqua Ammonia	100	1336-21-6
WATER	80.1 - 95	7732-18-5
ammonia	5 - 19.9	7664-41-7

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

Eye contact : Get medical attention immediately. Call a poison center or physician. 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. Chemical burns must be treated promptly by a physician.

Inhalation : Get medical attention immediately. Call a poison center or physician. 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. 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.

Skin contact : Get medical attention immediately. Call a poison center or physician. Flush contaminated skin with plenty of water. Remove contaminated clothing and shoes. Wash contaminated clothing thoroughly with water before removing it, or wear gloves. Continue to rinse for at least 10 minutes. Chemical burns must be treated promptly by a physician. Wash clothing before reuse. Clean shoes thoroughly before reuse.

Ingestion : Get medical attention immediately. Call a poison center or physician. Wash out mouth with water. Remove dentures if any. Remove victim to fresh air and keep at rest in a position comfortable for breathing. If material has been swallowed and the exposed person is conscious, give small quantities of water to drink. Stop if the exposed person feels sick as vomiting may be dangerous. Do not induce vomiting unless directed to do so by medical personnel. If vomiting occurs, the head should be kept low so that vomit does not enter the lungs. Chemical burns must be treated promptly by a physician. Never give anything by mouth to an unconscious person. 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.

Most important symptoms/effects, acute and delayed

Potential acute health effects

Eye contact : No known significant effects or critical hazards.

Inhalation : May cause respiratory irritation.

Skin contact : Causes severe burns.

Section 4. First aid measures

Frostbite : Try to warm up the frozen tissues and seek medical attention.

Ingestion : No known significant effects or critical hazards.

Over-exposure signs/symptoms

Eye contact : Adverse symptoms may include the following:, pain, watering, redness

Inhalation : Adverse symptoms may include the following:, respiratory tract irritation, coughing

Skin contact : Adverse symptoms may include the following:, pain or irritation, redness, blistering may occur

Ingestion : Adverse symptoms may include the following:, stomach pains

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

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. Wash contaminated clothing thoroughly with water before removing it, or wear gloves.

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 : In a fire or if heated, a pressure increase will occur and the container may burst. This material is very toxic to aquatic life. Fire water contaminated with this material must be contained and prevented from being discharged to any waterway, sewer or drain.

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.

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. Do not touch or walk through spilled material. Do not breathe vapor or mist. 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 : Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air). Water polluting material. May be harmful to the environment if released in large quantities. Collect spillage.

Section 6. Accidental release measures

Methods and materials for containment and cleaning up

Small spill : Stop leak if without risk. Move containers from spill area. Dilute with water and mop up if water-soluble. Alternatively, or if water-insoluble, absorb with an inert dry material and place in an appropriate waste disposal container. Dispose of via a licensed waste disposal contractor.

Large spill : Stop leak if without risk. Move containers from spill area. Approach release from upwind. Prevent entry into sewers, water courses, basements or confined areas. Wash spillages into an effluent treatment plant or proceed as follows. Contain and collect spillage with non-combustible, absorbent material e.g. sand, earth, vermiculite or diatomaceous earth and place in container for disposal according to local regulations (see Section 13). Dispose of via a licensed waste disposal contractor. Contaminated absorbent material may pose the same hazard as the spilled product. 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). Do not get in eyes or on skin or clothing. Use only with adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Avoid release to the environment. Do not ingest. Empty containers retain product residue and can be hazardous. Keep in the original container or an approved alternative made from a compatible material, kept tightly closed when not in use. Do not reuse container. Do not breathe vapor or mist.

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 original container protected from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see Section 10) and food and drink. Store locked up. Keep container tightly closed and sealed until ready for use. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabeled containers. Use appropriate containment to avoid environmental contamination. 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
Aqua Ammonia WATER ammonia	None. None. **California PEL for Chemical Contaminants (*Table AC-1*) (United States).** PEL: 25 ppm 8 hours. STEL: 35 ppm 15 minutes. **ACGIH TLV (United States, 3/2017).** TWA: 25 ppm 8 hours. TWA: 17 mg/m³ 8 hours. STEL: 35 ppm 15 minutes. STEL: 24 mg/m³ 15 minutes. **OSHA PEL 1989 (United States, 3/1989).** STEL: 35 ppm 15 minutes. STEL: 27 mg/m³ 15 minutes. **NIOSH REL (United States, 10/2016).** TWA: 25 ppm 10 hours. TWA: 18 mg/m³ 10 hours.

Section 8. Exposure controls/personal protection

	STEL: 35 ppm 15 minutes. STEL: 27 mg/m³ 15 minutes. **OSHA PEL (United States, 6/2016).** TWA: 50 ppm 8 hours. TWA: 35 mg/m³ 8 hours.

