United States Steel Corporation

Anhydrous Ammonia

Material Safety Data Sheet (MSDS)/Safety Data Sheet (SDS)

USS IHS Number: 44

(Replaces USS Code Number: 5B81-83)

Location(s): Clairton, Hamilton, Lake Erie

Original Issue: 8/85 **Revised:** 03/21/2011 **Expiration:** 03/21/2014

Section 1 – Chemical Product and Company Identification

GHS Product Identifier: Anhydrous Ammonia

Other means of identification: Ammonia

CAS Number: 7664-41-7

Supplier's Details: United States Steel Corporation, 600 Grant Street, Room 1662, Pittsburgh, PA 15219-2800

Phone Number (s): (412) 433-6840 (8:00 am to 5:00 pm); FAX: (412) 433-5019

Off-Hour Emergency Phone Number: 1-800-262-8200 (CHEMTREC)

Section 2 - Hazards Identification

Anhydrous Ammonia is hazardous according to the criteria specified in European Directives 67/548/EEC and 1999/45/EC and 29 CFR 1910.1200 Hazard Communication Standard. The categories of Health Hazards as defined in "GLOBALLY HARMONIZED SYSTEM OF CLASSIFICATION AND LABELING OF CHEMICALS (GHS), Third revised edition ST/SG/AC.10/30/Rev. 3" United Nations, New York and Geneva, 2009 have been evaluated and are listed below. Refer to Section 3, 8 and 11 for additional information.

Hazard Classification	Hazard Category	Hazard Symbols	Signal Word	Hazard Statement
Physical Hazards	2	NA	**Warning**	**R10:** Flammable Gas
Acute Aquatic Hazard (covers Categories 1-5)	1		**Warning**	**R23:** Very toxic to aquatic life
Acute Toxicity Hazard (covers Categories 1-5)	3		**Danger**	**R23**: Toxic by inhalation
Skin Corrosion/Irritation (covers Categories 1-3)	1B		**Danger**	Causes severe skin burns and eye damage **R34:** Causes burns

Precautionary Statement/Emergency Overview: Cryogenic Liquid. If liquid comes in contact with skin, can cause burns from freezing. Exposure to liquid or rapidly expanding gases may cause severe chemical burns and frostbite to the eyes, lungs and skin. Keep away from heat/sparks/open flames/hot surfaces – No Smoking. Avoid release to the environment. Avoid breathing dusts/fume/gas/mist/vapor/spray. Use only outdoors or in a well-ventilated area. Wash thoroughly after handling. Wear protective gloves/protective clothing/eye protection/face protection.

S1- Keep locked up. **S9**- Keep container in a well-ventilated place. **S16**- Keep away from sources of ignition - No smoking. **S23** – Do not breathe gas/fumes/vapor/spray**. S26-** In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. **S36/37/39**- Wear suitable protective clothing, gloves and eye/face protection. **S45**- In case of accident or if you feel unwell seek medical advice immediately (show the label where possible). **S61**- Avoid release to the environment. Refer to special instructions/safety data sheet.

Section 3 – Composition/Information on Ingredients

Chemical identity of the substance:

Ingredient Name	EC Number	CAS Number	% weight
Anhydrous Ammonia	231-635-3	7664-41-7	99.5
Water	231-79-2	7732-18-5	0 - 0.4

EC- European Community

CAS- Chemical Abstract Service

Anhydrous Ammonia may contain trace amounts of Oil at 0.004% by weight or less.

Section 4 - First Aid Measures

Description of Necessary First Aid Measures:

- **Inhalation: CRYOGENIC LIQUID-IF INHALED:** Remove victim to fresh air and keep at rest in a position comfortable for breathing. Immediately call a POISON CENTER or doctor/physician.
- **Eye Contact: CRYOGENIC LIQUID-IF IN EYES:** Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
- **Skin Contact: CRYOGENIC LIQUID-IF ON SKIN (or Hair):** Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower. Wash contaminated clothing before reuse.
- **Ingestion: CRYOGENIC LIQUID-IF SWALLOWED:** Rinse mouth. Do NOT induce vomiting. Immediately call a POISON CENTER or doctor/physician.

Most Important Acute and Chronic Symptoms/Effects:
Primary Entry Routes: Operations which generate high vapor/mist concentrations may result in the following effects if exposures exceed recommended limits as listed in Section 8.

Target Organs: Respiratory system, Eyes, Skin

Acute Effects: Exposure to liquid or rapidly expanding gases may cause severe chemical burns and frostbite to the eyes, lungs and skin. Ammonia produces corrosive burns. Injury is dependent upon duration of exposure and ammonia concentration. Injury varies from mild edema and erythema to severe burns and life threatening pulmonary edema.

