

**BY ORDER OF THE COMMANDER
71ST FLYING TRAINING WING (AETC)**

**VANCE AIR FORCE BASE INSTRUCTION
48-105**



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Aerospace Medicine

***EMERGENCY MANAGEMENT OF
PERSONNEL EXPOSED TO HYDRAZINE***

COMPLIANCE WITH THIS PUBLICATION IS MANDATORY

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(Colonel Douglas B. Curry)

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This instruction implements and extends the guidance of Air Force Policy Directive (AFPD) 48-1, Aerospace Medicine Program, 3 October 2005. It prescribes the policies and procedures for the emergency and follow-up treatment of personnel exposed to Hydrazine (Hz). This instruction requires collecting and maintaining information protected by the Privacy Act of 1974 authorized by 10 U.S.C. 55, 10 U.S.C. 8013, 29 CFR 1960, and E.O. 9397. System of records notice F044 AF SG E, Medical Records System and F044 AF SG R, Reporting of Medical Conditions of Public Health and Military Significance, applies. Ensure that all records created as a result of processes prescribed in this publication are maintained in accordance with Air Force Manual (AFMAN) 33-363, Management of Records, and are disposed of in accordance with the Air Force Records Information Management System (AFRIMS) Air Force Records Disposition Schedule (RDS) located at <https://www.my.af.mil/afrims/afrims/afrims/rims.cft>. Refer recommended changes and questions about this publication to the Office of Primary Responsibility (OPR) using the AF Form 847, Recommendation for Change to Publication; route AF Form 847 from the field through the Vance AFB Publications and Forms Manager. (AF Form 847 is prescribed in AFI 11-215, USAF Flight Manuals Program [FMP]. Refer to that publication for guidance on filling out the form.)

SUMMARY OF CHANGES

Added AFMAN 48-155, Occupational and Environmental Health Exposure Controls, 1 October 2008 to References.

1. General information:

1.1. Hydrazine Toxicology: Hz (HxNxHx) is potentially toxic to the liver and kidney and is dangerous on exposure by inhalation, ingestion, or topical contact. The toxicity of Hz to biological systems requires prompt and effective action when accidental exposure occurs. It is a central nervous system depressant in large doses and a powerful reducing agent that causes burns to exposed skin and irritation to the lungs. Typically, one sees dermatitis, conjunctivitis, or inflamed mucous membranes within minutes of acute exposure. Pneumonitis or pulmonary edema may also develop, but not without obvious burns of the pharynx or nose. Pulmonary edema may be delayed four to eight hours. Sufficient exposure may produce blindness, while massive exposure may lead to convulsions. Chronic exposure to low levels of Hz (5-50 ppm) for long periods (5 hours/day x 30-60 days) may lead to liver, kidney, and blood disorders.

1.2. H-70 is composed of 70% Hz, 30% water and has a slight ammonia-like odor which becomes more apparent when burned. Approximately 40% of the combustion bi-products of Hz are ammonia.

1.3. Hz Occupational Exposure Limit (OEL): The Air Force follows the American Conference of Governmental Industrial Hygienists (ACGIH) threshold limit value time weighted average exposure guidelines of 0.01 parts per million (ppm). This is a concentration that nearly all workers may be repeatedly exposed to for eight hours per day, five days a week, without adverse effect.

1.3.1. Adverse effects of Hz exposure include:

1.3.1.1. Central Nervous System: When exposed to large doses, Hz can cause central nervous system depression.

1.3.1.2. Respiratory System: Inhalation can cause pulmonary edema and or irritation to the nose and throat.

1.3.1.3. Kidneys: When exposed to large doses, nonspecific injury may result.

1.3.1.4. Skin: When exposed to large doses, irritation, severe dermatitis, or penetrating burns may result.

1.3.1.5. Ocular: Hz is a powerful corrosive agent; the vapor is highly irritating and may cause delayed eye irritation. Permanent corneal lesions may result if the liquid has splashed into the eyes.

1.3.1.6. Carcinogenesis: Adenocarcinoma of the liver and lungs has been reported in animal studies.

2. Exposures:

2.1. Exposure: Potential for vapor inhalation or direct skin contact with liquid exists during F-16 emergency power unit (EPU) servicing, F-16 crash recovery, Hz drum and tank handling. Potential exposure also exists during leakage from Hz transfer lines inside the Hz storage facility.