Appropriate engineering controls : Use only with adequate ventilation. If user operations generate dust, fumes, gas, vapor or mist, 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: chemical splash goggles and/or face shield. If inhalation hazards exist, a full-face respirator may be required instead.

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.

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 : Based on the hazard and potential for exposure, select a respirator that meets the appropriate standard or certification. Respirators must be used according to a respiratory protection program to ensure proper fitting, training, and other important aspects of use.

Section 9. Physical and chemical properties

Appearance

Physical state : Liquid.

Color : Colorless.

Odor : Pungent.

Odor threshold : 5 ppm

pH : Approx. 11.6 for 1 N Sol'n. in water

Melting point : 22°F (5% solution) to −34°F (19.9% solution)

Boiling point : Lowest known value: 38°C (100.4°F) (ammonia). Weighted average: 68.21°C (154.8°F)

Critical temperature : Not available.

Flash point : Not available.

Section 9. Physical and chemical properties

Evaporation rate : Not available.

Flammability (solid, gas) : Extremely flammable in the presence of the following materials or conditions: Oxidizing

Lower and upper explosive (flammable) limits : Lower: 16%
Upper: 25%

Vapor pressure : 3-10 PSI @ 16 ◦C

Vapor density : Vapor density 0.6 (Air = 1) (ammonia)

Specific Volume (ft ^{3}/lb) : 20.79

Gas Density (lb/ft ^{3}) : 0.0481

Relative density : 0.6

Solubility : Soluble in water. Soluble in alcohol and ether.

Solubility in water : Complete 540 g/l

Partition coefficient: n-octanol/water : Not available.

Auto-ignition temperature : 651 °C (1,204°F) (ammonia vapor)

Decomposition temperature : Not available.

Viscosity : Not available.

Flow time (ISO 2431) : Not available.

Section 10. Stability and reactivity

Reactivity : No specific test data related to reactivity available for this product or its ingredients.

Chemical stability : The product is stable.

Possibility of hazardous reactions : Under normal conditions of storage and use, hazardous reactions will not occur.

Conditions to avoid : No specific data.

Incompatible materials : Yellow Metals (brass & copper)

Hazardous decomposition products : Under normal conditions of storage and use, hazardous decomposition products should not be produced.

Hazardous polymerization : Under normal conditions of storage and use, hazardous polymerization will not occur.

Section 11. Toxicological information

Information on toxicological effects

Acute toxicity

Product/ingredient name	Result	Species	Dose	Exposure
Aqua Ammonia ammonia	LD50 Oral LC50 Inhalation Gas.	Rat Rat	350 mg/kg 7338 ppm	- 1 hours

Irritation/Corrosion

Product/ingredient name	Result	Species	Score	Exposure	Observation
Aqua Ammonia	Eyes - Severe irritant Eyes - Severe irritant	Rabbit Rabbit	- -	250 Micrograms 0.5 minutes 1 milligrams	- -

Sensitization

Section 11. Toxicological information

Not available.

Mutagenicity

Not available.

Carcinogenicity

Not available.

Reproductive toxicity

Not available.

Teratogenicity

Not available.

Specific target organ toxicity (single exposure)

Name	Category	Route of exposure	Target organs
Aqua Ammonia	Category 3	Not applicable.	Respiratory tract irritation

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 : No known significant effects or critical hazards.

Inhalation : May cause respiratory irritation.

Skin contact : Causes severe burns.

Ingestion : No known significant effects or critical hazards.

Symptoms related to the physical, chemical and toxicological characteristics

Eye contact : Adverse symptoms may include the following:, pain, watering, redness

Inhalation : Adverse symptoms may include the following:, respiratory tract irritation, coughing

Skin contact : Adverse symptoms may include the following:, pain or irritation, redness, blistering may occur

Ingestion : Adverse symptoms may include the following:, stomach pains

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.

Section 11. Toxicological information

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

Product/ingredient name	Result	Species	Exposure
Aqua Ammonia ammonia	Acute LC50 37 ppm Fresh water Acute EC50 29.2 mg/l Marine water Acute LC50 2080 µg/l Fresh water Acute LC50 0.53 ppm Fresh water Acute LC50 300 µg/l Fresh water Chronic NOEC 0.204 mg/l Marine water	Fish - Gambusia affinis - Adult Algae - Ulva fasciata - Zoea Crustaceans - Gammarus pulex Daphnia - Daphnia magna Fish - Hypophthalmichthys nobilis Fish - Dicentrarchus labrax	96 hours 96 hours 48 hours 48 hours 96 hours 62 days

Persistence and degradability

Not available.

Bioaccumulative potential

Product/ingredient name	$LogP_{ow}$	BCF	Potential
WATER	-1.38	-	low

Mobility in soil

Soil/water partition coefficient (K_{OC}) : Not available.

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. 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. Care should be taken when handling emptied containers that have not been cleaned or rinsed out. Empty containers or liners may retain some product residues. Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.