- **Inhalation:** Breathing mist and vapors can cause severe chemical burns and frostbite and can be extremely destructive to mucous membranes, and upper respiratory tract.
- **Eye:** Causes severe chemical burns and frostbite
- **Skin:** Causes severe chemical burns and frostbite. May be harmful if absorbed through skin.
- **Ingestion:** Causes irritation to the gastrointestinal tract.

Chronic Effects: Chronic inhalation of vapors/mists are associated with the following conditions:

- **Inhalation:** Prolonged or repeated exposures may result in respiratory disorders. Chronic obstructive pulmonary disease may also develop from fibrous obstruction of the smaller always. Repeated exposure may cause chronic cough, bronchitis, asthma, vocal cord dysfunction, reactive airways disease, and lung fibrosis. A permanent decrement in pulmonary function has been noted to occur.
- **Eye:** Splashes in eyes may cause severe corneal irritation and blindness.
- **Skin:** Prolonged or repeated exposures may cause severe irritation and burns
- **Ingestion:** Causes damage to respiratory and gastrointestinal tracts with oral exposures.

Carcinogenicity: IARC, NTP, and OSHA do not list Anhydrous Ammonia as a carcinogen

Medical Conditions Aggravated by Long-Term Exposure: May exacerbate chronic respiratory disease, glaucoma or corneal disease.

SARA Potential Hazard Categories: Immediate Acute Health Hazard; Delayed Chronic Health Hazard

Section 5 – Fire and Explosion Hazard Information

Suitable Extinguishing Media: Leaking gas fire: Do not extinguish, unless leak can be stopped safely. Eliminate all ignition sources if safe to do so.

Specific Hazards Arising from the Chemical: Explosion potential if vessel containing liquid ammonia is exposed to heat. Irritating ammonia and nitrogen oxide vapors/gas may form in fire.

Explosion hazard: May explode if mixed with acids, aldehydes, alkylene oxides, amides, boron, boron halides, calcium, chlorine azide, chloric acid, chlorine monoxide, chlorites, halogens, heavy metals and many other materials.

Special Protective Equipment and Precautions for Fire Fighters: Wear a self-contained breathing apparatus (SCBA) with a full face-piece operated in pressure-demand or positive pressure mode and full protective clothing.

Section 6 - Accidental Release Measures

Personal Precautions, Protective Equipment and Emergency Procedures: For spills, personnel should be protected against contact with eyes and skin and avoid inhalation of vapor/mist. Do not release into sewers or waterways. Collect material in appropriate, labeled containers for recovery or disposal in accordance with Federal, state, and local regulations.

Environmental Precautions: Avoid release to the environment. Follow applicable Federal, state, and local regulations.

Methods and Materials for Containment and Clean Up: Collect spillage in appropriate, labeled containers for recovery or disposal in accordance with Federal, state, and local regulations. Follow applicable OSHA regulations (29 CFR 1910.120) and all other pertinent state and Federal requirements.

Section 7 - Handling and Storage

Precautions for Safe Handling: Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower. Wash contaminated clothing before reuse. Wash thoroughly after handling. Do not eat, drink or smoke when using this product. Use only outdoors or in a well ventilated area. Operations with the potential for generating high concentrations of vapors/mists should be evaluated and controlled as necessary. Practice good housekeeping. Avoid breathing vapors/mists.

Conditions for Safe Storage, Including Any Incompatibilities: Keep container tightly closed. Store locked up. Store in a well ventilated place. Store away from incompatible materials.

Section 8 - Exposure Controls / Personal Protection

Occupational Exposure Limits (OELs):

Ingredients	OSHA PEL [1]	ACGIH TLV [2]	NIOSH REL [3]	IDLH [4]
Ammonia	50 ppm	25 ppm "STEL" 35 ppm	25 ppm "STEL" 35 ppm	300 ppm

NE - None Established

Notes:

1. OSHA PEL (Permissible Exposure Limit(s)) are 8-hour TWA (time-weighted average) concentrations unless otherwise noted. A ("C") designation denotes a ceiling limit, which should not be exceeded during any part of the working exposure unless otherwise noted. A Short Term Exposure Limit (STEL) is defined as a 15-minute exposure, which should not be exceeded at any time during a workday.
2. Threshold Limit Values (TLV) established by the American Conference of Governmental Industrial Hygienists (ACGIH) are 8-hour TWA concentrations unless otherwise noted. ACGIH TLVs are for guideline purposes only and as such are not legal, regulatory limits for compliance purposes.
3. The National Institute for Occupational Safety and Health Recommended Exposure Limits (NIOSH-REL) - Compendium of Policy and Statements. NIOSH, Cincinnati, OH (1992). NIOSH is the federal agency designated to conduct research relative to occupational safety and health. As is the case with ACGIH TLVs, NIOSH RELs are for guideline purposes only and as such are not legal, regulatory limits for compliance purposes.
4. The "immediately dangerous to life or health air concentration values (IDLHs)" are used by NIOSH as part of the respirator selection criteria and were first developed in the mid-1970's by NIOSH. The Documentation for Immediately Dangerous to Life or Health Concentrations (IDLHs) is a compilation of the rationale and sources of information used by NIOSH during the original determination of 387 IDLHs and their subsequent review and revision in 1994

Appropriate Engineering Controls: Local exhaust ventilation should be used to control the emission of air contaminants. General dilution ventilation may assist with the reduction of air contaminant concentrations. Emergency eye wash stations and deluge safety showers should be available in the work area.

Personal Protective Equipment (PPE): Use Personal protective equipment as required.

- **Respiratory Protection:** Seek professional advice prior to respirator selection and use. Follow OSHA respirator regulations (29 CFR 1910.134) and, if necessary, use only a NIOSH-approved respirator. Select respirator based on its suitability to provide adequate worker protection for given working conditions, level of airborne contamination, and presence of sufficient oxygen. Concentration in air of the various contaminants determines the extent of respiratory protection needed. Half-face, negative-pressure, air-purifying respirator equipped with an Ammonia/Methylamine filter is acceptable for concentrations up to 10 times the exposure limit. Full-face, negative-pressure, air-purifying respirator equipped with an Ammonia/Methylamine filter is acceptable for concentrations up to 50 times the exposure limit. Protection by air-purifying negative-pressure and powered air respirators is limited. Use a positive-pressure-demand, full-face, supplied air respirator or self contained breathing apparatus (SCBA) for concentrations above 50 times the exposure limit. If exposure is above the IDLH (Immediately dangerous to life or health) for any of the constituents, or there is a possibility of an uncontrolled release or exposure levels are unknown, then use a positive-demand, full-face, supplied air respirator with escape bottle or SCBA.

  Warning! Air-purifying respirators, both negative-pressure, and powered-air do not protect workers in oxygen-deficient atmospheres.

Protective Clothing/Equipment: Use Protective Equipment as Required

- **Eyes**: Wear eye protection/face protection. Chemical goggles, face shields or glasses should be worn to prevent eye contact. Contact lenses should not be worn where industrial exposure to this material is likely.
- **Skin**: Wear protective gloves/protective clothing. Take off contaminated clothing and wash before reuse. Contaminated work clothing should not be allowed out of the workplace. Wash thoroughly after handling. Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower.
- **Other Protective Equipment**: An eyewash fountain and deluge shower should be readily available in the work area.

Section 9 - Physical and Chemical Properties

Appearance and Odor: Colorless gas/liquid. Pungent characteristic odor
Odor Threshold: 46.8 ppm
Vapor Pressure at 20°C (60°F): 4802.9 (94 psi)
Vapor Density (Air = 1): 0.60
Formula Weight: ND
Density: ND
Specific Gravity (H_2O = 1, at 15.6°C): 0.62
pH: 11.6 for 1N soln.in water
Flash Point: ND
Auto-ignition Temperature: 651°C
Decomposition Temperature: Decomposes above 454°C
Partition Coefficient n-octanol/water: NA
Flammability (solid, gas): Not flammable
Explosive Properties: ND

Water Solubility: Highly Soluble
Fat Solubility: ND
Other Solubilities: ND
Boiling Point: - 28.1°F (-33.4°C)
Viscosity: ND
Refractive Index: ND
Surface Tension: ND
% Volatile by volume: 100%
Evaporation Rate: NA
Freezing Point: NA
Melting Point: -107.9°F(-77.7°C)
UEL: 28%
LEL: 15%
Oxidizing Properties: ND

NA - Not Applicable
ND - Not Determined for product as a whole

Section 10 - Stability and Reactivity

Reactivity: Not Determined (ND) for product as a whole.

Stability: Anhydrous Ammonia is stable under normal storage and handling conditions.

Polymerization: Hazardous polymerization will not occur.

Chemical Incompatibilities: Acids, aldehydes, alkylene oxides, amides, boron, boron halides, calcium, chlorine azide, chloric acid, chlorine monoxide, chlorites, halogens, and heavy metals.