2.1.1. During F-16 pre-launch check out, vapor inhalation can occur if the EPU is fired accidentally. A trace amount of Hz vapor may be present in the exhaust for the first few minutes of operation as the EPU heats up. An Hz vapor concentration of 0.24 ppm has been measured at approximately 12 inches from the exhaust duct. Only catastrophic

mechanical malfunction during pre-launch could result in potential for contact with liquid Hz. In-flight firings of the EPU present no hazard from EPU exhaust for recovery personnel, as all Hz is consumed.

2.2. Exposure scenarios requiring intervention:

2.2.1. Any individual without proper personal protective equipment (PPE) in an area where vapor levels of Hz are measured or estimated by Bioenvironmental Engineering (BE) or other trained response personnel to be above the OEL.

2.2.2. Any person without PPE that has been engulfed by a visible cloud of EPU exhaust. CAUTION: The visible exhaust is not Hz. Flightline workers and emergency response personnel are taught that if they smell ammonia, they have been exposed to Hz. Direct exposure to EPU exhaust is primarily an exposure to ammonia vapor and is not considered a medically significant exposure to Hz. A worker can be exposed to 0.2 ppm of Hz vapor for at least 25 minutes before exceeding the OEL. Only in the event of contact with liquid is it necessary to decontaminate the exposed worker. The on-scene flight surgeon will decide if decontamination is needed. It is also very important to determine whether the workers were directly contaminated by exhaust of an activated EPU and for how long, or whether they were only in the area and smelled ammonia briefly.

2.2.3. A pilot or other individual found or suspected to have been contaminated with Hz in the cockpit (not breathing 100% oxygen).

2.2.4. Any individual suspected by a physician to have been exposed to Hz by any route.

2.2.5. Any individual to whom the criteria above does not apply, but nevertheless complains of dizziness, nausea, burning skin or mucous membranes, lacrimation, or coughing and believes the symptoms may be related to Hz exposure.

3. Incident response:

3.1. Responsibilities:

3.1.1. Fire Department personnel normally make the initial response to any hydrazine incident site. Standard procedures are already in place. When needed for decontamination, Fire Department personnel will provide a rinse water reservoir, such as a child's plastic wading pool, 5-gallon plastic buckets for draining the pool after neutralization, and four to six gallons of household bleach.

3.1.2. The fire chief, as on-scene commander, may request additional forces. Medical Group activities (i.e., Bioenvironmental Engineering (BE), flight surgeon, etc.) will respond as directed.

3.1.3. If needed, the Environmental Program manager will provide one or more 25-30 gallon plastic DOT drums and a drum dolly for removing treated water from the decontamination site. Environmental personnel will also provide on-scene disposal guidance.

3.1.4. If needed, BE will also provide air sampling to determine when the Hz has been neutralized and guidance/assistance with the decontamination and neutralization process.

3.1.5. Personnel responding to the incident will move exposed workers to a safe location, 80 - 160 feet upwind of the incident site. DO NOT DELAY REMOVAL OF ANY CLOTHING CONTAMINATED WITH LIQUID HZ.

3.2. Non-Medical Actions:

3.2.1. On-scene decontamination of an exposed worker will be accomplished when:

3.2.1.1. The worker had direct skin (or clothing) contact with liquid HZ.

3.2.1.2. The worker believes he or she had direct contact with HZ.

3.2.1.3. The on-scene commander decides decontamination is needed. Once a decision to decontaminate is made, under no circumstances will the patient be transported without first being decontaminated on scene. At isolated outside areas, the fire chief can dispatch a Fire Department vehicle and team to hose down the patient.

3.2.2. Remove all contaminated clothing, including boots. Wash the patient with mild soap (if available), flush with water for 15 minutes, and then turn the patient over to on-scene medical personnel.

3.2.3. On scene personnel will mix two to three gallons of bleach into the drum of wash water and add any items suspected of contamination (to include clothing and personal articles). After mixing, BE will test to determine whether additional bleach is needed to complete the HZ neutralization.