Section 14. Transport information

	DOT	TDG	Mexico	IMDG	IATA
UN number	UN2672	UN2672	UN2672	UN2672	UN2672
UN proper shipping name	Ammonium Hydroxide or Ammonia solutions	AMMONIA SOLUTION	AMMONIA SOLUTION	AMMONIA SOLUTION	Ammonia solution
Transport hazard class(es)	8 	8 	8 	8 	8 
Packing group	III	III	III	III	III
Environmental hazards	Yes.	Yes.	Yes. The environmentally hazardous substance mark is not required.	Yes.	Yes. The environmentally hazardous substance mark is not required.

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

Additional information

DOT Classification : This product is not regulated as a marine pollutant when transported on inland waterways in sizes of ≤5 L or ≤5 kg or by road, rail, or inland air in non-bulk sizes, provided the packagings meet the general provisions of §§ 173.24 and 173.24a. **Reportable quantity** 1000 lbs / 454 kg. Package sizes shipped in quantities less than the product reportable quantity are not subject to the RQ (reportable quantity) transportation requirements.

TDG Classification : Product classified as per the following sections of the Transportation of Dangerous Goods Regulations: 2.40-2.42 (Class 8), 2.7 (Marine pollutant mark). The marine pollutant mark is not required when transported by road or rail.

IMDG : The marine pollutant mark is not required when transported in sizes of ≤5 L or ≤5 kg.

IATA : The environmentally hazardous substance mark may appear if required by other transportation regulations.

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 Annex II of MARPOL and the IBC Code : Not available.

Section 15. Regulatory information

U.S. Federal regulations : **TSCA 8(a) CDR Exempt/Partial exemption**: Not determined

Clean Water Act (CWA) 311: ammonia; ammonia

Clean Air Act (CAA) 112 regulated toxic substances: ammonia

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

Clean Air Act Section 602 Class I Substances : Not listed

Section 15. Regulatory information

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

Name	%	EHS	SARA 302 TPQ		SARA 304 RQ	
			(lbs)	(gallons)	(lbs)	(gallons)
ammonia	5 - 19.9	Yes.	500	-	100	-

SARA 304 RQ : 502.5 lbs / 228.1 kg

SARA 311/312

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

SARA 313

	Product name	CAS number	%
Form R - Reporting requirements	ammonia ammonia	1336-21-6 7664-41-7	100 5 - 19.9
Supplier notification	ammonia ammonia	1336-21-6 7664-41-7	100 5 - 19.9

SARA 313 notifications must not be detached from the SDS and any copying and redistribution of the SDS shall include copying and redistribution of the notice attached to copies of the SDS subsequently redistributed.

State regulations

Massachusetts : The following components are listed: AMMONIUM HYDROXIDE; AMMONIUM WATER; AMMONIA; AMMONIA, ANHYDROUS

New York : The following components are listed: Ammonium hydroxide; Ammonia

New Jersey : The following components are listed: AMMONIUM HYDROXIDE; AMMONIA

Pennsylvania : The following components are listed: AMMONIUM HYDROXIDE; AMMONIA

International regulations

Chemical Weapon Convention List Schedules I, II & III Chemicals

Not listed.

Montreal Protocol (Annexes A, B, C, E)

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 : All components are listed or exempted.

Canada : All components are listed or exempted.

China : All components are listed or exempted.

Europe : All components are listed or exempted.

Japan : **Japan inventory (ENCS)**: All components are listed or exempted.
Japan inventory (ISHL): Not determined.

Section 15. Regulatory information

Malaysia	:	All components are listed or exempted.
New Zealand	:	All components are listed or exempted.
Philippines	:	All components are listed or exempted.
Republic of Korea	:	All components are listed or exempted.
Taiwan	:	All components are listed or exempted.
Thailand	:	Not determined.
Turkey	:	Not determined.
United States	:	All components are listed or exempted.
Viet Nam	:	Not determined.

Section 16. Other information

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

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
SKIN CORROSION - Category 1B	Expert judgment
SPECIFIC TARGET ORGAN TOXICITY (SINGLE EXPOSURE) (Respiratory tract irritation) - Category 3	Calculation method
AQUATIC HAZARD (ACUTE) - Category 1	Calculation method

History

Date of printing	:	2/15/2018
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Date of previous issue	:	2/15/2018
Version	:	0.1

Section 16. Other information

Key to abbreviations : 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
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.

Other special considerations : 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.

SAFETY DATA SHEET

Aqua Ammonia (20-30%)

Airgas
an Air Liquide company

Section 1. Identification

GHS product identifier : Aqua Ammonia (20-30%)

Other means of identification : Aqua Ammonia, Ammonium Hydroxide

Product type : Liquid.

Product use : Synthetic/Analytical chemistry.