Section 10 - Stability and Reactivity (continued)

Conditions to Avoid: Heat, incompatibles. May react violently with acids, aldehydes, alkylene oxides, amides, boron, boron halides, calcium, chlorine azide, chloric acid, chlorine monoxide, chlorites, halogens, heavy metals and many other materials.

Hazardous Decomposition/Combustion Products: May emit ammonia and oxides of nitrogen.

Sensitivity to Mechanical Impact: ND

Sensitivity to Static Discharge: ND

Section 11 - Toxicological Information

The following toxicity data have been determined for **Anhydrous Ammonia** using the information available for its components applied to the guidance on the preparation of a SDS under the requirements of the GHS:

a. LC_{50} or LD_{50} has been determined for the components:

- **Ammonia:** LC_{50}= 17,401 ppm/15min. (Inhalation Rat)

The above toxicity information was determined from available scientific sources to illustrate the prevailing posture of the scientific community. The scientific resources includes: The American Conference of Governmental Industrial Hygienist (ACGIH) Documentation of the Threshold Limit Values (TLVs) and Biological Exposure indices (BEIs) with Other Worldwide Occupational Exposure Values 2009, The International Agency for Research on Cancer (IARC), The National Toxicology Program (NTP) updated documentation, the World Health Organization (WHO) and other available resources, the International Uniform Chemical Information Database (IUCLID), European Union Risk Assessment Report (EU-RAR), Concise International Chemical Assessment Documents (CICAD), European Union Scientific Committee for Occupational Exposure Limits (EU-SCOEL), Agency for Toxic Substances and Disease Registry (ATSDR), Hazardous Substance Data Bank (HSDB), and International Programme on Chemical Safety (IPCS).

Section 12 - Ecological Information

Hazard Category: Category 1 Acute to the Aquatic Environment

Hazard Symbol: 

Signal Word: Warning

Hazard Statement: Very Toxic to aquatic life

Ecotoxicity: Anhydrous Ammonia is very toxic to aquatic life.

Mobility: No Information Found (NIF)

Persistence & Degradability: NIF

Bioaccumulative Potential: NIF

Note: The listing of regulations relating to a USS product may not be complete and should not be solely relied upon for all regulatory compliance responsibilities.

Section 13 - Disposal Considerations

Disposal: Dispose of contents/containers in accordance with federal, state and local regulations.

Container Cleaning and Disposal: Follow applicable federal, state and local regulations. Observe safe handling precautions. European Waste Catalogue 16-03-05 (organic wastes containing dangerous substances)

Please note this information is for Anhydrous Ammonia in its original form. Any alterations can void this information.

Section 14 - Transport Information

DOT Transportation Data (49 CFR 172.101):

U.S. Department of Transportation (DOT), under 49 CFR 172, regulates **Anhydrous Ammonia** as a hazardous material. All federal, state, and local laws and regulations that apply to the transport of this type of material must be adhered to.

Shipping Name: Ammonia, Anhydrous	**Packaging Authorizations**	**Quantity Limitations**
Shipping Symbols: D	**a) Exceptions:** None	**a) Passenger Aircraft or Railcar:** Forbidden
Hazard Class: 2.2	**b) Non-bulk:** 304	**b) Cargo Aircraft Only:** Forbidden
UN No UN1005	**c) Bulk:** 314, 315	**Vessel Stowage Requirements**
Packing Group: NA		**a) Vessel Stowage:** D
DOT/ IMO Label: Nonflammable Gas		**b) Other:** 40, 57
Special Provisions (172.102): 13, T50		**DOT Reportable Quantities**: 100 lb

The International Maritime Dangerous Goods (IMDG) and the Regulations Concerning the International Carriage of Dangerous Goods by Rail (RID) classification, packaging and shipping requirements follow the US DOT Hazardous Materials Regulation.

ADR – Regulations Concerning the International Carriage of Dangerous Goods by Road regulates **Anhydrous Ammonia** as a hazardous substance.

Shipping Name: Ammonia, Anhydrous	**Packaging**	**Portable Tanks & Bulk Containers**
Classification Code: 2.3	**a) Packing Instructions:** P200	**a) Instructions:** T50
UN No.: UN1005	**b) Special Packing Provisions:** NA	**b) Special Provisions:** NA
Packing Group: NA	**c) Mixed Packing Provisions:** NA	
ADR Label: Poison Gas, Corrosive		
Special Provisions: 23		
Limited Quantities: 0		

Section 14 - Transport Information (continued)

IATA – International Air Transport Association (IATA) regulates **Anhydrous Ammonia** as a hazardous substance.