3.2.4. The owning squadron will provide labor to assist as directed by the on-scene commander. The squadron will also assist environmental management in disposal actions and take possession of decontaminated clothing.

3.3. Medical Actions:

3.3.1. Treatment is symptomatic for convulsion. Diazepam or a short-acting barbiturate may be indicated, with due regard for the CNS depressant effect of hydrazine. The use of pyridoxine (Vitamin B6) in advance of CNS involvement is controversial. It does not appear to be helpful in prophylaxis of CNS symptoms.

3.3.2. Admit any patient with shortness of breath, burns of the pharynx or nose, ingestion of liquid HZ or severe skin burns to the hospital. The main concern is the possibility of delayed pulmonary edema.

3.3.3. CAUTION: Exposure to EPU exhaust should be treated as an exposure to ammonia.

3.3.4. Laboratory -- Unless otherwise directed by the treating physician, the following tests will be performed on all suspected, symptomatic or actual exposures to skin, vapor or ingestion:

3.3.4.1. Immediately obtain specimens for: Aspartate transaminase (AST), Alanine amino-transferase (ALT), Gamma Glutamyl Transferase (GGT), Complete Blood Count (CBC) and Differential (Diff) Urinalysis (UA) with Microscopic (Micro) evaluation. Perform and record a pulmonary function test. Obtain posterior-anterior and lateral chest X-rays (physician discretion).

- 3.3.4.2. At 24 hours and seven days post exposure (fasting state) repeat: AST, ALT, GGT, CBC, and Diff and UA with micro.
- 3.3.4.3. Repeat abnormal results.
- 3.3.4.4. At physician's discretion, patients with minor skin burns or conjunctival irritation may be followed as outpatients. An individual with no physical signs or symptoms and or laboratory evidence of adverse effect may return to work associated with possible Hz exposure at physician's discretion. Otherwise healthy personnel with minor liver function test deviations that return to normal values within 48 hours can be returned to work with Hz no sooner than 72 hours from exposure. In this situation, follow up liver function tests should be performed monthly for three months.
- 3.3.4.5. All follow-up treatment, analysis of laboratory tests, and definitive care will be administered by a flight surgeon. Return-to-work determination for personnel with chronic Hz exposure and abnormal liver, kidney, or hematologic tests will be determined by the senior flight surgeon, the Commander, 71st Medical Group, or HQ AETC/SGP.
- 3.3.5. All Hz exposures resulting in illness for active duty personnel will be reported on AF Form 190, Occupational Illness/Injury Report.

RUSSELL L. MACK, Colonel, USAF
Commander, 71st Flying Training Wing

Attachment 1**GLOSSARY OF REFERENCES AND SUPPORTING INFORMATION*****References***

AFPD 48-1, Aerospace Medical Program, 3 October 2005

AFMAN 33-363, Management of Records, 1 March 2008

AFI 48-101, Aerospace Medical Operations, 19 August 2005

AFI 48-145, Occupational and Environmental Health Program, 5 March 2008

AFMAN 48-155, Occupational and Environmental Health Exposure Controls, 1 October 2008

ACGIH Threshold Limit Values for Chemical Substances and Physical Agents Biological Exposure Indices

Adopted Forms

AF Form 190, Occupational Illness/Injury Report

AF Form 847, Recommendation for Change of Publication

Abbreviations and Acronyms

ACGIH—American Conference of Governmental Industrial Hygienists

AETC—Air Education Training Command

AF—Air Force

AFB—Air Force Base

AFPD—Air Force Policy Directive

AFMAN—Air Force Manual

AFRIMS—Air Force Records Information Management System

ALT—Alanine amino-transferase

AST—Aspartate Transaminase

BE—Bioenvironmental Engineering

CBC—Complete Blood Count

Diff—Differential

EPU—Emergency Power Unit

FMP—Flight Manuals Program

GGT—Gamma Glutamyl Transferase

HQ—Head Quarters

Hz—Hydrazine

Micro—Microscopic

OEL— Occupational Exposure Limit

OPR—Office of Primary Responsibility

PPE—Personal Protective Equipment

ppm—parts per million

RDS—Records Disposition Schedule

UA—Urinalysis