Synonym : Aqua Ammonia, Ammonium Hydroxide

SDS # : 001195

Supplier's details : Airgas USA, LLC and its affiliates
259 North Radnor-Chester Road
Suite 100
Radnor, PA 19087-5283
1-610-687-5253

24-hour telephone : 1-866-734-3438

Section 2. Hazards identification

OSHA/HCS status : This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).

Classification of the substance or mixture : SKIN CORROSION - Category 1B
SPECIFIC TARGET ORGAN TOXICITY (SINGLE EXPOSURE) (Respiratory tract irritation) - Category 3
AQUATIC HAZARD (ACUTE) - Category 1

GHS label elements

Hazard pictograms :

Signal word : Danger

Hazard statements : May displace oxygen and cause rapid suffocation.
Causes severe skin burns and eye damage.
May cause respiratory irritation.
Very toxic to aquatic life.

Precautionary statements

General : Read label before use. Keep out of reach of children. If medical advice is needed, have product container or label at hand.

Prevention : Wear protective gloves. Wear eye or face protection. Wear protective clothing. Use only outdoors or in a well-ventilated area. Avoid release to the environment. Avoid breathing vapor. Wash hands thoroughly after handling.

Response : Collect spillage. IF INHALED: Remove person to fresh air and keep comfortable for breathing. Immediately call a POISON CENTER or physician. IF SWALLOWED: Immediately call a POISON CENTER or physician. Rinse mouth. Do NOT induce vomiting. IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water or shower. Wash contaminated clothing before reuse. Immediately call a POISON CENTER or physician. IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISON CENTER or physician.

Storage : Store locked up.

Disposal : Dispose of contents and container in accordance with all local, regional, national and international regulations.

Section 2. Hazards identification

Hazards not otherwise classified : None known.

Section 3. Composition/information on ingredients

Substance/mixture : Mixture

Other means of identification : Aqua Ammonia, Ammonium Hydroxide

Product code : 001195

Ingredient name	%	CAS number
Aqua Ammonia	100	1336-21-6
WATER	70 - 80	7732-18-5
ammonia	20 - 30	7664-41-7

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

Eye contact : Get medical attention immediately. Call a poison center or physician. 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. Chemical burns must be treated promptly by a physician.

Inhalation : Get medical attention immediately. Call a poison center or physician. 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. 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.

Skin contact : Get medical attention immediately. Call a poison center or physician. Flush contaminated skin with plenty of water. Remove contaminated clothing and shoes. Wash contaminated clothing thoroughly with water before removing it, or wear gloves. Continue to rinse for at least 10 minutes. Chemical burns must be treated promptly by a physician. Wash clothing before reuse. Clean shoes thoroughly before reuse.

Ingestion : Get medical attention immediately. Call a poison center or physician. Wash out mouth with water. Remove dentures if any. Remove victim to fresh air and keep at rest in a position comfortable for breathing. If material has been swallowed and the exposed person is conscious, give small quantities of water to drink. Stop if the exposed person feels sick as vomiting may be dangerous. Do not induce vomiting unless directed to do so by medical personnel. If vomiting occurs, the head should be kept low so that vomit does not enter the lungs. Chemical burns must be treated promptly by a physician. Never give anything by mouth to an unconscious person. 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.

Most important symptoms/effects, acute and delayed

Potential acute health effects

Eye contact : No known significant effects or critical hazards.

Inhalation : May cause respiratory irritation.

Skin contact : Causes severe burns.

Section 4. First aid measures

Frostbite : Try to warm up the frozen tissues and seek medical attention.

Ingestion : No known significant effects or critical hazards.

Over-exposure signs/symptoms

Eye contact : Adverse symptoms may include the following:, pain, watering, redness

Inhalation : Adverse symptoms may include the following:, respiratory tract irritation, coughing

Skin contact : Adverse symptoms may include the following:, pain or irritation, redness, blistering may occur

Ingestion : Adverse symptoms may include the following:, stomach pains

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

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. Wash contaminated clothing thoroughly with water before removing it, or wear gloves.

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 : In a fire or if heated, a pressure increase will occur and the container may burst. This material is very toxic to aquatic life. Fire water contaminated with this material must be contained and prevented from being discharged to any waterway, sewer or drain.

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.

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. Do not touch or walk through spilled material. Do not breathe vapor or mist. 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 : Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air). Water polluting material. May be harmful to the environment if released in large quantities. Collect spillage.

Section 6. Accidental release measures

Methods and materials for containment and cleaning up

Small spill : Stop leak if without risk. Move containers from spill area. Dilute with water and mop up if water-soluble. Alternatively, or if water-insoluble, absorb with an inert dry material and place in an appropriate waste disposal container. Dispose of via a licensed waste disposal contractor.