Shipping Name: Ammonia, Anhydrous **Class/Division:** 2.3 (8) **Hazard Label (s):** NA **UN No.:** UN1005 **Packing Group:** NA **Excepted Quantities (EQ):** NA	**Passenger & Cargo Aircraft - FORBIDDEN** **Limited Quantity (EQ)**		**Cargo Aircraft Only FORBIDDEN** **Pkg Inst:** NA **Max Net Qty/Pkg:** NA	**Special Provisions:** A2 **ERG Code:** 2CP
	Pkg Inst: NA **Max Net Qty/Pkg:** NA	**Pkg Inst:** NA **Max Net Qty/Pkg:** NA		

Pkg Inst – Packing Instructions Max Net Qty/Pkg – Maximum Net Quantity per Package ERG – Emergency Response Drill Code

Transport Dangerous Goods (TDG) Classification: Anhydrous Ammonia has a TDG classification of 2.3 Toxic Gas

Section 15 - Regulatory Information

Regulatory Information: *The following listing of regulations relating to an U. S. Steel product may not be complete and should not be solely relied upon for all regulatory compliance responsibilities.*

This product and/or its constituents are subject to the following regulations:

OSHA Regulations: Exposures are regulated under OSHA Air Contaminants Standard (29 CFR1910.1000 Table Z-1) for individual components. Refer to Section 8, Exposure Controls and Personal Protection

EPA Regulations: Anhydrous Ammonia is listed in the following regulatory listings: CAA, CERCLA (100 lbs.), SARA

SARA Potential Hazard Categories: Immediate Acute Health Hazard; Delayed Chronic Health Hazard

Section 313 Supplier Notification: Anhydrous Ammonia is subject to the reporting requirements of section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 and 40 CFR part 372:

CAS #	Chemical Name	Percent by Weight
7664-41-7	Anhydrous Ammonia	99.5

TSCA: Anhydrous Ammonia is listed on the inventory

Regulations Key:

CAA	Clean Air Act (42 USC Sec. 7412; 40 CFR Part 61 [As of: 8/18/06]), No ingredients are listed.
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act (42 USC secs. 9601(14), 9603(a); 40 CFR Sec. 302.4, Table 302.4, Table 302.4 and App. A)
CWA	Clean Water Act (33 USC Secs. 1311; 1314(b), (c), (e), (g); 136(b), (c); 137(b), (c) [as of 8/2/06])
RCRA	Resource Conservation Recovery Act (42 USC Sec. 6921; 40 CFR Part 261 App VIII)
SARA	Superfund Amendments and Reauthorization Title III Section 302 Extremely Hazardous Substances (42 USC secs. 11023, 13106; 40 CFR Sec. 372.65) and Section 313 Toxic Chemicals (42 USC secs. 11023, 13106; 40 CFR sec. 372.65 [as of 6/30/05])
TSCA	Toxic Substance Control Act (15 U.S.C. s/s 2601 et seq. [1976])
SDWA	Safe Drinking Water Act (42 U.S.C. s/s 300f et seq. [1974])

State Regulations: The product, **Anhydrous Ammonia** is listed in the following state regulations:

Pennsylvania Right to Know: Listed

California Prop. 65: Not Listed

New Jersey: Listed

Minnesota: Listed

Massachusetts: Listed

Other Regulations:

WHMIS Classification (Canadian): Ammonia is classified as A, B, D1A, E with a disclosure at 1.0%

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all the information required by the Controlled Products Regulations.

Section 16 - Other Information

Prepared By: United States Steel Corporation

Revision History:

03/21/11 – Update of content and format to comply with GHS

Hazardous Material Identification System (HMIS) Classification

Health Hazard	3
Fire Hazard	1
Physical hazards	0

HEALTH= **3** (Major injury likely unless prompt action is taken and medical treatment is given.).

FIRE= **1**, Materials that must be preheated before ignition will occur.

PHYSICAL HAZARDS = **0**, Materials that are normally stable, even under fire conditions, and will not react with water, polymerize, decompose, condense, or self-react. Non-explosives.

National Fire Protection Association (NFPA)

HEALTH = 3 (Short exposure could cause serious temporary or residual injury even though prompt medical attention was given.)

FIRE = **1,** Must be preheated before ignition can occur.

INSTABILITY = **0**, Normally stable, even under fire exposure conditions, and are not reactive with water.

Disclaimer: This information is taken from sources or based upon data believed to be reliable. However, United States Steel Corporation makes no warranty as to the absolute correctness or sufficiency of any of the foregoing or that additional or other measures may not be required under particular conditions.