GUIDELINES FOR THE LOCATION OF STATIONARY BULK AMMONIA STORAGE FACILITIES

In accordance with Part 1, Section 4 of the Clean Air (General) Regulations, being Alberta Statute 216/75, the Department of the Environment hereby issues

GUIDELINES FOR THE

LOCATION OF STATIONARY BULK AMMONIA STORAGE FACILITIES

Prepared by:

Alberta Environment

Standards and Approvals Division

May, 1977

Third Issue August, 1982

FOREWORD

This publication is intended to assist owners, operators and local approval authorities in locating new stationary ammonia storage facilities* with a view to eliminating the possibility of the public becoming exposed to harmful concentrations of ammonia. Existing facilities should be upgraded to include as many of the guideline recommendations as possible.

The minimum distance recommendations should generally be complied with in locating new tanks; however, they are recommendations only and as such, the final decision as to siting rests with the development approval authorities.

No approvals are necessary from Alberta Environment unless an individual installation has been specifically notified otherwise pursuant to section 3(1)(g) of the Alberta Clean Air Act.

* These guidelines do not apply to ammonia storage facilities which incorporate separate continuous vapor recovery systems. These facilities must, however, apply under the provisions of The Clean Air Act.

Normal operation of an ammonia storage facility should not result in any emissions; however, if ammonia is being emitted for some reason, causing a pollution problem, the Department will initiate enforcement action.

This document also includes a summary of the properties of ammonia, a brief description of the agencies and authorities from which approvals are required, and a brief reference list for additional information.

INTRODUCTION

Application for approval of the construction and location of bulk ammonia storage facilities must be made to all of the following agencies:

(1) The local hamlet, village, town or city council or authority if the facility is to be located within an urban boundary.

(2) The local county authority if the facility is to be located in a rural area.

(3) The local Regional Planning Commission or the Planning Branch of the Alberta Department of Municipal Affairs, if land re-zoning is necessary.

(4) The Railway Transport Commissioners of the Canadian Transport Commission if the facility is to be located on the right-of-way owned or leased by any railway company subject to the jurisdiction of the Canadian Transport Commission.[1]

(5) Alberta Transportation if access to roads or highways is required.

Other agencies, such as Alberta Department of Agriculture may also have an interest but approvals are not required.

PROPERTIES OF AMMONIA

"Ammonia is a natural constituent of the atmosphere but exists in concentrations below the level which is hazardous to humans, animals, plants or materials. High concentrations of ammonia gas are corrosive to mucous membranes; can cause damage to the eye, throat and upper respiratory tract; and can produce residual damage and even death to humans and animals. High concentrations are also toxic to most plant life and have corrosive effects on materials."[2]

20 μg/m (0.027 ppm)[3]	-	average atmospheric background concentration.
30 - 36,000 μg/m^3 (.04 - 50 ppm)	-	odor threshold.
1.44 mg/m^3 (2.0 ppm)	-	maximum one hour atmospheric concentration limit used by the Department of the Environment for design of a plant emitting ammonia on a continuous or semi-continuous basis if a buffer area is available. A limit of 0.50 ppm may be desirable if a surrounding buffer is not possible.
18 mg/m^3 (25 ppm)	-	threshold limit value to which it is believed workers may be exposed continuously for 8 hours without adverse effects[3].
280 - 490 mg/m^3 (390 - 680 ppm)	-	concentration range where NH_3 gas produces eye, nose and throat irritation and may injure respiratory mucous.
360 mg/m^3 (500 ppm)	-	suggested maximum short-term atmospheric concentration due to uncontrolled release of ammonia resulting from equipment failure, safety valves discharging or any other single release.

1,700 - 4,500 mg/m^3 (2,360 - 6,250 ppm)	-	concentration range in which NH_3 acts as an asphyxiant.
above 4,500 mg/m^3	-	fatal.

Solid, liquid and gaseous ammonia are colorless. Gaseous ammonia is lighter than air and will rise.* The flammable limits of ammonia are from 15% to 25% by volume in air; however, ammonia is difficult to ignite in spite of this. Gaseous ammonia will dissolve readily in water at a rate of approximately 700 volumes/volume of water.

Melting point : -77.4◦C
Boiling point: -33.4◦C
Density: 0.677 g per c.c.

* Due to the chilling effect of evaporation, ammonia vapor resulting from a large spill may move down-wind as a visible cloud some distance before dissipating or rising.

RECOMMENDATIONS

(1) The following separations should be maintained:

Nominal Capacity of Tank		Min. Distance From Tank to Residential Buildings* Meters (Feet)
Litres	(Gallons)	
over 2770 to 9090	(500 to 2,000)	75 (250)
over 9,090 to 90,900	(2,000 to 20,000)	150 (500)
over 90,900 to 136,400	(20,000 to 30,000)	230 (750)
over 136,400 to 454,600	(30,000 to 100,000)	300 (1,000)
over 454,600	(over 100,000)	380 (1,250)
* Isolated residences where occupant has an influence over the location of the tank (i.e. from whom land is bought or leased) are excluded. Two or more tanks - use capacity of largest tank.		

If the recommended distances cannot be met, provisions for a high pressure water spray, which may be directed on any possible point of ammonia emissions to the atmosphere, should be included in the design.

(2) Provisions should be included in the design such that displaced vapors from tanks are not emitted to the atmosphere during loading or unloading operations. Design operating details should be submitted.

(3) Any hose used for loading or unloading should have a shut-off valve as close to the discharge point as possible. Any ammonia remaining in the liquid ammonia hose after transfer operations should be absorbed in water such that it is not discharged to the ground or atmosphere in an uncontrolled manner.

(4) The manner in which unauthorized personnel will be prevented from causing vandalistic emissions of ammonia; for example, fencing and locked gate.

PROHIBITIONS

(1) Purging of any tank which has contained or contains liquid ammonia such that ammonia-containing gases are vented directly to the atmosphere is prohibited. Purging on-site may be approved if appropriate facilities are available.

(2) "The transfer of anhydrous ammonia between a tank car located on the right-of-way of a railway subject to the jurisdiction of the Board and any vessel other than a permanently installed storage tank of sufficient capacity to receive the entire contents of the tank car is prohibited..." The Railway Transport Commissioners of The Canadian Transport Commission, General Order No. 0-33.

(3) Temporary facilities not within the jurisdiction of the Board should not be operated for more than 1 year and only long enough to establish market conditions.

REFERENCES

1. The Railway Transport Commissioners of the Canadian Transport Commission, General Order No. 0-33.

2. "Air Pollution Aspects of Ammonia" prepared for the National Air Pollution Control Administration (U.S.) by S. Miner.

3. "Threshold Limit Values for 1973", 35th Annual Meeting of the American Conference of Governmental Industrial Hygienists, Boston, Mass.

4. Government of the Province of Alberta, The Clean Air Act.

5. Agricultural Nitrogen Institute - "Standards for the Storage and Handling of Agricultural Anhydrous Ammonia".