Large spill : Stop leak if without risk. Move containers from spill area. Approach release from upwind. Prevent entry into sewers, water courses, basements or confined areas. Wash spillages into an effluent treatment plant or proceed as follows. Contain and collect spillage with non-combustible, absorbent material e.g. sand, earth, vermiculite or diatomaceous earth and place in container for disposal according to local regulations (see Section 13). Dispose of via a licensed waste disposal contractor. Contaminated absorbent material may pose the same hazard as the spilled product. 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). Do not get in eyes or on skin or clothing. Use only with adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Avoid release to the environment. Do not ingest. Empty containers retain product residue and can be hazardous. Keep in the original container or an approved alternative made from a compatible material, kept tightly closed when not in use. Do not reuse container. Do not breathe vapor or mist.

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 original container protected from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see Section 10) and food and drink. Store locked up. Keep container tightly closed and sealed until ready for use. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabeled containers. Use appropriate containment to avoid environmental contamination. 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
Aqua Ammonia	None.
WATER	None.
ammonia	**California PEL for Chemical Contaminants (*Table AC-1*) (United States).** PEL: 25 ppm 8 hours. STEL: 35 ppm 15 minutes. **ACGIH TLV (United States, 3/2017).** TWA: 25 ppm 8 hours. TWA: 17 mg/m³ 8 hours. STEL: 35 ppm 15 minutes. STEL: 24 mg/m³ 15 minutes. **OSHA PEL 1989 (United States, 3/1989).** STEL: 35 ppm 15 minutes. STEL: 27 mg/m³ 15 minutes. **NIOSH REL (United States, 10/2016).** TWA: 25 ppm 10 hours. TWA: 18 mg/m³ 10 hours.

Section 8. Exposure controls/personal protection

	STEL: 35 ppm 15 minutes. STEL: 27 mg/m³ 15 minutes. **OSHA PEL (United States, 6/2016).** TWA: 50 ppm 8 hours. TWA: 35 mg/m³ 8 hours.

Appropriate engineering controls : Use only with adequate ventilation. If user operations generate dust, fumes, gas, vapor or mist, 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: chemical splash goggles and/or face shield. If inhalation hazards exist, a full-face respirator may be required instead.

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.

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 : Based on the hazard and potential for exposure, select a respirator that meets the appropriate standard or certification. Respirators must be used according to a respiratory protection program to ensure proper fitting, training, and other important aspects of use.

Section 9. Physical and chemical properties

Appearance

Physical state : Liquid.

Color : Clear.

Odor : Pungent.

Odor threshold : 5 ppm

pH : Approx. 11.6 for 1 N Sol'n. in water

Melting point : -35ºF (20% solution) to -115ºF(30% solution)

Boiling point : Lowest known value: 38°C (100.4°F) (ammonia). Weighted average: 65.56°C (150°F)

Critical temperature : Not available.

Flash point : Not available.

Section 9. Physical and chemical properties

Evaporation rate : Not available.

Flammability (solid, gas) : Extremely flammable in the presence of the following materials or conditions: Oxidizing

Lower and upper explosive (flammable) limits : Lower: 16%
Upper: 25%

Vapor pressure : 3-10 PSI @ 16 ◦C

Vapor density : Vapor density 0.6 (Air = 1) (ammonia)

Specific Volume (ft ^{3}/lb) : 20.79

Gas Density (lb/ft ^{3}) : 0.0481

Relative density : 0.6

Solubility : Soluble in water. Soluble in alcohol and ether.

Solubility in water : Complete 540 g/l

Partition coefficient: n-octanol/water : Not available.

Auto-ignition temperature : 651°C (1203.8°F)

Decomposition temperature : Not available.

Viscosity : Not available.

Flow time (ISO 2431) : Not available.

Section 10. Stability and reactivity

Reactivity : No specific test data related to reactivity available for this product or its ingredients.

Chemical stability : The product is stable.

Possibility of hazardous reactions : Under normal conditions of storage and use, hazardous reactions will not occur.

Conditions to avoid : No specific data.

Incompatible materials : Yellow Metals (brass & copper)

Hazardous decomposition products : Under normal conditions of storage and use, hazardous decomposition products should not be produced.

Hazardous polymerization : Under normal conditions of storage and use, hazardous polymerization will not occur.

Section 11. Toxicological information

Information on toxicological effects

Acute toxicity

Product/ingredient name	Result	Species	Dose	Exposure
Aqua Ammonia	LD50 Oral	Rat	350 mg/kg	-
ammonia	LC50 Inhalation Gas.	Rat	7338 ppm	1 hours

Irritation/Corrosion

Product/ingredient name	Result	Species	Score	Exposure	Observation
Aqua Ammonia	Eyes - Severe irritant	Rabbit	-	250 Micrograms	-
	Eyes - Severe irritant	Rabbit	-	0.5 minutes 1 milligrams	-

Sensitization

Section 11. Toxicological information

Not available.

Mutagenicity

Not available.

