U.S. Department
of Transportation

**Research and
Special Programs
Administration**

400 Seventh Street, S.W.
Washington, D.C. 20590

DEC 3, 1998

Ref. No. 98-0139

Mr. William R. Fink
Packaging Engineer
Air Products and Chemicals
Specialty Gas Department
R.R. #1, P.O. Box 351
Tamaqua, PA 18252

Dear Mr. Fink:

This is in response to your letter, dated June 9, 1998, requesting clarifications of the definition of rare gases and the use of singular or plural form of proper shipping names under the Hazardous Materials Regulations (HMR; 49 CFR Parts 171-180). Your questions are paraphrased and answered as follows:

Q1. What rare gases are included when describing the proper shipping names "Rare gases and nitrogen mixtures, compressed", "Rare gases and oxygen mixtures, compressed", and "Rare gases mixtures, compressed"? Does your Office concur with the Compressed Gas Association (CGA) definition of rare gases as specified in the CGA Handbook of Compressed Gases, Third Edition?

A1. Although the CGA Handbook of Compressed Gases is not incorporated by reference in the HMR, this Office agrees that Argon, Helium, Neon, Krypton, and Xenon are rare gases. Also, this position is supported by Table 2-14 of the International Civil Aviation Organization (ICAO) Technical Instructions for the Safe Transport of Dangerous Goods by Air which lists the entry "Rare gases mixture, compressed (e.g. argon; helium; krypton; neon; xenon)".

Q2. Do you agree with the proper shipping names selected for the gas mixtures described in our four examples?

A2. Section 172.101 provides that the name which most appropriately describes the mixture shall be used. Note that § 172.203(k)(1) provides that all shipping descriptions for poisonous materials for which the proper shipping name does not specifically identify the poisonous constituent shall have the technical name of the constituent entered in parentheses in association with the basic description. Also, § 172.203(k)(2) provides that the technical names of at least two components predominantly contributing to the hazards of a mixture shall be entered in parentheses in association with the basic description.

The following proper shipping names have been selected based on the four scenarios you provided. Examples A and B are proper shipping names only, while Examples C and D are proper shipping names and required additional information specified in §§ 172.202(k)(3) and 172.203(m)(3), respectively.

Example	Components	Shipping Name
A	1% xenon 10% neon 89% nitrogen	Rare gases and nitrogen, compressed
B	1% xenon 99% nitrogen	Rare gas and nitrogen, compressed
C	1% fluorine 10% neon 9% krypton 71% helium	Compressed gases, n.o.s. (helium, neon)
D	10% fluorine 10% neon 9% krypton 71% helium	Compressed gases, toxic, n.o.s. (fluorine, helium) *Inhalation Hazard Zone C*

Fluorine, compressed is listed by name in the § 172.101 Table and is identified as poisonous by inhalation in hazard zone A, as referenced by Special Provision 1 in column 7. The hazard zone for a mixture of fluorine and other components is determined from the criteria in § 173.116(a), based on the LC50 calculated using the formula in § 173.133(b)(1)(i). The CGA publication, Pamphlet P-20, "Standards for Classification of Toxic Gas Mixtures", lists Fluorine in pure form as having an LC50 of 185 parts per million. A gas mixture with a concentration of fluorine greater than or equal to 6.17%, but less than 18.50%, would be described as an inhalation hazard zone C. Therefore, the gas mixture you describe in Example D, containing 10% fluorine, would be described as an inhalation hazard zone C, and not A, as you indicated. Although not incorporated by reference in the HMR, this Office takes no exception to the criteria in CGA Pamphlet P-20 relative to the classification of toxic gas mixtures.

Q3. Are we permitted to use the singular or plural form of the various "rare gases" proper shipping names when describing these mixtures?

A3. Section 171.101(c)(1) authorizes the use of proper shipping names in the singular or plural. For example, the § 172.101 Table lists the entry, "Rare gases and oxygen mixture". A mixture containing a single rare gas and oxygen would be described as "Rare gas and oxygen mixture".

I hope this satisfies your inquiry. If you need additional assistance please do not hesitate to contact us.