Carcinogenicity

Not available.

Reproductive toxicity

Not available.

Teratogenicity

Not available.

Specific target organ toxicity (single exposure)

Name	Category	Route of exposure	Target organs
Aqua Ammonia	Category 3	Not applicable.	Respiratory tract irritation

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 : No known significant effects or critical hazards.

Inhalation : May cause respiratory irritation.

Skin contact : Causes severe burns.

Ingestion : No known significant effects or critical hazards.

Symptoms related to the physical, chemical and toxicological characteristics

Eye contact : Adverse symptoms may include the following:, pain, watering, redness

Inhalation : Adverse symptoms may include the following:, respiratory tract irritation, coughing

Skin contact : Adverse symptoms may include the following:, pain or irritation, redness, blistering may occur

Ingestion : Adverse symptoms may include the following:, stomach pains

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.

Section 11. Toxicological information

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

Product/ingredient name	Result	Species	Exposure
Aqua Ammonia ammonia	Acute LC50 37 ppm Fresh water Acute EC50 29.2 mg/l Marine water Acute LC50 2080 µg/l Fresh water Acute LC50 0.53 ppm Fresh water Acute LC50 300 µg/l Fresh water Chronic NOEC 0.204 mg/l Marine water	Fish - Gambusia affinis - Adult Algae - Ulva fasciata - Zoea Crustaceans - Gammarus pulex Daphnia - Daphnia magna Fish - Hypophthalmichthys nobilis Fish - Dicentrarchus labrax	96 hours 96 hours 48 hours 48 hours 96 hours 62 days

Persistence and degradability

Not available.

Bioaccumulative potential

Product/ingredient name	$LogP_{ow}$	BCF	Potential
WATER	-1.38	-	low

Mobility in soil

Soil/water partition coefficient (K_{OC}) : Not available.

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. 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. Care should be taken when handling emptied containers that have not been cleaned or rinsed out. Empty containers or liners may retain some product residues. Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.

Section 14. Transport information

	DOT	TDG	Mexico	IMDG	IATA
UN number	UN2672	UN2672	UN2672	UN2672	UN2672
UN proper shipping name	Ammonium Hydroxide or Ammonia solutions	AMMONIA SOLUTION	AMMONIA SOLUTION	AMMONIA SOLUTION	Ammonia solution
Transport hazard class(es)	8 	8 	8 	8 	8 
Packing group	III	III	III	III	III
Environmental hazards	Yes.	Yes.	Yes. The environmentally hazardous substance mark is not required.	Yes.	Yes. The environmentally hazardous substance mark is not required.

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

Additional information

DOT Classification : This product is not regulated as a marine pollutant when transported on inland waterways in sizes of ≤5 L or ≤5 kg or by road, rail, or inland air in non-bulk sizes, provided the packagings meet the general provisions of §§ 173.24 and 173.24a. **Reportable quantity** 1000 lbs / 454 kg [2493.4 gal / 9438.7 L]. Package sizes shipped in quantities less than the product reportable quantity are not subject to the RQ (reportable quantity) transportation requirements.

TDG Classification : Product classified as per the following sections of the Transportation of Dangerous Goods Regulations: 2.40-2.42 (Class 8), 2.7 (Marine pollutant mark). The marine pollutant mark is not required when transported by road or rail.

IMDG : The marine pollutant mark is not required when transported in sizes of ≤5 L or ≤5 kg.

IATA : The environmentally hazardous substance mark may appear if required by other transportation regulations.

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 Annex II of MARPOL and the IBC Code : Not available.

Section 15. Regulatory information

U.S. Federal regulations : **TSCA 8(a) CDR Exempt/Partial exemption**: Not determined

Clean Water Act (CWA) 311: ammonia; ammonia

Clean Air Act (CAA) 112 regulated toxic substances: ammonia

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

Clean Air Act Section 602 Class I Substances : Not listed

Section 15. Regulatory information

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

Name	%	EHS	SARA 302 TPQ		SARA 304 RQ	
			(lbs)	(gallons)	(lbs)	(gallons)
ammonia	20 - 30	Yes.	500	-	100	-

SARA 304 RQ : 333.3 lbs / 151.3 kg [831.1 gal / 3146.2 L]

SARA 311/312

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

SARA 313

	Product name	CAS number	%
Form R - Reporting requirements	ammonia ammonia	1336-21-6 7664-41-7	100 20 - 30
Supplier notification	ammonia ammonia	1336-21-6 7664-41-7	100 20 - 30

SARA 313 notifications must not be detached from the SDS and any copying and redistribution of the SDS shall include copying and redistribution of the notice attached to copies of the SDS subsequently redistributed.