Sincerely,

Hattie L. Mitchell

Hattie L. Mitchell, Chief
Regulatory Review and Reinvention
Office of Hazardous Materials Standards

Stevens
File 172.101 R
Rare gases

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AIR PRODUCTS

U.S. Department of Transportation
Director of Hazardous Materials Standards
Mr. Ed Mazzullo
400 7th Street, SW
Washington, DC 20590-0001

9 June 1998

Mr. Ed Mazzullo,

Air Product and Chemicals is requesting that the following proper shipping names, be clearly define by the department;

a) Rare gases and Nitrogen mixtures, compressed
b) Rare gases and Oxygen mixtures, compressed
c) Rare gases, mixtures, compressed

There are two issues that the use of the proper shipping names listed above present Air Products and Chemicals with; 1) the definition of a rare gas- Air Products is using as its reference the "Handbook of Compressed Gases", Third Edition, pg. 549 (attached) where the handbook defines Krypton, Neon and Xenon as each being a rare gas. Does the DOT concur with the handbook with respect to this definition? 2) The use of the word "gases" in the proper shipping name is plural, thus Air Products is interpreting that more than one rare gas needs to be present in a gas mixture to use the proper shipping name "Rare gases..., compressed". Perhaps this is best explained by using some examples.

Example A

1% Xenon
10% Neon
89% Nitrogen

Since example A contains two rare gases the proper shipping name is,
Rare gases and Nitrogen, compressed

Example B

1% Xenon
99% Nitrogen

Since example B contains only one rare gas the proper shipping name is,
Compressed gases, n.o.s. (Xenon, Nitrogen)

Example C

1%Fluorine
10% Neon
9% Krypton
80% Helium

Since example C contains two rare gases and Fluorine is not considered a toxic gas at the 1% level per the guidelines of CGA Pamphlet P-20, Standard for Classification of Toxic Gas Mixtures, the proper shipping name is,
Rare Gases, mixture, compressed

Example D

10% Fluorine
10% Neon
9% Krypton
71% Helium

Since Example D contains 10% Fluorine the mixture is now classified as,
Compressed gases, toxic, n.o.s. (Fluorine, Neon, Krypton, Helium) Inhalation Hazard Zone A B

C bec 10/8/98

Please note the DOT's consistent use of the plural to indicate more than one gas is present. It is upon this basis that Air Products is interpreting the term "Rare gases..." to mean more than one rare gas must be present in a mixture for the mixture to have the proper shipping name, "Rare gases..., compressed".

Should you or your staff have any questions please feel free to call me at 717-467-4308.

I will look forward to your response.