State regulations

Massachusetts : The following components are listed: AMMONIUM HYDROXIDE; AMMONIUM WATER; AMMONIA; AMMONIA, ANHYDROUS

New York : The following components are listed: Ammonium hydroxide; Ammonia

New Jersey : The following components are listed: AMMONIUM HYDROXIDE; AMMONIA

Pennsylvania : The following components are listed: AMMONIUM HYDROXIDE; AMMONIA

International regulations

Chemical Weapon Convention List Schedules I, II & III Chemicals

Not listed.

Montreal Protocol (Annexes A, B, C, E)

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 : All components are listed or exempted.

Canada : All components are listed or exempted.

China : All components are listed or exempted.

Europe : All components are listed or exempted.

Japan : **Japan inventory (ENCS)**: All components are listed or exempted.
Japan inventory (ISHL): Not determined.

Section 15. Regulatory information

Malaysia	:	All components are listed or exempted.
New Zealand	:	All components are listed or exempted.
Philippines	:	All components are listed or exempted.
Republic of Korea	:	All components are listed or exempted.
Taiwan	:	All components are listed or exempted.
Thailand	:	Not determined.
Turkey	:	Not determined.
United States	:	All components are listed or exempted.
Viet Nam	:	Not determined.

Section 16. Other information

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

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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ATTACHMENT A

Airgas
SPECIALTY PRODUCTS

Product Specification

AMMONIUM HYDROXIDE (AQUA AMMONIA) REAGENT GRADE

NH_4OH **Formula Weight 35.05**

General Information

Ammonium hydroxide (aqua ammonia) covered by this specification will meet the ACS Reagent Grade requirements except for assay as follows:

Assay	18% - 20% NH_3
Appearance	Colorless and free from suspended matter or sediment.

Impurities	
Residue after ignition	0.002% maximum
Carbon Dioxide ($C0_2$)	0.002% maximum
Chloride (Cl)	0.5 ppm maximum
Phosphate ($P0_4$)	2 ppm maximum
Total Sulfur ($S0_4$)	2 ppm maximum
Heavy Metals (Pb)	0.5 ppm maximum
Iron (Fe)	0.2 ppm maximum
Substances Reducing Permanganate	To pass test

This product is exempt from the submission requirements of the Federal EPA Risk Management Program.

*This product exceeds the specifications established by the Airgas Specialty Products Technical Grade Ammonium Hydroxide (Aqua Ammonia) product specification sheet.

NOTE: When performing assay tests, sample container and contents shall be cooled to 5°C and 10°C and maintained at this temperature to prevent loss of ammonia gas when opening and transferring for analysis. All transferring shall be done as quickly as possible.

www.airgasspecialtyproducts.com
(800)-295-2225
01/2016

ATTACHMENT A

Airgas
SPECIALTY PRODUCTS

Product Specification

AMMONIUM HYDROXIDE (AQUA AMMONIA) REAGENT GRADE

NH_4OH **Formula Weight 35.05**

General Information

Ammonium hydroxide (aqua ammonia) covered by this specification will meet the ACS Reagent Grade requirements as follows:

Assay	28% - 30% NH_3
Appearance	Colorless and free from suspended matter or sediment.

Impurities	
Residue after ignition	0.002% maximum
Carbon Dioxide ($C0_2$)	0.002% maximum
Chloride (Cl)	0.5 ppm maximum
Phosphate ($P0_4$)	2 ppm maximum
Total Sulfur ($S0_4$)	2 ppm maximum
Heavy Metals (Pb)	0.5 ppm maximum
Iron (Fe)	0.2 ppm maximum
Substances Reducing Permanganate	To pass test

NOTE: When performing assay tests, sample container and contents shall be cooled to 5ºC and 10ºC and maintained at this temperature to prevent loss of ammonia gas when opening and transferring for analysis. All transferring shall be done as quickly as possible.

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1/2006

EXHIBIT B
Insurance Requirements
(Chemical Vendor - Aqueous Ammonia)

Contractor shall procure and maintain for the duration of the contract insurance against claims for injuries to persons or damages to property which may arise from or in connection with the performance of the work hereunder and the results of that work by the Contractor, their agents, representatives, employees or subcontractors.

MINIMUM SCOPE AND LIMIT OF INSURANCE

Coverage shall be at least as broad as:

1. **Commercial General Liability** (CGL): Insurance Services Office Form CG 00 01 covering CGL on an "occurrence" basis, including products and completed operations, property damage, bodily injury and personal & advertising injury with limits no less than **$3,000,000** per occurrence. If a general aggregate limit applies, either the general aggregate limit shall apply separately to this project/location or the general aggregate limit shall be twice the required occurrence limit.
2. **Automobile Liability** (AL): ISO Form Number CA 00 01 covering any auto (Code 1) with combined single limits of liability of no less than **$1,000,000** per accident for bodily injury and property damage, including **MCS90** endorsement form.
3. **Workers' Compensation:** as required by the State of California, with Statutory Limits, and Employer's Liability Insurance with limit of no less than **$1,000,000** per accident for bodily injury or disease.
4. **Environmental Impairment/Contractors' Pollution Legal Liability** with limits no less than **$1,000,000** per occurrence or claim, to include liability for Groundwater contamination, Explosion, Sudden and Accidental and Environmental cleanup, etc

If the contractor maintains higher limits than the minimums shown above, the City of Stockton requires and shall be entitled to coverage for the higher limits maintained by the contractor. Any available insurance proceeds in excess of the specified minimum limits of insurance and coverage shall be available to the City of Stockton.