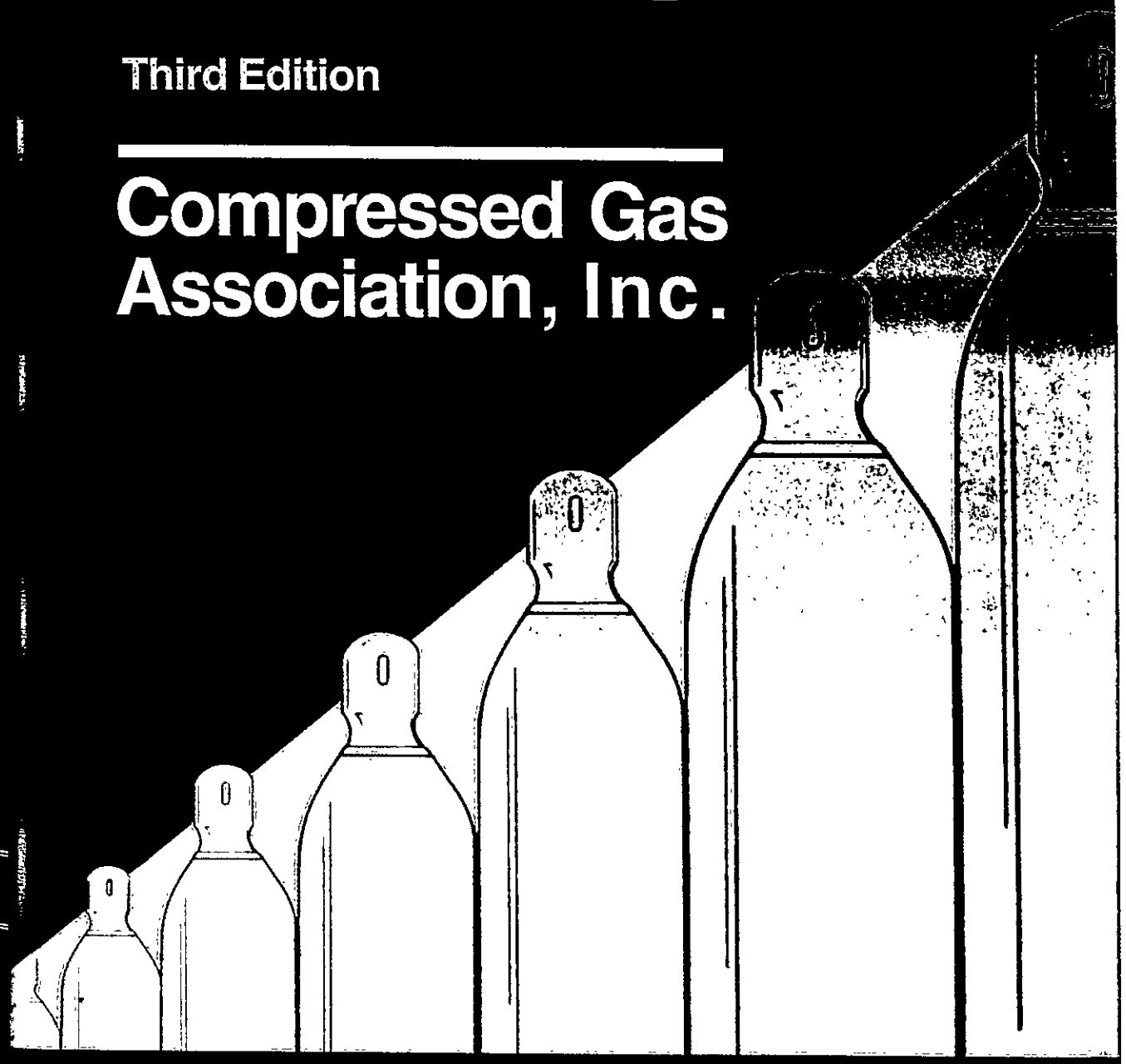
Sincerely,

William R. Fink
Packaging Engineer
Air Products and Chemicals

HANDBOOK OF COMPRESSED GASES

Third Edition

Compressed Gas Association, Inc.



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Rare Gases: Krypton, Neon, Xenon

	Krypton	Neon	Xenon
Chemical Symbol:	Kr	Ne	Xe
CAS Registry Number:	7439-90-9	7440-01-9	7440-63-3
DOT Classification:	Nonflammable gas	Nonflammable gas	Nonflammable gas
DOT Label:	Nonflammable gas	Nonflammable gas	Nonflammable gas
Transport Canada Classification:	2.2	2.2	2.2
UN Number:			
(compressed gas):	UN 1056	UN 1065	UN 2036
(refrigerated liquid):	UN 1970	UN 1913	UN 2591

PHYSICAL CONSTANTS

Krypton

	U.S. Units	SI Units
Chemical formula	Kr	Kr
Molecular weight	83.80	83.80
Density of the gas at 70°F (21.1°C) and 1 atm	0.2172 lb/ft^3	3.479 kg/m^3
Specific gravity of the gas at 70°F (21.1°C) and 1 atm (air = 1)	2.899	2.899
Specific volume of the gas at 70°F (21.1°C) and 1 atm	4.604 ft^3/lb	0.287 m^3/kg
Boiling point at 1 atm	−244.0°F	−153.4°C
Melting point at 1 atm	−251°F	−157°C
Critical temperature	−82.8°F	−63.8°C
Critical pressure	798.0 psia	5502 kPa abs
Critical density	56.7 lb/ft^3	908 kg/m^3
Triple point	−251.3°F at 10.6 psia	−157.4°C at 73.2 kPa abs
Latent heat of vaporization at boiling point	46.2 Btu/lb	107.5 kJ/kg
Latent heat of fusion at triple point	8.41 Btu/lb	19.57 kJ/kg
Specific heat of the gas at 70°F (21.1°C) and 1 atm		