Other Insurance Provisions
The insurance policies are to contain, or be endorsed to contain, the following provisions:

- ***Additional Insured Status***
  The *City of Stockton, its Mayor, Council, officers, representatives, agents, employees and volunteers* are to be covered as additional insureds on the CGL and AL policy with respect to liability arising out of work or operations performed by or on behalf of the Contractor including materials, parts, or equipment furnished in connection with such work or operations. General liability coverage can be provided in the form of an endorsement to the Contractor's insurance (**at least as broad as** ISO Form CG 20 10 11 85 or if not available, through the addition of both

CG 20 10 and CG 20 37 if a later edition is used). Policy shall cover City of Stockton, its Mayor, Council, officers, representatives, agents, employees and volunteers for all locations work is done under this contract.

- ***Primary Coverage***
  For any claims related to this contract, the Contractor's insurance coverage shall be endorsed as primary insurance as respects the *City of Stockton, its Mayor, Council, officers, representatives, agents, employees and volunteers*. Any insurance or self-insurance maintained by the *City of Stockton, its Mayor, Council, officers, representatives, agents, employees and volunteers* shall be excess of the Contractor's insurance and shall not contribute with it. The City of Stockton does not accept endorsements limiting the Contractor's insurance coverage to sole negligence of the Named Insured.

- ***Notice of Cancellation***
  Each insurance policy required above shall provide that coverage shall not be canceled, except with notice to the City of Stockton.

- ***Waiver of Subrogation***
  Contractor hereby grants to the City of Stockton a waiver of any right to subrogation which any insurer of said Contractor may acquire against the City of Stockton by virtue of the payment of any loss under such insurance. Contractor agrees to obtain any endorsement that may be necessary to affect this waiver of subrogation, but this provision applies regardless of whether or not the City of Stockton has received a waiver of subrogation endorsement from the insurer.

- ***Deductibles and Self-Insured Retentions***
  Any deductibles or self-insured retentions must be declared to and approved by the City of Stockton Risk Services. The City of Stockton may require the Contractor to purchase coverage with a lower deductible or retention or provide proof of ability to pay losses and related investigations, claim administration, and defense expenses within the retention.

- ***Acceptability of Insurers***
  Insurance is to be placed with insurers with a current A.M. Best's rating of no less than A:VII if admitted to do business in the State of California; If not admitted to do business in the State of California, insurance is to be placed with insurers with a current A.M. Best's rating of no less than A+:X.

- ***Claims Made Policies***

  If any of the required policies provide claims-made coverage:

  - The Retroactive Date must be shown, and must be before the date of the contract or the beginning of contract work.

- If Claims Made policy form is used, a three (3) year discovery and reporting tail period of coverage is required after completion of work.

- ***Verification of Coverage***
  Contractor shall furnish the City of Stockton with original certificates and amendatory endorsements required by this clause. All certificates and endorsements are to be received and approved by the City of Stockton Risk Services before work commences. Failure to obtain the required documents prior to the work beginning shall not waive the Contractor's obligation to provide them. The City of Stockton reserves the right to require complete, certified copies of all required insurance policies, including endorsements required by these specifications, at any time, for any reason or no reason.

- ***Special Risks or Circumstances***
  The City of Stockton reserves the right to modify these requirements, including limits, based on the nature of the risk, prior experience, insurer, coverage, or other circumstances.

- ***Certificate holder address***
  Proper address for mailing certificates, endorsements and notices shall be:

  - City of Stockton
  - Attention: Risk Services
  - 425 N. El Dorado Street
  - Stockton, CA 95202

  City of Stockton Risk Services Phone: 209-937-5037
  City of Stockton Risk Services Fax: 209-937-8558

- ***Maintenance of Insurance***
  If at any time during the life of the Contract or any extension, the Contractor fails to maintain the required insurance in full force and effect, all work under the Contract shall be discontinued immediately. Any failure to maintain the required insurance shall be sufficient cause for the CITY to terminate this Contract.

- ***Subcontractors***
  If the Contractor should subcontract all or any portion of the work to be performed in this contract, the Contractor shall cover the sub-contractor, and/or require each sub-contractor to adhere to all subparagraphs of these Insurance Requirements section. Similarly, any cancellation, lapse, reduction or change of sub-contractor's insurance shall have the same impact as described above.